Long-Term Environmental Management Plan

Moorebank Precinct West (MPW)

Prepared for: Qube Property Management Services Pty Ltd

EP1489.001 v12 27 October 2020

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

Long-Term Environmental Management Plan

Moorebank Precinct West Site, 400 Moorebank Avenue, Moorebank, NSW

Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd
Via email: mhowley@tacticalgroup.com.au

27 October 2020

Our Ref: EP1489.001_MPW LTEMP v12

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Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
AF	Asbestos Fines	AF includes free fibres, small fibre bundles and small fragments of bonded ACM that pass through a 7 mm x 7mm sieve. Equivalent to "friable" asbestos in SafeWork NSW *Code of Practice: How to Manage and control asbestos in the workplace* (SafeWork NSW 2019).
AHD	-	Australian Height Datum
Ammunition	Ammunition	A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial, or other non-operational purposes.
AMP	Asbestos Management Plan	See **(Golder 2016b).**
AOC	Area of Concern	An area identified as containing potential contamination. Can also be referred to as Quarantined Area.
As	-	Arsenic
BGS	-	Below Ground Surface
BioBanking Agreement Area	See also Offset Area	Vegetated areas which are to be conserved and no construction to occur.
Bonded ACM	Bonded Asbestos Containing Materials	Bonded ACM comprises ACM, which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. This term is restricted to material that cannot pass a 7 mm x 7mm sieve. Equivalent to "non-friable" asbestos in SafeWork NSW *Code of Practice: How to Manage and control asbestos in the workplace* (SafeWork NSW 2019).
BTEX	-	Benzene, Toluene, Ethylbenzene and Xylenes
Cd	-	Cadmium
CLM	-	Contaminated Land Management
CMP	Contamination Management Plan	EP Risk 2020
CoC	Conditions of Consent	Conditions of Consent SSD 5066
Conservation Area	Same as BioBanking Area	See BioBanking Area
Construction Area	-	Extent of construction works, namely areas to be disturbed during the construction of the Site.
COPC	-	Contaminants of Potential Concern
Cr	-	Chromium
CSM	-	Conceptual Site Model
Cu	-	Copper
DBYD	-	Dial Before You Dig
DNAPL	-	Dense Non-Aqueous Phase Hydrocarbons
DPI&E	-	NSW Department of Planning, Industry and Environment
DQI	-	Data Quality Indicator
DQO	-	Data Quality Objective
DSI	-	Detailed Site Investigation
DUXOP	Defence Unexploded Ordnance Panel	The panel of contractors and consultants from whom the Department of Defence selects remembers for UXO related tasks

Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
EEC	Endangered Ecological Communities	Vegetated areas inaccessible during SSD 5066 development works. Located within both the Construction and Offset Areas.
EIL	-	Ecological Investigation Level
EO	-	Explosive Ordnance
EOW	-	Exploded Ordnance Waste
EPA	-	Environment Protection Authority
ESL	-	Ecological Screening Level
FA	Fibrous Asbestos	FA comprises friable asbestos material and includes severely weather cement sheet, insulation products and woven asbestos material. Defined as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Equivalent to "friable" asbestos in SafeWork NSW *Code of Practice: How to Manage and control asbestos in the workplace* (SafeWork NSW 2019).
Ha	-	Hectares
HCB	-	Hexachlorobenzene
Hg	-	Mercury
HIL	-	Health Investigation Level
HSL	-	Health Screening Level
IMEX	-	Import-Export
IMT	-	Intermodal Terminal
Induction	Site Specific Induction	The *Work Health and Safety Act 2011* (WHS Act) main objective is to secure the health and safety of workers and workplaces. A site-specific induction is necessary for all workers on the Site to understand the site-specific risks.
LGA	-	Local Government Area or Agency
LNAPL	-	Light Non-Aqueous Phase Hydrocarbons
Metallic Debris	Metallic Debris	Debris comprising metal (ferrous) items. May include fragments of former ordnance items.
MIC	-	Moorebank Intermodal Company
MPE Project	Moorebank Precinct East Project	The MPE Intermodal Terminal Facility, including a rail link and warehouse and distribution facilities at Moorebank (eastern side of Moorebank Avenue) as approved by the Concept Plan Approval (MP10_0913) and the MPE Stage 1 Consent (14_6766).
MPE Stage 1 Site	Moorebank Precinct East Stage 1 Site	Moorebank Precinct East Stage 1 Site, including the MPE Stage 1 Site and the Rail Corridor, i.e. the area for which approval (construction and operation) was sought within the MPE Stage 1 Proposal EIS.
MPE Stage 2 Site	Moorebank Precinct East Stage 2 Site	Stage 2 of the MPE Concept Plan Approval including the construction and operation of 300,000m^2 of warehousing and distribution facilities on the MPE Site and the Moorebank Avenue upgrade within the Moorebank Precinct.
MPW Project	Moorebank Precinct West Project	The subject of this LTEMP. The MPW Intermodal Terminal Facility as approved under the MPW Concept and Early Works Consent (SSD_5066), MPW EPBC Approval (No. 2011/6086) and MPW Stage 2 Consent(SSD_7709).
MPW Site	Moorebank Precinct West Site	The site which is the subject of the MPW Concept and Early Works (Stage 1) Consent, MPW EPBC Approval and MPW

Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
		Stage 2 SSD 7709. The MPW Site does not include the rail link as referenced in the MPW Concept Consent or MPE Concept Plan Approval.
Ni	-	Nickel
OCP	-	Organochlorine Pesticides
Offset Area	BioBanking Agreement Area	Vegetated areas which are to be conserved and no construction to occur.
Ordnance	Ordnance	Any item of potential military origin. See Ammunition, Category A and B Ordnance Item and UXO.
PAH	-	Polycyclic Aromatic Hydrocarbons
Pb	-	Lead
PCB	-	Polychlorinated Biphenyls
PFAS	Per- and polyfluoroalkyl substances	Per- and polyfluoroalkyl substances are a diverse group of compounds resistant to heat, water, and oil. These chemicals are persistent, and resist degradation in the environment. They also bioaccumulate, meaning their concentration increases over time in blood and organs.
PFOS, PFOA and PFHxS	Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS)	Man-made chemicals belonging to the group known as PFAS. See PFAS.
PSH	-	Phase Separated Hydrocarbon
PSI	-	Preliminary Site Investigation
QA/QC	-	Quality Assurance and Quality Control
QUBE	QUBE Holdings Ltd	Owners of the Moorebank Precinct
RAE	-	Royal Australian Engineers
Rail Corridor	-	Area defined as the 'Rail Corridor' within the MPE Concept Plan Approval.
Rail Link	-	The rail link from the South Sydney Freight Line to the MPE IMEX Terminal, including the area on either side to be impacted by the construction works included in MPE Stage 1.
RPD	-	Relative Percentage Difference
SAQP	-	Sampling Analysis and Quality Plan
SIMTA	-	Sydney Intermodal Terminal Alliance - a consortium comprising Qube and Aurizon Holdings.
Site	Site	MPW Project, excludes the Rail Corridor
SME	-	School of Military Engineering
SMP	-	Site Management Plan
SSD	-	State Significant Development
SSFL	-	South Sydney Freight Line
SVOC	-	Semi Volatile Organic Compounds
Tactical	Tactical Group	Project Managers of the Moorebank Precinct for Qube
MAUW	Moorebank Avenue Upgrade Works	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade. Raising of the vertical alignment of Moorebank Avenue for 1.5 kilometres of its length by approximately two metres, from the northern boundary of the MPE Site to approximately 120 metres south of the MPE Site. The Moorebank Avenue upgrade also includes upgrades to intersections, ancillary

Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
		works, and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW Site.
The Moorebank Precinct	-	Refers to the whole Moorebank intermodal precinct, i.e. the MPE Site and the MPW Site.
TPH	-	Total Petroleum Hydrocarbons
TRH	-	Total Recoverable Hydrocarbons
UCL	-	Upper Confidence Limit
UST	-	Underground Storage Tank
UXO	Unexploded Ordnance	Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting place for any reason, including souveniring.
Vegetated Areas	EEC	Refers only to those areas inaccessible during SSD 5066 works.
VOC	-	Volatile Organic Compounds
Zn	-	Zinc

1 Introduction

Qube (Qube) Property Management Services Pty Ltd, c/o Tactical Group Pty Ltd (Tactical), engaged EP Risk Management Pty Ltd (EP Risk) to prepare a Long-Term Environmental Management Plan (LTEMP) for the Moorebank Precinct West (MPW) Site located at 400 Moorebank Avenue, Moorebank NSW, 2170 (the Site). The location of the Site is provided as **Figure 1**.

The Site is legally described as Lot 1 in Deposited Plan (DP) 1197707, Lot 2 in DP 1197707, Part Lot 3 in DP 1197707, Lot 100 in DP 1049508, Lot 101 in DP 1049508, Part Anzac Road and Moorebank Avenue public road reserves. It is understood the Site has been owned by the Commonwealth Government since 1913, used as a Defence facility since the 1940s and is approximately 190 hectares (ha) in area.

The Site is currently being redeveloped into the Moorebank Intermodal Terminal Development (MITD) (Proposed Development) and comprises land within a developable area, for construction and operation of the Intermodal Terminal (IMT), and land reserved as an offset and conservation area. These areas are identified as follows:

- **Construction Area**: Encompasses the portion of the Site inside the MPW Stage 2 Construction Boundary and includes the proposed onsite stormwater detention basins (ref: **Figure 1**).
- **Offset Area**: Comprises the riparian area adjacent the Georges River which is located outside the MPW Stage 2 Construction Area Boundary in the western portion of the Site (ref: **Figure 1**).

Activities associated with construction of the Proposed Development are limited to the Construction Area of the Site. Construction work is not proposed within the Offset Area to protect environmental values and endangered ecological communities (EEC), where they occur. Minor low disturbance works are proposed for the Offset Area which include re-vegetation and maintenance works in accordance with the Biobanking Agreement, executed between the Commonwealth and Office of Environment and Heritage (OEH) in April 2019.

Planning consent for the Proposed Development includes MPW Early Works (Stage 1) under State Significant Development (SSD) (SSD 5066), and Stage 2 Development (SSD 7099).

In accordance with planning consent under SSD 5066, remediation was required in accordance with the approved Remediation Action Plan (RAP) prepared by Golder (2016)[1]. Remediation of the Site was undertaken by Liberty Industrial Pty Ltd (Liberty), except for areas within the Construction Area with identified EEC. At the completion of remediation, a validation assessment was prepared by JBS&G Australia Pty Ltd (JBS&G) (2020)[2]. JBS&G reported the Site had been remediated to a commercial / industrial land use and was therefore suitable for the intended Intermodal Terminal, subject to the implementation of a Contamination Management Plan (CMP) for the Construction Area, an LTEMP for the whole Site and restricted access to the Offset Area.

[1] Golder (2016) *Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan*.
[2] JBS&G (2020) *Remediation Validation Report, Land Preparation Work – Demolition and Remediation Moorebank Property West, Moorebank, NSW,* 17 March 2020 (ref: 51997-120265/Rev 0).

EP Risk (2020) prepared a CMP[3] for the management of vegetation clearing and remediation of residual contamination identified by JBS&G (2020) within these vegetation areas once vegetation clearing was complete within the Construction Area. Management and close out of remaining contamination within the EECs, as identified in the EP Risk (2020) CMP was subsequently completed by JBS&G (2020a)[4], however there are several residual issues present on-site that require ongoing management during the construction phase of works.

This LTEMP provides an environmental management framework for the whole Site and is focused on both short to medium-term management during construction and long-term management of the Proposed Development post construction. The LTEMP will be revised once Stage 2 earthworks are complete in accordance with staged development of the Site.

1.1 Purpose

The LTEMP has been prepared in accordance with the requirements of relevant legislation, regulations, codes of practice, Australian Standards and conditions of consent to address the potential risk to human health and the environment from impacted media during construction and operation of the Proposed Development. The objectives of this LTEMP are to:

- Outline the nature and extent of impacted soils, sediment, surface water and groundwater requiring short to long-term management at the Site.
- Develop management measures for the management of impacted materials encountered during construction works and long-term operation of the Site including monitoring and reporting in satisfaction of relevant health and safety and environmental legislation.
- Assign responsibilities for the implementation of management measures.

1.2 Parties Responsible for the Implementation and Review / Maintenance

The parties responsible for the implementation and review / maintenance of the LTEMP include:

- Site Owner;
- Principal Contractor (during Stage 2 construction);
- Operational Managing Entity (post construction);
- Environmental Consultant;
- Construction Worker; and
- Operational Worker.

[3] EP Risk (2020) *Contamination Management Plan, Moorebank Precinct West, 400 Moorebank Avenue, Moorebank, NSW*, 30 July 2020 (ref: EP1489.002_v11.0).
[4] JBS&G (2020a) MPW Stage 1 Supplementary Validation Report, Moorebank Avenue, Moorebank NSW, dated 11 September 2020 (ref: 58753/132401 (Rev A)).

1.3 How the LTEMP will be made Enforceable

NSW EPA (2017)[5] states that an environmental management plan can reasonably be made to be legally enforceable by compliance of development consent conditions issued by the relevant consent authority. Therefore, the LTEMP can reasonably be made to the legally enforceable by compliance to Condition B172 of SSD 7709, which specifies that: '*Where remediation outcomes for the site require long term environmental management, a suitably qualified and experienced person must prepare a Long-Term Environmental Management Plan (LTEMP), to the satisfaction of the Site Auditor'.* The LTEMP will inform statutory Site Audit Statements (SAS) to be prepared by the Site Auditor in accordance with Condition B3 of SSD 5066 and Conditions B169 and B171 of SSD 7709.

1.4 Where the LTEMP will be Recorded

The LTEMP must be registered on the property title (Section 10.7 certificate) in satisfaction of Condition B173 of SSD 7709.

[5] NSW EPA (2017) *Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, dated October 2017.

2 Background

2.1 Site Identification

The site identification details are presented in **Table 1**.

Table 1 – Site Identification

Item	Description
Site Address	400 Moorebank Avenue, Moorebank, NSW, 2170 (see **Figure 1**)
Legal Description	Lot 1 DP 1197707; Lot 101 DP 1049508; Lot 100 DP 1049508; Lot 2 DP 1197707; Part Lot 3 DP 1197707; and Part Anzac Road and Moorebank Avenue public road reserves The lot boundaries are provided as **Appendix A**
Approximate Site Area	190 ha
Site Owner	Moorebank Intermodal Company
Municipality	Liverpool City Council
Site Zoning	IN1 General Industry E3 – Environmental Management

The Site is located approximately 27 km south-west of the Sydney Central Business District ('CBD') and approximately 26 km west of Port Botany. The Site is situated within the Liverpool Local Government Area ('LGA'), in Sydney's South West subregion, approximately 2.5 km from the Liverpool City Centre. The Site is located approximately 800 m south of the intersection of Moorebank Avenue and the M5 Motorway.

2.2 Current Land Use

At the time of writing, the Site was undergoing redevelopment as part of Early Works (Stage 1) of the construction of the MITD. Buildings and associated infrastructure previously used by Defence had been demolished and remediation / validation works progressively completed in accordance with the Golder (2016) RAP. In addition, services had been removed as part of the early works package.

2.3 Proposed Land Use

Construction Area

Qube is developing the Site into the Moorebank Logistics Park. MIC, a Commonwealth Government Business Enterprise and the landowner, was established to oversee and facilitate the development of the western intermodal terminal at Moorebank, and Qube, reached an agreement, known as the Development and Operations Deed to develop the land referred to below, on a 'whole of precinct' basis.

Development of the Site is only proposed along the eastern portion of the Site (Construction Area) within the MPW Stage 2 Construction Boundary (**Figure 1**).

It is proposed the following will be constructed within the Construction Area:

- An open access interstate freight terminal with an ultimate capacity of up to 500,000 TEU per annum.
- Terminal warehousing and distribution facilities comprising approximately 215,000 m^2 of warehousing with ancillary offices.
- A rail access, connecting the Southern Sydney Freight Line (SSFL) at the southern end of the interstate and IMEX terminal (Constructed under SSD MPE Stage 1 – SSD6766).
- Northern and southern connections into the SSFL to accommodate 1,800 m length trains.
- A freight village of support services on site, including management and security offices, meeting rooms, driver facilities, retail and business services.
- Six on-site stormwater detention basins (OSDs) (OSD 3, OSD 4, OSD 5, OSD 6, OSD 8 and OSD 10).

The locations of infrastructure associated with the Proposed Development is provided in the MPW Master Plan provided as **Appendix B**.

Offset Area

The vegetated western portion of the Site (Offset Area) consists of a riparian zone containing some EEC areas adjacent the Georges River and also the former training areas (Dust Bowl and Fire-Fighting Training Area (FFTA)). The remnant EEC within the Offset Area will remain in place and revegetation of non-EEC areas will be undertaken in accordance with the executed biobanking agreement.

JBS&G (2020a) reported that:

> *'…the biobanking area will not be open to recreational use. To protect the area, use of the area will be low frequency and short duration by persons undertaking ecological surveys once or twice per year (non-intrusive), and maintenance of fire trail, fencing, environmental control (e.g. erosion control) and service easements, as well as weeding, planting, micro habitat relocation, and waste removal as necessary.'*

The locations of the Biobanking Areas within the Offset Area are presented in **Figure 2** and the Master Plan for the Proposed Development is provided as **Appendix B**. Notably the construction area includes land provision for the construction of OSD outlet channels from the main construction area to the Georges River. These portions of the construction footprint are not included within the identified Offset Area.

2.4 Surrounding Land Use

The land surrounding the Site comprises:

- **North:** Industrial warehouses, the M5 motorway, small pockets of remnant bushland and further industrial and residential properties beyond. The Georges River meanders to the north east.
- **South:** Rail corridor, Holsworthy Defence land, and residential properties to the west of the Georges River.
- **East:** Moorebank Avenue, MPE, general industrial properties and infrastructure (Defence), Liverpool Fire Station (north-east), Anzac Creek, low density and medium density residential properties beyond.
- **West:** The Georges River (which flows north), Glenfield Tip, rail corridor and Casula Station, Leacock Regional Park and low and medium density residential properties beyond.

2.5 Topography

The topography of the Site was generally level in the eastern portion and gradually sloped down towards the Georges River in the western portion.

2.6 Hydrology

Drainage at the Site is anticipated to follow the general topography of the land as overland flow or via drainage channels, swales and detention basins to the Georges River located adjacent to the western boundary or to one of the following surface water bodies located at the Site:

- The head waters of Anzac Creek, which flows through the golf course in the southern portion of the Site and discharges off-site to the east.
- Lake Sisinyak to the north east of the Dust Bowl.
- A number of excavated swales and sediment basins (excavated as part of Early Works).

The historical drainage system has been replaced by temporary sediment control swales and dams during Stage 1 Works. The temporary sediment control swales and dams are to be replaced by the proposed OSDs shown on **Figure 2** (OSD 5, OSD6 and OSD 8). In addition, another OSD (OSD 10) is proposed to be constructed along Moorebank Avenue to the east of the Site. The OSDs are to be constructed with an impermeable base to limit infiltration of stormwater within these areas. Construction of the OSDs will involve shallow excavation that is not anticipated to intercept the groundwater table based upon the design levels.

A strip of land (up to approximately 250 m wide) along the western edge of the Site lies below the 1% annual exceedance probability (AEP) flood level.

2.7 Geology

Based upon a review of the NSW Government Planning and Environment Resources and Energy Penrith 1:100,000 Geological Map (Sheet 9030, First Edition) (1991), the majority of the Site is underlain by Fluvial, clayey quartzose sand and clay from the Tertiary period. The western portion of

the Site adjoining the Georges River is underlain by fluvial and estuarine quartz sand, silty sand and clay from the more recent Quaternary aged Holocene epoch. The underlying bedrock consists of interbedded Hawkesbury Sandstone and Ashfield Shale (Wianamatta) from the middle Triassic period.

2.8 Hydrogeology

EP Risk (2018) reported groundwater flow was towards the west and the nearest surface water body, the Georges River. Groundwater ranged from 1.784 m Australian Height Datum ('AHD') to 14.055 m AHD.

Alluvial sediments adjacent to the Georges River in the western portion of the Site reported higher horizontal hydraulic conductivities and groundwater velocities than the predominately clay aquifer in the eastern portion of the Site.

EP Risk (2018) also reported that groundwater was predominantly fresh to brackish water (relatively low electrical conductivity, EC) with the exception of six (6) groundwater monitoring wells (GMWs) which indicated an area of high salinity (> 10,000 µS/cm) in the central portion of the Site. Dissolved oxygen ('DO') measurements indicated generally anaerobic conditions. The oxidation-reduction potential ('ORP') indicated reducing conditions and the pH measurements were generally slightly acidic.

2.9 Acid Sulfate Soil

A review of the Liverpool Local Environmental Plan 2008 indicates the Site is located predominantly within Class 5 and Class 1 acid sulfate soil ('ASS') developmental control areas. The Development Area is within a Class 5 ASS area with the exception of the OSD Basin 5, 6 and 8 spillways which cross into the Georges River Class 1 Area. Development consent is required for carrying out any works in Class 1 acid sulfate soil (ASS) developmental control areas.

Based on the review of available information (PB 2014[6] and Golder 2015[7]) actual and potential acid sulfate soils were identified in shallow soils between 1.0 metres below ground level (mBGL) and 2.0 mBGL in the Offset Area along the Georges River. Golder 2015 concluded the acid generating potential of the soils was not caused by sulfidic material. Both Golder (2015) and PB (2014) recommended an Acid Sulfate Soil Management Plan (ASSMP) was a requirement for future earthworks.

Development consent SSD 7709 Condition B39 for MPW Stage 2, required the preparation of an ASSMP for the entire Site. The purpose of the acid sulfate soil management plan is to deal with any unexpected discovery of actual or potential acid sulfate soil. The ASSMP must include procedures for the investigation, handling, treatment and management of such soil and water seepage. The ASSMP must form part of the CEMP[8] for Stage 2 works in satisfaction of condition C2 of SSD 7709.

EP Risk (2020b) has prepared an ASSMP which is to be included as a sub-plan to the CEMP.

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[6] PB (2014) *Phase 2 Environmental Site Assessment Moorebank Intermodal Terminal*, dated 28.05.14 (ref: 2103829A-CLM_REP-1 Rev B) Parsons Brinkerhoff Pty Ltd.
[7] Golder (2015) *Post Phase 2 Environmental Site Assessment*. Golder Associates.
[8] SIMTA (2020) Construction Environmental Management Plan, Moorebank Precinct West Stage 2, dated 14 January 2020 (ref: MIC2-QPMS-EN-APP-00001).

2.10 Summary of Site History

A summary of the site history is provided in **Table 2**.

Table 2 – Summary of Site History

Year	Summary
1913	The Site was purchased by the Commonwealth Government.
1930	The Site was predominantly vacant and covered in bushland/grazing land.
1940s	The Site was used by Australian Defence Force (ADF) as a training base for the Army.
Prior to 1956	The Site had had been developed as a Defence base.
1956 to circa 1995	The Site had undergone various phases of development. A former fire training area (FFTA) approximately 50 m wide and 100 m long was identified close to the Georges River in the southern portion of the Site opposite Jacquinot Road. Fire training involved pouring diesel and other flammable materials into shallow drains, in pans, in above ground storage tanks and car bodies, igniting the fuel and then extinguishing the fire using foam extinguishers. Based upon a review of aerial photographs, it was inferred that fire training activities in this area ceased somewhere between 1991 and 1994. Another fire training area approximately 60 m wide by 160 m long was located in the southern portion of the Dust Bowl. It was understood that fire activities in this area included igniting oil in trays and extinguishing them with foam including AFFF and there was no information available on when fire training activities ceased in this area. Historical excavator training within the Dust Bowl resulted in routine excavation up to depths of 4 m.
2015	The Site was vacated by Defence, with the relocation of military units to new facilities at the nearby Holsworthy Base.

Numerous contamination assessments have been undertaken at the Site, the findings of which are summarised in **Appendix C**.

3 Description of Existing / Residual Contamination

3.1 Summary of Impacted Media

Historical operation of the Site as a defence facility has resulted in contamination of soil, soil vapour, sediment, surface water and groundwater. Remediation works were undertaken in accordance with the Golder (2016) RAP and a validation report prepared by JBS&G (2020). At the completion of remediation activities residual contamination remained at the Site that required short-to long-term management. A summary of the remaining areas of environmental concern (AEC) and contaminants of concern is provided as follows:

- AEC 1 – Chlorinated hydrocarbons impact (Trichloroethylene (TCE) and Cis-1,2-dichlorothene (cis-DCE)) and total recoverable hydrocarbons (TRH) in the north west portion of the Site to the south of the ABB Building.
- AEC 2 – Petroleum hydrocarbon impact including light non-aqueous phase hydrocarbons (LNAPL) in the eastern portion of the Site.
- AEC 3 – PFAS impact associated with historical fire-fighting training.

The location of the AECs at the Site is provided as **Figure 3**. Further information relating to the AECs is provided in the Conceptual Site Model (CSM) provided as **Appendix C.** A CSM Figure is provided as **Figure 4**.

There were also underground services and anthropogenic fill materials located within vegetated areas located within the Construction Area that were unable to be remediation and validated by JBS&G (2020). Vegetation removal and remediation of the majority of identified remaining contamination was undertaken in accordance with the EP Risk (2020) CMP, with the management and close out completed and subsequently validated by JBS&G (2020a). However, the following areas were unable to be closed out by JBS&G (2020a) at the completion of CMP works and require ongoing management during the construction phase of works:

- Former STP area (fill material beneath SP10) and Anthro-2.
- UF111 and UF230 adjacent to live high-risk services and no capping or removal was considered safe or practical during the CMP works.
- Selected stockpiles of site won soil/materials where PFAS-impacts are suspected or have been reported.

3.2 Source – Pathway – Receptor Linkages Requiring Management

Based on the CSM provided in **Appendix C**, a summary of impacted media requiring management in this LTEMP is provided in **Table 3**.

Management of any unidentified contamination is to be managed in accordance with an unexpected finds protocol provided as **Appendix F**.

Table 3 – Identified Areas of Environmental Concern and Impacted Media

Area of Environmental Concern (AEC)	COPC	Impacted Media	Risk Assessment / Management	Source – pathway-receptor linkages requiring management
AEC 1 - North west portion of the Site to the south of the ABB Building.	Chlorinated hydrocarbons: • TCE • cis DCE	**Soil** – TCE Impacted soil likely to be impacted at depths between 3 and 7 mBGL [9] based on XSD [10] responses with a membrane interface probe (MIP). **Groundwater** – Exceedances of Tier 1 criteria (maximum TCE concentration 419 µg/L in MWBHB1). Groundwater was observed between 7 – 9 metres below top of casing (mBTOC). **Soil Vapour** – Elevated TCE levels were reported in shallow soil (44 – 280 mg/m^3).	• Golder (2015a) [11] prepared a human health risk assessment that assessed risks for commercial workers having intermittent use of the area, intrusive maintenance workers within shallow excavations and members of the public having intermittent use of the area. • The health risk to onsite workers was assessed to be low and acceptable for open space land use including road verges and woodland / riparian conservation areas with no buildings. • Given the depth of groundwater in AEC 1, there is a low likelihood that groundwater will be encountered during construction works within this area. • It was considered unlikely by Golder (2015) that chlorinated hydrocarbons would impact the Georges River or the mass flux be affected by the construction of the OSD in this area.	• Vapour intrusion into buildings / permanent structures. • Worker exposure during intrusive maintenance works.

[9] mBGL – metres below ground level.
[10] XSD – halogen specific response.
[11] Golder (2015a) *Onsite Quantitative Human Health Risk Assessment, Moorebank Intermodal Terminal* (ref: 147623070-043-R-Rev1).

Table 3 – Identified Areas of Environmental Concern and Impacted Media

Area of Environmental Concern (AEC)	COPC	Impacted Media	Risk Assessment / Management	Source – pathway receptor linkages requiring management
AEC 2 - Eastern portion of the Site to the west of the former DNSDC refuelling area.	LNAPL and petroleum hydrocarbons	**Soil** – Exceedance of Tier 1 management limit criteria from VS01_0.9m located at the tank farm on the IMEX site. **Groundwater** – measurable LNAPL at GW19, GW20 and GW146 up to maximum historical apparent thickness of 1.7m. • Historical dissolved phase concentrations in GW119 up to 29 mg/L in the F1 fraction more than the NEPC (2013) HSLs[16]. • Groundwater was reported to be approximately 6 mBGL.	• A human health risk assessment was prepared by GHD (2016) [12] that identified a risk to commercial / industrial workers from inhalation of soil vapours associated with LNAPL if a one storey basement was constructed. • GHD (2018)[13] prepared a validation report for the MPE Site which relied upon the implementation of an EMP (GHD 2018a). There was no risk to ecological receptors identified by GHD (2018). • GHD (2018a)[14] prepared an Environmental management Plan for the refuelling facility. • Golder (2016) [15] prepared a Site Management Plan for the restricted area within Moorebank Avenue. • As the GHD (2018 and 2018a) and Golder (2016) reports have not been prepared for the Site, but for adjacent land to the east, the management protocols within these documents that are applicable to the Site have been integrated into the LTEMP.	• Vapour intrusion into buildings / permanent structures. • Explosive atmospheres.

[12] GHD (2016a) *Former DNSDC Refuelling Area, Moorebank NSW, Human Health and Ecological Risk Assessment* (report reference 21/25471/217592), October 2016.
[13] GHD (2018) *Former DNSDC Refuelling Area Remediation Validation Report - Phase C* (report reference 21\25471\WP\220903), March 2018.
[14] GHD (2018a) *Former DNSDC Refuelling Area, Moorebank NSW, Environmental Management Plan* (report reference 21/25471), October 2018.
[15] Golder (2016a) *Moorebank Avenue – Site Management Plan*, dated 4 July 2016 (ref: 147623070-052-Rev1).
[16] HSL – Health screening level.

Table 3 – Identified Areas of Environmental Concern and Impacted Media

Area of Environmental Concern (AEC)	COPC	Impacted Media	Risk Assessment / Management	Source – pathway receptor linkages requiring management
AEC 3 - Former firefighting training areas where aqueous film forming foam (AFFF) was used and surrounding land.	PFAS	**Soil** – Exceedances of Tier 1 ecological indirect commercial / industrial criteria[17] in Construction Area and indirect ecological recreational / open space criteria in the Offset Area[18].	• EnRiskS (2019) [19] undertook a human health risk assessment of the Site and reported the risk to human health at the Site was low and acceptable, but bioaccumulation and the effects on higher order ecological consumers were unable to be excluded. • EnRiskS (2019a) [20] reported a potential health risk to children who consume more than two serves of fish per month sourced from the Georges River and potential adverse effects to the aquatic environment by bioaccumulation and the effects on higher order ecological consumers.	• Leaching and erosion of PFAS from soil to surface water and groundwater associated with soil disturbance during construction (primarily construction of the OSDs and outlets). • Recreational fishing resulting in the consumption by children of more than two serves of fish per month. • Bioaccumulation and the effects on higher order ecological consumers.
		Soil leachate – Detectable leachable PFAS concentrations reported up to a maximum concentration of 84 µg/L for PFOS + PFHxS.		
		Sediments - Detectable PFAS concentrations reported up to a maximum of 0.92 mg/kg for PFOS + PFHxS.		
		Surface water - Exceedances of Tier 1 criteria for samples collected within temporary detention basins during Early Works construction and from the Georges River.		
		Groundwater – Exceedances of Tier 1 criteria.		

[17] Based upon one exceedance of the ecological direct criteria for soil <2mBGL within the Construction Area, which is less than 250% of ecological direct criteria and the 95% UCL_{mean} concentration is less than the ecological direct criteria.
[18] Based upon one exceedance of the ecological direct criteria for soil <2mBGL within the Offset Area, which is less than 250% of ecological direct criteria and the 95% UCL_{mean} concentration is less than the ecological direct criteria.
[19] EnRiskS (2019) *Land Human Health and Ecological Risk Assessment (Land HERA)*, dated 6 May 2019 (ref: MICL/19/BIOR001, Revision B – Revised Draft).
[20] EnRiskS (2019a) *Waterway Human Health and Ecological Risk Assessment (Waterway HHERA)*, dated 10 May 2019 (ref: MICL/18/GRR001, Revision E – Revised Draft).

Table 3 – Identified Areas of Environmental Concern and Impacted Media

Area of Environmental Concern (AEC)	COPC	Impacted Media	Risk Assessment / Management	Source – pathway receptor linkages requiring management
Additional Areas Requiring Management following CMP works: • STP fill material and Anthro-2; and • UF111 and UF230	Asbestos and anthropogenic materials	Soil	• JBS&G (2020a) have identified that '*the anthropogenic materials which remain in the STP area beneath Stockpile SP 10 and the fill area identified as Anthro-2 will be managed under the LTEMP (EP Risk 2020b) during construction'*. • JBS&G (2020a) have identified that '*Two pipes were adjacent live high-risk services (UF111 and UF230) and no capping or removal was considered safe or practical'*.	• Inhalation (asbestos) for construction workers and future site users. • visual amenity (anthropogenic materials) for future site users.
Additional Areas Requiring Management following CMP works: • PFAS impacted stockpiles	PFAS	Soil and soil leachate	• JBS&G (2020a) have identified that *'Where stockpiles are known or suspected to be impacted by PFAS, the management and reuse of the stockpiled material will be undertaken in accordance with the LTEMP (EP Risk 2020b)'.* • JBS&G (2020a) have identified that '*Where potentially PFAS impacted soils are to reused onsite, the soils PFAS concentrations (total and leachate) must conform with the trigger levels and reuse zones provided on Table 8 and Figure 5 respectively of the LTEMP (EP Risk 2020b)'*.	• Leaching and erosion of PFAS from soil to surface water and groundwater associated with soil disturbance during construction. • Recreational fishing resulting in the consumption by children of more than two serves of fish per month. • Bioaccumulation and the effects on higher order ecological consumers.

4 Management Activities

4.1 LTEMP Roles and Responsibilities

This LTEMP has been developed to provide an environmental framework for short to medium term environmental management during construction and operation of the Proposed Development. The terminology, roles and responsibilities relevant to the LTEMP are provided in **Table 4**.

Table 4 – Responsibilities for LTEMP Implementation

Position	Company/Entity	Responsibilities
Site Owner (or their representative)	Qube	The Site owner is responsible for: • The engagement of the Principal Contractor (during construction); • Management of the operation of the Site post construction or engagement of the Operational Managing Entity. • Ensuring that the LTEMP is noted on the property title and is legally enforceable. • Ensuring that the Principal Contractor or Managing Operational Entity implement the LTEMP.
Principal Contractor (during Stage 2 construction)	Georgiou	• Responsible for the implementation of the LTEMP during Stage 2 construction works. Means the contractor is in primary control of the Site. Responsible for inductions, training, notifying the owner, appropriate consultant or contractor in relation to unexpected finds. Also responsible for quarantining unexpected finds requiring management with suitable barricades and informing other workers of its location. • Persons and/or company appropriately qualified to undertake the required management works and has the appropriate insurances and licences. • Responsible for undertaking works in accordance with this LTEMP.
Operational Managing Entity (post construction)	Knight Frank	• Responsible for the implementation of the LTEMP at the Proposed Development during long-term operation.
Environmental Consultant	To be appointed	• As defined under the NEPM (NEPC 2013) (Schedule B9) the environmental consultant responsible for the assessment of contaminated sites and preparation of assessment reports should be able to demonstrate relevant qualifications and experience to a level appropriate to the contamination issues relevant to the site under investigation. • The environmental consultant is to have a certified practitioner (Site Contamination) recognised by one of the certifying bodies recognised by the NSW EPA. Any reports prepared should be 'signed off' by the individual certified practitioner (Site Contamination). • Responsible for the following:

Table 4 - Responsibilities for LTEMP Implementation

Position	Company/Entity	Responsibilities
		○ notifying the Client and Principal Contractor of any unexpected finds. ○ Undertaking the assessment, remediation and validation of an unexpected find. ○ Engaging the Ordnance Contractor should UXO or EOW be identified as an unexpected find. ○ Notifying the Principal contractor once unexpected finds have been validated and can be reoccupied. Any environmental monitoring required under the LTEMP.
Construction Worker	Commercial industrial worker during construction	Any worker on the Site, including any contractor or sub-contractor. Must adhere to the requirements of the LTEMP during short to medium term construction. Responsible for undertaking their tasks in a safe manner and notifying the Principal Contractor if they see any items/conditions which may constitute and unexpected find.
Operational worker	Commercial industrial worker during operation	To adhere to the requirements of the LTEMP during long-term operation of the Proposed Development post construction.

4.2 Approval and Licensing Requirements

SSD 7709 provides specific requirements for the LTEMP which are provided in **Table 5**.

Table 5 – Planning Conditions Specific to the LTEMP

Condition	
SSD 7709 – B172	Where remediation outcomes for the site require long term environmental management, a suitably qualified and experienced person must prepare a Long-Term Environmental Management Plan (LTEMP), to the satisfaction of the Site Auditor. The plan must: a) be submitted to the Planning Secretary and EPA prior to commencement of construction (other than vegetation clearing); and b) include, but not be limited to: i. a description of the nature and location of any contamination remaining on site, ii. provisions to manage and monitor any remaining contamination, including details of any restrictions placed on the land to prevent development over the containment cell, iii. a description of the procedures for managing any leachate generated from the containment cell, including any requirements for testing, pumping, treatment and/ or disposal, iv. a description of the procedures for monitoring the integrity of the containment cell, v. a surface and groundwater monitoring program, vi. mechanisms to report results to relevant agencies, vii. triggers that would indicate if further remediation is required, and viii. details of any contingency measures that the Applicant is to carry out to address any ongoing contamination.
SSD 7709 – B173	The LTEMP must be registered on the title to the land.

All planning conditions of consent for the Proposed Development relevant to the LTEMP are shown in **Table 6**. Further details of the condition of consent / approval and mitigation measures and how they relate to the LTEMP are provided as a compliance matrix at **Appendix E**.

Table 6 – Planning Approval Conditions of Consent		
Planning Approval	**Condition of Consent**	**Notes**
SSD 5066[21]	B2	Contamination
	B3	
SSD 7709	B161	Contamination and Remediation - Site Auditor
	B162	Provision of all reports to the NSW EPA
	B163	Notification to NSW EPA
	B164	Preparation of a CMP
	B165	Provision of documents to the Planning Secretary
	B166	Remediation
	B167	Validation Report
	B168	Provision of Validation Report to the Planning Secretary
	B169	Site Audit Statements
	B170	Staging of Site Audit Statements
	B171	Provision of Site Audit Statements to the Planning Secretary
	B172	Requirements for the LTEMP
	B173	Registration of the LTEMP
	B180	Waste Management
	C1	Management Plan Requirements
EPBC 2011/6086	8a	MPW Concept EIS, Soil and Contamination PEMF Section 6.2 – Management controls – Early Works and Construction phase
		MPW Concept EIS, Soil and Contamination PEMF Section 6.4– monitoring
		MPW Concept EIS, Soil and Contamination PEMF Section 6.5 – Management response to incidents and non-compliances
	8b) and c)	REMM 7A, REMM 7B, REMM 7C, REMM 7D, REMM 7E, REMM 7F, REMM 7I, REMM 7J, REMM 7K, REMM 8B, REMM 8D, REMM 8E, REMM 8F, REMM 8G, REMM 8H, REMM 8I, REMM 8J, REMM 8K, REMM 8L, REMM 8M, REMM 8N, REMM 8RO, REMM 8P, REMM 8Q, REMM 8R, REMM 8S, REMM 8T, REMM 8U, REMM 8V, REMM 8W, REMM 8X, REMM 8Y, REMM 8Z, REMM 8AA
	8 d)	i), ii), iii), iv), v), vi), vii),
Final Completion of Mitigation Measures	-	OB, 5A, 5I, 6A, 6B, 6C, 6D, 6E, 6F, 6H, 6I, 6J, 7A, 12A,

[21] Including modification dated 30 October 2019.

4.3 Implementation of the LTEMP

The LTEMP will be implemented after completion of the Phase 1 Early Works and during the following subsequent phases of development:

- Phase 2 Contamination Management Works;
- Phase 2 Site Preparation Works;
- Phase 2 Construction Works; and
- Operational Phase.

The LTEMP and EP Risk (2020) CMP are to be implemented during Stage 2 works in conjunction with the SIMTA (2020) CEMP.

Based upon details of the Proposed Development provided in **Appendix B** and summarised in **Section 2.3**, the following potential activities are proposed to be carried out within each of the AECs during construction:

Proposed Development Activities within AEC 1

Based upon the Masterplan provided as **Appendix B**, the following activities are proposed within AEC 1:

Phase 2 Contamination Management Works

- Land use restrictions.
- Validation of contamination management works.

Phase 2 Site Preparation Works

- Importation of fill material to raise site levels[22] [23].

Phase 2 Construction Works

- Construction of roadway and pedestrian access track (construction to be within imported fill level).
- Installation of underground services.

Operational Phase

- Sub-surface maintenance works.
- Maintenance of landscaped areas.

[22] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.
[23] Costin Roe Consulting Pty Ltd (2020) *Bulk Earthworks Sections, Sheet 3,* Section 11, Drawing Number LPWPIW-COS-CV-DWG-0353, Issue 2, dated 12.06.20.

Proposed Development Activities within AEC 2

Based upon the Masterplan provided as **Appendix B**, the following activities are proposed within AEC 2:

Phase 2 Contamination Management Works

- Land use restrictions.
- Development of a Contamination Assessment and Treatment Area ('CATA').
- Excavation of OSD 10 to a maximum depth of 12.50 mAHD[24] (depth of excavation to be approximately 3.4 m above the level of LNAPL contamination)[25].
- Validation of contamination management works.

Phase 2 Site Preparation Works

- Importation of fill material to raise site levels[26].

Phase 2 Construction Works

- Construction of rail line (construction to be within imported fill level).
- Installation of underground services.
- Construction of OSD 10 (construction drawings provided as **Appendix B**).

Operational Phase

- Sub-surface maintenance works

Proposed Development Activities within AEC 3

Based upon the Masterplan and associated construction plans provided as **Appendix B**, the following activities are proposed within AEC 3:

Phase 2 Contamination Management Works

- Development of a CATA.
- Development of a PFAS Engineered Stockpile Area.
- Excavation of OSDs to the following maximum depths:
    - OSD 3 – minimum 13.95 m AHD[27] (depth of excavation to be approximately 4.8 m above the reported groundwater level)[28].

[24] Northrop Pty Ltd (2020) *Bulk Earthworks Plan Sheet 01*, Drawing No. MAUW-NRP-CV_DWG-9121, Sheet No. 9121, dated 20.07.2020, rev 09.
[25] EP Risk (2018) reported groundwater at 9.12 mAHD at MW6003, which is the closest surveyed well to the portion of OSD 10 within AEC 2.
[26] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.
[27] Northrop Pty Ltd (2020) *Bulk Earthworks Plan Sheet 02*, Drawing No. MAUW-NRP-CV_DWG-9122, Sheet No. 9122, dated 20.07.2020, rev 04.
[28] EP Risk (2018) reported groundwater at 9.12 mAHD at MW6003, which is the closest surveyed well to the portion of OSD 3 within AEC 3.

- OSD 6 – 10.30 mAHD[29] (depth of excavation to be approximately 6.5 m above the reported groundwater level)[30].
- OSD 8 – 10.65 mAHD[31] (depth of excavation to be approximately 7.6 m above the reported groundwater level)[32].
- OSD 10 – 12.50 m AHD[33] (depth of excavation to be approximately 3.4 m above the groundwater level)[34].

- Installation of clay liners at OSD 5, OSD 6 and OSD 8 in accordance with the construction drawings provided as **Appendix B**. The clay liner to consist of clean clay capping liner; 600 mm minimum thickness through embankments and basin floors; and 300 mm thickness under bio-retention basins with a maximum permeability of $1x10^{-9}$ m/s[35] to minimise infiltration to groundwater from these structures. The construction of the clay liners has been designed to mitigate any preferential pathways of stormwater to groundwater and limit leaching from PFAS impacted soil remaining insitu beneath these structures.
- Implementation of erosion, sedimentation, and stormwater controls during bulk earthworks and sequencing works to minimise the potential for leaching of PFAS to groundwater and surface water.
- Validation of Contamination Management Works.

Phase 2 Site Preparation Works

- Importation of fill material to raise site levels[36].
- Bulk earthworks excavation of soil in accordance with the Cut and Fill Plan[37].

Phase 2 Construction Works

- Construction of OSD 6, OSD 8 and OSD 10.
- Installation of underground services.
- Construction of rail line (construction to be within imported fill level).
- Construction of roadways, warehouses, and landscaped areas.

Operational Phase

- Sub-surface maintenance works.
- Maintenance of landscaped areas.

[29] Costin Roe Consulting Pty Ltd (2020) *Basin 6 Sections*, Drawing Number LPWPIW-COS-CV-DWG-0437, Issue 1, dated 25.05.20.
[30] EP Risk (2018) reported groundwater at 3.763 mAHD within MW3005 at the proposed location of OSD 6.
[31] Costin Roe Consulting Pty Ltd (2020) *Basin 8 Sections*, Drawing Number LPWPIW-COS-CV-DWG-0438, Issue 1, dated 25.05.20.
[32] EP Risk (2018) reported groundwater at 3.06 mAHD within MW2010 at the proposed location of OSD 8.
[33] Northrop Pty Ltd (2020) *Bulk Earthworks Plan Sheet 02*, Drawing No. MAUW-NRP-CV_DWG-9122, Sheet No. 9122, dated 20.07.2020, rev 04.
[34] EP Risk (2018) reported groundwater at 9.12 mAHD at MW6003, which is the closest surveyed well to the portion of OSD 10 within AEC 3.
[35] Costin Roe Consulting Pty Ltd (2020) *Basin 5 Plan*, Drawing Number LPWPIW-COS-CV-DWG-0433, Issue 1, dated 25.05.20 – Basin capping note, which also applies to OSD 6 and OSD 8 (referenced in respective plans).
[36] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.
[37] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.

- Groundwater and surface water monitoring.
- Operation and maintenance of Engineered Stockpile.

Proposed Development Activities for Additional Areas Requiring Management Following CMP Works

Phase 2 Construction Works

- Management of fill material beneath SP10 at former STP and Anthro-2.
- Management of UF111 and UF230 adjacent to live high-risk services where no capping or removal was considered safe or practical during the CMP works.
- Reuse or offsite disposal of selected stockpiles of site won soil/materials where PFAS-impacts are suspected or have been reported.

Proposed Development Activities within the Offset Area

Development activities in the Offset Area are based upon Biobanking Agreement No. 341, which is underpinned by the Framework for Biodiversity Assessment as a Directive of the NSW Office of Environment and Heritage (OEH 2014). The Biodiversity Management Implementation Plan (BIMP) was developed by Arcadis (2020)[38] which listed the following activities within the Offset Area:

Phase 2 Contamination Management Works

- Land use restrictions.

Phase 2 Site Preparation Works

- Weed Control and revegetation planting including:
    - Application of a growing medium cover layer to exposed PFAS impacted areas outside of EEC areas[39].
    - Hand planting of tube stock by augering.
    - Direct seeding including ripping of soil to a depth of 20 – 50 cm, spreading seed mix and cover with 5 – 10 cm of soil via a rake hoe / McLeod tool.
- Management of human disturbance including construction of a perimeter fence, access gates and signage.

Operational Phase

- Maintenance activities in accordance with the Arcadis (2020) BIMP.
- Maintenance of cover over layer.
- Groundwater and surface water monitoring.

[38] Arcadis (2020) Moorebank Precinct Biodiversity Management Implementation Plan, dated 15 May 2020 (ref: IFT).
[39] Not included in the Arcadis (2020) BIMP but required to manage complete source - exposure – receptor pathways identified by EnRiskS (2019).

4.4 LTEMP Environmental Management and Monitoring Procedures

The approach to managing the potential source – pathway – receptors addressed within the LTEMP is provided in the environmental management procedures (EMP) below and is consistent with the RAP (Golder 2016) and EP Risk (2020) CMP. The EMPs are provided in **Appendix D** and summarised as follows:

- EMP01 – Land use restrictions.
- EMP02 – Subsurface works – AEC1.
- EMP03 – Subsurface works – AEC2.
- EMP04 – Subsurface works – AEC3.
- EMP05 – Materials Tracking.
- EMP06 – Stockpile Management.
- EMP07 – Soil Reuse – AEC 3.
- EMP08 – Lining of OSD 5, OSD 6 and OSD 8.
- EMP09 – Application of Cover Over Layer in the Offset Area.
- EMP10 – Off-site disposal of excavated/unsuitable material.
- EMP11 – Importation of fill materials/aggregate.
- EMP12 – Subsurface maintenance works.
- EMP13 – Landscape Maintenance.
- EMP14 - Unexpected finds.
- EMP15 – Additional Validation Requirements.
- EMP16 – Management of groundwater.
- EMP17 – Management of surface water.
- EMP18 – Groundwater and surface water monitoring.
- EMP19 – Training.
- EMP20 – Contractor and subcontractor management.
- EMP21 – Contingency plan.
- EMP22 – Non-compliances with the LTEMP.
- EMP23 – Record keeping.
- EMP24 – Audit/review of LTEMP implementation.
- EMP25 – LTEMP review.
- EMP26 – Cessation of LTEMP application.

Summary of Source – Pathway – Receptor Linkages Requiring Management

Based upon a review of the source – pathway – receptor linkages reported in **Table 3**, potentially contaminating activities associated with the construction and operation of the Proposed Development which require long term management are provided in **Table 7**.

Table 7 – Management of Potentially Contaminating Activities associated with the Proposed Development

Project Stage	AEC	Activity	Management Procedure
Phase 2 Contamination Management Works	AEC 1	Land use restrictions	EMP01
		Validation of contamination management works in AEC 1	EMP15
	AEC 2	Land use restrictions	EMP01
		Development of a CATA	EMP06
		Excavation of OSD 10	EMP03, EMP05, EMP06, EMP14
		Validation of contamination management works in AEC 2	EMP15
	AEC 3	Development of a CATA	EMP06
		Development of an Engineered Stockpile	EMP07 and Appendix H
		Excavation of OSD 6, OSD 8 and OSD 10	EMP04, EMP14
		Installation of clay liner in OSD 5, OSD 6 and OSD 8	EMP08
		Bulk earthworks	EMP04, EMP14
		Validation of contamination management works in AEC 3	EMP15
	Offset Area	Land use restrictions	EMP01
		Validation of contamination management works in Offset Area	EMP15
Phase 2 Site Preparation Works	AEC 1	Importation of fill material to raise site levels	EMP11
	AEC 2	Importation of fill material to raise site levels	EMP11
	AEC 3	Importation of fill material to raise site levels	EMP11
	Offset Area	Revegetation including application of a growing medium cover layer, weed control and vegetation planting	Arcadis (2020) BIMP, EMP09
		Management of human disturbance including construction of a perimeter fence, access gates and signage	Arcadis (2020) BIMP EMP01
Phase 2 Construction Works	AEC 1	Installation of underground services	EMP02, EMP14
		Construction of roadway and pedestrian access track	EMP02, EMP14
	AEC 2	Installation of underground services	EMP03, EMP14
		Construction of rail line and OSD 10	EMP03, EMP14
	AEC 3	Installation of underground services	EMP04, EMP14
		Construction of rail line, roadways, warehouses, ODSs and landscaped areas	EMP04, EMP14

Table 7 – Management of Potentially Contaminating Activities associated with the Proposed Development

Project Stage	AEC	Activity	Management Procedure
	CMP Management Areas	Additional areas requiring management following CMP Works	EMP06, EMP15
		Management of site won stockpiles	EMP06, EMP07
Operation of Proposed Development	AEC 1	Sub-surface maintenance works	EMP12, EMP14
	AEC 2	Sub-surface maintenance works	EMP12, EMP14
	AEC 3	Sub-surface maintenance works	EMP12, EMP14
		Maintenance of landscaped areas	EMP13
		Groundwater and Surface water monitoring	EMP18
		Operation and Maintenance of Engineered Stockpile	Appendix H
	Offset Area	Maintenance of vegetation	Arcadis (2020) BIMP
		Groundwater and Surface water monitoring	EMP18

4.5 Reuse of PFAS Impacted Soil

Reuse of PFAS impacted soil at the Site can be undertaken with consideration to the risks posed to human health and / or the environment in accordance with the framework provided by the PFAS NEMP[40]. The critical exposure pathways requiring management during soil reuse at Site are:

- transport of PFAS to surface water and groundwater through leaching from PFAS-contaminated material; and
- bioaccumulation in plants and animals, in particular, those consumed by humans and animals.

Proposed PFAS Criteria and Management Measures

EnRiskS (2020)[41] prepared a material reuse risk assessment in relation to the presence of PFAS in soil to inform management procedures for soil reuse in the LTEMP. EnRiskS (2020) provided revised criteria for PFAS in soil to be reused in the Construction Area which are presented in **Table 8.** The revised criteria for PFAS in soil can only be implemented where the management measures outlined in **Table 8** are adopted.

[40] Heads of EPA Australia and New Zealand (2020) *PFAS National Environmental Management Plan Version 2.0*.
[41] EnRiskS (2020) Moorebank Intermodal Terminal: LTEMP Material Reuse Risk Assessment for PFAS, dated 9 October 2020.

Table 8 – PFAS Trigger Levels for Soil Reuse Within the Construction Area

Soil Reuse Zone	Analyte	Land use	Criteria	Management Measures
Soil Reuse Zone 1 (all areas)	Soil - PFOS[42]	All land uses	≤ 0.01 mg/kg	Materials must be placed at least 1 m above groundwater (seasonal maximum). These criteria relate to material that may be placed adjacent to OSD basins and overflow drainage channels that have a clay liner or equivalent geosynthetic liner[43].
	Leachate (neutral pH) - PFOS + PFHxS[44]		≤ 0.07 µg/L	
Soil Reuse Zone 2 (beneath surface cover materials as described in management measures)	Soil - PFOS	All land uses	≤ 0.01 mg/kg	Materials must be placed at least 1 m above groundwater (seasonal maximum). Materials must be placed beneath Engineered Fill[45], concrete or a clay liner or equivalent geosynthetic liner[43].
Soil Reuse Zone 3 – Soil beneath subdivided area for warehouse development / lease area.	Soil - PFOS	Intensively developed sites	≤ 0.01 mg/kg	Materials must be placed at least 1 m above groundwater (seasonal maximum). Materials must be placed beneath Engineered Fill[45], concrete, or a clay liner or equivalent geosynthetic liner[43].
Soil Reuse Zone 4 – Soil beneath the western ring road and interstate terminal/access areas	Soil - PFOS	Intensively developed sites	≤ 0.14 mg/kg	Materials must be placed at least 1 m above groundwater (seasonal maximum). Materials must be placed beneath Engineered Fill[45], concrete, or a clay liner or equivalent geosynthetic liner[43].

[42] PFOS - Perfluorooctane sulfonate.

[43] The clay liner/geosynthetic liner must comply with the following requirements:

- Install clay liners (or equivalent geosynthetic liners) through embankments and basin floors (minimum 600 mm) and under bio-retention basins (minimum 300 mm), as well as OSD overflow drainage channels to mitigate any preferential pathways for soil leachate to directly enter surface water and stormwater to migrate to groundwater. The clay/geosynthetic liner should meet a maximum permeability of 1x10-9 m/s.
- The liners should be monitored via inspection if possible (minimum yearly) or by installation and testing of monitoring well(s) and repaired if damaged or deteriorated.
- All works undertaken in the area of the OSD stormwater infrastructure should not damage these liners. If damage occurs the liners need to be repaired as soon as practicable.

[44] PFHxS – Perfluorohexane sulfonate.

[45] Engineered Fill of a minimum 1 m thickness is to conform to one of the following:

- Sandstone Fill from road header excavation, tunnel boring machine excavation or ripped or rock hammer excavation.
- Approved imported fill materials.
- Site won VENM or Excavated Natural Material (ENM).

Where the thickness of Engineered Fill is less than 1m, the surface cover must also include concrete pavement or a building slab.
Engineered Fill shall be placed in accordance with the following requirements:

- In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the Geotechnical Inspection and Testing Authority (GITA).
- The compacted thickness of each layer shall be equal to or less than 300 mm. Engineered Fill shall only be placed on subgrade in accordance with the Moorebank Intermodal Logistics Precinct: Bulk Earthworks Specification Area A, B, D (EPSM3813-021S REV 1) and approved by the GITA.
- Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.
- The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.

Further details of the derivation of the soil reuse criteria provided in **Table 8** are contained in the EnRiskS (2020) report.

Based upon a review of the setting and development proposed for the Site approximate footprints of the soil reuse zones were developed based upon a 200 m[46] buffer distance from waterways and a 50 m[47] buffer distance from stormwater structures. A table presenting differences between seasonal maximum groundwater levels and ground surface levels is provided as **Appendix M**. Shallow groundwater at depths less than 1.0 m are likely to be found within the Offset Area adjacent to the Georges River.

Areas where groundwater is within 1.0 m of the ground surface or within flood prone areas have not been included in the reuse zones provided as **Figure 5**. The approximate locations of the soil reuse zones are presented in **Figure 5** and further details of the management of reuse of PFAS impacted soil is provided as **EMP07**.

It should be noted that the reuse zones in **Figure 5** have been prepared based upon the Precinct Master Plan ('PMP') provided as **Appendix B**. The PMP at **Appendix B** has been finalised and accepted by MIC and Qube and no further revision to the PMP is contemplated. Should the PMP change then the LTEMP will need to be revised in accordance with **EMP25**.

Therefore, soil excavated from AEC 3 that has been subject to historical PFAS testing, as outlined in **Appendix J** or which is sampled and tested in accordance with **EMP07** with concentrations less than trigger values provided in **Table 8** can be reused within the respective zone within the Construction Area as appropriate without further assessment of risk. However, where practicable, soil excavated from AEC 3 that is reported below the Soil Reuse Zone 1 (all areas) criteria can be reused within Zone 2, Zone 3 or Zone 4, but should be preferentially placed beneath imported fill areas.

In alignment with Section 12.1.1 and 12.1.2 of the PFAS NEMP, an assessment of historical soil PFOS and leachate (neutral pH) PFOS + PFHxS results reported by EP Risk (2018) for the proposed cut areas[48] was undertaken with the results provided in **Table J1, Table J2** and **Table J3** of **Appendix J**. Based upon an assessment of the summary data provided in **Table J1**, exceedances of the soil reuse criteria provided in **Table 8** were reported in samples collected soil to be excavated from OSD 6 and OSD 8 and the general cut areas. The analytical results, 95% UCL_{mean}[49] calculations and sampling locations are provided as **Appendix J**. Further testing of soil where historical data is absent or limited is to be undertaken in accordance with **EMP07**.

In addition, JBS&G (2020a) reported that there are numerous site-won stockpiles of soil at the Site from Stage 1 works with limited information (principally leachate data) to identify reuse opportunities and appropriate management. Details of known or potential PFAS impacted stockpiles compiled by JBS&G are provided as **Appendix L**.

[46] HEPA (2020) NEMP 2.0 – Contact with the environmental regulator must be made before any proposal for reuse within 200 m of a surface water body or wetland area.
[47] A buffer distance of 50 m from stormwater structures was adopted for reuse of soil for all land uses within the Construction Area. The buffer distance of 50m was considered sufficiently protective to reduce the risk of leaching and erosion of soil to stormwater structures with consideration to the urban setting, the intensively developed nature of the Construction Area where greater than 80% of the surface area is covered by hard surfaces and the absence of secondary consumers.
[48] Costin Roe Consulting Pty Ltd (2020) Cut and Fill Plan, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.
[49] 95% UCL_{mean} – 95% upper confidence levels of the arithmetic mean.

Additional testing of site won stockpiles will be required in accordance with **EMP07** where:

- Stockpiles have reported detectable PFAS total concentrations above the laboratory limit of reporting, but leachate testing was not undertaken; or
- Soil in the stockpile has been excavated from AEC 3 and has not been sampled or tested; or
- Soil tracking documentation identifying the source location of the stockpile is not available.

The preliminary reuse category of stockpiled soil with respect to PFAS, where analytical testing results are available, is provided as **Appendix L**. The information in **Appendix L** will change as site works progress and further excavation takes place. The information in **Appendix L** should be updated in accordance with the material tracking procedures provided as **EMP05**.

Additional Site-Specific Risk Assessment

Future works that require excavation of soil in the reuse zones can only be undertaken in accordance with **Table 8** and the management procedures provided as **EMP07**, unless a further additional site-specific risk assessment is conducted.

Short to Medium Term Stockpiling of PFAS Impacted Soil

Where reported PFAS concentrations in soil exceed the reuse criteria in **Table 8**, or where there are limited opportunities for reuse, then the soil is to be placed within and Engineered Stockpile to be constructed at the Site in accordance with the concept design provided as **Appendix H**. The concept design has been developed in accordance with the requirements in the PFAS NEMP for stockpiling over the medium term (2-5 years) as outlined in **EMP06**. The on-site storage and containment of the excavated soil will be required to facilitate the construction program until appropriate treatment options become available.

It should be noted that the design requirements for medium term storage include an engineered containment facility with effective stormwater controls and are the same as the design requirements for storage over the long-term (>5 years).

4.6 Compliance Matrix

The Development Consent made under *Section 89E of the Environmental Planning and Assessment Act 1979* has listed the conditions of consent for SSD 5066 and SSD 7709 in **Appendix E** in relation to the LTEMP.

4.7 Adopted Remediation Criteria

The adopted remediation criteria for the validation of additional areas requiring management following CMP Works or any unexpected finds identified during Stage 2 works and on-going operation of the Site is provided below.

Soil Criteria

For the purposes of assessing the results of validation analytical testing of soil at the Site, the following guidelines will be considered:

- NSW DEC (2017) Guidelines for the NSW Auditor Scheme (Third Edition);
- National Environment Protection Council (NEPC) 2013, National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra (ASC NEPM, 2013);
- Friebel, E & Nadebaum, P 2011, Health Screening Levels for Petroleum Hydrocarbons in soil and Groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia; and
- Heads of EPAs Australia and New Zealand (HEPA), *PFAS National Environmental Management Plan*, January 2020 ('HEPA NEMP 2020').

In accordance with the decision-making process for assessing urban redevelopment sites (Appendix C, NSW DEC 2017), soil concentrations, where required, will be compared against the following soil investigation levels (SILs):

- **Health-based Criteria for the proposed land use**: ASC NEPM (2013) Health-based Investigation levels ('HILs') for commercial/industrial land uses, the Health Screening Levels ('HSLs') for commercial/industrial land uses and the CRC Care (2011) Soil Health Screening Levels for Direct Contact and Intrusive Maintenance Worker ('HSLs');
- **Environmental Criteria**: ASC NEPM (2013) Ecological Screening Levels ('ESLs') and Ecological Investigation Levels ('EILs') for commercial/industrial;
- **Management Limits**: ASC NEPM (2013) Management Limits for commercial/industrial land use ('Management Limits'); and
- **Aesthetics**: The consultant should also consider the need for management based on the 'aesthetic' contamination as outlined in Schedule B (1) of the ASC NEPM (2013) that states that *'there are no numeric Aesthetic Guidelines however site assessment requires balanced consideration of the quality, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity*'. Where required, soil odour and discolouration may need to be assessed.

Asbestos Assessment Criteria

Asbestos Forms

Asbestos contamination can occur in a range of forms, sizes and degrees of deterioration. ASC NEPM (2013) separates asbestos contamination into the following forms:

- Bonded (non-friable) ACM – Asbestos bound in a matrix, and in sound condition e.g. vinyl floor tiles, cement sheeting;
- Fibrous Asbestos ('FA') – Friable asbestos material such as weathered ACM and loose fibrous material (insulation products); and
- Asbestos Fines ('AF') – Free fibres of asbestos, small fibre bundles and ACM fragments that can pass through a 7 mm x 7 mm sieve.

Asbestos - Health Screening Levels

ASC NEPM (2013) (Schedule B1 *Guideline on the Investigation Levels for Soil and Groundwater*, Section 4.8 and Table 7) provides HSLs for the five exposure settings based on scenario-specific likely exposure levels adopted from the Western Australia Department of Health ('WA DoH') *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia,* May 2009.

A HSL of 0.05 % w/w asbestos for bonded ACM was adopted as the remediation criteria for bonded ACM validation based on the intended commercial / industrial land use.

ASC NEPM (2013) states a criterion of 0.001% for FA and AF (< 7 mm) for all site uses to screen the analytical results. It should be noted that in accordance with Australian Standard AS4964-2004 and the laboratories NATA accreditation, the LOR for AF/FA in soil is 0.1 g/kg (0.01 % w/w). The risk assessment of FA and AF in soil to 0.001 % for FA and AF for assessment with ASC NEPM 2013 is reported as a non-NATA accredited result.

Consequently, NATA accredited laboratories provide additional commentary on visual observations made during analysis relating to the presence of visible FA and AF (if present). These observations are noteworthy, based on the weight of evidence approach, in accordance with ASC NEPM (2013).

For the purposes of this assessment a qualitative criterion was adopted (i.e. the laboratory's observation of visible FA/AF in the soil samples) to apply professional judgement and a risk-based approach.

The adopted remediation criteria provided by Golder (2016a) and JBS&G (2020) are provided in **Table** 9.

Table 9 – Adopted Soil Remediation Criteria

	Commercial Industrial HIL-D	HSL-D Vapour Intrusion Sand 0-1m	HSL-D Vapour Intrusion Sand 0-1m	ESL[50] - Coarse	EIL[51]	Mgt Limits[52]
Metals						
Arsenic	3,000	-	-	-	160	-
Cadmium	900	-	-	-	-	-
Chromium (VI)	3,600[53]	-	-	-	-	-
Chromium (III)	-	-	-	-	930	-
Copper	240,000	-	-	-	140	-
Lead	1,500	-	-	-	1,800	-
Mercury (inorganic)	730[54]	-	-	-	-	-
Nickel	6,000	-	-	-	40	-
Zinc	400,000	-	-	-	430	-
Polycyclic Aromatic Hydrocarbons (PAHs)						
Carcinogenic PAHs (as B(a)P TEQ)[55]	40	-	-	-	-	-
Benzo(a)pyrene	-	-	-	1.4	-	-
Total PAHs[56]	4,000	-	-	-	-	-
BTEXN						
Benzene	-	3	3	75	-	-
Toluene	-	NL[57]/99,000[58]	NL[59]	135	-	-
Ethylbenzene	-	NL[57]/27,000[58]	NL	165	-	-
Total Xylenes	-	230	NL	180	-	-
Naphthalene	-	NL[57]/11,000[58]	NL	-	370	-
Total Recoverable Hydrocarbons (TRH)						
F1 C_6-C_{10}	-	260[60]	370	215[61]	-	700
F2 >C10-C16	-	NL[60]/20,000[58]	NL	170[61]	-	1,000
F3 >C16-C34	-	NL/27,000[58]	NL	1,700	-	3,500
F4 >C34-C40	-	NL/38,000[58]	NL	3,300	-	10,000
Phenols						
Phenol	240,000	-	-	-	-	-
Pentachlorophenol	660	-	-	-	-	-

[50] ESLs are of low reliability except where indicated.
[51] EILs calculated based on CSIRO NEPM EILS Calculation Workbook (http://www.scew.gov.au/node/941) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.
[52] Management limits are applied after consideration of relevant HSLs and ESLs.
[53] Guideline values presented are for Chromium (VI) in absence of total Chromium values. Where total Chromium results are elevated, samples will be analysed for Chromium (VI).
[54] Guideline values are for inorganic mercury. Where elevated mercury concentrations are encountered and/or site information suggests the potential presence of elemental mercury and/or methyl mercury, consideration of applicability would be needed.
[55] Carcinogenic PAHs calculated as per Benzo(a)pyrene Toxicity Equivalent Factor requirements presented in NEPC 2013.
[56] Total PAHs calculated as per requirements presented in NEPC 2013.
[57] Soil Health Screening Levels for Vapour Intrusion: Clay Soils. Values presented are those for 0 to <1 mBGL for the various land use. Reference should be made to NEPC 2013 for further detail of levels at greater depths.
[58] Direct Contact criteria (CRCCARE 2011).
[59] NL – not limiting.
[60] Values for F1 C6-C9 are obtained by subtracting BTEX (Sum) from laboratory result for C6-C9 TRH. Naphthalene is not subtracted as there is separate limits for Naphthalene.
[61] ESLs are of moderate reliability.

Table 9 – Adopted Soil Remediation Criteria

	Commercial Industrial HIL-D	HSL-D Vapour Intrusion Sand 0-1m	HSL-D Vapour Intrusion Sand 0-1m	ESL[62] - Coarse	EIL[63]	Mgt Limits[64]
Organochlorine Pesticides (OCPs)						
DDT + DDD + DDE	3,600	-	-	-	-	-
Aldrin + Dieldrin	45	-	-	-	-	-
Chlordane	530	-	-	-	-	-
Endosulfan	2,000	-	-	-	-	-
Endrin	100	-	-	-	-	-
Heptachlor	50	-	-	-	-	-
Methoxychlor	2,500	-	-	-	-	-
HCB	80	-	-	-	-	-
DDT	-	-	-	-	-	-
Organophosphorus Pesticides (OPPs)						
Chlorpyrifos	2,000	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)						
PCBs	7	-	-	-	-	-
Asbestos						
Bonded Asbestos	0.05% w/w	-	-	-	-	-
AF/FA	0.001% w/w	-	-	-	-	-

4.8 Validation Sampling Program

Validation of additional areas requiring management following CMP Works and unexpected finds will be undertaken as per Section 8 of the RAP (Golder 2016) and the summary and procedures are based on the RAP. The usability of the data collected during the program will be assessed in accordance with Section 8.7 of the RAP (Golder 2016). Reporting will be undertaken in accordance with the NSW EPA *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land* (NSW EPA 2020).

4.9 Waste Classification

Contaminated soils requiring disposal off-site shall be assessed and classified in accordance with **EMP10**.

4.10 Contingency Plan

In accordance with SSD 7709 – B172, the LTEMP must include *'details of any contingency measures that the Applicant is to carry out to address any ongoing contamination'*. Procedures for the management of unexpected finds (**EMP 14**) and a contingency plan (**EMP21**) are provided within this plan.

[62] ESLs are of low reliability except where indicated.
[63] EILs calculated based on CSIRO NEPM EILS Calculation Workbook (http://www.scew.gov.au/node/941) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.
[64] Management limits are applied after consideration of relevant HSLs and ESLs.

5 Monitoring and Reporting

5.1 Contamination Management Plan Periodic Review

A periodic review of the LTEMP should be undertaken for the following (**EMP25**, **Appendix D**):

- If there are any regulatory changes relevant to the implementation of the LTEMP.
- If there is any significant change in land use or additional development of the Site.
- Once construction activities have been completed and prior to occupation of the Site.

Any revisions to the LTEMP must be approved by the appointed NSW EPA accredited Site Auditor (**EMP25**, **Appendix D**). Where the LTEMP is revised, copies should be provided to all current stakeholders, training provided, and induction procedures updated where necessary.

5.2 Period of Implementation

The LTEMP is to be implemented during construction and operation of the Proposed Development and will not cease until the conditions detailed in **EMP26** (**Appendix D**) are met.

5.3 Managing and Reporting

Incidents and Non-compliances

The requirement is for the owner of the Site to be compliant with conditions of consent and undertake the development in accordance with all consent and planning documentation. However, in the event of an incident and/or non-compliance with the LTEMP, these will be managed in accordance with **EMP22** (**Appendix D**). Reporting registers are provided as **Appendix G**.

Complaints

All complaints will be managed in accordance with the CEMP.

Continual Improvement

Continual improvement of this LTEMP will be undertaken in accordance with the **EMP24** and **EMP25** in **Appendix D.** Continuous improvement will be achieved by the ongoing evaluation of environmental management performance and effectiveness of this plan against the environmental policies, objectives, and targets.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

5.4 Record Keeping

All documents in relation to the LTEMP will be managed in accordance with **EMP23** (**Appendix D**).

5.5 Groundwater and Surface Water Monitoring

The requirement for a soil and groundwater monitoring program is provided in the following:

- The Golder (2016) RAP recommended that a routine monitoring regime be established as part of the LTEMP.
- Condition B172 of SSD 7709 requires that the LTEMP must include a surface water and groundwater monitoring program.

Groundwater plumes associated with the following areas have been identified:

- **AEC 1** - The chlorinated hydrocarbon plume in the north west portion of the Site;
- **AEC 2** - The LNAPL plume in the eastern portion of the Site; and
- **AEC 3** - PFAS plume associated with historical firefighting at the Site.

AEC 1: Based upon a review of the Golder (2015a) risk assessment and Golder (2016) RAP, JBS&G (2020) concluded further groundwater monitoring and / or remediation of the TCE plume was not necessary to satisfy the Golder (2016) RAP. Therefore, future groundwater monitoring of the TCE plume has not been included in the LTEMP.

AEC 2: Based upon a review of the Site Audit Report (Enviroview 2019)[65] prepared for the adjacent IMEX Site and the GHD (2018) EMP, ongoing monitoring of the LNAPL groundwater plume is required until such time as it can be demonstrated the Site is suitable for commercial / industrial land use as an intermodal terminal without ongoing management. It is a requirement that groundwater monitoring of the LNAPL groundwater plume at the Site is undertaken in accordance with the GHD (2018) EMP. However, monitoring of the IMEX site and wells located at the Site is currently being undertaken to close out conditions of the Site Audit Statement[66] for the IMEX site and will not be duplicated in this LTEMP or included in **EMP18**. The proposed monitoring wells will be installed at the Site at the completion of Stage 2 construction works, with the locations provided as **Appendix I**.

AEC 3: Golder (2016) recommended PFAS concentrations be assessed and where required, a routine monitoring regime established as part of the LTEMP. Groundwater and surface water monitoring of PFAS concentrations will be undertaken during and after construction works to assess effects of redevelopment on PFAS mass flux to the Georges River to inform the appropriateness of mitigation measures provided in the LTEMP. Ongoing groundwater monitoring will also be undertaken at the site of the Proposed Engineered Stockpile. Further details of the monitoring program are provided in **EMP18** in **Appendix D**.

[65] *Site Audit Report, IMEX Terminal Site, Moorebank Precinct East, Sydney Intermodal, 402 Moorebank Ave, Moorebank*, dated 15 August 2019 (ref: 600099_0301-1613-2).
[66] *Site Audit Statement No. 0301-1613-2* prepared by James Davis on 15 August 2019.

6 References

- *Site Audit Report and Site Audit Statement Moorebank Intermodal Terminal, Moorebank, NSW*, AECOM Australia Pty Ltd Mr Frank Mohen NSW EPA accredited Site Auditor No.9801, 10 July 2014 (AECOM 2014).
- Coffey (2017) *PFAS Assessment Report – Royal Australian Engineers (RAE) Golf Course*, dated 29 September 2017 (ref: GEOTLCOV24072AF CD) Coffey.
- Costin Roe Consulting Pty Ltd (2020) Construction Soil and Water Management Plan, Moorebank Logistic Park, Precinct West Stage 2, Moorebank Avenue, Moorebank, NSW, dated 16 March 2020, Revision 10 (ref: 13455.07-03_10.rpt)
- DIPNR (2004) Department of Infrastructure, Planning and Natural Resources, *Guidelines for the preparation of Environmental Management Plans.*
- EnRiskS (2019) *Land Human Health and Ecological Risk Assessment (Land HERA)*, dated 6 May 2019 (ref: MICL/19/BIOR001, Revision B – Revised Draft).
- EnRiskS (2019a) *Waterway Human Health and Ecological Risk Assessment (Waterway HHERA)*, dated 10 May 2019 (ref: MICL/18/GRR001, Revision E – Revised Draft).
- EnRiskS (2020) *Moorebank Intermodal Terminal: LTEMP Material Reuse Risk Assessment for PFAS*, letter dated 9 October 2020.
- EP Risk (2017) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v3, 03.10.17) EP Risk Management Pty Ltd.
- EP Risk (2017a) *Per- and Poly-fluoroalkyl Substances (PFAS) Data Gap Investigation* (ref: EP00464.002, v2, 20.11.17) EP Risk Management Pty Ltd.
- EP Risk (2017b) *Per- and Poly-fluoroalkyl Substances (PFAS) Nested Well Investigation* (ref: EP00561.002, v1, 10.07.17) EP Risk Management Pty Ltd.
- EP Risk (2018) *Moorebank Precinct West Site-Wide Per- and Poly- Fluoroalkyl Substances (PFAS) Assessment* (ref: EP0748.008 v1, 22.08.18) EP Risk Management Pty Ltd.
- EP Risk (2017c) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v.3, 03.10.17).
- EP Risk (2020) *Contamination Management Plan, Moorebank Precinct West, 400 Moorebank Avenue, Moorebank, NSW*, 30 July 2020 (ref: EP1489.002_v11).
- Enviroview (2016) *Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan*, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
- Enviroview (2019) *Site Audit Interim Advice 29 – Review of Human Health and Ecological Risk Assessment (HHERA): PFAS in Georges River Adjacent to Proposed Moorebank Intermodal Terminal prepared by EnRiskS*. Letter to Tactical Group dated 29 January 2019 from Mr James Davis.

- Enviroview (2019a) *Site Audit Interim Advice 30 – Review of Land and Waterway Human Health and Ecological Risk Assessments (HHERAs) prepared by EnRiskS*. Letter to Tactical Group dated 17 July 2019 from Mr James Davis.
- Enviroview (2020) *Site Audit Interim Advice 31 – Review of JBS&G Report – Remediation Validation Report for Moorebank Precinct West*. Letter to Tactical Group dated 20 February 2020 from Mr James Davis.
- Enviroview (2020a) *Site Audit Interim Advice 32 – Review of EP Risk Reports – Long-Term Environmental Management Plan (LTEMP) and Contamination Management Plan (CMP) for Moorebank Precinct West*. Letter to Tactical Group dated 5 March 2020 from Mr James Davis.
- Enviroview (2020b) *Site Audit Interim Advice 33 – Review of JBS&G Report – Revised Remediation Validation Report for Moorebank Precinct West*. Letter to Tactical Group dated 6 May 2020 from Mr James Davis.
- Enviroview (2020c) *Site Audit Interim Advice 34 – Review of Revised EP Risk Report – Contamination Management Plan (CMP) for Moorebank Precinct West*.
- Enviroview (2020d) *Site Audit Interim Advice 35 – Review of Revised EP Risk Reports – Long-Term Environmental Management Plan (LTEMP) and Contamination Management Plan (CMP) for Moorebank Precinct West*.
- Enviroview (2020e) *Site Audit Interim Advice 37 – Review of Revised Long-Term Environmental Management Plan (LTEMP) (v5) for Moorebank Precinct West*.
- Enviroview (2020f) *Site Audit Interim Advice 38 – Review of Revised Long-Term Environmental Management Plan (LTEMP) (v6) for Moorebank Precinct West*.
- Enviroview (2020g) *Site Audit Interim Advice 02 – Review of Long-Term Environmental Management Plan (LTEMP) (rev 9) for Moorebank Precinct West, Stage 2 works*.
- Enviroview (2020h) *Site Audit Interim Advice 03 – Review of LTEMP Material Reuse Risk Assessment for PFAS for Moorebank Intermodal Terminal*, dated 1 October 2020 (ref: IA 0301-2014_03).
- Enviroview (2020i) *Site Audit Interim Advice 04 – Review of LTEMP Material Reuse Risk Assessment for PFAS for Moorebank Intermodal Terminal*, dated 14 October 2020 (ref: IA 0301-2014_04).
- Enviroview (2020j) *Site Audit Interim Advice 05 – Review of Revised LTEMP Material Reuse Risk Assessment for PFAS for Moorebank Intermodal Terminal*, dated 22 October 2020 (ref: IA0301-2014_05).
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- JBS&G (2019a) *Environmental Management Plan for Land Preparation Work – Demolition and Remediation MPW, Moorebank, NSW,* February 2019.
- JBS&G (2020) *Remediation Validation Report, Land Preparation Work – Demolition and Remediation, Moorebank Intermodal Company Property West, Moorebank NSW*, dated 22 July 2020 (ref: 51997-120265/Rev1).
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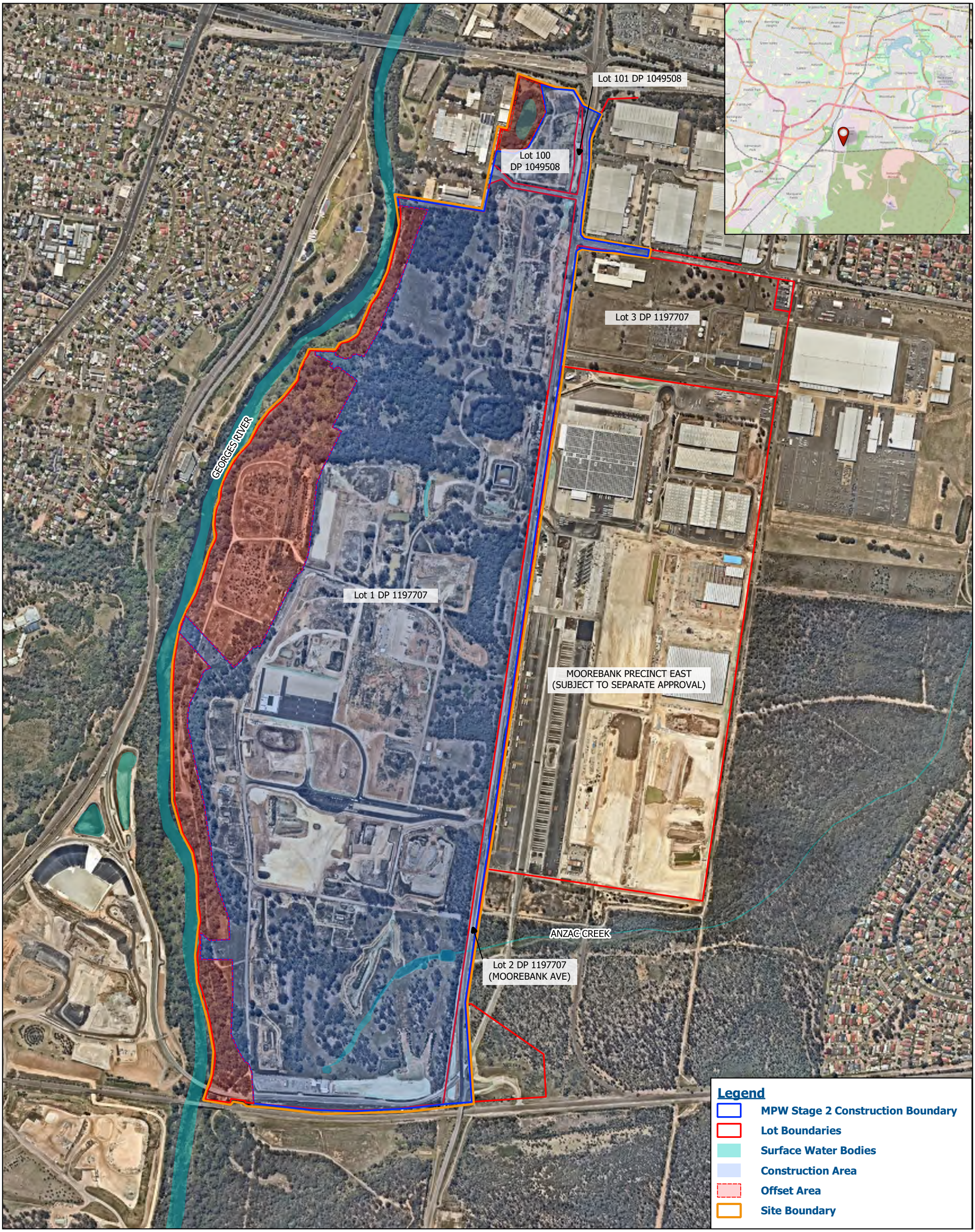
- SEPP 55 – Remediation of Land.
- SIMTA (2020) *Construction Environmental Management Plan, Moorebank Precinct West Stage 2*, dated 14 January 2020 (ref: MIC2-QPMS-EN-APP-00001).

Figures



EP RISK

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Long Term Environmental Management Plan
Moorebank Precinct West

Figure 1 - Site Location

Job No: EP1489.001
Date: 17/06/2020
Drawing Ref: Fig 1
Version No: v1

N

0 130 260 390 m

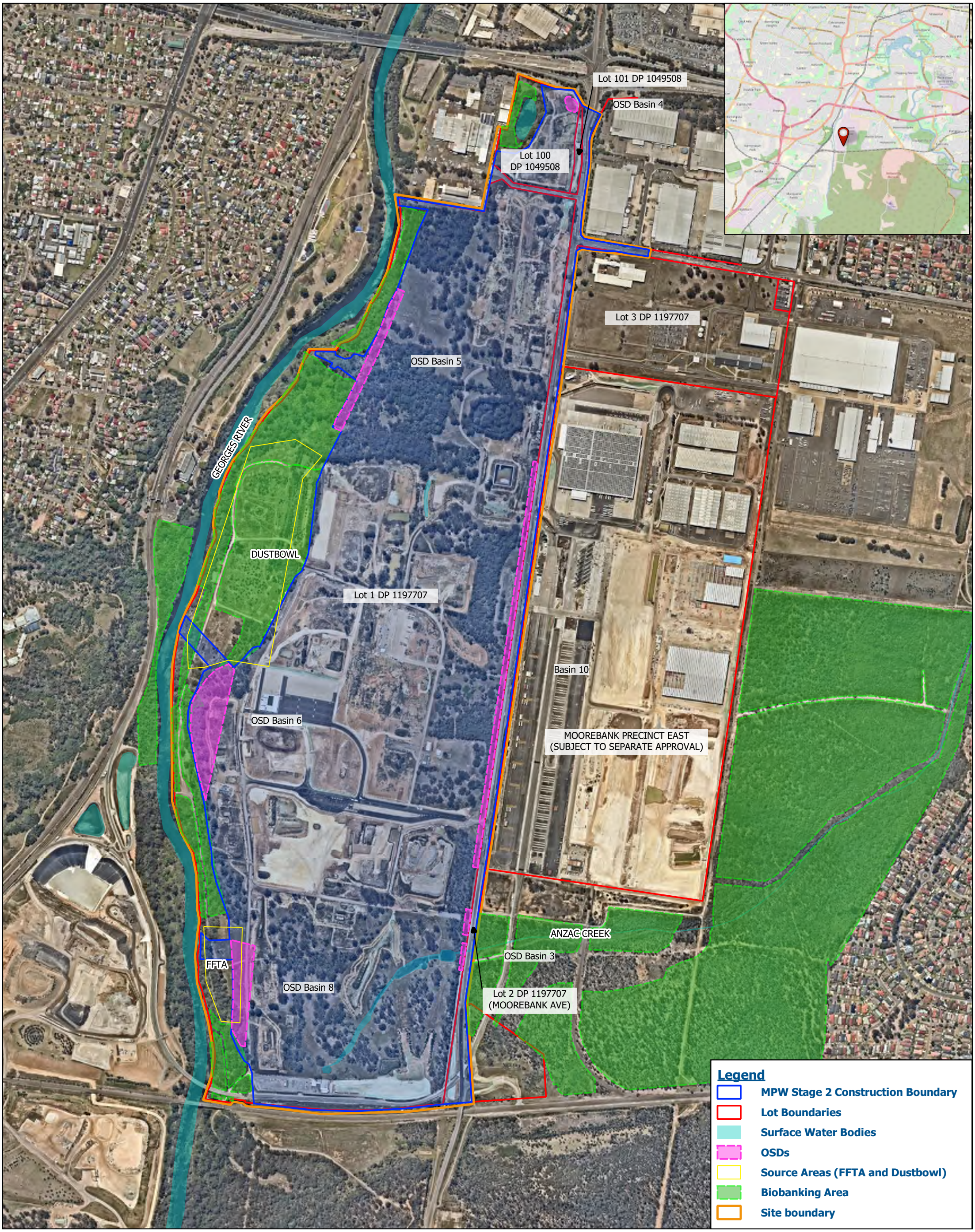
Approximate Scale Only

Coordinate System: WGS 84
Drawn by: OG Checked by: PS
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



EP RISK

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Long Term Environmental Management Plan
Moorebank Precinct West

Figure 2 - MPW Project Layout and Features

Job No: EP1489.001
Date: 03/08/2020
Drawing Ref: Fig 2
Version No: v1

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0 130 260 390 m

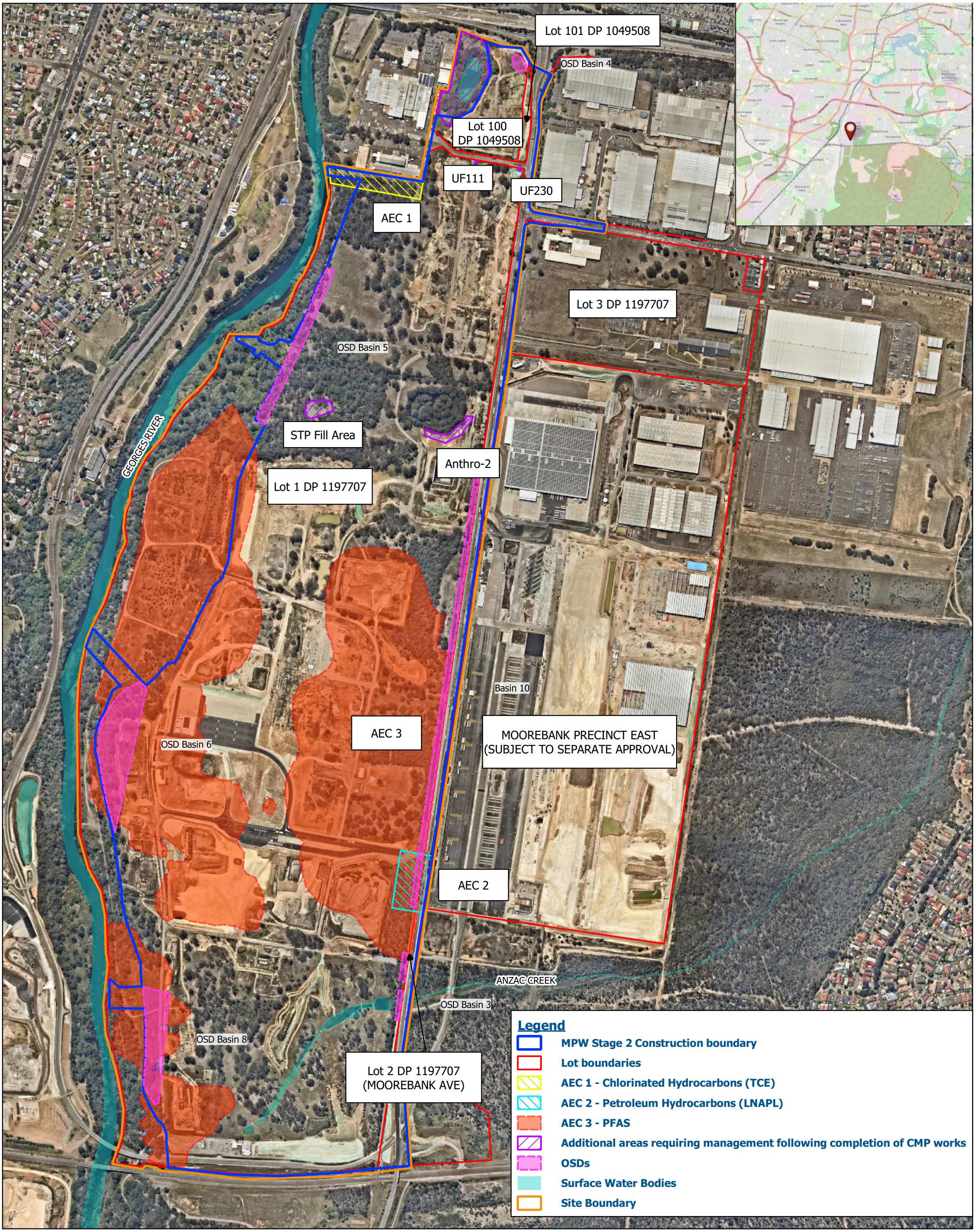
Approximate Scale Only

Coordinate System: WGS 84
Drawn by: OG **Checked by:** KG
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



EP RISK

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Long Term Environmental Management Plan
Moorebank Precinct West

Figure 3 - Areas of Environmental Concern

Job No: EP1489.001
Date: 24/09/2020
Drawing Ref: Fig 3
Version No: v4

N

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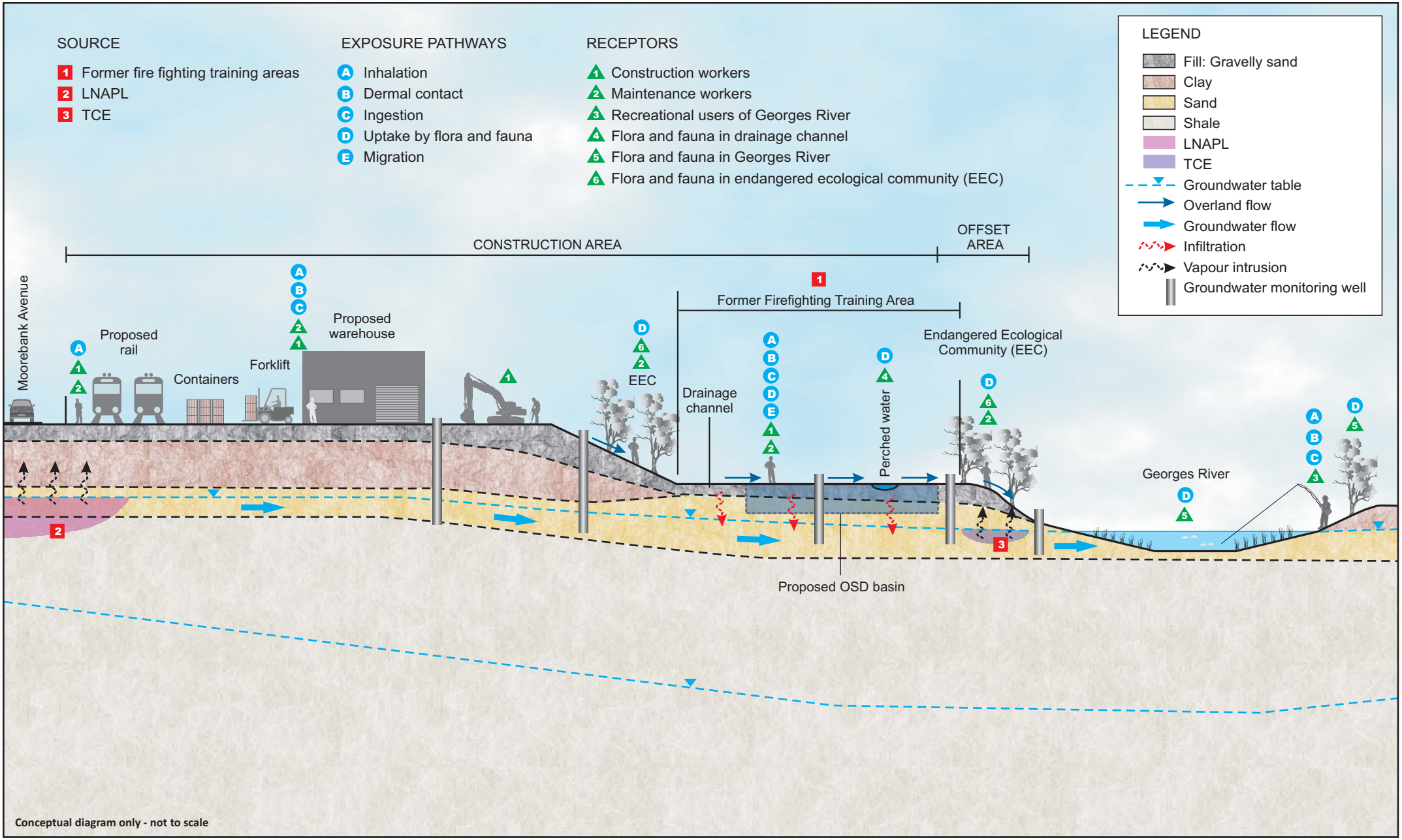
Approximate Scale Only

Coordinate System: MGA 84
Drawn by: SL **Checked by:** SL
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



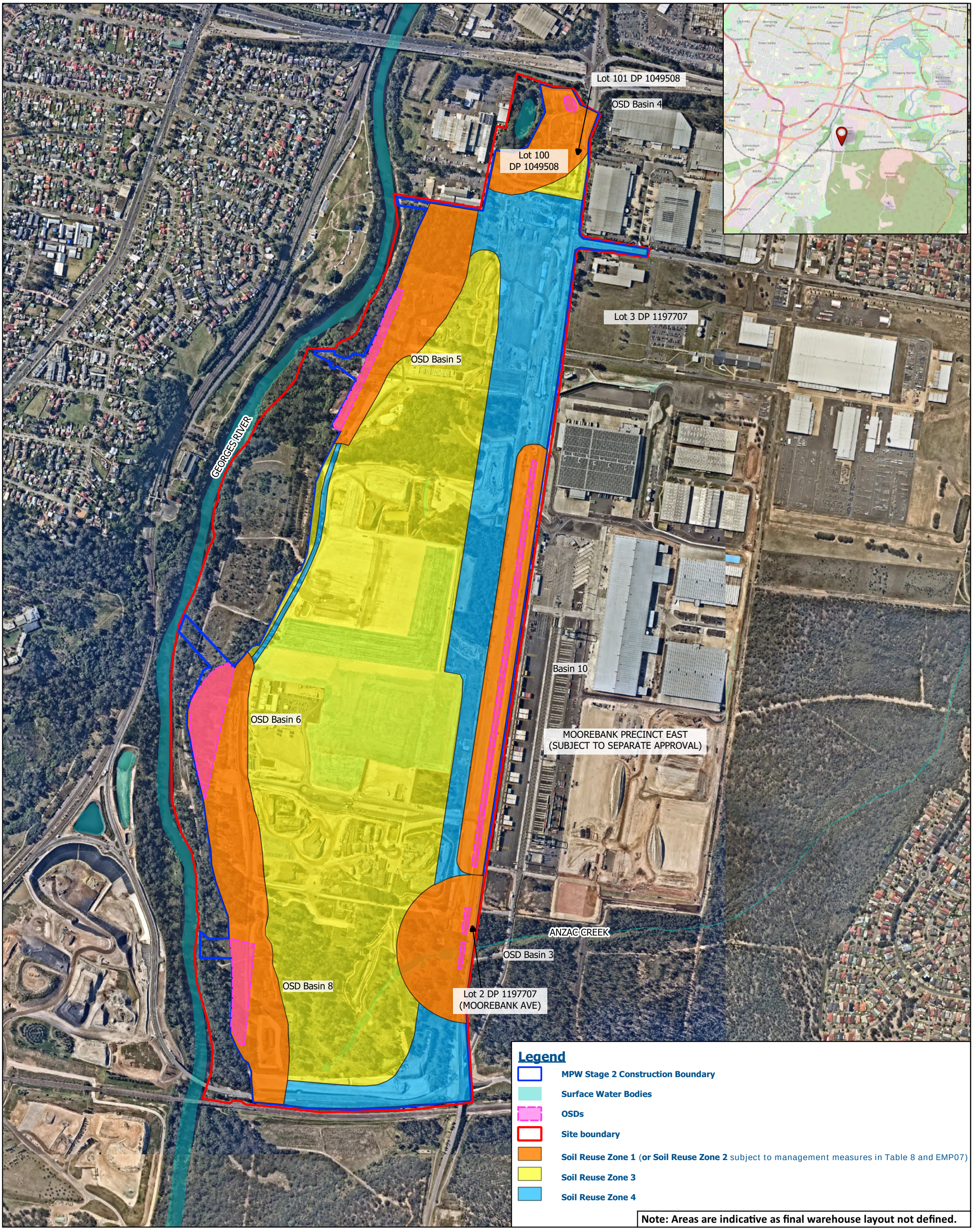
EP RISK

Long Term Environmental Management Plan
Moorebank Precinct West

Figure 4 - Conceptual Site Model

Job No: EP1489
Date: 5/5/2020
Drawing Ref: EP1489_001.cdr
Version No: v1

Drawn By: B.W.
Checked By: P.S.



Long Term Environmental Management Plan
Moorebank Precinct West

Figure 5 - Soil Reuse Zones

EP RISK

www.eprisk.com.au

Job No: EP1489.001
Date: 26/10/2020
Drawing Ref: Fig 5
Version No: v3

N

0 130 260 390 m

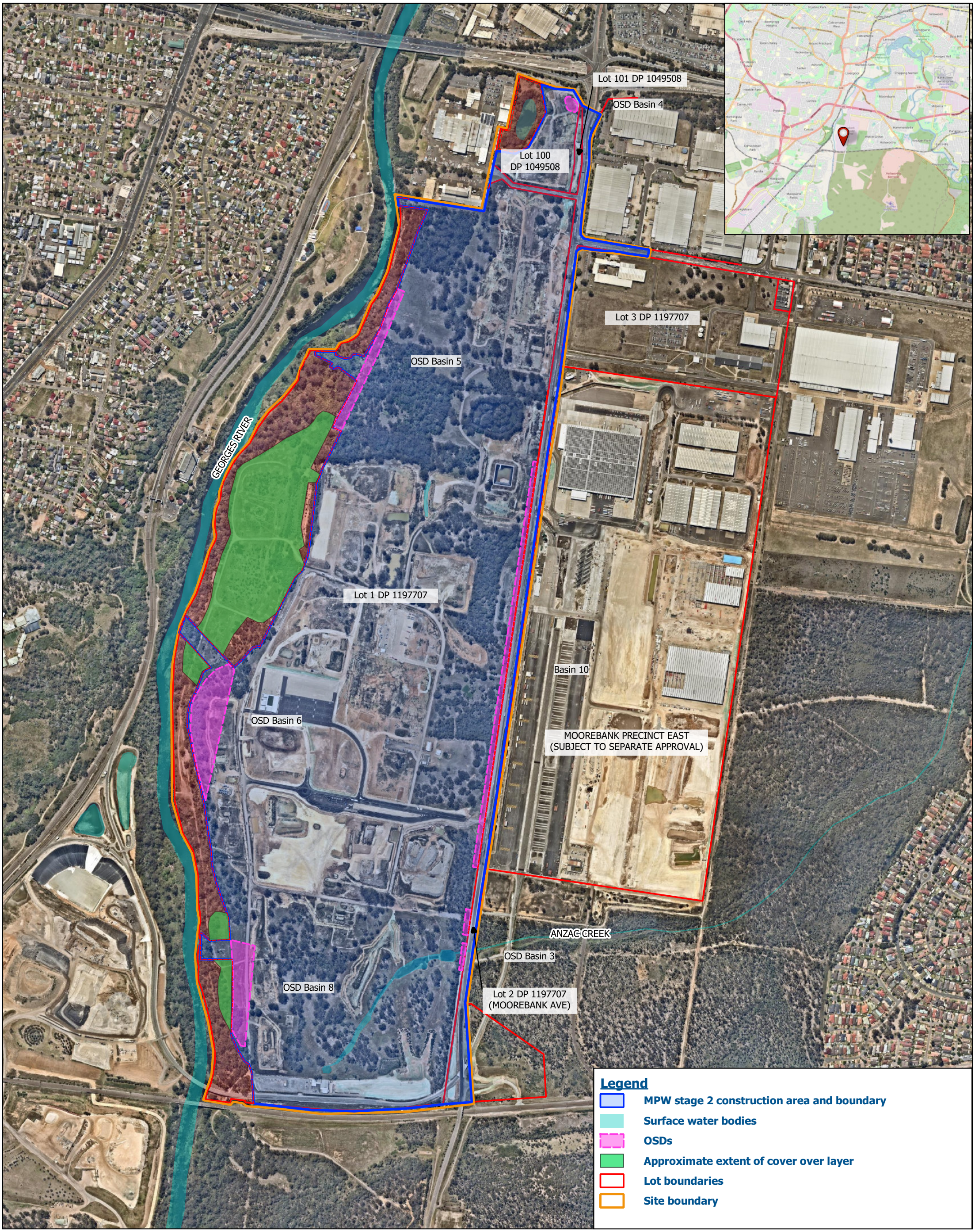
Approximate Scale Only

Coordinate System: WGS 84
Drawn by: MBO **Checked by:** PS
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



Long Term Environmental Management Plan Moorebank Precinct West

Figure 6 - Cover Over Layer in Offset Area

EP RISK

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Job No: EP1489.001
Date: 14.08.2020
Drawing Ref: Fig 6
Version No: v2

N

0 130 260 390 m

Approximate Scale Only

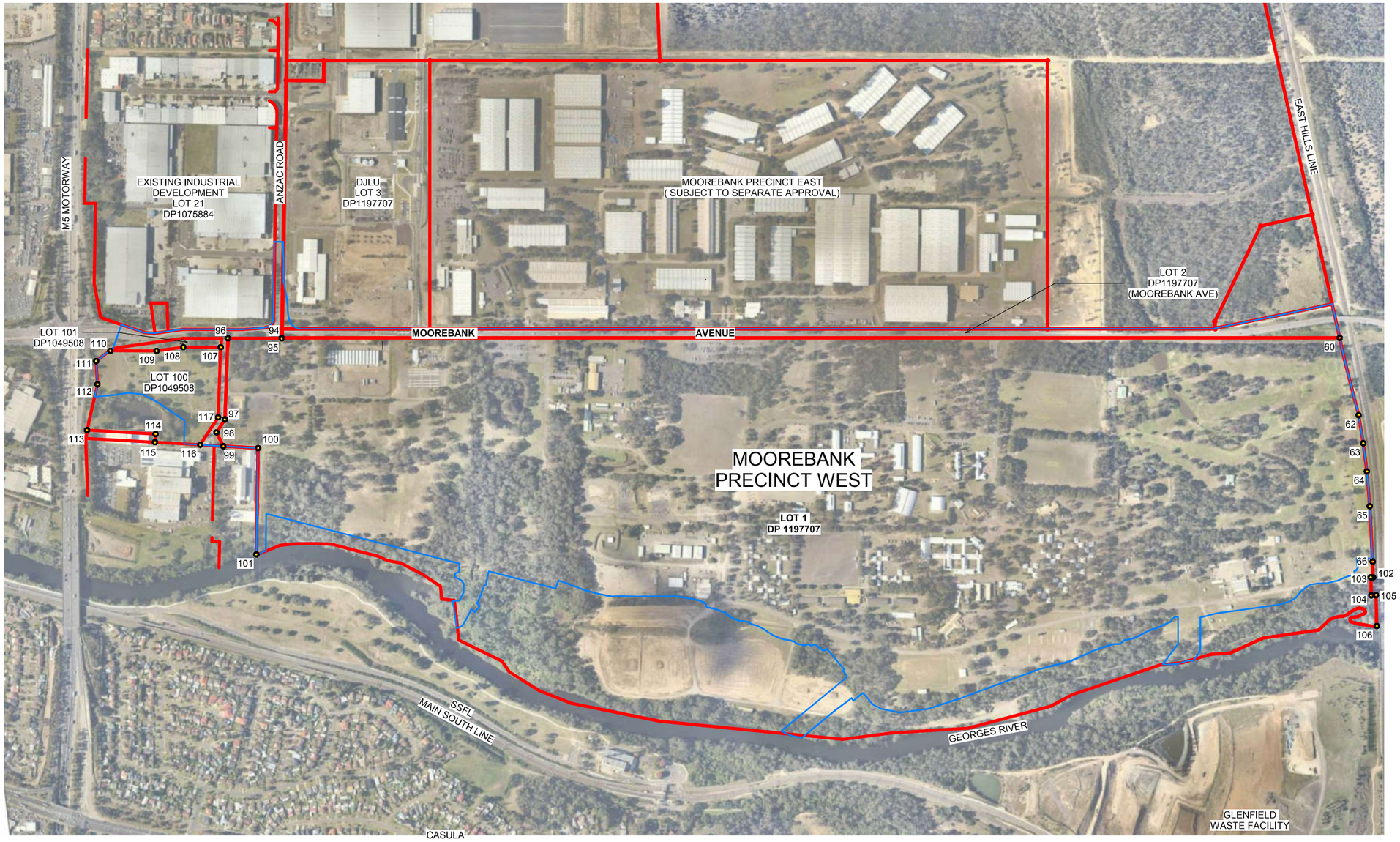
Coordinate System: WGS 84
Drawn by: OG Checked by: KG
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

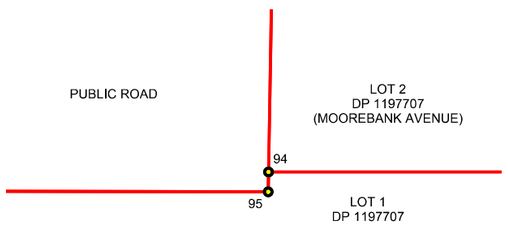
APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

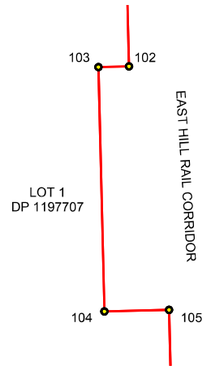
APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

Appendix A
MPW STAGE 2 LOT BOUNDARIES



Site Coordinate Boundaries		
Point	E	N
60	307 860.568	6 239 766.887
62	307 683.718	6 239 746.852
63	307 620.255	6 239 744.471
64	307 556.748	6 239 744.491
65	307 478.726	6 239 747.812
66	308 007.151	6 240 914.68
94	308 160.388	6 242 114.54
95	308 159.102	6 242 114.727
96	308 174.57	6 242 234.079
97	307 995.439	6 242 263.613
98	307 969.255	6 242 285.993
99	307 936.892	6 242 274.555
100	307 922.712	6 242 198.119
101	307 687.634	6 242 231.948
102	307 320.056	6 239 760.576
103	307 320.569	6 239 765.549
104	307 280.775	6 239 769.657
105	307 279.687	6 239 759.113
106	307 211.251	6 239 766.176
107	308 156.894	6 242 252.429
108	308 167.667	6 242 335.549
109	308 166.834	6 242 395.719
110	308 180.535	6 242 499.513
111	308 161.49	6 242 532.768
112	308 109.722	6 242 536.338
113	308 010.949	6 242 572.571
114	307 982.921	6 242 421.672
115	307 964.938	6 242 425.012
116	307 946.349	6 242 325.592
117	308 002.084	6 242 277.954





LEGEND:

- LAND PARTNERS LOT BOUNDARIES (SEE REFERENCED DRAWING FOR DETAILS)
- MPW STAGE 2 CONSTRUCTION BOUNDARY
- COORDINATE POINT

REFERENCE DRAWINGS

MOOREBANK PRECINCT WEST - LOT BOUNDARY SURVEY - LAND PARTNERS: SY073909-SV3-V2; DATED 25/08/2016

MOOREBANK PLAN OF COORDINATES OF BOUNDARIES - LAND PARTNERS: PREC-LPN-SU-DWG-0001-1; DATED 21/02/2019

CONSTRUCTION BOUNDARY - ARCADIS: MPW2-ARC-CV-DWG-0002-2; 01/11/2018

BOUNDARY COORDINATES - LAND PARTNERS: PREC-LPN-SU-DWG-0003(C) ; DATED 31/03/2020

NOTES

- REFER TO SURVEY REFERENCE FILES FOR DETAILS AND COORDINATES.
- ALL BOUNDARIES ARE APPROXIMATE ONLY AND SUBJECT TO SURVEYORS INFORMATION.
- DO NOT SCALE OFF THIS DRAWING.

NSW Registered Architect Mark David Roach, 10332
NSW Registered Architect James Webb, 10187

Issue	Description	Date	DR	CH
A	Issue for Review	01.04.2020	AM	MF
B	Issue for Review	03.04.2020	AM	MF
C	Issue for Information	08.04.2020	AM	MF

North

Notes
ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED BY A REGISTERED LAND SURVEYOR.

Project
MOOREBANK PRECINCT WEST STAGE 2

Project Address
MOOREBANK AVENUE, MOOREBANK, NSW

Owner / Developer
SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Project Manager
TACTICAL GROUP

Architect
REIDCAMPBELL
Architecture, Interiors, Planning
ACN 002 033 801 ABN 28 317 605 875
Level 15, 124 Walker Street
North Sydney NSW 2060 Australia
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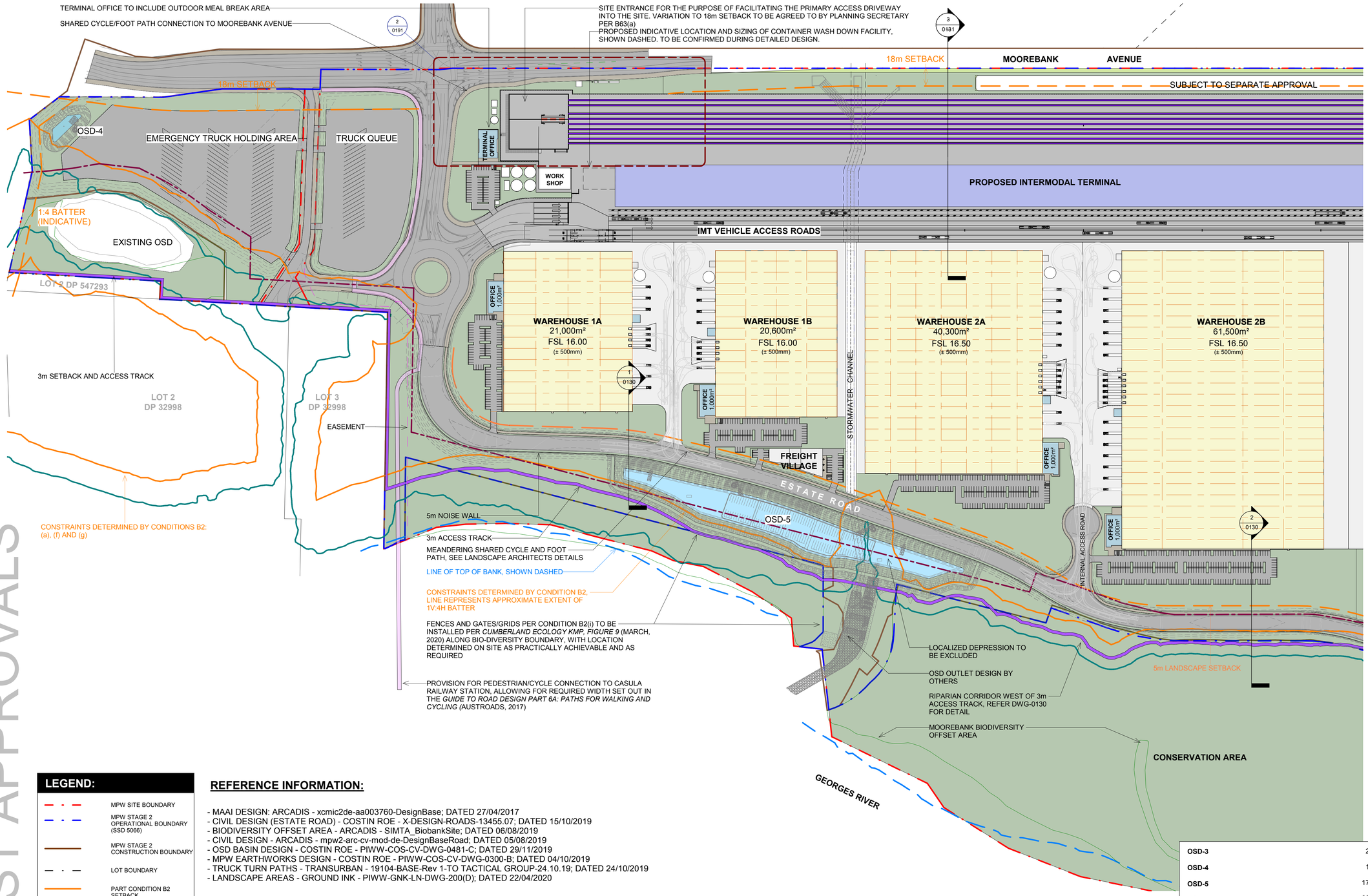
Fax: 61 02 9954 4946 Web: www.reidcampbell.com

Drawing Title
MPW SURVEY LOT BOUNDARIES AND COORDINATES

Drawn	Checked	Print Date	Scale @ A1
AM	MF	8/04/2020 8:48:30 AM	As indicated

Project Number 115123
Issue C
Drawing Number PIWW-RCG-AR-SKC-170

Appendix B
CONCEPT PLANS FOR THE PROPOSED DEVELOPMENT



POST APPROVALS

LEGEND:

- MPW SITE BOUNDARY
- MPW STAGE 2 OPERATIONAL BOUNDARY (SSD 5066)
- MPW STAGE 2 CONSTRUCTION BOUNDARY
- LOT BOUNDARY
- PART CONDITION B2 SETBACK
- TOP OF BANK
- LIMIT OF 1:100 YEAR FLOOD EXTENT
- ASSET PROTECTION ZONE SETBACK

NOTES:
1. ALL LEVELS ARE INDICATIVE & SHOULD BE READ IN CONJUNCTION WITH CIVIL ENG. DWGS FOR FINAL LEVELS OF ALL EARTH WORKS
2. ALL SERVICES RELOCATION TO BE CONFIRMED BY ENG.

REFERENCE INFORMATION:

- MAAI DESIGN: ARCADIS - xcmic2de-aa003760-DesignBase; DATED 27/04/2017
- CIVIL DESIGN (ESTATE ROAD) - COSTIN ROE - X-DESIGN-ROADS-13455.07; DATED 15/10/2019
- BIODIVERSITY OFFSET AREA - ARCADIS - SIMTA_BiobankSite; DATED 06/08/2019
- CIVIL DESIGN - ARCADIS - mpw2-arc-cv-mod-de-DesignBaseRoad; DATED 05/08/2019
- OSD BASIN DESIGN - COSTIN ROE - PIWW-COS-CV-DWG-0481-C; DATED 29/11/2019
- MPW EARTHWORKS DESIGN - COSTIN ROE - PIWW-COS-CV-DWG-0300-B; DATED 04/10/2019
- TRUCK TURN PATHS - TRANSURBAN - 19104-BASE-Rev 1-TO TACTICAL GROUP-24.10.19; DATED 24/10/2019
- LANDSCAPE AREAS - GROUND INK - PIWW-GNK-LN-DWG-200(D); DATED 22/04/2020

1 0100

MPW NORTH WAREHOUSING PLAN

1 : 2000

DEVELOPMENT SCHEDULE

SITE 1A	
LOT SITE AREA (APPROX.)	42,280m²
BUILDING AREAS (GFA)	
WAREHOUSE	21,000 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	8,690 m²
HARD LANDSCAPING	760 m²
PROPOSED CAR PARKING	97 SPACES
PROPOSED BICYCLE PARKING	10 SPACES
SITE 1B	
LOT SITE AREA (APPROX.)	36,890 m²
BUILDING AREAS (GFA)	
WAREHOUSE	20,600 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	3590 m²
HARD LANDSCAPING	270 m²
PROPOSED CAR PARKING	94 SPACES
PROPOSED BICYCLE PARKING	10 SPACES
SITE 2A	
LOT SITE AREA (APPROX.)	68,350 m²
BUILDING AREAS (GFA)	
WAREHOUSE	40,300 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	10,140 m²
HARD LANDSCAPING	800 m²
PROPOSED CAR PARKING	164 SPACES
PROPOSED BICYCLE PARKING	16 SPACES
SITE 2B	
LOT SITE AREA (APPROX.)	100,680 m²
BUILDING AREAS (GFA)	
WAREHOUSE	61,500 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	11,470 m²
HARD LANDSCAPING	1,035 m²
PROPOSED CAR PARKING	230 SPACES
PROPOSED BICYCLE PARKING	23 SPACES
SITE 3A	
LOT SITE AREA (APPROX.)	65,570 m²
BUILDING AREAS (GFA)	
WAREHOUSE	39,900 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	2,290 m²
HARD LANDSCAPING	200 m²
PROPOSED CAR PARKING	180 SPACES
PROPOSED BICYCLE PARKING	18 SPACES
SITE 3B	
LOT SITE AREA (APPROX.)	52,310 m²
BUILDING AREAS (GFA)	
WAREHOUSE	31,700 m²
OFFICE (2 LEVEL)	1,000 m²
SOFT LANDSCAPING	5,140 m²
HARD LANDSCAPING	1,280 m²
PROPOSED CAR PARKING	138 SPACES
PROPOSED BICYCLE PARKING	14 SPACES
FREIGHT VILLAGE	
LOT SITE AREA (APPROX.)	3,180 m²
BUILDING AREAS (GFA)	800 m²
SOFT LANDSCAPING	900 m²
HARD LANDSCAPING	440 m²
PROPOSED CAR PARKING	23 SPACES
PROPOSED BICYCLE PARKING	3 SPACES

OSD-3	2,910 m²
OSD-4	1,480 m²
OSD-5	17,130 m²
OSD-6	22,910 m²
OSD-8	12,770 m²
WAREHOUSE SITE AREA (INCL. OSD-5 TOTAL AREA)	**386,414 m²**
WAREHOUSE AREA SOFT LANDSCAPE	59,487 m²
WAREHOUSE AREA HARD LANDSCAPE	4,785 m²
OSD-5 LANDSCAPE AREA	17,154 m²
TOTAL LANDSCAPING PERCENTAGE	**16.64%**

Issue	Description	Date	DR	CH
A	FOR REVIEW	05/09/2019	AM	MF
B	FOR REVIEW	23/09/2019	AM	MF
C	ISSUE FOR INFORMATION	15/10/2019	AM	MF
D	ISSUE FOR INFORMATION	25/10/2019	AM	MF
E	ISSUE FOR INFORMATION	12/11/2019	AM	MF
F	ISSUE FOR INFORMATION	13/12/2019	AM	MF
G	ISSUE FOR INFORMATION	06/03/2020	AM	MF
H	KMP NOTE ADJUSTED - REFERENCE TO FIG 9 OF KMP	19/03/2020	AM	MF
I	ISSUE FOR INFORMATION	22/04/2020	AM	MF
J	UPDATED AS RESPONSE TO DPIE RFI	27/04/2020	AM	MF
K	UPDATE FOR DPIE RFI	18/06/2020	AM	MF
L	UPDATE FOR DPIE RFI	23/06/2020	AM	MF
M	UPDATED FOR DPIE RFI	13/07/2020	AM	MF

North

Notes
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Project
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Project Address
MOOREBANK AVENUE, MOOREBANK, NSW

Owner / Developer
SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Project Manager
TACTICAL GROUP

Architect
REIDCAMPBELL
Architecture, Interiors, Planning
ACN 002 033 801 ABN 28 317 605 875
Level 15, 124 Walker Street
North Sydney NSW 2060 Australia
Tel: 61 02 9954 5011 Email: sydney@reidcampbell.com
Fax: 61 02 9954 4946 Web: www.reidcampbell.com

Drawing Title
POST APPROVALS - MPW MASTERPLAN - PART 1

Drawn	Checked	Print Date	Scale @ A1
AM.SS	MF.GD	13/07/2020 2:54:33 PM	1 : 2000

Project Number 115123
Issue M
Drawing Number PIWW-RCG-AR-DWG-0100

POST APPROVALS

MOOREBANK AVENUE

SUBJECT TO SEPARATE APPROVAL

OSD-3

18m SETBACK

EXISTING CANOPY TREES

1:4 BATTER (INDICATIVE)

PROPOSED RAIL LINK CONNECTION

SUBJECT TO FUTURE APPLICATION

PROVISION BOUNDARY LANDSCAPE TREATMENT AND CANOPY TREES WITHIN RAIL CORRIDOR, TO BE CONFIRMED BY RAIL ENGINEERS AND EXTENT OF BOUNDARY BATTER. PERIMITER BATTERS MUST BE STABILISED WITH VEGETATION - REFER LANDSCAPE DESIGN DRAWINGS.

EXISTING SSFL CONNECTION

TIE IN ACCESS TRACK TO EXISTING TRACK ALONG RAIL CORRIDOR, INDICATIVELY SHOWN DASHED

WAREHOUSE 3A
39,900m²
FSL 16.50
(± 500mm)

OFFICE
1,000m²

OFFICE
1,000m²

WAREHOUSE 3B
31,700m²
FSL 16.50
(± 500mm)

INTERNAL ACCESS ROAD

ESTATE ROAD

OSD-8

CONSTRAINT DETERMINED BY CONDITIONS B2: (a), (f) AND (g)

OSD OUTLET DESIGN BY OTHERS

KOALA MOVEMENT CORRIDOR INDICATED BY WHITE ARROWS. REFER *CUMBERLAND ECOLOGY KMP, FIGURE 9* (MARCH, 2020) FOR DETAILS

FENCES AND GATES/GRIDS PER CONDITION B2(i) TO BE INSTALLED PER *CUMBERLAND ECOLOGY KMP, FIGURE 9* (MARCH, 2020) ALONG BIO-DIVERSITY BOUNDARY, WITH LOCATION DETERMINED ON SITE AS PRACTICALLY ACHIEVABLE AND AS REQUIRED

MEANDERING SHARED CYCLE AND FOOT PATH, SEE LANDSCAPE ARCHITECTS DETAILS

CONSERVATION AREA

RIPARIAN CORRIDOR WEST OF 3m ACCESS TRACK, REFER DWG-0130 FOR DETAIL

5m LANDSCAPE SETBACK

MOOREBANK BIODIVERSITY OFFSET AREA

OSD OUTLET DESIGN BY OTHERS

OSD-6

3m ACCESS TRACK

GEORGES RIVER

LEGEND:

- MPW SITE BOUNDARY
- MPW STAGE 2 OPERATIONAL BOUNDARY (SSD 5066)
- MPW STAGE 2 CONSTRUCTION BOUNDARY
- LOT BOUNDARY
- PART CONDITION B2 SETBACK
- TOP OF BANK
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- CIVIL DESIGN - ARCADIS: mpw2-arc-cv-mod-de-DesignBaseRoad; DATED 05/08/2019
- OSD BASIN DESIGN - COSTIN ROE: PIWW-COS-CV-DWG-0481-C; DATED 29/11/2019
- MPW EARTHWORKS DESIGN - COSTIN ROE: PIWW-COS-CV-DWG-0300-B; DATED 04/10/2019
- TRUCK TURN PATHS - TRANSURBAN: 19104-BASE-Rev 1-TO TACTICAL GROUP-24.10.19; DATED 4/10/2019
- OSD-8 DESIGN - COSTIN ROE: PIWW-COS-CV-DWG-BASIN 8 CAD; RECEIVED 02/03/2020

NSW Registered Architect Mark David Roach, 10332
NSW Registered Architect James Webb, 10187

Issue	Description	Date	DR	CH
A	FOR REVIEW	05/09/2019	AM	MF
B	FOR REVIEW	23/09/2019	AM	MF
C	ISSUE FOR INFORMATION	15/10/2019	AM	MF
D	ISSUE FOR INFORMATION	25/10/2019	AM	MF
E	ISSUE FOR INFORMATION	12/11/2019	AM	MF
F	ISSUE FOR INFORMATION	13/12/2019	AM	MF
G	ISSUE FOR INFORMATION	06/03/2020	AM	MF
H	RMP NOTE ADJUSTED - REFERENCE TO FIG 9 OF KMP	19/03/2020	AM	MF
I	UPDATED AS RESPONSE TO DPIE RFI	27/04/2020	AM	MF
J	UPDATE FOR DPIE RFI	18/06/2020	AM	MF
K	UPDATE FOR DPIE RFI	23/06/2020	AM	MF

North

Notes
ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED BY A REGISTERED LAND SURVEYOR.

Project
MOOREBANK PRECINCT WEST STAGE 2

Project Address
MOOREBANK AVENUE, MOOREBANK, NSW

Owner / Developer
SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Project Manager
TACTICAL GROUP

Architect
REIDCAMPBELL
Architecture, Interiors, Planning
ACN 002 033 801 ABN 28 317 605 875
Level 15, 124 Walker Street
North Sydney NSW 2060 Australia
Tel: 61 02 9954 5011 Email: sydney@reidcampbell.com
Fax: 61 02 9954 4946 Web: www.reidcampbell.com

Drawing Title
POST APPROVALS - MPW MASTERPLAN - PART 2

Drawn AM.SS Checked MF.GD Print Date 23/06/2020 11:57:00 AM Scale @ A1 1 : 2000
Project Number 115123 Issue K
Drawing Number PIWW-RCG-AR-DWG-0101

DRAWING 0312

DRAWING 0314

DRAWING 0311

DRAWING 0313

EXISTING SITE ACCESS, HAUL ROAD, & COMPOUND TO REMAIN UNDISTURBED FOR STAGE 1 OF EARTHWORKS

BASIN 5

BASIN 6

BASIN 8

DUST BOWL

X= 0.00
Y= 0.00

BULK EARTHWORKS PLAN
1:3000 SCALE

BULK EARTHWORKS VOLUMES

VOLUMES SHOWN BELOW ARE BASED ON THE COMPARISON BETWEEN THE DETAILED EARTHWORKS LEVELS AND EXISTING SITE LEVELS AS SHOWN ON THE CARDNO SITE SURVEY REF: 118896/1001 DATED 01/05/2019.

TOPSOIL (APPROXIMATE)	= - 300,000m³
CUT MATERIAL	= - 291,500m³
FILL MATERIAL	= + 1,514,300m³
SITE WON FILL FROM DUST BOWL	= + 300,000m³
DETAILED EXCAVATION FROM FUTURE WAREHOUSING AT 1,500m³/Ha (9.47Ha OF WAREHOUSING)	= - 150,000m³
BALANCE	= + 1,072,800m³ (I.E. IMPORT)

NOTE:
EARTHWORK VOLUMES ARE APPROXIMATE ONLY.
NO ALLOWANCE HAS BEEN MADE FOR DELETERIOUS MATERIAL, EXISTING SLAB REMOVAL, EROSION AND SEDIMENT CONTROL OR BULKING OR COMPACTION OF FILLED SOILS. CONTRACTOR TO ALLOW FOR THESE ITEMS AS REQUIRED.

EXISTING COMPOUND EARTHWORK VOLUMES

VOLUMES SHOWN BELOW ARE BASED ON THE COMPARISON BETWEEN THE DETAILED EARTHWORKS LEVELS AND EXISTING LEVELS IN THE COMPOUND AS SHOWN ON THE TOTAL SURVEYING SOLUTIONS SITE SURVEY REF: 190150 DATED 31/10/2019.

CUT MATERIAL	= - 23,800m³
FILL MATERIAL	= + 20,600m³
BALANCE	= - 3,200m³ (I.E. EXPORT)

NOTE:
EARTHWORK VOLUMES ARE APPROXIMATE ONLY.
NO ALLOWANCE HAS BEEN MADE FOR DELETERIOUS MATERIAL, EXISTING SLAB REMOVAL, EROSION AND SEDIMENT CONTROL OR BULKING OR COMPACTION OF FILLED SOILS. CONTRACTOR TO ALLOW FOR THESE ITEMS AS REQUIRED.

EAST-WEST CULVERT NOTE

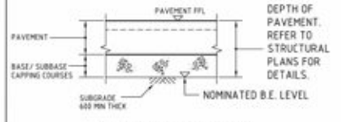
REFER TO PIWW-COS-CV-DWG-0440 FOR EARTHWORKS ASSOCIATED WITH EAST-WEST CULVERT WORKS.

LEGEND

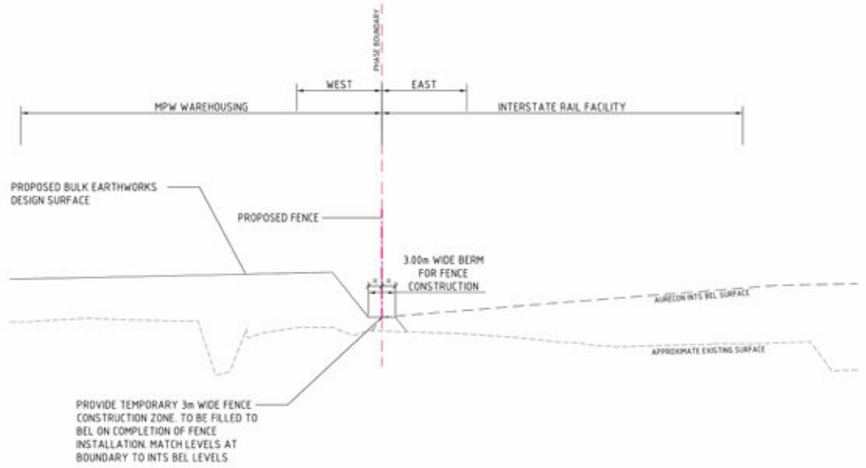
LEVELS DATUM IS AHD

EXISTING SURVEY LEVELS BASED ON SURVEY INFORMATION PREPARED BY CARDNO REF: 115804500 REV.22 DATED 12.10.2017.

- DENOTES 3m ACCESS TRACK
- DENOTES 10m BUFFER
- EXISTING CONTOUR (1.0m INTERVAL)
- B.E.L. CONTOUR (MAJOR 1.0m)
- B.E.L. CONTOUR (MINOR 0.25m)
- B.E.L. SPOT LEVEL



NOMINATED B.E.L. DETAIL
N.T.S.



SECTION 1:250 X
INTS INTERFACE

30m 0 50 100 150 200 250 300m
1:3000 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

50% DESIGN COMPLETION	20.03.20	F			
50% DESIGN COMPLETION	17.02.20	E			
ISSUED FOR INFORMATION	20.12.19	D	REVISED FOR UPDATED INTERSTATE FACILITY INTERFACE	12.06.20	3
ISSUED FOR POST APPROVALS	29.11.19	C	BIO-BANKING PROMINENCE	20.05.20	2
PRELIMINARY ONLY	04.10.19	B	ISSUED FOR CONSTRUCTION	08.05.20	1
PRELIMINARY ONLY	23.08.19	A	ISSUED FOR CONSTRUCTION	20.03.20	0
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

DEVELOPER: MOOREBANK; QUBE

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0300

Costin Roe Consulting Pty Ltd.
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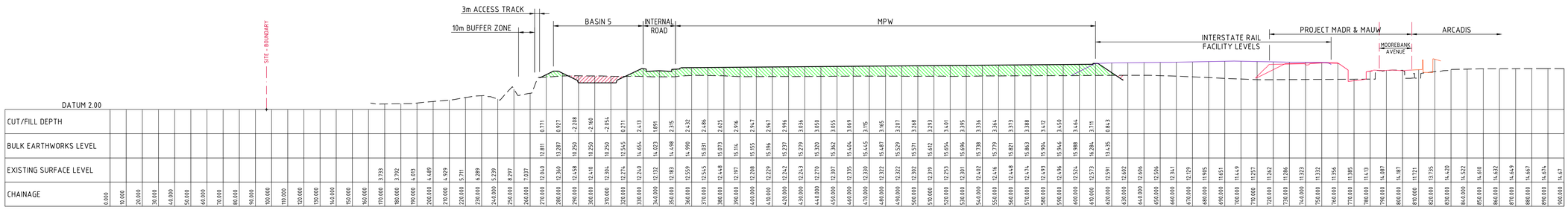
Costin Roe Consulting

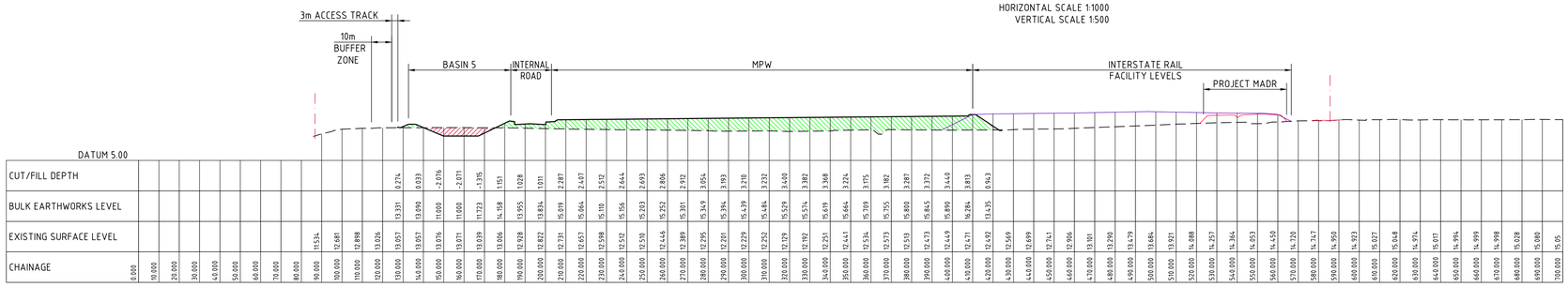
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: BULK EARTHWORKS PLAN

DRAWING No: LPWPIW-COS-CV-DWG-0300 ISSUE: 3



SECTION 9
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500



SECTION 10
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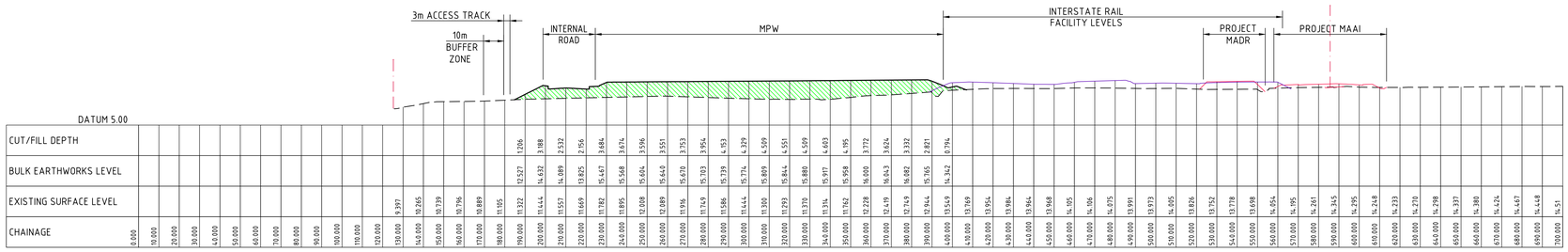
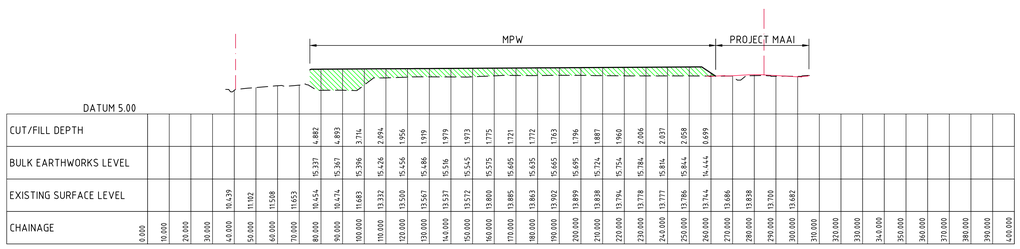
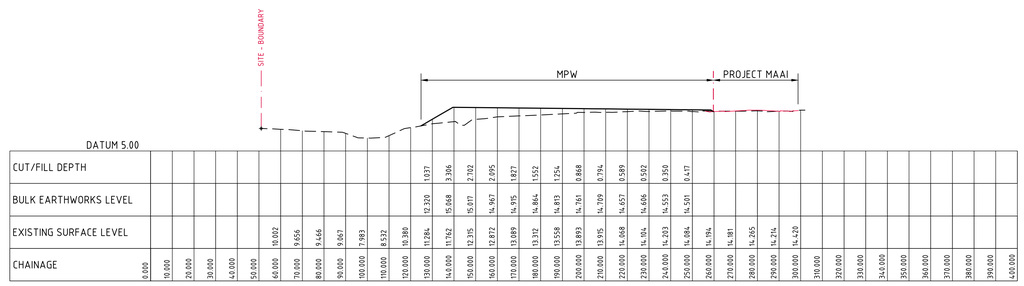
VERTICAL SCALE 1:500



SECTION 11
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500



SECTION 12
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500



SECTION 13
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

LEGEND:

- DENOTES BULK EARTHWORKS PROFILE
- DENOTES EXISTING PROFILE
- DENOTES AREA IN CUT
- DENOTES AREA IN FILL

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

10m 0 10 20 30 40 50 60 70 80 90 100m
1:1000 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

AMENDMENTS	DATE	ISSUE
ISSUED FOR CONSTRUCTION	12.06.20	2
ISSUED FOR CONSTRUCTION	08.05.20	1
ISSUED FOR CONSTRUCTION	20.03.20	0
50% DESIGN COMPLETION	17.02.20	C
ISSUED FOR POST APPROVALS	29.11.19	B
PRELIMINARY ONLY	04.10.19	A

DEVELOPER: MOOREBANK, QUBE

ARCHITECT: REIDCAMPBELL
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PROJECT MANAGER: J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0353

Costin Roe Consulting Pty Ltd.
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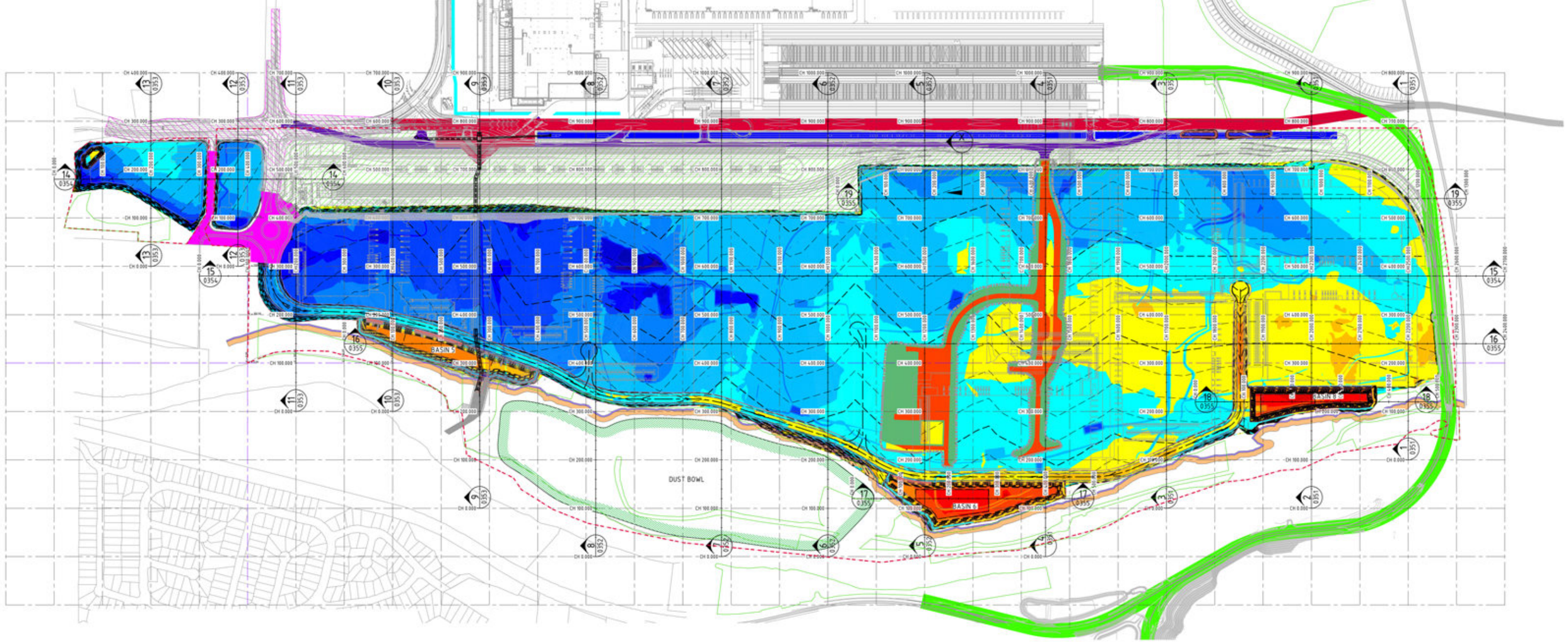
email: mail@costinroe.com.au ©

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: BULK EARTHWORKS SECTIONS SHEET 3

DRAWING No: LPWPIW-COS-CV-DWG-0353 ISSUE: 2



CUT/FILL PLAN
1:3000 SCALE @A1

DEPTH RANGE				
	No.	FROM DEPTH	TO DEPTH	COLOUR	DEPTH RANGE VOLUME
CUT	1	-7.000	-6.000		0m
	2	-6.000	-5.000		31m
	3	-5.000	-4.000		1869m
	4	-4.000	-3.000		12267m
	5	-3.000	-2.000		25559m
	6	-2.000	-1.000		46879m
	7	-1.000	0.000		158768m
FILL	8	0.000	1.000		765767m
	9	1.000	2.000		442972m
	10	2.000	3.000		211982m
	11	3.000	4.000		80378m
	12	4.000	5.000		18848m
	13	5.000	6.000		6563m
	14	6.000	7.000		1188m
	15	7.000	8.000		107m

30m 0 50 100 150 200 250 300m
1:3000 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

AMENDMENTS	DATE	ISSUE
50% DESIGN COMPLETION	20.03.20	F
50% DESIGN COMPLETION	17.02.20	E
ISSUED FOR INFORMATION	20.12.19	D
ISSUED FOR POST APPROVALS	29.11.19	C
PRELIMINARY ONLY	04.10.19	B
PRELIMINARY ONLY	23.08.19	A

AMENDMENTS	DATE	ISSUE
REVISED FOR UPDATED INTERSTATE FACILITY INTERFACE	12.04.20	3
BIO-BANKING PROMINENCE	20.05.20	2
ISSUED FOR CONSTRUCTION	08.05.20	1
ISSUED FOR CONSTRUCTION	20.03.20	0

DEVELOPER: MOOREBANK QUBE

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.M.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0301

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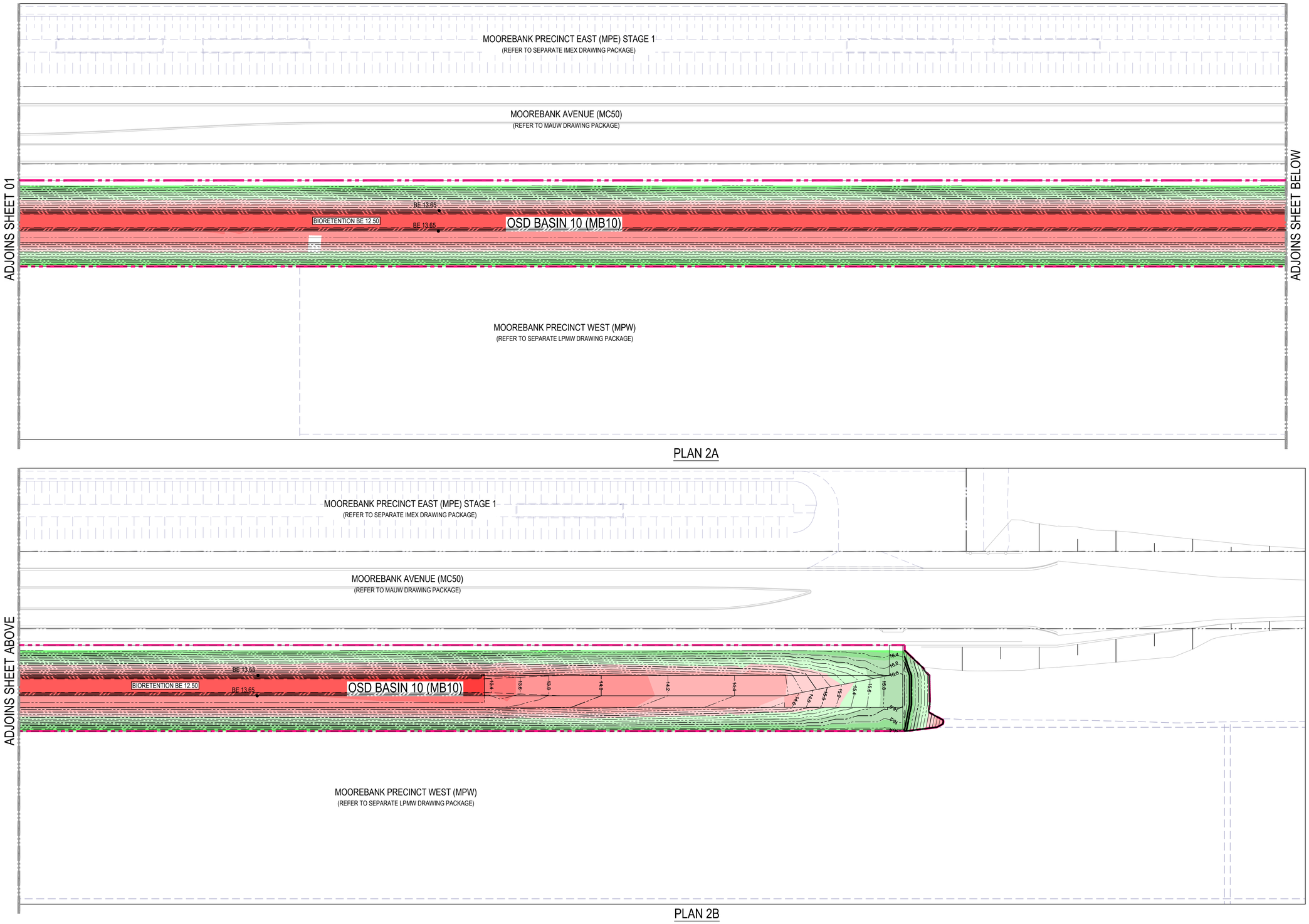
Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: CUT/FILL PLAN

DRAWING No: LPWPIW-COS-CV-DWG-0301



LEGEND

- PROPOSED OSD BASIN 10 (MB10) LIMIT OF WORKS BOUNDARY
- PROPOSED ULTIMATE WORKS (REFER TO SEPERATE DRAWING PACKAGE)
- SURVEY TITLE BOUNDARIES
- PROPOSED CONTOURS
- PROPOSED PROPOSED MAUW CONTOURS

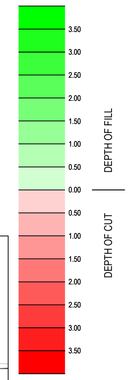
VOLUMES

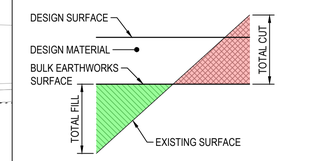
TOTAL CUT	-19,750 m³
TOTAL FILL	8,590 m³
BALANCE (CUT TO BE REMOVED)	-11,160 m³

ASSUMPTIONS AND NOTES

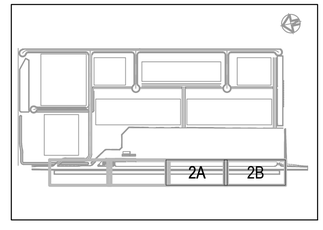
1. HATCHING SHOWN REPRESENTS DEPTH RANGE BETWEEN THE EXISTING SURFACE WITH 150 mm STRIP AND THE BULK EARTHWORKS SURFACE.
2. NO ALLOWANCE HAS BEEN MADE FOR;
   - BULKING OR COMPACTION FACTORS
   - TRENCHING FOR UTILITIES (INC. STORMWATER, WATER, SEWER, ELECTRICAL AND COMMUNICATIONS)
3. DESIGN MATERIAL THICKNESS HAS BEEN ASSUMED AS:
   - TOPSOIL DEPTH 150mm
   - RAINGARDEN DEPTH 1000mm
   - CONCRETE RAMP FORMATION 300mm
4. IT IS ASSUMED NO OVER EXCAVATION IS REQUIRED FOR PLACEMENT OF IMPORTED FILL
5. CONTOURS SHOWN REPRESENT THE BULK EARTHWORKS LEVELS.

DEPTH RANGE LEGEND





TYPICAL EARTHWORKS SECTION



NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
\\ne-revit\Revit\2018\180396 - Moorebank Avenue Works MAW\2-CAD\2-CAD FILES\09-MAUW OSD\MAUW-NRP-CV-DWG-9121.dwg

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

PROJECT TITLE BLOCK_R65_A1
msg_n:p_cv_e_legend_matter
msg_n:p_cv_e_legend_shared
maw_n:p_cv_e_design_proposed_boundary
msg_n:p_cv_e_sheet_layout
maw_n:p_cv_e_sheet_boundaries
maw_n:p_cv_e_design_subbasin_layout
maw_n:p_cv_e_design_sub_catchments
maw_n:p_cv_e_bulk_contours_proposed
maw_n:p_cv_e_design_bulk_levels
msg_n:p_cv_e_future_works_top
maw_n:p_cv_e_arc_plan
maw_n:p_cv_e_design_road
maw_n:p_cv_e_design_road_contour

REV	DATE	AMENDMENT / REVISION DESCRIPTION	REVIEWED	APPROVAL
09	20.07.2020	100% RMS RE-SUBMISSION	GC	MR
08	08.07.2020	100% RMS RE-SUBMISSION	GC	MR
07	24.06.2020	100% RMS RE-SUBMISSION	GC	MR
06	29.05.2020	100% RMS SUBMISSION	GC	MR
05	17.02.2020	85% RMS RE-SUBMISSION	GC	MR
04	02.08.2019	85% RMS SUBMISSION	GC	MR

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
SCALE 1:500m

CO-ORDINATE SYSTEM | HEIGHT DATUM

DRAWINGS / DESIGN PREPARED BY

NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PLOT DATE / TIME: 20 Jul 2020 - 03:56PM
PLOT BY: DChapman

	NAME	DATE
TITLE		
DRAWN	D.CHAPMAN	20.07.20
DRG CHECK	A.RIVETT	20.07.20
DESIGN	A.RIVETT	20.07.20
DESIGN CHECK	G.COLLINS	20.07.20
DESIGN MNGR	G.COLLINS	20.07.20
PROJECT MNGR	M.RICHARDS	20.07.20

DRAWING No. MAUW-NRP-CV-DWG-9122

CLIENT: BMD

PREPARED FOR: NSW GOVERNMENT Transport Roads & Maritime Services

MOOREBANK AVENUE WORKS
OSD BASIN 10 (MB10)
BULK EARTHWORKS PLAN SHEET 02

A1

RMS REGISTRATION No. DS 2019/000519

PART

ISSUE STATUS | EDMS No. | SHEET No. 9122 | ISSUE 09

PROVIDE INTERNAL HIGH-FLOW/ LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

PROVIDE 3.0m WIDE GRAVEL MAINTENANCE ACCESS TRACK WITH TIMBER EDGING.

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS AS SHOWN ON DRAWING DWG-454.

GPT UNIT
ROCLA CDS3018 OR APPROVED EQUIVALENT.

EAST-WEST CULVERT PASSES UNDERNEATH BASIN. REFER DRAWING DWG-0440-0449 FOR DESIGN DETAILS

STANDARD FLOODWAY/OSD WARNING SIGN IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL HANDBOOK FOR DRAINAGE DESIGN CRITERIA

GPT UNIT
ROCLA CDS 3018 OR APPROVED EQUIVALENT.

BASIN 5 INLET/DISCHARGE CONTROL PIT
2xLOW FLOW ORIFICES (ø400) ATTACHED TO PIT WALL AT IL9.00
4m LONG HIGH-FLOW WEIR AT RL12.90
PIT DISCHARGES THROUGH 2xø1200 RCP TO GEORGES RIVER (33% BLOCKAGE)
FOR DETAILS REFER DRG 0457.

CONNECTIVITY BETWEEN ROAD MPW01 AND MAINTENANCE ACCESS TRACK TO BE CONFIRMED

ROAD MPW01

PROVIDE MINIMUM 3m WIDE ACCESS TRACK AT RL13.90

PROVIDE CHAIN LINK FENCE AT BOTTOM OF THE BATTER

PROPOSED OSD/BIO-RETENTION BASIN 5
SURFACE AREA = 4,300m² MIN.
PROVIDED INTO 5 EQUAL CELLS OF 860m² EACH (<1,000m²)
BIO RETENTION = 1 % OF CATCHMENT AREA (43.00ha)
300mm MIN EXTENDED DETENTION DEPTH
500mm MIN FILTER MEDIA DEPTH
ON-SITE DETENTION STORAGE PROVIDED = 31,600m³

PROVIDE 900mm SQUARE BASIN INLET PIT TO EACH BIO-RETENTION CELL.

PROVIDE 2.5m WIDE, 150mm HIGH COMPACTED CLAY BERM BETWEEN BIO-RETENTION CELLS. REFER DETAIL A ON DRAWING 0454

BIO-RETENTION SUBSOIL LINE @ 2.5m CTS TYPICAL

PROVIDE INTERNAL HIGH-FLOW/LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS AS SHOWN ON DRAWING DWG-454

CONNECTIVITY BETWEEN ROAD MPW01 AND MAINTENANCE ACCESS TRACK TO BE CONFIRMED

OUTLET STRUCTURE 5
2xø1200 RCPs + BOX CULVERTS FROM BASIN 9+10 DISCHARGE THROUGH HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. REFER TO DRAWING DWG-0481 FOR DISCHARGE DETAILS.

PROVIDE ACCESS GATES BETWEEN BASIN ACCESS PATH & ESTATE MAINTENANCE TRAIL

GEORGES RIVER

BASIN 5 PLAN
1:500 SCALE

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CARDNO DATED 01.05.2019

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.25m INTERVALS
- 3.0m ACCESS TRACK
- 10.0m BUFFER ZONE
- OPERATIONAL BOUNDARY
- EDGE OF BANK
- SITE BOUNDARY

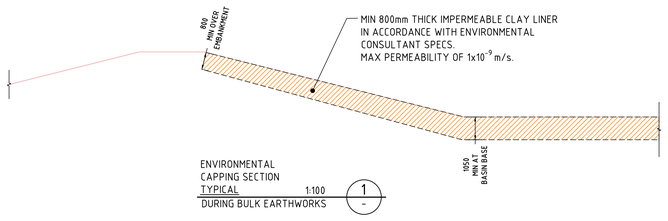
BASIN CAPPING NOTE:

CONTRACTOR TO PROVIDE IMPERMEABLE CLAY LINER UNDER ENTIRE BASIN FOOTPRINT AS SHOWN ON BULK EARTHWORKS DRAWINGS DWG-0311 - DWG-0314.

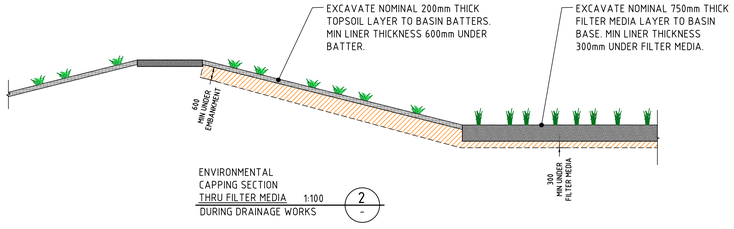
A MINIMUM OF 800mm SHALL BE PLACED ACROSS THE BATTER DURING CONSTRUCTION WORKS. CONTRACTOR TO ALLOW FOR FUTURE BIO-RETENTION FILTER MEDIA AS NECESSARY. MINIMUM LAYER THICKNESSES SHALL BE AS PER SECTIONS 1-3 ON DRAWING DWG-0433.

MAX CLAY PERMEABILITY SHALL BE $1x10^{-9}$ m/s.

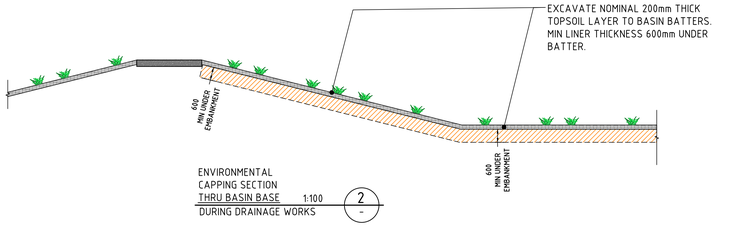
REMEDIATION & VALIDATION TO BE CONFIRMED IN ACCORDANCE WITH THE ENVIRONMENTAL CONSULTANT'S ADVICE.



ENVIRONMENTAL CAPPING SECTION
TYPICAL 1:100 (1)
DURING BULK EARTHWORKS



ENVIRONMENTAL CAPPING SECTION
THRU FILTER MEDIA 1:100 (2)
DURING DRAINAGE WORKS



ENVIRONMENTAL CAPPING SECTION
THRU BASIN BASE 1:100 (2)
DURING DRAINAGE WORKS

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

PRELIMINARY ISSUE ONLY	22.11.19	F
PRELIMINARY ISSUE ONLY	04.10.19	E
PRELIMINARY ISSUE ONLY	20.09.19	D
PRELIMINARY ISSUE ONLY	06.09.19	C
CONDITIONAL CONSTRAINTS ADDED	19.07.19	B
PRELIMINARY ISSUE ONLY	16.07.19	A
AMENDMENTS	DATE	ISSUE

ISSUED FOR CONSTRUCTION	25.05.20	I
ISSUED FOR CONSTRUCTION	03.04.20	O
50% DESIGN COMPLETION	27.03.20	I
50% DESIGN COMPLETION	17.02.20	H
ISSUED FOR POST APPROVALS	29.11.19	G
AMENDMENTS	DATE	ISSUE

DEVELOPER: MOOREBANK, QUBE

ARCHITECT: REIDCAMPBELL
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PROJECT MANAGER: J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0433

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email: mail@costinroe.com.au

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: BASIN 5 PLAN

DRAWING No: LPWPIW-COS-CV-DWG-0433 ISSUE: 1

PROVIDE INTERNAL HIGH-FLOW/LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS T.B.C TYPICAL

GPT UNIT ROCLA CDS3018 OR APPROVED EQUIVALENT.

ROAD MPW01

PROVIDE INTERNAL HIGH-FLOW/LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

GPT UNIT ROCLA CDS3018 OR APPROVED EQUIVALENT.

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS T.B.C TYPICAL

STANDARD FLOODWAY/OSD WARNING SIGN IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL HANDBOOK FOR DRAINAGE DESIGN CRITERIA

PROVIDE CHAIN LINK FENCE AT BOTTOM OF THE BATTER

PROVIDE 2.5m WIDE, 150mm HIGH COMPACTED CLAY BERM BETWEEN BIO-RETENTION CELLS. REFER DETAIL B ON DRAWING 0454

PROVIDE ACCESS BETWEEN BASIN ACCESS PATH & ESTATE MAINTENANCE TRAIL

BASIN 6 DISCHARGE CONTROL PIT
2xLOW FLOW ORIFICES (Ø400) ATTACHED TO PIT WALL AT RL9.00
6m LONG HIGH-FLOW WEIR AT RL13.10
PIT DISCHARGES THROUGH 2xØ1200 RCP TO GEORGES RIVER (33% BLOCKAGE)
FOR DETAILS REFER DRG 0458.

OUTLET STRUCTURE 6
2xØ1200 RCPs DISCHARGE THROUGH HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. REFER TO DETAILS ON DRAWING DWG-0482

PROVIDE BASIN INLET PIT TO EACH BIO-RETENTION CELL.

BIO-RETENTION SUBSOIL LINE @ 2.5m CTS TYPICAL

PROVIDE MINIMUM 3m WIDE ACCESS TRACK AT RL14.00

PROPOSED OSD/BIO-RETENTION BASIN 6
SURFACE AREA = 6,000m² MIN.
PROVIDED INTO 6 EQUAL CELLS OF 1000m² EACH (=1,000m²)
BIO RETENTION = 1% OF CATCHMENT AREA (58.82ha)
300mm MIN EXTENDED DETENTION DEPTH
500mm MIN FILTER MEDIA DEPTH
ON-SITE DETENTION STORAGE PROVIDED = 47,000m³

GEORGES RIVER

BASIN 6 PLAN
1500 SCALE

BASIN CAPPING NOTE:
REFER TO DRAWING DWG-0433 FOR BASIN CAPPING NOTES

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CARDNO DATED 01.05.2019

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.25m INTERVALS
- 3.0m ACCESS TRACK
- 10.0m BUFFER ZONE
- OPERATIONAL BOUNDARY
- EDGE OF BANK
- SITE BOUNDARY

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

PRELIMINARY ISSUE ONLY	22.11.19	F			
PRELIMINARY ISSUE ONLY	04.10.19	E	ISSUED FOR CONSTRUCTION	25.05.20	T
PRELIMINARY ISSUE ONLY	20.09.19	D	ISSUED FOR CONSTRUCTION	03.04.20	R
PRELIMINARY ISSUE ONLY	06.09.19	C	50% DESIGN COMPLETION	27.03.20	I
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AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

DEVELOPER: MOOREBANK, QUBE

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	lpwiw-cos-cv-dwg-0434

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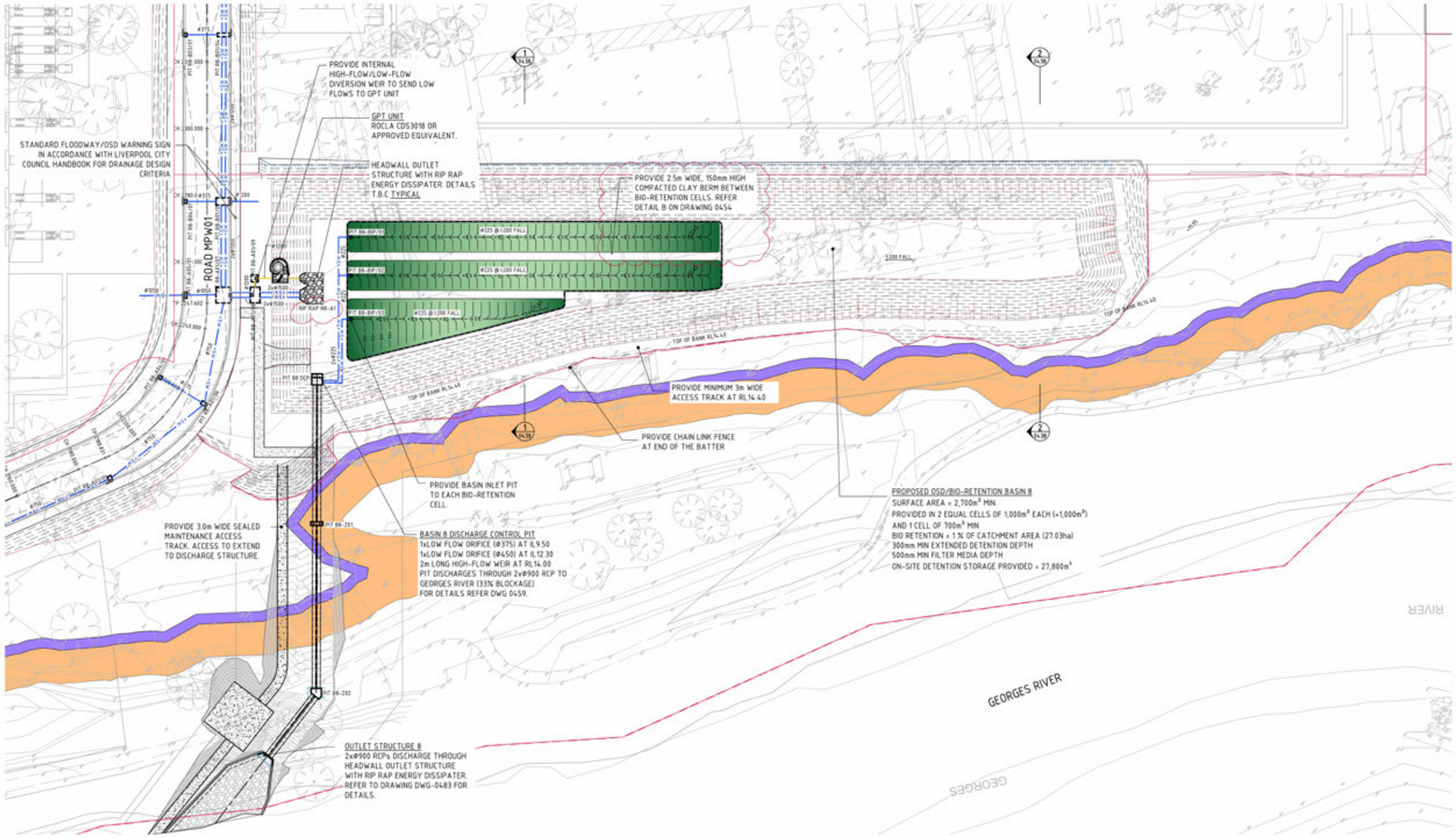
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: BASIN 6 PLAN

DRAWING No: LPWPIW-COS-CV-DWG-0434 ISSUE: 1



BASIN 8 PLAN
1:250 SCALE

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CARDNO DATED 01.05.2019

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.25m INTERVALS
- 3.0m ACCESS TRACK
- 10.0m BUFFER ZONE
- OPERATIONAL BOUNDARY
- EDGE OF BANK
- SITE BOUNDARY

BASIN CAPPING NOTE:
REFER TO DRAWING DWG-0433 FOR BASIN CAPPING NOTES

2m 0 5 10 15 20 25m
1:250 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

PRELIMINARY ISSUE ONLY	22.11.19	F	ISSUED FOR CONSTRUCTION	25.05.20	I
PRELIMINARY ISSUE ONLY	04.10.19	E	ISSUED FOR CONSTRUCTION	03.04.20	H
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AMENDMENTS	DATE	ISSUE			

DEVELOPER: MOOREBANK, QUBE

ARCHITECT: REIDCAMPBELL
Architecture, Interiors, Project Management

PROJECT MANAGER: J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0435

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DRAWING TITLE: BASIN 8 PLAN
DRAWING No: LPWPIW-COS-CV-DWG-0435 ISSUE: 1

PROVIDE INTERNAL HIGH-FLOW/ LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

PROVIDE 3.0m WIDE GRAVEL MAINTENANCE ACCESS TRACK WITH TIMBER EDGING.

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS AS SHOWN ON DRAWING DWG-454.

ROAD MPW01

GPT UNIT
ROCLA CDS3018 OR APPROVED EQUIVALENT.

EAST-WEST CULVERT PASSES UNDERNEATH BASIN. REFER DRAWING DWG-0440-0449 FOR DESIGN DETAILS

STANDARD FLOODWAY/OSD WARNING SIGN IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL HANDBOOK FOR DRAINAGE DESIGN CRITERIA

CONNECTIVITY BETWEEN ROAD MPW01 AND MAINTENANCE ACCESS TRACK TO BE CONFIRMED

GPT UNIT
ROCLA CDS 3018 OR APPROVED EQUIVALENT.

BASIN 5 INLET/DISCHARGE CONTROL PIT
2xLOW FLOW ORIFICES (Ø400) ATTACHED TO PIT WALL AT IL9.00
4m LONG HIGH-FLOW WEIR AT RL12.90
PIT DISCHARGES THROUGH 2xØ1200 RCP TO GEORGES RIVER (33% BLOCKAGE)
FOR DETAILS REFER DRG 0457.

PROVIDE MINIMUM 3m WIDE ACCESS TRACK AT RL13.90

PROVIDE CHAIN LINK FENCE AT BOTTOM OF THE BATTER

PROVIDE INTERNAL HIGH-FLOW/LOW-FLOW DIVERSION WEIR TO SEND LOW FLOWS TO GPT UNIT

HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. DETAILS AS SHOWN ON DRAWING DWG-454

PROPOSED OSD/BIO-RETENTION BASIN 5
SURFACE AREA = 4,300m² MIN.
PROVIDED INTO 5 EQUAL CELLS OF 860m² EACH (=1,000m²)
BIO RETENTION = 1% OF CATCHMENT AREA (43.00ha)
300mm MIN EXTENDED DETENTION DEPTH
500mm MIN FILTER MEDIA DEPTH
ON-SITE DETENTION STORAGE PROVIDED = 31,600m³

PROVIDE 900mm SQUARE BASIN INLET PIT TO EACH BIO-RETENTION CELL.

PROVIDE 2.5m WIDE, 150mm HIGH COMPACTED CLAY BERM BETWEEN BIO-RETENTION CELLS. REFER DETAIL A ON DRAWING 0454

BIO-RETENTION SUBSOIL LINE @ 2.5m CTS TYPICAL

CONNECTIVITY BETWEEN ROAD MPW01 AND MAINTENANCE ACCESS TRACK TO BE CONFIRMED

OUTLET STRUCTURE 5
2xØ1200 RCPs + BOX CULVERTS FROM BASIN 9+10 DISCHARGE THROUGH HEADWALL OUTLET STRUCTURE WITH RIP RAP ENERGY DISSIPATER. REFER TO DRAWING DWG-0481 FOR DISCHARGE DETAILS.

PROVIDE ACCESS GATES BETWEEN BASIN ACCESS PATH & ESTATE MAINTENANCE TRAIL

GEORGES RIVER

BASIN 5 PLAN
1500 SCALE

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY CARDNO DATED 01.05.2019

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.25m INTERVALS
- 3.0m ACCESS TRACK
- 10.0m BUFFER ZONE
- OPERATIONAL BOUNDARY
- EDGE OF BANK
- SITE BOUNDARY

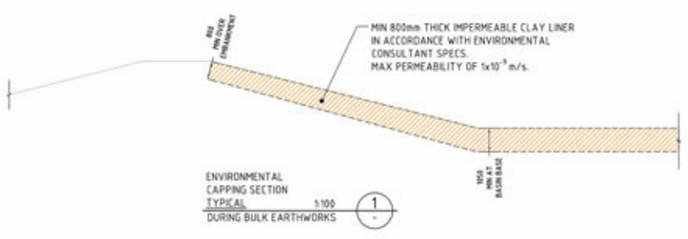
BASIN CAPPING NOTE:

CONTRACTOR TO PROVIDE IMPERMEABLE CLAY LINER UNDER ENTIRE BASIN FOOTPRINT AS SHOWN ON BULK EARTHWORKS DRAWINGS DWG-0311 - DWG-0314.

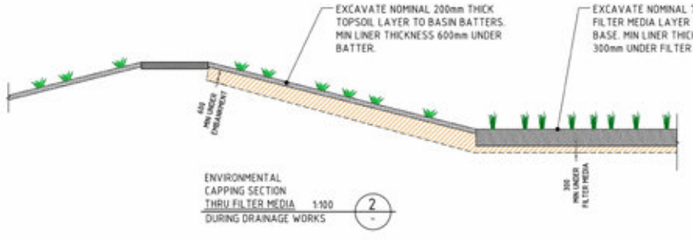
A MINIMUM OF 800mm SHALL BE PLACED ACROSS THE BATTER DURING CONSTRUCTION WORKS. CONTRACTOR TO ALLOW FOR FUTURE BIO-RETENTION FILTER MEDIA AS NECESSARY. MINIMUM LAYER THICKNESSES SHALL BE AS PER SECTIONS 1-3 ON DRAWING DWG-0433.

MAX CLAY PERMEABILITY SHALL BE $1x10^{-9}$ m/s.

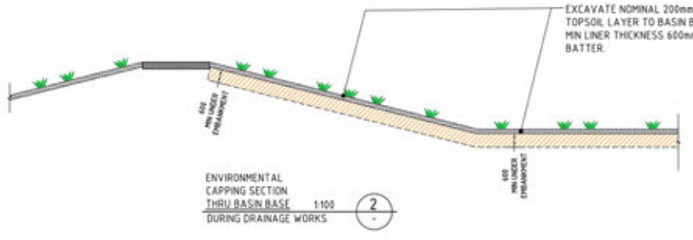
REMEDIATION & VALIDATION TO BE CONFIRMED IN ACCORDANCE WITH THE ENVIRONMENTAL CONSULTANT'S ADVICE.



ENVIRONMENTAL CAPPING SECTION TYPICAL 1:100 (1) DURING BULK EARTHWORKS



ENVIRONMENTAL CAPPING SECTION THRU FILTER MEDIA 1:100 (2) DURING DRAINAGE WORKS



ENVIRONMENTAL CAPPING SECTION THRU BASIN BASE 1:100 (2) DURING DRAINAGE WORKS

5m 0 10 20 30 40 50m
1500 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

PRELIMINARY ISSUE ONLY	22.11.19	F	ISSUED FOR CONSTRUCTION	25.05.20	I
PRELIMINARY ISSUE ONLY	04.10.19	E	ISSUED FOR CONSTRUCTION	03.04.20	H
PRELIMINARY ISSUE ONLY	20.09.19	D	50% DESIGN COMPLETION	27.03.20	G
PRELIMINARY ISSUE ONLY	06.09.19	C	50% DESIGN COMPLETION	17.02.20	F
CONDITIONAL CONSTRAINTS ADDED	19.07.19	B	ISSUED FOR POST APPROVALS	29.11.19	E
PRELIMINARY ISSUE ONLY	16.07.19	A	AMENDMENTS	DATE	ISSUE
AMENDMENTS	DATE	ISSUE			

DEVELOPER: MOOREBANK, QUBE

ARCHITECT: REIDCAMPBELL
Architecture, Interiors, Project Management

PROJECT MANAGER: J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0433

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DRAWING TITLE: BASIN 5 PLAN

DRAWING No: LPWPIW-COS-CV-DWG-0433 ISSUE: I

SAW-CUT EXISTING CONCRETE LINED CHANNEL AND DEMOLISH TO EXTENTS SHOWN. PROVIDE 3m WIDE, 1.5m DEEP STABILISED DIVERSION SWALE AS SHOWN TO FACILITATE EXCAVATION OF EAST-WEST CULVERT. DIVERSION TO BE MAINTAINED UNTIL CULVERT WORKS ARE COMPLETED

FUTURE EAST-WEST CULVERT CONSTRUCTION EARTHWORKS AREA SHOWN HATCHED.

SAW-CUT EXISTING CONCRETE LINED CHANNEL AND DEMOLISH TO EXTENTS SHOWN. PROVIDE 3m WIDE, 1.5m DEEP STABILISED DIVERSION SWALE AS SHOWN TO FACILITATE EXCAVATION OF EAST-WEST CULVERT. DIVERSION TO BE MAINTAINED UNTIL CULVERT WORKS ARE COMPLETED

INDICATIVE FUTURE MOOREBANK AVENUE DRAINAGE WORKS SHOWN FOR REFERENCE.

INTERSTATE RAIL FACILITY

MOOREBANK AVENUE UPGRADE WORKS AREA

DIVERSION SWALE ALIGNED TO FACILITATE TEMPORARY CONSTRUCTION BATTERS OF EAST-WEST CULVERT WORKS. CONTRACTOR TO ENSURE NECESSARY ADJUSTMENTS TO CHANNEL ARE MADE TO SUIT SOILS ENCOUNTERED ON SITE. REFER TYPICAL SECTION BELOW.

EXISTING CONCRETE LINED CHANNEL TO BE PRESERVED FOR DISCHARGE OF UPSTREAM CATCHMENTS AT EXTENTS SHOWN.

CHANNEL TO BE MAINTAINED AND OPERATIONAL UNTIL ALL EAST-WEST CULVERT WORKS ARE COMPLETE.

CHANNEL TO BE FULLY DEMOLISHED ON COMMISSIONING OF EAST-WEST CULVERT & TEMPORARY SWALE.

DIVERSION SWALE ALIGNED TO FACILITATE TEMPORARY CONSTRUCTION BATTERS OF EAST-WEST CULVERT WORKS. CONTRACTOR TO ENSURE NECESSARY ADJUSTMENTS TO CHANNEL ARE MADE TO SUIT SOILS ENCOUNTERED ON SITE. REFER TYPICAL SECTION BELOW.

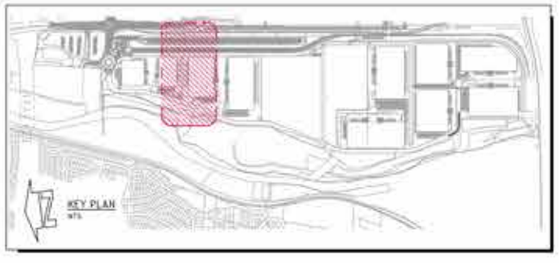
MOOREBANK AVENUE UPGRADE WORKS

EAST-WEST CULVERT PLAN - STAGE 1 BULK EARTHWORKS
1:500 SCALE

EXTERNAL CONSULTANT NOTE:

EXTERNAL DESIGNS SHOWN ARE INDICATIVE FOR PRICING PURPOSES ONLY.
FOR FURTHER DESIGN INFORMATION, REFER TO THE BELOW RESPECTIVE CONSULTANT'S DESIGN PACKAGES:

ARCADIS	- MPW (MOOREBANK PRECINCT WEST LOOP ROAD - LPMW-ARC-CV-DWG)
AURECON	- INTS (INTERSTATE RAIL FACILITY - INTS-AUR-PV-SKC)
AURECON	- RALP (INTERMODAL TERMINAL DEVELOPMENT - N01031-PWD-DRG-GEN)
NORTHROP	- MAUW (MOOREBANK AVENUE UPGRADE WORKS - MAUW-NRP-CV-DWG)
NORTHROP	- MADR (MOOREBANK AVENUE DIVERSION ROAD - MADR-NRP-CV-DWG)
NORTHROP	- MAAI (MOOREBANK AVENUE ANZAC ROAD INTERSECTION - MAAI-NRP-CV-DWG)



EARTHWORKS VOLUMES

CUT TO EXISTING LEVEL = - 6,200 m³
FILL TO EXISTING LEVEL = + 200 m³

BALANCE (IMPORT) = - 6,000 m³ (i.e. EXPORT)

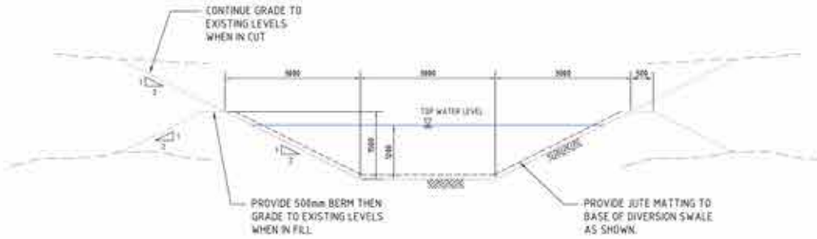
EARTHWORK VOLUMES ARE APPROXIMATE ONLY.
NO ALLOWANCE HAS BEEN MADE IN THE ABOVE VOLUMES FOR BULKING OR COMPACTION OF FILLED SOILS, EROSION AND SEDIMENT CONTROL BASINS AND MEASURES, THE REMOVAL OF UNCONTROLLED FILL, TOPSOIL STRIP OR CONTAMINATED MATERIAL, TEMPORARY DRAINAGE SWALES WITHIN BUILDING PADS, OR ANY OTHER UNSPECIFIED EXCAVATION RELATED TO FUTURE WAREHOUSE CONSTRUCTION.

EXISTING CHANNEL DIVERSION - WEST

No.	FROM DEPTH	TO DEPTH	COLOUR	DEPTH RANGE VOLUME
1	-3.000	-4.000		23m³
2	-4.000	-5.000		87m³
3	-5.000	-6.000		423m³
4	-6.000	-7.000		1265m³
5	-7.000	-8.000		1930m³
6	-8.000	-9.000		2570m³
7	-9.000	-9.900		2179m³

EXISTING CHANNEL DIVERSION - EAST

No.	FROM DEPTH	TO DEPTH	COLOUR	DEPTH RANGE VOLUME
1	-3.000	-2.000		23m³
2	-2.000	-1.000		87m³
3	-1.000	0.000		154.3m³
4	0.000	1.000		59m³
5	1.000	2.000		4m³



SECTION 1:50 X

NOTE

STAGE 1 CULVERT WORKS INVOLVES CONSTRUCTING TEMPORARY DIVERSIONS OF THE EXISTING EAST-WEST CHANNEL TO PROVIDE A CLEAR WORKING ZONE FOR THE FUTURE EAST-WEST CULVERT INSTALLATION. THE DIVERSIONS ARE TO BE OPERATIONAL UNTIL SUCH TIME AS THE CUVLERT HAS BEEN CONSTRUCTED AND IS READY FOR COMMISSIONING.

LEGEND:

- ROUNDABOUT & LOOP ROAD BY NORTHROP
- MAAI BY NORTHROP
- MADR BY NORTHROP
- MAUW BY NORTHROP
- MOOREBANK INTERMODAL TERMINAL DEVELOPMENT BY AURECON
- INTERSTATE TERMINAL AND RAIL ACCESS BY AURECON
- OSD 10 BY NORTHROP
- OSD 9 BY ARCADIS

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

ISSUED FOR	DATE	ISSUE
ISSUED FOR CONSTRUCTION	22.05.20	J
ISSUED FOR CONSTRUCTION	07.04.20	I
ISSUED FOR CONSTRUCTION	03.04.20	H
ISSUED FOR INFORMATION ONLY	31.03.20	G
ISSUED FOR INFORMATION ONLY	14.02.20	B
ISSUED FOR INFORMATION ONLY	20.12.19	A

AMENDMENTS — DATE — ISSUE

DEVELOPER: MOOREBANK, QUBE
ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management
PROJECT MANAGER: J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	P.M.	A0	AS SHOWN	

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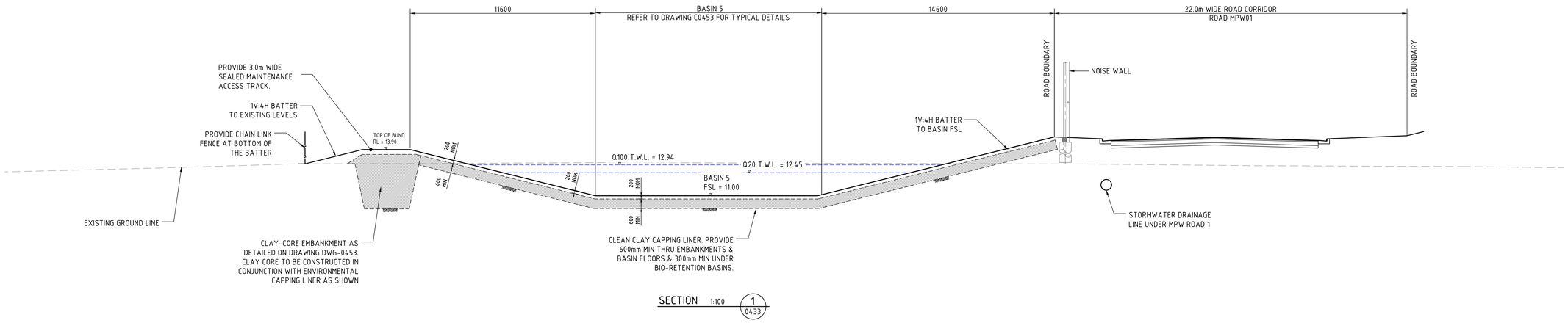
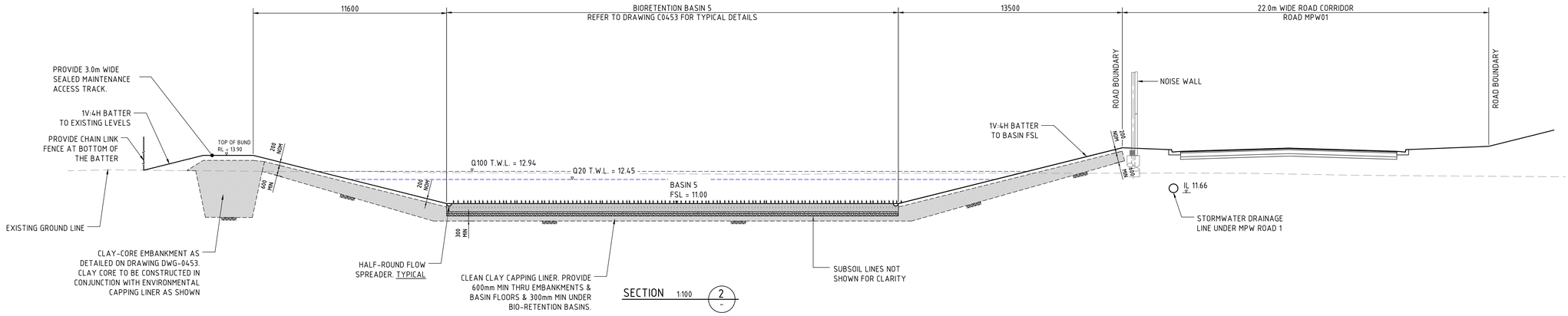
DRAWING TITLE: EAST-WEST CULVERT PLAN STAGE 1
DRAWING No: LPWPIW-COS-CV-DWG-0440
ISSUE: J



SECTION 1:100 (1 / 0433)



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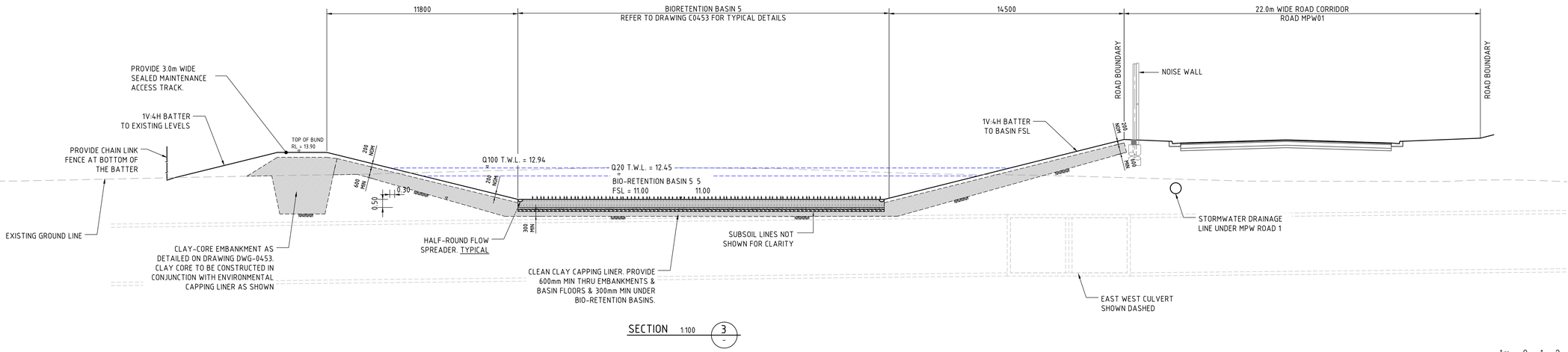

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FOR CONSTRUCTION

AMENDMENTS	DATE	ISSUE
REVISED FOR ENVIRONMENTAL CAPPING	25.05.20	1
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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0436

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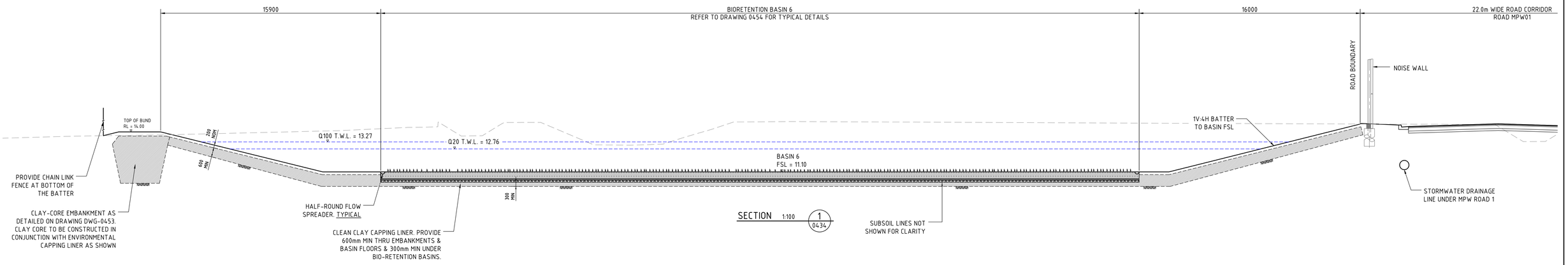
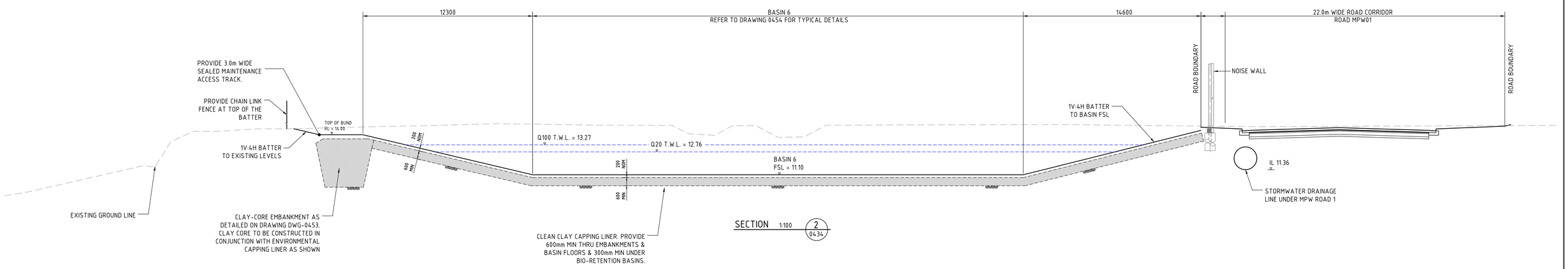
DRAWING TITLE: BASIN 5 SECTIONS

DRAWING No. LPWPIW-COS-CV-DWG-0436 ISSUE 1





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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0437

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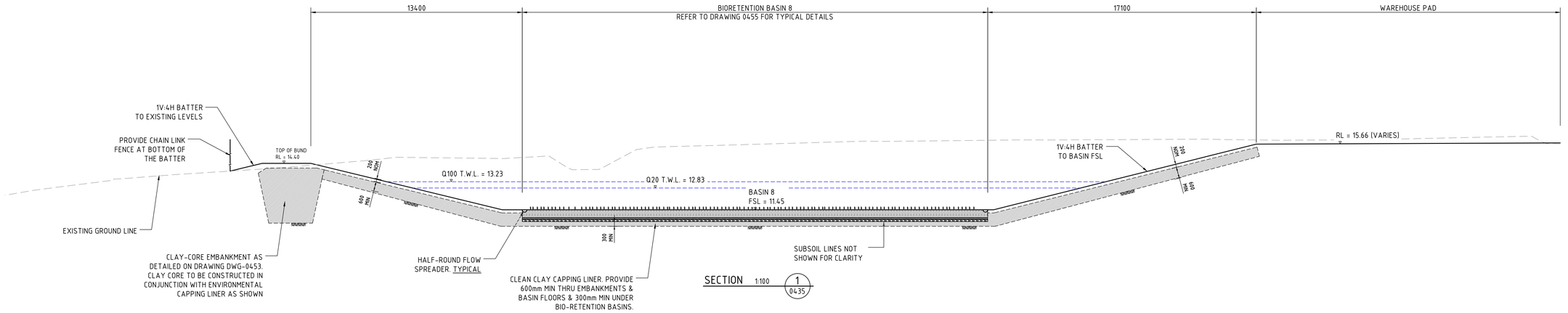

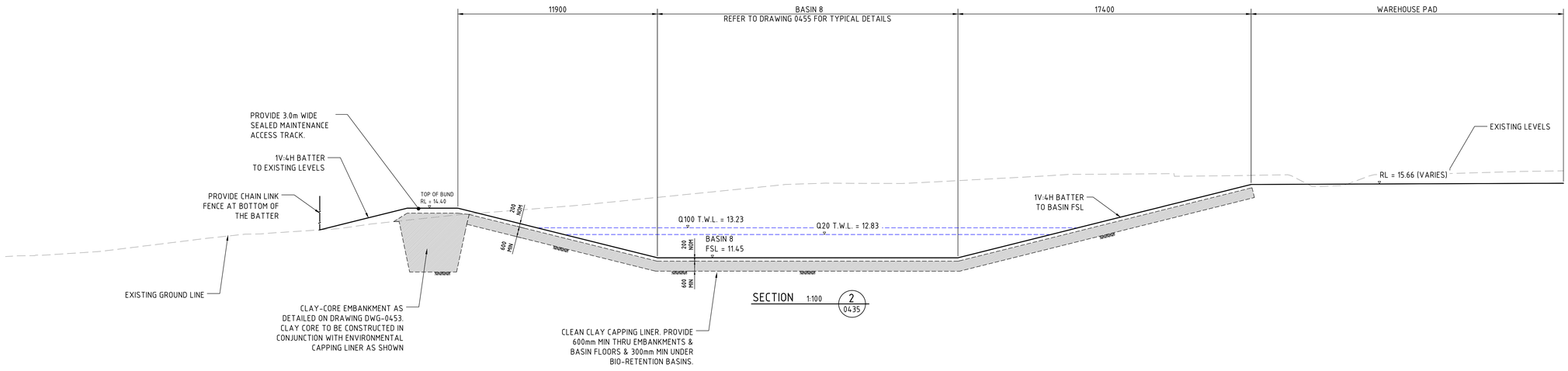

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AMENDMENTS	DATE	ISSUE
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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0438

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DRAWING TITLE: BASIN 8 SECTIONS

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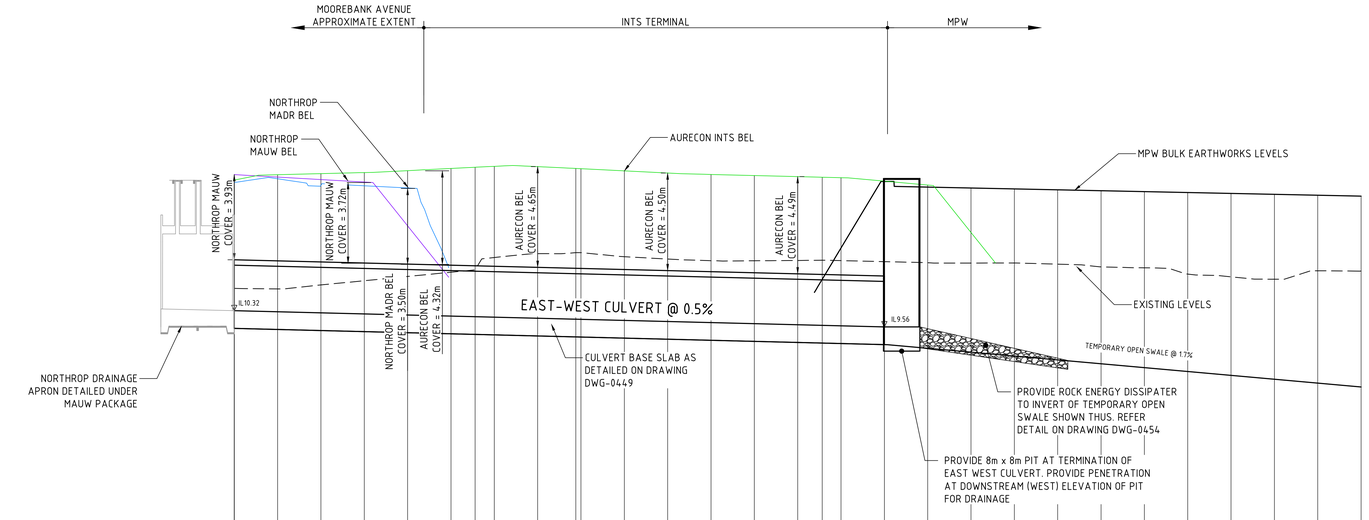

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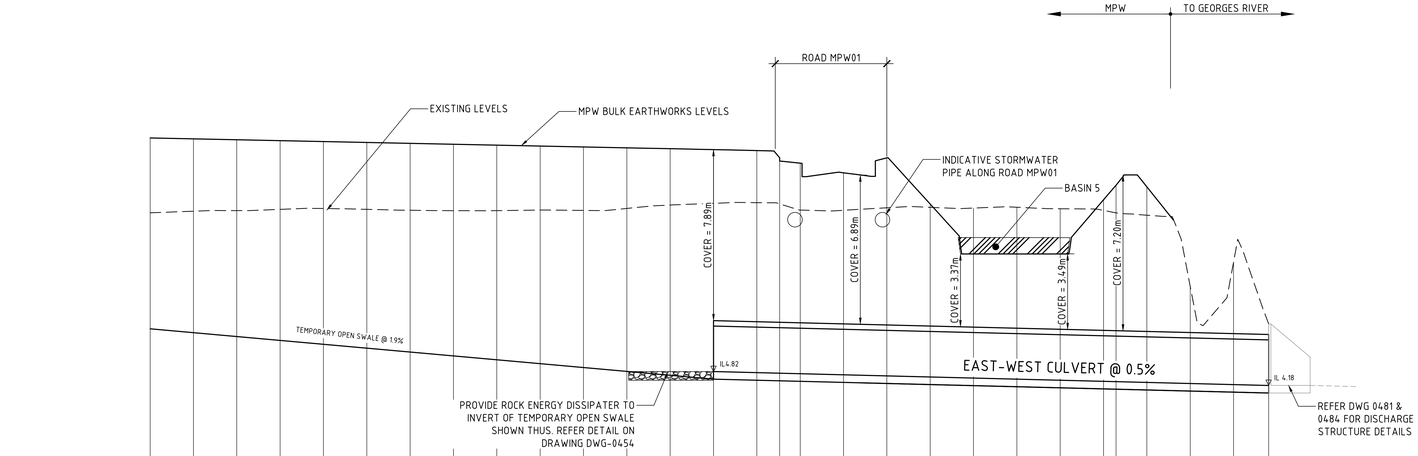
EXISTING SURFACE LEVEL			11.344	11.321	11.508	11.700	11.897	12.092	12.20	12.771	12.952	13.00	12.997	12.899	12.701	12.626	12.621	12.635	12.65	12.628	12.581	12.578	12.531	12.516	12.508	12.464	12.345	12.258	12.14	12.037	11.769	11.560	11.347
EAST-WEST CULVERT EXCAVATION LEVEL			9.950	9.450	9.400	9.350	9.300	9.250	9.222	9.200	9.150	9.106	9.100	9.050	9.000	8.950	8.900	8.850	8.822	8.800	8.750	8.716	8.581	8.402	8.223	8.045	7.866	7.687	7.509	7.330	7.151	6.972	6.794
CUT/FILL DEPTH			-1.844	-1.871	-2.108	-2.350	-2.597	-2.842	-2.978	-3.571	-3.802	-3.889	-3.897	-3.759	-3.701	-3.676	-3.721	-3.785	-3.825	-3.828	-3.831	-3.831	-3.951	-4.114	-4.294	-4.449	-4.474	-4.669	-4.496	-4.559	-4.618	-5.188	-5.353

SECTION CL EAST-WEST CULVERT
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



DATUM 0.00

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EXISTING SURFACE LEVEL	12.147	12.222	12.251	12.307	12.347	12.389	12.265	12.248	12.249	12.274	12.258	12.349	12.566	12.586	12.416	12.56	12.274	12.264	12.280	12.401	12.367	12.424	12.335	12.258	12.14	12.037	11.754	11.874	11.621			
EAST-WEST CULVERT EXCAVATION LEVEL	6.794	6.615	6.436	6.258	6.079	5.900	5.722	5.543	5.364	5.186	5.007	4.828	4.649	4.471	4.421	4.394	4.371	4.321	4.271	4.221	4.171	4.121	4.071	4.021	4.006	3.971	3.921	3.871	3.830			
CUT/FILL DEPTH	-5.353	-5.607	-5.815	-6.050	-6.268	-6.408	-6.544	-6.705	-6.885	-7.088	-7.251	-7.521	-7.857	-8.115	-8.196	-8.165	-7.903	-7.944	-8.109	-8.180	-8.196	-8.283	-8.264	-8.238	-8.138	-8.066	-8.834	-6.003	-3.791			

SECTION CL EAST-WEST CULVERT
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

NOTES:

EXTERNAL CONSULTANT NOTE:
EXTERNAL DESIGNS SHOWN ARE INDICATIVE FOR PRICING PURPOSES ONLY.
FOR FURTHER DESIGN INFORMATION, REFER TO THE BELOW RESPECTIVE CONSULTANT'S DESIGN PACKAGES.

ARCADIS	- MPW (MOOREBANK PRECINCT WEST LOOP ROAD - LPMW-ARC-CV-DWG)
AURECON	- INTS (INTERSTATE RAIL FACILITY - INTS-AUR-PV-SKC)
AURECON	- RALP (INTERMODAL TERMINAL DEVELOPMENT - N01031-PWD-DRG-GEN)
NORTHROP	- MAUW (MOOREBANK AVENUE UPGRADE WORKS - MAUW-NRP-CV-DWG)
NORTHROP	- MADR (MOOREBANK AVENUE DIVERSION ROAD - MADR-NRP-CV-DWG)
NORTHROP	- MAAI (MOOREBANK AVENUE ANZAC ROAD INTERSECTION - MAAI-NRP-CV-DWG)

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1:100 SCALE AT A0 SHEET SIZE

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1:500 SCALE AT A0 SHEET SIZE

FOR CONSTRUCTION

AMENDMENTS	DATE	ISSUE
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PROJECT: PRECINCT INFRASTRUCTURE WORKS WEST
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	AUG 19	M.W.	A0	AS SHOWN	LPWPIW-COS-CV-DWG-0444

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DRAWING TITLE: EAST-WEST CULVERT CUT AND COVER PROFILES

DRAWING No: LPWPIW-COS-CV-DWG-0444 ISSUE: 1

Appendix C
CONCEPTUAL SITE MODEL

Conceptual Site Model

The information provided in this section together with the figures included in this report aid in presenting a conceptual site model (CSM) for the Site with respect to PFAS, TCE and petroleum hydrocarbon contamination, based on a review of relevant background historical site information and the investigation works undertaken to date.

ASC NEPM (2013) identifies a CSM as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and human / ecological receptors. The development of a CSM is an essential part of all site assessments and remediation activities.

ASC NEPM (2013) identified the essential elements of a CSM as including:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination.
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air).
- Human and ecological receptors.
- Potential and complete exposure pathways.
- Potential preferential pathways for vapour migration (if potential for vapours identified).

Site Description

At the time of writing, the Site had undergone significant redevelopment as part of the Early Works (Stage 1) of the Proposed Development (construction Area). Access to the Site was off Moorebank Avenue on the eastern boundary. The Site included an Offset Area, which included the riparian zone along the western portion of the Site, located adjacent to the Georges River.

Buildings, roadways and services previously used by Defence had been demolished and removed. Exposed soils were present across much of the Site, apart from areas within the Offset Area. EEC areas have been identified on-site within the Construction Area and Offset area.

Soil had been imported to raise site levels within the Construction Area. Exposed soils had been sprayed with a polymer to reduce erosion and extensive shallow soil works had been undertaken over much of the area including the removal of underground services and installation of swales and sediment basins.

The two PFAS source areas were located in the Offset Area, known as the Dust Bowl and the FFTA. The location of the Dust Bowl and FFTA is provided as **Figure 2** in the '**Figures**' section of this report.

Proposed Development

The Site is currently being redeveloped into the Moorebank Intermodal Terminal Development. Activities associated with construction of the Proposed Development are limited to the Construction Area of the Site as follows:

- **Construction Area**: Encompasses the portion of the Site inside the MPW Stage 2 Construction Boundary and includes the proposed onsite stormwater detention basins (ref: **Figure 1**).
- **Offset Area**: Comprises the riparian area adjacent the Georges River which is located outside the MPW Stage 2 Construction Boundary in the western portion of the Site (ref: **Figure 1**).

Construction work is not proposed for the Offset Area to protect environmental values and endangered ecological communities ('EEC'), where they occur. Minor low disturbance works are proposed for the Offset Area which include re-vegetation in accordance with the Biobanking Agreement.

Summary of Environmental Investigations

In July 2014, the Site Auditor at the time, Frank Mohen issued a Section B Site Audit Statement[67] stating the Moorebank Land Preparation Work – Demolition and Remediation ('LPWDR') site could be made suitable for commercial/industrial use subject to implementation of the Parsons Brinkerhoff ('PB') Moorebank Intermodal Terminal RAP (2012)[68].

Subsequent to the issuing of the part B Site Audit Statement, the development consent (SSD 5066) for the intermodal development required the subject site be remediated in accordance with the RAP, SEPP 55[69] and guidelines in force under the Contaminated Land Management (CLM) Act. Amendments to the approved RAP as a result of further site investigations would require approval by a Site Auditor, in consultation with the NSW EPA.

Investigations of a petroleum hydrocarbon refuelling facility located on the Moorebank Precinct East ('MPE') site to the east was undertaken by GHD (2014[70], 2015[71] and 2015a[72]) reported that LNAPL had migrated onto the eastern portion of the MPW Site. Remediation of the refuelling facility was undertaken in accordance with the GHD (2015b[73]) RAP and GHD (2016[74]) technical specification and included removal of underground storage tanks (USTs), excavation of impacted soil, removal of LNAPL by multi-phase vacuum extraction (MPVE), preparation of a human health and ecological risk assessment (2016b[75]) and preparation of staged validation reports (GHD 2016a[76]and GHD 2018[77]).

---

[67] AECOM (2014) *Site Audit Report and Site Audit Statement Moorebank Intermodal Terminal, Moorebank, NSW*, AECOM Australia Pty Ltd Mr Frank Mohen NSW EPA Accredited Site Auditor No.9801, 10 July 2014.
[68] Parsons Brinckerhoff (2012) *Moorebank Intermodal Remediation Action Plan (RAP) Stage 1A Development Moorebank Avenue, Moorebank, NSW*, dated 31 October 2012.
[69] *State Environmental Planning Policy No 55 – Remediation of Land*. 31 August 2018 (SEPP 55).
[70] GHD (2014) *Stage 1 contamination assessment and data gap analysis report* (report reference 21/24133/204711), December 2014.
[71] GHD (2015) *Intrusive site investigations* (Ref 21/24133/207651), November 2015.
[72] GHD (2015a) Additional site investigations and remedial options evaluation (report reference 21/24133/209789), November 2015.
[73] GHD (2015b) *DNSDC Moorebank – Refuelling Area Remedial Action Plan* (21/24133/211259).
[74] GHD (2016) *DNSDC Refuelling Area Technical Specification* (2125471), May 2016.
[75] GHD (2016b) *Former DNSDC Refuelling Area, Moorebank NSW, Human Health and Ecological Risk Assessment* (report reference 21/25471/217592), October 2016.
[76] GHD (2016a) *Validation Report – Phase A* (report reference 21/25471/217655), September 2016.
[77] GHD (2018) *Former DNSDC Refuelling Area Remediation Validation Report - Phase C* (report reference 21\25471\WP\220903), March 2018.

Residual LNAPL is present at the refuelling facility and the impacted portion of the Site requiring on-going management in accordance with the GHD (2018a [78]) EMP. Recent gauging of LNAPL concentrations within this portion of the Site was undertaken by JBS&G (2020)[79] where increased LNAPL apparent thicknesses were reported in some wells. These increases were attributed to the low saturations of LNAPL within the effective porosity of the fine-grained soils at the Site, consistent with the low recoverability of LNAPL reported by GHD (2018). JBS&G (2020) undertook a detailed risk assessment that reported the LNAPL does not pose a potential health risk subject to the implementation of a LTEMP.

Andrew Lau of JBS&G was commissioned as the Site Auditor for the MPE Site and prepared a Site Audit Statement (SAS) and Site Audit Report[80] (SAR) in 2018 for the MPE Site concluding the LNAPL plume was stable or declining and residual contamination could be appropriately managed by the GHD (2018a) EMP.

James Davis of Enviroview was subsequently engaged as the Site Auditor of the IMEX Terminal portion of the MPE Site (which included the refuelling facility) and issued a SAS and SAR[81]. The SAS concluded that the IMEX Site was suitable for commercial / industrial land use subject to compliance with the GHD (2018a) EMP and excluding the construction of basements.

A Site Management Plan (SMP) was prepared by Golder (2016a)[82] for Moorebank Avenue to inform management of LNAPL that had migrated off-site from the refuelling facility at the MPE Site to Moorebank Avenue.

Golder Associates Pty Ltd (Golder) was commissioned by the Moorebank Intermodal Company (MIC) to undertake a data gap investigation (Golder 2015[83]) and Quantitative Human Health Risk Assessment (Golder 2015a[84]) of chlorinated hydrocarbon impacted soil and groundwater in the north western portion of the Site to the south of the ABB Building. Trichloroethylene (TCE) and Cis-1,2-dichlorothene (cis-DCE) was reported in soil and groundwater in this portion of the Site and the health risk to onsite workers was assessed to be low and acceptable for the proposed open space land use including road verges and woodland / riparian conservation areas with no buildings. Subsequent testing of shallow soil and soil gas by Golder (2018) [85] in this portion of the Site did not detect any chlorinated hydrocarbon soil concentrations above the adopted criteria, however soil vapour concentrations of TCE were reported above the adopted HIL C (recreational open space) and HIL D (commercial / industrial) criteria and cis-1,2-dichloroethene above the adopted HIL D (commercial / industrial) criteria. Groundwater assessment of this portion of the Site by JBS&G (2020) reported TCE groundwater concentrations were stable when compared to the results reported by Golder (2015).

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[78] GHD (2018a) *Former DNSDC Refuelling Area, Moorebank NSW, Environmental Management Plan* (report reference 21/25471), October 2018.
[79] JBS&G (2020) *Qube Property Management Services, Site Wide Groundwater Assessment Report, Land Preparation Work – Demolition and Remediation, Moorebank Intermodal Company Property West, Moorebank, NSW*, dated 17 March 2020 (ref: 51997-120679 (rev 0)).
[80] JBS&G (2018) *Site Audit Report 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW*. 30 October 2018 (ref. 51732-114653).
[81] Enviroview (2019) *Site Audit Report, IMEX Terminal Site Moorebank Precinct East, Sydney Intermodal 402 Moorebank Avenue, Moorebank, NSW* (ref: 600099_0301-1613-2), dated August 2019.
[82] Golder (2016a) *Moorebank Avenue – Site Management Plan*, dated 4 July 2016 (ref: 147623070-052-Rev1).
[83] Golder (2015) *Post Phase 2 Environmental Site Assessment*. Golder Associates.
[84] Golder (2015a) *Onsite Quantitative Human Health Risk Assessment, Moorebank Intermodal Terminal* (ref: 147623070-043-R-Rev1).
[85] Golder (2018) *Technical Memorandum, Results – Additional Soil and Soil Vapour Investigation of TCE Contamination* (ref: 147623070-078-M-Rev0).

Golder was commissioned to amend the RAP (Golder 2016) with the objective to remediate and/or manage contamination risks at the Site, to render the Site suitable for the proposed commercial / industrial and conservation / open space land use.

James Davis of Enviroview Pty Ltd was engaged in 2016 as the Site Auditor in relation to the Moorebank Intermodal Terminal and reviewed the RAP (Golder 2016) for the MPW Site. Mr Davis concluded *'…the RAP provided meets the requirements of the guidelines and it is my opinion that the site can be made suitable with the implementation of the RAP…'* (Enviroview 2016[86]).

The Golder (2016) RAP contained recommendations that PFAS be assessed and where required, a routine monitoring regime be established as part of the LTEMP. Numerous investigations at the Site have been undertaken for per- and poly-fluoroalkyl substances (PFAS) (PB 2014[87], Golder 2015b[88], Golder 2016b[89], Golder 2016c[90], Golder 2016d[91], Golder 2016e[92], Golder 2017[93], Coffey 2017[94], EP Risk 2017[95], EP Risk 2017a[96], EP Risk 2017b[97], EP Risk 2017c[98], JBS&G 2019[99] and JBS&G 2020). The findings of these reports have identified PFAS concentrations in soil below the human health-based guidelines for commercial / industrial land use but exceeding the indirect ecological criteria. Impacted sediment, groundwater and surface water was reported at the Site sourced from historical firefighting activities undertaken at the former FFTA and Dust Bowl in the eastern portion of the Site. EP Risk (2017)[100]was engaged by Qube to prepare a Tier 2 PFAS human health and ecological risk assessment for the development and identified the potential human health risk to workers through dermal exposure to PFAS impacted water and a potential risk to ecological receptors in the Georges River from PFAS impacted soil, sediments, surface water and groundwater at the Site.

[86] Enviroview (2016) *Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan*, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
[87] PB (2014) *Phase 2 Environmental Site Assessment Moorebank Intermodal Terminal*, dated 28.05.14 (ref: 2103829A-CLM_REP-1 Rev B) Parsons Brinkerhoff Pty Ltd.
[88] Golder (2015b) *Preliminary Aqueous Film Forming Foam Investigation* (ref: 147623070-035-M-Rev0, FINAL, 28.10.15) Golder Associates Pty Ltd.
[89] (Golder 2016b) *Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigations: Stage 1 Onsite Screening Assessment* (ref: 147623070-059-R-Rev0, FINAL, 29.10.16) Golder Associates Pty Ltd.
[90] Golder (2016c) *Perfluoroalkyl Substances Surface Water and Sediment Investigation Georges River*, dated 22 March 2016 (ref: 147623070-047-R-Rev0).
[91] Golder (2016d) *Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigation: Stage 2 Onsite Delineation* (ref: 147623070-064-R-Rev1, FINAL, 29.10.2016) Golder Associates Pty Ltd.
[92] Golder (2016e) *Moorebank Intermodal Terminal, Preliminary PFAS in Groundwater Remedial Options Appraisal, Moorebank Intermodal Terminal, Moorebank, NSW* (ref: 147623070-065-R-Rev0, 01.09.16) Golder Associates Pty Ltd (Golder 2016c).
[93] Golder (2017) *Moorebank Intermodal Terminal, Per-fluoroalkyl Substances Surface Water and Sediment Investigation Georges River*, dated 22 March 2017 (ref: 147623070-047-R-Rev0) Golder Associates Pty Ltd.
[94] Coffey (2017) *PFAS Assessment Report – Royal Australian Engineers (RAE) Golf Course*, dated 29 September 2017 (ref: GEOTLCOV24072AF-CD) Coffey.
[95] EP Risk (2017) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v3, 03.10.17) EP Risk Management Pty Ltd.
[96] EP Risk (2017a) *Per- and Poly-fluoroalkyl Substances (PFAS) Data Gap Investigation* (ref: EP00464.002, v2, 20.11.17) EP Risk Management Pty Ltd.
[97] EP Risk (2017b) *Per- and Poly-fluoroalkyl Substances (PFAS) Nested Well Investigation* (ref: EP00561.002, v1, 10.07.17) EP Risk Management Pty Ltd.
[98] EP Risk (2018) *Moorebank Precinct West Site-Wide Per- and Poly- Fluoroalkyl Substances (PFAS) Assessment* (ref: EP0748.008 v1, 22.08.18) EP Risk Management Pty Ltd.
[99] JBS&G (2019b) *Moorebank Precinct West, Moorebank Intermodal Terminal, NSW – Dust Bowl Assessment* (ref: JBS&G 51997-125644 L342 (Dust Bowl Assessment) Rev A, dated 8 November 2019).
[100] EP Risk (2017c) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v.3, 03.10.17).

MIC engaged EnRiskS (2019[101] and 2019a[102]) to prepare updated human health and ecological risk assessments for the Site and the Georges River. The risk assessments included sampling of biota in the Georges River to assess the risk of PFAS exposure to both on-site and off-site receptors. EnRiskS (2019) reported the risk to human health at the Site was low and acceptable, but bioaccumulation and the effects on higher order ecological consumers were unable to be excluded. EnRiskS (2019a) reported additional unknown sources of PFAS to biota in the Georges River, but the location of these additional sources could not be identified. However, EnRiskS (2019a) reported a potential health risk to children who consume more than two serves of fish per month sourced from the Georges River and potential adverse effects to the aquatic environment by bioaccumulation and the effects on higher order ecological consumers.

MIC engaged GHD (2019) [103] to prepare a summary report of historical PFAS investigations and prepare a conceptual site model. Based upon the findings by EnRiskS (2019 and 2019a) and GHD (2019), MIC engaged GHD to prepare a PFAS Management Plan (2019a) to outline the strategy for long term management of the off-site migration of PFAS from the Site to the Georges River. The GHD (2019a) PFAS Management Plan was not implemented and has/will be superseded.

To render the Site suitable for the Proposed Development, remedial works were undertaken in accordance with the requirements of the RAP (Golder 2016), and the outcomes provided in the Remediation Validation Report for Land Preparation Work (JBS&G 2020). In summary, JBS&G (2020) concluded that in some areas of the Site, the scope of the RAP (Golder 2016) was constrained by areas mapped as endangered ecological communities (EECs) which could not be disturbed and are fenced / barricaded to prevent access. Management of these restricted areas during construction was recommended via the implementation of a CMP. JBS&G (2020) concluded that the Site is suitable for the intended Intermodal Terminal subject to the implementation of a CMP for restricted access areas during the construction phase and biobanking areas with restricted access.

Management and close out of remaining contamination within the EECs, as identified in the EP Risk (2020) CMP was completed by JBS&G (2020a) to the extent practicable. However, JBS&G (2020a) have identified a number of areas where it was not practicable to complete validation works due to site constraints which will require on-going management during construction works.

EnRiskS (2020)[104] prepared a material reuse risk assessment in relation to the presence of PFAS in soil to inform management procedures in the LTEMP, which presents revised criteria for PFAS in soil to be reused in the Construction Area, which can be implemented in conjunction with the management measures provided.

[101] EnRiskS (2019) *Land Human Health and Ecological Risk Assessment (Land HERA)*, dated 6 May 2019 (ref: MICL/19/BIOR001, Revision B – Revised Draft).
[102] EnRiskS (2019a) *Waterway Human Health and Ecological Risk Assessment (Waterway HHERA)*, dated 10 May 2019 (ref: MICL/18/GRR001, Revision E – Revised Draft).
[103] GHD (2019) *Moorebank Precinct West, Report Summarising PFAS Investigations to February 2019*, dated April 2019 (ref: 2128111).
[104] EnRiskS (2020) Moorebank Intermodal Terminal: LTEMP Material Reuse Risk Assessment for PFAS, dated 9 October 2020.

Summary of Contamination

Historical operation of the Site as a defence facility has resulted in contamination of soil, soil vapour, sediment, surface water and groundwater. Remediation works were undertaken in accordance with the Golder (2016) RAP and a Validation Report and Supplementary Validation Report prepared by JBS&G (2020 and 2020a). At the completion of remediation activities residual contamination remained at the Site that required short-to long-term management. A summary of the remaining areas of environmental concern ('AEC') and contaminants of concern ('COC') is provided as follows:

- AEC 1 – Chlorinated hydrocarbons impact (TCE and cis-DCE) and total recoverable hydrocarbon in the north west portion of the Site to the south of the ABB Building.
- AEC 2 - Petroleum hydrocarbon impact including LNAPL in the eastern portion of the Site.
- AEC 3 - PFAS impact associated with historical firefighting training at the Site.

There were also underground services and anthropogenic fill materials located within vegetated areas located within the Construction Area that were unable to be remediation and validated by JBS&G (2020). Vegetation removal and remediation of the majority of identified remaining contamination was undertaken in accordance with the EP Risk (2020) CMP, with the management and close out completed and subsequently validated by JBS&G (2020a). However, the following areas were not able to be closed out by JBS&G (2020a) at the completion of CMP works and require ongoing management during the construction phase of works:

- STP area and Anthro-2.
- UF111 and UF230 adjacent to live high-risk services and no capping or removal was considered safe or practical during the CMP works.
- Selected stockpiles of site won soil/materials where PFAS-impacts are suspected or have been reported.

The location of the AECs at the Site is provided as **Figure 3** and further information relating to these AECs is provided below. The locations of stockpiled material requiring further assessment was not provided by JBS&G (2020a) due to limited information.

AEC 1 – Chlorinated Hydrocarbons Impacted Area

A summary of the historical chlorinated hydrocarbon analytical results compiled by Golder 2015, Golder 2015a, Golder 2018 and JBS&G 2020 identified the following contaminants of potential concern in AEC 1:

- TCE;
- Cis-DCE; and
- TRH.

Golder (2015a) and JBS&G (2020a) provided a summary of historical chlorinated hydrocarbon concentrations reported at AEC 1 as follows:

- Groundwater concentrations of volatile organic compounds (VOCs) and TRH above the laboratory limit of reporting (LOR) were historically reported at MWBHB1 – MWBHB11, MWBHB14 and concentrations of TCE, cis-DCE and TRH were reported above the laboratory LOR in groundwater collected from MWBHB1, MWBHB2, MWBHB3 and MWBHB7.
- The maximum TCE and cis-DCE concentrations of 0.419 mg/L and 0.028 mg/L at MWBHB1 and a TCE concentration of 0.303 mg/L at MWBHB3.
- Shallow soil chlorinated hydrocarbon concentrations were below laboratory LOR with the exception of GA-HA13 with a TCE concentration of 0.6 mg/kg.
- Screening of deeper soil with the membrane interface probe (MIP) identified elevated XSD responses between 3 and 7 mBGL, indicative of vertical migration through the soil profile.
- Elevated soil vapour TCE concentrations at two locations, screened in the unsaturated zone.

A summary of groundwater and soil vapour concentrations reported in AEC 1 is provided in **Table C1** and **Table C2**.

Table C1 – Summary of Historical Groundwater Chlorinated Hydrocarbon Concentrations (AEC 1)

Constituent	Adopted Criteria (mg/L)	Maximum Concentration (mg/L)	Exceedance
cis-1,2- DCE	0.06	0.028	No
TCE	0.07	0.419	Yes
Tetrachloroethene (PCE)	0.05	0.003	No

Table C2 – Summary of Historical Soil Vapour Chlorinated Hydrocarbon and Petroleum Hydrocarbon Concentrations (AEC 1)

Constituent in Soil Vapour	Criteria (µg/m^3)		Maximum Concentration (µg/m^3)	Exceedance
	HSL / HIL C	HSL / HIL D		
cis-1,2- DCE	2000	300	2900	Yes
Trans 1,2-Dichloroethene (trans-DCE)	2000	300	120	No
Chloroform	430	430	120	No
Benzene	2,400,000	10,000	19.2	No
TCE	400	80	280,000	Yes
Toluene	NL	16,000,000	74.2	No
PCE	40,000	8,000	440	No

Figures illustrating the locations of elevated chlorinated hydrocarbon concentrations is provided at the end of **Appendix C**.

AEC 2 –Petroleum Hydrocarbon Impacted Area

A summary of the historical petroleum hydrocarbon gauging and analytical results reported by Golder 2016, GHD 2018 and JBS&G 2020 identified the following COC at AEC 2:

- TRH;
- Benzene, toluene, ethylbenzene and xylene (BTEX);
- Naphthalene;
- Lead; and
- Polycyclic aromatic hydrocarbons (PAH).

A summary of petroleum hydrocarbon exceedances at AEC 2 are as follows:

- One soil sample reported a TRH (C_{10}-C_{16}) concentration more than the adopted management limit.
- LNAPL in three monitoring wells (GW119, GW120 and GW146) located in the eastern portion of the Site, downgradient of the former DNSDC refuelling facility located on the MPE Site to the east.
- LNAPL thickness was gauged in November 2016 and October 2017 as follows:
    - GW19: 0.032 m – 1.937 m;
    - GW20: 0.061 m - 1.47 m; and
    - GW146: 0.007 m – 1.980 m.

Figures illustrating the locations of petroleum impacted groundwater are provided at the end of **Appendix C**.

AEC 3 - PFAS Contamination in Affected Media Onsite

The historical soil, soil leachate sediment, surface water and groundwater PFAS analytical results reported by PB (2014), Golder (2015), Golder (2016b), EP Risk (2017a, 2017b and 2018a) and JBS&G (2019b) are presented in **Table C3, Table C4**, **Table C5**, **Table C6** and **Table C7** respectively. Ecological criteria were only compared to the data set from 0 to 2 mBGL in accordance with the requirements of the ASC NEPM (2013) as this horizon corresponds with the root zone and habitation zone of many species. Figures illustrating the locations of PFAS impact are provided at the end of **Appendix C**.

Table C3 – Summary of Historical Soil PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (mBGL)	Analyte	No. of samples	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Mean Conc. (mg/kg)	Standard Deviation (mg/kg)	No. Samples >LOR	No. Samples > Criteria[105]	No. Samples > 250% Criteria	95% UCL_{mean} (mg/kg)[106]	95% UCL_{mean} Exceedance of Criteria[107]
Construction Area	<2	PFOS	212	<0.0001	1.6	0.035	0.14	122	EC (dir.)[108] – 1 EC (ind.)[109] – 13	EC (dir.) – 0 EC (ind. – 3)[110]	EC (dir.) – 0.1 EC (ind.) - 0.035	EC (dir.) – No EC (ind.) – No
		PFOS + PFHxS	212	<0.0001	1.612	0.038	0.15	128	0	0	-	-
		PFOA	212	<0.0001	0.014	-	-	48	0	0	-	-
	>2	PFOS	94	<0.0001	0.29	0.16	0.046	36	-	0	-	-
		PFOS + PFHxS	94	<0.0001	0.2987	0.019	0.052	42	0	0	-	-
		PFOA	94	<0.0001	<0.005	-	-	13	0	0	-	-
Offset Area	<2	PFOS	184	<0.0001	2.3	0.1	0.22	159	EC (dir.) – 1 EC (ind.) - 132	EC (dir.) – 0 EC (ind.) – 109	EC (dir.) – 0.17 EC (ind.) – 0.011[111]	EC (dir.) – no EC (ind.) – yes
		PFOS + PFHxS	184	<0.0002	2.338	0.12	0.23	163	HC[112] - 1	0	HC – 0.194	No
		PFOA	184	0.0001	0.011	-	-	9	0	0	-	-
	>2	PFOS	43	<0.0001	1.8	0.14	0.36	26	0	0	-	-
		PFOS + PFHxS	43	0.0001	2.06	0.19	0.41	31	HC - 2	0	HC - 0.586	No

[105] Health based criteria assuming commercial / industrial land use for the Construction Area and recreational / open space criteria for the Offset Area and for soil <2m and >2m. Ecological criteria assuming industrial commercial for the Construction Area and public open space / residential for the Offset Area for soil <2m (PFAS NEMP).
[106] Excluding samples results greater than 250% of the adopted criteria.
[107] Standard deviation must be less than 50% of the adopted criteria.
[108] 'EC (dir.)' – interim soil ecological direct exposure (PFAS NEMP).
[109] 'EC (ind.)' – interim soil – ecological indirect exposure (PFAS NEMP) The ecological indirect exposure criteria of 0.14 mg/kg was adopted for the Construction Area on the basis that the Site has been intensively developed in the past and further intensive development is proposed which will limit the presence of secondary consumers and the potential for indirect ecological exposure.
[110] Hotspot exceedances of ecological indirect criteria are all located in areas that are proposed to be covered with impermeable pavement or building footprints.
[111] Standard deviation exceeds 50% of the adopted criteria.
[112] 'HC' – human health screening values – Public open space (Offset Area) / commercial / industrial (Developable Portion (PFAS NEMP).

Table C3 – Summary of Historical Soil PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (mBGL)	Analyte	No. of samples	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Mean Conc. (mg/kg)	Standard Deviation (mg/kg)	No. Samples >LOR	No. Samples > Criteria[105]	No. Samples > 250% Criteria	95% UCL_{mean} (mg/kg)[106]	95% UCL_{mean} Exceedance of Criteria[107]
		PFOA	43	<0.0001	0.0269	-	-	8	0	0	-	-

Table C4 – Summary of Historical Neutral pH Leachate PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (mBGL)	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR	95% UCL_{mean} (µg/L)
Construction Area	< 2	PFOS	123	<0.01	80	2.2	8.6	88	-
		PFOS + PFHxS	123	<0.01	80.66	2.4	8.9	99	-
		PFOA	123	<0.01	0.55	0.026	0.069	40	-
	> 2	PFOS	47	<0.01	71	2.1	10	23	-
		PFOS + PFHxS	47	<0.01	84	2.6	12	28	-
		PFOA	47	<0.01	0.92	0.037	0.14	9	-

Table C5 – Summary of Historical Sediment PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (mBGL)	Analyte	No. of samples	Minimum conc. (mg/kg)	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)	Standard Deviation (mg/kg)	No. Samples >LOR
Construction Area	< 0.1	PFOS	39	<0.0005	0.0568	0.004	0.011	31
		PFOS + PFHxS	39	<0.005	0.0647	0.0045	0.013	31
		PFOA	39	<0.0005	<0.0005	0.0003	0	0
Offset Area	< 0.1	PFOS	31	0.0005	0.922	0.04	0.16	31
		PFOS + PFHxS	31	0.0005	0.9276	0.043	0.17	31
		PFOA	31	<0.0005	0.0023	0.0004	0.0004	2

Table C6 – Summary of Historical Surface Water PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR
Construction Area	PFOS	18	0.004	0.749	0.11	0.2	18
	PFOS + PFHxS	18	0.004	1.099	0.2	0.32	18
	PFOA	18	<0.002	0.02	0.0042	0.0068	4
Offset Area	PFOS	11	0.018	87.9	8.1	26	11
	PFOS + PFHxS	11	0.023	97.56	9.1	29	11
	PFOA	11	<0.002	0.453	0.046	0.14	8

Table C7 – Summary of Historical Groundwater PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth of well (mBGL)	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR	No. Samples > Criteria[113]	95% UCL_{mean} (µg/L)	95% UCL_{mean} Exceedance of Criteria
Construction Area	Shallow (<6 mBGL)	PFOS	9	0.012	152	33	49	9	9	63.54	Yes
		PFOS + PFHxS	8	0.15	422	101	143	8	8	196.7	Yes
		PFOA	9	<0.002	21.6	3.8	7	7	4	29.36	Yes
	Intermediate (>6 - <12 mBGL)	PFOS	25	0.0021	68.4	10	19	25	25	47.47	Yes
		PFOS + PFHxS	20	0.0021	93.1	20	30	20	18	48.08	Yes
		PFOA	25	<0.001	2.13	0.28	0.59	17	4	1.454	Yes
	Deep (>12 mBGL)	PFOS	79	<0.0001	66	2.1	7.8	75	75	5.939	Yes
		PFOS + PFHxS	69	<0.001	111	6.3	16	67	52	18.51	Yes

[113] Criteria adopted for human health (drinking water and recreational water quality) and ecological (Freshwater 99% species protection) (PFAS NEMP).

Table C7 – Summary of Historical Groundwater PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth of well (mBGL)	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR	No. Samples > Criteria[113]	95% UCL_{mean} (µg/L)	95% UCL_{mean} Exceedance of Criteria
		PFOA	79	<0.001	1.9	0.11	0.26	57	4	0.236	No
Offset Area	Shallow (<6 mBGL)	PFOS	34	<0.002	348	30	90	33	33	126.6	Yes
		PFOS + PFHxS	34	<0.002	550	87	151	33	33	159.8	Yes
		PFOA	34	<0.002	8.12	1.3	2	32	15	2.229	Yes
	Intermediate (>6 - <12 mBGL)	PFOS	100	<0.002	624	32	75	99	99	64.22	Yes
		PFOS + PFHxS	99	0.0022	656	46	88	99	95	84.74	Yes
		PFOA	100	<0.001	12.4	0.79	1.6	95	31	1.051	Yes
	Deep (>12 mBGL)	PFOS	13	0.0065	3.2	0.69	1	13	13	1.886	Yes
		PFOS + PFHxS	13	0.0135	4.34	1.3	1.4	13	10	1.938	Yes
		PFOA	13	<0.001	0.054	0.017	0.018	8	0	0.0262	No

Assessment of Precursors

EP Risk (2018) reported that total oxidising precursor assay ('TOPA') results indicated that total oxidising concentrations of PFOS and PFHxS + PFOS were generally decreasing in concentration post oxidation under laboratory conditions using a strong oxidant. Based on the laboratory results, it was considered unlikely that significant transformation of PFAS precursors would occur under the less oxidising conditions present on-site.

Additional Areas Requiring Management at the Completion of CMP Works

The additional areas requiring management at the completion of CMP Works have been identified at the Site by JBS&G (2020a) and a summary of the contamination within each area is as follows:

- Anthro-2 – consists of sandy silty clay soil with inclusions of metal, wire, gravels, concrete, asphalt, glass, plastic, brick, tile, wood, terracotta and ACM adjacent to a swamp area.
- Former STP (fill material beneath SP10) – silty clay with inclusions of organic material, concrete, metal, gravels, glass, terracotta, plastic and ACM.
- Two ACM pipes were adjacent live high-risk services (UF111 and UF230) and no capping or removal was considered safe or practical.
- Selected stockpiles of site won soil/materials where PFAS-impacts are suspected or have been reported.

Sensitive Receptors

Sensitive receptors identified at and near the Site are:

- On-site receptors:
    - Construction, remediation and subsurface maintenance workers and future commercial / industrial site users.
    - Recreational users who trespass on the Offset Area.
    - Terrestrial flora and fauna including threatened species in the Offset Area.
    - Future terrestrial flora and fauna in proposed landscaped areas located within the Developable Portion.
- Off-site receptors:
    - Recreational users of the Georges River.
    - Terrestrial and aquatic flora and fauna dependent upon the Georges River and Anzac Creek.

Source-Pathway-Receptor Linkages

Based upon the findings of the most recent human health and ecological risk assessments prepared for the Site and the Georges River by EnRiskS (2019 and 2019a) and Golder (2015a), an analysis of the potential source-pathway-receptor linkages are provided in **Table C8** and illustrated in **Figure 4** in the '**Figures**' section of the report.

Table C8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	Secondary	Transport Mechanisms	Exposure Pathways		
AEC1 – Chlorinated Hydrocarbon Impacted Area					
Chlorinated hydrocarbon impacted groundwater from the adjoining property to the north	Soil	Direct contact	Human Health: - incidental ingestion. - Dermal contact. - Dust inhalation	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public	Incomplete as the cut and fill plan shows the area is proposed to be filled and soil impact is located at depths below the likely maximum depth of excavation in this area[114].
			Ecological (direct) - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Incomplete as soil impact is located at depths greater than 2m[115].
	Soil vapour	Vapour migration	Human Health: - inhalation of vapour.	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public.	Potentially complete if appropriate health and safety controls and PPE are not implemented during construction or sub-surface maintenance works and if the future land use includes buildings or permanent structures in this area.
	Impacted groundwater	Groundwater migration	Human Health: - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Incomplete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.
			Ecological - Direct uptake.	Ecosystems dependent upon the Georges River and Anzac Creek.	Incomplete as it is unlikely that chlorinated impacted groundwater would migrate to the Georges River.

[114] Costin Roe Consulting Pty Ltd (2020) Cut and Fill Plan, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20 and Costin Roe Consulting Pty Ltd (2020) Bulk Earthworks Sections, Sheet 3, Section 11, Drawing Number LPWPIW-COS-CV-DWG-0353, Issue 2, dated 12.06.20.
[115] Costin Roe Consulting Pty Ltd (2020) Cut and Fill Plan, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20 and Costin Roe Consulting Pty Ltd (2020) Bulk Earthworks Sections, Sheet 3, Section 11, Drawing Number LPWPIW-COS-CV-DWG-0353, Issue 2, dated 12.06.20.

Table C8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	Secondary	Transport Mechanisms	Exposure Pathways		
			- Bioaccumulation and biomagnification.		
AEC 2 – Petroleum Hydrocarbon Impacted Area					
Petroleum hydrocarbon impacted groundwater from the adjoining property to the east	Soil	Direct contact	Human Health: - incidental ingestion. - Dermal contact. - Dust inhalation.	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public	Incomplete as soil impact is located at depths below the likely maximum depth of excavation in this area. Soil impacts (if present) would likely be associated with LNAPL impacted groundwater which was reported at depths greater than 5 mBGL, whilst the maximum depth of excavation is 2.5 to 3.0 mBGL[116].
			Explosive atmospheres.	Damage to buried infrastructure or aesthetic impacts to human receptors.	Unlikely to be complete given the marginal exceedance, the location of the exceedance at the source area of the IMEX Site and the fact that all other samples were below management limits.
			Ecological (direct): - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Incomplete as soil impact is located at depths greater than 2m.
	Soil vapour	Vapour migration	Human Health: - inhalation of vapour.	Future commercial / industrial site users in a building with a basement.	Potentially complete if appropriate health and safety controls and PPE are not implemented during construction or sub-surface maintenance works and if the future land use includes buildings or permanent structures with basements in this area.

[116] Northrop Pty Ltd (2020) Bulk Earthworks Plan Sheet 02, Drawing No. MAUW-NRP-CV_DWG-9122, Sheet No. 9122, dated 20.07.2020, rev 04.

Table C8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
	Impacted groundwater	Groundwater migration	Human Health: - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Incomplete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.
			Ecological: - Direct uptake. - Bioaccumulation	Ecosystems dependent upon the Georges River and Anzac Creek.	Incomplete as it is unlikely that petroleum impacted groundwater would migrate to the Georges River.
AEC3 – PFAS Impacted Area					
Construction Area					
Application of AFFF to ground at fire-fighting training areas: • Dust Bowl • FFTA	PFAS impacted soil and sediment within primary source areas and surrounding land.	- Leaching of PFAS through the soil profile to groundwater. - Leaching of PFAS from exposed soil to surface water.	Human Health: - incidental ingestion. - Dermal contact. - inhalation of dust.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Unlikely assuming appropriate health and safety controls and PPE are implemented during construction or sub-surface maintenance works.
			Ecological (direct): - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented.
			Ecological (indirect) - Bioaccumulation and biomagnification.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented.
	PFAS impacted groundwater, surface water and sediment.	Groundwater migration and surface water flow to the	Human Health: - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Incomplete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.

Table C8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	Secondary	Transport Mechanisms	Exposure Pathways		
		Georges River and Anzac Creek.	Ecological: - Bioaccumulation and biomagnification.	Ecosystems dependent upon the Georges River and Anzac Creek.	Potentially complete if appropriate soil and water management controls are not implemented during construction due to the high leachability of PFAS in soils. Excavation of OSDs will not encounter groundwater due to the reported groundwater depth below design levels[117] [118] [119].
Offset Area					
Application of AFFF to ground at fire-fighting training areas: • Dust Bowl • FFTA	PFAS impacted soil and sediment within primary source areas and surrounding land.	- Leaching of PFAS through the soil profile to groundwater. - Leaching of PFAS from exposed soil to surface water.	Human Health: - incidental ingestion. - Dermal contact. - inhalation of dust.	- Revegetation workers. - Recreational users who trespass on the Offset Area. - Recreational users of the Georges River.	Incomplete due to the limited access provided.
			Ecological (direct): - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Incomplete.
			Ecological (indirect): - Bioaccumulation and biomagnification.	Terrestrial higher order consumers.	Potentially complete (effects are unable to be excluded).
	PFAS impacted surface water	Groundwater migration and surface water	Human Health: - incidental ingestion. - Dermal contact.	Recreational users of the Georges River.	Incomplete.

[117] Costin Roe Consulting Pty Ltd (2020) *Basin 6 Sections*, Drawing Number LPWPIW-COS-CV-DWG-0437, Issue 1, dated 25.05.20. EP Risk (2018) reported groundwater at 3.763 mAHD within MW3005 at the proposed location of OSD 6

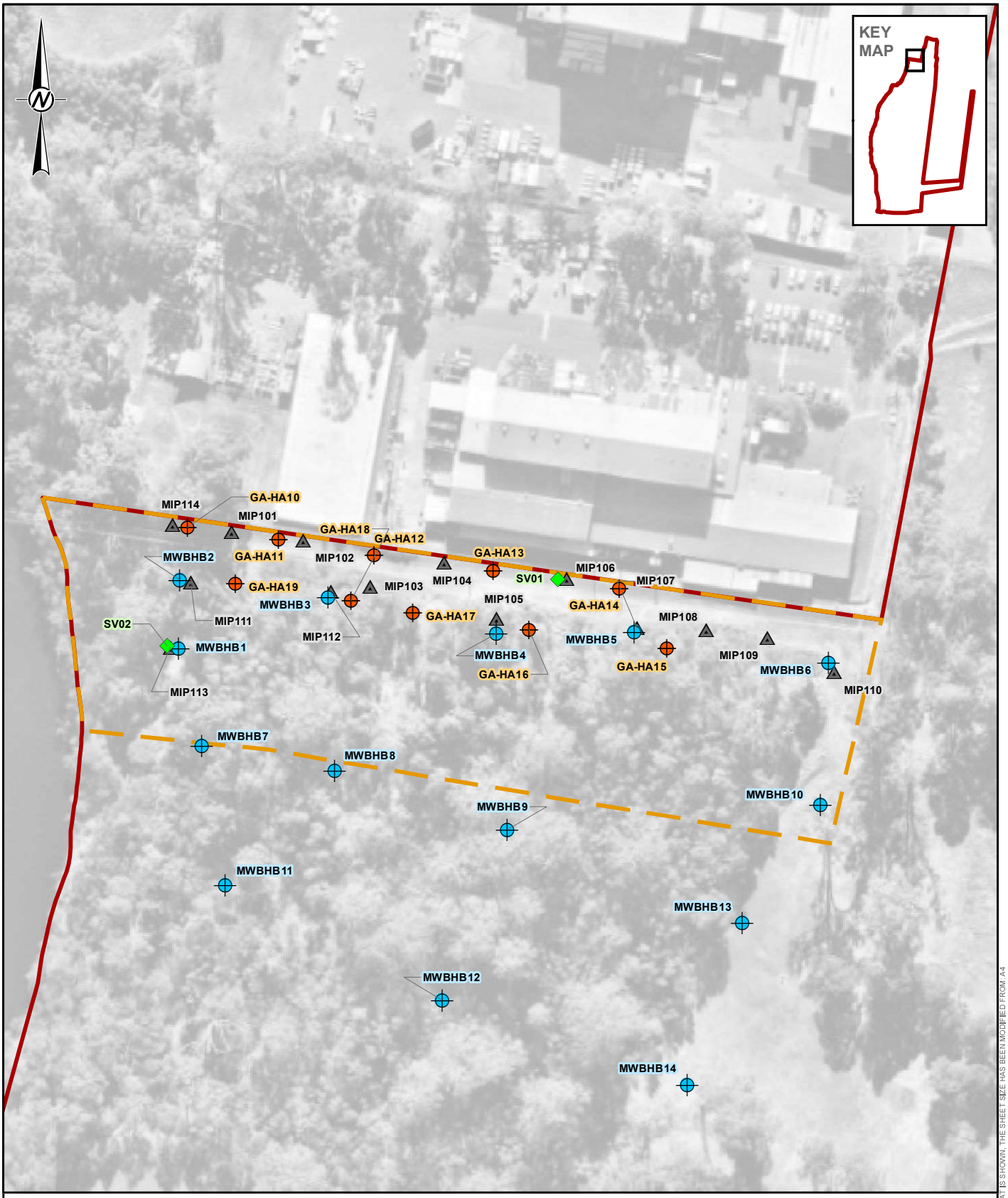
[118] Costin Roe Consulting Pty Ltd (2020) *Basin 8 Sections*, Drawing Number LPWPIW-COS-CV-DWG-0438, Issue 1, dated 25.05.20. EP Risk (2018) reported groundwater at 3.06 mAHD within MW2010 at the proposed location of OSD 8.

[119] Northrop Pty Ltd (2020) *Bulk Earthworks Plan Sheet 02*, Drawing No. MAUW-NRP-CV_DWG-9122, Sheet No. 9122, dated 20.07.2020, rev 04. EP Risk (2018) reported groundwater at 6.77 m BTOC within GW119, compared to an anticipated excavation depth for OSD 10 of 2.5 – 3.0 mBGL.

Table C8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	Secondary	Transport Mechanisms	Exposure Pathways		
	and groundwater	flow to the Georges River and Anzac Creek.	Human Health: - Consumption of fish	Recreational users of the Georges River.	Complete (exposure by children who consume for than two serves of fish per month sourced from the Georges River adjacent to the Site).
			Ecological: - Direct uptake.	Aquatic environment of the Georges River and Anzac Creek.	Incomplete.
			Ecological: - Bioaccumulation and higher order consumers.	Ecosystems dependent upon the Georges River and Anzac Creek.	Complete (The potential for adverse effects to the environment cannot be excluded. The assessment of potential impacts is noted to be complicated by other, as yet unknown, sources that contribute to PFAS impacts in the Georges River).
Additional Areas Requiring Management Following Completion of CMP Works					
Asbestos and anthropogenic material impacted soil	N/A	Wind and Mechanical Disturbance	• Human Health – Inhalation of Dust. • Aesthetic - Visual	• Construction and Maintenance Workers • Future site users	Potentially complete if appropriate soil management controls are not implemented.
Application of AFFF to ground at fire-fighting training areas: • Dust Bowl • FFTA	Excavation and stockpiling of site won materials from areas impacted by PFAS	- Leaching of PFAS through the soil profile to groundwater. - Leaching of PFAS from exposed soil to surface water.	Human Health: - incidental ingestion. - Dermal contact. - inhalation of dust.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Unlikely assuming appropriate health and safety controls and PPE are implemented during construction or sub-surface maintenance works.
			Ecological (direct): - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented.
			Ecological (indirect) - Bioaccumulation and biomagnification.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented.

AEC 1



LEGEND

- Approximate Site Boundary
- Tier 2 QRA Assessment
- MIP
- Grounwater Well
- Soil Vapour Well
- Hand Auger Well

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder Geotechnical and Geochemical project.

REFERENCE

1. Aerial Photography Copyright NearMap Pty Ltd.

0 5 10 20 30 40 50 Metres

REFERENCE SCALE: 1:1,500 (at A4)
PROJECTION: GDA 1994 MGA Zone 56

CLIENT
MOOREBANK INTERMODAL COMPANY

PROJECT
MOOREBANK INTERMODAL TERMINAL

TITLE
INVESTIGATION LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-07-31
PREPARED	AOB
DESIGN	-
REVIEW	RB
APPROVED	GVS

PROJECT	DOCUMENT	Rev.	FIGURE
147623070	078	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4
25mm
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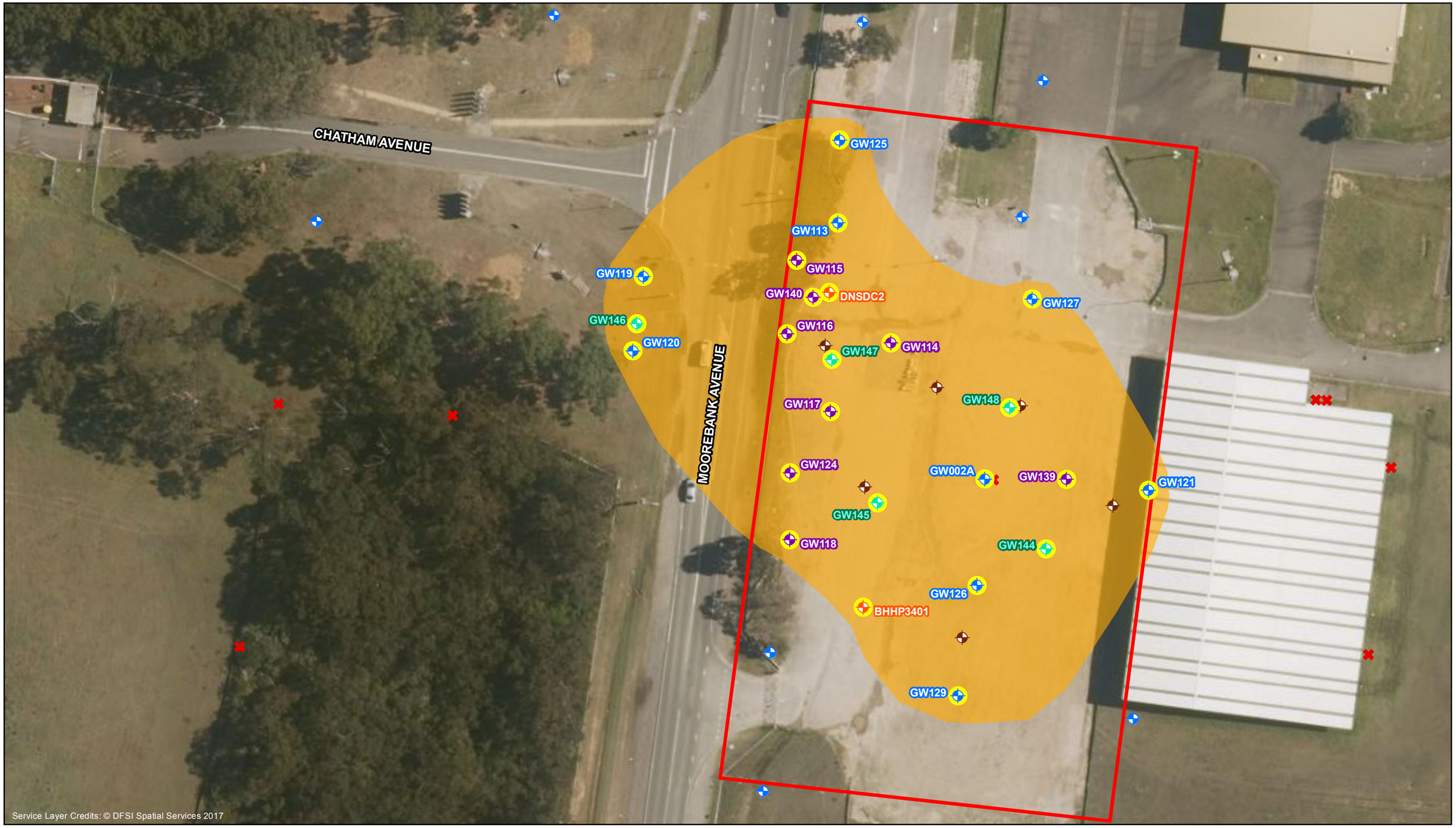
Path: \\golder.gds\gap\Melbourne\GIS\Commonwealth\MCL Project\Deliverable\035-Rev A\147623070-035-R-0004-Rev0.mxd

AEC 2



Paper Size A4

0 5 10 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Site Boundary
- Inferred LNAPL extent (October 2017)
- LNAPL Present (October 2017)
- Observed Existing Groundwater Wells
- Groundwater Well Location (GHD, 2015)
- Groundwater Extraction Well Location (GHD, 2015)
- Groundwater Extraction Well (OPEC, 2016)
- Soil Vapour Wells (GHD, Sept 2016)
- Well Destroyed / Not Accessible

Department of Defence
DNSDC Refuelling Area Remediation
Moorebank Ave, Moorebank NSW

Job Number	21-25471
Revision	A
Date	18 Dec 2017

LNAPL extent
Validation results - 11-12 October 2017

Figure 7

N:\AU\Sydney\Projects\21\25471\GIS\Maps\Deliverables\DNSDC_November2017\21_25471_Z042_LNAPL_Extent.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Aerial imagery - SIXmaps 2017; General topo - NSW LPI DTDB 2012. Created by:jrprice

AEC 3

Legend:

- Approximate Site Boundary
- Areas Of Potential Concern
- Services Excavation
- UST
- Stormwater
- Sewerage
- Sample Location

JBS&G

Job No: 51997

Client: Tactical Group

Version: L277 Rev A	Date: 18-Jan-2019
Drawn By: FH	Checked By: JS

Scale 1:1,800

0 20 40
metres

Coor. Sys. GDA 1994 MGA Zone 56

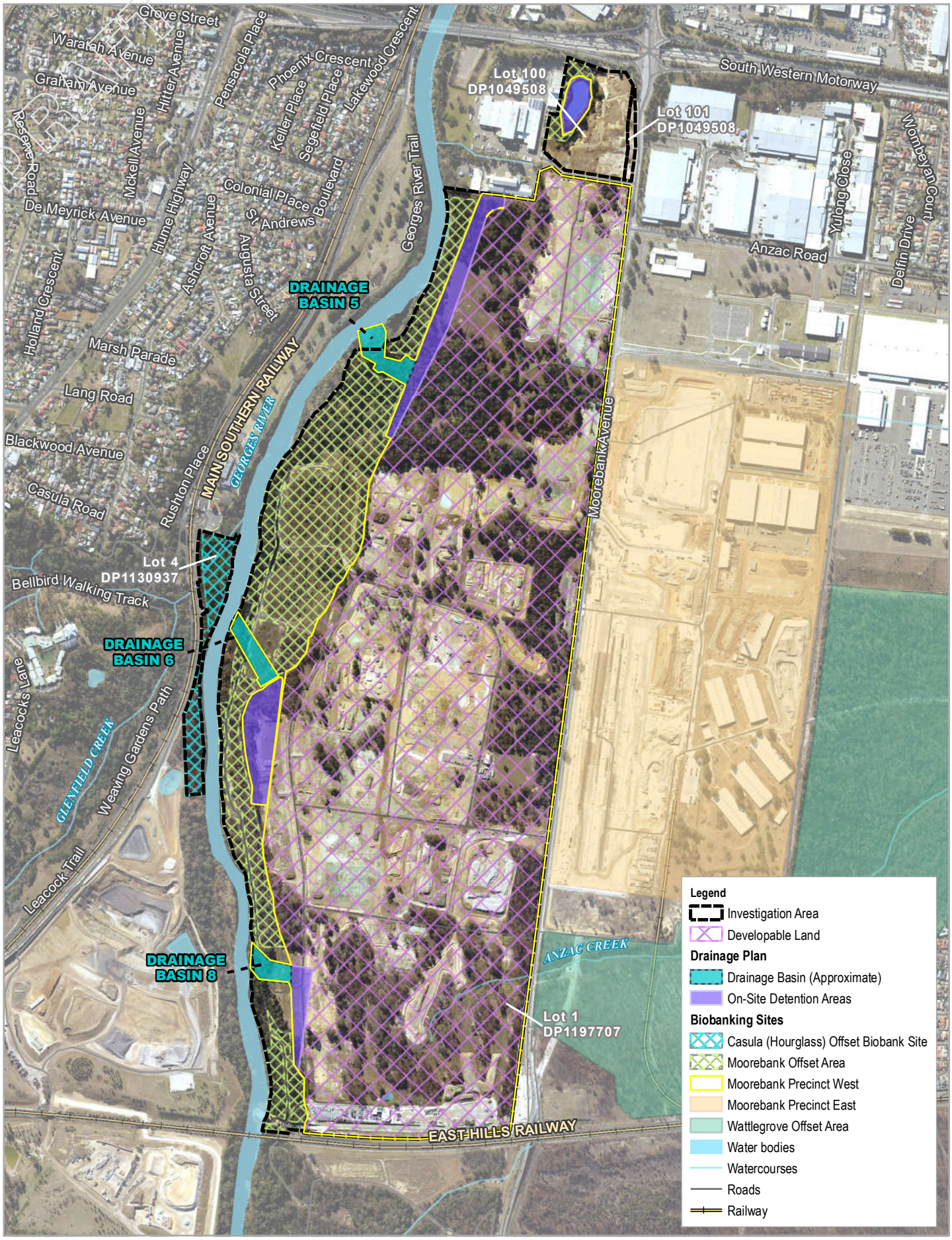
Assessment of High Risk Services

Chatham Avenue Moorebank, NSW

SITE LAYOUT AREA 20 AND 22

FIGURE: 3D

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L277 Rev A\51997_03_DDP.mxd
Reference: Nearmap http://www.nearmap.com.au - Imagery 17-07-2018



Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Project No. **21-28111**
Revision No. **B**
Date **17/ 04/ 2019**

Site Layout - Proposed Development

FIGURE 2

G:\21\28111\GIS\Maps\Deliverables\21_28111_Z003_Moorebank_SiteLayout_ProposedDevelopment.mxd
Print date: 17 Apr 2019 - 15:14

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco

Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

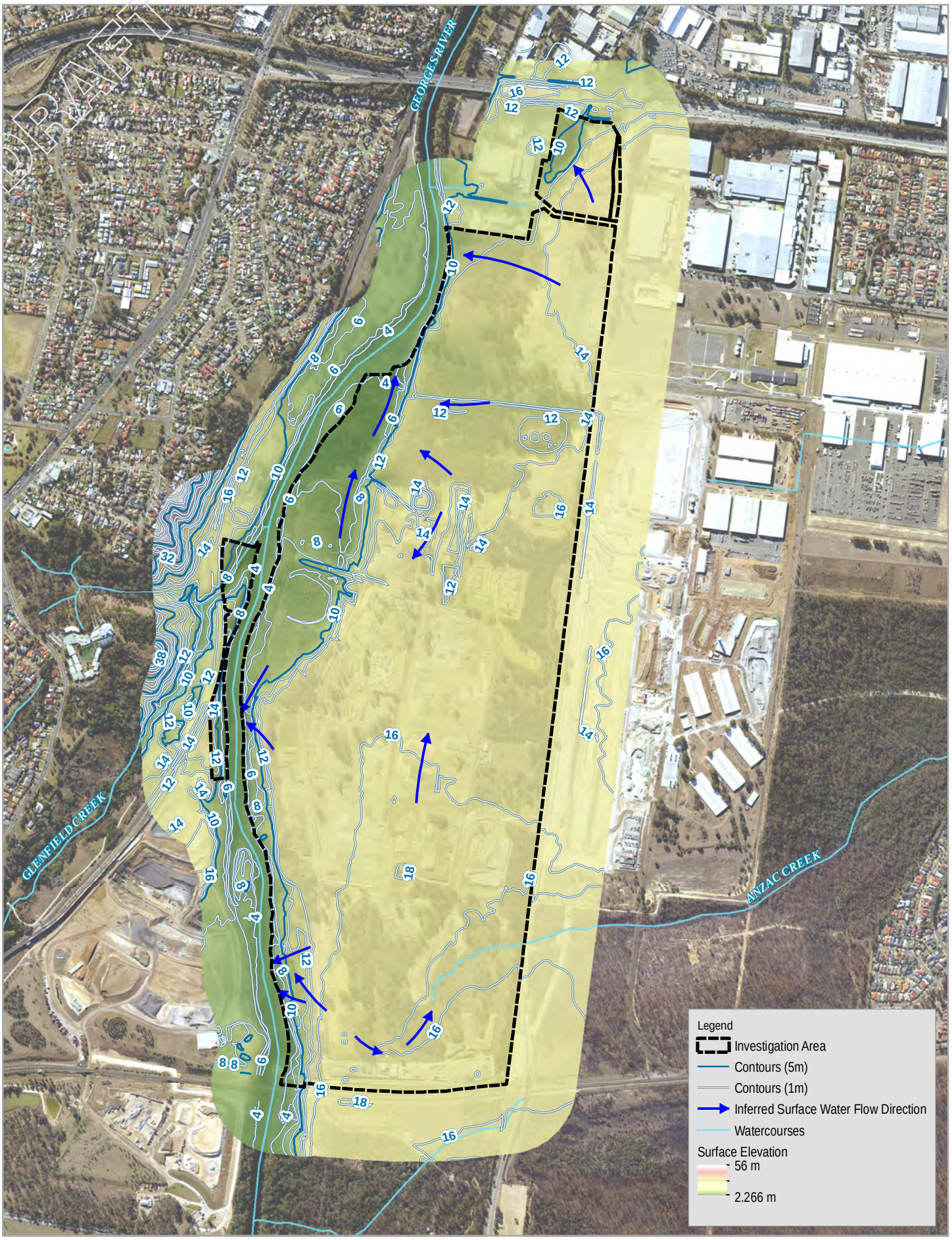
Project No. **21-28111**
Revision No. **B**
Date **17/ 04/ 2019**

PFAS Source Areas

FIGURE 3

G:\21\28111\GIS\Maps\Deliverables\21_28111_Z004_Moorebank_PFASSourceAreas.mxd
Print date: 17 Apr 2019 - 14:08

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco



Paper Size ISO A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

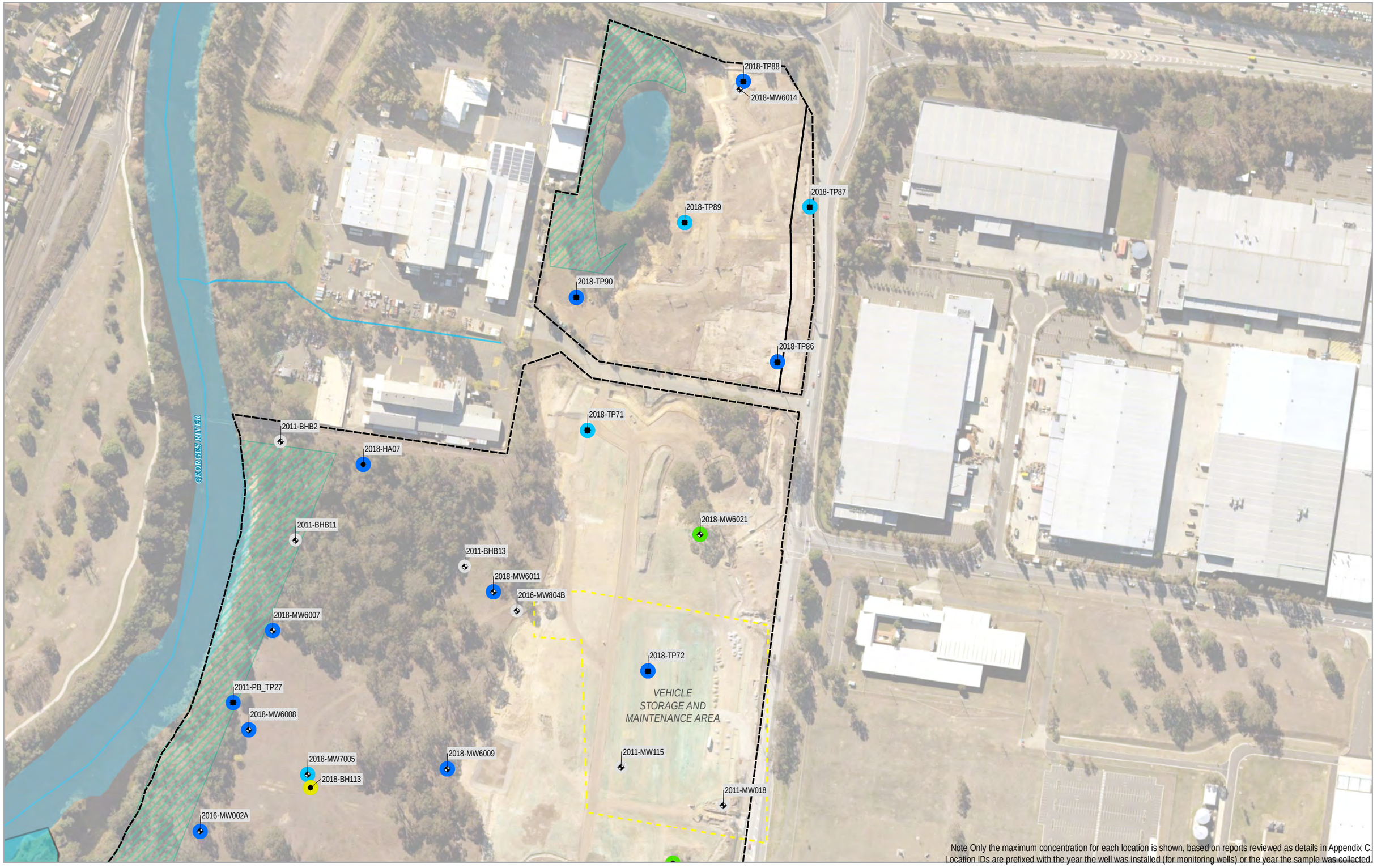
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Project No. 21-28111
Revision No. B
Date 17/ 04/ 2019

Topography and Surface Water Flows

FIGURE 4

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco



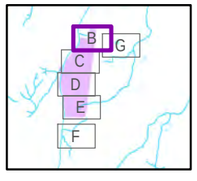
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

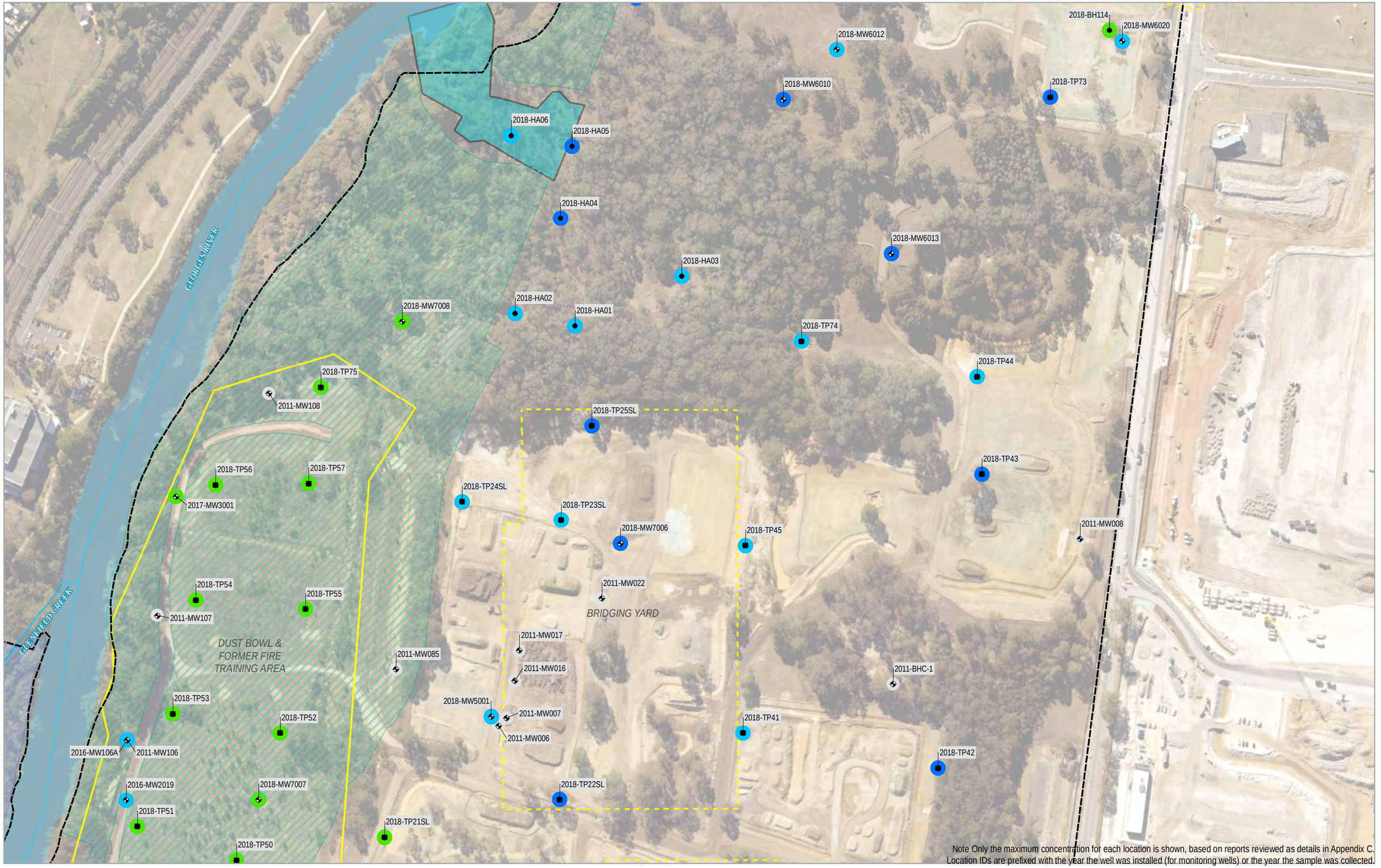
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 1

Project No.	21-28111
Revision No.	A
Date	12 Apr 2019

FIGURE 6B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



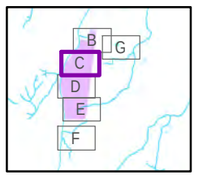
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

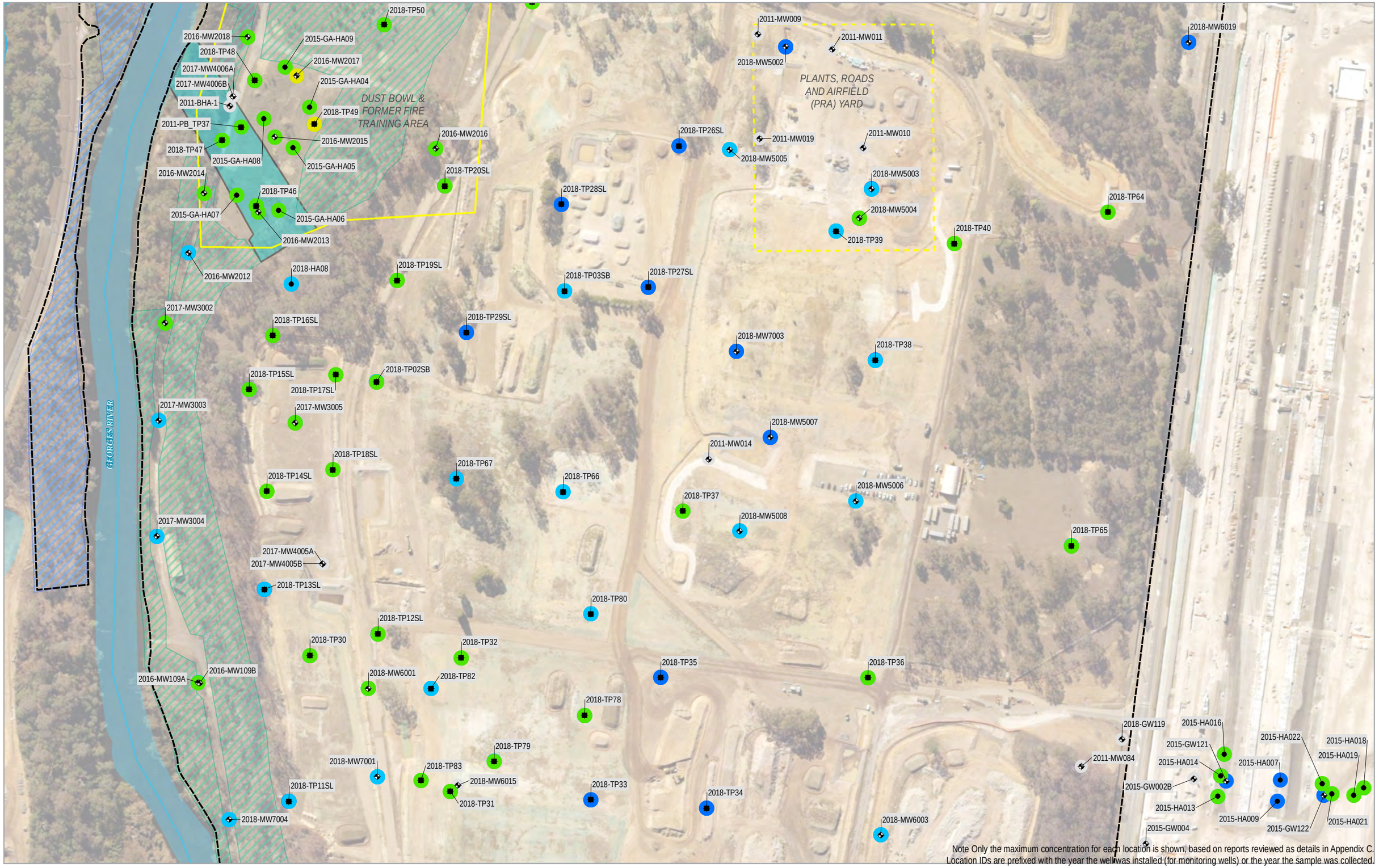
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 2

Project No.	21-28111
Revision No.	A
Date	12 Apr 2019

FIGURE 6C

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



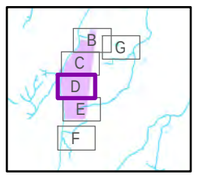
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

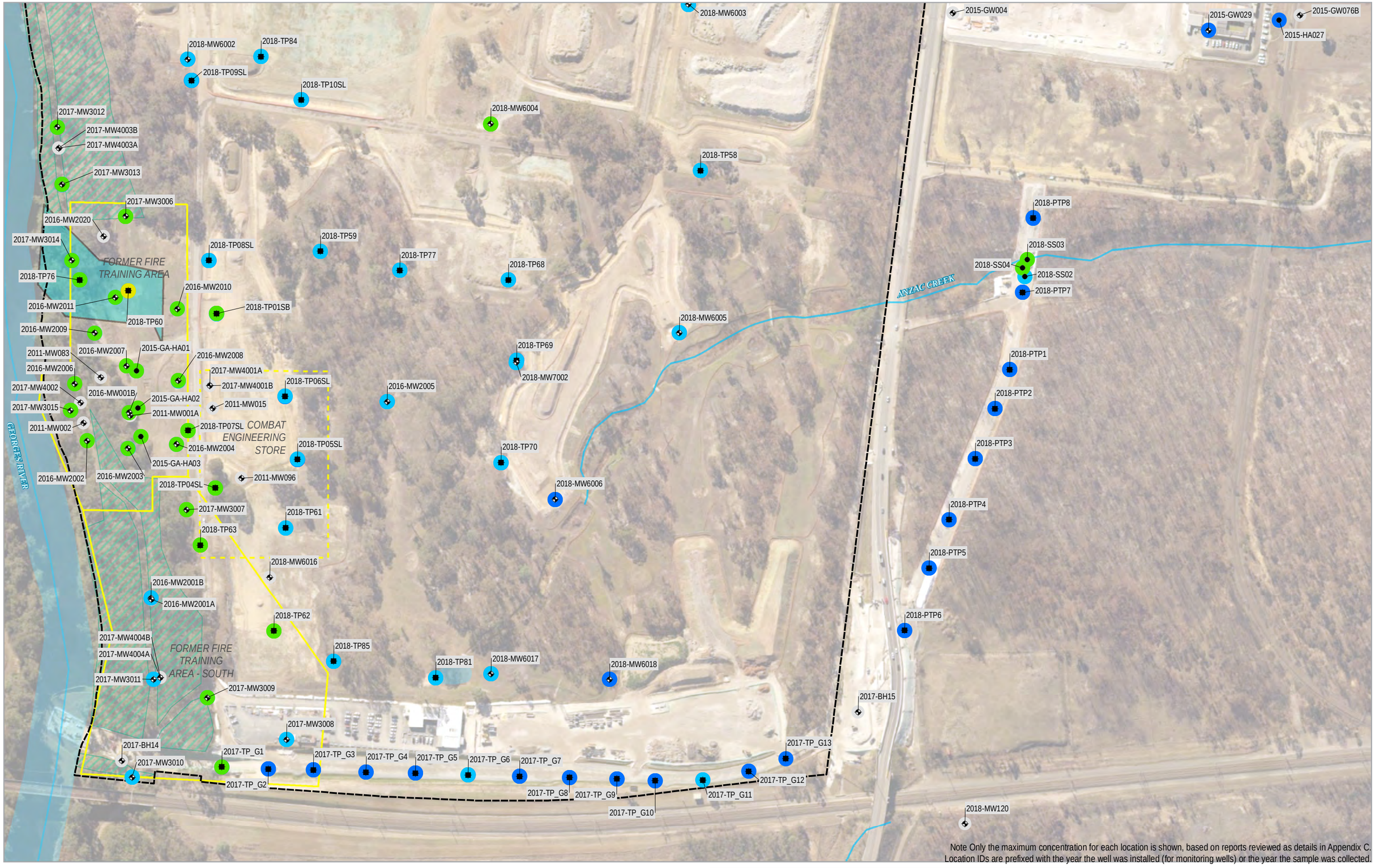
GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 3

Project No.	21-28111
Revision No.	A
Date	12 Apr 2019

FIGURE 6D



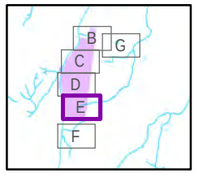
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 4

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 6E

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

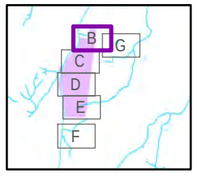
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

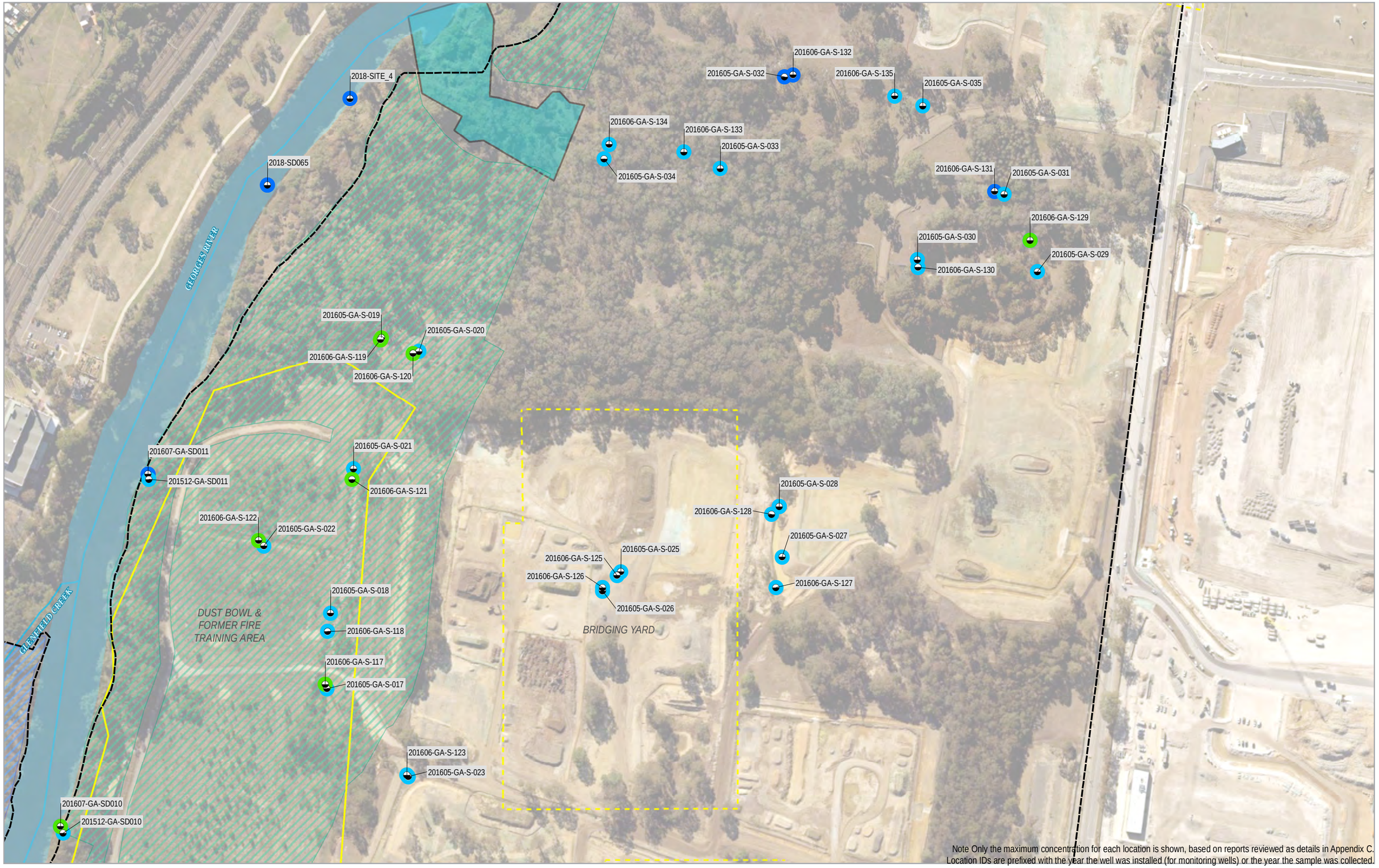
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 1

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

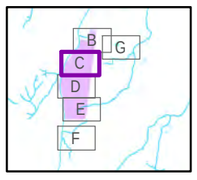
LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)

- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

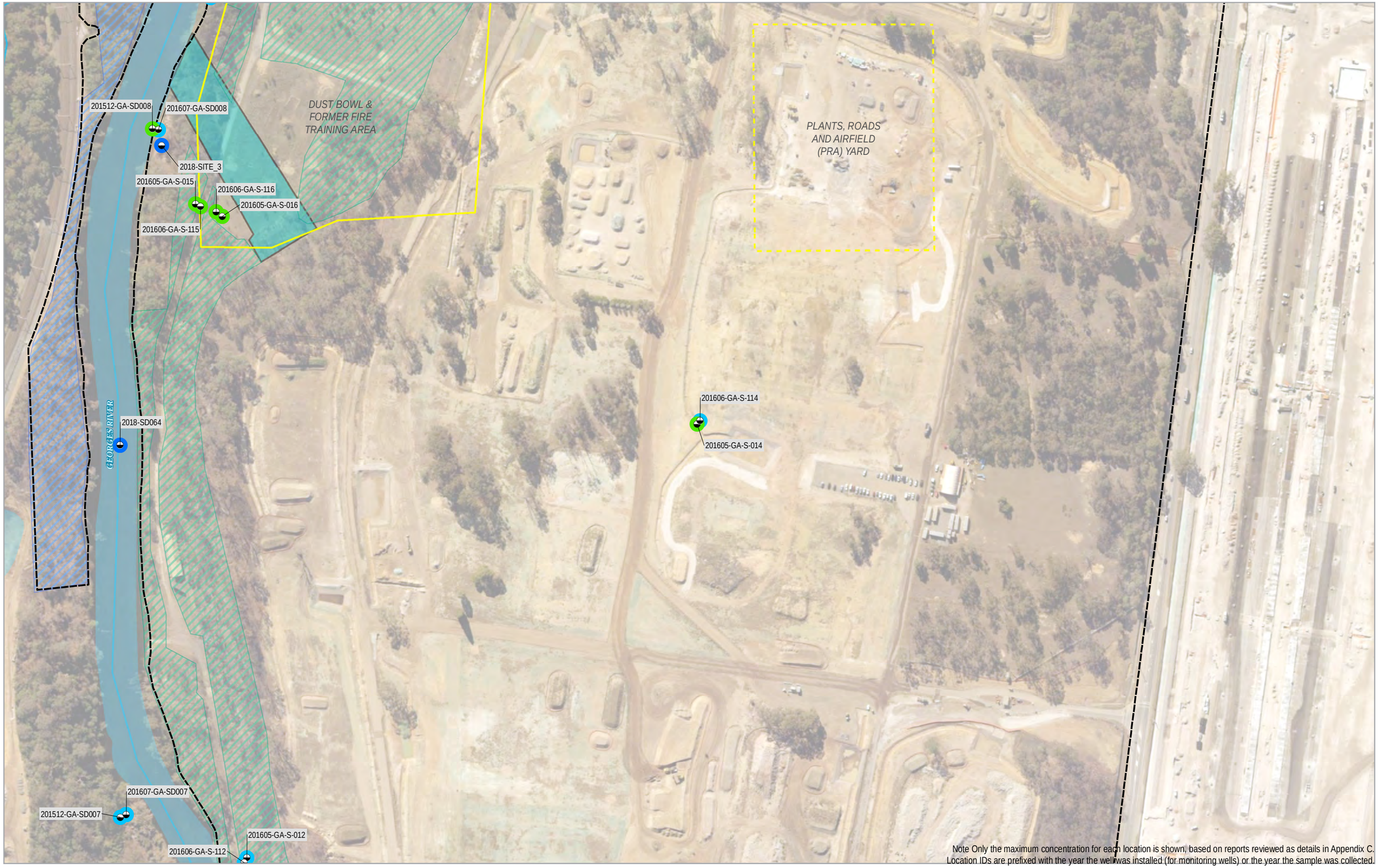
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 2

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7C

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



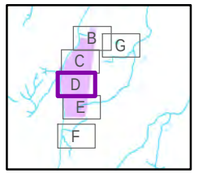
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

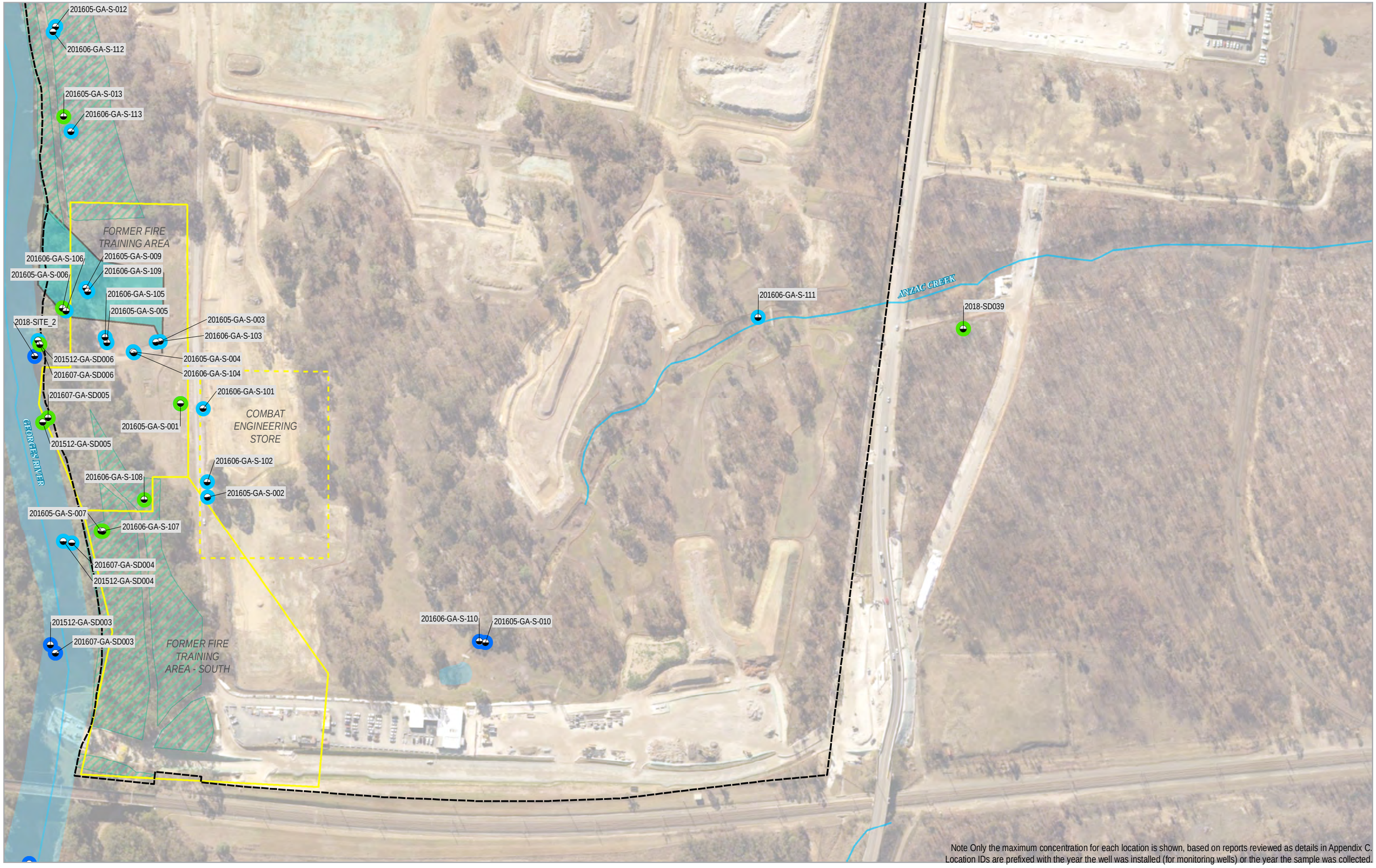
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 3

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7D

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



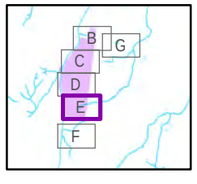
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 4

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7E

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

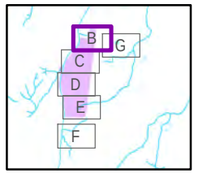
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 1

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 8B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

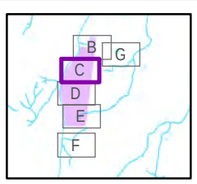
LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)

- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

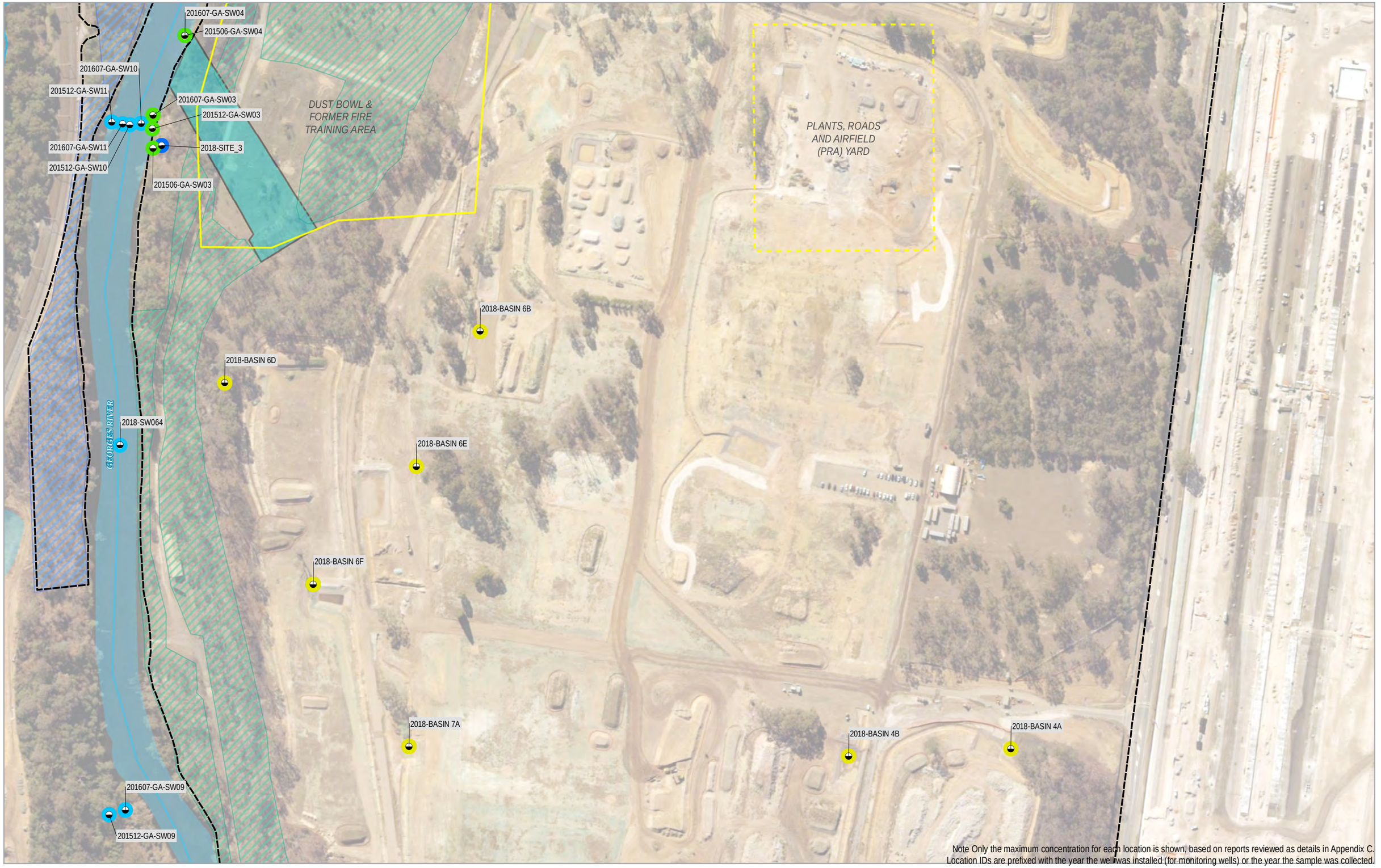
GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 2

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 8C



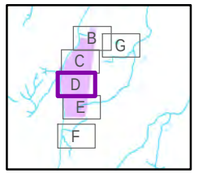
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

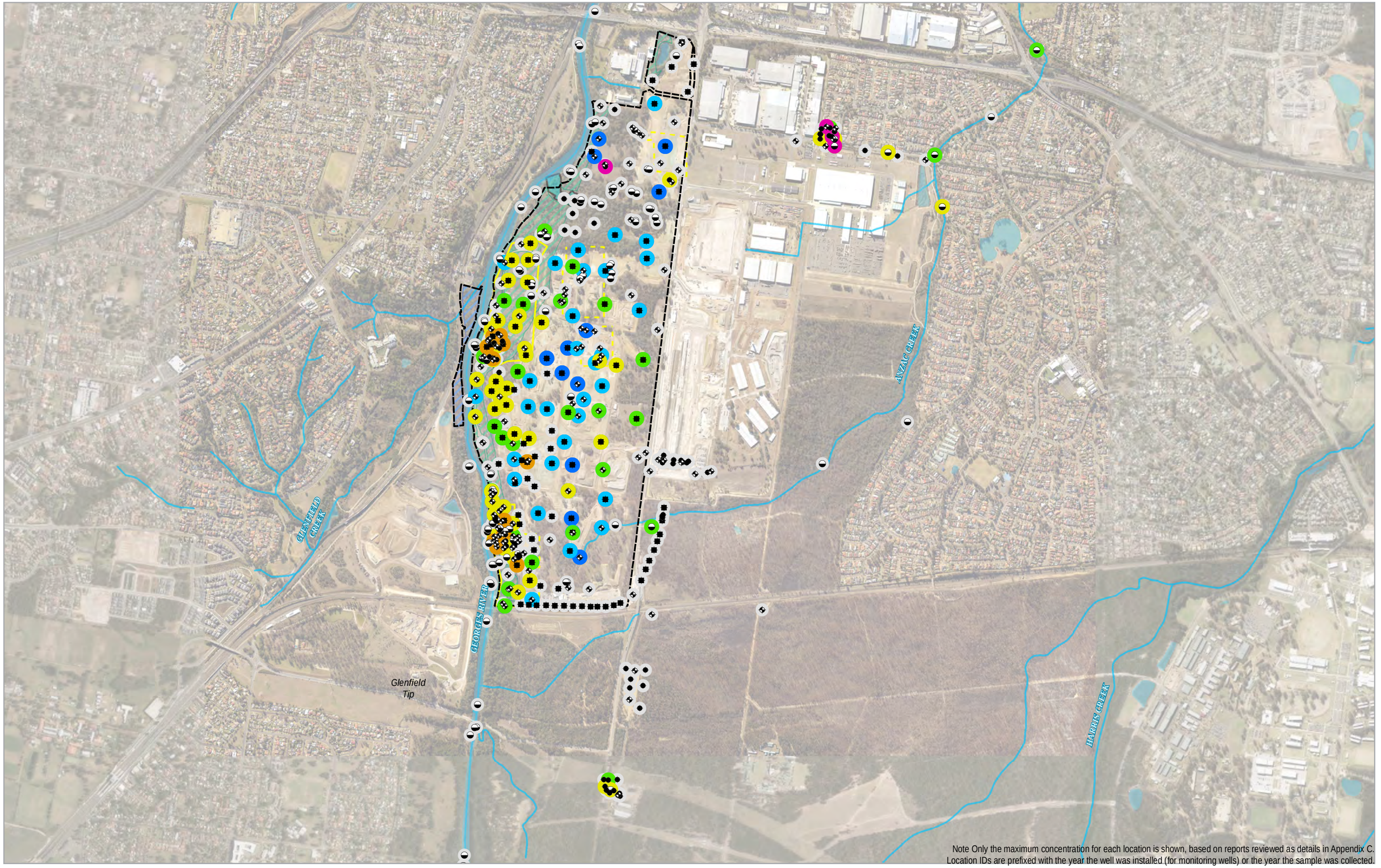
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 3

Project No.	21-28111
Revision No.	A
Date	12 Apr 2019

FIGURE 8D

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Liverpool Fire Station
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit
- Sediment Sample

Max PFOS + PFHxS Concentration (µg/L)

- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data

Paper Size ISO A3

0 200 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil & Sediment ASLP

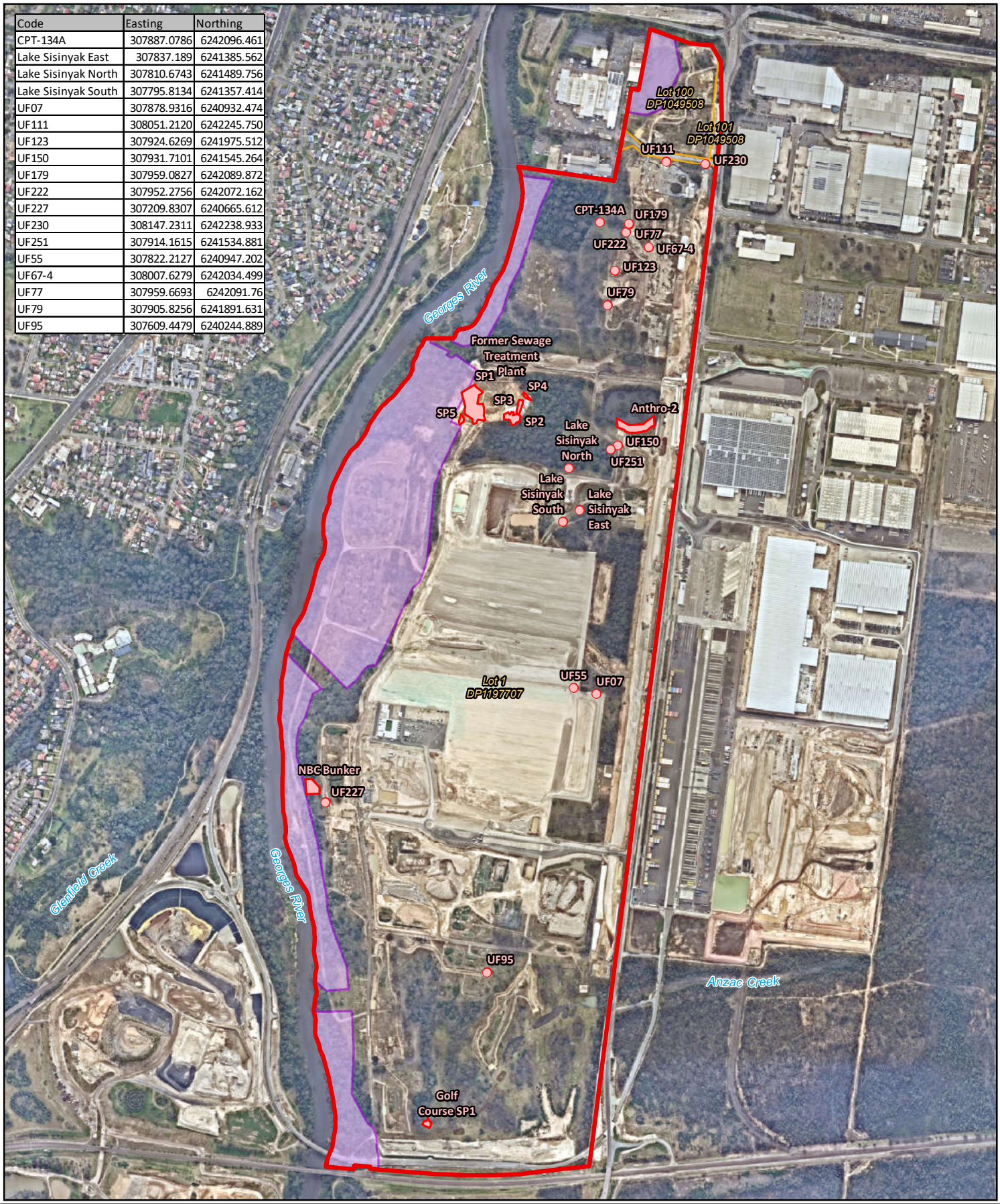
PFOS + PFHxS Results Overview

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 11

Additional Areas Requiring Management Following **C**MP Works

Code	Easting	Northing
CPT-134A	307887.0786	6242096.461
Lake Sisinyak East	307837.189	6241385.562
Lake Sisinyak North	307810.6743	6241489.756
Lake Sisinyak South	307795.8134	6241357.414
UF07	307878.9316	6240932.474
UF111	308051.2120	6242245.750
UF123	307924.6269	6241975.512
UF150	307931.7101	6241545.264
UF179	307959.0827	6242089.872
UF222	307952.2756	6242072.162
UF227	307209.8307	6240665.612
UF230	308147.2311	6242238.933
UF251	307914.1615	6241534.881
UF55	307822.2127	6240947.202
UF67-4	308007.6279	6242034.499
UF77	307959.6693	6242091.76
UF79	307905.8256	6241891.631
UF95	307609.4479	6240244.889



Legend:

- Approximate Site Boundary
- NSW Cadastre (DFSI, 2020)
- Locations Closed Out
- Areas Closed Out
- Offset Area

Scale 1:12,500 (0, 150, 300 metres)

CS GDA 1994 MGA Zone 56

Job No: 58753

Client: J Wyndham Prince

Version: R01 Rev B | Checked By: LL

Date 10/09/2020 | Drawn By: AS

MPW, Moorebank, NSW

CMP UNEXPECTED FINDS CLOSE OUT

FIGURE: 3

JBS&G

File Name: \\JBSG-NSW-FS01\Company Data\Projects\J Wyndham Prince\58753 Moorebank Precinct West Stage 2\GIS\Maps\R01 Rev A\58753_03_CMP_UFCloseOut.mxd
Reference: Nearmap 03-08-2020

Legend:

- Existng Water Body - "Swamp"
- Anthropogenic Area

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: LTEMP	Date: 25-Aug-2020
Drawn By: AS	Checked by: LL

Scale 1:1,000

0 20

metres

Coor. Sys. GDA 1994 MGA Zone 56

MPW
Moorebank, NSW

ANTHROPOGENIC MANAGEMENT AREA

FIGURE: 1

File Name: \\jbsg-nsw-fs01\Company Data\Projects\J Wyndham Prince\58753 Moorebank Precinct West Stage 2\GIS\Maps\ZzMisc\20200825_LL_LTEMP\58753_01_ANTHRO2.mxd
Reference: www.nearmap.com - Imagery 16-06-2020

Legend:

Stockpile Location

JBS&G

Job No: 51997

Client: Tactical Group

Version: LTEMP	Date: 25-Aug-2020
Drawn By: AS	Checked by: LL

Scale 1:1,000

0 20

metres

Coor. Sys. GDA 1994 MGA Zone 56

MPW
Moorebank, NSW

STP-SP10

FIGURE: 2

File Name: \\jbsg-nsw-fs01\Company Data\Projects\J Wyndham Prince\58753 Moorebank Precinct West Stage 2\GIS\Maps\ZzMisc\20200825_LL_LTEMP\58753_02_STP-SP10.mxd
Reference: www.nearmap.com - Imagery 03-08-2020

Appendix D

ENVIRONMENTAL MANAGEMENT PROCEDURES

Land use restrictions		EMP01
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To manage risk to human health and the environment through land use restrictions	
Areas of the Site	AEC 1, AEC 2, AEC 3 and Offset Area	

AEC 1 – TCE Impacted Area

Golder 2015a undertook a risk assessment of the potential impact of TCE and cis-DCE impacted soil, soil vapour and groundwater in AEC1 and concluded that overall the risks associated with the VOCs were low and acceptable for the proposed open space land use including roads, road verges and woodland / riparian conservation areas.

Based upon the risk assessment prepared by Golder 2015a, permanent structures including buildings and / or buildings containing basements or other habitable spaces should not be permitted within AEC 1.

The MPW Master Plan (**Appendix B**) does not identify any OSDs, buildings and / or buildings containing basements or other habitable spaces within AEC 1. Should the design of the Proposed Development change, then an additional site-specific risk assessment should be undertaken and the LTEMP will need to be revised.

AEC 2 – Petroleum Hydrocarbon Impacted Area

GHD (2016b) undertook a risk assessment of the potential impact of petroleum hydrocarbon impacted soil, soil vapour and groundwater in AEC2 and concluded that there was a theoretical risk to users on site based on the future commercial/industrial land use scenario from the inhalation of soil vapours associated with LNAPL, if a one storey basement was to be constructed. No risks were identified to offsite ecological receptors (Georges River nor a commercial/industrial land use scenario (with no basement).

Based upon the risk assessment prepared by Golder 2015a, buildings containing basements or other subterranean habitable spaces should not be permitted within AEC 2.

The MPW Master Plan (**Appendix B**) does not identify any buildings and / or buildings containing basements or other habitable spaces within AEC 2. Should the design of the Proposed Development change, then an additional site-specific risk assessment should be undertaken and the LTEMP will need to be revised.

In accordance with the GHD (2018a) EMP, three monitoring wells are to be installed and monitored as part of the IMEX Audit close out works. The location of the monitoring wells is provided as **Appendix I** and once installed these wells will require protection and appropriate access provided. Any construction or ground disturbance at the location of these monitoring wells will need to be managed to protect the integrity of the wells. Where these wells are destroyed, then they will need to be replaced in the same location.

AEC 3 – PFAS Impacted Area

The construction of the Proposed Development is generally anticipated to provide a reduction in infiltration, leaching and groundwater mass flux of PFAS entering the Georges River resulting is a corresponding reduction in long-term exposure of PFAS to potential sensitive receptors.

However, it has been identified that the OSDs may increase and concentrate infiltration within PFAS source areas should the design of the OSDs include a permeable base layer. The increased infiltration within the PFAS source areas could have the unintended effect of promoting leaching of PFAS from soil to groundwater and increase the mass flux of PFAS impacted groundwater to the Georges River.

The future design of the OSD basins and associated spillways must include impermeable base and walls. The base and walls should consist of an appropriately sized clay liner with a minimum permeability of $1x10^{-9}$ m/s (or equivalent). Should the design of the OSDs require a permeable base, then additional site-specific risk

assessment and / or groundwater modelling will be required to inform the OSD design and may require revision of the LTEMP.

Off-Set Area

The JBS&G (2020a) Remediation and Validation Report states that: '*the site is suitable for the intended Intermodal Terminal, subject to implementation of a CMP during the construction phase, and biobanking areas with restricted access.*'

In order to achieve '*restricted access*' within the Offset Area, only the following low frequency and short duration activities are permitted:

- persons undertaking ecological surveys once or twice per year (non-intrusive).
- persons undertaking maintenance of the fire trail, fencing, environmental control (e.g. erosion control) and service easements.
- Persons undertaking weeding, planting, micro habitat relocation, and waste removal, as necessary.

As required by the Arcadis (2020) BIMP, the Offset Area must be adequately fenced and secured to restrict access to recreational users and any other workers not involved in the above activities.

Should any additional activities be undertaken within the Offset Area then a site-specific risk assessment should be undertaken and the LTEMP will need to be revised and / or a PFAS Management Strategy prepared.

Georges River

EnRiskS (2019a) reported there is a human health risk to children who consume more than two serves of fish per month caught from the section of the Georges River adjacent to the Site.

Short to medium-term management of fishing in the Georges River has been implemented through restrictions placed by the government relating to fishing.

EnRiskS (2019a) reported that: *"Do not eat fish or shellfish" signs by NSW DPI Fisheries have been in place in sections of the Georges River since April 2016 due to high levels of industrial pollutants. This sign covers the Georges River and its tributaries upstream from Rabaul Road Boat Ramp (i.e. the area investigated by this HHERA). This area is 'catch and release only' - fishers are advised not to consume fish and shellfish in these waters due to the presence of high levels of industrial pollutants*'.

The current institutional controls implemented by the government to restrict fishing within the Georges River must remain in place. Should these restrictions be removed then the LTEMP will need to be revised and / or a PFAS Management Strategy prepared.

Beneficial Use of Groundwater

Groundwater must not be abstracted from the Site for any beneficial use.

Landscaped Areas

Reuse of soil should preferentially only occur in areas outside of proposed landscaped areas. However, should soil reuse within landscaped areas by required then the restrictions relating to landscape maintenance within these areas must be undertaken in accordance with **EMP13**.

Future Excavation within Reuse Zones

EnRiskS (2020) has provided criteria (**Table 8)** for the reuse of PFAS in soil within reuse zones at the Construction Area that are predicated on the implementation of management measures relating to future

Land use restrictions	EMP01

excavation. The management measures for future excavation within the reuse zones are provided as **EMP02, EMP03, EMP04, EMP07** and **EMP12.**

Cessation of Land Use Restrictions

The land use restrictions provided in EMP01 can be removed where a site specific human health and ecological risk assessment concludes that a risk to human health and the environment is no longer present and subject to approval by a NSW EPA accredited Site Auditor and / or the NSW EPA.

Subsurface works – AEC 1		EMP02
Responsibility:	Site Owner (or nominated representative)	
Frequency:	During Stage 2 works	
Objective:	To protect human health and the environment	
Areas of the Site	AEC 1 - TCE Impacted Area	

Human Health

Based upon the Golder (2015a) HHRA and the depth to groundwater between 7 – 9 m BTOC, there was no risk to commercial workers and intrusive workers working within AEC 1 in a trench posed by the presence of identified chlorinated hydrocarbons in soil, soil vapour and groundwater. The conclusions in the Golder HHRA are based upon the proposed open space land use including roads, road verges and woodland / riparian areas. With reference to the MPW Master Plan provided as **Appendix B**, the only infrastructure proposed for AEC 1 is a roadway, pedestrian access way and landscaped areas; therefore, the conclusions provided by Golder (2015a) are relevant to the Proposed Development.

Based upon the cut and fill plans for AEC 1 provided by Costin Roe Consulting Pty Ltd[120] soil is not proposed to be cut from AEC 1 and the area is to be raised with greater than 2m of fill to design levels.

Ecological

The following management procedures are to be implemented when excavating within areas where PFAS in soil has been placed within re-use zones:

- All excavations must minimise the area of PFAS contaminated soil at any one time.
- Stockpiles of PFAS contaminated soil must be managed in accordance with **EMP06**.
- The surface cover placed over re-use of soil must be maintained and reinstated after excavation in accordance with the specifications listed as footnotes to **Table 8** as soon as practicable.
- Reuse of any materials won from excavations in the reuse zones can only be undertaken as detailed in **Table 8** and **EMP07** unless a further additional risk assessment is conducted as detailed in **Section 4.5**.

The location of PFAS reuse zones are provided as **Figure 5**.

Refer to **EMP01** for land use restrictions within AEC 1. Please refer to **EMP14** for the management of any unexpected finds during sub-surface works.

[120] Costin Roe Consulting Pty Ltd (2020) Cut and Fill Plan, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20 and Costin Roe Consulting Pty Ltd (2020) Bulk Earthworks Sections, Sheet 3, Section 11, Drawing Number LPWPIW-COS-CV-DWG-0353, Issue 2, dated 12.06.20.

Subsurface Works – AEC 2		EMP03
Responsibility:	Site Owner (or nominated representative)	
Frequency:	During Stage 2 Works	
Objective:	To protect human health and the environment	
Areas of the Site	AEC 2 – Petroleum Hydrocarbons Impacted Area	

GHD (2018a) identified there is a low potential for explosive atmospheres to be encountered during subsurface works at the area impacted by petroleum hydrocarbons (AEC 2). Based upon the low risk, GHD (2018a) recommended the following management protocols be adopted for subsurface works:

Human Health

All works are to comply with the Work Health and Safety Act (2011). Note any works involving confined spaces should also be carried out in accordance with AS 2865: Safe Working in a Confined Space (2009) and any revisions.

Pits or excavations may be considered confined spaces due to the limitations on egress and the potential accumulation of vapours or presence of depleted oxygen within the pits or excavations.

All subsurface works involving the disturbance of the impacted soil must be undertaken in accordance with relevant health and safety guidelines and WorkSafe NSW provisions including:

Any subsurface works shall include the following measures:

- Providing a safe work method statement (SWMS). This shall be reviewed and authorised by the Site Owner (or their representative) or any future occupier.
- If encountered, groundwater is always to be kept contained.
- If any strong odours are present on breaching sealed surfaces, or in an excavation, a precautionary approach shall be applied to consider if additional management measures are required to manage vapour inhalation risk prior to proceeding.
- Respiratory protective equipment (RPE) would also be provided for subsurface works where necessary.
- Air monitoring would be mandatory for all excavations and confined space works.
- Additional controls may include the use of blowers to increase flushing of the trench/excavation with fresh air.

All workers potentially exposed to impacted materials are required to wear appropriate levels of personal protective equipment ('PPE'), which shall include as a minimum:

- Long sleeve shirt and trousers;
- Appropriate respirator;
- Head covering;
- Over boots; and
- Gloves.

Subsurface Works – AEC 2	EMP03

Explosion risk management onsite will include:

- Comprehensive health, safety and environmental planning prior to undertaking any work on-site.
- Preparation personal safety risk assessments and/or job hazard analysis for specific tasks.
- Preparation of specific requirements permitting hot work or cold work these should be confirmed with the site's owner or operator.
- Recording of concentrations of methane, TRH – photoionization detector (PID) and the lower explosive limit (LEL) during soil vapour sampling events.
- Assessing the obtained results against the Action Level criteria as per CRC Care Technical Report No. 23, July 2013 in accordance with Table 2, Action Levels for immediate short-term response, action level subsurface near foundations.
- Prevention of unpermitted entry to confined spaces.

Ecological

The Proposed OSD 10 is in AEC 2 and will involve the excavation of large volumes of potentially impacted soil to a maximum depth of 2.5 – 3.0 mBGL. Given that groundwater has been reported at depths greater than 5 mBGL (EP Risk 2018), the proposed excavation is not considered likely to intersect groundwater potentially containing LNAPL.

Stockpiling of surplus excavated soil within AEC 2 should be minimised with surplus soil transported to the CATA for assessment in accordance with **EMP06** and materials tracking undertaken in accordance with **EMP05**. Water runoff from excavation and temporary stockpiling areas should be managed and retained on-site and not be allowed to flow off-site to surface water bodies (Anzac Creek and Georges River) (refer to **EMP17** for management of surface water).

Any hydrocarbon impacts identified during excavation should be handled as an unexpected find in accordance with **EMP14**.

The following management procedures are to be implemented when excavating within areas where PFAS in soil has been placed within re-use zones:

- All excavations must minimise the area of PFAS contaminated soil at any one time.
- Stockpiles of PFAS contaminated soil must be managed in accordance with **EMP06**.
- The surface cover placed over re-use of soil must be maintained and reinstated after excavation in accordance with the specifications listed as footnotes to **Table 8** as soon as practicable.
- Reuse of any materials won from excavations in the reuse zones can only be undertaken as detailed in **Table 8** and **EMP07** unless a further additional risk assessment is conducted as detailed in **Section 4.5**.

The location of PFAS reuse zones are provided as **Figure 5**.

Subsurface Works – AEC 3		EMP04
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 Works	
Objective:	To protect human health and the environment	
Areas of the Site	AEC 3 – PFAS Impacted Areas	

Human Health

Based on the EnRiskS (2019) Land HHERA, the potential risk to human health associated with workers having direct contact with PFAS in soil, sediment and water was low and acceptable on the assumption that typical workplace safety protocols and PPE are implemented. In order to manage exposure of PFAS to workers at the Site, the following management controls should be implemented:

- Project inductions to identify areas with high risk of PFAS contamination.
- Prepare SWMS to identify risks associated with PFAS and appropriate control measures.
- Where appropriate, the area of the excavation/disturbance shall be appropriately separated from the balance of the Site to minimise inadvertent traffic and/or worker exposure.
- PPE used in the PFAS impacted area to include:
  - Disposable coverall suits including boots.
  - Disposable waterproof nitrite gloves in addition to standard glove requirements.
  - All other standard PPE required for works on Site.
- Signage placed in ablution blocks to ensure all workers wash hands and face prior to eating, regardless if gloves are worn.
- If worker's skin comes into contact with PFAS impacted water, ensure skin is immediately washed with clean water and wet clothing is removed immediately after work is complete.
- Dewatering of water in excavations impacted with PFAS should be avoided where practicable.

Ecological

EnRiskS (2019) reported PFAS impacted soil is leachable and the following control measures should be implemented to minimise the risk to ecological receptors during construction:

- Excavation to be scheduled to minimise the area of PFAS impacted soil exposed at any one time.
- All soils excavated from AEC 3 should be handled in alignment with the requirements for PFAS-Impacted Stockpiles in **EMP06**.
- Erosion and sediment controls outlined in **EMP17** to be adopted to minimize the potential for leaching and migration to surface water bodies.
- Excavated PFAS impacted soil should be temporarily stockpiled on impermeable surfaces (e.g. hardstand, high density polyethylene ('HDPE') plastic or geomembrane) within a specially designed CATA.
- Appropriate bunding (e.g. hay bales or silt fences) should be placed around stockpiles.

- Stockpiling areas should not be located near stormwater drains, pits or gutters.
- Water runoff from stockpiling areas should be managed and retained on-site and not be allowed to flow into the Offset Area and off-site to surface water bodies (Anzac Creek and Georges River) (refer to **EMP17** for management of surface water).
- During windy weather conditions, dust control measures should be implemented (e.g. fine water spray or covers).
- Odour suppressant should be applied to the soil where odorous soils are encountered.
- Where practicable, excavated soil should be backfilled in the excavation in the reverse order to which it was excavated.
- Where excavated soil is surplus to requirements, then the soil should be classified in accordance with **EMP10**.
- Materials tracking, and off-site disposal records and documentation should be retained for all soil that is to be reused on-site or disposed offsite.

Bulk Earthworks and OSD Excavation

Where soil is excavated during bulk earthworks as part of the general cut and fill plan[121] and excavation to facilitate OSD construction soil reuse opportunities should be adopted in accordance with **EMP07**.

Excavation within PFAS in Soil Reuse Areas

The following management procedures are to be implemented when excavating within areas where PFAS in soil has been placed within re-use zones:

- All excavations must minimise the area of PFAS contaminated soil at any one time.
- Stockpiles of PFAS contaminated soil must be managed in accordance with **EMP06**.
- The surface cover placed over re-use of soil must be maintained and reinstated after excavation in accordance with the specifications listed as footnotes to **Table 8** as soon as practicable.
- Reuse of any materials won from excavations in the reuse zones can only be undertaken as detailed in **Table 8** and **EMP07** unless a further additional risk assessment is conducted as detailed in **Section 4.5**.

The location of PFAS reuse zones are provided as **Figure 5**.

[121] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.

Materials Tracking		EMP05
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 Works	
Objective:	To protect human health and the environment	
Areas of the Site	AEC 1, AEC 2 and AEC 3	

All materials generated as part of the construction works will be tracked via a Materials Tracking Plan ('MTP') by the Principal Contractor. The aim of the MTP is to identify the source and destination of all materials on the Site at any time and requires the following tasks:

- Establish and maintain a nomenclature system for identification of all source and destination areas for soil both on and off the Site. This includes excavations, stockpiles (both clean and potentially contaminated), soils for treatment or disposal (including destination) and offsite sources of material;
- Use appropriate signage to identify the classification of the material and area number for each excavation prior to soil movement using the project documentation or in consultation with the Contract Administrator, prior to work being undertaken;
- Complete a 'Record of Soil Movement' sheet identifying the source of the materials, classification, volume, and destination area of each load of material moved on or off-site;
- Place the soil in an approved location for the material based on its soil classification;
- Maintain the location of the soil without mixing with other soil classes; and
- Educate all operators in the requirements of the system.
- Monitoring and Review.

Information relating to stockpiles impacted or potentially impacted with PFAS as at the date of this Plan is provided as **Appendix L**. The information in Appendix L should be updated as site works progress and further excavation takes place in accordance with **EMP05**.

Stockpile Management		EMP06
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required in the event of the stockpiling of soil	
Objective:	To minimise the risk to human health and the environment from the stockpiling of soil.	
Areas of the Site	AEC 1, AEC 2 and AEC 3	

General Stockpiles

All stockpiles will be managed in accordance with the CEMP and sub-plans, and in accordance with the EPBC Act conditions of approval for 2011/6086 and maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to mitigate collapse or sliding of the stockpiled materials. Stockpiles are to be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating handling requirements. Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 4. All such preparatory works would be undertaken prior to the placement of material in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil. All stockpiling to be undertaken in accordance with the Costin Roe Consulting Pty Ltd (2020) Construction Soil and Water Management Plan.

Earthworks undertaken as part of the proposed Stage 2 works, which are located outside of AEC 1, AEC 2 or AEC 3 may temporarily generate excess material which may be stockpiled for re-use. Unless some event or observation indicates the material excavated and placed into the stockpile is potentially contaminated, no treatment is required other than normal dust suppression, and erosion controls in accordance with relevant CEMP requirements.

Where temporary stockpiling is permitted such stockpiles shall be installed and maintained to eliminate risk to workers and other people due to exposure to contaminants in dust or vapours and risk to the environment as a result of silt or contamination of stormwater in accordance with the any site materials management and tracking plan as part of the CEMP.

If cover is required, they shall extend beyond the footprint of the stockpiles and shall be secured to prevent being blown away by wind. Stockpiles must be placed in a secure location onsite and covered if to remain for more than 24 hours. Stockpiles will be placed at approved locations and located to mitigate environmental impacts while facilitating material handling requirements.

Where the material is suspected to be contaminated then it should be managed in accordance with the Unexpected Finds Protocol provided in **EMP14** and as detailed below.

Contaminated Stockpiles

If assessment by the Environmental Consultant or the Ordnance Contractor identifies contamination in soil excavated from the Site, or a stockpile is observed to be contaminated, then the Environmental Consultant will assess the stockpile in accordance with the unexpected finds protocol (**EMP14**) to delineate the contamination and assess the extent of management, if required.

Contaminated or potentially contaminated materials would only be stockpiled within areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding

areas (e.g. hardstand areas). A CATA will be established to allow assessment and treatment of contaminated soil.

The following protocols will be applied at each CATA:

- Stockpiles would only be constructed in areas of the Construction Area that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 4.
- Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in un-remediated areas of the Construction Area or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).
- The CATA will be located outside of flood zones and separated from stormwater channels or overland flow areas.
- A designated CATA will be set up for the management of each type of contaminated soil to make sure that materials contaminated with different contaminants are segregated.
- All preparatory works associated with the construction of the CATA would be undertaken prior to the placement of material in the stockpile.
- All new stockpiles will be given a unique identifier and their location recorded. A stockpiling and materials tracking procedure is to be developed as part of the CEMP and implemented during Stage 2 Works.
- Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil and to prevent seepage of leachate to groundwater or surface water.
- Contaminated material will be covered to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission.
- Surface water will be diverted away from the stockpiles using bunds or water diversion measures to ensure surface water does not become contaminated.
- Any leachate collected from the CATA must be tested and treated or disposed off-site.
- Temporary stockpiles of asbestos containing material ('ACM') soil if encountered as an unexpected find would be covered to minimise dust and potential asbestos release.
- All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.
- The CATA will be sign posted noting that contaminated soils are stored there and inspected weekly to ensure proper containment and management.
- Before the reuse of any material on-site, it would be validated with respect to the proposed use.
- Should the soil be surplus to requirements then it will be classified in accordance with **EMP10** prior to off-site disposal. The fate of the material from each CATA will be recorded as will its final location and classification as described in **EMP05**.

- Following the completion of the works these areas will be assessed and validated by the environmental consultant.
- The source and fate of all stockpiled soil will be recorded by the implementation of the materials tracking plan.

PFAS Impacted Stockpiles

In addition to the general and contaminated stockpile management controls provided above, the following additional management controls in accordance with the PFAS NEMP provided in **Table EMP06_1** should be applied for PFAS impacted soil.

Table EMP06_1 – Temporary PFAS Stockpile Management

Stockpile Description	**Timeframe**	**Storage infrastructure for solid wastes and contaminated equipment**
Transient	Less than 48 hours with no rain predicted	Covered stockpile or storage area on impervious bottom liner (e.g. tarp, plastic sheeting, membrane, etc.).
Temporary	From 48 hours to 6 months	Managed stockpile, covered, on impervious, bunded hardstand, with effective stormwater controls (e.g. diversion drains, banks, etc.).
Short-term	From 6 months to 2 years	Constructed stockpile with robust anchored covers, impervious bottom liner, and effective stormwater controls to ensure that rainwater and sheet flow do not contact impacted solids.
Medium-term	From 2 to 5 years	Engineered containment facility, with effective stormwater controls.
Long-term •	More than 5 years	Engineered containment facility, with effective stormwater controls.

Soil Reuse – AEC 3		EMP07
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 works	
Objective:	To ensure that appropriate reuse of PFAS impacted soil is achieved during Stage 2 works to ensure that there are no additional risks to human health or the Environment.	

Reuse of Soil

Soil can be reused at the Site in accordance with the PFAS trigger values provided in **Table 8** within reuse zones provided as **Figure 5** without further assessment of risk, but are subject to the implementation of the following management measures provided by EnRiskS (2020).

When placing soil within the reuse zones, soil must not be placed within 2m of the lateral boundary of the reuse zone, where the adjacent area does not have equivalent management measures in place.

Soil Reuse Zone 1 (all areas)

Soil that meets the criteria in **Table 8** for Soil Reuse Zone 1 (all areas) can be used anywhere at the Site, subject to the following management measures:

- *Materials must be placed at least 1 m above groundwater (seasonal maximum).*
- *This criteria relates to material that may be placed adjacent to OSD basins and overflow drainage channels that have a clay liner or equivalent geosynthetic liner.*

The clay liner/geosynthetic liner for the OSD Basins and overflow drainage channels must comply with the requirements provided as **EMP08**.

Soil Reuse Zone 2 (beneath surface cover materials as described in management measures)

Soil that meets the criteria in **Table 8** for Soil Reuse Zone 2 (beneath surface cover materials as described in management measures) can be used within the areas presented in **Figure 5**, subject to the following management measures:

- *Materials must be placed at least 1 m above groundwater (seasonal maximum).*
- *Materials must be placed beneath Engineered Fill, concrete or a clay liner or equivalent geosynthetic liner.*
- *The clay liner/geosynthetic liner must comply with the following requirements:*
  - *Install clay liners (or equivalent geosynthetic liners) through embankments and basin floors (minimum 600 mm) and under bio-retention basins (minimum 300 mm), as well as OSD overflow drainage channels to mitigate any preferential pathways for soil leachate to directly enter surface water and stormwater to migrate to groundwater. The clay/geosynthetic liner should meet a maximum permeability of $1x10^{-9}$ m/s.*
  - *The liners should be monitored via inspection if possible (minimum yearly) or by installation and testing of monitoring well(s) and repaired if damaged or deteriorated.*
  - *All works undertaken in the area of the OSD stormwater infrastructure should not damage these liners. If damage occurs the liners need to be repaired as soon as practicable.*
- *Engineered Fill of a minimum 1 m thickness is to conform to one of the following:*
  - *Sandstone Fill from road header excavation, tunnel boring machine excavation or ripped or rock hammer excavation.*

- *Approved imported fill materials.*
- *Site won VENM or excavated natural material (ENM).*
- *Where the thickness of Engineered Fill is less than 1m, the surface cover must also include concrete pavement or a building slab.*

- *Engineered Fill shall be placed in accordance with the following requirements:*
  - *In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the Geotechnical Inspection and Testing Authority (GITA).*
  - *The compacted thickness of each layer shall be equal to or less than 300 mm. Engineered Fill shall only be placed on subgrade in accordance with the Moorebank Intermodal Logistics Precinct: Bulk Earthworks Specification Area A, B, D (EPSM3813-021S REV 1) and approved by the GITA.*
  - *Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.*
  - *The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.*

Soil Reuse Zone 3 (beneath sub-divided area for warehouse development / lease area)

Soil that meets the criteria in **Table 8** for Soil Reuse Zone 3 (beneath sub-divided area for warehouse development / lease area) can be used within the areas presented in **Figure 5**, subject to the following management measures:

- *Materials must be placed at least 1 m above groundwater (seasonal maximum).*
- *Materials must be placed beneath Engineered Fill, concrete or a clay liner or equivalent geosynthetic liner.*
- *Engineered Fill of a minimum 1 m thickness is to conform to one of the following:*
  - *Sandstone Fill from road header excavation, tunnel boring machine excavation or ripped or rock hammer excavation*
  - *Approved imported fill materials*
  - *Site won VENM or excavated natural material (ENM).*
  - *Where the thickness of Engineered Fill is less than 1m, the surface cover must also include concrete pavement or a building slab.*
- *Engineered Fill shall be placed in accordance with the following requirements:*
  - *In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the Geotechnical Inspection and Testing Authority (GITA).*
  - *The compacted thickness of each layer shall be equal to or less than 300 mm. Engineered Fill shall only be placed on subgrade in accordance with the Moorebank Intermodal Logistics Precinct: Bulk Earthworks Specification Area A, B, D (EPSM3813-021S REV 1) and approved by the GITA.*
  - *Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.*
  - *The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.*

Soil Reuse – AEC 3	EMP07

Soil reuse for landscaped areas within Soil Reuse Zone 3 must be placed beneath a clay liner/geosynthetic liner of minimum thickness 0.5 m.

- *The clay liner/geosynthetic liner must comply with the following requirements:*
  - *The clay/geosynthetic liner should meet a maximum permeability of $1x10^{-9}$ m/s.*
  - *The liners should be monitored via inspection if possible (minimum yearly) or by installation and testing of monitoring well(s) and repaired if damaged or deteriorated.*

All works undertaken in landscaped areas should not damage these liners and be undertaken in accordance with **EMP13**. If damage occurs the liners need to be repaired as soon as practicable.

Soil Reuse Zone 4 (beneath western ring road and interstate terminal/access areas)

Soil that meets the criteria in **Table 8** for Soil Reuse Zone 4 (beneath western ring road and interstate terminal/access areas) can be used within the areas presented in **Figure 5**, subject to the following management measures:

- *Materials must be placed at least 1 m above groundwater (seasonal maximum).*
- *Materials must be placed beneath Engineered Fill, concrete or a clay liner or equivalent geosynthetic liner.*
- *Engineered Fill of a minimum 1 m thickness is to conform to one of the following:*
  - *Sandstone Fill from road header excavation, tunnel boring machine excavation or ripped or rock hammer excavation*
  - *Approved imported fill materials*
  - *Site won VENM or excavated natural material (ENM).*
  - *Where the thickness of Engineered Fill is less than 1m, the surface cover must also include concrete pavement or a building slab.*
- *Engineered Fill shall be placed in accordance with the following requirements:*
  - *In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the Geotechnical Inspection and Testing Authority (GITA).*
  - *The compacted thickness of each layer shall be equal to or less than 300 mm. Engineered Fill shall only be placed on subgrade in accordance with the Moorebank Intermodal Logistics Precinct: Bulk Earthworks Specification Area A, B, D (EPSM3813-021S REV 1) and approved by the GITA.*
  - *Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.*
  - *The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.*

Soil reuse for landscaped areas within Soil Reuse Zone 4 must be placed beneath a clay liner/geosynthetic liner of minimum thickness 0.5 m.

- *The clay liner/geosynthetic liner must comply with the following requirements:*
  - *The clay/geosynthetic liner should meet a maximum permeability of $1x10^{-9}$ m/s.*

The liners should be monitored via inspection if possible (minimum yearly) or by installation and testing of

monitoring well(s) and repaired if damaged or deteriorated.

Assessment of Soil for Reuse

The result of soil and leachate (neutral pH) PFAS testing results from the proposed cut areas during Stage 2 works are provided as **Appendix J**. Prior to bulk excavation the soil and leachate (neutral pH) analytical results summarised in **Appendix J** should be reviewed to identify areas of soil that may qualify for reuse in accordance with **Table 8**.

Where additional excavation is required within AEC 3 to that proposed in the Cut and Fill Plan[122] then additional assessment / delineation may be required where there is insufficient data is available. Additional insitu sampling or stockpiling sampling must be undertaken in accordance with the sampling methodology for *Data Gap Assessments* provided Section 7.3 of the Golder (2016) RAP which is summarised as follows:

- Sampling should be undertaken by a suitably qualified Environmental Consultant.
- Additional insitu / delineation sampling to be undertaken in accordance with the NSW EPA Sampling Design Guidelines (1995).
- Samples to be collected from 0-0.2 mBGL, 0.5 mBGL, 1.0 mBGL and every metre thereafter to a maximum depth of 0.5 mBGL beyond the maximum proposed depth of excavation.
- Stockpile sampling to be undertaken in accordance with the sampling methodology provided in **EMP10**.

Additional testing of site won stockpiles will be required where:

- Stockpiles have reported detectable PFAS total concentrations above the laboratory limit of reporting, but leachate testing was not undertaken; or
- Soil in the stockpile has been excavated from AEC 3 and has not been sampled or tested; or
- Soil tracking documentation identifying the source location of the stockpile is not available.

Sampling of stockpiles should be undertaken in accordance with the following:

- One test per 25 m^3 for soils assessed for volumes less than 200 m^3; or
- The use of the 95% upper confidence level of the arithmetic mean ('UCL_{mean}') value for the data set from each stockpile, with a total number of samples of not less than 10 collected from each stockpile (e.g. for a maximum size stockpile of 2,500 m^3, the sampling frequency of one test per 250 m^3 will be adopted).

Analytical testing of additional soil sampling for assessment of reuse opportunities at the Site should include the following analytes:

- PFAS suite (28 analytes); and
- AUS leaching Procedure (neutral pH) for PFAS.

The results of analytical testing are to be compared to the Soil Reuse Criteria in **Table 8**. Sample results that are below all the criteria in **Table 8** can be reused in the respective soil reuse zones provided as **Figure 5**. Where practicable soil excavated from AEC 3 that is reported below the Soil Reuse Criteria should be preferentially placed beneath imported fill areas, paved areas or building footprints.

[122] Costin Roe Consulting Pty Ltd (2020) *Cut and Fill Plan*, Drawing Number LPWPIW-COS-CV-DWG-0301, Issue 3, dated 12.06.20.

Soil Reuse – AEC 3	EMP07

Documentation of Reuse Zones

The following procedures should be implemented to document the reuse zones:

- Supervision of soil reuse by a suitably qualified Environmental Consultant.
- Soil tracking should be undertaken in accordance with **EMP05**.
- Survey of the specific placement location and the lateral and vertical depth of placement of the reused soil.
- Surveys of the lateral and vertical profile of surface cover over reused soil should be undertaken during construction.
- Geotechnical testing of surface cover must be undertaken to confirm compliance with permeability design criteria (where applicable).
- Photographs of surface cover layers should be taken during installation of cover layers.
- Records of soil tracking, site surveys, geotechnical testing results and site photographs should be maintained in accordance with **EMP23**.
- At the completion of soil reuse works, the LTEMP should be revised with all relevant documentation pertaining to excavation, soil tracking, soil placement and surface cover within reuse zones in accordance with **EMP25**.

Site Specific Risk Assessment

Future works that require excavation of soil in the reuse zones can only be undertaken in accordance with **Table 8** and the management procedures provided as **EMP07**, unless a further additional site-specific risk assessment is conducted.

Short to Medium-Term Engineered Stockpiling

Where PFAS impacted soil exceeds the reuse criteria provided as **Table 8** and is not acceptable to be reused at the Site, or where there are limited opportunities for reuse, then the soil is to be placed within an Engineered Stockpile to be constructed at the Site in accordance with the concept design provided as **Appendix H**.

Proposed OSD 6 and OSD 8 are located in AEC 3 near former PFAS training areas where elevated concentrations of PFAS have been reported by EP Risk (2018) above the trigger values provided in **Table 8**. It is estimated that approximately 200,000 m^3 (**Appendix K**) of PFAS impacted soil will be won from the excavation of OSD 6 and OSD 8 and associated bulk earthworks within AEC 3.

The conceptual design of the engineered stockpile has been based upon the volume of PFAS impacted soil excavated from OSD 6 and OSD 8. The on-site storage and containment of the excavated soil will be required to facilitate the construction program until appropriate treatment options become available. The conceptual design of the Engineered Stockpile is provided as **Appendix H** and the final detailed design will depend upon the outcome of the site-specific detailed risk assessment.

Lining of OSD 5, OSD 6 and OSD 8		EMP08
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 works	
Objective:	To ensure that construction and operation of OSD 5, OSD 6 and OSD 8 does not result in preferential groundwater pathways.	

The construction of the Proposed Development will alter the spatial permeability of the surface of the Site, the hydrology and stormwater management. There was a risk that due to the size and location of OSDs along the western boundary and the large catchment, the OSDs may increase infiltration within their footprints and exacerbate migration of contamination from PFAS source areas to the Georges River.

EnRiskS (2020) has provided the following management measures for clay liners in the OSDs:

- Install clay liners (or equivalent geosynthetic liners) through embankments and basin floors (minimum 600 mm) and under bio-retention basins (minimum 300 mm), as well as OSD overflow drainage channels to mitigate any preferential pathways for soil leachate to directly enter surface water and stormwater to migrate to groundwater. The clay/geosynthetic liner should meet a maximum permeability of $1x10^{-9}$ m/s.
- The liners should be monitored via inspection if possible (minimum yearly) or by installation and testing of monitoring well(s) and repaired if damaged or deteriorated.
- All works undertaken in the area of the OSD stormwater infrastructure should not damage these liners. If damage occurs the liners need to be repaired as soon as practicable.

In order to manage this risk, the base and walls of the OSDs are proposed to be lined in accordance with the following 'for construction' plans provided as **Appendix B**:

- Costin Roe Consulting Pty Ltd (2020) Basin 5 Plan, Drawing Number LPWPIW-COS-CV-DWG-0433, Issue 1, dated 25.05.20.
- Costin Roe Consulting Pty Ltd (2020) Basin 6 Sections, Drawing Number LPWPIW-COS-CV-DWG-0437, Issue 1, dated 25.05.20.
- Costin Roe Consulting Pty Ltd (2020) Basin 8 Sections, Drawing Number LPWPIW-COS-CV-DWG-0438, Issue 1, dated 25.05.20.

Based upon the construction plans prepared by Costin Roe, the basin liner is proposed to consist of a clay liner consisting of 600 mm minimum thickness through embankments and basin floors and 300 mm minimum thickness under bioretention basins with a maximum clay permeability of 1×10^{-9} m/s.

Once construction of the OSDs is complete a survey of the OSD liners must be undertaken and geotechnical testing completed to confirm the lateral extent, thickness and maximum permeability of the liners have met the design criteria. The LTEMP must be revised with as-built drawings of the OSDs in accordance with **EMP25**.

Where groundwater is encountered during excavation works, management of groundwater to be undertaken in accordance with **EMP16**.

Application of Cover Over Layer in the Offset Area		EMP09
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 works	
Objective:	To ensure that construction and operation of OSD 5, OSD 6 and OSD 8 does not result in preferential groundwater pathways	

The EnRiskS (2019) Land HHERA reported the potential ecological risk to terrestrial ecological higher order consumers from bioaccumulation of PFAS was unable to be excluded.

The proposed management activities include the application of a cover over layer in areas where impacted soil exceeds the adopted Tier 1 ecological criteria. The application of the cover over layer is proposed during revegetation of the Offset Area undertaken during the construction phase of works as outlined in the Arcadis (2020) BIMP.

The purpose of the cover over layer will provide habitat for terrestrial organisms (insects / invertebrates) living primarily in the surface soil. The cover over layer is to be applied at a minimum thickness of 0.5 m and consist of an appropriate growing medium suitable for the species of flora proposed by Arcadis (2020). The extent of the proposed cover over layer is provided as **Figure 6**.

The cover over layer should be applied immediately prior to seeding or planting during revegetation works as proposed in the Arcadis (2020) BIMP and appropriate sediment and stormwater controls applied.

Off-site Disposal of Excavated / Unsuitable Material		EMP10
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Continuous	
Objective:	To ensure that surplus material is appropriately classified for off-site disposal or reuse and lawfully disposed from the site.	

Minimise Waste

It is recommended that disturbance of soil within AEC1, AEC 2 and AEC 3 should be minimised by incorporating the following into the construction methodology:

- Conventional footings where practical should not penetrate below the imported fill layer, to minimise the requirements for disposal of excavated contaminated material.
- Where pier footings are required, screw piles would be recommended over bored piers.
- Minimise excavation of materials below the imported fill layer to reduce disposal costs of excavated material.
- Reuse and retain material on the Site where practicable.

Stockpile Classification

Where the Site Owner (or nominated representative) identifies the requirement to remove material from the site, the material is required to be characterised by an Environmental Consultant to evaluate potential off-site removal options.

The Environmental Consultant shall consider the relevant requirements of NSW legislation, regulations, and guidelines in the identification of appropriate options for off-site disposal / reuse including, but not limited to the following:

- NSW EPA Waste Classification Guidelines (EPA 2014):
    - Part 1: Classifying waste;
    - Part 2: Immobilising Waste;
    - Part 3: Waste containing radioactive material;
    - Part 4: Acid Sulfate Soils; and
    - Addendum to Part 1: Classifying Waste.
- Excavated Natural Material Exemption (2014) and Excavated Natural Material Order (2014).
- Relevant resource recovery orders and resource recovery exemptions made by the NSW EPA.

The requirements for use of licensed vehicles, waste tracking, covering of vehicles, etc. as noted in the POEO (Waste) Regulation (2014) will be identified by the Environmental Consultant and documented as part of a waste classification report to facilitate off-site disposal of waste material to a facility with the appropriate NSW EPA Environmental Protection License to accept the classified material.

Disposal records for all material removed from the site shall be required to be provided to the Site Owner or appointed representative, by the appointed contractor upon completion of the disposal works. These records will be maintained in accordance with **EMP23**. The records will be made available to the Environmental Consultant engaged to prepare final site condition reports upon request to demonstrate the lawful off-site disposal of material from the Site.

Off-site Disposal of Excavated / Unsuitable Material	EMP10

ACM conduits or ACM impacted soils identified as unexpected finds must be disposed offsite as Special Waste (Asbestos) in combination with other classes of waste (if applicable). Asbestos waste is to be tracked in accordance with Clauses 76 and 79 of the POEO (Waste) Regulation 2014.

Stockpile Classification Testing

Stockpile classification testing will be undertaken by the Environmental Consultant in accordance with the following:

- All stockpiles must be classified prior to off-site disposal. Stockpiles of general fill (non-soil) may be classified visually based on their waste content and observations. All other stockpiles will be classified based on classification testing, with samples scheduled for laboratory analysis of the contaminants of concern corresponding with the source of the stockpile;
- Classification testing will be undertaken by the Environmental Consultant, and classification samples will be collected from the stockpiled material at the following sampling frequency:
    - One test per 25 m^3 for soils assessed for volumes less than 200 m^3; or
    - The use of the 95% upper confidence level of the arithmetic mean ('UCL_{mean}') value for the data set from each stockpile, with a total number of samples of not less than 10 collected from each stockpile (e.g. for a maximum size stockpile of 2,500 m^3, the sampling frequency of one test per 250 m^3 will be adopted).
- Sampling densities for resource recovery should be undertaken in accordance with the respective resource recovery order and exemption.

Liquid Wastes

All liquid wastes requiring offsite disposal should be classified in accordance with NSW EPA (2014).

Importation of Fill Material / Aggregate		EMP11
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 Works and Operation	
Objective:	To ensure that only material fit for purpose and lawfully able to be brought onto site is imported either temporarily or permanently onto the subject site.	

The verification of imported fill material has been developed in the Golder (2016) RAP and is provided below.

"The verification of imported soils required to backfill remediation excavation will be based upon a review by the environmental consultant of the information provided by the remediation contractor. Imported fill will meet specified geotechnical parameters as well as demonstration of the classification of imported soil by:

- *A review of the site use, history and material properties of the source of the material in order to assess potential for the presence of contaminants.*
- *Depending upon the outcome of the review, soil samples may need to be collected if it cannot be established that the materials satisfy the definition of VENM (refer to Section 7.2.3). If required, sampling will be collected from the imported fill at the following sampling frequency and results screened against the adopted criteria suitable for classify the material as Class 1 or Class 2 materials[123].*
    - *One test per 25 m^3 for soils assessed for volumes less than 200 m^3; or*
    - *The use of the 95% UCL value for the data set, with a total number of samples not less than 10 and a minimum sampling frequency of 1 per 500 m^3; and*
    - *Testing shall be for the analytes identified as potential contaminants of concern through the review of the site use, and history of the material source.*
- *An inspection of the material on arrival at the Site to ensure that the material is consistent with information provided by the Remediation Contractor.*

It should be noted that natural soil intended for use as backfill may contain concentrations of contaminants above the adopted validation criteria. Any background concentrations of contaminants need to be less that validation criteria[124], unless agreed with Environmental Consultant and the Auditor.".

[123] Refer to Section 7.2.3 of the Golder (2016) RAP.
[124] Refer to Section 6.0 and Appendix C of the Golder (2016) RAP.

Subsurface Maintenance Works		EMP12
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Operation	
Objective:	To ensure that subsurface maintenance works will not result in risk to human health and the environment.	

Given that the depth of fill material imported to the Site will be in excess of 2m over the majority of the Construction Area, and the depth of any anticipated subsurface maintenance activities will not likely penetrate depths greater than 2 mBGL, the risk to subsurface maintenance contractors undertaking routine subsurface maintenance is considered to be low.

Should subsurface maintenance works exceed the depth of imported fill material and encounter natural site soil then the following procedure should be followed.

Work Health and Safety

All works are to comply with the Work Health and Safety Act (2011). Note any works involving confined spaces should also be carried out in accordance with AS 2865: Safe Working in a Confined Space (2009) and any revisions. Pits or excavations may be considered confined spaces due to the limitations on egress and the potential accumulation of vapours or presence of depleted oxygen within the pits or excavations.

Any subsurface works that penetrate the capping layer shall include the following measures:

- Providing a safe work method statement (SWMS). This shall be reviewed and authorised by the Site Owner (or their representative) or any future occupier.
- All upstream stormwater flow to be redirected around the work area.
- All stormwater from the works area to be diverted through sediment controls.
- If encountered, groundwater is always to be kept contained.
- If any strong odours are present on breaching sealed surfaces, or in an excavation, a precautionary approach shall be applied to consider if additional management measures are required to manage vapour inhalation risk prior to proceeding.
- Respiratory protective equipment (RPE) would also be provided for subsurface works where necessary.
- Air monitoring would be mandatory for entry into confined space works within excavations.
- Additional controls may include the use of blowers to increase flushing of the trench/excavation with fresh air.

All workers potentially exposed to impacted materials are required to wear appropriate levels of PPE, which shall include as a minimum:

- Long sleeve shirt and trousers;
- Appropriate respirator;
- Head covering;
- Over boots; and
- Gloves.

Subsurface Maintenance Works	EMP12

Ecological

Excavation and reinstatement of excavations should consider the following general principles:

- Stockpiling of excavated soil to be managed in accordance with **EMP06**.
- Excavated imported fill material that was stockpiled separately after excavation is to be returned to the excavations in the reverse order to which it came out.
- Reuse of excavated soil to be undertaken in accordance with **EMP07**.
- Movement of soil should be tracked in accordance with **EMP05**.
- All surplus groundwater and soil removed from excavations must be classified in accordance with NSW EPA (2014) Waste Classification Guidelines NSW EPA (2016) Addendum for PFAS prior to disposal at an appropriately licensed facility in accordance with **EMP10**.
- Recontoured site surfaces must permit free drainage and not permit ponding of surface water.

Management Measures for Surface Cover over Reused Soil

Subsurface maintenance works within reuse zones where surface cover over reused soil is present must implement the following management measures in accordance with EnRiskS (2020):

- Ensuring groundwater is not extracted and used for any purpose subject to the requirements of **EMP16**.
- All excavations minimise the area of PFAS contaminated soil at any one time.
- Stockpiles of PFAS contaminated soil require management in accordance with **EMP06** to ensure water runoff to the offset area or off-site waterbodies does not occur, and appropriate erosion and sediment control measures are implemented.
- All discharges of water from the site comply with the EPL.
- The surface cover placed over reused soil with PFAS impacts must be maintained.
- If the surface cover over reused soil is damaged during maintenance works, the surface cover must be repaired as soon as practicable in accordance with **EMP07** and **Table 8**.
- Any future works that require excavation of soil in the reuse zones can only reuse these materials as detailed in **Table 8** unless a further additional site-specific risk assessment is conducted. Failing this, materials must be appropriately classified and disposed to a licenced landfill in accordance with **EMP10** or stored onsite in accordance with **EMP07**.

Landscape Maintenance		EMP13
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Operation	
Objective:	To ensure that landscape maintenance works will not result in risk to human health and the environment.	

Landscape Maintenance Outside Areas of Reuse

Given that the depth of fill material imported to the Site will be in excess of 2m over the majority of proposed landscape areas within the Construction Area, and the depth of any anticipated landscape maintenance activities will not penetrate depths greater than 2 mBGL, the risk to landscape contractors undertaking routine landscape maintenance is considered to be low outside of areas of reuse.

Landscape Maintenance Inside Areas of Reuse

Landscaped areas where PFAS in soil has been reused will require additional management by the landscape contractor during future operation of the Site. The following management measures are proposed during construction and operation of landscaped areas:

Construction

- PFAS in soil to be preferentially placed outside of landscaped areas.
- Where soil reuse within landscaped areas is required then the following measures should be adopted:
    - Reuse of soil within landscaped areas to be supervised by a suitably qualified Environmental Consultant.
    - where an Engineered Fill layer of a minimum 1.0 m thickness is not present, a clay liner or equivalent geosynthetic liner must be constructed over reused soil in accordance with **EMP07**.
    - A growth medium of thickness greater than the maximum root depth of vegetation proposed within the landscaped areas should be placed above the Engineered fill / clay liner / equivalent geosynthetic liner.
    - Mulching of the surface of the growth medium should be applied and maintained to reduce the risk of erosion and exposure of the cover layer.
    - Plants with maximum root depths greater than the depth of growth medium applied are prohibited within these areas.
    - As the final design of the Proposed Development has not been finalised, the LTEMP is to be revised in accordance with **EMP25** once construction of landscaped areas is complete with details of soil tracking, survey drawings, capping construction and long term management requirements.

Operation

Where soil has been reused within landscaped areas then the following management measures are to be implemented during future operation of the Site:

- All landscape staff to undertake a site induction and appropriate training of the management measures provided in the LTEMP in accordance with **EMP19**.
- Prior to the commencement of operation, a landscape management plan to be prepared, which will include (as a minimum) the following management measures:
  - Identification of soil reuse areas where additional management is required.
  - Requirements for the replacement of plants and vegetation to only permit species with a maximum root depth less than the depth of growth medium to not penetrate and damage the integrity of the surface cover over reused soil.
  - Should any landscape maintenance works exceed the depth of imported fill material or encounter the clay liner or equivalent geosynthetic liner, then the procedure provided as **EMP12** must be followed.
  - Where landscaping maintenance works damage the surface cover over reused soil, then the surface cover must be repaired in accordance with the specifications provided as **EMP07** and **Table 8**.

Unexpected finds		EMP14
Responsibility:	Site Owner (or nominated representative)	
Frequency:	Stage 2 Works and Operation	
Objective:	To minimise exposure of contractors and site personnel to impacted sub-surface soils during future excavation works beneath the Site.	

During Stage 2 Works

An unexpected finds protocol (UFP) has been prepared by SIMTA (2018)[125] for the Stage 2 works in accordance with SSD 7709. This UFP has been developed to manage the unexpected discovery of contamination within imported spoil, heritage items, threatened flora and fauna, and onsite contamination during the construction phase of Stage 2 Works. A copy of the SIMTA 2018 UFP is provided as **Appendix F** and has been incorporated into the CEMP for Stage 2 Works. An unexploded ordnance ('UXO') Risk Review and Management Plan has been prepared by Gtek (2019)[126] to inform management of any unexpected finds involving UXO.

During Operation

During subsurface maintenance works post construction, there is a possibility some hazards within the site have not been identified to date. The nature of hazards which may be present, and which may be discovered are expected to generally be detectable through visual or olfactory means, for example:

- The presence of significant aggregates of friable or non-friable asbestos materials (visible) including redundant services conduits;
- Excessive quantities of Construction/Demolition Waste (visible);
- Hydrocarbon impacted materials (visible/odorous);
- Drums or underground storage tanks (USTs) (visible); and
- Oily Ash and/or oily slag contaminated soils/fill materials (visible/odorous).

As a precautionary measure to ensure the protection of the workforce, should any of the abovementioned substances (or any other unexpected potentially hazardous substance) be uncovered during ground disturbance activities, then the following should be immediately implemented:

- Stop work within the area. Isolate the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc.) to prevent exposure to site personnel and/or off-site airborne dust migration; and
- an Environmental Consultant should be immediately contacted to determine an appropriate course of action regarding the assessment and/or management of the "Unexpected Find".

It is envisaged the assessment strategy will be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The Environmental Consultant will also be responsible for any reporting necessary to document the details of the Unexpected Find and the results of the validation sampling and will be responsible for providing

[125] SIMTA (2018) Unexpected Finds Protocol, Moorebank Precinct West Stage 2, dated 26 October 2018 (ref: MIC2-QPMS-EN-APP-00022).
[126] Gtek (2019) Unexploded Ordnance (UXO) Risk Review and Management Plan, Moorebank Precinct West Stage 2 (MPW2) Incorporating Moorebank Avenue Upgrade Works (MAUW) Moorebank, NSW, dated 9 October 2019 (ref: 17114EPR1, version 1.01).

clearance certificates stating it is suitable to resume works at the remediated Unexpected Find area.

The UFP for the operational facility post construction should be developed at the completion of Stage 2 works when the LTEMP is updated.

Additional Validation Requirements		EMP15
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure contamination management activities and unexpected finds have been appropriately characterised and validation for the intended land use.	

JBS&G (2020) has prepared a validation assessment for the Site for all accessible areas outside the identified endangered ecological communities and subject to the implementation of the EP Risk (2020) Contamination Management Plan (CMP) and this LTEMP. A number of the contamination management activities outlined in the LTEMP will require validation which should be undertaken in accordance with the methodology and criteria provided in Section 7 of the Golder (2016) RAP. Additional information relating to the validation relevant to the LTEMP is provided below.

AEC 1 – TCE impacted Area

EMP01 requires that no buildings or buildings with underground habitable spaces are constructed in AEC 1. Validation that the land use restrictions outlined in EMP01 have been implemented during Stage 2 Works include the following:

- Preparation of 'As-built' survey drawings of the infrastructure constructed during Stage 2 works to confirm the absence of buildings with underground habitable spaces.

AEC 2 – Petroleum Hydrocarbon Impacted Area

EMP01 requires that no buildings or buildings with underground habitable spaces are constructed in AEC 2. Information required to validate that land use restrictions outlined in EMP01 have been implemented during Stage 2 Works include the following:

- Preparation of 'As-built' survey drawings of the infrastructure constructed during Stage 2 works to confirm the absence of buildings with underground habitable spaces.

Preparatory works including excavation of soil within the proposed OSD 10 footprint to depths ranging from 2.5 to 3.0 mBGL require the following information:

- Soil tracking data to confirm the location where the soil was reused at the Site.
- Validation sampling data of stockpiled soil in accordance with **EMP06**.
- Soil classification data and landfill receipts for soil disposed offsite.

AEC 3 – PFAS Impacted Area

Preparatory works including excavation of soil within the proposed OSD 3, OSD 6, OSD 8 and OSD 10 footprints will require the following information to verify that appropriate reuse or off-site disposal of surplus material has been undertaken:

- Soil tracking data to confirm the source and final location of PFAS impacted soil reused at the Site in accordance with EMP07.
- Soil sampling and analytical results to confirm that the soil meets the requirements for reuse outlined in **EMP07** and the reuse criteria provided in **Table 8**.
- Survey data to confirm the location and depth of PFAS impacted soil reused at the Site under the conditions of restricted reuse provided in **EMP07**.

Additional Validation Requirements	EMP15

- Soil classification data and landfill receipts for soil disposed off-site.
- As-built drawings, permeability laboratory reports and photographs of the constructed Engineered Stockpile to verify that it was constructed in accordance with the Detailed Design.

As-built drawing, permeability laboratory reports and photographs to confirm that the liners of OSD 5, OSD 6 and OSD 8 have been constructed in accordance with the detailed design drawings provided as **Appendix B**.

Offset Area

The following information will be required to verify that the cover over layer has been applied to the Offset Area as required in **EMP09:**

- Survey drawings detailing the lateral extent and depth of the cover over layer applied to the Offset Area.
- Confirmation of appropriate classification of the cover over material prior to importation to the Site.

Unexpected Finds

Validation of Unexpected Finds will be undertaken as per Section 8 of the RAP (Golder 2016). The usability of the data collected during the validation program will be assessed in accordance with Section 8.7 of the RAP (Golder 2016).

Additional Areas Requiring Management Following Completion of CMP Works

Validation of additional areas requiring management following completion of CMP Works will be undertaken as per Section 8 of the RAP (Golder 2016). The usability of the data collected during the validation program will be assessed in accordance with Section 8.7 of the RAP (Golder 2016).

On-going Monitoring

The results of ongoing monitoring collected in accordance with **EMP18** will be required to verify whether the redevelopment works have resulted in reducing or stable PFAS groundwater and surface water concentrations at the Site.

Validation reporting

Validation reporting should be prepared in accordance with Section 12 of the Golder (2016) RAP and the NSW EPA (2020) *Guidelines for Consultants Reporting on Contaminated Land*.

Management of Groundwater		EMP16
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure that groundwater is managed so as not to present a risk to human health or the environment.	

Based upon previous assessments undertaken, elevated levels of chlorinated hydrocarbons (AEC 1), petroleum hydrocarbons (AEC 2) and PFAS (AEC 3) in groundwater samples collected have been reported at the Site (**Appendix C**). Further discussion of groundwater management is provided below.

Groundwater Extraction

Groundwater extraction during and post construction is not permitted at the Site for any beneficial use. Based upon the proposed commercial / industrial land use of the Proposed Development and the availability of a reticulated water supply, it is considered the requirement for the beneficial use of groundwater at the Site is low.

It is not anticipated that groundwater will be encountered during construction of the Proposed Development and construction dewatering of contaminated groundwater should be avoided where practicable. However, should construction dewatering be unavoidable then a Dewatering Management Plan must be prepared which details appropriate control measures to manage and treat contaminated groundwater which is generated from dewatering. An extraction licence should be sought form the appropriate regulatory authority prior to commencing dewatering in accordance with the relevant legislation (if required).

Worker Health and Safety

In order to manage workers exposure to contaminated groundwater the following should be implemented for works where groundwater is expected to be encountered:

- Project inductions should be undertaken to identify areas with high risk of groundwater contamination.
- SWMS and JSAs to identify hazards associated with contaminated groundwater and detail appropriate control measures.
- PPE used in high risk areas including:
  - Disposable overall suits including boots.
  - Disposable waterproof nitrite gloves in addition to standard glove requirements.
  - All other standard PPE required for works on Site.
- Signage placed in ablution blocks to ensure all workers wash hands and face prior to eating, regardless if gloves are worn.
- If worker's skin comes into contact with contaminated water, ensure skin is immediately washed with clean water and wet clothing is removed immediately after work is complete.

Groundwater Monitoring

Groundwater monitoring will be required during construction to assess the short -term effects of construction on groundwater migration and mass flux. The details of the groundwater monitoring program are provided in **EMP18**.

Management of surface water		EMP17
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure that surface water is managed so as not to present a risk to human health or the environment.	

Based upon previous assessments undertaken, disturbance of soil in AEC 3 has the potential to leach PFAS to stormwater. Further discussion of surface water management is provided below.

Management of On-site Surface Water

Use of contaminated surface water at the Site is not permitted for any beneficial use.

During construction works the following precautions should be implemented:

- Excavation to be scheduled to minimise the area of soil exposed at any one time.
- To reduce PFAS impacted sediment, stormwater controls should be designed to limit infiltration of run-off into areas where PFAS impacted soils are located.
- Disturbed soils within AEC 3 should be capped or covered to the extent practicable to prevent leaching of PFAS to stormwater.
- Temporary sediment basins and swales constructed in a catchment located within AEC 3 should be lined with an impermeable geotextile liner to prevent infiltration of PFAS impacted stormwater to underlying groundwater.
- Stormwater in sediment basins should be tested prior to being discharged. PFAS impacted stormwater may be reused for dust suppression or discharged to the Georges River provided the results of analytical testing meets the criteria provided in the PFAS NEMP and the Environmental Protection Licence ('EPL').
- Discharge of stormwater to the Georges River during construction work will be a temporary requirement, and then only a last resort if the ten-day holding requirement cannot be met and alternative dust suppression options are not available.

Water Treatment

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

Although implementation of the prevention measures listed above will reduce long-term PFAS stormwater concentrations in the sediment basins, an on-site water treatment system should be designed and commissioned at the Site as a contingency to treat stormwater which exceeds the adopted PFAS stormwater disposal criteria during prolonged rain events. The system should be designed to treat PFAS concentrations to below the adopted PFAS stormwater disposal criteria.

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

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

- Catchment area of each PFAS impacted temporary stormwater basin.
- Other basins in the vicinity that may accumulate runoff with PFAS concentrations above the discharge concentrations listed in the Environment Protection Licence.

- Run off from unexpected finds of PFAS and dewatering (if required) of any PFAS remediation works.
- All temporary construction stormwater basins must have their design capacity available within 5-days of a rainfall event.
- A treatment rate of 2 to 5 litres per second.

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

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

Compliance testing of treated effluent is to be undertaken to confirm concentration of PFAS are below the adopted criteria (provided in the EPL). The compliance sampling frequency will involve:

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

The Environmental Consultant must approve in writing the waters are suitable once water has been tested and meets all the criteria for discharge offsite or for reuse on site. Subsequently, the Environment Advisor must authorise the discharge by signing the Discharge or Reuse Water Approval. All sediment basins are required to maintain their design capacity, within 5 days following any rainfall event.

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

- Retreated on-site through the treatment plant. The water will then be retested to confirm compliance; or
- Disposed of off-site to a suitably licenced facility lawfully able to accept the waste.

Worker Health and Safety

In order to manage workers exposure to contaminated surface water the following should be implemented for works where groundwater is expected to be encountered:

- Project inductions should be undertaken to identify areas with high risk of surface water contamination.
- SWMS and JSAs to identify hazards associated with contaminated surface water and detail appropriate control measures.

Management of surface water	EMP17

- PPE used in high risk areas including:
    - Disposable overall suits including boots.
    - Disposable waterproof nitrite gloves in addition to standard glove requirements.
    - All other standard PPE required for works on Site.
- Signage placed in ablution blocks to ensure all workers wash hands and face prior to eating, regardless if gloves are worn.
- If worker's skin comes into contact with contaminated water, ensure skin is immediately washed with clean water and wet clothing is removed immediately after work is complete.

Surface Water Monitoring

Surface water monitoring will be required during construction to assess the effects of construction on contamination migration and mass flux. The details of the surface water monitoring program are provided in **EMP18**.

Groundwater and Surface Water Monitoring		EMP18
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure that groundwater and surface water is managed during and post construction so as not to present a risk to human health or the environment.	

Monitoring of groundwater and surface water will be required during construction to assess any impact to the migration of PFAS impacted groundwater and PFAS mass flux to the Georges River as a result of construction of the Proposed Development and the effectiveness of the management measures implemented.

Post construction monitoring will establish whether the residual groundwater PFAS contamination plume is shrinking, stable, or increasing, and whether natural attenuation and/or migration is occurring according to expectations through line-of-evidence collection.

Although there are monitoring wells present at the Site which may be used for monitoring, there is the potential additional wells may be required. This section details monitoring well installation and monitoring procedures. The monitoring program has been tailored to address assessment of PFAS trends in groundwater and surface water associated with historical firefighting training at the Site.

Groundwater monitoring of petroleum hydrocarbon impacts has been recommended by GHD (2018a) for AEC 2, however as these monitoring requirements are associated with the adjacent MPE property to the east and a separate Site Audit, no monitoring of AEC 2 will be undertaken as a requirement of this LTEMP. The location of the monitoring wells recommended by GHD (2018a) are provided as **Appendix I** and additional controls to manage the protection of wells during construction and future access is provided as **EMP01**.

No monitoring of TCE impacted groundwater was recommended by Golder (2015a) to assess the stability or risk of harm to human health or the environmental associated with AEC 1.

Frequency of Monitoring

The following monitoring frequency should be implemented during construction:

- Conduct quarterly sampling during and at completion of the Stage 2 construction works.
- Sample targeted monitoring wells along the western downgradient boundary with the Georges River as presented in **Figure EMP18_1**.
- Sampling of surface water from the Georges River should be undertaken in conjunction with groundwater sampling. The location of surface water sampling locations is presented in **Figure EMP18_1**.

The following monitoring frequency should be implemented post construction:

- Monitoring should be undertaken at the same monitoring locations that were sampled during construction presented in **Figure EMP18_1**.
- Conduct quarterly sampling after completion of the Stage 2 construction works for a minimum period of 2 years to ensure a range of seasonal and river flow variations is assessed in accordance with the Final Compilation of Mitigation Measures (FCMMs).
- The long-term monitoring program should be established to gather concentration trend data at key locations before, during, and after the major construction works at the site. An endpoint to the monitoring programme should be discussed following review of the trends after completion of construction works and the 2 year post-occupation period. The LTEMP should be revised at this point in time.

Monitoring Well Installation Scope

The groundwater monitoring strategy will utilise existing monitoring wells where practicable. However, where existing monitoring wells have been destroyed during construction works, installation of replacement monitoring wells will be completed in accordance with the following methodology:

- Advance bores using hollow stem augers to the final depth of the groundwater monitoring well. The final depth will be dependent on groundwater conditions at each of the proposed sample locations.
- Log soil in accordance with the Unified Soil Classification System (USCS). In addition to geological parameters, the presence of fill, and any evidence of contamination, will be recorded.
- Construct wells using 50 mm diameter, Class 18 uPVC screen and blank riser. The annular space will be backfilled with washed 8/16" sand to a minimum of 0.5 m above the slotted screen. Approximately 0.5 m of hydrated bentonite will be placed above the sand. The well will then be completed using cement/bentonite grout to the surface, and protected with a traffic-rated metal, bolt-down cover. Alternatively, the PVC may extend above the ground and be covered with a protective, lockable standpipe. The final method will be dependent on the location of each well and with consideration for proper access. Some well installation details such as annular seal may require modification in areas with shallow groundwater.
- Develop each well using a submersible pump to improve the connectivity with the surrounding formation. During development, water quality parameters pH, electrical conductivity, dissolved oxygen, redox potential, turbidity and temperature will be collected sing a calibrated water quality meter and flow through cell. Development will continue until the well is dry, the water is clear, or ten well volumes have been removed.
- Survey the location and elevation of each newly installed groundwater monitoring well.
- Collect any contaminated soil cuttings in a sealed drum pending off-site disposal at an appropriately licensed facility.
- Allow the wells a minimum of seven days to stabilise prior to sampling.

Groundwater Monitoring Well Sampling

The proposed groundwater sampling program scope is as follows:

- Gauge depth to groundwater in all existing and newly installed wells using an electronic water level sounder.
- Purge and sample groundwater from all existing and newly installed wells using a low-flow Micropurge® bladder sampling pump. This is in accordance with NSW recognised best practice sampling techniques. The inlet of the pump will be lowered to approximately 1 m below the groundwater level, and the pump rate adjusted to minimise drawdown. If drawdown exceeds the maximum allowance of 0.2 m, the well will be purged dry, allowed to recharge, and sampled using the low-flow pump.
- Field parameters pH, electrical conductivity, dissolved oxygen, redox potential, and temperature will be recorded during purging using a calibrated water quality meter and flow through cell. The wells will only be sampled when all parameters have stabilised to within 10%.
- Groundwater samples will be collected in laboratory prepared and appropriately preserved glass and plastic bottles specific to each analyte, with the sample details added to the label on the jar.
- Quality samples will be collected in accordance with the NEPC and AS4482.1 and will include approximately one blind and one split duplicate per 20 primary samples analysed (1 in 10 for PFAS analysis), and a rinsate and trip blank for each day of sampling to verify decontamination and transport procedures.
- The samples will be placed immediately on ice after sampling and transported to the NATA accredited

laboratories under appropriate chain-of-custody documentation for analytical testing of PFAS.

Surface water Sampling

The proposed surface water sampling program scope is as follows:

- Surface water sampling locations will be identified by GPS co-ordinates to ensure that each sampling event will be undertaken at the same location.
- Sampling of surface water will be undertaken at the same time as groundwater sampling.
- Field parameters pH, electrical conductivity, dissolved oxygen, redox potential, and temperature will be recorded prior to sampling using a calibrated water quality meter.
- Surface water samples will be collected from the bank of the river using a grab sampler and placed in laboratory prepared and appropriately preserved glass and plastic bottles specific to each analyte, with the sample details added to the label on the jar.
- Quality samples will be collected in accordance with the NEPC and AS4482.1 and will include approximately one blind and one split duplicate per 20 primary samples analysed (1 in 10 for PFAS), and a rinsate and trip blank for each day of sampling to verify decontamination and transport procedures.
- The samples will be placed immediately on ice after sampling and transported to the NATA accredited laboratories under appropriate chain-of-custody documentation for analytical testing of PFAS chemicals.

Onsite Surface Water Sampling During Construction within AEC 3

To confirm and maintain the effectiveness of the PFAS stormwater preventative measures outlined in **EMP17**, the following should be undertaken during construction works:

- Sample stormwater from lined basins after rain events to test the effectiveness of capping in reducing PFAS concentrations.
- Inspect capping layers after storm events to ensure the integrity of the capping layer and liners. Undertake repairs / upgrades to capping layers and liners where required.
- Where new temporary stormwater basins are constructed, or significant soil disturbance occurs to existing catchments, additional testing of stormwater should be undertaken to determine if additional preventative measures require implementation.
- Stormwater in basins and swales must be sampled and the results must be below the discharge criteria provided in the EPL prior to discharge.

Groundwater investigation Levels (GILs)

The GILS adopted for Tier 1 assessment of the analytical results are per the ASC NEPM (2013) and PFAS NEMP.

Quality Assurance and Quality Control

Fieldwork was undertaken in accordance with Table A1 of the Western Australia Department of Environment Regulation (WA DER), Interim Guideline on the Assessment and Management of PFAS, 2016 (WA DER 2016), and the PFAS NEMP, which lists the following precautions during sampling:

- Prohibited for sampling personnel:
  - New clothing;
  - Clothing with stain-resistant, or waterproof coatings/treated fabric (e.g. GORE-TEX®);
  - Tyvek® clothing; and
  - Fast food wrappers/containers and pre-wrapped foods.
  - Prohibited sampling equipment and containers at the Site:

  - Teflon®-containing or coated field equipment;
  - Teflon®-lined lids on containers;
  - Glass sample containers.
  - Drilling fluids or drilling water; and
  - Decontamination solutions.

- Other products prohibited at the Site:
  - Aluminium foil;
  - Self-sticking notes (e.g. 3M Post-it notes);
  - Waterproof paper, notebooks and labels;
  - Drilling fluid containing PFAS;
  - Detergents and decontamination solutions (e.g. Decon 90®);
  - Reusable chemical or gel ice packs (e.g. BlueIce®); and
  - Sunscreen;
  - Cosmetics; and
  - Fast food wrappers.

EP Risk notes that additional guidance on Quality Assurance and Quality Control is provided in the PFAS NEMP.

Decontamination and Rinsate Preparation

Prior to the commencement of sampling activities, any non-disposable sampling equipment, including sampling trowel/knife was cleaned with a water and a brush, rinsed deionised water, sprayed with deionised water and then air dried. The equipment was then inspected to ensure that no soil, oil, debris or other contaminants were apparent on the equipment prior to the commencement of works. Sampling equipment was subsequently decontaminated using the above process between each sampling location.

Rinsate samples were collected following decontamination of all non-disposable sampling equipment during each of the soil and groundwater sampling events.

Duplicate and Triplicate Sample Preparation

Field soil and groundwater duplicate and triplicate samples were obtained during the field works. The collected samples were divided laterally into three samples with minimal disturbance and placed in three sets of the appropriate sampling containers. Each sample was then labelled with a primary, duplicate or triplicate sample identification before being placed in the same chilled esky for laboratory transport.

Reporting

Preparation of a report after each monitoring round, in accordance with the NSW EPA (2020) *Consultants Reporting on Contaminated Sites*, including:

- A clear definition of the sampling and analysis completed.
- A clear definition of the contamination assessment criteria.
- Figures displaying sampling locations.
- Analytical summary tables comparing results to the Tier 1 assessment criteria provided in the ASC NEPM 2013 and PFAS NEMP.
- Field records (e.g. sampling logs, field instrument calibration records and photographs).
- Chain of custody documentation and laboratory analytical reports.
- An assessment of data reliability.
- A discussion of the field observations, analytical results and groundwater trends against baseline

conditions.

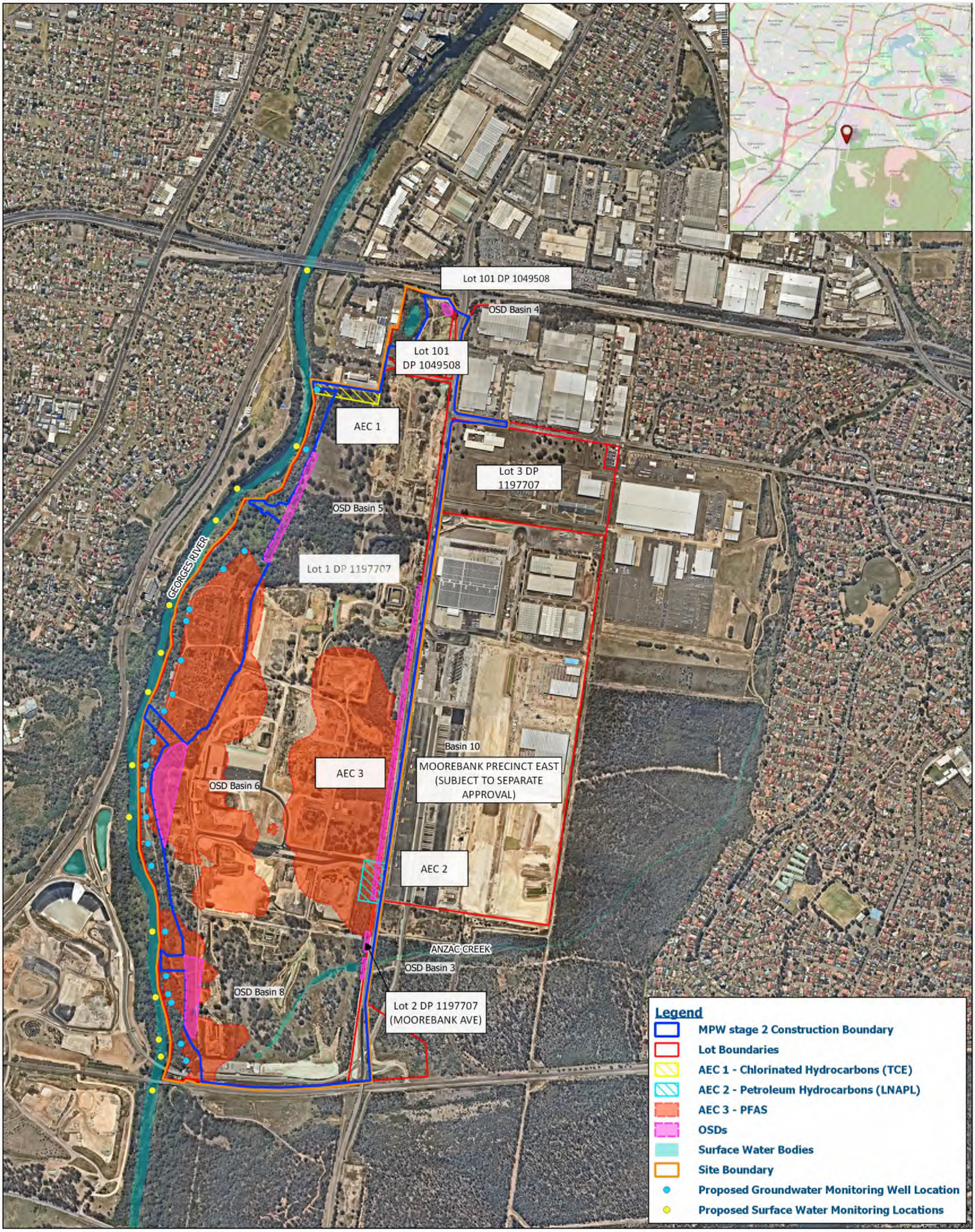
- Establish whether the residual groundwater contamination plume is shrinking, stable, or increasing, and whether natural attenuation and/or migration is occurring according to expectations through line-of-evidence collection.
- Detect changes in environmental conditions (e.g. hydrogeologic, geochemical or other changes) that may reduce the efficacy of any natural attenuation processes or that could lead to a change in the nature of impact.
- Recommendations for any changes to future monitoring scope or procedures.

Cessation of Monitoring

At the end of the 2 year post construction monitoring program, should stable or reducing concentrations in surface water, groundwater and stable or reducing groundwater mass flux be reported then a recommendation from a suitably qualified consultant to cease monitoring can be made for approval by the Site Auditor and / or NSW EPA.

Should stable or reducing conditions not be reported then additional monitoring will be required in accordance with recommendations by the suitably qualified consultant and a long-term monitoring program should be developed.

Groundwater monitoring can be ceased prior to completion of the 2 year post construction period, subject to completion of a human health and ecological risk assessment that concludes there is no risk to human health or the environment and approval by the Site Auditor and / or NSW EPA.



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Long Term Environmental Management Plan
Moorebank Precinct West

Figure EMP18_1 - Monitoring Locations

Job No: EP1489.001
Date: 2/09/2020
Drawing Ref: EMP18_1

N

0 170 340 510 m

Approximate Scale Only

Coordinate System: MGA 84
Drawn by: SL Checked by: PS
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

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

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

Training		EMP19
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Suitably trained personnel will be available to implement the requirements of the LTEMP.	

The Site owner or nominated responsible party, shall ensure that any personnel engaged in the implementation of nominated tasks for which the Site Occupant is responsible, have been provided with adequate training to manage the site contamination and hazardous materials conditions which may be encountered during site ground disturbance activities.

Personnel conducting sampling, measuring, monitoring and reporting activities are to be suitably trained or experienced in the activity. Records of all training are to be filed in accordance with the project filing system.

As a minimum the induction will include the following:

- Existence and requirements of this LTEMP;
- Relevant legislation, penalties, fines;
- Roles and responsibilities for Contamination Management;
- Landscape management measures;
- Asbestos identification and management requirements;
- Stockpile management measures;
- Material movement and tracking measures;
- Unexpected finds; and
- Toolbox meetings will also be undertaken, as and when required.

The Site Occupant shall maintain records of personnel engaged in the nominated tasks and their relevant training/qualifications for the period of implementation of the LTEMP in accordance with **EMP23** and with the document control system outlined in the CEMP.

Works involving contractors and subcontractors will be managed in accordance with **EMP20**.

Contractor and Subcontractor Management		EMP20
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Ensure that all persons who may be exposed to contaminated material are suitably aware of conditions and requirements of this LTEMP.	

The Site Owner (or nominated representative) is required to ensure that Contractors and Sub-contractors are advised of potential safety and environmental issues on site during site-specific induction training. This induction shall include the occupational health and safety responsibilities, requirements and controls for all (sub)contractors working on site. In addition, all site workers, including contractors and subcontractors shall be made aware that they are required to implement the provisions of this LTEMP.

All subcontractor activities will be monitored by the Site Owner, or a nominated representative, to ensure compliance with the requirements of this LTEMP.

They shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. All contractors and subcontractors are responsible for:

1. Providing their own personal protective equipment;
2. Training their employees in accordance with applicable laws;
3. Providing medical surveillance and obtaining medical approvals for their employees;
4. Ensuring their employees are advised of and meet the minimum requirements of this LTEMP and any other additional measures required by their site activities; and
5. Designating their own site safety officer.

All contractors/subcontractors must sign an acceptance form prior to commencing work on site.

Part 6.5 of the *Work Health and Safety Regulation 2011* required that an employer of employees undertaking construction work must ensure that the employees have completed induction training as specified by the Regulation. In addition, the Principal Contractor (if required) must not allow any person to carry out construction work unless he/she is satisfied that the person has undergone work health and safety induction training, including:

- General occupational health and safety training for construction work;
- Work activity-based health and safety training (job specific training); and
- Site specific health and safety induction training.

The Site Owner (or nominated representative) shall require all contractors completing such works to maintain, for each person carrying out construction/maintenance works, for a period of three years:

- A copy of relevant statements of OHS induction training, or a statement indicating that the Principal Contractor is satisfied that the relevant OHS induction training has been undertaken; and
- A brief description of the site-specific training undertaken by the person.

Contingency Plan		EMP21
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Ensure that in the event of unplanned exposure of impacted materials all appropriate measures are implemented to minimise the risk to on-site personnel and the environment.	

In the event site operations or conditions result in the disturbance of significant impacted material without the prior preparation of specific works/management procedures and implementation of appropriate exposure minimisation measures, or alternatively an environmental incident occurs (contaminant leak/spill, identification of asbestos in imported material, etc.), the following shall be implemented:

- Isolation of the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc.) to prevent exposure to site personnel and/or off-site airborne dust migration; and
- Implementation of applicable EMPs with respect to personnel and site management, or where appropriate the Unexpected Finds Protocol included in this LTEMP (**EMP14**), and subsequent appropriate removal/management of the identified impacted material via excavation and off-site removal or otherwise containment/treatment as applicable.

Where considered appropriate by the Site Owner (or its nominated representative), an appointed Environmental Consultant shall undertake an assessment of the impacted area such it can be confirmed the disturbance of material has not resulted in conditions with unacceptable risks to site users or the environment. This may include inspections, and or soil/water sampling within the site and subsequent analysis of samples for identified contaminants of concern at the site.

Following implementation of these procedures to ensure there are no further unacceptable exposures to site workers and/or environmental emissions, consideration shall be given to the requirements of **EMP22** to **EMP24** inclusive, in relation to documentation and renewal of the LTEMP to minimise the potential for future exposure of impacted material. This should include a formal review of the incident by an appropriately qualified person appointed by the Site Owner (or nominated representative) with the objective of identifying the cause of the incident and providing recommendations on alternative procedures or systems to be implemented at the site and/or within the LTEMP to prevent/minimise the likelihood of the incident reoccurring.

The incident shall be documented within the activity register as outlined in **EMP23** and where appropriate, amendment(s) to the LTEMP will be undertaken as outlined in **EMP24**.

Non-compliance with LTEMP		EMP22
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure the LTEMP is implemented as intended.	

Non-compliances with the intent and procedures of the LTEMP may occur during the implementation of the LTEMP.

Where a non-compliance is identified by a responsible organisation, they shall inform the affected organisations of the non-compliance in writing. Where a non-compliance with the LTEMP is identified by another organisation (in the activities of an alternate organisation), then they shall have the responsibility of informing the non-complying party in writing of the non-compliance. The non-complying party will be required to rectify the non-conformity as soon as possible, as per the requirements of the relevant procedure(s) where non-compliance has occurred.

Detail of the action taken to rectify the non-compliance shall be provided to each of the affected organisations in writing. Where a non-compliance cannot be rectified, then the LTEMP will require to be reviewed as per the requirements of **EMP25** LTEMP Review.

Where contaminated soil/spoil, water and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal / discharge) this will constitute a non-conformance to be managed under the CEMP.

Where contaminated soil/spoil, water and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal / discharge) the following will be undertaken:

- Where required, isolation of the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc) to prevent exposure to site personnel and/or off-site airborne dust migration;
- Implementation the Unexpected Finds Protocol Included in this LTEMP, and subsequent appropriate removal/management of the identified impacted material via excavation and off-site removal or otherwise containment/treatment as applicable;
- Fill out incident response form and raise a non-conformance for improvement; and
- Where required, notify regulatory authorities.

Record Keeping		EMP23
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Records of the implementation of the LTEMP require to be retained.	

The Site Owner (or nominated representative) shall be responsible for the maintenance of all documents relating to the implementation of the LTEMP. This shall include any contamination assessments and validation undertaken, registers for the maintenance of the LTEMP (site inspection forms, works approval checklists, revised plans, *etc.*) and any relevant correspondence between the Site Owner (or nominated representative), Contractors and/or any other party.

All records shall be retained by the Site Owner (or nominated representative) throughout the time of implementation of the LTEMP. In the event that the role of the Site Owner (or nominated representative) is transferred from one organisation to another, control of all relevant (historical and current) documents will be transferred for safe keeping to the current Site Owner (or nominated representative).

Audit / Review of LTEMP Implementation	EMP24
Responsibility:	Site Owner (or nominated representative)
Frequency:	Once every 12 months
Objective:	The implementation of the LTEMP requires to be audited in accordance with EPA guidance publications to identify areas of non-compliance or partial compliance with relevant legislation/regulations and/or the requirements of this plan.

An environmental audit shall be undertaken annually from implementation of this LTEMP to ensure ongoing compliance with the LTEMP requirements. The audit shall be undertaken by an Environmental Consultant in general compliance with the DEC '*Compliance Audit Handbook*' (DEC, Feb 2006) and identify areas of non-compliance or partial compliance with the requirements of:

- Relevant legislation / regulations; and
- This plan.

The findings of the audit should be documented and form the basis of the subsequent management review process as outlined following.

Specific tasks that will be undertaken as part of the audit include:

- Review of records generated by the Site Owner, and their respective contractors to ensure they meet the intended scope of the LTEMP;
- Review of the works register documenting ground disturbance activities completed at the site and associated work method statements, monitoring/validation activities to ensure that the management activities undertaken have met the intended scope of the LTEMP; and
- Periodic review and inspection of the Site condition, including annual inspection of liners within the OSDs and overflow drainage channels.

Where a non-compliance is detected during the audit process, then the non-compliance shall be informed as per the requirements of **EMP22**: Non-Compliances with LTEMP.

The Site Owner (or nominated representative) is required to maintain records of the audit review. Records will require to be maintained on site and made available to relevant authorities in the event of a site inspection.

The results of the audit will be considered as part of a broader review of the LTEMP to be undertaken on an annual basis by an Environmental Consultant in conjunction with the Site Owner. This review shall consider:

- The results of the LTEMP Audit as outlined above;
- Any non-compliances with the LTEMP that have been unable to be resolved;
- Practicalities and efficiencies of management measures and whether there are more effective ways to improve environmental compliance;
- Any changes in state or national environmental protection legislation or guidelines that impact any part of the LTEMP; or
- Any proposed changes in land-use of the site or adjoining sites which may impact upon exposure pathways.

Audit / Review of LTEMP Implementation	EMP24
Where a review identifies items, which are required to be modified, or added to the LTEMP, then a revision of the LTEMP shall be prepared by a Suitably Qualified Person. The revised LTEMP will require approval by relevant stakeholders prior to implementation of the revised plan.	

LTEMP Review		EMP25
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	The LTEMP requires review to ensure its continued appropriateness to be used on the Site.	

A review of the LTEMP shall be undertaken as required by an Environmental Consultant in conjunction with the Site Owner (or nominated representative). This review shall consider:

- The results of the LTEMP Audit as outlined in **EMP24**;
- Any non-compliances with the LTEMP that have been unable to be resolved;
- Practicalities and efficiencies of management measures and whether there are more effective ways to improve environmental compliance;
- Any changes in state or national environmental protection legislation or guidelines that impact any part of the LTEMP; or
- Any proposed changes in land-use of the site or adjoining sites which may impact upon exposure pathways.

If the Site Owner ceases to be recognised as the Site Manager, a review of the LTEMP document and compliance measures will be necessary to identify suitable replacement LTEMP compliance mechanisms.

In addition, where a review identifies items which are required to be modified, or added to the LTEMP, then a revision of the LTEMP shall be prepared by a suitably qualified person.

This plan is to be revised at the completion of Stage 2 earthworks to include protocols for ongoing maintenance and/or monitoring or any long term remedial/mitigation measures to be implemented following completion of the Site Audit Statement.

Any revisions to the LTEMP must be approved by the appointed NSW EPA accredited Site Auditor.

Cessation of LTEMP Application		EMP26
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure impacts associated with residual issues requiring management at the Site during construction and operation of the Proposed Development been appropriately resolved to ensure the ongoing suitability of the site for the proposed land use.	

To address potential residual soil and groundwater issues after the scope of the remediation is completed, the Golder (2016) RAP envisaged implementation of a LTEMP to provide a management, monitoring and review framework.

Cessation of the application of the LTEMP will be dependent upon the results of groundwater and surface water monitoring and trend analysis and will require an additional site-specific human health and ecological risk assessment.

Once the Environmental Consultant is satisfied that the residual contamination at the Site does not present a risk of harm to human health and the environment, then the final site-specific human health and ecological risk assessment will include recommendations for cessation of the LTEMP for approval by the NSW EPA or appointed NSW EPA accredited Site Auditor.

Appendix E

CONDITIONS OF CONSENT COMPLIANCE MATRIX

Table E1 – Conditions of Consent (CoC) – SSD 5066			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B2	The approved works (including and excavation required for remediation) must not occur below 5 metres Australian Height Datum (AHD) and lower the water table below 1 m AHD on adjacent class 1, 2, 3, 4 land in accordance with the Liverpool Local Environmental Plan ('LEP') (2008).	EP Risk (2020b) ASSMP	All works below 5 m AHD to be undertaken in accordance with an acid sulfate soil management plan.
B3	The subject site is to be remediated in accordance with: a) The approved Remedial Action Plan; b) State Environmental Planning Policy No. 55 – Remediation of Land; and c) The guidelines in force under the Contaminated Land Management Act.	Golders (2016) RAP and JBS&G (2020) Remediation Validation Report prepared.	JBS&G (2020) reported that remediation was undertaken in accordance with the Golders (2016) RAP, which includes compliance with SEPP 55 and the CLM Act.
	Amendments to the approved Remedial Action Plan required as a result of further site investigations must be approved by the site auditor, in consultation with the EPA.		No amendments to the RAP have been prepared.
	Within 3 months after completion of the remediation works, a notice of completion, including a validation and/ or monitoring report is to be provided to the Secretary. This notice must be consistent with State Environmental Planning Policy No. 55 – Remediation of Land.	JBS&G (2020) Remediation Validation Report	The JBS&G (2020) Remediation Validation Report will be provided to the Secretary pending approval by the Site Auditor.
	The validation and monitoring report is to be independently audited and a Site Audit Statement issued. The audit is to be carried out by an independent auditor accredited by the Environmental Protection Authority. Any conditions recorded on the Site Audit Statement are to be complied with.		The JBS&G (2020) Remediation Validation Report has been provided to the Site Auditor for review in the preparation of a site audit statement (pending).

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B161	Prior to the commencement of any works, the Applicant must engage a Site Auditor accredited under the Contaminated Land Management Act 1997 NSW Site Auditor Scheme.	Section 1.3	Site Auditor engaged
B162	Prior to construction, the Applicant must provide the EPA [Environment Protection Authority] with a copy of all reports to date relating to the assessment of PFAS undertaken for the development and in relation to contamination from the development.		Post the Provision of the MPW S 2 Site Audit Statement including the subsequent approval of the LTEMP all records will be provided to the EPA
B163	Should the Applicant identify a potential risk to off-site receptors due to PFAS contamination, the Applicant must contact the EPA as soon as practicable to discuss requirements for community consultation.		EnRiskS (2019) has prepared an off-site Waterway Human Health and Ecological Risk Assessment that has been provided to the Site Auditor. The Site Auditor has reviewed the EnRiskS (2019) report and provided his review and the EnRiskS (2019) report to the EPA.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B164	Prior to vegetation clearing: • The Applicant must identify contamination within vegetated areas and prepare options for remediation in those areas, with the objectives to: - retain vegetation to the greatest extent possible beyond the completion of remediation; - minimise land disturbance in accordance with Condition B41; and - not reduce the ability to provide connectivity and habitat corridors in accordance with Conditions B2 and B152; • Where remediation requires vegetation clearing, an appropriate assessment of the impact of clearing on contaminated land must be prepared by a suitably qualified and experienced consultant; and • Where contamination is identified as occurring within those areas where vegetation is proposed to be cleared, a Contamination Management Plan must be prepared in consultation with the Site Auditor detailing the location and nature of the contamination and the proposed remediation and/ or management measures that will be undertaken to address the on-site and potential off-site impacts.	EP Risk (2020) CMP	A CMP was prepared and all vegetation removal works are complete. Any residual contamination remaining post CMP works are outlined in Appendix C with management procedures provided in
B165	A copy of the assessment required by Condition B164 above and any associated update of the CEMP required must be provided to the Planning Secretary for approval one month before commencement of vegetation clearing. Evidence of consultation with the Site Auditor must be included.	EP Risk (2020) CMP	Qube has provided CMP to the Planning Secretary.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B166	Following vegetation clearing and prior to the commencement of other construction activities, the Applicant must complete remediation of the site in accordance with any relevant Remedial Action Plan (RAP) to the satisfaction of the Planning Secretary. The RAP must include options to remediate and/or manage PFAS impacted areas across the site, including the conservation area. The RAP must be submitted to the accredited site auditor and the NSW EPA for comment prior to implementation. If any amendments are required to the RAP, the amendments must be approved by an EPA accredited Site Auditor.	Golder (2016) RAP and JBS&G (2020) Remediation and Validation Report	The Golder (2016) RAP has been prepared and approved by the Site Auditor and no amendments have been made. Remediation of the site has been completed following vegetation clearing and prior to construction activities as detailed in the JBS&G (2020) Remediation Validation Report.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B167	The Applicant must prepare a Validation Report for the Stage 1 development. The Validation Report must: • Be reviewed by an EPA accredited Site Auditor; • Be prepared in accordance with the RAP and the Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011); - Include, but not be limited to: - comment on the extent and nature of the remediation undertaken, - describe the location, nature and extent of any remaining contamination on site, - sampling and analysis plan and sampling methodology, - details of the volume of treated material emplaced within any remaining containment cell, - results of any validation sampling, compared to relevant guidelines/ criteria, and - discussion of the suitability of the remediated areas for the intended future land uses described under SSD 5066 and SSD 7709 – Stage 2 (including for the raised landform and imported fill characteristics and the drainage outlet structures in the riparian corridor).	JBS&G (2020) Remediation Validation Report	JBS&G (2020) Remediation Validation Report prepared and submitted to the Site Auditor for approval.
B168	A copy of the Validation Report must be provided to the Planning Secretary, EPA and the Certifying Authority prior to commencement of construction (other than the vegetation clearing required for remediation).	JBS&G (2020) Remediation Validation Assessment Report	To be provided to the Planning Secretary after approval by the Site Auditor.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
B169	Upon completion of the remediation required in relation to Stage 1 (SSD 5066) and this development and prior to the commencement of construction (other than the vegetation clearing required for remediation) in relation to this approval (i.e. Stage 2 SSD 7709), the Applicant must submit to the Planning Secretary, a Site Audit Report and a Site Audit Statement A for the whole site, prepared in accordance with the NSW Contaminated Land Management - Guidelines for the NSW Site Auditor Scheme 2017, which demonstrates the site is suitable for its intended land uses under Stage 2 SSD 7709 including for the: a) importation and placement of fill, b) construction of a warehouse estate including warehouse buildings, c) development of an intermodal terminal, and protection of the conservation area including riparian corridor and biodiversity offset sites.	JBS&G (2020) Remediation and Validation Assessment Report. This Plan	• JBS&G (2020) Remediation Validation Report prepared in accordance with the Golder (2016) RAP. • The JBS&G (2020) Remediation Validation Report states that the site is suitable for the intended land use subject to the implementation of this Plan. • The JBS&G (2020) Remediation Validation Report and this Plan have been provided to the Site Auditor for approval.
B170	To ensure that no residual contaminated land on site is impacted by this approval, the requirements of Site Audit Statement required by Condition B169 cannot be staged.	NA	To be actioned by the Site Auditor
B171	Upon completion of importation and placement of fill and prior to construction of permanent built surface works, the Applicant must submit to the Planning Secretary, a Site Audit Report and a Site Audit Statement A for the whole site, prepared in accordance with the NSW Contaminated Land Management - Guidelines for the NSW Site Auditor Scheme 2017, which demonstrates the site is suitable for its intended land uses under MPW Stage 2 SSD 7709.	NA	To be actioned by the Site Auditor
B172	Where remediation outcomes for the site require long term environmental management, a suitably qualified and experienced person must prepare a Long-Term Environmental Management Plan (LTEMP), to the satisfaction of the Site Auditor. The plan must:	This Plan	LTEMP prepared by a suitably qualified and experienced person – Certified Environmental Practitioner – Contaminated Land (CEnvP CL). This Plan has been sent to the Site Auditor for approval.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
	a) be submitted to the Planning Secretary and EPA prior to commencement of construction (other than vegetation clearing); and		Qube to provide this Plan to the Planning Secretary once approved by the Site Auditor.
	b) include, but not be limited to:		
	i. a description of the nature and location of any contamination remaining on site,		**Appendix C** of this Plan.
	ii. provisions to manage and monitor any remaining contamination, including details of any restrictions placed on the land to prevent development over the containment cell,		**Appendix D** of the LTEMP provides Environmental Management Procedures including details of restrictions. A containment cell is not proposed in this Plan, however a conceptual design for a short to medium term engineered stockpile is provided as **Appendix H**.
	iii. a description of the procedures for managing any leachate generated from the containment cell, including any requirements for testing, pumping, treatment and/ or disposal,		A containment cell is not proposed in this Plan, however **Appendix H** of this Plan provides conceptual design and description of leachate management for the short to medium term engineered stockpile.
	iv. a description of the procedures for monitoring the integrity of the containment cell,		A containment cell is not proposed in this Plan, however **Appendix H** of this Plan provides description of leak detection and monitoring for the short to medium term engineered stockpile.
	v. a surface and groundwater monitoring program,		The surface and groundwater monitoring program is detailed in Section 5 of this Plan and **EMP18** in **Appendix D** of this Plan.
	vi. mechanisms to report results to relevant agencies,		Reporting mechanisms provided in Section 5 and **Appendix D** of this Plan. EMP18 in Appendix D provides protocols for the cessation of monitoring post development subject to approval by the Site Auditor and / or NSW EPA.
	vii. triggers that would indicate if further remediation is required, and		An unexpected finds protocol to manage further remediation is provided as Appendix F of the LTEMP.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
	viii. details of any contingency measures that the Applicant is to carry out to address any ongoing contamination.		A contingency plan is provided as **EMP21** in **Appendix D** of this Plan.
B173	The LTEMP must be registered on the title to the land.	This Plan	Section 1.3
B180	The Applicant must assess and classify all liquid and nonliquid wastes to be taken off site in accordance with the latest version of EPA's Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA 2014) and dispose of all wastes to a facility that may lawfully accept the waste.	Appendix D	**EMP10** in **Appendix D** addresses liquid and non-liquid waste classification
C1	The applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include: a) Baseline data; b) A description of: (i) The relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) Any relevant limits or performance measures/criteria; and (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 measurement measures; c) A description of the management measures to be implemented to comply with the relevant statutory requirements, limits or performance measures/criteria; d) A program to monitor and report on the: (i) Impacts and environmental performance of the development; and (ii) Effectiveness of any management measures (see (c) above); e) A contingency plan to manage any unpredicted impacts and their consequences;	a) Section 3 and Appendix C b) i) Section 4 ii) Appendix D iii) Appendix D c) Appendix D d) i) Appendix D ii) Section 5 e) EMP21 f) EMP24 g) EMP22 h) Section 4.1 i) EMP25	a) Includes known site conditions and summarised remaining contamination issues. b) (i) Covers any relevant approval and/or licence. (ii) Specifies adopted criteria to be used for assessment and validation. (iii) Specifies sampling and validation plans and the decision questions needing to be answered for each different type of assessment/validation. c) Specifies the details of each management plan as required by Golder (2016a). d) (i) Describes the sampling analysis and reporting program for each contamination issue requiring management; and (ii) The sampling and validation programs will report on the effectiveness of the management measures. e) Details the Unexpected Finds Procedure in relation to contamination.

Table E2 – Conditions of Consent (CoC) – SSD 7709			
CoC	**Requirement**	**Document Reference**	**How Addressed**
	f) A program to investigate and implement ways to improve the environmental performance of the development over time; g) A protocol for management and reporting any: (i) Incidents and non-compliances; (ii) Complaints; (iii) Non-compliances with statutory requirements; and h) Roles and responsibilities for implementing the plan; and i) A protocol for periodic review of the plan.		f) Continual improvement for the LTEMP is discussed. g) Appendix D provides protocols and reporting: (i) Specifies how incidents and non-compliances will be managed. (ii) Specifies how complaints in relation to contamination will be managed. (iii) Specifies how non-compliance to statutory requirements will be managed. h) Lists the responsibilities for the LTEMP Implementation. i) Specified how the LTEMP will be reviewed/updated.

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.2 – Management controls – Early Works and Construction phase	Contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory and preliminary field test results.	**Section 3** provides an overview on the remaining contamination issues remaining at the Site. **Appendix D** – **EMP14** describes the chase out of impacted soils and fill for unexpected finds.
		Excavated soil would be temporarily stockpiled, sampled and analysed for waste classification processes. Following receipt of waste classification results, the material would be transported to a licensed off-site waste disposal facility as soon as practicable to minimise dust and odour issue through storage of materials on-site	**EMP06** and **EMP10**
		Stockpiled soils would be stored on a sealed surface and the stockpiled areas would be securely bunded using silt fencing to prevent silt laden surface water from entering or leaving the stockpiles or the Project site.	**EMP06**
		All excavation works would be undertaken by licensed contractor experienced in remediation projects and the handling of contaminated soils.	**Section 4**
		All asbestos removal, transport and disposal must be performed in accordance with the Work Health and Safety Regulation 2011 (WH&S Regulation).	**EMP14**
		The removal works would be conducted in accordance with the National Occupational Health and Safety Commission Code of Practice for the Safe Removal of	**EMP14**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		Asbestos, 2nd Edition [NOHSC 2002 (2005)] (NOHSC 2005a).	
		An appropriate asbestos removal licence issued by WorkCover would be required for the removal of asbestos impacted soil.	**EMP14**
		Environmental management and WH&S procedures would be put in place for the asbestos removal during excavation to protect workers, surrounding residents and the environment.	**EMP14**
		Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	**EMP14**
		An asbestos removal clearance certification would be prepared by an occupational hygienist at the completion of the removal work. This would follow the systematic removal of asbestos containing materials and any affected soils from the Project site and validation of these areas (through visual inspection and laboratory analysis of selected soil samples).	**EMP14**
		Asbestos fibre air monitoring would be undertaken during the removal of the asbestos materials and in conjunction with the visual clearance inspection. The monitoring would be conducted in accordance with the National Occupational Health and Safety Commission Guidance Note on the Membrane Filter Method for the Estimating	**EMP14**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		Airborne Asbestos Fibre, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).	
		All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.	**EMP06**
		Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).	**EMP06**
		Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 4. All such preparatory works would be undertaken prior to the placement of material in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil.	**EMP06**
		The stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater	**EMP06**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		infiltration and to reduce windblown dust or odour emission	
		Before the reuse of any material on-site, it would be validated so that the lateral and vertical extent of the contamination is defined	**EMP06 and EMP07**
		Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities	**EMP10**
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.4– monitoring	Within each of the Project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:	
		The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;	**EMP22, EMP 23 and EMP24**
		Project approvals issued under the EPBC Act and EP&A Act;	Approval provided
		Contractual requirements established between MIC and the developer and operator for the Project;	N/A
		Other permits and/or licences required during the Project; and	N/A
		Objectives, targets and indicators as presented in this PEMF.	CEMP

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.5 – Management response to incidents and non-compliances	Contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal).	**EMP05, EMP06, EMP07, EMP10**
8b) and c)	REMM 7A	To minimise the risk of leakages involving natural gas, liquid natural gas (LNG) and flammable and combustible liquids to the atmosphere: appropriate standards for a gas reticulation network, including AS 2944-1 (2007) and AS 2944-2 (2007), would be referred to in the detailed design process; correct schedule pipes would be used; a fire protection system would be installed if necessary for gas users; cathodic protection would be installed for external corrosion if appropriate; and access to the Project site would be secure.	CEMP
	REMM 7B	To minimise the risks of leakage of LNG and liquid petroleum gas (LPG) and flammable liquids during transport: materials would be transported according to the Australian Dangerous Goods (ADG) Code, relevant standards and regulations; and contractors delivering the gas would be trained, competent and certified by the relevant authorities	CEMP

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
	REMM 7C	To minimise hazards associated with venting of natural gas, LNG and LPG: LNG storage would be designed to AS/NZS 1596-2008 standards; access to the Project site would be secure; and significant separation distances to residences and other assets would be put in place	CEMP
8b) and c)	REMM 7D	Storage of flammable/combustible liquids would be carried out in accordance with AS 1940, with secondary containment in place and location away from drainage paths	CEMP
	REMM 7E	Standby or emergency generators and transformers would all have secondary containment	CEMP
	REMM 7F	Oil coolers would generally be located in areas where leaks and runoff are appropriately controlled at source or in a retention basin.	CEMP
	REMM 7I	No hazardous or regulated wastes would be disposed of onsite.	**EMP06 and EMP10**
	REMM 7J	All offsite disposals would be carried out by approved transport operators and to approved facilities	**EMP10** and CEMP
	REMM 7K	Other dangerous goods, including any waste materials present on the Project site, would be suitably contained, with secondary containment and runoff controls implemented where appropriate to prevent leaks or spills	CEMP

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.	
	REMM 8B	Before construction, a remediation program would be implemented in accordance with the Moorebank Intermodal Terminal Preliminary Remediation Action Plan (RAP) (or equivalent). The program will have been formally reviewed and approved by the Site Auditor under Part 4 of the NSW Contaminated Land Management Act 1997 (CLM Act).	Currently Stage 1 works have been completed in accordance with the RAP (Golder 2016a). The outcomes of the remediation are documented in the JBS&G (2020) Remediation Validation Report under review by the Site NSW EPA Accredited Auditor. The remaining contamination is documented in this Plan in **Appendix C** along with the management measures in **Appendix D**
	REMM 8D	An unexploded ordnance (UXO) management plan (or equivalent) would be developed for the Project site. This plan would detail a framework for addressing the discovery of UXO or explosive ordnance waste (EOW) to ensure a safe environment for all Project staff, visitors and contractors.	**Appendix H**
	REMM 8E	An ASS management plan (or equivalent) would be developed in accordance with the ASSMAC Assessment Guidelines (1998), with active ongoing management through the construction phases. Offsite disposal would need to be in accordance with the NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils (2009).	EP Risk (2020b) has prepared an Acid Sulfate Soil Management Plan which has been included in the CEMP for Stage 2 works.
	REMM 8F	Further testing of residual sediments would be undertaken to gather data to inform the management of sediments likely to be disturbed/dewatered during construction.	Further testing of sediments has been undertaken by JBS&G 2018a[1].

[1] L144 (PFAS Soil Assessment - Swales and Basins) Rev 0. JBS&G April 2018.

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
	REMM 8G	Ground penetrating radar (GPR) or similar techniques would be used to locate and document all existing and underground tank infrastructure across the Project site.	This process was conducted as part of the Stage 1 MPW works and is documented in the validation report (JBS&G 2020).
	REMM 8H	A management tracking system for excavated materials would be developed to ensure the proper management of the material movements at the Project site, particularly during excavation works.	**EMP05** and **EMP06**
	REMM 8I	Contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory and preliminary field test results.	**EMP01, EMP02, EMP03, EMP04**
	REMM 8J	Excavated soil would be temporarily stockpiled, sampled and analysed for waste classification processes. Subject to receipt of waste classification results, the material would be transported to a licensed offsite waste disposal facility as soon as practicable to minimise dust and odour issue through storage of materials on site.	**EMP06** and **EMP10**
8b) and c)	REMM 8K	Stockpiled soils would be stored on a sealed surface and the stockpiled areas would be securely bunded using silt fencing to prevent silt laden surface water from entering or leaving the stockpiles or the Project site	**EMP06**
	REMM 8L	All excavation works associated with potential contaminated lands would be undertaken by licensed contractors, experienced in remediation projects and the handling of contaminated soils.	**Section 4**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
	REMM 8M	All asbestos removal, transport and disposal would be performed in accordance with the Work Health and Safety Regulation 2011 (WHS Regulation)	**EMP14**
	REMM 8N	The removal works would be conducted in accordance with the National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC 2002 (2005)] (NOHSC 2005a).	**EMP14**
	REMM 8RO	An appropriate asbestos removal licence issued by WorkCover NSW would be required for the removal of asbestos contaminated soil.	**EMP14**
	REMM 8P	Environmental management and WHS procedures would be put in place for the asbestos removal during excavation to protect workers, surrounding residents and the environment.	**EMP14**
	REMM 8Q	Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	**EMP14**
	REMM 8R	An asbestos removal clearance certification would be prepared by an occupational hygienist at the completion of the removal work. This would follow the systematic removal of asbestos containing materials and any affected soils from the Project site, and validation of these areas (through visual inspection and laboratory analysis of selected soil samples)	**EMP14**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
8b) and c)	REMM 8S	Asbestos fibre air monitoring would be undertaken during the removal of ACMs and in conjunction with the visual clearance inspection. The monitoring would be conducted in accordance with the National Occupational Health and Safety Commission Guidance Note on the Membrane Filter Method For the Estimating Airborne Asbestos Fibre, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).	**EMP14**
	REMM 8T	All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials	**EMP06**
	REMM 8U	Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas)	**EMP06**
	REMM 8V	Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 5A and 5B. All such preparatory works would be undertaken before material is placed in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density	**EMP06**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil	
8b) and c)	REMM 8W	Any stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission	**EMP06**
	REMM 8X	Before the reuse of any material on site, it would be validated so that the lateral and vertical extent of the contamination is defined.	**EMP07**
	REMM 8Y	Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities	**EMP10**
	REMM 8Z	Where necessary, consider undertaking further investigations to determine whether other buildings have organochlorine pesticides (OCP) impacts subgrade materials, and to quantify the volume of OCP impacted materials across the site	Not relevant as all buildings have been removed as part of the Stage 1 Early Works.
	REMM 8AA	Additional Aqueous Film Forming Foam assessment (AFFF) be undertaken to determine if any direct remedial and/or management actions are required. A stage approach is considered appropriate and is detailed in the Preliminary AFFF Assessment (Golder Associates 2015b).	Additional PFAS Investigations have been undertaken on the Site and are summarised by EP Risk (2018) and ongoing groundwater monitoring is proposed in **EMP18** in **Appendix D**.
8 d)	-	In relation to management of PFAS:	

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
	i)	be consistent with: • National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (ASC NEPM 2013). • Australian and New Zealand Guidelines for Fresh and Marine Water Quality (under the National Water Quality Management Strategy) including the draft default guideline values for perfluorooctanoic acid (PFOS) and perfluorooctane sulfonic acid (PFOA) in freshwater as applied by the State government • relevant Commonwealth environmental management guidance on PFOS and PFOA	**Section 4** and **Appendix D** of this Plan are consistent with these guidelines (where relevant).
	ii)	detail implementation and operational procedures, appropriate to the risk posed by any contamination, including: • roles and responsibilities • management of potential PFAS contaminated sites as yet un-investigated • management of areas of known PFAS contamination, including strategies to reduce runoff, dewatering and migration of contamination across and off the proposed site • a contingency action plan for unexpected PFAS contaminant discoveries	**Section 4.1** EP Risk (2018) **EMP04, EMP05, EMP06, EMP07, EMP08, EMP09, EMP14, EMP21**
	iii)	detail soil, groundwater and surface water PFAS contamination monitoring requirements and testing and	**EMP18**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		disposal procedures appropriate to the risk posed by any contamination	
	iv)	include requirements for site validation reports appropriate to the risk posed by any contamination	Golder 2016a RAP
	v)	include requirements for remedial action plans appropriate to the risk posed by any contamination	Golder 2016a RAP
	vi)	detail review procedures appropriate to the risk posed by any contamination	**EMP25**
	vii)	impose the following performance measures for managing earthworks and the potential for effects to occur due to disturbance of PFAS contaminated soils during construction: • contaminated sediment to be discharged outside the site of the action to be minimised • contaminated waste material, including excavated soil, to be released through dewatering to be handled appropriately to the risk posed by the contamination and disposed of in an environmentally sound manner such that potential for the PFAS content to enter the environment is minimised contaminated waste material, including excavated soil, with a PFOS or PFOA content above 50 milligrams per kilogram (mg / kg) to be stored or disposed of in an environmentally sound manner, such that PFAS content does not enter the environment	**Appendix D**

Table E3 – Conditions of Approval (CoA) – EPBC 2011/6086			
CoA	**Reference**	**Condition Requirement**	**Document Reference and How Addressed**
		• all soil remaining at the site of the action to be suitable for purpose	

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
OB	The CEMP, or equivalent, for the Proposal would be based on the PCEMP (Appendix I of this EIS), and include the following preliminary management plans: • Preliminary Construction Traffic Management Plan (PCTMP) (Appendix M of the EIS) • Air Quality Management Plan (Appendix O of the EIS) • Erosion and Sediment Control Plans (ESCPs) and Bulk Earthworks Plans, within the Stormwater Drainage Design Drawings (Appendix R of the EIS) As a minimum, the CEMP would include the following sub-plans: • Construction Traffic Management Plan (CTMP) • Construction Noise and Vibration Management Plan (CNVMP), prepared in accordance with the Interim Construction Noise Guideline • Cultural Heritage Assessment Report/Management Plan • Construction Air Quality Management Plan • Construction Soil and Water Management Plan (SWMP), prepared in accordance with Managing Urban Stormwater, 4th Edition, Volume 1, (2004) • ESCP • Flood Emergency Response and Evacuation Plan • UXO, EO, and EOW Management Plan • Acid Sulfate Soils Management Plan • Bushfire Management Strategy • Community Information and Awareness Strategy. • Flora and Fauna Management Plan (FFMP) • Groundwater Monitoring Program (GMP)	**CEMP**	CEMP prepared by the Principal Contractor during construction

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
5A	A SWMP and ESCP, or equivalent, would be prepared for the Proposal. The SWMP and ESCPs would be prepared in accordance with the principles and requirements of the Blue Book and based on the Preliminary ESCPs provided in the Stormwater and Flooding Assessment Report (refer to Appendix R of the EIS). The following aspects would be addressed within the SWMP and ESCPs: Stockpiles would be located away from flow paths on appropriate impermeable surfaces, to minimise potential sediment transportation. Where practicable, stockpiles would be stabilised if the exposed face of the stockpile is inactive more than ten days, and would be formed with sediment filters in place immediately downslope	**CEMP**	While this plan is separate to the SWMP and ESCP it does include this requirement for the management of stockpiles.
5I	Stockpile sites established during construction are to be managed in accordance with stockpile management principles set out in Appendix L of this RtS. Mitigation measures within the Stockpile Management Protocol include: In order to accept fill material onto site, material characterisation reports/certification showing that the material being supplied is virgin excavated natural material (VENM) / excavated natural material (ENM) must be provided. Each truck entering the Site will be visually checked and documented to confirm that only approved materials that are consistent with the environmental approvals are allowed to enter the site. Only fully tarped loads are to be accepted by the gatekeeper. Environmental Assurance of imported fill material will be conducted to confirm that the materials comply with the NSW EPA Waste Classification Guidelines and the Earthworks Specification for the MPW site. The	**EMP06, EMP10** and **CEMP**	These measures have been included in the LTEMP.

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	frequency of assurance testing will be as nominated by the Environmental assuror/auditor. All trucks accessing the site for the purpose of clean general fill importation would enter and exit via the existing main Site access located from Moorebank Avenue. Ingress and egress to the stockpiling areas would be arranged so that the reversing of trucks within the site is minimised. Stockpiles would not exceed ten-metres in height from the final site levels, with battered walls at gradients of 1V:3H For any stockpile heights greater than 4 m, benching would be implemented. Where reasonable and feasible, and to minimise the potential for erosion and sedimentation of stockpile(s), stockpile profiles would typically be at angle of repose (the steepest angle at which a sloping surface formed of loose material is stable) with a slight concave slope to limit the loss of sediments off the slope, or through the profile and the formation of a toe drain. The top surface of the stockpile(s) would be slightly sloped to avoid ponding and increase run off. Topsoil stockpiles would be vegetated to minimise erosion. Stockpiles would be protected from upslope stormwater surface flow through the use of catch drains, berms, or similar feature(s) to divert water around the stockpile(s). A sediment control device, such as a sediment fence, berm, or similar, would be positioned downslope of the stockpile to minimise sediment migration. Any water seepage from stockpiles would be directed by toe drains at the base of the stockpiles toward the sediment basins or check dams and away from the emplacement or extraction working face.		

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	Newly formed stockpiles would be compacted (sealed off) using a smooth drum roller at the end of each working day to minimise water infiltration. Haul roads would be located alongside the stockpile to the work/tipping area. As per best practice, the catchment area of haul roads for surface water runoff would be approximately 2530 m lengths, facilitated by the provision of spine drains which would convey water from the haul road to toe drains at the base of the stockpile, and then to sediment basins. Temporary sediment basins would be established in accordance with the ESCP prepared for the site. Stockpiling of clean fill material is to be carried out during Works Period A (pre-construction) and Works Period D (bulk earthworks). Any imported clean general fill material that would be subject to stockpiling within the Proposal site for more than a 10-day period without being worked on, would be subject to stabilisation works, to minimise the potential for erosion. Where the material being stockpiled is less coarse or has a significant component of fines then surface and slope stabilisation would be undertaken. Methods for slope stabilisation may include one or a combination of the following: – Application of a polymer to bind material together – Application of hydro-seed or hydromulch – Covering batters with mulch to provide ground cover – Covering batters with geofabric – Use of a simple sprinkler system for temporary stockpiles, including use of radiating sprinkler nozzles to maintain fine spray over exposed surfaces		

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	– Other options identified by the Contractor Topsoil stockpiles would be seeded with a grass/legume or nitrogen fixing species (such as acacia) to assist in erosion control and reduce loss of beneficial soil nutrients and micro-organisms		
6A	The CEMP would identify the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol), and will address REMM items 8H, 8T, 8U, 8V and 8W (of the MPW Concept Plan Approval (SSD 5066)).	**CEMP**	To be addressed in the CEMP.
6B	A site-specific Remediation Action Plan (RAP) is not considered to be required for the Proposal. The following documentation would be utilised for the purposes of remediating the site: • The Preliminary Remediation Action Plan (PB, 2014a) • The Validation Plan – Principles (Golder, 2015b) • The Demolition and Remediation Specification (Golder 2015c) • Any other contamination documentation prepared for the remediation activities undertaken for MPW Early Works (Stage 1).	**JBS&G 2020**	Currently Stage 1 works are completed and have been completed in accordance with the RAP (Golder 2016). The outcomes of the remediation are documented in the Validation Report (JBS&G 2020) under review by the Site NSW EPA Accredited Auditor.
6C	The CEMP would include the preparation of a site-wide UXO, EO, and EOW management plan (or equivalent) based on the UXO Risk Review and Management Plan (G-Tek, 2016). This plan would be implemented to address the discovery of UXO or EOW during construction, to ensure a safe environment for all staff, visitors and contractors.	**CEMP**	The plan outlines the review and actions required to manage any unexpected finds in relation to the UXO Risk.
6D	An Asbestos in Soils Management Plan (AMP) is to be implemented as part of the CEMP in accordance with the Safe Work NSW requirements, including but not limited to: • the Guidelines for Managing asbestos in or on soil (2014), and • Codes of Practice - How to Safely Remove Asbestos (2011) and	**Golder 2016b**	The asbestos in soils management plan has been developed in accordance with current Guidelines and codes of practice.

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	• How to Manage and Control Asbestos in the Workplace (2011).		
6E	An Acid Sulfate Soils Management Plan (ASSMP) (or equivalent) would be prepared as part of the CEMP in accordance with the ASSMAC Assessment Guidelines (1998), for areas identified as being of low or high risk i.e. works within close vicinity of the Georges River (Figure 13-2 of this EIS). In addition, a risk assessment quantifying the risks associated with the volumes of soil to be disturbed, the laboratory results from ASS testing undertaken, the end use of the materials and the proximity to sensitive environments is to be undertaken. All offsite disposal would be in accordance with the *NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils* (2009).	**EP Risk 2020b**	A separate ASSMP has been prepared for the Site.
6F	The existing groundwater monitoring undertaken for the Proposal would continue. A GMP would be developed at the conclusion of remediation activities for the Proposal and included as part a Long-Term Environmental Management Plan (LTEMP) (to be prepared for approval by the Accredited Site Auditor and in association with the OEMP). The main purpose of the GMP would be to assist in the management of groundwater contamination (particularly PFAS impacts) at the site, and to minimise potential harm to human health and the environment. The GMP would achieve the following objectives: Establish whether the residual groundwater contamination plume is shrinking, stable, or increasing, and whether natural attenuation and/or migration is occurring according to expectations through line-of-evidence collection Provide appropriate groundwater investigation levels (GILs) for groundwater contaminants, in accordance with the National	**EMP18**	A groundwater sampling strategy is included in **EMP18**.

Table E4 – Final Compilation of Mitigation Measures (FCMMs)			
FCMM	**Requirement**	**Document Reference**	**How Addressed**
	Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM). Should exceedances be identified, contingency plans for further investigations or remediation would be prepared. Provide appropriate trigger levels for key contaminants (where available), based on the receptor of interest and identified contaminants Serve as a compliance program, so that potential impacts to down-gradient receptors are identified before adverse effect occurs (relative to above objectives) Detect changes in environmental conditions (e.g. hydrogeologic, geochemical or other changes) that may reduce the efficacy of any natural attenuation processes or that could lead to a change in the nature of impact. Establish groundwater conditions (i.e. concentrations and/or trends) which indicated that groundwater monitoring could be reduced or ceased and the requirements of the GMP absolved. The monitoring program is to be undertaken for two years post operation of the Proposal to ensure a range of seasonal and river flow variations is assessed. At the completion of the two-year period, subject to analysis of results, consideration would be given to whether this monitoring is required to continue. The approach to PFAS management will be confirmed following further monitoring in consultation with, and the approval of, the NSW EPA Accredited Site Auditor.		
6H	At the conclusion of remediation works, a Remediation and Validation Report (RVR) is to be prepared for the Proposal to facilitate the Auditor's review of remediation and validation activities. The RVR is to document the remediation and validation activities completed within specific areas of the Proposal, including:	**JBS&G 2020**	Currently Stage 1 works are completed and have been completed in accordance with the RAP (Golder 2016a). The outcomes of the remediation are documented in the Validation Report (JBS&G 2020) under review by the Site NSW EPA Accredited Auditor.

Table E4 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	• Information relating to the materials used in the separation layers such as the soil types, geotextile materials, and sealant types etc. (if required) • An as-constructed plan of the site showing the locations, depths and materials of the separation layers installed at the site.		
6I	The existing site-wide Long-Term Environmental Management Plan (LTEMP), such as the one established at the completion of Early Works, is to be revised at the completion of the Proposal remediation activities to include protocols for ongoing maintenance and/or monitoring or any long term remedial/mitigation measures to be implemented following completion of the Site Audit Statement.	**This Plan**	Provides requirements to revise the LTEMP post construction.
6J	In order to accept fill material onto site, the following will be undertaken: • Material characterisation reports/certification showing that the material being supplied is VENM/ENM must be provided. • Each truck entry will be visually checked and documented to confirm that only approved materials that are consistent with the environmental approvals are allowed to enter the site. Only fully tarped loads are to be accepted by the gatekeeper. Environmental Assurance of imported fill material will be conducted to confirm that the materials comply with the NSW EPA Waste Classification Guidelines and the Earthworks Specification for the MPW site. The frequency of assurance testing will be as nominated by the Environmental assuror/auditor.	**Golder 2016 RAP** **EMP11**	Both requirements for the acceptance of fill are stated within this section.
7A	The following measures would be included in the CEMP (or equivalent) to minimise hazards and risks: • Procedures for safe removal of asbestos	**CEMP**	This plan includes procedures for the safe removal of asbestos.

Table E4 – Final Compilation of Mitigation Measures (FCMMs)			
FCMM	**Requirement**	**Document Reference**	**How Addressed**
	• Provision for safe operational access and egress for emergency service personnel and workers would be provided at all times • An Incident Response Plan that would include a Spill Management Procedure.		The remaining two requirements are not the scope of this plan.
12A	The following mitigation measures would be implemented as part of the CEMP (or equivalent) for waste management: • Characterisation of construction waste streams in accordance with the NSW Waste Classification Guidelines • Management of any identified hazardous waste streams • Procedures to manage construction waste streams, including handling, storage, classification, quantification, identification and tracking • Mitigation measures for avoidance and minimisation of waste materials • Procedures and targets for re-use and recycling of waste materials.	**CEMP**	To be included in the CEMP

Appendix F
UNEXPECTED FINDS PROTOCOL

Construction

UNEXPECTED FINDS PROTOCOL

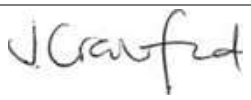
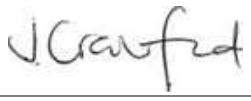
Moorebank Precinct West Stage 2

02 AUGUST 2019

SYDNEY INTERMODAL TERMINAL ALLIANCE

Moorebank Precinct East Stage 2

Unexpected Finds Protocol

Author	Ketan Patel	
Checker	Jamie Crawford	
Approver	Jamie Crawford	

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REVISIONS

Revision	Date	Description	Prepared by	Approved by
001	27/07/2018	Draft for review	AK	KP
002	14/09/2018	Second draft for client review	KN	JC
003	26/10/2018	Issued for ER Review	JC	JC
004	02/08/2019	Updated based on Conditions of Consent	KP	KP
005	27/08/2019	Updated to reflect the CFFMP	KP	KP

ACRONYMS AND DEFINITIONS

Acronym/Term	Meaning
BAR	Biodiversity Assessment Report
CFFMP	Construction Flora and Fauna Management Plan
CoCs	Conditions of Consent
DoTEE	Commonwealth Department of the Environment and Energy
EM	Contractor's Environment Manager
EP&A Act	*Environmental Planning and Assessment Act, 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
MPW	Moorebank Precinct West
OEH	NSW Office of Environment and Heritage
PE	Project Ecologist
PFAS	Per & Poly-Fluoroalkyl Substances
RCMM	Revised Compilation of Mitigation Measures
SIMTA	Sydney Intermodal Terminal Alliance
SSD	State significant development
UFP	Unexpected Finds Protocol

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1 INTRODUCTION

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 2 of the Moorebank Precinct West (MPW) Project (SSD 7709), which comprises the second stage of development under the MPW Concept Approval (SSD 5066). This Unexpected Finds Protocol (UFP) has been developed to manage the unexpected discovery of contamination within imported spoil, heritage items, threatened flora and fauna, and onsite contamination during the construction phase of Stage 2 of the Moorebank Precinct West (MPW) Project (the Project).

Within this protocol, a strategy has been established to demonstrate the Construction Contractor's approach to the management of unexpected discoveries.

1.1 Objectives and Targets

Refer to Table 1 for high level objectives and targets set for the Project for the management of unexpected discoveries.

Table 1 Objectives and Targets

Objective	Target	Timeframe	Accountability
To implement the unexpected finds protocol to minimise impacts of imported spoil	STOP works in 100% cases where potential contamination is identified in accordance with the Unexpected (Contamination within Imported Spoil) Finds Protocol (Appendix A)	Duration of works	Contractor's CM
To implement the unexpected finds protocol to minimise impacts on unknown heritage items	STOP works in 100% cases where potential heritage is identified in accordance with the Unexpected (Heritage) Finds Protocol (Appendix B)	Duration of works	Contractor's CM
To implement the unexpected finds protocol to minimise impacts on threatened flora and/or fauna species or threatened ecological communities that have not been previously recorded within the Project Site	Stop relevant works in 100% of cases where potential threatened flora and/or fauna species or threatened ecological communities are identified in accordance with the Unexpected (Biodiversity) Finds Protocol (Appendix C)	Duration of works	Contractor's CM
To implement the unexpected finds protocol to minimise the impacts of onsite contamination that has not previously been recorded within the Project site.	Stop relevant works in 100% of cases where potential contamination is identified in accordance with the Unexpected Finds (Onsite Contamination) Protocol (Appendix D)	Duration of works	Contractor's CM

2 ENVIRONMENTAL MANAGEMENT

2.1 Compliance Matrices

The Project is being delivered under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The Conditions of Consent (CoCs) include requirements to be addressed in this protocol and delivered during the Project. These requirements, and how they are addressed are provided within Table 2.

Table 2 Conditions of Consent (CoCs)

CoC	Requirement	Plan Section	How Addressed
B174	Unexpected Ordnance (UXO), Exploded Ordnance (EO) and Exploded Ordnance Waste (EOW) protocols must be prepared by an UXO contractor listed on the Defence Panel of suitably qualified UXO consultants and contractors.	Appendix D	This Protocol
B175	The CEMP required under **Condition C2** must include an Unexpected Finds Protocol(s) for, but not limited to, contamination, ordnances, Aboriginal sites, non-indigenous heritage and flora and fauna.	Appendix B	This Protocol

The Revised Compilation of Mitigation Measures (RCMMs) were prepared as part of the Response to Submissions (Arcadis 2017). A list of the RCMMs as relevant to the Project and how they have been complied within this protocol are provided in Table 3.

Table 3 Revised Compilation of Mitigation Measures (RCMMs)

RCMM	Requirement	Document Reference
6A	The CEMP would identify the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol), and will address REMM items 8H, 8T, 8U, 8V and 8W (of the MPW Concept Approval (SSD 5066)).	Appendix D
9E	An unexpected finds procedure would be included in the ACHAR and in place for the construction phase of the Proposal.	Appendix B
9G	Consultation with RAPs would continue throughout the life of the Proposal, as necessary. Ongoing consultation with RAPs would take place throughout the reburial of retrieved artefacts and in the event of the discovery of any unexpected Aboriginal objects.	Appendix A Appendix B
10C	An unexpected finds protocol (or equivalent) would be included within the CEMP. If unexpected finds are identified during works, a suitably qualified archaeological consultant would be engaged to assess the significance of the finds and the NSW Heritage Council notified. In this instance, further archaeological work or recording may be required.	Appendix B

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval for the MPW Concept was granted by the Commonwealth Department of the Environment and Energy (DoTEE) in September 2016 (No. 2011/6086). This approval was provided for the impact of the MPW Project on listed threatened species and communities (Sections 18 and 18A of the EPBC Act) and Commonwealth action (Section 28 of the EPBC Act).

The construction and operation of the Project has been designed to be consistent with the EPBC Act Approval conditions, where relevant. EPBC Act Approval conditions for the Project include specific conditions

and commitments that are required to be addressed in this UFP. These conditions relevant to this UFP are identified below in Table 4.

Table 4 Commonwealth Approvals

Commonwealth	Requirement	Document Reference
8	Sections of the CEMP and OEMP relating to contamination and soils must be prepared by a suitably qualified expert and must: … (d) in relation to management of PFAS: … ii) detail implementation and operational procedures, appropriate to the risk posed by any contamination, including: … • a contingency action plan for unexpected PFAS contaminant discoveries	Refer to the Moorebank Precinct West – Early Works Per & Poly-Fluoroalkyl Substances (PFAS) Management Plan

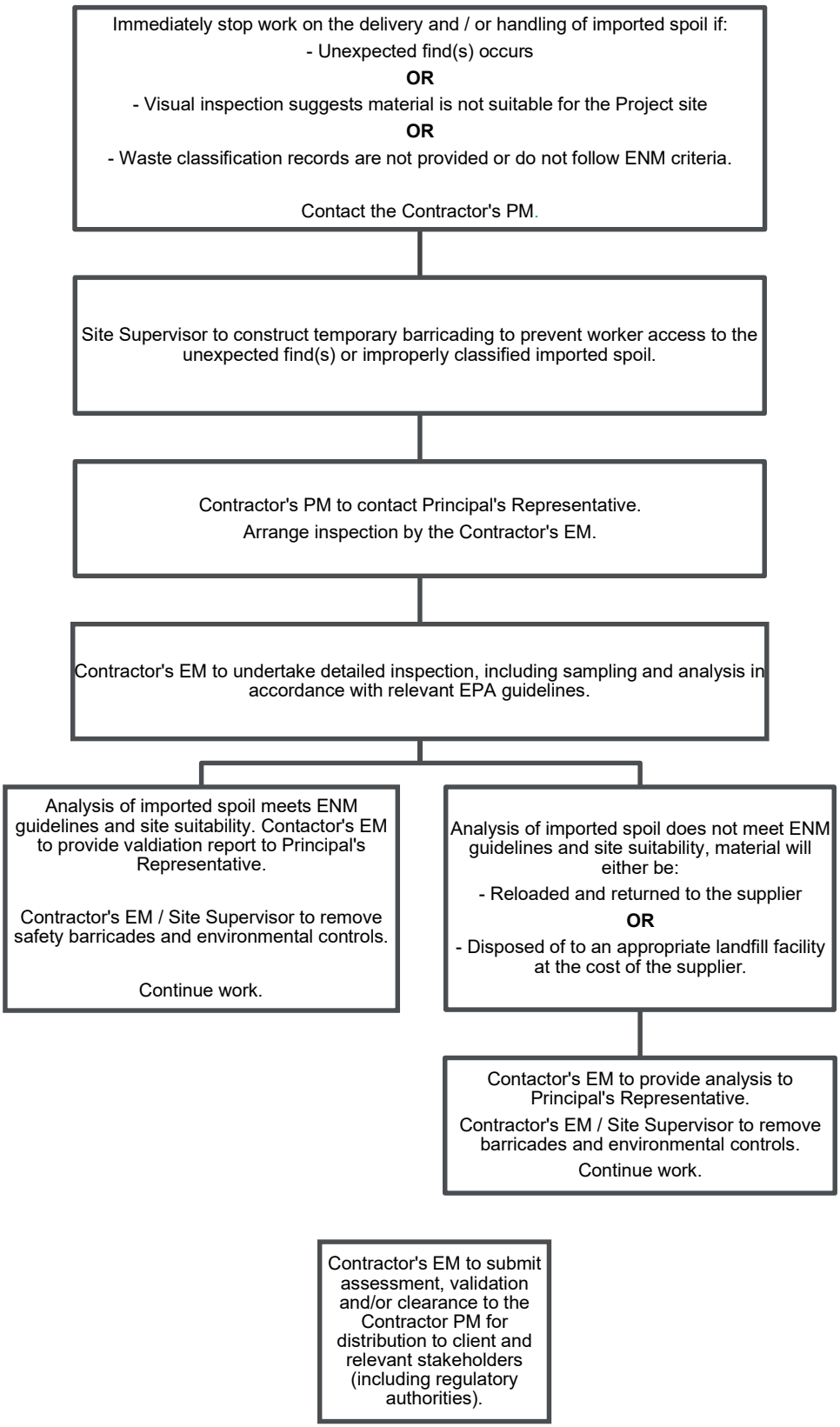
2.2 Unexpected Finds Protocols

Specific protocols for the discovery of unexpected finds have been developed for potential:

- Contamination within imported spoil
- Aboriginal and non-Aboriginal finds
- Threatened flora and/or fauna species or threatened ecological communities
- Onsite contamination including ordnance.

Each of these specific protocols is included in the following appendices.

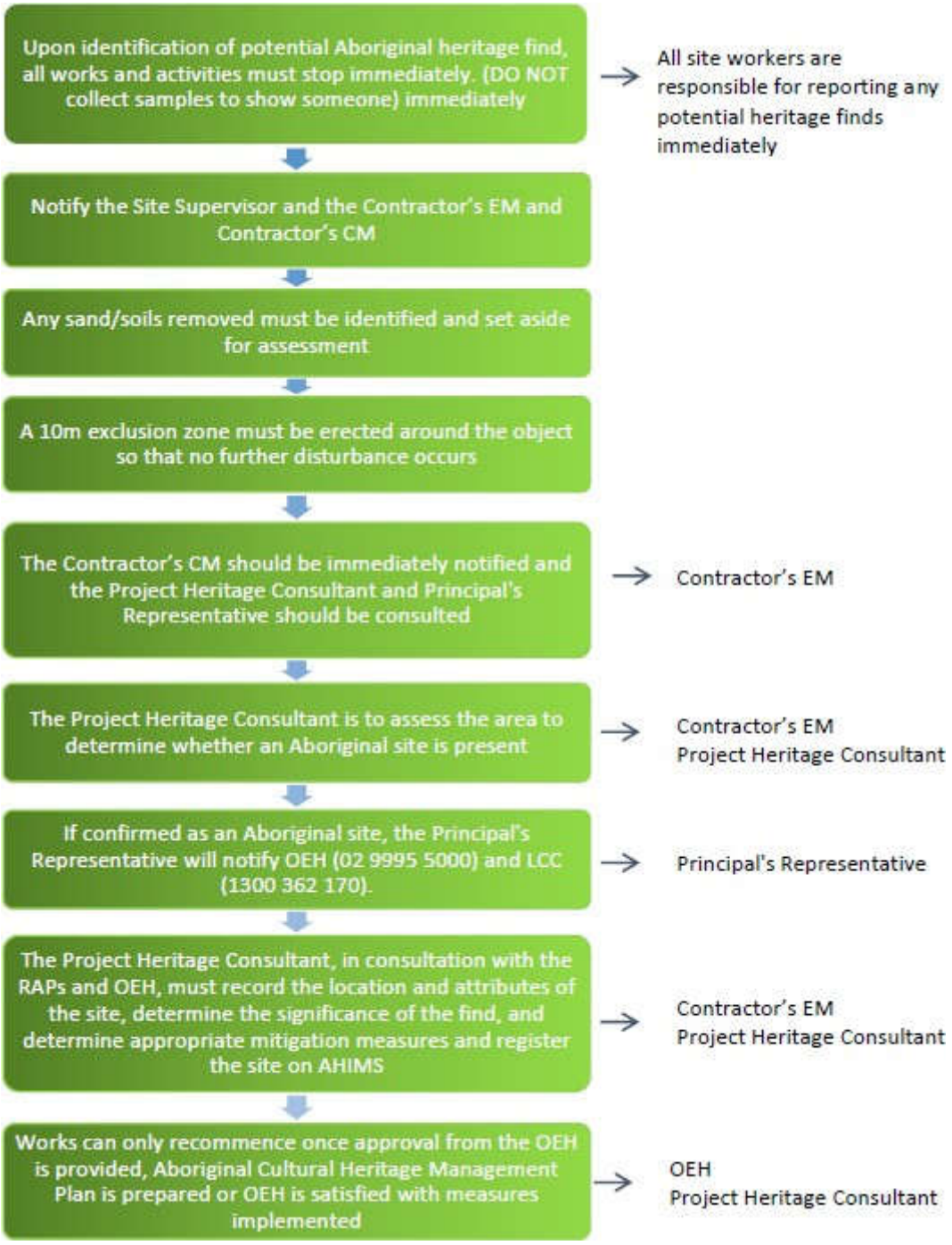
APPENDIX A UNEXPECTED (CONTAMINATION WITHIN IMPORTED SPOIL) FINDS PROTOCOL


Immediately stop work on the delivery and / or handling of imported spoil if:
- Unexpected find(s) occurs
OR
- Visual inspection suggests material is not suitable for the Project site
OR
- Waste classification records are not provided or do not follow ENM criteria.
Contact the Contractor's PM.
Site Supervisor to construct temporary barricading to prevent worker access to the unexpected find(s) or improperly classified imported spoil.
Contractor's PM to contact Principal's Representative.
Arrange inspection by the Contractor's EM.
Contractor's EM to undertake detailed inspection, including sampling and analysis in accordance with relevant EPA guidelines.
Analysis of imported spoil meets ENM guidelines and site suitability. Contactor's EM to provide valdiation report to Principal's Representative.
Contractor's EM / Site Supervisor to remove safety barricades and environmental controls.
Continue work.
Analysis of imported spoil does not meet ENM guidelines and site suitability, material will either be:
- Reloaded and returned to the supplier
OR
- Disposed of to an appropriate landfill facility at the cost of the supplier.
Contactor's EM to provide analysis to Principal's Representative.
Contractor's EM / Site Supervisor to remove barricades and environmental controls.
Continue work.
Contractor's EM to submit assessment, validation and/or clearance to the Contractor PM for distribution to client and relevant stakeholders (including regulatory authorities).

APPENDIX B UNEXPECTED (HERITAGE) FINDS

Unexpected (Heritage) Finds Protocol

Aboriginal Heritage



Examples of Potential Unexpected Aboriginal Finds

It is highly unlikely that any Aboriginal artefacts will be identified on the site due to the historical disturbance of the area. However, the most likely finds are isolated finds such as flaked stone tools.

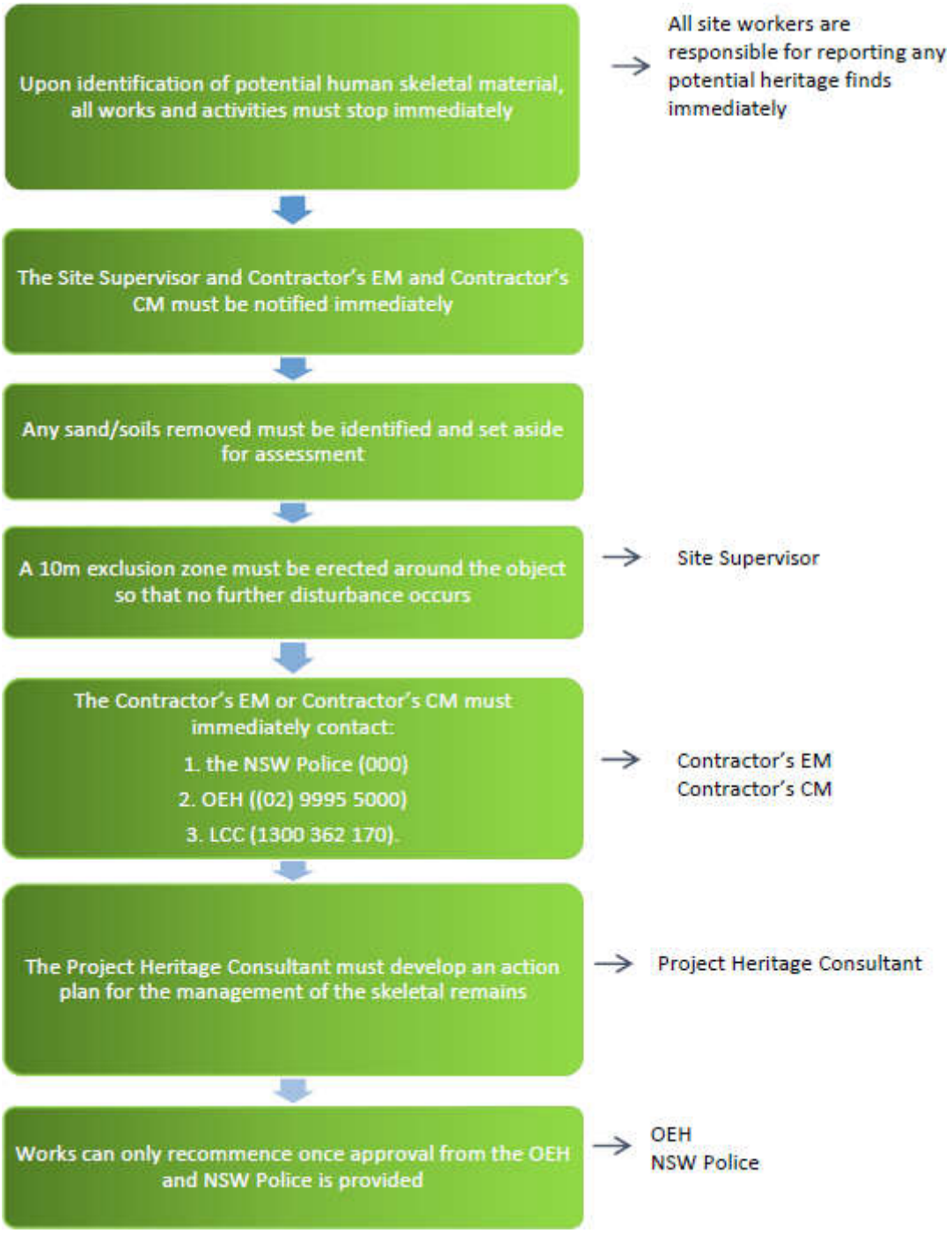
Typical characteristics of flaked stone tools include:

- Sharp edges.
  - Retouch along one or more edges.
  - Stone rich in silica.

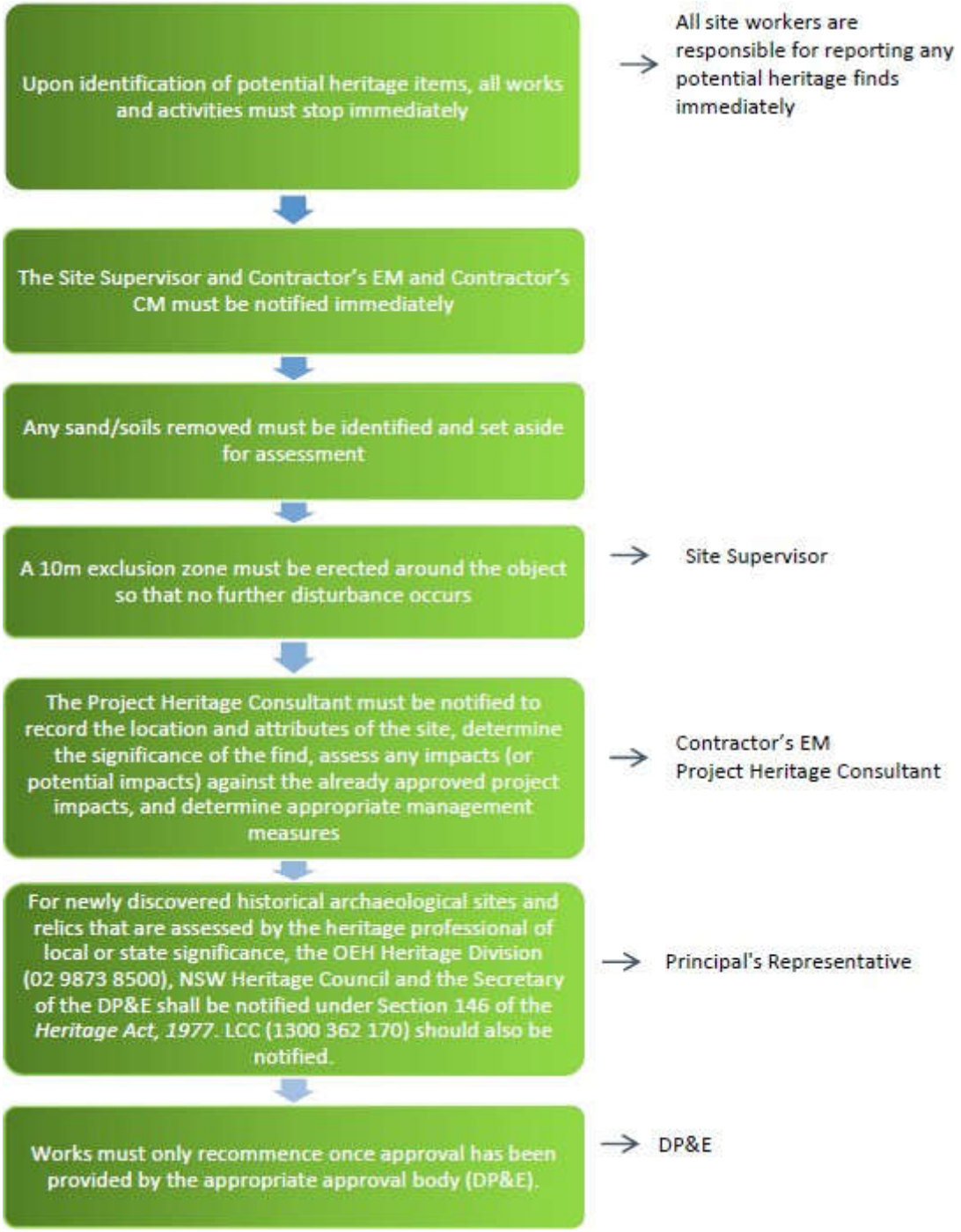
  - Stone type often different to the natural rock in the area.
- Flakes
  - Usually less than 50 mm long.
  - A ‘striking platform’ visible.
  - Impact point often present on the striking platform.
  - A ‘bulb of percussion’ often present below the striking platform.
  - May have been shaped into a recognisable tool form, such as a point or scraper.
- Cores
- May be fist-sized or smaller.
- May have one or more scars where flakes have been removed.

It is noted that not all features can be seen on each stone tool and some require an experienced eye to identify them. Breakage can remove key features.

Skeletal Remains



Non-Aboriginal Heritage



Note: In the context of this UFP, an unexpected find is defined as a previously unknown heritage item or evidence of heritage value. It does not include uncovering findings within previously identified potential archaeological deposits.

APPENDIX C UNEXPECTED (BIODIVERSITY) FINDS

Unexpected (Biodiversity) Finds protocol

Purpose

This Unexpected Finds Protocol explains the actions and measures to be implemented if any threatened flora and/or fauna species or threatened ecological communities that have not been previously recorded within the Project Site (as identified in the documents outlined in CoC A3) are identified during construction.

Training

All personnel undertaking construction activities within the Project site will be inducted on the identification of known and potential threatened species and ecological communities occurring on site, and will be trained in this protocol through Toolbox Talks or a site induction.

Protocol

Upon detection of a threatened species or ecological community during construction activities, the following steps must be followed.

1. **STOP ALL WORK** in the vicinity of the find. Immediately notify the Contractor's Environment Manager (Contractor's EM) who will notify the Project Ecologist (PE) and Principal's Representative. The project ecologist must confirm the presence of the threatened species.
2. **EXCLUSION ZONE.** In consultation with the PE, create a buffer zone/ exclusion zone around the find
3. **EXTERNAL NOTIFICATION.** Principal's Representative to notify OEH of previously unidentified species
4. **ASSESS IMPACT**. An assessment is to be undertaken by the Contractor's EM, PE and Principal's Representative in consultation with OEH to identify the flora and/or fauna species level, the likely impact to them and appropriate management options, such as re-location measures.
5. **OBTAIN APPROVALS**. Obtain any relevant licences, permits or approvals required if the threatened species / ecological community is likely to be significantly impacted. Consultation with OEH must be completed for any proposed amendments to the location or reclassification of threatened species, populations and ecological communities as identified in the updated BAR.
6. **RECOMMENCE WORKS**. Construction works may recommence once the Contractor's EM has:
    a. Obtained approvals as required, and
    b. Confirmed that all corrective actions and additional mitigation measures have been implemented.
7. **UPDATE PLANS AND PROCEDURES**. The Contractor's EM must ensure that the threatened species / ecological community is included in subsequent site plans and/or sensitive area drawings, inductions and Toolbox Talks. The Contractor's EM must provide information to enable an update of ecological monitoring and/ or biodiversity offset requirements

APPENDIX D UNEXPECTED (ONSITE CONTAMINATION) FINDS PROTOCOL

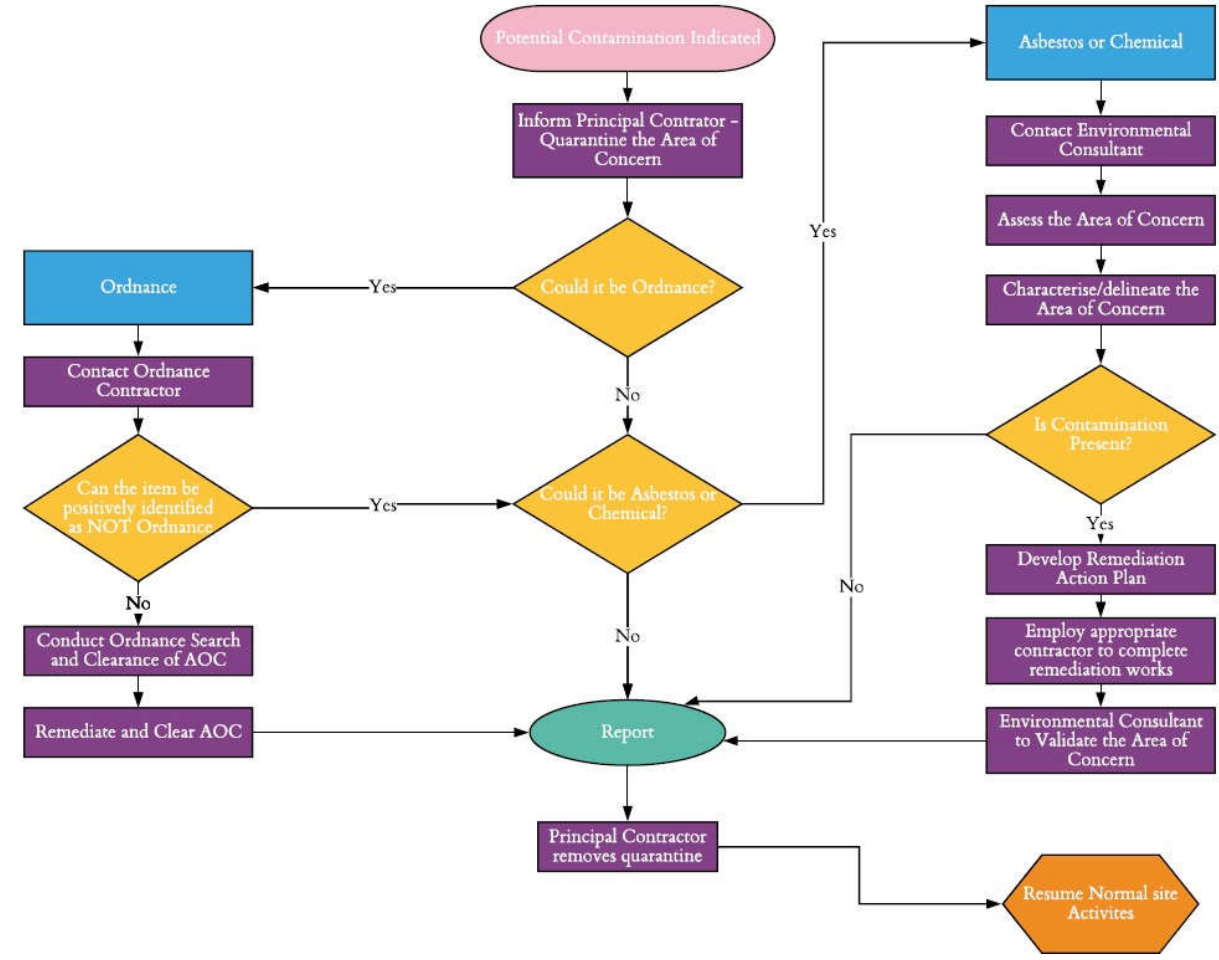
Potential Site Hazards

If you SEE or SMELL anything unusual

STOP WORK & contact Site Foreman

Do not restart work before the area has been investigated and cleared by an Environmental Consultant

Unexpected Finds Protocol (UFP)



Operation

8D – Process Report Form

Customer:		Report no:	
Report Title:			
Project Number:			
Project Description:			
Date Opened:		Updated:	
Team Leader:			
Team Members: (D1)			

Problem Description (D2)

Immediate Containment Action (D3)	Responsibility	Effective Date(s):

Verification of Containment Action (D3)	By Whom	Date(s):

Root Causes (D4)		% Contribution

Permanent Corrective/Preventative Action (Short and/or Long Term) (D5)	Responsibility	Effective Date(s):

Verification of Permanent Corrective/Preventative Action (D6)	By Whom	Date(s):

Prevent Recurrence / Lessons Learned (D7)

Signature & Congratulate Team (D8)		
Team Leader:		**Quality Systems Manager**
Date:		*for external customers*
		Other signatures - nominate as required **Date:**

WI_007

Appendix G
REPORTING REGISTERS

Appendix G

Table G-1: Incidents and Non-conformances Register

Name of Person Who Raised Issue	Date Raised	Category (Int Audit, NCR, Injury/Incident, System Imp, Inspection)	Details of Issue	Has it already been resolved? How?	What action was or will be taken to prevent recurrence of the problem or improve the system?	Responsibility	Verification Results: Action verified as effective? Verification outcomes	Open / Closed?	Name & date when action veified as effective

Appendix G

Table G-2: Complaints Register

Name of Person Who Complained	Date Raised	Contact details - address	Contact details - Phone	Contact details - email	Details of Complaint	Action taken to prevent recurrence of the problem or improve the system?	Responsibility	Verification Results: Action verified as effective? Verification outcomes	Open / Closed?	Name & date when action veified as effective

Appendix H

ENGINEERED STOCKPILE CONCEPT DESIGN

Appendix H – Engineered Stockpile Conceptual Design

Section 10 of NEMP 2.0 2020[1] identifies three common methods used for on-site capping including engineered stockpiles, capping and covering and engineered containment facilities. All are designed to minimise release of PFAS to the environment through, dust generation, storm water flow and infiltration or groundwater inflow and migration. Section 10 of NEMP 2.0 2020 also outlines guidance on siting and controls for PFAS impacted materials with PFAS concentrations above 0.14 mg/kg and below 50 mg/kg.

Table 6 of the NEMP 2.0 2020 describes five classes of stockpiles and the hierarchy of controls required for transient through to medium and long-term storage of PFAS impacted soil in stockpiles. The stockpile class is determined by the timeframe they are to be present for, including transient (<48 hours), temporary (48 hours to six months), short-term (six months to two years), medium-term (two to five years) and long-term (> five years).

Stockpile controls range from anchored covers and earthen bunds on impervious base or hardstand for temporary stockpiles, to engineered containment infrastructure with composite covers and liners, leachate collection systems and monitoring systems for medium-term and long-term stockpiles. Given the potential for PFAS contaminated soils to be stored for more than two years and with reference to specifications for engineered stockpiles prepared by Defence 2018[2] the medium-term stockpile controls were adopted for the conceptual design.

Based on the anticipated volume of soil to be excavated from OSD 6 and OSD 8 of approximately 200,000 m^3 and the MPW project layout and proposed staging, the preferred option for short-term to medium-term on-site management of the low level PFAS impacted soil materials is storage in an engineered stockpile. The location for the proposed short to medium-term engineered stockpile is shown in **Figure H1** in **Appendix H**.

The design criteria for the short-term to medium-term engineered stockpile from Section 10 of NEMP 2.0 2020 are presented in **Table H1**.

[1] PFAS National Environmental Management Plan (NEMP), National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA), Version 2.0 dated January 2020

[2] Defence PFAS Engineered Stockpile Facility Performance Specification, V 1.0 (WIP) 12 March 2018

Table H1 – Engineered Stockpile Design Criteria – Short to Medium-Term[3]	
Item	**Description**
Stockpile Location	The stockpile will be located above the Georges River flood zone, at an elevation greater than 2m above the groundwater table, with a design life to consider climatic conditions and with suitable buffers and setbacks.
Stockpile Height and Batter	The stockpile will be sited in accordance with the Development Consent[4], 1V:3H, which permits stockpiles up to 10 m high with benches > 4m.
Management Plan	Ongoing management of the stockpile will be in accordance with this LTEMP, which includes ongoing monitoring, maintenance and management
Access	Access for preparation, monitoring, maintenance and unloading/removing of stockpile.
Storm Water Management	The stockpile design will include measures to divert stormwater flow away from the stockpile, to minimise drainage into the stockpile and manage flow off clean stormwater off the stockpile. Earthen bunds around the stockpile ensure surface stormwater is diverted away and will also be used to manage clean stormwater run-off from the surface of the stockpile. The proposed batter of 1:3 to 1:4 and surface drainage layer will prevent water pooling on the liner and allows clean surface stormwater to be diverted off the stockpile minimising infiltration and generation of leachate.
Protection Layer	The design will include a protection vegetated topsoil layer to prevent damage from site construction and maintenance activities, plant growth and burrowing animals.
Drainage Layer	A subsurface drainage layer will be incorporated into the design to prevent pooling of surface stormwater on the liner and allow clean surface water infiltration to be diverted off the stockpile.
Composite Cap and Side Lining	The cap will include a composite lining system designed to limit the medium-term to long-term seepage through the cap and side lining. The design will be based on composite layers of geosynthetic and low permeability clay to provide a permeability less than $1x10^{-9}$ m/s.
Composite Base Lining	The liner will include a composite lining system designed to limit the medium-term to long-term seepage through the baseliner. The cap and liner system should also be joined where possible to fully encapsulate the PFAS contaminated soils.
Leachate Drainage and Capture	The design will incorporate a drainage layer to minimise hydraulic pressure on the liner and capture leachate and allow for leachate collection system. The liner and liner drainage layer will grade to the side of the stockpile to allow maintenance. A sump will be used to collect leachate and will incorporate a pump and leachate storage tank/s to allow for storage, testing and collection for off-site disposal of leachate.
Detailed Design	A detailed design of the engineered stockpile will be developed by the Stage 2 contractor prior to implementation.

[3] Adopted from Section 10 of NEMP 2.0 2020

[4] Development Consent, Moorebank Precinct West Stage 2 (MPW Stage 2), under Section 4.38 of the Environmental Planning and Assessment Act 1979, dated November 2019

Table H1 – Engineered Stockpile Design Criteria – Short to Medium-Term[3]	
Item	**Description**
Construction Quality Plan and Quality Control Measures	A construction quality assurance plan will be developed to ensure preparation of stockpile area and installation of composite liners, drainage layers and leachate collection infrastructure in accordance with design specifications and manufactures installation instructions. PFAS impacted soil will also need to be suitably placed and compacted to minimise stockpile settlement or sharp objects/surfaces which could damage or compromise the cap liners.
Leak Detection and Monitoring	A leak detection system, such as a drainage layer under the liner and sump, will be installed to monitor liner and leachate collection system performance. Groundwater monitoring wells will be installed up and down gradient of the engineered stockpile to monitor PFAS concentrations in groundwater flow migrating toward and away from the stockpile. Groundwater monitoring will be undertaken in accordance with **EMP18**.
Maintenance	An operation and maintenance plan will be prepared after finalisation of the detailed design. The operation and maintenance plan will detail the timing and scope of inspection and maintenance of the capping layer to prevent pooling of surface water and ensure timely repairs to liner damaged by site activities or settlement.

A conceptual cross section of the engineered stockpile, illustrating the main design elements is illustrated in **Figure H2** in **Appendix H,** adopted from NEMP 2.0 2020 and United States Environmental Protection Agency, Citizen's Guide to Capping (US EPA 2012)[5].

[5] United States Environmental Protection Agency, Office of Solid Waste and Emergency Response (5102G), EPA 542-F-12-004, September 2012

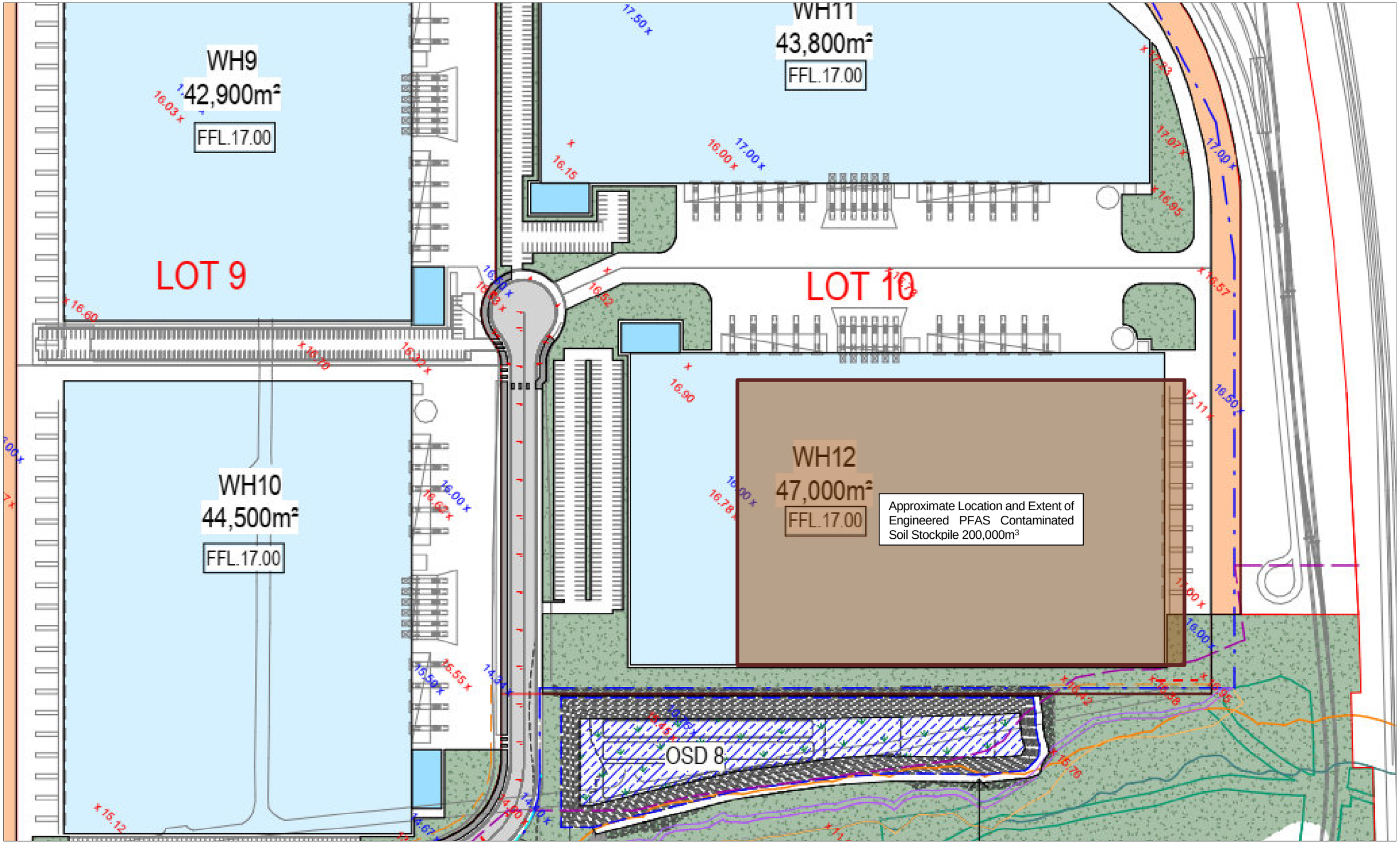


Figure H1 – Engineered Stockpile Concept Plan –Medium Term - Layout – Plan View

EP RISK

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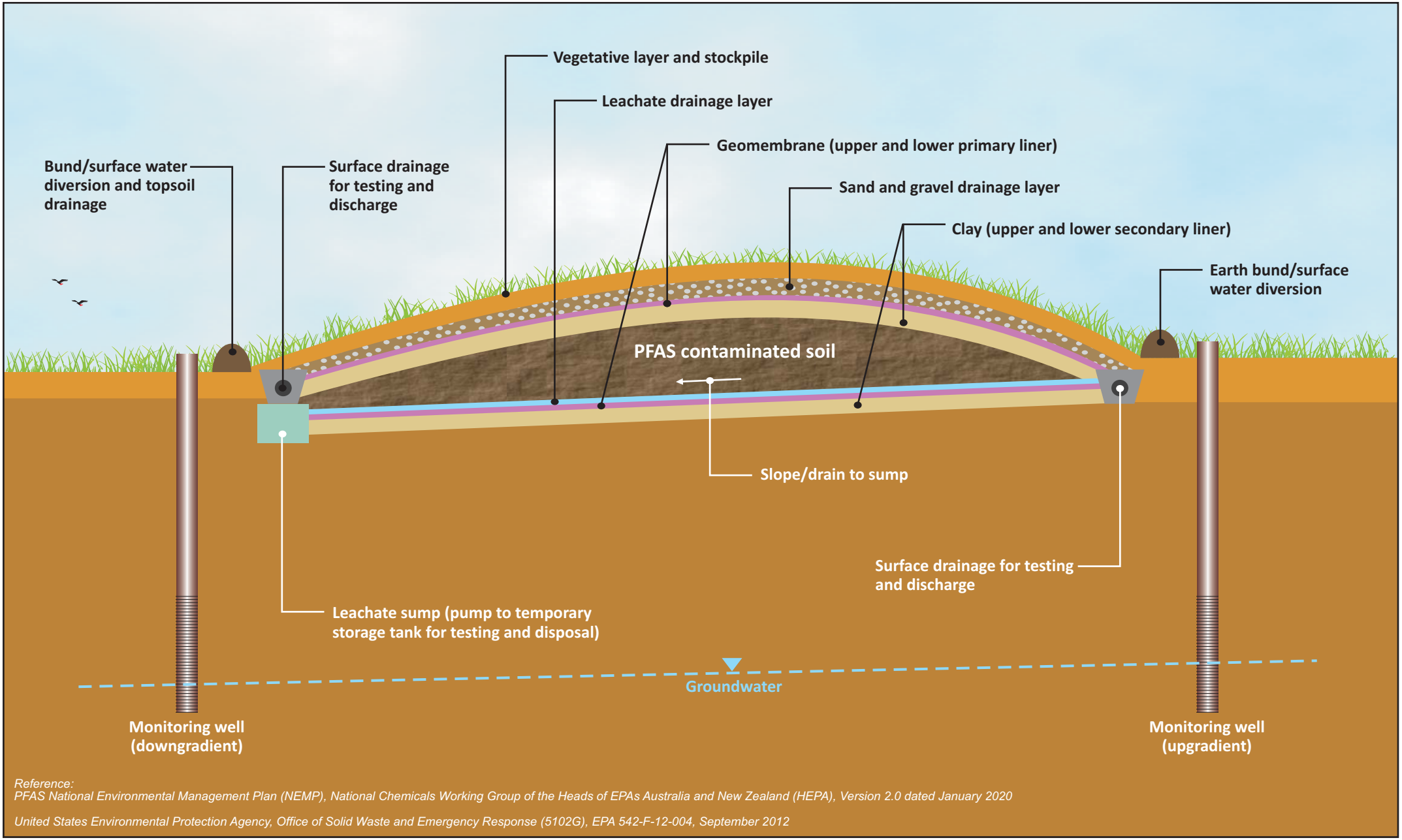
Qube Property Management Services Pty Ltd
Moorebank Precinct West (MPW), Long Term Environmental Management Plan

Job No: EP1489.001
Date: 3/08/2020
Drawing Ref:EP1489.001 FigH1
Version No: v1

0 50 100 200
Approximate Scale Only (m)

Co-ordinate system: MGA 56
Drawn by: TR Checked by: PS
Source: NearMaps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services
APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services
APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



Reference:
PFAS National Environmental Management Plan (NEMP), National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA), Version 2.0 dated January 2020

United States Environmental Protection Agency, Office of Solid Waste and Emergency Response (5102G), EPA 542-F-12-004, September 2012

EP RISK

Qube Property Management Services Pty Ltd
Moorebank Precinct West (MPW), Long Term Environmental Management Plan

Job No: EP1489
Date: 31.07.2020
Drawing Ref: EP11489.001._03.cdr
Version No: v5

Schematic diagram only - not to scale

Drawn By: B.W.
Checked By: T.R.

Figure H2 - Engineered Stockpile Concept Plan - Medium Term - Cross Section

Appendix I

AEC -2 PROPOSED GROUNDWATER MONITORING LOCATIONS

0 10 20 30 40
Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

Site Boundary

Proposed groundwater wells

Department of Defence
DNSDC Refuelling Area Remediation
Environmental Management Plan

Job Number	21-24133
Revision	A
Date	02 Oct 2018

Proposed groundwater monitoring locations

Figure 6

\\ghdnet\ghd\AU\Sydney\Projects\21\25471\GIS\Maps\Deliverables\21_25471_Z047_DNSDC_ProposedEMPLocations.mxd

Data Source: Aerial Imagery - Sixmaps (2018 - DFSI), mweber

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Appendix J

SOIL REUSE DATA

Summary of Existing Soil PFOS and Leachate PFOS + PFHxS Data

EP Risk (2018) undertook soil and leachate (neutral pH) PFAS testing in proposed cut and fill areas at the Site. A summary of soil PFAS and leachable PFAS (neutral pH) results are summarised in **Table J1**, with all analytical results collected from OSD 6, OSD 8 and general cut areas provided in **Table J2.**

Additional sampling data collected from the Site outside of OSD6, OSD 8 and proposed cut areas is also data provided in **Table J3.** The corresponding sampling locations are provided in the figure contained within this Appendix (EP0745.008 Figure 6, EP Risk 2018).

Table J1 – Soil and leachate (neutral pH) within OSD 6, OSD 8 and general cut areas										
Area	**No. Samples**	**Analytes**	**Criteria**	**>EIE**	**>ADWG**	**Min**	**Max**	**SD**	**Mean**	**95% UCL_{mean}[127]**
OSD 6, OSD 8	15	Soil - PFOS	0.14 mg/kg	4	-	<0.0001 mg/kg	1.6 mg/kg	0.41 mg/kg	0.2 mg/kg	0.56 mg/kg
			0.01 mg/kg	11						
		Soil leachate (neutral pH) – PFOS + PFHxS	0.07 µg/L	-	14	<0.01 µg/L	80.7 µg/L	20.6 µg/L	10 µg/L	26.4 µg/L
General cut and Fill	57	Soil - PFOS	0.14 mg/kg	4	-	<0.0001 mg/kg	0.96 mg/kg	0.14 mg/kg	0.04 mg/kg	0.122 mg/kg
			0.01 mg/kg	16						
		Soil leachate (neutral pH) – PFOS + PFHxS	0.07 µg/L	-	26	<0.01 µg/L	43.2 µg/L	5.96 µg/L	1.62 µg/L	5.06 µg/L

[127] 95% UCL_{mean} – 95% upper confidence level of the arithmetic mean.

Table J2 - Leachability of Soil (Neutral pH) in Proposed Bulk Earthworks Cut Areas, OSD 6 and OSD 8

General Cut and fill		Soil leachate (neutral ph) - Sum (PFHxS + PFOS)	Soil - Perfluorooctane sulfonic acid (PFOS)
Units	ug/L		mg/kg
PQL		0.01	0.0001
Guideline		0.07	0.14 / 0.01
BH6006_0.5	<0.01		<0.0001
BH6006_2.0	<0.01		<0.0001
TP17SL_2.0		0.57	<0.001
TP18SL_0.5		3.63	0.057
TP18SL_2.0		3.80	0.054
TP19SL_0.2		0.15	0.0037
TP19SL_1.0		0.54	0.016
TP20SL_0.5		1.21	0.033
TP20SL_3.0		0.03	<0.001
TP21SL_0.2		0.78	0.016
TP21SL_2.0		0.58	0.02
TP27SL_0.5	<0.01		<0.001
TP27SL_3.0	<0.01		<0.001
TP28SL_1.0	<0.01		<0.001
TP28SL_4.0	<0.01		<0.001
TP30_0.2		0.05	0.0038
TP30_2.0		0.39	0.014
TP31_0.5		43.24	0.96
TP31_2.0		5.62	0.14
TP32_0.2		1.53	0.031
TP32_1.0		9.70	0.31
TP33_0.5		0.03	<0.0001
TP33_1.0	<0.01		<0.0001
TP34_0.5	<0.01		<0.0001
TP34_3.0	<0.01		<0.0001
TP35_0.2		0.02	<0.0001
TP35_3.0	<0.01		<0.0001
TP37_0.2		0.60	0.014
TP37_2.0		0.22	<0.0001
TP38_0.2		0.03	0.0009
TP38_0.5		0.02	<0.0001
TP39_0.2		0.09	0.0019
TP39_1.0		0.04	<0.0001
TP40_0.5		1.60	0.04
TP40_2.0		6.10	0.29
TP41_0.2		0.36	0.0064
TP41_0.5		0.28	0.0053
TP42_0.2	<0.01		<0.0001
TP42_1.0		0.04	<0.0001
TP43_0.2	<0.01		<0.0001
TP43_3.0		0.05	<0.0001
TP58_0.2		0.02	0.0002
TP58_0.5	<0.01		<0.0001
TP59_0.2		0.08	0.0019
TP59_0.5		0.03	0.0002
TP61_0.2		0.30	0.0063
TP61_2.0		0.06	0.0003
TP62_0.2		7.96	0.21
TP62_1.0		1.77	0.089
TP66_0.15		0.10	0.0022
TP66_0.5		0.12	<0.0001
TP67_0.15		0.06	0.0013
TP67_2.0		0.05	0.0005
TP68_0.5	<0.01		<0.0001
TP68_2.0	<0.01		<0.0001
TP69_0.15		0.07	0.0018
TP69_1.0	<0.01		<0.0001

Number	57	57
Min	<0.01	<0.001
max	43.24	0.96
SD	5.96	0.139
Mean	1.62	0.04
95% UCL	5.06	0.122

OSD 6 and OSD 8		Soil leachate (neutral ph) - Sum (PFHxS + PFOS)	Soil - Perfluorooctane sulfonic acid (PFOS)
Units	ug/L		mg/kg
PQL		0.01	0.0001
Guideline		0.07	0.14 / 0.01
TP13SL_0.5		0.01	<0.001
TP13SL_3.0		0.15	<0.001
TP14SL_0.2		2.17	0.055
TP14SL_2.0		2.13	0.067
TP15SL_0.5		1.24	0.035
TP15SL_4.0		0.12	<0.001
TP16SL_0.5		6.47	0.15
TP16SL_2.0		2.96	<0.001
TP17SL_0.2		1.67	0.056
TP47_0.5		25.10	0.52
TP47_3.0		9.70	0.12
TP60_0.2		2.79	0.058
TP60_1.0		80.66	1.6
TP63_0.5		11.23	0.27
TP63_3.0		3.60	0.067

Number	15	15
Min	<0.01	<0.0001
max	80.66	1.60
SD	20.60	0.41
Mean	10.00	0.20
95% UCL	26.39	0.56

Notes:

Soil - Exceedance of PFAS NEMP Indirect Ecological Criteria (commercial / industrial)

Soil - Exceedance of PFAS NEMP Indirect Ecological Criteria (all uses)

Leachate - Exceedance of ADWG HBGVs

Table J3 - Leachability of Soil (neutral pH)

		Soil leachate (neutral ph) - Sum (PFHxS + PFOS)	Soil - Perfluorooctane sulfonic acid (PFOS)
All data			
Units	ug/L		mg/kg
PQL		0.01	0.0001
Guideline		0.07	0.14 / 0.01
BH5001_0.2		0.22	0.0032
BH5001_1.0		0.08	<0.0001
BH5002_0.5	<0.01		<0.0001
BH5002_2.0	<0.01		<0.0001
BH5003_0.2		0.08	<0.0001
BH5003_0.5		0.04	<0.0001
BH5004_0.5		1.68	0.03
BH5004_3.0	<0.01		<0.0001
BH5005_0.2		0.03	0.0005
BH5005_1.0		0.10	0.0017
BH5006_0.2		0.17	0.0046
BH5006_1.0		0.05	0.0004
BH5007_0.5		0.02	<0.0001
BH5007_2.0	<0.01		<0.0001
BH5008_0.5		0.09	<0.0001
BH5008_1.0		0.02	<0.0001
BH6001_0.5		0.24	0.0049
BH6001_2.0		0.36	0.014
BH6002_0.2		0.10	0.0033
BH6002_1.0	<0.01		<0.0001
BH6003_0.2		0.25	0.0075
BH6003_2.0		0.02	<0.0001
BH6004_0.2		0.27	0.0086
BH6004_1.0		0.84	<0.0001
BH6005_0.5		0.02	<0.0001
BH6005_1.0	<0.01		0.0002
BH6006_0.5	<0.01		<0.0001
BH6006_2.0	<0.01		<0.0001
BH6007_5.0	<0.01		<0.005 - 0.0048
BH6008_4.0	<0.01		<0.0001
BH7001_0.2	<0.01		0.0006
BH7001_2.0		0.08	<0.0001
BH7002_0.2		0.14	0.0051
BH7002_0.5		0.05	<0.0001
BH7003_0.5	<0.01		<0.0001
BH7003_1.0	<0.01		<0.0001
BH7006_0.2		0.01	<0.0001

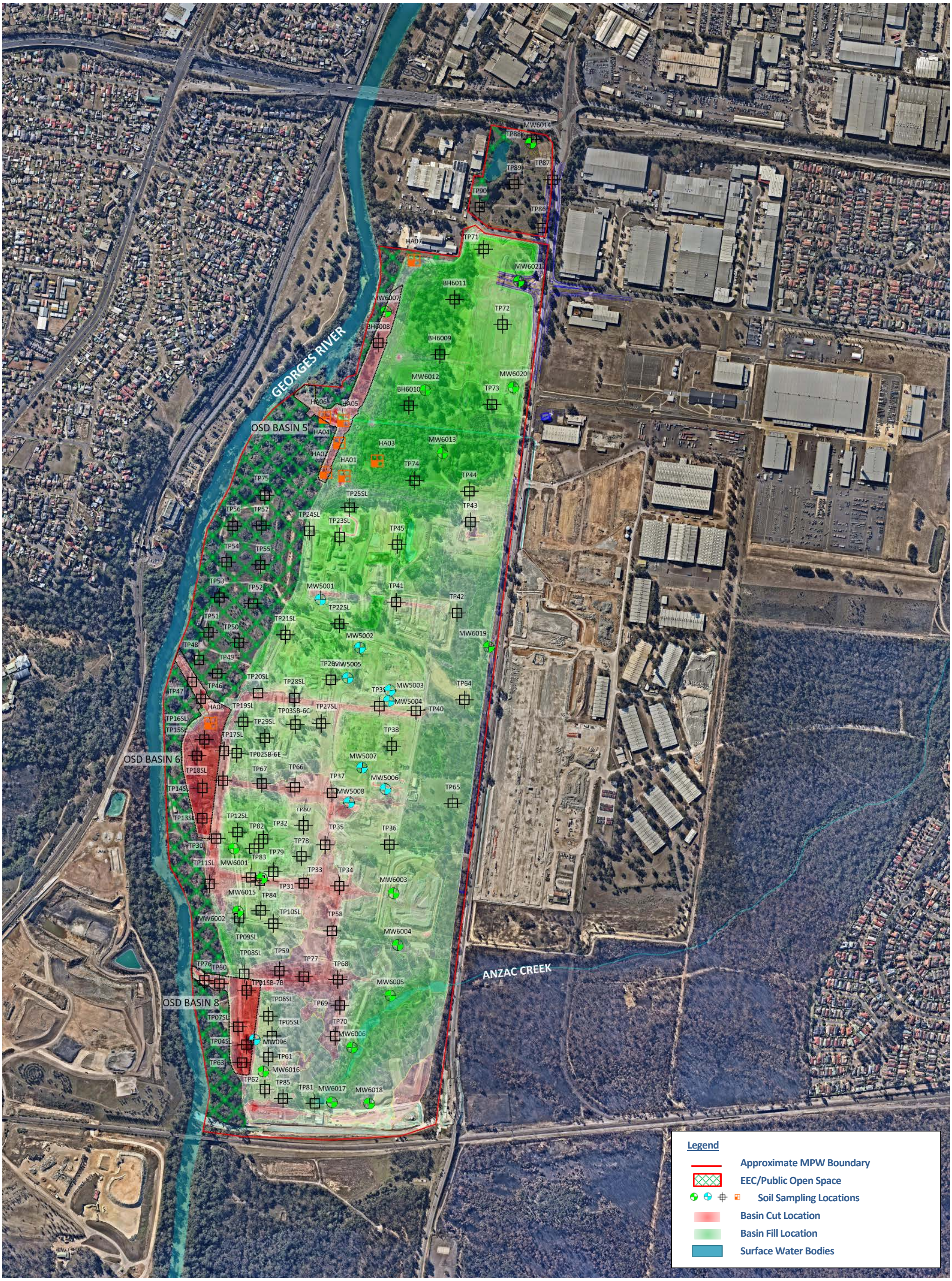
BH7006_1.0	<0.01	<0.0001	
BH7007_0.5	2.07	<0.0001	
BH7007_3.0	0.05	<0.0001	
BH7008_0.2	0.37	<0.0001	
BH7008_2.0	0.22	<0.0001	
TP12SL_0.2	0.88	0.019	
TP12SL_2.0	0.06	<0.001	
TP13SL_0.5	0.01	<0.001	
TP13SL_3.0	0.15	<0.001	
TP14SL_0.2	2.17	0.055	
TP14SL_2.0	2.13	0.067	
TP15SL_0.5	1.24	0.035	
TP15SL_4.0	0.12	<0.001	
TP16SL_0.5	6.47	0.15	
TP16SL_2.0	2.96	<0.001	
TP17SL_0.2	1.67	0.056	
TP17SL_2.0	0.57	<0.001	
TP18SL_0.5	3.63	0.057	
TP18SL_2.0	3.80	0.054	
TP19SL_0.2	0.15	0.0037	
TP19SL_1.0	0.54	0.016	
TP20SL_0.5	1.21	0.033	
TP20SL_3.0	0.03	<0.001	
TP21SL_0.2	0.78	0.016	
TP21SL_2.0	0.58	0.02	
TP22SL_0.5	0.01	<0.001	
TP22SL_2.0	<0.01	<0.001	
TP23SL_0.2	0.26	0.0052	
TP23SL_3.0	0.02	<0.001	
TP24SL_0.2	0.13	0.002	
TP24SL_1.0	<0.01	<0.001	
TP25SL_0.5	0.02	<0.001	
TP25SL_2.0	<0.01	<0.001	
TP26SL_0.2	<0.01	<0.001	
TP26SL_1.0	<0.01	<0.001	
TP27SL_0.5	<0.01	<0.001	
TP27SL_3.0	<0.01	<0.001	
TP28SL_1.0	<0.01	<0.001	
TP28SL_4.0	<0.01	<0.001	
TP29SL_0.2	0.11	<0.001	
TP29SL_2.0	<0.01	<0.001	
TP30_0.2	0.05	0.0038	
TP30_2.0	0.39	0.014	
TP31_0.5	43.24	0.96	
TP31_2.0	5.62	0.14	
TP32_0.2	1.53	0.031	
TP32_1.0	9.70	0.31	
TP33_0.5	0.03	<0.0001	
TP33_1.0	<0.01	<0.0001	
TP34_0.5	<0.01	<0.0001	
TP34_3.0	<0.01	<0.0001	
TP35_0.2	0.02	<0.0001	
TP35_3.0	<0.01	<0.0001	
TP36_0.2	1.81	0.04	

TP36_1.0		0.28	0.0038
TP37_0.2		0.60	0.014
TP37_2.0		0.22	<0.0001
TP38_0.2		0.03	0.0009
TP38_0.5		0.02	<0.0001
TP39_0.2		0.09	0.0019
TP39_1.0		0.04	<0.0001
TP40_0.5		1.60	0.04
TP40_2.0		6.10	0.29
TP41_0.2		0.36	0.0064
TP41_0.5		0.28	0.0053
TP42_0.2	<0.01		<0.0001
TP42_1.0		0.04	<0.0001
TP43_0.2	<0.01		<0.0001
TP43_3.0		0.05	<0.0001
TP44_0.5		0.02	0.0003
TP44_2.0	<0.01		<0.0001
TP45_0.2		0.06	0.0015
TP45_1.0	<0.01		0.003
TP46_0.5		19.50	0.35
TP46_1.0		20.50	0.28
TP47_0.5		25.10	0.52
TP47_3.0		9.70	0.12
TP58_0.2		0.02	0.0002
TP58_0.5	<0.01		<0.0001
TP59_0.2		0.08	0.0019
TP59_0.5		0.03	0.0002
TP60_0.2		2.79	0.058
TP60_1.0		80.66	1.6
TP61_0.2		0.30	0.0063
TP61_2.0		0.06	0.0003
TP62_0.2		7.96	0.21
TP62_1.0		1.77	0.089
TP63_0.5		11.23	0.27
TP63_3.0		3.60	0.067
TP64_0.1		0.54	0.067
TP64_0.5		0.13	0.0042
TP65_0.5		0.32	0.0088
TP65_1.0		0.15	0.0005
TP66_0.15		0.10	0.0022
TP66_0.5		0.12	<0.0001
TP67_0.15		0.06	0.0013
TP67_2.0		0.05	0.0005
TP68_0.5	<0.01		<0.0001
TP68_2.0	<0.01		<0.0001
TP69_0.15		0.07	0.0018
TP69_1.0	<0.01		<0.0001
TP70_0.15		0.09	0.0023
TP70_3.0	<0.01		<0.0001
TP71_0.2		0.09	0.0016
TP71_2.0	<0.01		0.0001
TP72_0.5	<0.01		<0.0001
TP72_2.0	<0.01		<0.0001
TP73_0.2	<0.01		<0.0001

TP73_1.0	<0.01	<0.0001	
TP74_0.5	0.03	0.0009	
TP74_1.0	0.07	0.0013	
TP75_0.5	1.15	0.0013	
TP75_3.0	0.03	0.0013	

Notes:

	Soil - Exceedance of PFAS NEMP Indirect Ecological Criteria (commercial / industrial)
	Soil - Exceedance of PFAS NEMP Indirect Ecological Criteria (all uses)
	Leachate - Exceedance of ADWG HBGVs



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Site Wide PFAS Assessment
Moorebank Precinct West

Figure 4 – Soil Sampling Locations

Job No: EP0745
Date: 13/08/2018
Drawing Ref: Fig4
Version No: v1

N

0 100 200 400
Approximate Scale Only (m)

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

1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation	14/08/2020 2:40:45 PM									
5	From File	WorkSheet_b.xls									
6	Full Precision	OFF									
7	Confidence Coefficient	95%									
8	Number of Bootstrap Operations	2000									
9											
10											
11	Cut and Fill Areas - Leachate (neutral pH) PFOS + PFHxS										
12											
13	General Statistics										
14	Total Number of Observations	57					Number of Distinct Observations	33			
15							Number of Missing Observations	0			
16	Minimum	0.01					Mean	1.615			
17	Maximum	43.24					Median	0.06			
18	SD	5.956					Std. Error of Mean	0.789			
19	Coefficient of Variation	3.687					Skewness	6.386			
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic	0.301					Shapiro Wilk GOF Test				
23	5% Shapiro Wilk P Value	0					Data Not Normal at 5% Significance Level				
24	Lilliefors Test Statistic	0.394					Lilliefors GOF Test				
25	5% Lilliefors Critical Value	0.117					Data Not Normal at 5% Significance Level				
26	Data Not Normal at 5% Significance Level										
27											
28	Assuming Normal Distribution										
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)				
30	95% Student's-t UCL	2.935					95% Adjusted-CLT UCL (Chen-1995)	3.626			
31							95% Modified-t UCL (Johnson-1978)	3.046			
32											
33	Gamma GOF Test										
34	A-D Test Statistic	5.107					Anderson-Darling Gamma GOF Test				
35	5% A-D Critical Value	0.883					Data Not Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic	0.221					Kolmogrov-Smirnoff Gamma GOF Test				
37	5% K-S Critical Value	0.129					Data Not Gamma Distributed at 5% Significance Level				
38	Data Not Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)	0.261					k star (bias corrected MLE)	0.259			
42	Theta hat (MLE)	6.197					Theta star (bias corrected MLE)	6.245			
43	nu hat (MLE)	29.72					nu star (bias corrected)	29.49			
44	MLE Mean (bias corrected)	1.615					MLE Sd (bias corrected)	3.176			
45							Approximate Chi Square Value (0.05)	18.09			
46	Adjusted Level of Significance	0.0458					Adjusted Chi Square Value	17.86			
47											
48	Assuming Gamma Distribution										
49	95% Approximate Gamma UCL (use when n>=50))	2.633					95% Adjusted Gamma UCL (use when n<50)	2.667			
50											
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic	0.882					Shapiro Wilk Lognormal GOF Test				
53	5% Shapiro Wilk P Value	7.6254E-6					Data Not Lognormal at 5% Significance Level				
54	Lilliefors Test Statistic	0.148					Lilliefors Lognormal GOF Test				
55	5% Lilliefors Critical Value	0.117					Data Not Lognormal at 5% Significance Level				
56	Data Not Lognormal at 5% Significance Level										
57											

58	Lognormal Statistics										
59				Minimum of Logged Data	-4.605			Mean of logged Data	-2.227		
60				Maximum of Logged Data	3.767			SD of logged Data	2.278		
61											
62	Assuming Lognormal Distribution										
63				95% H-UCL	5.266			90% Chebyshev (MVUE) UCL	3.001		
64				95% Chebyshev (MVUE) UCL	3.794			97.5% Chebyshev (MVUE) UCL	4.896		
65				99% Chebyshev (MVUE) UCL	7.06						
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data do not follow a Discernible Distribution (0.05)										
69											
70	Nonparametric Distribution Free UCLs										
71				95% CLT UCL	2.913			95% Jackknife UCL	2.935		
72				95% Standard Bootstrap UCL	2.913			95% Bootstrap-t UCL	5.744		
73				95% Hall's Bootstrap UCL	7.139			95% Percentile Bootstrap UCL	3.08		
74				95% BCA Bootstrap UCL	4.17						
75				90% Chebyshev(Mean, Sd) UCL	3.982			95% Chebyshev(Mean, Sd) UCL	5.054		
76				97.5% Chebyshev(Mean, Sd) UCL	6.542			99% Chebyshev(Mean, Sd) UCL	9.465		
77											
78	Suggested UCL to Use										
79				95% Chebyshev (Mean, Sd) UCL	5.054						
80											
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.										
84	For additional insight the user may want to consult a statistician.										
85											

	A	B	C	D	E	F	G	H	I	J	K	L
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7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	General Cut and Fill - Soil PFOS											
12												
13	General Statistics											
14	Total Number of Observations					57		Number of Distinct Observations				28
15								Number of Missing Observations				0
16	Minimum					2.0000E-4		Mean				0.0413
17	Maximum					0.96		Median				0.001
18	SD					0.139		Std. Error of Mean				0.0185
19	Coefficient of Variation					3.37		Skewness				5.563
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.34		Shapiro Wilk GOF Test				
23	5% Shapiro Wilk P Value					0		Data Not Normal at 5% Significance Level				
24	Lilliefors Test Statistic					0.384		Lilliefors GOF Test				
25	5% Lilliefors Critical Value					0.117		Data Not Normal at 5% Significance Level				
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL							95% UCLs (Adjusted for Skewness)				
30	95% Student's-t UCL					0.0722		95% Adjusted-CLT UCL (Chen-1995)				0.0862
31								95% Modified-t UCL (Johnson-1978)				0.0745
32												
33	Gamma GOF Test											
34	A-D Test Statistic					7.623		Anderson-Darling Gamma GOF Test				
35	5% A-D Critical Value					0.872		Data Not Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic					0.293		Kolmogrov-Smirnoff Gamma GOF Test				
37	5% K-S Critical Value					0.129		Data Not Gamma Distributed at 5% Significance Level				
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					0.282		k star (bias corrected MLE)				0.279
42	Theta hat (MLE)					0.147		Theta star (bias corrected MLE)				0.148
43	nu hat (MLE)					32.12		nu star (bias corrected)				31.77
44	MLE Mean (bias corrected)					0.0413		MLE Sd (bias corrected)				0.0783
45								Approximate Chi Square Value (0.05)				19.89
46	Adjusted Level of Significance					0.0458		Adjusted Chi Square Value				19.64
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					0.066		95% Adjusted Gamma UCL (use when n<50)				0.0669
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.825		Shapiro Wilk Lognormal GOF Test				
53	5% Shapiro Wilk P Value					7.3055E-9		Data Not Lognormal at 5% Significance Level				
54	Lilliefors Test Statistic					0.277		Lilliefors Lognormal GOF Test				
55	5% Lilliefors Critical Value					0.117		Data Not Lognormal at 5% Significance Level				
56	Data Not Lognormal at 5% Significance Level											
57												

58	Lognormal Statistics										
59				Minimum of Logged Data	-8.517			Mean of logged Data	-5.658		
60				Maximum of Logged Data	-0.0408			SD of logged Data	2.012		
61											
62	Assuming Lognormal Distribution										
63				95% H-UCL	0.0731			90% Chebyshev (MVUE) UCL	0.0524		
64				95% Chebyshev (MVUE) UCL	0.0653			97.5% Chebyshev (MVUE) UCL	0.0832		
65				99% Chebyshev (MVUE) UCL	0.118						
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data do not follow a Discernible Distribution (0.05)										
69											
70	Nonparametric Distribution Free UCLs										
71				95% CLT UCL	0.0717			95% Jackknife UCL	0.0722		
72				95% Standard Bootstrap UCL	0.0716			95% Bootstrap-t UCL	0.118		
73				95% Hall's Bootstrap UCL	0.166			95% Percentile Bootstrap UCL	0.0747		
74				95% BCA Bootstrap UCL	0.0936						
75				90% Chebyshev(Mean, Sd) UCL	0.0967			95% Chebyshev(Mean, Sd) UCL	0.122		
76				97.5% Chebyshev(Mean, Sd) UCL	0.157			99% Chebyshev(Mean, Sd) UCL	0.225		
77											
78	Suggested UCL to Use										
79				95% Chebyshev (Mean, Sd) UCL	0.122						
80											
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.										
84	For additional insight the user may want to consult a statistician.										
85											

	A	B	C	D	E	F	G	H	I	J	K	L
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7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	OSD 6 and OSD 8 - Soil PFOS											
12												
13	General Statistics											
14	Total Number of Observations	15					Number of Distinct Observations	11				
15							Number of Missing Observations	0				
16	Minimum	0.001					Mean	0.2				
17	Maximum	1.6					Median	0.058				
18	SD	0.41					Std. Error of Mean	0.106				
19	Coefficient of Variation	2.051					Skewness	3.248				
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic	0.516					Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value	0.881					Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic	0.349					Lilliefors GOF Test					
25	5% Lilliefors Critical Value	0.229					Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL	0.387					95% Adjusted-CLT UCL (Chen-1995)	0.469				
31							95% Modified-t UCL (Johnson-1978)	0.402				
32												
33	Gamma GOF Test											
34	A-D Test Statistic	0.651					Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value	0.819					Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic	0.168					Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value	0.238					Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)	0.377					k star (bias corrected MLE)	0.346				
42	Theta hat (MLE)	0.53					Theta star (bias corrected MLE)	0.578				
43	nu hat (MLE)	11.32					nu star (bias corrected)	10.39				
44	MLE Mean (bias corrected)	0.2					MLE Sd (bias corrected)	0.34				
45							Approximate Chi Square Value (0.05)	4.188				
46	Adjusted Level of Significance	0.0324					Adjusted Chi Square Value	3.715				
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50)	0.497					95% Adjusted Gamma UCL (use when n<50)	0.56				
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic	0.862					Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value	0.881					Data Not Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic	0.243					Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value	0.229					Data Not Lognormal at 5% Significance Level					
56	Data Not Lognormal at 5% Significance Level											
57												

	A	B	C	D	E	F	G	H	I	J	K	L
58	Lognormal Statistics											
59	Minimum of Logged Data					-6.908	Mean of logged Data					-3.369
60	Maximum of Logged Data					0.47	SD of logged Data					2.417
61												
62	Assuming Lognormal Distribution											
63	95% H-UCL					20.77	90% Chebyshev (MVUE) UCL					1.165
64	95% Chebyshev (MVUE) UCL					1.522	97.5% Chebyshev (MVUE) UCL					2.019
65	99% Chebyshev (MVUE) UCL					2.995						
66												
67	Nonparametric Distribution Free UCL Statistics											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	Nonparametric Distribution Free UCLs											
71	95% CLT UCL					0.374	95% Jackknife UCL					0.387
72	95% Standard Bootstrap UCL					0.367	95% Bootstrap-t UCL					0.938
73	95% Hall's Bootstrap UCL					0.997	95% Percentile Bootstrap UCL					0.385
74	95% BCA Bootstrap UCL					0.501						
75	90% Chebyshev(Mean, Sd) UCL					0.518	95% Chebyshev(Mean, Sd) UCL					0.662
76	97.5% Chebyshev(Mean, Sd) UCL					0.862	99% Chebyshev(Mean, Sd) UCL					1.255
77												
78	Suggested UCL to Use											
79	95% Adjusted Gamma UCL					0.56						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation	14/08/2020 2:51:29 PM										
5	From File	WorkSheet_d.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	OSD 6 and OSD 8 - Leachate (neutral pH) PFHxS + PFOS											
12												
13	General Statistics											
14	Total Number of Observations	15					Number of Distinct Observations	15				
15							Number of Missing Observations	0				
16	Minimum	0.01					Mean	10				
17	Maximum	80.66					Median	2.79				
18	SD	20.6					Std. Error of Mean	5.319				
19	Coefficient of Variation	2.06					Skewness	3.3				
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic	0.508					Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value	0.881					Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic	0.343					Lilliefors GOF Test					
25	5% Lilliefors Critical Value	0.229					Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL	19.37					95% Adjusted-CLT UCL (Chen-1995)	23.59				
31							95% Modified-t UCL (Johnson-1978)	20.12				
32												
33	Gamma GOF Test											
34	A-D Test Statistic	0.476					Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value	0.81					Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic	0.178					Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value	0.236					Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)	0.42					k star (bias corrected MLE)	0.38				
42	Theta hat (MLE)	23.83					Theta star (bias corrected MLE)	26.3				
43	nu hat (MLE)	12.59					nu star (bias corrected)	11.41				
44	MLE Mean (bias corrected)	10					MLE Sd (bias corrected)	16.22				
45							Approximate Chi Square Value (0.05)	4.838				
46	Adjusted Level of Significance	0.0324					Adjusted Chi Square Value	4.323				
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50)	23.57					95% Adjusted Gamma UCL (use when n<50)	26.39				
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic	0.932					Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value	0.881					Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic	0.206					Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value	0.229					Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												

58	Lognormal Statistics										
59				Minimum of Logged Data	-4.605			Mean of logged Data	0.747		
60				Maximum of Logged Data	4.39			SD of logged Data	2.243		
61											
62	Assuming Lognormal Distribution										
63				95% H-UCL	537			90% Chebyshev (MVUE) UCL	50.7		
64				95% Chebyshev (MVUE) UCL	65.95			97.5% Chebyshev (MVUE) UCL	87.13		
65				99% Chebyshev (MVUE) UCL	128.7						
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution at 5% Significance Level										
69											
70	Nonparametric Distribution Free UCLs										
71				95% CLT UCL	18.75			95% Jackknife UCL	19.37		
72				95% Standard Bootstrap UCL	18.61			95% Bootstrap-t UCL	51.62		
73				95% Hall's Bootstrap UCL	51.53			95% Percentile Bootstrap UCL	19.69		
74				95% BCA Bootstrap UCL	25.38						
75				90% Chebyshev(Mean, Sd) UCL	25.96			95% Chebyshev(Mean, Sd) UCL	33.18		
76				97.5% Chebyshev(Mean, Sd) UCL	43.22			99% Chebyshev(Mean, Sd) UCL	62.92		
77											
78	Suggested UCL to Use										
79				95% Adjusted Gamma UCL	26.39						
80											
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.										
84	For additional insight the user may want to consult a statistician.										
85											

Appendix K

ESTIMATE OF PFAS IMPACTED SOIL WON FROM EXCAVATION OF OSD 6 AND OSD 8

Appendix K - Estimate of PFAS impacted soil won from excavation of OSD 6 and OSD 8

An estimate of the volume of soil won from the excavation of OSD 6 and OSD 8 was prepared with consideration to the following construction drawings:

- Costin Roe (2020) DWG-SK-010; and
- Costin Roe (2020) DWG-SK-023.

The proposed cut and fill estimates for OSD 6 and OSD 8 are presented in **Figure K1** and **Figure K2,** respectively.

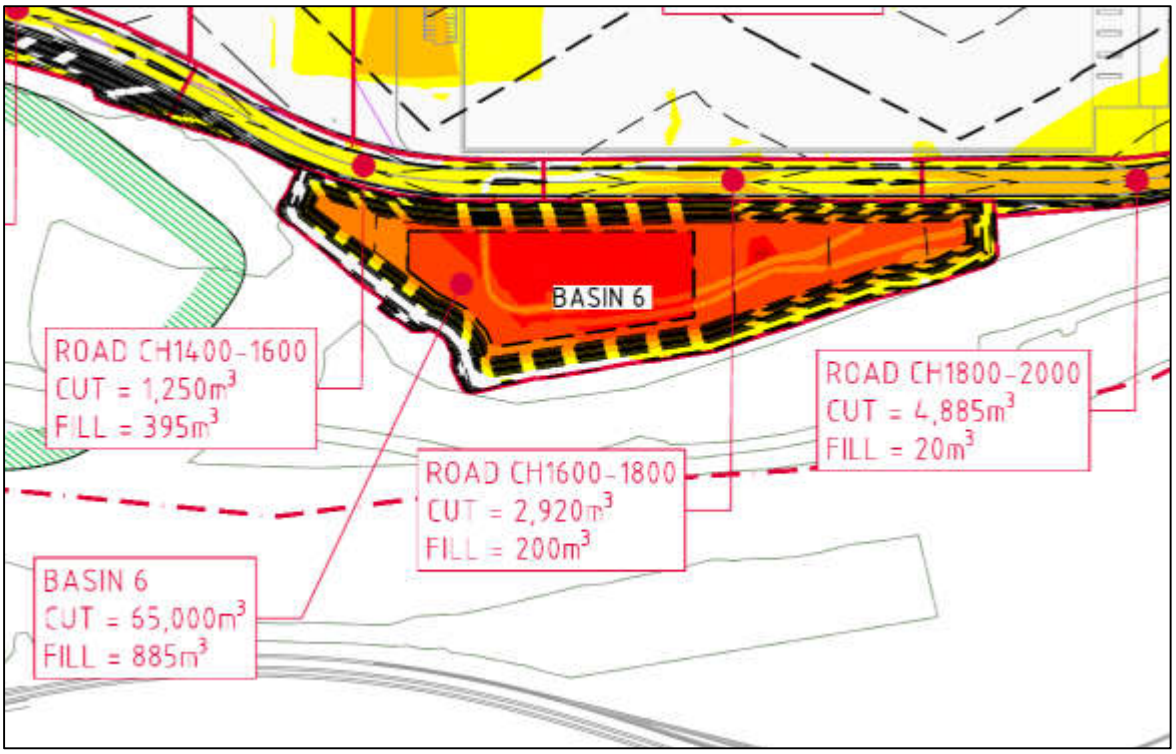

Figure K1 – Cut and Fill Plan for OSD 6

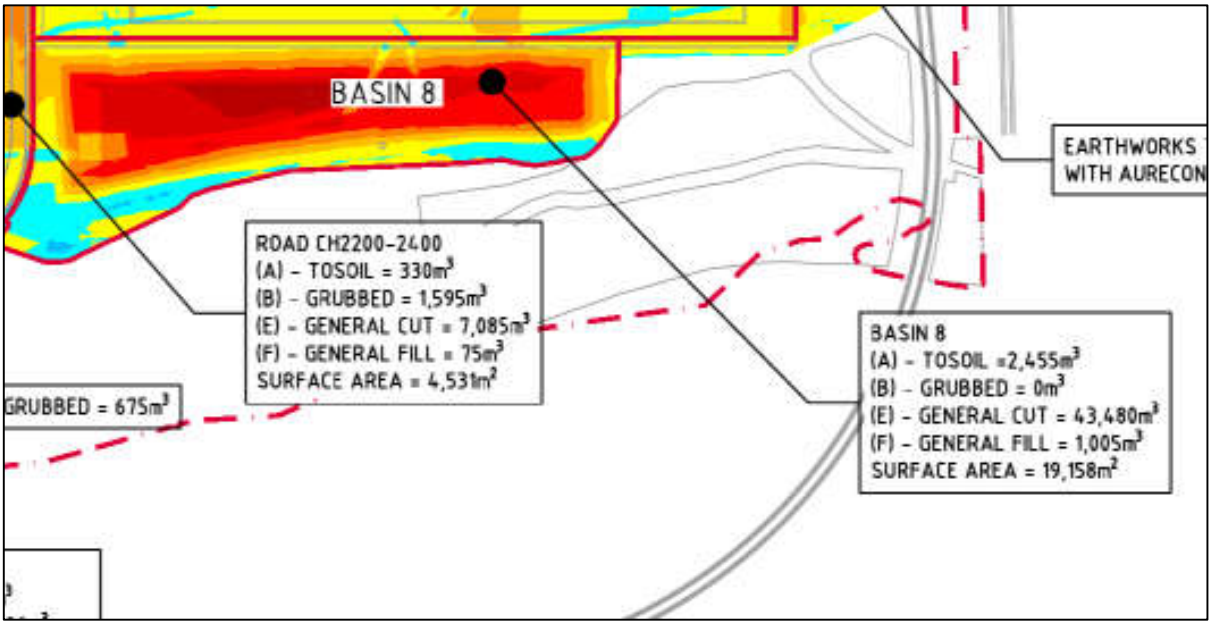

Figure K1 – Cut and Fill Plan for OSD 8

The estimate of fill to be won from the excavation of OSD 6 and OSD 6 is presented in **Table K1**.

Table K1 – Estimate of Fill Won from OSD 6 and OSD 8 Excavation

Excavation Area	Estimate of Volume (m^3)
OSD 6 - per Costin Roe (2020) DWG-SK-010	65,000
OSD 6 – additional excavation to install clay liner	15,000
OSD 8 – per Costin Roe (2020) DWG-SK-023	48,480
OSD 8 – additional excavation to install clay liner	15,000
Contingency allowance of for stormwater, drainage and service excavation	60,000
Total	**198,480 (round to 200,000)**

Appendix L
STOCKPILE SUMMARY TABLE

Appendix L - MPW Stockpile Assessment Register

JWP/Georgiou Stockpile Tracking Register					LTEMP v12 Comparision - JBS&G					
SP #	**SP source**	**Material Type**	**SP Location**	**Approximate volumes**	**Zone 1 (all areas, incl. surface), ≤0.01 mg/kg PFOS, and ASLP ≤0.07 µg/L PFOS**	**Zone 2 (beneath surface cover materials), ≤0.01 mg/kg PFOS**	**Zone 3 (beneath warehouses), ≤0.01 mg/kg PFOS**	**Zone 4 (beneath ring road and INTS), ≤0.14 mg/kg PFOS**	**Further sampling required under v11?**	**Comments**
Asphalt SP	Asphalt	Asphalt	Stockpile yard		**PFAS analysis required if soils are to be used as general fill.**	-	-	-	-	PFAS analysis required if soils are to be used as general fill.
Brick SP	Demolition and Remediation works	Brick	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
Concrete SP CSP1	Demolition and Remediation works	Concrete	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
Concrete SP CSP2	Demolition and Remediation works	Concrete	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
Concrete SP CSP3	Demolition and Remediation works	Concrete	Stockpile yard		Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
Concrete SP CSP4	Demolition and Remediation works	Concrete	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
Concrete SP CSP5	Demolition and Remediation works	Concrete	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
Concrete SP CSP6	Demolition and Remediation works	Concrete	Stockpile yard		Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	PFOS <0.01 mg/kg
MIC SP	SP M and SP M2, various materials from site.		North of Pad C	25500	**STOCKPILE SAMPLED 21-22/10/20 - PENDING ANALYSIS**					
SP10	Golf Course SP Consolidation of SP61, 134PRO, 142, 154PRO, 156, 162, 176, 177, 179, 181, 187, 191. SP155, SP188, SP214, SP226, SP233, SP241, and SP243.	General Fill	Stockpile yard	10000	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP11			Stockpile yard	450	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS in QA sample at 0.0024 mg/kg would require ASLP analysis. Soils would require screening for anthropogenics if selected for use on site surface.
SP132	Bridging yard coal material	Coal Material	South of stockpile yard, West of OSD 8	90	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP135/SP136 (SP29)	Zone B and Zone B carpark basins (1A, 1C) and surrounding swales - stockpiles combined and additional materials added	Topsoil	South of Turkey's Nest	220	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Partially assessed for PFAS due to mixed stockpile. Most of stockpile did not require PFAS assessment. PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **Note: stockpile is being reused on BMD INTS site.**
SP137	Topsoil pile west of SP111	Topsoil	South of Bapaume Rd	2000	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP138	North topsoil stockpile	Topsoil	OSD 6 Footprint	350	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP140 West	conc yard swale topsoil	Topsoil	South of stockpile yard, West of OSD 8	275	**PFAS ANALYSIS REQUIRED**	-	-	-	Yes	PFAS assessment required for reuse on site.
SP150	South of concrete yard	Topsoil	South of concrete stockpile at stockpile yard, West of OSD 8	200	**PFAS ANALYSIS REQUIRED**	-	-	-	Yes	PFAS assessment required for reuse on site.
SP155	CATA B north swale bricks	General Fill	Pad D footprint	-	**PFAS ANALYSIS REQUIRED**	-	-	-	Yes	PFAS assessment required for reuse on site.
SP161-1	Golf course swale and basin topsoil	Topsoil	Stockpile yard	240	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP161-2	Brick yard asphaltic material	General Fill	Stockpile yard	130	**PFAS ANALYSIS REQUIRED**	-	-	-	Yes	
SP161-3	Golf course swale and basin topsoil	Topsoil	Stockpile yard	580	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP161-4	unknown testing ongoing	unknown testing ongoing	Stockpile yard	1000	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS < 0.01 mg/kg, would require ASLP analysis for use on site surface.

Appendix L - MPW Stockpile Assessment Register

JWP/Georgiou Stockpile Tracking Register					LTEMP v12 Comparision - JBS&G					
SP #	**SP source**	**Material Type**	**SP Location**	**Approximate volumes**	**Zone 1 (all areas, incl. surface), ≤0.01 mg/kg PFOS, and ASLP ≤0.07 µg/L PFOS**	**Zone 2 (beneath surface cover materials), ≤0.01 mg/kg PFOS**	**Zone 3 (beneath warehouses), ≤0.01 mg/kg PFOS**	**Zone 4 (beneath ring road and INTS), ≤0.14 mg/kg PFOS**	**Further sampling required under v11?**	**Comments**
SP161-5	unknown testing ongoing	unknown testing ongoing	Stockpile yard	400	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP163	Basin 6E unsuitable material	Topsoil	South of stockpile yard, West of OSD 8	70	**PFAS ANALYSIS REQUIRED**	-	-	-	Yes	Limited PFAS samples available for the stockpile. Preliminary results indicate PFOS >0.01 mg/kg.
SP164	Services topsoil	Topsoil	South of stockpile yard, West of OSD 8	250	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP165	Services and ESC topsoil	Topsoil	South of stockpile yard, West of OSD 8	1300	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP170	Zone E Heritage area	Topsoil	South of stockpile yard, West of OSD 8	20	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP172	Swales surrounding basin 6D	Topsoil	OSD 6 Footprint	1100	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP188	Basin 7A and swales north of basin 7A	General Fill	Stockpile yard	-	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP192	Zone F Haunted House topsoil clearance for Variation 59	Topsoil	Stockpile yard	400	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP192A	Generated during LPWPIW		Stockpile yard	600	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS in QA sample at 0.0013 mg/kg, would require ASLP analysis for use on site surface.
SP192B	Generated during LPWPIW		Stockpile yard	170	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP197	Lot 100 Swales and Basins Topsoil	Topsoil	South of stockpile yard, West of OSD 8	170	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP198	Lot 100 swales	General Fill	North of Bapaume Rd	640	-	-	-	-	-	**Stockpile does not remain on site, replaced by Lot100-SP02.**
SP199	Lot 100 Swales and Basins Rubble	Topsoil	South of stockpile yard, West of OSD 8	30	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
Lot100-SP01	Lot 100		Lot 100		Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
Lot100-SP02	Lot 100		Lot 100		Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP200	Service Removal	General Fill	South of OSD 6	580	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP201	Topsoil from services removal	General Fill	South of OSD 6	680	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP202	Topsoil from swale crossing near CPB	Topsoil	South Western Corner of site, north west of CPB	40	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	No PFAS detected in samples.
SP203	Overburden from Basin 8A and swales	General Fill	South Western Corner of site, north west of CPB	950	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP204 North	Overburden from Basin 8A and swales	General Fill	South Western Corner of site, north west of CPB	510	Not suitable	Not suitable	Not suitable	Not suitable	No	**Soils > 0.14 mg/kg PFOS**
SP204 South	Topsoil from Basin 8A and swales	Topsoil	South Western Corner of site, north west of CPB	170	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP209	Topsoil from Basin 7B and swales	Topsoil	OSD 8 Footprint	860	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS

Appendix L - MPW Stockpile Assessment Register

JWP/Georgiou Stockpile Tracking Register					LTEMP v12 Comparision - JBS&G					
SP #	**SP source**	**Material Type**	**SP Location**	**Approximate volumes**	**Zone 1 (all areas, incl. surface), ≤0.01 mg/kg PFOS, and ASLP ≤0.07 µg/L PFOS**	**Zone 2 (beneath surface cover materials), ≤0.01 mg/kg PFOS**	**Zone 3 (beneath warehouses), ≤0.01 mg/kg PFOS**	**Zone 4 (beneath ring road and INTS), ≤0.14 mg/kg PFOS**	**Further sampling required under v11?**	**Comments**
SP210	Lot 100 unsuitable swale material	Topsoil	South of stockpile yard, West of OSD 8	240	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **NOTE: inconsistency between MTS and JBS&G assessment for SP source, however neither locations require PFAS assessment.**
SP211	Lot 100 unsuitable swale material	Topsoil	South of stockpile yard, West of OSD 8	130	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **NOTE: inconsistency between MTS and JBS&G assessment for SP source, however neither locations require PFAS assessment.**
SP215	Variation 97 CPB rd repairs	General Fill	South of stockpile yard, West of OSD 8	110	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP221	Lot 100 topsoil	Topsoil	South of stockpile yard, West of OSD 8	110	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP222	Zone F Swales	Topsoil	South of stockpile yard, West of OSD 8	160	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP222B	Existing stockpile	General Fill	South of stockpile yard, West of OSD 8	110	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS in QA sample at 0.0004 mg/kg, would require ASLP analysis for reuse on site surface.
SP237	New compound swale	General Fill	OSD 6 Footprint	760	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS at 0.007 mg/kg, would require ASLP analysis for use on site surface.
SP238	New compound bulk cut (Suitable)	General Fill	Stockpile yard	7200	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP239	Bulk cut works (Unsuitable Wet Material)	General Fill	Stockpile yard	11450	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP247	PFAS Capping	Topsoil	Stockpile yard	2950	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP248	Lot 100 Strip	Topsoil	North of Bapaume Rd	200	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **NOTE: current SP248 assessment (58753 L052) refers to stockpile relabelled as SP348. See L167.**
SP249	Lot 100 Strip	Topsoil	North of Bapaume Rd	200	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **Note: documented as L167.**
SP250	Lot 100 Strip	Topsoil	North of Bapaume Rd	200	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary. **Note: documented as L167.**
CPB STOCKPILE	CPB	General Fill	CPB	35000	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	**Not suitable for use on the final site surface due to ACM.** Soils <0.01 mg/kg PFOS.
CPB STOCKPILE	CPB	Topsoil	CPB	6000	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	**Not suitable for use on the final site surface due to ACM.** Soils <0.01 mg/kg PFOS.
SP252	Topsoil Strip from Bund Footprint	Topsoil	South of concrete stockpile at stockpile yard, West of OSD 8	600	**PFAS ANALYSIS REQUIRED**					PFAS assessment required for reuse of soils on site. Note: soils from accoustic bund.
SP258	Golf course swale excavation	General Fill	South of concrete stockpile at stockpile yard, West of OSD 8	100	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	Suitable - no PFAS assessment required (soils not from AEC3)	No	PFAS assessment for waste disposal only (if requested). Otherwise, no PFAS assessment necessary.
SP301	Existing stockpile	General Fill	South Eastern Corner of site / Eastern end of CPB Area	1000	-	-	-	-	-	See CPB Stockpile - Topsoil
SP302	Existing stockpile	Sandstone	South Eastern Corner of site / Eastern end of CPB Area	8000	-	-	-	-	-	See CPB Stockpile - General Fill

Appendix L - MPW Stockpile Assessment Register

JWP/Georgiou Stockpile Tracking Register					LTEMP v12 Comparision - JBS&G					
SP #	**SP source**	**Material Type**	**SP Location**	**Approximate volumes**	**Zone 1 (all areas, incl. surface), ≤0.01 mg/kg PFOS, and ASLP ≤0.07 µg/L PFOS**	**Zone 2 (beneath surface cover materials), ≤0.01 mg/kg PFOS**	**Zone 3 (beneath warehouses), ≤0.01 mg/kg PFOS**	**Zone 4 (beneath ring road and INTS), ≤0.14 mg/kg PFOS**	**Further sampling required under v11?**	**Comments**
SP303	Existing stockpile		South Eastern Corner of site / Eastern end of CPB Area	30	-	-	-	-	-	See CPB Stockpile - General Fill
SP304	Existing stockpile		South Eastern Corner of site / Eastern end of CPB Area	150	-	-	-	-	-	See CPB Stockpile - General Fill
SP305	Existing stockpile		South Eastern Corner of site / Eastern end of CPB Area	30	-	-	-	-	-	See CPB Stockpile - General Fill
SP306	EW Culvert area	Topsoil	Northern Stockpile area	4500	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS < 0.01 mg/kg in QA sample during in-situ E-W Culvert sampling, would require ASLP analysis for reuse on site surface. **NOTE: stockpile is TP-SP18.**
SP307	Stockpile yard open drains	GSW	OSD 6 footprint	50	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Detection of PFOS in QA sample at 0.0036 mg/kg, would require ASLP analysis for reuse on site surface.
SP348	(Existing SP248 was renamed to SP348 to avoid confusion with SP248 in lot 100)	Topsoil	Stockpile yard	2995	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS. **NOTE: stockpile assessment is documented as SP248.**
SP72	Zone F West trenches	General Fill	OSD 6 Footprint	35	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP-SERV-07	Zone C South	Topsoil	Stockpile yard	740	Not suitable	Not suitable	Not suitable	Not suitable	No	**Soils > 0.14 mg/kg PFOS**
SP-SERV-10	Zone F	Topsoil	OSD 6 Footprint	730	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
SP-SERV-10S	Zone F	Topsoil	OSD 6 Footprint	20	Not suitable	Not suitable	Not suitable	Suitable	No	Soils > 0.01 mg/kg and < 0.14 mg/kg PFOS
STP - SP014	STP (orange area)	Bonded ACM	STP		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP08	STP		STP	20	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP09	STP		STP	15	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP10	STP		STP	2900	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Not suitable for use on the final site surface due to ACM.
STP-SP11	STP		STP	90	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP277	STP		STP	10	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP-Concrete	STP	Concrete	STP	50	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	
STP-SP-PADS	STP		STP	150	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP-VEG	STP	VEG	STP	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
STP-SP-Wire	STP	Reinforcing	STP	45	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	
SP17	Eastern and central scrape of STP		Northern Stockpile	70	Potentially suitable subject to ASLP assessment.	Suitable	Suitable	Suitable	Only if selected for use in Zone 1 (all areas)	Not suitable for use on the final site surface due to ACM.
SP13	Scrapped UF264		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.

Appendix L - MPW Stockpile Assessment Register

JWP/Georgiou Stockpile Tracking Register					LTEMP v12 Comparision - JBS&G					
SP #	**SP source**	**Material Type**	**SP Location**	**Approximate volumes**	**Zone 1 (all areas, incl. surface), ≤0.01 mg/kg PFOS, and ASLP ≤0.07 µg/L PFOS**	**Zone 2 (beneath surface cover materials), ≤0.01 mg/kg PFOS**	**Zone 3 (beneath warehouses), ≤0.01 mg/kg PFOS**	**Zone 4 (beneath ring road and INTS), ≤0.14 mg/kg PFOS**	**Further sampling required under v11?**	**Comments**
SP25	EW Haul Rd Scrape		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP28	STP east scrape to natural		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP24	EW Haul Rd scrape TPHR central		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP27	STP haul rd scrape material		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP26	EW Haul Rd decon scrape		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
TP-SP34	Terrace pad ramp excavated clean material		Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP33			Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP36			Northern Stockpile	100	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
SP39			Northern Stockpile	20	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP45	Hardstand A	Concrete	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	
HA-SP47	Hardstand A		North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP48	Hardstand A	Topsoil	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP48A	Swale drain North East of hardstand A	Topsoil	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP49	Hardstand A	GSW-MIC	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP51	Hardstand A	Mixed concrete GSW	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP51A	Hardstand A	Mixed concrete GSW	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.
HA-SP52	Hardstand A	GSW-MIC	North EW culvert East of OSD 5		*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*Suitable - no PFAS assessment required (soils not from AEC3)*	*No*	Not suitable for use on the final site surface due to ACM.

Appendix M
GROUNDWATER SUMMARY TABLE

Job No. EP1489.001
Site: MPW LTEMP
Table Groundwater gauging summary

Location	Well	Easting	Northing	Top of casing	Stand pipe	Bottom of casing	Surface level	Well depth	Well depth	Screened interval	Groundwater elevation (mAHD)												Maximum groundwater level	Depth to surface
				(mAHD)	(m)	(mAHD)	(mAHD)	(mBTOC)	(mBGL)	(mBGL)	12/07/2016	13/07/2016	14/07/2016	28/02/2017	1/03/2017	2/03/2017	6/03/2017	27/03/2017	28/03/2017	30/03/2017	24/05/2017	18/06/2018	(m AHD)	(m)
North	MW6012	307830.275	6241827.41	13.343																		4.544	4.544	
North	BHB2	307727.161	307727.161	11.285																			2.98	
North	PB_MW2A	307638.598	6241866.802	13.781	0.72	1.351	13.061	12.43	11.71	9.0 - 12.0			4.371									3.8	4.371	8.69
Dust Bowl	BHA-1	307180.382	6241059.802											3.526				3.657			3.658	3.294	3.658	
Dust Bowl	MW085	307450.611	6241294.749											4.643				4.842			4.908	4.158	4.908	
Dust Bowl	MW106	307219.037	6241233.919											3.109				3.366			3.249		3.366	
Dust Bowl	MW106A	307219.073	6241234	8.83	0.68	1.09	8.15	7.74	7.06	3.0 - 7.5			3.42										3.42	4.73
Dust Bowl	MW107	307245.195	6241340.934											3.091				3.379			3.255	2.863	3.379	
Dust Bowl	MW108	307341.167	6241532.488											3.737				4.233			3.963	3.214	4.233	
Dust Bowl	MW109B	307154.511	6240563.005	8.103	0.72	-0.047	7.383	8.15	7.43	4.5 - 7.5	3.594				3.361			3.813			3.406	2.897	3.813	3.57
Dust Bowl	MW2012	307144.489	6240933.614	7.708	0.68	2.028	7.028	5.68	5	3.5 - 5.0			3.658	3.168				3.353			3.275	3.015	3.658	3.37
Dust Bowl	MW2013	307204.781	6240968.798	8.146	0.71	2.536	7.436	5.61	4.9	3.5 - 5.0		3.976		3.458				3.615			3.609	3.261	3.976	3.46
Dust Bowl	MW2014	307157.862	6240985.143	8.119	0.65	2.459	7.469	5.66	5.01	2.0 - 5.0		3.909		3.407				3.572			3.543		3.909	3.56
Dust Bowl	MW2015	307218.888	6241033.430	8.613	0.72	2.013	7.893	6.6	5.88	3.0 - 6.0		4.053		3.577				3.715			3.73	3.347	4.053	3.84
Dust Bowl	MW2016	307357.690	6241023.612	14.937	0.67	0.647	14.267	14.29	13.62	12.0 - 13.5		4.497			4.239			4.334			4.466	3.898	4.497	9.77
Dust Bowl	MW2017	307237.819	6241086.328	8.402	0.74	1.762	7.662	6.64	5.9	4.5 - 6.0		4.082		3.727				3.849			3.866	3.442	4.082	3.58
Dust Bowl	MW2018	307195.528	6241119.422	8.698	0.72	1.958	7.978	6.74	6.02	3.0 - 6.0			3.878	3.581				3.69			3.705	3.337	3.878	4.1
Dust Bowl	MW2019	307218.260	6241182.130	8.866	0.71	1.636	8.156	7.23	6.52	5.0 - 6.5			3.866	3.607				3.708			3.733	3.335	3.866	4.29
Dust Bowl	MW3001	307261.171	6241443.760	8.722	0		7.654		7	3.0 - 7.0						2.885		3.057			2.817	2.78	3.057	4.597
Dust Bowl	MW3002	307124.573	6240873.010	7.623	0		6.693		7	3.0 - 7.0						2.837		2.868			2.775	2.927	2.927	3.766
Dust Bowl	MW3003	307118.887	6240789.281	4.777	0		4.114		3.5	1.0 - 3.5						3.068		3.148			2.832	2.632	3.148	**0.966**
Dust Bowl	MW3004	307117.220	6240689.368	5.040	0		4.191		3	1.0 - 3.0						2.905		3.025			2.788	2.828	3.025	1.166
Dust Bowl	MW3005	307236.393	6240787.334	15.533	0		14.893		13.5	7.0 - 13.0						4.246		4.287			4.387	3.763	4.387	10.506
Fire Training	MW083	307233.977	6240109.739														3.039			3.159	3.152	4.302	4.302	
Fire Training	MW096	307355.457	6240022.849												3.418				3.538		4.716	3.086	4.716	
Fire Training	MW15	307330.490	6240083.161														3.387		3.6		3.619	3.019	3.619	
Fire Training	MW1A	307259.691	6240078.073												3.016					3.187	3.167		3.187	
Fire Training	MW1B	307258.410	6240079.580	11.034	0.72	1.294	10.314	9.74	9.02	7.5 - 9.0	3.594				3.005					3.184	3.169	2.77	3.594	6.72
Fire Training	MW2	307218.904	6240070.301												3.007					3.168	3.157	2.783	3.168	
Fire Training	MW2001B	307277.277	6239919.558	12.224	0.68	0.574	11.544	11.65	10.97	8.0 - 11.0			3.324		2.976				3.195		3.082	2.768	3.324	8.22
Fire Training	MW2002	307222.142	6240055.083	7.616	0.7	1.416	6.916	6.2	5.5	2.5 - 5.5		3.566			2.995					3.173	3.161	2.746	3.566	3.35
Fire Training	MW2003	307257.294	6240048.588	11.011	0.73	1.231	10.281	9.78	9.05	6.0 - 9.0	3.611				2.997					3.191	3.166	2.754	3.611	6.67
Fire Training	MW2005	307481.150	6240088.942	17.51	0.65	2.29	16.86	15.22	14.57	11.0 - 17.0	5.29				5.106				5.15		5.24	4.383	5.29	11.57
Fire Training	MW2006	307211.446	6240104.484	8.137	0.74	1.987	7.397	6.15	5.41	2.5 - 5.5			3.547		2.993					3.146	3.144		3.547	3.85
Fire Training	MW2007	307255.997	6240119.908	11.125	0.7	1.515	10.425	9.61	8.91	7.5 - 9.0	3.585						3.048			3.177	3.168		3.585	6.84
Fire Training	MW2008	307300.908	6240106.836	9.97	0.65	-2.01	9.32	11.98	11.33	8.5 - 11.5	3.968						3.524		3.929		3.608		3.968	5.352
Fire Training	MW2009	307228.722	6240148.142	10.044	0.71	0.304	9.334	9.74	9.03	6.0 - 9.0		3.554					3.044			3.148	3.15		3.554	5.78
Fire Training	MW2010	307300.142	6240168.854	14.3	0.7	2.56	13.6	11.74	11.04	8.0 - 11.0	4.05						3.396		3.611		3.534	3.067	4.05	9.55
Fire Training	MW2011	307246.297	6240178.824	12.533	0.68	0.793	11.853	11.74	11.06	9.5 - 11.0	3.573						3.049		3.15		3.164	2.779	3.573	8.28
Fire Training	MW2020	307236.181	6240231.628														3.044		3.14		3.158	2.8	3.158	
Fire Training	MW3006	307255.360	6240248.906	13.310	0		12.276		12	7.0 - 12.0						3.02			3.144		3.167	1.784	3.167	9.109
Fire Training	MW3007	307307.78	6239995.71	14.808	0		14.143		14	8.0 - 14.0						3.187			3.363		3.402	2.899	3.402	10.741
Fire Training	MW3012	307196.317	6240326.015	8.326	0		7.437		7	3.0 - 7.0							3.024			3.061	3.038	2.701	3.061	4.376
Fire Training	MW3013	307200.328	6240276.333	8.650	0		7.787		7.5	3.0 - 7.5							3.026			3.081	3.065	2.791	3.081	4.706
Fire Training	MW3014	307208.783	6240210.917	9.662	0		8.745		8	3.5 - 8.0							3.044			3.142	3.156	2.787	3.156	5.589
Fire Training	MW3015	307207.821	6240081.235	7.218	0		6.225		5	2.0 - 5.0						2.997				3.155	3.148	2.762	3.155	3.07
South	MW3008	307394.258	6239797.386	18.154	0		17.375		18.7	12.5 - 18.7						7.642			11.522		9.599		11.522	5.853
South	MW3009	307325.815	6239833.468	16.802	0		16.048		17	11.0 - 17.0						3.083			3.514		3.353	2.876	3.514	12.534
South	MW3010	307260.804	6239764.781	8.408	0		7.690		7	3.0 - 7.0						2.881			3.276		2.935		3.276	4.414
South	MW3011	307279.382	6239849.183	11.248	0		10.691		11	6.0 - 11.0							2.942		3.168		2.984	2.771	3.168	7.523

Minimum	0.966
Maximum	10.506