



Contamination Management Plan

Moorebank Precinct East Site

400 Moorebank Avenue, Moorebank NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd
EP1280.002_MAUW_CMP01 v4 8 November 2019



Contamination Management Plan

Moorebank Avenue Upgrade Works, 400 Moorebank Avenue, Moorebank NSW

8 November 2019

Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

Via email: [REDACTED]

Ref: EP1280.002_CMP01 v4

LIMITATIONS

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QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1.0	[REDACTED]	09.09.2019	[REDACTED]	09.09.2019	[REDACTED]	09.09.2019
v2.0	[REDACTED]	10.10.2019	[REDACTED]	25.09.2019	[REDACTED]	25.09.2019
v3.0	[REDACTED]	11.10.2019	[REDACTED]	25.09.2019	[REDACTED]	25.09.2019
v4.0	[REDACTED]	08.11.2019	[REDACTED]	08.11.2019	[REDACTED]	08.11.2019

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
V4	08.11.2019	EP1280.002_MAUW_CMP01 v4	Qube c/o Tactical

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Abbreviations and Terminology		
Abbreviations	Term	Definition
ACM Bonded	Asbestos Containing Materials Bonded	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 <i>Model Code of Practice: How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2018).
AF	Asbestos Fines	AF includes free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7mm sieve. Equivalent to “friable” asbestos in <i>Model Code of Practice: How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2018).
AFFF	-	Aqueous Film Forming Foam
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 Section 8 .
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
BTEX	-	Benzene, Toluene, Ethylbenzene and Xylenes
Cd	-	Cadmium
CLM	-	Contaminated Land Management
CMP	Contamination Management Plan	This Plan.
CoC	Conditions of Consent	Conditions of Consent SSD 7628
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

Abbreviations and Terminology		
Abbreviations	Term	Definition
DNSDC	-	Defence National Storage and Distribution Centre
DP&E	-	NSW Department of Planning 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.
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 <i>How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2018).
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 <i>Work Health and Safety Act 2011</i> (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 Central Precinct to understand the site specific risks.
LGA	-	Local Government Area or Agency
LNAPL	-	Light Non-Aqueous Phase Hydrocarbons

Abbreviations and Terminology		
Abbreviations	Term	Definition
MAUW	Moorebank Avenue Upgrade Works	<p>Subject of this CMP –</p> <p>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 works and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW Site, Figure 2, Attached Figures.</p>
Metallic Debris	Metallic Debris	Debris comprising metal (ferrous) items. May include fragments of former ordnance items.
MIC	-	Moorebank Intermodal Company
MPE Concept Plan Approval	Moorebank Precinct East Concept Plan Approval	Formerly the SIMTA Concept Plan Approval. MPE Concept Plan Approval (SSD_0193) granted by the NSW Department of Planning and Environment on 29 September 2014 for the development of former defence land at Moorebank to be developed in three stages; a rail link connecting the site to the Southern Sydney Freight Line, an intermodal terminal, warehousing and distribution facilities and a freight village.
MPE Project	Moorebank Precinct East Project	Formerly the SIMTA 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 Approval (14_6766).
MPE Site	Moorebank Precinct East Site	Formerly the SIMTA Site. Including the former DSND site and the land owned by SIMTA which is subject to the Concept Plan Approval. The MPE Site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
MPE Stage 1	Moorebank Precinct East Stage 1	Stage 1 (14-6766) of the MPE Concept Plan Approval for the development of the MPE Intermodal Terminal Facility, including the rail link at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.
MPE Stage 1 Site	Moorebank Precinct East Stage 1 Site	Includes 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 Project	Moorebank Precinct East Stage 2 Project	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.

Abbreviations and Terminology		
Abbreviations	Term	Definition
MPE Stage 2 Site	Moorebank Precinct East Stage 2 Site	The area within the MPE Site which would be disturbed by the MPE Stage 2 Proposal (including the operational area and construction area). The MPE Stage 2 site includes the former DSND site and the land owned by SIMTA which is subject to the MPE Concept Plan Approval. The MPE Site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
MPW Project	Moorebank Precinct West Project	Formerly the MIC Project. The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (SSD_5066) and the MPW EPBC Approval (No. 2011/6086).

Abbreviations and Terminology		
Abbreviations	Term	Definition
MPW Site	Moorebank Precinct West Site	Formerly the MIC Site. The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Approval and MPW Planning Proposal. The MPW Site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.
Ni	-	Nickel
OCP	-	Organochlorine Pesticides
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
Quarantined Area	Quarantined Area	Area removed from development activities due to potential contamination. Also see AOC.
QUBE	QUBE Holdings Ltd	Joint 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
Refuelling Area	-	Former DNSDC Refuelling Area located within Stage 1 MPE (Figure 2, Attached Figures)
SAQP	-	Sampling Analysis and Quality Plan
SIMTA	-	Sydney Intermodal Terminal Alliance - a consortium comprising Qube and Aurizon Holdings.

Abbreviations and Terminology		
Abbreviations	Term	Definition
Site	Site	Moorebank Avenue Upgrade Works, Figure 2, Attached Figures)
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
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.
VOC	-	Volatile Organic Compounds
Zn	-	Zinc

1 Introduction

EP Risk Management Pty Ltd (EP Risk) was engaged by Qube (Qube) Property Management Services Pty Ltd c/o Tactical Group Pty Ltd ('Tactical'), to prepare the Contamination Management Plan (CMP) for the Moorebank Avenue Upgrade Works (MAUW) located along Moorebank Avenue (the Site), **Figure 1 and 2(Attached Figures)**.

The Site is approximately 13.5 hectares in area and comprises the following Lots:

- Part Lot 2 DP 1197707 (Moorebank Avenue).
- Part Lot 1 DP 1197707 (Portion of Moorebank Precinct West (MPW)).

1.1 Background

The MPE Project involves the development of an intermodal terminal (IMT), including a rail link to the Southern Sydney Freight Line (SSFL) within the Rail Corridor, warehouse and distribution facilities with ancillary offices, a freight village (ancillary site and operational services), stormwater, landscaping, servicing, associated works on the eastern side of Moorebank Avenue, Moorebank, NSW.

The development of the Stage 2 portion of the MPE Project involves the construction and operation of warehousing and distribution facilities on the Site, as well as upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE Site boundary and 120 metres south of the southern MPE Site boundary (Arcadis 2016¹).

Key components of the development include:

- Warehousing comprising approximately 300,000m² gross floor area (GFA), additional ancillary offices and the ancillary freight village;
- Establishment of an internal road network, and connection of the Site to the surrounding public road network;
- Ancillary supporting infrastructure within the site, including stormwater and drainage infrastructure, utilities relocation, vegetation clearing, remediation, earthworks, signage and landscaping;
- Subdivision of the land;
- The associated Moorebank Avenue upgrade; and
- Upgrading existing intersections along Moorebank Avenue.

The following construction activities would be carried out across and surrounding the Site:

- Vegetation clearance;
- Demolition of infrastructure;
- Earthworks and levelling;

¹ *Moorebank Precinct East – Stage 2 Proposal Contamination Summary Report*, JBS&G Australia Pty Ltd c/o Arcadis, December 2016 (Arcadis 2016).

- Drainage and utilities installation;
- Establishment of hardstand;
- Construction of a temporary diversion road to allow for traffic management along the Moorebank Avenue portion of the Site during construction (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road); and
- Construction works associated with signage, landscaping, stormwater and drainage works.

The CMP was staged under Condition A14 (SIMTA 2018²), EP Risk (2018³), under condition A15 excluded the Moorebank Avenue Site and associated portion of the MPW (**Figure 1**). This was due to the groundwater Exclusion Zone (located underneath the Moorebank Avenue Site) being impacted with Light Non-Aqueous Phase Liquids (LNAPL).

Under Condition A15, this CMP has been compiled specifically for Moorebank Avenue Upgrade Works (MAUW) which includes the Moorebank Avenue Site and associated portion of the MPW.

A number of previous environmental investigations have been undertaken involving the former DNSDC and associated areas dating back to at least 1980, with more recent investigations and summary documents prepared between 2000 and 2016. A non-statutory SAS and Site Audit Report (SAR) was completed in 2002, for the Sydney Intermodal Terminal Alliance (SIMTA) site, with the Site Auditor certifying the SIMTA site as suitable for ongoing commercial/industrial use subject to implementation of a Site Management Plan (SMP), which was to include a range of actions relating to further investigation, remediation, groundwater monitoring and management controls. It is not known whether a SMP was prepared or implemented, or whether any recommended actions were undertaken.

Subsequent to the above and at the request of the Department of Defence, the following non-statutory site audits were completed within the following portions of the Site:

- Moorebank Avenue (Aecom 2016a⁴), the Site Auditor certified Moorebank Avenue as suitable for commercial / industrial use subject to compliance with the site management plan (SMP) (Golder 2016a⁵) (**Appendix A**) due to the presence of light non-aqueous phase liquids (LNAPL) in the groundwater beneath a portion of the Southern Section of Moorebank Avenue.
- Portion of MPW – while this portion of the Site has not been signed off as suitable for a commercial / industrial landuse, a Remediation Action Plan (RAP) (Golder 2016c⁶) has been developed for the site and reviewed by the Mr [REDACTED] (NSW EPA Contaminated Land Site

² Program for Delivery Phase Documentation Moorebank Precinct East Stage 2, Sydney Intermodal Terminal Alliance (SIMTA), 22/02/2018 (SIMTA 2018).

³ Contamination Management Plan Moorebank Precinct East Site 400 Moorebank Ave Moorebank NSW, EP Risk Management Pty Ltd, 23 May 2018 v5 (EP Risk 2018).

⁴ Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016 (Aecom 2016a).

⁵ Moorebank Avenue Site Management Plan. Report Ref. 147623070_052-Rev1, 4 July 2016 (Golder 2016a).

⁶ Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan, Golder Associates, 9 August 2016 (Golder 2016c).

Auditor) (Enviroview 2016⁷). 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).

In addition to the above, the following non-statutory site audit was completed on the neighbouring DNSDC Site (the subject of EP Risk 2018):

- DNSDC (JBS&G 2016a⁸), excluding the former DNSDC Refuelling Area. The Site Auditor certified the former DNSDC as suitable for commercial / industrial use subject to compliance with the Environmental Management Plan (EMP) prepared for the Site in July 2016 (GHD 2016⁹) and updated in 2018 (EP Risk 2018a¹⁰).

The DNSDC refuelling facility (**Figure 2, Attached Figures**) is not located within the Site. However, as a portion of the Southern Section of Moorebank Avenue is located downgradient of the former refuelling area reference will be made to the following reports where necessary:

- *Site Audit Report and Site Audit Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW*. Report Ref. 51732-105413, 13 October 2016 (JBS&G 2016b).
- *DNSDC Moorebank – Refuelling Area Remedial Action Plan*. Report Ref. PRECQPMS- EN-RPT-0007, November 2015 (GHD 2015b).
- *Former DNSDC Refuelling Area Remediation Validation Report – Phase A*, GHD, October 2016 (GHD 2016a).
- *Former DNSDC Refuelling Area, Moorebank, NSW Human Health and Ecological Risk Assessment*, GHD, October 2016 (GHD 2016b).
- *Former DNSDC Refuelling Area, Moorebank, NSW Validation Report – Phase C*, GHD, March 2018 (GHD 2018a).
- *Former DNSDC Refuelling Area, Moorebank, NSW Environmental Management Plan*, GHD, October 2018 (GHD 2018b).
- *Site Audit Report and Statement 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW*, JBS&G Australia Pty Ltd, 30 October 2018 (JBS&G 2018).

The adjoining property, Stage 1 MPE (**Figure 2, Attached Figures**), also known as the Import Export Terminal (IMEX), has been signed off (Section A2) as suitable for commercial / industrial land use

⁷ *Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan*, Enviroview Pty Ltd, Letter to Tactical Group dated 22 August 2016 from Mr James Davis (Enviroview 2016).

⁸ *Site Audit Statement and Report 0503-1611 Part Lot 1 in DP 1048263 Former Defence National Storage and Distribution Centre (DNSDC)*, Moorebank Avenue Moorebank NSW, JBS&G Australia Pty Ltd, 12 October 2016 (JBS&G 2016a).

⁹ *Department of Defence Former DNSDC, Moorebank, NSW Environmental Management Plan*, GHD, September 2016 (GHD 2016).

¹⁰ *Environmental Management Plan Moorebank Precinct East, 400 Moorebank Avenue, Moorebank NSW*, EP Risk Management Pty Ltd, January 2018 (EP Risk 2018a).

(Enviroview 2019a¹¹) subject to the compliance of the Former DNSDC Refuelling Area EMP (GHD 2018b).

Within the remaining areas requiring management, the SASs (Aecom 2016a) indicated the Site was suitable for continued commercial/industrial use or could be made suitable (Enviroview 2016), subject to the implementation of a SMP/RAP (Golder 2016a and 2016c).

This CMP has been developed based on general accordance the EMP (GHD 2016). As per Section 1.6 of GHD (2016) the EMP required amendment should the Site be redeveloped. The Site is currently part of two State Significant Development (SSD) approvals, SSD 6766 MPE Stage 1 (approved) and SSD 7628 MPE Stage 2. The EMP (GHD 2016) was updated and reported in EP Risk (2018a). The GHD (2016) EMP was reviewed and endorsed by the NSW EPA Site Auditor (JBS&G 2016a).

Per- and poly-fluoroalkyl substances (PFAS)

MPW Site

Based on current investigations within the MPW Site there are two main PFAS source areas. These are located on the western portion of the MPW Site and are not within the portion located within the Site.

It is noted there are a number of reference documents, which relate to PFAS within the MPW Site:

- *Literature Review, Criteria for Assessment of PFAS and Risk Assessment Moorebank Intermodal Terminal Development*, EP Risk Management Pty Ltd, 3 October 2017 (EP Risk 2017a).
- *Moorebank Precinct West Site Wide Per- and Poly Fluoroalkyl Substances (PFAS) Assessment Moorebank Precinct West, Moorebank Ave, Moorebank, NSW*, EP Risk Management Pty Ltd, 22 August 2018 (EP Risk 2018c¹²).
- *Addendum: Qualitative Human Health Risk Assessment Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW*, EP Risk Management Pty Ltd, 5 September 2018 (EP Risk 2018d¹³).
- *DRAFT PFAS Contamination Management Plan Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW*, EP Risk Management Pty Ltd, 26 March 2019 (EP Risk 2019c¹⁴).

Overall, PFAS impact within the MPW Site is located predominately within the groundwater and will be managed in accordance to the above reference documents, or subsequent iterations. The proposed development works within the Site located within the MPW Site are for temporary road re-alignment and excavation to depths intersecting groundwater is considered unlikely.

¹¹ *Site Audit Report IMEX Terminal Moorebank Precinct East, Sydney Intermodal 400 Moorebank Avenue, Moorebank*, Enviroview Pty Ltd, August 2019 (Enviroview 2019a).

Site Audit Statement 0301-1613-2 IMEX Terminal Moorebank Precinct East, Sydney Intermodal, prepared by Mr James Davis NSW EPA Site Auditor Accreditation no. 0301 (Enviroview 2019a).

¹² *Moorebank Precinct West Site Wide Per- and Poly Fluoroalkyl Substances (PFAS) Assessment Moorebank Precinct West, Moorebank Ave, Moorebank, NSW*, EP Risk Management Pty Ltd, 22 August 2018 (EP Risk 2018c).

¹³ *Addendum: Qualitative Human Health Risk Assessment Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW*, EP Risk Management Pty Ltd, 5 September 2018 (EP Risk 2018d).

¹⁴ *DRAFT PFAS Contamination Management Plan Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW*, EP Risk Management Pty Ltd, 26 March 2019 (EP Risk 2019c).

Moorebank Avenue

The portions of Moorebank Avenue do not contain areas identified as being potential PFAS sources (Aecom 2016a). Therefore, no further PFAS investigations are proposed within these areas of the Site.

The requirement for a CMP is provided within the conditions of consent for the Site (Development Consent).

1.2 Conditions of Consent

The Development Consent made under *Section 89E of the Environmental Planning and Assessment Act 1979* (SSD 7628) has listed the conditions of consent (CoC) in **Table 1** in relation to the CMP.

Additionally, the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approval for the MPW Concept (EPBC 2011/6086) was granted by a delegate of the Minister for the Environment on 27 September 2016. 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 development 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.

Upon review of the approval EPBC 2011/6086 and variation dated 17 September 2019 the relevant conditions of approval are listed within **Table 2** in relation to the CMP.

The MPW Stage 2 Environmental Impact Statement ((MPW Stage 2 EIS) Arcadis, 2016a¹⁵) identified a range of environmental impacts and recommended management and mitigation measures to avoid, remedy or mitigate these impacts. These mitigation measures were revised as part of the MPW Stage 2 Response to Submissions Report (RtS). The Final Compilation of Mitigation Measures (FCMM) presents the mitigation measures previously presented separately in the MPW Stage 2 EIS and Response to Submissions (RtS). A list of the relevant FCMMs relevant to the CMP and how they have been complied within this plan are provided in **Table 3**.

¹⁵ *Moorebank Precinct West Stage 2 Environmental Impact Statement*, Arcadis 2016 (Arcadis 2016).

Table 1 – Conditions of Consent (CoC) – SSD 7628

CoC	Requirement	Document Reference	How Addressed
A14	With approval of the Secretary, the Applicant may submit any strategy, plan or program required by this consent on a Staged basis.	Section 1.1	The subject of this version of the CMP, is the MAUW located predominately along Moorebank Avenue but also includes a portion of the MPW Site. (Figure 2, Attached Figures).
A15	If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program.	Section 1.1	This plan is for the MAUW and associated portion of the MPW Site and does not replace the CMP (EP Risk 2018) which covers the remaining portions of the Stage 2 MPE Site.
C7	<p>The applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include:</p> <ul style="list-style-type: none"> a) Baseline data; b) A description of: <ul style="list-style-type: none"> (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: <ul style="list-style-type: none"> (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; 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: <ul style="list-style-type: none"> (i) Incidents and non-compliances; (ii) Complaints; (iii) Non-compliances with statutory requirements; and h) A protocol for periodic review of the plan. 	<ul style="list-style-type: none"> a) Section 3, 4 and 5, Table 7; b) <ul style="list-style-type: none"> (i) Section 6, 8, 9.8 and 9.9; (ii) Section 1.3, 6, 8.2 and 9.5; (iii) Section 6, 8.6 and 9.5 and Appendix C (Section 8); c) Section 7, 8.5, 9.10, 9.11; d) <ul style="list-style-type: none"> (i) Section 8.6, 9.7 and 10.3; and (ii) Section 10.3; e) Section 9; f) Section 10.2; g) <ul style="list-style-type: none"> (i) Section 10.2; (ii) Section 10.2; (iii) Section 10.2; and h) Section 10.1. 	<ul style="list-style-type: none"> a) Includes known site conditions, summarised remaining contamination issues and conceptual site model; b) <ul style="list-style-type: none"> (i) Each section covers any relevant approval and/or license for each type of contamination management activity; (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 GHD (2016) and the Condition of Consent B134 and B135; d) <ul style="list-style-type: none"> (i) Each section describes the sampling analysis and reporting program for each contamination issue requiring management; and

Table 1 – Conditions of Consent (CoC) – SSD 7628

CoC	Requirement	Document Reference	How Addressed
			<ul style="list-style-type: none"> (ii) The sampling and validation programs will report on the effectiveness of the any of the management measures; e) Details the Unexpected Finds Procedure in relation to contamination; f) Continual improvement for the CMP is discussed; g) <ul style="list-style-type: none"> (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; and h) Specified how the CMP will be reviewed/updated.
B133	Prior to any demolition on the site, and entry and any subsurface activities within the southern burial pits, an UXO, EO and EOW Site Assessment Survey must be undertaken by a UXO contractor listed on the Defence Panel of suitably qualified UXO consultants and contractors and submitted to the Secretary.	Southern Burial Pits Covered by EP Risk (2018) Section 7 Appendix C	<p>G-tek a Defence Panel qualified UXO consultant, were engaged to review historical reports and risks. As a result of the review found that overall the MAUW was found to be to have a low risk and should be managed as per the requirements set out in the Management Plan (Appendix C).</p> <p>The Southern Burial Pits are not located within the Site which is the subject of this CMP (the MAUW). The Southern Burial Pits are closed out within EP Risk (2018).</p>
B134	Prior to early works and fill importation, a Contamination Management Plan must be prepared to the satisfaction of the Secretary and form part of the Construction	This plan and EP Risk (2018).	This plan forms a sub-plan to the CEMP along with CMP (EP Risk 2018).

Table 1 – Conditions of Consent (CoC) – SSD 7628

CoC	Requirement	Document Reference	How Addressed
	<p>Environmental Management Plan (CEMP) required under condition C1. The Contamination Management Plan is to be based on the Environmental Management Plan prepared by GHD (2016) and results of the UXO, EO and EOW Site Assessment Survey and must take into account additional risks posed by the proposed works and in particular:</p> <ul style="list-style-type: none"> (a) excavation within the southern burial pits; (b) removal/remediation of underground storage tanks; (c) disturbance of soil containing asbestos material; and (d) demolition of buildings containing asbestos materials. 	<p>GHD 2016 – was compiled for the former DNSDC Site and has been covered within the EP Risk (2018). Moorebank Avenue and the portion of MPW was not referenced in GHD 2016.</p> <p>UXO, EO and EOW – Section Error! Reference source not found., 7 and Appendix C a) EP Risk (2018) b) EP Risk (2018) c) Section 8 d) No buildings on the Site – covered under EP Risk (2018)</p>	<p>EP Risk (2018) was developed based on the EMP (GHD 2016), whereby the DNSDC conceptual site model and the remaining contamination issues presented within the EMP were incorporated into EP Risk (2018). This plan deals with the MAUW Site and was not included within GHD (2016).</p> <p>The CMP has been prepared with reference to CoC B133, see comments above.</p> <p>Additional risks will be managed as follows:</p> <ul style="list-style-type: none"> a) A plan has been provided in EP Risk (2018). Unexpected Finds will be managed as per Section 7 and 9 and Appendix C (UXO Management Plan). b) A plan has been provided in EP Risk (2018). c) The Asbestos Management Plan (AMP) details how Asbestos impacted soils will be managed. Unexpected ACM, including in soils, will be managed in accordance with Section 9.1 to 9.7 and Section 8. d) A plan has been provided in EP Risk (2018).
B135	<p>The Contamination Management Plan must include:</p> <ul style="list-style-type: none"> (a) an UXO, EO and EOW management and remediation plan, prepared by a qualified person(s) listed on the Defence Panel; (b) an Asbestos Management Plan; and (c) Unexpected Finds Procedure. <p>The Contamination Management Plan must be approved by a NSW EPA Accredited Site Auditor prior to submission to the Secretary.</p>	<ul style="list-style-type: none"> a) Section 7 and Appendix C b) Section 8 c) Section 9 <p>Appendix E</p>	<p>All plans provided in the Sections referenced and the CMP have been approved by the NSW EPA Accredited Site Auditor (Appendix E)</p>

Table 1 – Conditions of Consent (CoC) – SSD 7628

CoC	Requirement	Document Reference	How Addressed
B136	Following demolition, a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken and an updated Contamination Management Plan is to be prepared to the satisfaction of the Secretary to address any additional contamination issues identified. Remediation works must only be carried out by suitably qualified and experienced contractor(s) including a contractor listed on the Defence Panel in the case of UXO, EO and EOW.	No buildings on the Site – covered under EP Risk (2018)	See EP Risk (2018).
RtS	It is noted that the Stage 2 Response to Submissions (RtS) report outlines a number of Revised Mitigation Measures directly related to the preparation and implementation of the CMP. The additional Revised Mitigation Measures relevant to the CMP, and must be implemented prior to construction are listed below: (a) 6C, which requires the CMP to be prepared in consideration of the outcomes of the EMP (GHD, 2016) and SAS and Site Audit Report (JBS&G, 2016). (b) 6D, requiring a site-wide UXO, EO and EOW Management Plan.	(a) Covered by the EP Risk (2018) CMP (b) Section 7 and Appendix C.	(a) EP Risk (2018) was developed based on the EMP (GHD 2016), whereby the DNSDC conceptual site model and the remaining contamination issues presented within the EMP were incorporated into EP Risk (2018). This plan deals with the MAUW Site and was not included within GHD (2016). (b) G-tek a Defence Panel qualified UXO consultant prepared the UXO, EOW and EO Management and Remediation Plan after review of site historical reports. This plan is attached to the CMP as an appendix.

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
8a)	MPW Concept EIS, Soil and Contamination Provisional Environmental Management Framework (PEMF) Section 5 – Table 5.1	During the pre-construction and construction phases of the Project, ensure that the proposed contamination and soil controls are implemented.	Intention of the whole CMP.
		The implementation of a remediation program applicable to each stage of development in accordance with the Moorebank Intermodal Terminal Remediation Action Plan.	Not relevant. The Stage 2 MPE, which includes the MAUW did not have a Remediation Action Plan (RAP) as it was determined by the NSW EPA Auditor remnant contamination could be managed during construction via a Contamination Management Plan (CMP). The Department of Planning, Industry and Environment (DPIE) determined conditions for SSD 7628 include the requirement for this CMP.
		Establish and maintain awareness of the importance of ensuring impacts associated with contamination and disturbance of soil associated with the Project are minimised.	Where addressed: The whole plan establishes the awareness of the importance of managing contamination and disturbance of soil via the inclusion of the requirement for inductions into the CMP Section 1.3. Easy to read diagrams and flow charts for Unexpected Finds are included in Appendix D. These will be hung in site sheds.
		During construction and operational phases, all contaminated material including soil/spoil and hazardous materials (e.g. asbestos containing material) are handled, stored, transported and disposed of in a lawful manner.	Where addressed: The CMP deals only with the construction phase. Asbestos – Section 8.5 Soils/ spoil - Sections 9.8, 9.10 and 9.11
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.	Not relevant. No known areas of impacts requiring remediation have been identified within the MAUW Site. Should unexpected finds be identified they will be managed and/or remediated in accordance with Section 9 .
		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	Section 9.8, 9.10 and 9.11

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		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.	Section 9.10 and the Construction Environmental Management Plan (CEMP) sub-plans.
		All excavation works would be undertaken by licensed contractor experienced in remediation projects and the handling of contaminated soils.	Where unexpected finds are uncovered and require remediation. Unexploded Ordnance (UXO) – Section 7 Asbestos – Section 8 Unexpected Finds – Section 9
		All asbestos removal, transport and disposal must be performed in accordance with the Work Health and Safety Regulation 2011 (WH&S Regulation).	Included within the Asbestos Management Plan - Section 8
		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).	Included within the Asbestos Management Plan - Section 8
		An appropriate asbestos removal licence issued by WorkCover would be required for the removal of asbestos impacted soil.	Included within the Asbestos Management Plan - Section 8
		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.	Included within the Asbestos Management Plan - Section 8
		Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	Section 9.10
		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).	Included within the Asbestos Management Plan - Section 8

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		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 Airborne Asbestos Fibre, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).	Included within the Asbestos Management Plan - Section 8.6
		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.	Section 9.10
		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).	Section 9.10 and 9.11 and associated sub-plans to the CEMP.
		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 F 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.	Section 9.10 and 9.11 and associated sub-plans to the CEMP.
		The stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater	Section 9.10 and 9.11 and associated sub-plans to the CEMP.

Table 2 – 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	Section 9.11
		Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities	Section 9.11
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;	Monitoring requirements summarised in Section 10.3 - Table 8
		Project approvals issued under the EPBC Act and EP&A Act;	EP&A Act conditions of consent compliance specified in Section 1.2 – Table 1
		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	Section 10.3 – Table 8 Appendix B
		Objectives, targets and indicators as presented in this PEMF.	Discussed above - reference <i>MPW Concept EIS, Soil and Contamination PEMF Section 5 – Table 5.1</i>
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).	Section 10.2
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,	See Management commitments Appendix F

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		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.	
	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	See Management commitments Appendix F
	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	See Management commitments Appendix F
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	See Management commitments Appendix F
	REMM 7E	Standby or emergency generators and transformers would all have secondary containment	See Management commitments Appendix F
	REMM 7F	Oil coolers would generally be located in areas where leaks and runoff are appropriately controlled at source or in a retention basin.	See Management commitments Appendix F
	REMM 7I	No hazardous or regulated wastes would be disposed of onsite.	Section 9.8 and 9.11
	REMM 7J	All offsite disposals would be carried out by approved transport operators and to approved facilities	Section 9.8 and 9.11

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
	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 migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.	See Management commitments Appendix F
	REMM 8I	Contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory and preliminary field test results.	Not relevant. No known areas of impacts requiring remediation have been identified within the MAUW Site. Should unexpected finds be identified they will be managed and/or remediated in accordance with Section 9 .
	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.	Section 9.8 and 9.10
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	Section 9.10 and the Construction Environmental Management Plan (CEMP) sub-plans.
	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.	Where unexpected finds are uncovered and require remediation. Unexploded Ordnance (UXO) – Section 7 Asbestos – Section 8 Unexpected Finds – Section 9
	REMM 8M	All asbestos removal, transport and disposal would be performed in accordance with the Work Health and Safety Regulation 2011 (WHS Regulation)	Asbestos Management Plan – Section 8 .
	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).	Asbestos Management Plan – Section 8 .
	REMM 8RO	An appropriate asbestos removal licence issued by WorkCover NSW would be required for the removal of asbestos contaminated soil.	Asbestos Management Plan – Section 8 .
	REMM 8P	Environmental management and WHS procedures would be put in place for the asbestos removal during excavation	Asbestos Management Plan – Section 8 .

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		to protect workers, surrounding residents and the environment.	
	REMM 8Q	Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	Section 9.10
	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)	Included within the Asbestos Management Plan - Section 8
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).	Included within the Asbestos Management Plan - Section 8.6
	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	Section 9.10
	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)	Section 9.10 and 9.11 and associated sub-plans to the CEMP.
	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 F of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 5A and 5B. All such preparatory works	Section 9.10 and 9.11 and associated sub-plans to the CEMP.

Table 2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		would be undertaken before material is placed 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	
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 wind blown dust or odour emission	Section 9.10 and 9.11 and associated sub-plans to the CEMP.
	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.	Section 9.11
	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	Section 9.11
	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 no buildings located on the MAUW Site.
	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).	See variation to the conditions of approval - CoA 3a) to 3i) An additional PFAS assessment within the MAUW will be undertaken.

Table 3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
OB	<p>The Construction Environmental Management Plan (CEMP), or equivalent, for the Proposal would be based on the PCEMP (Appendix I of this EIS), and include the following preliminary management plans:</p> <ul style="list-style-type: none"> 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) <p>As a minimum, the CEMP would include the following sub-plans:</p> <ul style="list-style-type: none"> 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). Erosion and Sediment Control Plan ▪ 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) 	<p>Section 7 Appendix C</p>	<p>This plan includes the UXO, EO, and EOW Management Plan.</p>
6A	<p>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)).</p>	<p>Section 9</p>	<p>The CMP details the unexpected finds protocol in relation to land contamination.</p> <p>Reference to how REMM items have been addressed is provided in Table 2.</p>

Table 3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
6B	<p>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:</p> <ul style="list-style-type: none"> 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). 	<p>Section 1.1</p> <p>Section 4</p> <p>Section 5</p>	<p>Overall, the Site is not known to contain contamination.</p> <p>The MPW portion of the Site has been remediated in accordance with Golder 2016c.</p>
6C	<p>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.</p>	<p>Section 7</p> <p>Appendix C</p>	<p>The plan outlines the review and actions required to manage any unexpected finds in relation to the UXO Risk.</p>
6D	<p>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:</p> <ul style="list-style-type: none"> the Guidelines for Managing asbestos in or on soil (2014), and Codes of Practice - How to Safely Remove Asbestos (2011) and How to Manage and Control Asbestos in the Workplace (2011). 	<p>Section 8</p>	<p>The AMP has been developed in accordance with current Guidelines and codes of practice.</p>
6H	<p>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:</p> <ul style="list-style-type: none"> 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. 	<p>Section 9.7</p>	<p>Where unexpected find are identified and remediation / management required a validation report will be compiled to document the activities undertaken.</p>
6J	<p>In order to accept fill material onto site, the following will be undertaken:</p>	<p>Section 9.9</p>	<p>Both requirements for the acceptance of fill are stated within this section.</p>

Table 3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	<ul style="list-style-type: none"> 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 assessor/auditor. 		
7A	<p>The following measures would be included in the CEMP (or equivalent) to minimise hazards and risks:</p> <ul style="list-style-type: none"> Procedures for safe removal of asbestos 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. 	Section 8	<p>This plan includes procedures for the safe removal of asbestos.</p> <p>The remaining two requirements are not the scope of this plan.</p>
12A	<p>The following mitigation measures would be implemented as part of the CEMP (or equivalent) for waste management:</p> <ul style="list-style-type: none"> 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. 	Section 9.8 and 9.11	<p>These sections of the plan detail waste management and soil classification and treatment covering these requirements.</p> <p>The following requirements would form part of the Waste Management Plan on the Site and are not included in this plan:</p> <ul style="list-style-type: none"> Mitigation measures for avoidance and minimisation of waste materials Procedures and targets for re-use and recycling of waste materials

1.3 Objectives

The objectives of this CMP are to meet the requirements of Conditions of Consent B134 and B135, relevant EPBC Act conditions of approval for EPBC 2011/6086, and provide procedures to unexpected contamination issues during the Site construction activities.

As per Condition of Consent B134 and EPBC approval 2011/6086, this plan forms a sub-plan to the CEMP.

As per Condition of Consent B135 the CMP will also include the following management plans:

- An unexploded ordnance (UXO), Exploded Ordnance Waste (EOW) and explosive waste (EO) Management and Remediation Plan prepare by G-tek Australia Pty Ltd (G-tek) a qualified member of the Defence Panel - procedures required for handling and disposing of any identified UXO, EOW or EO during the development;
- Asbestos Management Plan (AMP) - procedures required for handling and disposing of any identified ACM and asbestos impacted soils during the development; and

Unexpected Finds Procedure (UFP) - provide an appropriate framework for identifying and addressing any discovery of chemical contamination, potentially explosive ordnance or any other form of hazard during development so as to ensure a safe working environment for workers and to avoid unacceptable impact on the natural environment. In accordance with Condition 8(a) this plan also provides objectives, targets and indicators for managing contamination:

Objectives ¹⁶	Targets	Performance indicators
During the pre-construction and construction phases of the Project, ensure that the proposed contamination and soil controls are implemented	Contamination and soil control measures have been implemented during construction	Instances where nominated controls measures have not been implemented during construction phase.
Establish and maintain awareness of the importance of ensuring impacts associated with contamination and disturbance of soil associated with the Project are minimised	All Project and workforce will be inducted into the CMP. Unexpected Find Protocol will be displayed in lunch rooms and project offices.	Number and percentage of project and workforce personnel who have not attended required induction prior to commencing work on the project site.
During construction and operational phases, all contaminated material including soil/spoil and hazardous materials (e.g. asbestos containing material) are handled, stored, transported and disposed of in a lawful manner.	Zero environmental incidents.	Project environmental and safety incident statistics during construction phase.

¹⁶ The implementation of a remediation program applicable to each stage of development in accordance with the Moorebank Intermodal Terminal Remediation Action Plan was not required as it was determined by the NSW EPA Auditor remnant contamination could be managed during construction via a Contamination Management Plan (CMP).

The successful implementation of the CMP requires the appropriate briefing and Specific Work Health and Safety (WHS) induction of site workers who may uncover potential chemical contamination (including potential asbestos containing materials) and/or explosive ordnance. It is proposed this briefing will include the review of this CMP and the associated flow chart (**Appendix D**).

This CMP describes reporting procedures and lines of responsibility, including the contact numbers for relevant experts at the commencement of the development works (See **Section 1.5**). These experts will include those with detailed knowledge of the Site, and access to, the supporting documents related to the assessment of the Site.

Waste materials present on the Site will be suitably contained, with secondary containment and runoff controls implemented where appropriate to prevent leaks or spills migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.

The Site has been audited and declared suitable for the intended use (Aecom 2016a) or could be made suitable (Enviroview 2016), subject to the implementation of a SMP/RAP (Golder 2016a and 2016c). Remnant contamination, if present, is most likely to be discovered during the development earthworks. The approaches included in this CMP are intended for use only during the Site preparation phase of development, during which structures are demolished and disposed of, land levels are altered and redundant infrastructure is removed. Post-construction management plans, if required, would be administered through the relevant local government authority or the NSW Department of Planning.

1.4 Scope of Work

The scope of work undertaken to achieve the CMP objectives comprised the following:

1. Review of existing documentation; and
2. Preparation of this CMP in general accordance with the requirements of NSW legislation, NSW EPA and Safe Work NSW Codes of Practice.

1.5 Roles and Responsibilities

Provided in the tables below are the terminology and roles and responsibilities relevant to the Site

Table 4 – Responsibilities for CMP Implementation	
Position and Company/Entity	Responsibilities
Client	QUBE c/o of Tactical. The owner of the Site. Responsible for the overall management of the Site and the engagement of the Principal Contractor and Environmental Consultant.
Principal Contractor	Means the contractor in primary control of the Site. Responsible for notifying the client, appropriate consultant or contractor in relation to unexpected finds. Also responsible for quarantining AOC with suitable barricades and informing other workers of its location.
Environmental Consultant	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 recognised by one of the certifying bodies recognised by the NSW EPA. Any reports prepared should be 'signed off' by the individual certified practitioner. Responsible for notifying the Client and Principal Contractor of any unexpected finds. Also responsible for undertaking the assessment, remediation and validation of any AOC in relation to chemical contamination. Additionally, responsible for engaging the Ordnance contractor.
Ordnance Contractor	Persons and/or company appropriately qualified to undertake ordnance searches, clearances and prepare reports. Responsible for undertaking ordnance searches, removal of items and clearances. The ordnance contractor is to be a qualified contractor listed on the Defence Environment and Heritage Panel (DEHP) as a D2 and/or F2.
Licensed Asbestos Assessor	Means a person who holds an asbestos assessor licence. Responsible for final clearances after asbestos removal works are undertaken.
Licensed asbestos removalist (Asbestos Removal Contractor)	Means a person conducting a business or undertaking who is licensed under the WHS Regulation to carry out Class A or Class B asbestos removal work. Responsible for the safe removal of asbestos of any AOC in accordance with the relevant legislation and codes of practice.
Asbestos Consultant / Competent Person	A person who has acquired through training or experience the knowledge and skills of relevant asbestos removal industry practice and holds a certification in relation to the specified vocational education and training (VET) course for asbestos assessor work or a tertiary qualification in occupational health and safety, occupational hygiene, science, building, construction or environmental health. For all other purposes, competent person means a person who has acquired through training, qualification or experience, the knowledge and skills to carry out the task.
Remediation Contractor	Persons and/or company appropriately qualified to undertake the required remediation works and has the appropriate insurances and licences. Responsible for undertaking remedial works in accordance with any developed remediation action plans or strategies.
Worker	Any worker on the Site, including any contractor or sub-contractor. 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.

2 Site Identification

The site identification details are presented in **Table 5**.

Table 5 – Site Identification	
Item	Description
Site Address	MAUW, along Moorebank Avenue, Moorebank, NSW (see Figure 1 and Figure 2, Attached Figures)
Legal Description	Part Lot 2 DP 1197707 (Moorebank Avenue). Part Lot 1 DP 1197707 (Portion of Moorebank Precinct West (MPW)).
Approximate Site Area	13.5 Hectares
Site Owner	Sydney Intermodal Terminal Alliance (SIMTA), a consortium comprising Qube and Aurizon Holdings.
Municipality	Liverpool City Council
Site Zoning	IN1 General Industry

3 Site Conditions and Surrounding Environment

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. The location of the Site is shown in **Figure 1 (Attached Figures)**. The boundary of the Site is shown in **Figure 2 (Attached Figures)**.

3.1 Current and Proposed Land Use

The Site is currently utilised as a roadway and associated verge. The proposed land use is a roadway, verge and onsite stormwater detention (OSD) basin.

3.2 Site Description and Surrounding Land Use

The Moorebank Avenue portion (Part Lot 2 DP 1197707) of the Site has historically and is currently a road alignment.

The MPW portion (Part Lot 1 DP 1197707) was part of the former School of Military Engineering (SME) used for military training purposes.

Existing infrastructure and features on the Site are shown on **Figure 2 (Attached Figures)**.

The Site lies predominantly to the east of the MPE Stage 1 Site and includes the area presented in **Figure 2 (Attached Figures)**.

The areas of interest as reported in Aecom (2016a) and Golder (2016a) relating to the Moorebank Ave portion (**Figure 2, Attached Figures**) of the Site are:

- Investigations of the potential contamination risks associated with the Moorebank Avenue identified LNAPL on the groundwater beneath Moorebank Avenue in the vicinity of the former DNSDC Refuelling Facility.
- Arcadis (2016) reported the part of northern portion of this portion of the Site was reported to have historically been used for Explosive Ordnance Demolition (EOD) and a dog training area. As such, it was considered there was a low possibility of this portion of the Site being impacted by explosives, UXOs and metals.

The area of interest as reported in Golder (2016c) adjacent the portion of the MPW Site located in the Site (**Figure 2, Attached Figures**) is an area of anthropogenic fill predominately impacted with buried wastes and geotechnically unsuitable fill materials. It should be noted the remediation and validation activities (Golder 2016c) within the MPW Site are predominately complete and the NSW Site Auditor is currently reviewing documentation prior to the issue of a Site Audit Statement.

The land surrounding the Site comprises:

- The MPW Site, formerly the School of Military Engineering (SME), on the western side directly adjacent to the Site.
- Continuation of Moorebank Avenue and MPW Site to the north and south of the Site.

- To the east, MPE Stage 1 (IMEX) and Stage 2.

3.3 Topography

Currently the Site is predominately a roadway and the topography of the Site is generally flat and ranges from 14-15 mAHD (Metres Australia Height Datum). Surface water drainage would flow in the stormwater system of the roadway and discharge to the Georges River to the west of the Site.

3.4 Hydrology

The closest significant water body to the Site is the Georges River, located approximately 700 m to the west of the Proposal site. The Georges River flows through to Lake Moore, which is situated approximately 2.5 km north, north east of the Site, and into Chipping Norton Lake, located approximately 5.6 km north east of the Site. The Site is situated near the upstream portion of Georges River, which flows in a general north, then east / south easterly direction towards Botany Bay which is located approximately 20 km south south-east of the Site (GHD 2016).

Other surface water bodies identified in the surrounding area include:

- Anzac Creek, located approximately 250 m to the south and east of the Site. Anzac Creek is eastwest aligned and flows generally north-east to its confluence with the Georges River, approximately 5 km north of the Site. The western extent of Anzac Creek appears to exist in the former Royal Australian Engineers (RAE) Golf Course on the western side of Moorebank Avenue (within the MPW Site), where the creek appears to have been modified into a series of water features (dams/ponds).
- Another series of dams/ponds are visible on the northern portion of the Moorebank Precinct situated to the west of Moorebank Avenue. The visible bodies range in shape, area and distance from the Site as follows:
 - A rough rectangular shaped pond is present with an approximate area of 550 m², situated approximately 300 m to the west of the boundary of the Site.
 - A circular body of water is present with a diameter of 60 m, and an approximate area of 3000 m². This pond is situated approximately 100 m to the west of the Site.

3.5 Geology

GHD (2016) reported the regional geology consists of Tertiary aged fluvial deposits of clayey quartzose sand clay overlying a thin band of Middle Triassic ages Ashfield Shale of the Wianamatta Group overlying Hawkesbury Sandstone.

The Site is reported to be underlain by Tertiary fluvial deposits comprising clayey sand and clay, as well as silty clay with some ironstone Arcadis (2016). Clay is present to depths of at least 10 m to 12 metres below ground surface (m BGS). Surface cover material overlying the clay includes silty sand topsoil to approximately 0.3 m BGS and clay fill to variable depth between 0.5 m and 1.5 m BGS.

Additionally, Arcadis (2016) reported surface material and fluvial deposits are underlain at depth by shale associated with Ashfield Shale deposits. Registered bores immediately west of the Georges River, associated with the Glenfield Waste Facility, indicate sandy clay and sands to 10 m BGS overlying shale to 20 m BGS overlying sandstone to 30 m BGS. Furthermore, Arcadis (2016) noted shale bedrock

was encountered in the eastern portion of the Site, while sandstone bedrock was reported in the southern portion of the Site.

3.6 Hydrogeology

Arcadis (2016) reported that groundwater was intercepted at varying depths proximal to the Site (western boundary of MPE), though generally found between 4 m BGS and 5 m BGS. Groundwater was noted within a number of geological units including the fill material, shale and sandy clays. Groundwater is expected to flow in a westerly or north-westerly direction towards the Georges River.

Arcadis (2016) reported deeper groundwater generally exhibited high salinity and therefore has little or no beneficial use. Shallow groundwater was reported having lower salinity, potentially as a result of local recharge via surface infiltration.

4 Previous Environmental Works

A number of investigations and related works have been undertaken within the broader Stage 1 and 2 MPE and MPW Site since the 1980s. The following reports related to the works completed since 2000 were made available for Arcadis (2016) to review:

- Egis (2000) Preliminary Site Investigation at the Defence National Supply and Distribution Centre, Moorebank Defence Lands, September 2000.
- Graham Brooks and Associates (2002) Heritage Assessment Defence National Storage Distribution Centre (DNSDC) Moorebank Defence Site, Moorebank, October 2002.
- URS (2002a) Assessment of DNSDC Buildings – Supplement to Egis 2000 Stage 1 Preliminary Site Investigation of Areas A1 to A6, March 2002.
- HLA (2002) Soil and Groundwater Investigation, Precinct H (DNSDC), Moorebank Defence Lands, November 2002.
- URS (2002b) Investigation Review Report DNSDC, Moorebank Defence Lands, 10 December 2002.
- Contamination Management (CM 2002) Summary Site Audit Report and Site Audit Statement, DNSDC Site, Moorebank, December 2002.
- Environmental and Earth Sciences (EES 2002a) Memorandum: Review of Reports Pertinent to Environmental Investigations Conducted at DNSDC, Moorebank, NSW, 12 December 2002.
- EES (2002a) Memorandum: Review of Investigation Review Report DNSDC, Moorebank Defence Lands (URS) and Site Audit Statement WRR118 (Dr William Ryall), 16 December 2002.
- Milsearch (2002) Ordnance Investigation, 2002.
- Douglas Partners (DP 2009) Summary Environmental Conditions, Proposed Intermodal Freight Terminal, DNSDC Site – Moorebank Avenue, Moorebank, December 2009.
- GHD (2015a) DNSDC Moorebank Intrusive Site Investigations, September 2015.
- GHD (2015b) DNSDC Moorebank – Refuelling Area Remedial Action Plan. Report Ref. PRECQPMS- EN-RPT-0007, November 2015. GHD (2016) Former DNSDC, Moorebank NSW Environmental Management Plan, July 2016.
- Golder (2016a) Moorebank Avenue Site Management Plan. Report Ref. 147623070_052-Rev1, 4 July 2016.
- Aecom/Frank Mohen (Aecom 2016a) Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016.
- Golder (2016c) Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan, Golder Associates, 9 August 2016.
- Golder Associates (Golder 2016b). Contamination Summary Report, Remedial and Site Management Plan– Butchers Knife, Moorebank Intermodal Terminal. Document No. 147623070-055-R-Rev2, 10 August 2016.

- Aecom/Frank Mohen (Aecom 2016b) Site Audit Report and Site Audit Statement - Butchers Knife Part Lot 4 DP 1197707, Moorebank, NSW. Report Ref 60507697, 12 August 2016.
- Enviroview (2016) Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan, Enviroview Pty Ltd, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
- GHD (2016) Department of Defence Former DNSDC Moorebank NSW Environmental Management Plan, GHD Pty Ltd.
- JBS&G (2016a) Site Audit Statement and Report 0503-1611-R Part Lot 1 in DP 1048263 Former Defence National Storage and Distribution Centre (DNSDC) Moorebank Avenue, Moorebank, NSW, 12 October 2016.
- JBS&G/Andrew Lau (JBS&G 2016b) Site Audit Report and Site Audit Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW. Report Ref. 51732-105413, 13 October 2016.

Since the completion of JBS&G (2016a and 2016b) the following reports have been completed:

- Former DNSDC Refuelling Area Remediation Validation Report – Phase A, GHD, October 2016 (GHD 2016a).
- Former DNSDC Refuelling Area, Moorebank, NSW Human Health and Ecological Risk Assessment, GHD, October 2016 (GHD 2016b).
- Former DNSDC Refuelling Area, Moorebank, NSW Validation Report – Phase C, GHD, March 2018 (GHD 2018a).
- Former DNSDC Refuelling Area, Moorebank, NSW Environmental Management Plan, GHD, October 2018 (GHD 2018b).
- Site Audit Report and Statement 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW, JBS&G Australia Pty Ltd, 30 October 2018 (JBS&G 2018).
- Site Audit Report Northwest Limited Works Stage Moorebank Precinct East, Sydney Intermodal 400 Moorebank Avenue, Moorebank, Enviroview Pty Ltd, May 2019 (Enviroview 2019).
 - Site Audit Statement 0301-1613-1R Northwest Limited Works Stage Moorebank Precinct East, prepared by Mr James Davis NSW EPA Site Auditor Accreditation no. 0301 (Enviroview 2019).
- Site Audit Report IMEX Terminal Moorebank Precinct East, Sydney Intermodal 400 Moorebank Avenue, Moorebank, Enviroview Pty Ltd, August 2019 (Enviroview 2019a).
 - Site Audit Statement 0301-1613-2 IMEX Terminal Moorebank Precinct East, Sydney Intermodal, prepared by Mr James Davis NSW EPA Site Auditor Accreditation no. 0301 (Enviroview 2019a).

The Site Audit Reports listed above for the Moorebank Ave (Aecom 2016a) and the RAP (Golder 2016c) for the MPW Site summarise the remaining contamination issues across the whole of these sites. **Section 4.1** below presents a discussion of the remaining contamination issues within the Site based on the historical reports listed above.

The Conceptual Site Model (**Section 5**) summaries the remaining contamination issues on the Site which will be managed under this CMP.

4.1 Remaining Contamination Issues

Moorebank Avenue

- Golder (2016a) identified the potential contamination risks associated with the Moorebank Avenue as LNAPL on the groundwater beneath Moorebank Avenue in the vicinity (west) of the former DNSDC Refuelling facility.
- The RAP of the former refuelling facility has been documented in GHD (2015b). The former refuelling facility has been the subject of a Site Audit (JBS&G 2016b) where it was concluded the land subject to the audit can be made suitable for commercial/industrial land use subject to the implementation of this RAP.
 - The RAP has been implemented and documented in GHD (2016a, 2016b and 2018a). All primary sources (tanks and impacted soils) and a portion of the secondary source (LNAPL) has been removed. Based on review of these reports LNAPL is likely to be present on the surface of the groundwater below Moorebank Ave.
- A human health and ecological risk assessment (HHERA) (GHD 2016b) was developed for the former refuelling facility to assess the potential risks associated with current contamination for future commercial users, neighbouring properties and to off-site ecological receptors. The key findings relevant for the LNAPL located underneath Moorebank Ave are:
 - The estimated incremental lifetime cancer risk from theoretical LNAPL for intrusive maintenance workers from inhalation exposure was considered acceptable.
 - Measured soil-vapour concentrations are within acceptable levels for commercial/industrial workers in a building based on slab-on ground construction design.
 - The groundwater fate and transport modelling simulated no risks to existing groundwater users or identified ecological and recreational users in potentially down gradient surface water bodies.
- An EMP (GHD 2018b) has been developed for the former Refuelling Facility (located offsite upgradient) and specifies the following impacts remain:
 - One location at 0.9 m depth of Total Recoverable Hydrocarbons (TRH) C10-C16 – potential for odorous soils underlying Moorebank Ave.
 - Dissolved groundwater concentrations of benzene, naphthalene and o-xylene.

- LNAPL ranging in thickness between 0.004 m to 0.87 m, within the former facility, underlying Moorebank Ave and within MPW.
- A Section B Site Audit Statement (JBS&G 2018) prepared to determine the appropriateness of the validation reports (GHD 2016a and 2018a), the HHERA (GHD 2016b) and the EMP (GHD 2018b) reported all plans were appropriate for the stated purposes. The Auditor noted on the basis of the HHERA (GHD 2016b) no unacceptable risks are posed by residual contamination under the proposed commercial/industrial land use (excluding basements). The Auditor also noted any potential risks posed by the residual contamination can be managed appropriately via the EMP (GHD 2018b).
- A Section A2 Site Audit Statement (Enviroview 2019a) was prepared to determine the suitability of the neighbouring IMEX (Stage 1 MPE). This included the former DNSDC refuelling facility. The Auditor certified, subject to compliance with the GHD (2018b) EMP, the IMEX is suitable for a commercial / industrial land use. Enviroview (2019a) summarised the actions required under the EMP (GHD 2018b) on the IMEX as follows:
 - Subsurface works – procedure outlines caution for conducting any excavation works at the site;
 - Groundwater monitoring – following the completion of construction works the groundwater well network must be reinstalled at the IMEX. Biannual groundwater gauging, sampling, and LNAPL gauging is to be conducted for a minimum period of two calendar years post-installation of the wells. Following completion of the monitoring data review shall be conducted;
 - Water management – no groundwater extraction and other controls to ensure appropriate handling of groundwater (if encountered during subsurface works); and
 - Site inspections – at minimum annual inspections (and maintenance if required) of the IMEX surface to maintain the integrity of the surface (seal) across the IMEX.
- The presence of the LNAPL necessitated the preparation of a SMP to allow ongoing use of Moorebank Avenue as a publicly accessible road alignment and to facilitate the future development of Moorebank Avenue for commercial/industrial land use (Golder 2016a).
- The Golder (2016a) SMP has been prepared to document the management of the identified LNAPL contaminated groundwater located beneath Moorebank Avenue downgradient of the former DNSDC refuelling facility, referred to as the *exclusion zone* (**Figure 2, Attached Figures**) and has been prepared assuming ongoing use as a publicly accessible road alignment and its future development.
- Therefore, based on the above, under this CMP the *exclusion zone* is to be managed in accordance with the Golder (2016a) SMP (**Appendix A**) with reference where required to GHD (2018b).

It is noted the proposed development works within this portion of the Site are for road re-alignment and approximately 2 m of materials above the current levels will be placed to form the new road. Therefore, intersection of the groundwater (>8 m below ground surface) is considered unlikely.

MPW Site

A portion of the MPW site is located within the Site (**Figure 2, Attached Figures**).

Overall, the MPW Site had a number of site contamination issues managed under a RAP (Golder 2016c); one anthropogenic fill area was located proximal to the Site. Remediation and validation activities (Golder 2016c) within the MPW Site are predominately complete and the NSW Site Auditor is currently reviewing documentation prior to the issue of a Site Audit Statement.

As mentioned in **Section 1.1** any legacy PFAS in groundwater issues have been assessed and PFAS impact within the MPW Site is located predominately within the groundwater and will be managed in accordance to the documents specified in **Section 1.1**, or subsequent iterations.

Furthermore, it is noted groundwater impacts from the former DNSDC Refuelling facility are located within this portion of the MPW Site as the *exclusion zone* is located upgradient (Golder 2016a) (**Figure 2, Attached Figures**). Even though this area of the Site is not located within the *exclusion zone*, works undertaken in this portion of the Site are also subject to management actions specified in the SMP (**Appendix A**).

It is noted the proposed development works within this portion of the MPW Site are for temporary road re-alignment and filling. Excavation to depths intersecting groundwater (>8 m below ground surface) is unlikely.

Any unexpected finds within the portion of the MPW Site located in the Site will be managed in accordance with this CMP.

Summary

Overall, based on the review of the recent Site Audits (JBS&G 2016b, Aecom 2016a and Aecom 2016b) the following known contamination issues remain with the Site and require management:

- Potential odorous (hydrocarbons) soils within the *exclusion zone* located underneath Moorebank Ave.
- LNAPL on top of groundwater within the *exclusion zone* located underneath Moorebank Ave.
- LNAPL on top of groundwater within the MPW portion of the Site to the west of the *exclusion zone*.
- Northern portion of Moorebank Ave was reported to have historically been used for Explosive Ordnance Demolition (EOD) and a dog training area. Low possibility of this portion of the Site being impacted by explosives, UXOs and metals.

Where existing pavements are removed, then the requirements in the CMP relating to the management of asbestos / UXO / EOW, or any other forms of contamination as directed by the unexpected finds protocol, will be adhered to.

5 Conceptual Site Model

The information in this section together with the figures included in this report aid in presenting a CSM for the Site, based on a review of relevant background historical site information sourced from and Golder (2016a and 2016c).

The National Environment Protection (Assessment of Site Contamination) Measure, NEPC, 1999 (as amended 2013, NEPC 2013) identifies a CSM as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments and remediation activities.

NEPC (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.
- Any potential preferential pathways for vapour migration (if potential for vapours identified).

5.1 Sources and Contaminants of Concern

Following a review of the findings of intrusive investigations and in which AOCs were investigated and assessed, the remaining AOCs and COPCs have been identified in **Table 6** and presented in **Figure 2 (Attached Figures)**.

Table 6 – Areas of Identified Environmental Concern and Associated Contaminants of Concern	
AOC	Contaminants of Potential Concern (COPC)
Unexpected Finds	TPH PAHs OCPs/OPPs PCBs Asbestos Metals UXO, EOW or EO (Northern Portion)
MPW and Moorebank Avenue portion of Site – former refuelling Facility	As per Golder 2016a and 2016c (Appendix A) LNAPL TRH BTEX Naphthene Unexpected Finds

It is noted the Moorebank Avenue portion of the Site (**Figure 2, Attached Figures**) was formed as a roadway prior to the development of the MPE Site. As such, it is unlikely the Moorebank Avenue portion of the Site was subject to significant contaminating activities, with the exception of the hydrocarbon impacted groundwater migrating from the former refuelling facility south west of the Site. The contamination reported in this area will be managed in accordance with Golder (2016a) (**Appendix A**).

5.2 Potentially Contaminated Media

Potentially contaminated media present at the site may include:

- Fill material, including buried wastes;
- Surface soil (potential dust);
- Natural soils;
- Groundwater; and
- Stormwater/surface water.

5.3 Pathways

Potential pathways by which contamination could migrate towards an identified off-site receptor or present a potential exposure pathway to commercial/industrial site workers include:

- Direct contact.
- Inhalation of particulates and vapours.
- Solubilisation into groundwater and groundwater, potential discharge into Georges River.

5.4 Potential Receptors

The potential receptors for contamination during development are considered to include:

- Construction and maintenance workers.
- Commercial workers on the site.
- Downstream ecological receptors – Georges River.




5.5 Potential and Complete Exposure Pathways

An analysis of the potential and complete source-pathway-receptor linkages between the COPC are presented in **Table 7** below.

Table 7 – Potential and Complete Exposure Pathways

Location	Primary Sources	Secondary Sources / Affected Media	Release Mechanism	Pathway	On-Site				Off-Site			
					Current and future intrusive workers/construction workers	Current t users and visitors of the Site and future commercial workers		Limited on site ecological receptors (terrestrial flora and fauna) in the	Current and future intrusive workers/construction workers	Commercial workers at surrounding commercial/industrial properties	Aquatic fauna and flora at Anzac Creek and the Georges River	
On-site	Unexpected Finds	Soil Surface water Sediments Groundwater Soil vapour	Fugitive dust Direct contact	Air – ingestion (particles)	Potential*		Potential*		N/A	Potential*	Potential*	N/A
				Dermal contact	Potential*	Potential*	Potential*	Potential*	N/A	Potential*	Potential*	N/A
				Ingestion	Potential*	Potential*	Potential*	Potential*	N/A	Potential*	Potential*	N/A
				Inhalation	Potential*		Potential*		N/A	Potential*	Potential*	N/A
On- and off-site	MPW and Moorebank Avenue portion of Site – former refuelling Facility	Groundwater Soil vapour	Migration of contaminated groundwater	Dermal Contact	Limited due to depth		Limited due to depth		N/A	Limited due to depth	Limited due to depth	N/A
			Vapour intrusion/ Groundwater	Inhalation	Potential Managed by Golder 2016a		Potential Managed by Golder 2016a		N/A	Potential Managed by Golder 2016a	Potential Managed by Golder 2016a	N/A
			Direct Contact	Uptake by fauna and flora	N/A		N/A		**	N/A	N/A	**

Potential Exposure Pathway:

Soil - 
Water - 
Soil Vapour - 

* Managed by the CMP

** Potential Managed by Golder 2016a

5.6 CSM Summary

Previous investigations conducted within the Site have not identified widespread residual contamination and as such, the risk posed by contamination on the Site is considered to be low, as evidenced by the potential and complete exposure pathways (**Table 7**). However, this finding does not preclude the possibility of encountering unexpected and incidental contamination during the development of the Site.

6 Adopted Assessment Criteria

6.1 Soil Criteria

For the purposes of assessing the results of 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).
- Friebe, 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.

In accordance with the decision-making process for assessing urban redevelopment sites (Appendix A, 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').
- **Aesthetics:** The consultant will also consider the need for remediation 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.

6.2 Ground and Surface Water Criteria

Where required, for the purposes of assessing any results of analytical testing of surface water and/or groundwater at the Site, the following guidelines will be considered:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines (ANZG 2018);
 - ANZG 2018 is the current revision of the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management

Council of Australia and New Zealand (ARMCANZ) guidelines, presented as an online platform.

- Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, NSW DEC, March 2007 (DEC 2007);
- National Health and Medical Research Council (NHMRC) Guidelines for Managing Risk in Recreational Waters, 2008 (GMRRW 2008);
- Guidance on Per and Polyfluoroalkyl substances in Recreational Water, Canberra, NHMRC 2019 (NHMRC 2019);
- National Environment Protection Council (NEPC) 2013, National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra (ASC NEPM, 2013);
- NSW DEC (2017) Guidelines for the NSW Site Auditor Scheme (Third Edition); and
- Heads of EPAs Australia and New Zealand (HEPA), *PFAS National Environmental Management Plan*, January 2018 (HEPA 2018).

Where required, the NEPM (2013) Groundwater Investigation Levels (GILs) for freshwater aquatic ecosystems are adopted as one component of the surface water and/or groundwater investigation criteria for the Site. It is noted that the NEPM GILs apply to typical slightly to moderately disturbed systems and have been adopted from the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000), National Water Quality Management Strategy, Australian Water Quality Guidelines for the Protection of Aquatic Ecosystems (ANZECC/ARMCANZ, 2000), which has recently been revised as ANZG (2018).

It is noted where any stormwater has accumulated during construction the Moorebank Precinct Environmental Protection Licence (EPL, 21054) requirements and discharge criteria will be followed.

The Site is located in an urban environment with reticulated potable water supply and the current and future land use is commercial / industrial. Based on the evaluation undertaken, drinking water is not considered to be a relevant current or future environmental value at the Site.

Where required, to evaluate the potential risk posed from vapour intrusion (VI) from groundwater, analytical results would need to be compared to the NEPM (2013) HSLs for VI from groundwater. The NEPM HSLs have generally adopted the CRC Care HSLs for evaluation of VI risk posed from groundwater with some minor deviations. Based on the intended ongoing land use of the site being commercial/industrial, the analytical results will be compared to the clay HSL D criteria for VI.

The NEPM groundwater HSLs have been drafted as a screening tool to determine whether further investigation is necessary. This means should the identified concentrations be below the adopted HSLs then no further investigation is required. However, should the identified concentrations be above the HSLs it is noted this is a trigger value requiring further detailed assessment.

Where no criterion is available, the background levels (if known) or the laboratory limit of reporting can be adopted as the water criteria.

7 UXO, EO and EOW Management and Remediation Plan

Overall, G-tek (2019¹⁷) reported there is a low risk for Unexploded Ordnance (UXO), Exploded Ordnance (EO) and EOW (Exploded Ordnance Waste) to be present within the Site. However, where the MAUW overlaps with the Southern Portion of the MPW two areas SW0190 (Bomb Disposal Training Area) and SW0192 (Potential Explosive Ordnance Drowning Area) present a potential for remnant inert air delivered munitions to have been left in situ or within the sub-surface (see Section 8 **Appendix C**).

Where cut occurs greater than the depth of topsoil remediation within SW0190 and SW0192 portions within the Site will require remediation. As works will be required within these areas remediation will be required.

Remediation will be carried out in accordance with the remediation action plan (G-tek 2019a¹⁸) specified in **Appendix C** for areas SW0190 and SW0192.

In relation to unexpected finds, the management plan (G-tek 2019) Section 8 (**Appendix C**) must be implemented and followed as part of the CMP.

Should any contamination issues be identified the CMP will be updated to the satisfaction of the Secretary. Where remediation works are required they will only be carried out by a suitably qualified and experienced contractor(s) contractor listed on the Defence Environment and Heritage Panel (DEHP) as a F2. F2 companies can undertake UXO remediation works. Additionally, all excavation works would be undertaken by licensed contractor experienced in remediation projects and the handling of contaminated soils.

¹⁷ *Unexploded Ordnance (UXO) Risk Review and Management Plan Moorebank Precinct West Stage 2 (MPW2) incorporating Moorebank Avenue Upgrade Works (MAUW) Moorebank, NSW*, G-tek Australia Pty limited, 9 October 2019 (G-tek 2019).

¹⁸ *Remediation Action Plan Unexploded Ordnance Moorebank Precinct West Moorebank Avenue Upgrade Works*, G-tek Australia Pty limited, 8 November 2019 (G-tek 2019a).

8 Asbestos Management Plan (AMP)

An Asbestos Management Plan (AMP) is required to ensure if asbestos containing materials (ACM) or asbestos impacted soils are encountered at the Site during the redevelopment, it is appropriately managed to ensure protection of human health of site workers, future site workers and the neighbouring community. This AMP also outlines the requirements for managing any potentially asbestos impacted fill materials.

8.1 Summary of Contaminant Type

Friable asbestos is defined by Safe Work Australia's Code of Practice 'How to Safely Remove Asbestos (2019)' as being "...material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos". This includes asbestos fibre impacted soils (fibrous asbestos, FA or asbestos fines, AF) and asbestos fines as identified by laboratory analysis.

Non-friable asbestos material is defined by How to Safely Remove Asbestos (2019) as being "...material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound." This includes bonded asbestos fragments found in soils, subject to laboratory analysis for respirable fibres.

Mechanical disturbance of the fragments may result in the release of fibres and therefore, such activities will be managed to prevent any fibres becoming airborne. The primary issue associated with the asbestos contamination is inhalation of respirable fibres if the materials were to be disturbed and abraded. A secondary issue with asbestos contamination is disposal of excess spoil that may be impacted with asbestos.

8.2 Objectives

The purpose of this AMP is to outline the required procedures for handling and disposing of any identified ACM and asbestos impacted soils during the development (bulk earthworks) at the Site, to outline the measures required to protect the health and safety of workers who may encounter asbestos containing materials or asbestos impacted soils whilst completing the planned works and to prevent any adverse health effects on any future workers or neighbouring community in accordance with relevant National Codes of Practice and Work Health and Safety Legislation.

Specifically, the objectives are to:

- Outline, monitor and enforce safe working condition for all workers.
- Outline, monitor and enforce safe environmental conditions for all persons outside of the AOC.
- Outline, monitor and enforce procedures to manage works within asbestos impacted soils identified in the Site during works.
- Outline measures for the safe onsite storage and, if required, off-site disposal of asbestos materials in accordance with all relevant legal and statutory requirements.
- Outline ongoing management requirements of the Site to ensure the risk posed by any potential asbestos contamination is properly managed.

8.3 AMP Responsibilities during Redevelopment Works

Appointment of Principal Contractor

In accordance with the provisions of the Work Health and Safety Regulation 2017 prepared under the Work Health and Safety Act 2011 QUBE c/o Tactical has been appointed as the “person conducting a business or undertaking” (PCBU).

Responsibilities of the Principal Contractor

Responsibilities of the Principal Contractor include, but are not limited to the following. The Principal Contractor must:

- Be responsible for the proposed project work at all times until the work is completed.
- Ensure that all persons involved with proposed project work have undertaken occupational health and safety training if ACM is identified.
- Keep records of induction training for workers and any specific training.
- Ensure that any subcontractors provide safe work method statements for the activities for which they are engaged.
- Ensure all asbestos removal, transport and disposal must be performed in accordance with the Work Health and Safety Regulation 2017 and the National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos, 2nd Edition
- Monitor any subcontractors to ensure that they are complying with the safe work method statements.
- Maintain a hazardous substances register for all hazardous substances used or present on the Site.

The Principal Contractor is responsible for co-ordinating health and safety activities for the project. Other responsibilities of the Principal Contractor include:

- Compliance with occupational health and safety and environmental legislation, regulations, standards, codes and the Central Precinct specific rules relating to safety contained in this AMP.
- Ensuring that sufficient funds are available to procure the necessary health and safety equipment such as personal protective equipment (PPE).
- Managing accident and emergency procedures.
- Managing workplace injury management and rehabilitation.

The Principal Contractor has the authority to provide for the auditing of compliance with the provisions of this AMP, suspension or modification of work practices, and administration of disciplinary actions for individuals whose conduct does not meet the requirements set forth herein.

Asbestos Consultant or Competent Person

An Asbestos Consultant or Competent person, shall be engaged by the Principal Contractor or Remediation Contractor to assess any suspected asbestos containing materials when encountered during the redevelopment of the Site and prepare a management/remediation plan, if necessary.

The asbestos consultant or competent person shall also complete airborne asbestos monitoring and dust monitoring during any asbestos works. Where required, air monitoring will be conducted in accordance with **Section 8.6**.

The Asbestos Consultant shall:

- Provide a remediation or management strategy prior to works commencing.
- Provide on-site supervision of all potential asbestos works.
- Licensed Asbestos Assessor (LAA) to complete static asbestos air monitoring during any potential asbestos works and display daily results for the information of workers.
- Provide on-site advice, if required, in relation to suspected asbestos containing materials and the management of asbestos issues associated with the works.
- Be available, if required, for consultation with regards to the conditions and requirements of this AMP.

Should asbestos be encountered during the planned excavation works, additional clearance inspections and clearance asbestos air monitoring may be required to confirm the suitability of the AOC prior to works recommencing.

Class A/ B Licensed Asbestos Removal Contractor

A Class A (friable) or Class B (non-friable) licensed asbestos removal contractor shall be engaged if ACM is identified. The asbestos removal contractor will remove ACM or asbestos impacted soils from the AOC and dispose of them to a suitably licensed waste facility lawfully able to accept the waste. The licensed asbestos removal contractor will be the primary person responsible and in charge for works on site involving ACM or asbestos impacted soils.

Their responsibilities include:

- Complete a site walkover and 'emu-pick' to remove any observed ACM on the ground surface prior to any topsoil stripping works commencing.
- Completion of required Safework NSW permits (friable asbestos removal) or notifications (non-friable asbestos removal).
- Prepare a site-specific Asbestos Removal Control Plan (ARCP) prior to commencement of any asbestos removal works.
- Ensuring compliance with relevant legislation and the conditions of this AMP.

- Removal and disposal of asbestos containing materials or asbestos impacted soils from the site in accordance with relevant legislation. Or remediate bonded ACM impacted soils via an approved method (e.g. walking and picking or tilling etc).
- Ensure appropriate environmental and safety controls outlined in this AMP are maintained for the duration of the works.
- Assisting all site sub-contractors where required in complying with relevant legislation and the procedures outlined in this AMP.
- Completion of a final site walkover and removal of all visible asbestos containing material from the ground surface across the site.

8.4 Health and Safety Management

Safe Work Method Statements

Safe work method statements must be prepared by the Principal Contractor or by subcontractors completing significant intrusive works and also covering other aspects of the proposed project works not related to significant intrusive works, are to be prepared and approved by the Principal Contractor prior to those activities commencing.

Safe Work Method Statements must:

- Describe how work is to be carried out.
- Identify the safety risks.
- Describe the control measures that must be applied to the work.
- Describe the equipment used in the work.
- Describe any standards or codes applicable to the work.
- Training and qualifications required of persons undertaking the work.

Safe work method statements for all workers must be reviewed and approved by the Principal Contractor.

Site Access Control

The Principal Contractor shall ensure if works are to occur in an area in which ACM has been identified the construction area is securely fenced and access is controlled. Entrance to the asbestos area will be via a dedicated entry point which will contain the following features in addition to site security measures as required for a construction site as per relevant health and safety provisions:

- Readily identifiable and delineated site access / egress point. Where possible this location shall be visibly identifiable by site fencing / barricading.
- Decontamination unit for all workers to remove PPE and dispose of contaminated articles and will also include a hand wash and boot wash facility. The decontamination unit will be located in close proximity of the designated site access / egress point.

- Signage including “No Entry Without Required PPE” and a contact number for members of the public to direct any queries / complaints.
- Emergency contact details.

The overall construction site boundary will be secured by fencing. It is anticipated if areas of ACM are identified then localised active construction site access points maybe delineated within the overall site boundaries. Access to the construction site will be controlled and permitted by the Principal Contractor only after persons entering the area have been advised of the potential contamination hazards. This shall at least include notification of the potential presence of asbestos containing materials and asbestos impacted soils.

If ACM is identified then any authorised person accessing the site will do so in accordance with health and safety requirements as indicated in this AMP. The implementation of the health, safety and environmental requirements will be administered by the Principal Contractor.

Site access will not be allowed until the workers have been inducted, have signed in, and if entering the asbestos area must have donned the required PPE (below). Upon exiting the area, personnel must remove and dispose of/clean the PPE in the provided decontamination area.

Asbestos removal boundaries (if required) shall be determined by the Principal Contractor in consultation with the asbestos consultant and will vary according to the location and size of the required daily activities. Any asbestos removal boundaries will be designed to allow other site works not involving significant intrusive works to continue without being required to adhere to this AMP.

It may be found that the asbestos removal boundaries require to be assigned to the Site boundaries, in which case all site workers must adhere to the requirements of this AMP.

Training and Certification

The Principal Contractor must not allow any person to carry out project works unless he/she are satisfied that the person has undergone OHS induction training.

The OHS induction training required by the Regulation is as follows:

- 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.

For each person carrying out project works, for a period of three years, the Principal Contractor must keep a record of the following:

- A copy of relevant statements of OHS induction training, or a statement indicating 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.

Site Safety Induction

If ACM is identified it is the responsibility of the Principal Contractor to ensure all persons carrying out construction work on site are given site-specific occupational health and safety training. The induction shall be undertaken by the Principal Contractor. The induction shall be undertaken as per a standard presentation which will address the following topics as per the requirements of this AMP:

- Identification of any site specific hazards and risk control measures in relation to the asbestos impacted nature of the site.
- Regulatory requirements or codes of practice relevant to identified site specific hazards as restricted to asbestos impact.
- Directions on what to do if suspected asbestos containing materials or asbestos impacted soils are encountered.
- Site orientation at least including location of asbestos decontamination areas at site access / egress points.
- Site specific safety rules in relation to asbestos.

The Principal Contractor is responsible for establishing site specific safety rules. The rules must be displayed in an easily observable location (nominally in the site office) so as to ensure all site workers, have ready access.

At the completion of the induction presentation, each worker shall be required to acknowledge that they have understood the requirements for the site works and health, safety and environmental obligations by completion of a site induction form.

Personal Protective Equipment (PPE) Requirements

Prior to any asbestos containing materials or asbestos impacted soils being encountered, no additional PPE is required above the standard construction site PPE outlined by the Principal Contractor for the site. Should suspected ACM be identified then the supervising asbestos consultant will be contacted, the following additional items of PPE are required in addition to the standard construction site PPE outlined by the Principal Contractor for the Site, and applies for any ground workers within the asbestos work area, as defined by the supervising asbestos consultant:

- Disposable 'type 5, category 3 (EN ISO 13982–1) rated or better' coverall suits must be worn.
- Disposable gloves – non disposable gloves must be cleaned within the decontamination unit in accordance with Safe Work Australia (2019).
- P2 class respirator or higher – non disposable respirators must be cleaned in the decontamination unit in accordance with How to Safely Remove Asbestos (2018).
- Laceless steel capped rubber soled work shoes or gumboots.

Plant operators must close cabin doors and windows and set air conditioning to re-circulate when operating within the asbestos work area.

Management of Subcontractors

If ACM is identified then workers on-site will be required to adopt the provisions of this AMP and will be advised of potential safety and environmental issues on site during site-specific induction training. This induction will include the occupational health and safety responsibilities, requirements and controls for all workers on site. All workers activities involved in asbestos works will be monitored by the Principal Contractor, the licensed Asbestos Removal Contractor and the Asbestos Consultant to ensure compliance with the requirements of this AMP.

Workers whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information contained in this AMP.

They shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. All workers are responsible for:

- Providing their own personal protective equipment as required by the Principal.
- Conditions set out in this AMP.
- Training their employees in accordance with applicable laws.
- Providing medical surveillance and obtaining medical approvals for their employees, as appropriate.
- Ensuring their employees are advised of and meet the minimum requirements of this AMP and any other additional measures required by their site activities.
- Designating their own site safety officer.

Workers must sign an acceptance form prior to commencing work on site. Workers may only modify, and then only to improve, the conditions specified in this AMP with approval from the Principal Contractor, or his nominee.

8.5 Environmental Management

Asbestos Works

In the event significant asbestos contamination is identified and intrusive works are to be carried out in the asbestos work area then the following management measures will apply.

Prior to any intrusive work commencing:

- Review of the information available for the site.
- Approval for the works must be sought from the Principal Contractor or their representative who will assess whether the works are necessary or if there is an alternative that will not result in exposure of ACM impacted soils. The Principal Contractor must review the job specific risk assessment (JSRA) and safe work method statements (SWMS) and ensure that workers who will undertake the works are inducted into the AMP.

- The asbestos consultant must complete supervision of the significant intrusive works and complete regular inspections for the presence of visible asbestos. Static airborne asbestos monitoring must also be completed by the asbestos consultant for the duration of significant intrusive works.
- The works area must be isolated from casual entry using temporary barriers and only personnel inducted in the requirements of the AMP will be permitted to enter the works area.
- Sufficient room must be provided within the works area to allow stockpiling of spoil from excavations, if required, in accordance with **Section 9.9**.
- A water supply must be provided to the works area for the purpose of maintaining exposed asbestos impacted fill or soil in the excavations and stockpiles in a moist state.
- Personnel entering the works area must wear appropriate PPE in accordance with the section above.
- Stockpiles of excavated spoil must be managed in accordance with **Section 9.9**.
- Air monitoring requirements must be met as outlined in **Section 8.6**.

Should visible asbestos be identified by the asbestos consultant or airborne asbestos monitoring results identify airborne asbestos fibres in the vicinity of the works area, specific requirements for working with asbestos containing materials or asbestos impacted materials shall be enforced as outlined in below.

Specific Requirements for Working with Asbestos Impacted Material

Asbestos may be present in non-friable or friable form. In the event that either friable or nonfriable asbestos is encountered, as determined by the Asbestos Consultant, the following procedures shall be implemented for the remaining significant earthworks to ensure workers safety and to mitigate any potential off site migration of contamination.

Friable and Non-Friable Asbestos

Prior to Excavation:

- Workers and visitors to the asbestos work area will be made aware of the encountered soil contamination and only authorised people shall enter the asbestos work area, which must contain a perimeter barrier separate to the site boundaries to restrict entry. Where the asbestos work area boundary is also the site perimeter boundary, an exclusion zone of at least 5 m shall be erected beyond the site perimeter boundary (if practical/possible) to restrict access to the asbestos work area.
- Asbestos removal caution signs shall be placed on the perimeter barrier (or exclusion zone barrier, whichever is furthest from the asbestos removal work area), as per AS1319.

During Excavation/Transport/Disposal

- A WorkCover permit for friable asbestos removal works or WorkCover notification for non-friable asbestos removal works shall be sought by the licensed asbestos removal contractor.

Friable asbestos removal permits must be submitted at least 7 days prior to any friable asbestos being disposed off-site.

- All wastes will be classified, managed and disposed in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014).
- Personnel within the excavation work area shall wear a Disposable 'type 5, category 3 (EN ISO 13982–1) rated or better' coverall suit, respirator (e.g. half faced P2 respirator), disposable gloves and laceless steel capped rubber soled work shoes or gumboots at all times when within the asbestos work area and until clearance certification is provided by the asbestos consultant.
- Any obvious pieces of asbestos containing materials shall be picked up and placed into a labelled asbestos waste bag and set aside in a designated waste storage area for off-site disposal.
- The excavation shall be kept damp by water spraying at all times during excavation to reduce the possibility of dust generation.
- Personal protective equipment used during the works, such as disposable coverall suits and half faced respirators, shall be disposed of as asbestos waste.
- Airborne asbestos monitoring shall be conducted for the duration of the excavation works in accordance with **Section 8.6**.
- Any stockpiled excavated material shall be kept moist, covered or appropriately stabilised if left for more than 24 hours in accordance with the Dust Management section below.
- Appropriate leak proof transport vehicles must be used to transport materials offsite.
- Transport vehicle shall be covered prior to leaving Site and any material removed from wheels to prevent tracking outside the Site.
- Any areas required imported materials for backfill must only be completed in accordance with **Section 9.9**.

Post Excavation

- Any excavation floor and walls shall be inspected by the Asbestos Consultant/LAA/Occupational Hygienist who is trained and experienced in the identification of asbestos. Any visible ACM shall be removed by the licensed Asbestos Removal Contractor.
- Where friable asbestos has been encountered, validation samples shall be collected from the excavation walls and base and analysed at a NATA Accredited testing laboratory for the presence of asbestos. Clearance airborne asbestos monitoring shall also be conducted by a Licensed Asbestos Assessor (LAA) following the completion of the excavation and reinstatement works to be included in clearance certification. Clearance monitoring is not required if only non-friable asbestos is encountered.
- Upon receipt of both visual and laboratory data (where required) confirming the absence of asbestos, the asbestos work area shall be deemed suitable for reoccupation and a clearance letter shall be provided by the LAA/Occupational Hygienist.

Disposal and Storage of Asbestos Containing Materials

Where asbestos fragments or other forms of asbestos are identified either during redevelopment works or on the ground surface, these materials will be removed under the supervision of a licensed Asbestos Removal Contractor and in accordance with *How to Safely Remove Asbestos* (2019).

The asbestos materials will be placed into heavy-duty 200µm (minimum thickness) polythene bags that are no more than 1200 mm long and 900mm wide. The bags will be labelled as asbestos waste, sealed and placed in a designated waste area for off-site disposal.

Stockpiles will be managed in accordance with **Section 9.9**.

Dust Management

Dust levels shall be managed by ensuring:

- All stockpiles will be either periodically wetted down, covered to control dusts or otherwise appropriately stabilised.
- Water sprays will be used on the excavation areas, stockpiles and haulage pathways where necessary.
- Any haulage vehicles shall be covered and leave via the designated (stabilised) site access;
- All haulage vehicles and plant and equipment shall be washed down whenever they leave the Asbestos in Soil (ASBINS) work area.
- All access roads are sufficiently maintained to ensure no visible dust at the site boundary.
- Dust suppressors will be fitted to equipment as required.

If dust is visible at the boundary of the work area, then additional dust control measures shall be employed, which may include:

- Temporarily suspending activities until wind speeds reduce; and/or
- additional use of water sprays.

Waste Management

There shall be no wastes brought onto the Site for storage, treatment, processing, reprocessing or disposal unless permitted by a licence issued under the POEO Act.

All wastes will be classified, managed and disposed in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014).

All wastes disposed off-site will be controlled as per the EPA's requirements for waste tracking and acceptance using the WasteLocate online tracking system. Under clauses 76 and 79 of the *Protection of the Environment Operations (waste) Regulation 2014* transporters must use WasteLocate when:

- consigning, transporting or accepting more than 100 kilograms of asbestos waste, or more than 10 square metres of waste asbestos sheeting, in any single load.

8.6 Monitoring Program

In the event that significant asbestos is found a monitoring program will be implemented to ensure that the control measures being implemented at the Site are effective, the following monitoring procedures will be implemented:

- Daily static airborne asbestos fibre monitoring at work area boundaries during significant asbestos works; and
- clearance monitoring (if friable asbestos is encountered only).
- Site Inspections.

Daily Static Airborne Asbestos Fibre Monitoring

During excavation works or any other works that may disturb significant asbestos in soil at the Site, airborne asbestos fibre monitoring will be undertaken by a licensed Asbestos Assessor using calibrated portable air sampling pumps. Monitoring will be conducted at 4 locations around the work area boundaries each day over the work period and targeting any neighbouring sensitive receptors and with consideration to the daily location of works.

At the end of each monitoring period the pump and attached filter will be collected and analysed at a NATA-accredited laboratory in accordance with NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition (NOHSC:3003 [2005]).

The results of air monitoring will be available on a 24-hour turnaround time basis. Daily air monitoring reports shall be displayed in a common area outside of the asbestos work area (e.g. site office or lunch shed) or be able to be produced upon request.

The following action levels will be applied upon receipt of daily results, as outlined in the How to Safely Remove Asbestos (2019):

- Reading of less than 0.01 fibres/mL – control measures in place are working effectively, site works to continue.
- Reading between 0.01 and 0.02 fibres / mL – a review of control measures shall be completed in the work area.
- Reading greater than 0.02 fibres / mL – works shall cease until the cause of contamination is identified and rectified.

It is noted that these action levels adopted are more conservative than the exposure standard for airborne asbestos (0.1 fibres/mL (TWA)) as outlined in the Adopted National Exposure Standards for Workplace Exposure Standards for Airborne Contaminants (Safe work Australia 2013) for an 8 hour shift.

Clearance Monitoring

In the event that friable asbestos is encountered during the excavation works, clearance airborne asbestos monitoring shall be required following the friable asbestos removal. Following the completion of all earthworks, backfill of the excavated area, clearance air monitoring will take place in the vicinity of the work area to ensure that there is no residual contamination remaining at the Site. Clearance air monitoring will be achieved by recording airborne asbestos concentration levels in all sampling locations below 0.01 fibres / mL.

Site Inspections

Following the completion of any asbestos removal works, a final site walkover will be completed by the Asbestos Consultant/LAA/Occupational Hygienist to inspect the site ground surface for the presence of ACM. Any ACM observed will be removed and placed in asbestos waste bags in accordance with How to Safely Remove Asbestos (2019). Once a successful inspection has been completed and both the licensed Asbestos Removal Contractor and the Asbestos Consultant/LAA/Occupational Hygienist are satisfied there is no visible residual asbestos impacts on the ground surface, the area shall be deemed suitable for re-occupation and a clearance report issued by the LAA/Occupational Hygienist.

9 Unexpected Finds Protocol

The objective of the UFP is to provide clear guidance on the safe and appropriate actions in the event of encountering potential chemical or ordnance contamination during development works. The unexpected Finds Protocol (UFP) is summarised in **Appendix D** and is detailed in the following sections.

Where such material is uncovered the UFP prescribes the quarantining of the relevant area of concern, allowing other works to proceed unhindered, while the area of concern is assessed and, if necessary, remediated and validated.

The AOC may be identified by the Principal Contractor, Environmental Consultant or a site worker. The AOC will be quarantined by the Principal Contractor by means of some appropriate barrier to prevent access to the area. The quarantined area/s will be communicated with workers during the daily tool box talks.

Two classes of potential contamination: chemical (including potential asbestos containing materials), presented in the following sections and ordnance, discussed in **Section 7 and Appendix C**.

9.1 State the Problem

Hazards may arise from unexpected contamination during redevelopment. The nature of any residual hazards which may be present at the Site are likely detectable through visual or olfactory means, for example:

- Potentially asbestos containing sheeting, fragments or insulation materials (visible).
- UXO, EOW and EO (visible).
- Discoloured / odorous soils (visible and odorous).
- Drums / bottles / containers of chemicals (visible).
- Construction / demolition waste (visible).
- Ash and/or slag contaminated soils / fill materials (visible).
- Petroleum contaminated soils (staining / odorous / discolouration visible).
- Volatile organic compound contaminated soils (odorous).
- Asphalt contaminated fill (visual).
- Uncovering in-ground infrastructure (e.g. underground storage tanks, USTs).

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Appendix D** and detailed in the following sections is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use at the Site, will be posted in the site Office and referred to during the site specific induction by the Principal Contractor.

If the Principal Contractor considers material to be potential chemical contamination the area will be quarantined and a suitably qualified Environmental Consultant will be contacted. The Environmental

Consultant will be responsible for assessing the findings, taking samples to characterise and delineate the extent of the potential contamination and defining appropriate remedial actions, if required, in accordance with **Section 9.1 to 9.7**.

Suspected asbestos containing materials will be assessed in accordance with **Section 9.1 to 9.7** and managed in accordance with relevant WorkCover requirements and the asbestos management plan (AMP) detailed in **Section 8**.

Suspected UXO, EOW or EO will be managed and remediated in accordance with G-Tek (2019) included in **Appendix C**.

Where contamination is identified within any AOC an Investigation Report and Remediation Action Plan will be prepared by the Environmental Consultant detailing how the impacts will be managed, validated and reported.

If the area is determined by the Environmental Consultant to not be contaminated or the analyses meet the relevant site criteria (**Section 6**), the Environmental Consultant will notify the Principal Contractor that the quarantine restrictions on the area can be lifted and the works in that area may resume. The Environmental Consultant will prepare a report on the investigation and the conclusions drawn.

9.2 Identify the Decision

Based on the decision making process for assessing urban redevelopment sites detailed in DEC (2017), modified to meet the specific project objectives, the following decisions must be made during any unexpected find assessment:

- Are there any unacceptable risks to likely future onsite receptors from impacted soils during development?
- Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?
- Are there any impacts of chemical mixtures?
- Are there any aesthetic concerns in fill soils present at the Site?
- Is there any evidence of, or potential for, migration of contaminants off-site?
- Is the site specific risk assessment required to be updated?
- Is a site management strategy required?

9.3 Identify Inputs to the Decision

Inputs to the decisions are:

- Environmental data as collected by sampling and analysis and site observations made during this investigation.
- Assessment criteria to be achieved on the site as based on the intended landuse and project objectives, as defined by assessment criteria nominated in **Section 6**.
- Final site surface survey.

- Confirmation that data generated by sampling and analysis are of an acceptable quality to allow reliable comparison to assessment criteria as undertaken by assessment of quality assurance / quality control (QA/QC) as per the data quality indicators (DQIs) established in **Section 9.6**.

9.4 Define the Study Boundaries

Each AOC identified and investigated and where required, remediated, will be surveyed to provide accurate boundaries. The vertical extent of any investigation will be 0.3 m into natural soils. Data will be representative of the timing and duration of each investigation.

9.5 Develop a Decision Rule

Laboratory analytical data will be assessed against NSW EPA endorsed criteria as identified in **Section 6**. The decision rules adopted to answer the decisions identified in **Section 9.2** are summarised in **Table 8**.

Table 8 – Summary of Decision Rules	
Site	Area and Aspect
1. Are there any unacceptable risks to likely future onsite receptors from impacted soils during development?	The nature and extent of soil impacts will be assessed, and soil analytical data will be compared against EPA endorsed criteria (health and ecological). Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions. The following statistical criteria will be adopted with respect to soils: Either: the reported concentrations are all below the site criteria; Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250% of the adopted site criterion; and the standard deviation of the results must be less than 50% of the site criteria. And: the 95% upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion. If the statistical criteria stated above are satisfied, and an assessment of risk indicates no unacceptable risks, the decision is No. Otherwise, the decision is Yes.
2. Are there any issues relating to the local area background soil concentrations that exceed relevant investigation criteria?	If the 95% UCL of natural soils exceeded calculated background concentrations (NEPC 2013), the decision is Yes. Otherwise the decision is No.
3. Are there any chemical mixtures	Are there more than one group of contaminants present which increase the risk of harm? If there is, the decision is Yes. Otherwise, the decision is No.
4. Are there any aesthetics issues in fill soils at the site?	If there are any unacceptable odours, anthropogenic materials or staining the answer to the decision is Yes. Otherwise, the answer to the decision is No.
5. Is there any evidence of, or potential for, migration of contaminants off-site?	Are contaminants present within natural soils at concentrations exceeding EPA endorsed criteria? If yes, the answer to the decision is Yes. Otherwise, the answer to the decision is No. And If groundwater analytical results exceed the NEPC 2013 criteria and the downgradient groundwater impacted, the decision is yes. Otherwise, the decision is No.
6. Is a site specific risk assessment required?	If the 95%UCLs of the COPC are detected above the adopted Site criteria, a Site Specific Risk Assessment may be required.

Table 8 – Summary of Decision Rules	
Site	Area and Aspect
7. Is a site management strategy required?	Is the answer to any of the above decisions Yes? If yes, a site management strategy will be required to be developed. If no, a site management strategy is not required.

9.6 Specify Limits of Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013) and appropriate indicators of data quality (DQIs used to assess QA/QC).

To assess the usability of the data prior to making decisions, the data will be assessed against predetermined DQIs for completeness, comparability, representativeness, precision and accuracy. The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined DQIs established for the project are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters), and are shown in **Table 9**.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- Representativeness –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- Completeness – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include

requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

Table 9 – DQO, Requirements and Indicators		
DQO	Requirement	DQI
Precision		
Standard operating procedures appropriate and complied with	The sampling methods comply with industry standards and guidelines	Meet requirement
Intra-laboratory duplicates	1 per 20 samples	RPDs < 50%
Inter-laboratory duplicates	1 per 20 samples	RPDs < 50%
Laboratory duplicates	Minimum of 1 per batch per analyte	RPDs < 50%
Accuracy		
Laboratory matrix spikes	1 per batch per volatile/semi-volatile analyte	Recoveries 50% to 150%
Laboratory surrogate spikes	1 per volatile/semi-volatile analyte sample (as appropriate)	Recoveries 70% to 130%
Laboratory control/method blank samples	At least 1 per batch per analyte tested for	Result < laboratory reporting limit
Trip blanks	1 per lab batch for volatile analytes	Result < laboratory reporting limit
Trip spikes	1 per lab batch for volatile analytes	Recoveries 60-100%
Representativeness		
Sampling methodology - preservation	Appropriate for the sample type and analytes	Meet requirement
Samples extracted and analysed within holding times	Specific to each analyte	Meet requirement
Field equipment calibration	All field equipment calibrated and calibration records provided.	Meet requirement
Comparability		
Sampling approach	Consistent for each sample	Meet requirement
Analysis methodology	Consistent methodology for each sample	Meet requirement
Handling conditions and sampler	Consistent for each sample	Meet requirement
Field observations and analytical	Field observations to support analytical results	Meet requirement
Consistent laboratory reporting limit	Consistent between primary and secondary laboratories	Meet requirement
Completeness		
Sampling staff	Consistent sampling staff used.	Meet requirement
Laboratory accreditation	NATA Accredited laboratory for methods used	Meet requirement
Accredited methods	NATA accredited methods used appropriate for each analyte.	Meet requirement

Table 9 – DQO, Requirements and Indicators

DQO	Requirement	DQI
ASC NEPM (2013) lab methods	Lab methods consistent with the ASC NEPM (2013).	Meet requirement
Laboratory reporting limit	Laboratory reporting limit consistent and appropriate	Meet requirement
Consistent weather / field conditions	Consistent	Meet requirement
Chain of custody documentation	Appropriately completed	Meet requirement
Field sampling documentation	Appropriately completed	Meet requirement

9.7 Optimise the Design for Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in EPA (1995), including judgemental, random, systematic and stratified sampling patterns. Random sampling is not appropriate. Based on the history of the site a systematic sampling program is considered the most appropriate for any unexpected finds. Sampling locations will initially be placed systematically across the AOC.

Soil Sampling Methodology

Each sample collected as part of the assessment will be examined for signs of contamination and screened with a calibrated PID to identify the presence of VOCs, which might indicate contamination.

Soil samples will be collected directly from the excavator bucket and/or walls of the excavation surface using a dedicated pair of nitrile gloves for each sample to prevent cross contamination.

Testpitting will be undertaken by the Environmental Consultant, with the use of an excavator or backhoe, on an appropriately spaced grid (*in situ* materials and stockpile footprints) or 1 sample per 25 m³ if potential impacts are identified within a stockpile. Testpits will be extended through fill material or the stockpile to a maximum depth of 0.3 m into natural, whichever is the shallower.

Soil samples will be collected at 0-0.15 m, 0.3 m, 0.5 m and every 0.5 m interval to a maximum depth of 0.3 m into natural materials (or prior refusal). Should physical evidence of gross contamination be identified during the works, sampling locations may be extended to vertically delineate contamination. During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indicators of contamination will be noted.

Samples will be placed into laboratory prepared glass sampling jars with lined screw-on caps. Sample identification details will be added to the label on each jar.

The sample jar will be preserved on ice immediately after sampling and during shipment to National Association of Testing Authorities Australia (NATA) accredited laboratories. The laboratory chain of custody documentation will be completed and accompany the samples during shipment.

Potential ACM Areas

Where potential ACM has been identified an additional 10 L sample will be collected from each 1 m interval for asbestos quantification, as detailed below:

- Environmental Consultant trained and experienced in the identification of ACM.
- If ACM is identified within stockpiled material, the AQ sample will be collected at a rate of 1/70 m³ (as per guidance provided in NEPM 2013).
- If ACM is identified within in-situ fill material, the AQ samples will be collected on an appropriately spaced grid across the area.
- Testpit locations will be flagged for subsequent remedial works.
- ACM in stockpiled fill material will be quantified by the methods advised in NEPM 2013 and WA DoH 2009. At each sample location, recovered fill material (10 L) will be spread and raked. All ACM will be recovered and bagged. The volume of fill material within the testpit will be calculated and logged.
- One 500 mL soil sample will be collected from within the 10 L AQ sample and submitted for laboratory analysis to assess for the presence of FA/AF and free asbestos (respirable) fibres.
- ACM collected and bagged from each testpit will be weighed in-house using an externally calibrated scale with an accuracy of 1 g.
- Should any asbestos be observed during field works, these areas will be noted for later excavation for off-site disposal and validation. No allowance is made for management of such material during assessment works.

Potential PFAS Areas

Where potential PFAS impacted soils and/or sediments are identified the following will be conducted:

- Analyse and record the volume, concentrations and masses of PFAS contaminants, of soil, sediment, water and other materials taken, excavated, extracted or discharged from within Moorebank Avenue, at an appropriate frequency to allow for effective management intervention;
- Record the source location, and intended disposal destination of soil, sediment, water and other materials taken, excavated, extracted or discharged from within Moorebank Avenue;
- Manage, treat, remediate, or dispose of any soil with concentrations of PFOS, PFHxS, or the sum of PFOS+PFHxS greater than 0.01 mg/kg and below 50mg/kg or ppm, and or concentrations of PFOA greater than 0.3 mg/kg and below 50mg/kg or ppm, in accordance with the PFAS NEMP;
- In accordance with the PFAS NEMP, treat, remediate, completely contain, or destroy any PFAS-contaminated material including water and excavated soil, with a PFOS, PFOA, or PFHxS

content above 50 milligrams per kilogram (mg/kg or ppm) such that PFAS contaminants are prevented from entering the environment;

- Not re-use excavated and extracted soils and sediments until the CoA 3 (g) and (h) (**Table 2**) are met. Temporary or long term stockpiling of soils, sediments and materials, such as while analysis is undertaken, must be in accordance with guidance set out in the PFAS NEMP.

Additionally, where PFAS impacted surface waters and/or groundwaters are encountered EP Risk (2019a) will be followed and include the following:

- Not infiltrate, recharge, discharge, or re-use water arising from dewatering if the mean concentrations of PFAS contaminants exceed the ecosystem freshwater guideline values for the 95% species protection set out in the PFAS NEMP; and
- Treat water reported above 95% species protection set out in the PFAS NEMP to remove the PFOS and PFOA content to at or below these limits before being infiltrated, recharged or discharged.

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination (e.g. ACM, staining, odours) will be noted. Photographs of site layout and features will be taken.

Decontamination

Prior to the commencement of sampling activities, any non-disposable sampling equipment, including sampling trowel/knife will be cleaned with a water/detergent spray, rinsed with water and then air dried. The equipment will then be inspected to ensure that no soil, oil, debris or other contaminants were apparent on the equipment prior to the commencement of works. Sampling equipment will be subsequently decontaminated using the above process between each sampling location.

Duplicate and Triplicate Sample Preparation

Field soil duplicate and triplicate samples will be obtained during the field works. The collected samples will be divided laterally into three samples with minimal disturbance to reduce the potential for loss of volatiles and placed in three clean glass jars and sample bags as appropriate. Each sample will then labelled with a primary, duplicate or triplicate sample identification before being placed in the same chilled esky for laboratory transport.

Laboratory Analysis

The Environmental Consultant will contract a NATA registered primary and secondary laboratory for all analyses. Laboratory analysis of samples will be conducted as summarised in **Table 10**.

Table 10 – Unexpected Finds Sampling and Analytical Program

UF Indicator	Sampling Strategy	COPC
Discoloured / Odorous soils (visible and odorous); Drums / bottles / containers of chemicals (visible); Construction / demolition waste (visible); Ash and/or slag contaminated soils / fill materials (visible); Petroleum contaminated soils (staining / discolouration visible); or Volatile organic compound contaminated soils (odorous).	Appropriately spaced grid. Or 1 per 25 m ³ Or 1 per 5 lineal meters and 1 per 25 m ²	Heavy Metals ¹ TPH/BTEX PAHs OCP/PCBs Asbestos PFAS ²
Potentially asbestos containing sheeting, fragments or insulation materials (visible)	Appropriately spaced grid. Or 1 per 25 m ³ Or 1 per 5 lineal meters and 1 per 25 m ²	Asbestos

¹ Heavy metals analysis includes As, Ba, Cd, Cr, Cu, Pb, Ni, Hg, Ni, Zn.

² PFAS – 28 parameter suite.

Potential Groundwater Contamination

Should indicators of potential groundwater contamination be noted during any unexpected find assessment works, then the installation and sampling of groundwater wells will be recommended.

Indicators for potential groundwater impact can include the following:

- Concentration of contaminants in soils above the site criteria within natural soils; and / or
- odours or sheen on seepage water.

Groundwater assessment, if required, will implement DEC (2007) guidance, including adoption of appropriate groundwater investigation levels protective of relevant environmental values.

Remediation and Validation of Unexpected Finds

If any of the decisions in **Table 8** are 'yes', i.e. where unexpected finds are assessed as a potential human health or ecological risk to remain on the Site, a remediation/management plan will be developed.

It is noted contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory and preliminary field test results.

Additionally, all excavation works would be undertaken by a licensed contractor experienced in remediation projects and the handling of contaminated soils.

Reporting

All unexpected finds will be documented in a report/letter prepared in general accordance with the NSW Office of Environment and Heritage (OEH) 2011 *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

9.8 Waste Classification

Contaminated soils requiring disposal off-site shall be assessed in accordance with EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*. No hazardous or regulated wastes would be disposed of onsite.

9.9 Imported Fill Materials

Imported fill materials will be recorded and managed in accordance with Condition 3A of approval for EPBC 2011/6086.

Prior to the importation of fill materials onto the Site the following will be undertaken:

- Material characterisation reports/certification showing the material being supplied is virgin excavated natural material (VENM) / excavated natural material (ENM) must be provided.
- Each truck entry will be visually checked and documented to confirm only approved materials 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 the materials comply with NSW EPA Waste Classification Guidelines and the Earthworks Specification for the Site. The frequency of assurance testing will be endorsed by the Environmental Representative/Site Auditor.
- The importation of fill will be managed by the Importation of Fill Protocol CARAS (2018¹⁹)

9.10 Stockpile Management

Earthworks in the development phase are likely to, temporarily, generate excess material which may be stockpiled for re-use. Unless some event or observation indicates the material excavated and

¹⁹ *Moorebank Precinct East (MPE) Imported Fill Protocol (IFP)*, Construction and Remediation Advisory Services, 5 February 2018 (CARAS 2018).

placed into the stockpile is potentially contaminated, no particular treatment is required other than normal dust suppression, and erosion controls in accordance with relevant CEMP requirements.

All stockpiles will be managed in accordance with the CEMP and sub-plans (SIMTA 2018a²⁰), and in accordance with Condition 3A of 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 prevent collapse or sliding of the stockpiled materials.

Subject to the agreement of the relevant Consultant, it may be possible to move and stockpile impacted material. 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 Site Materials Management and Tracking Plan as part of the CEMP.

If assessment by the Environmental Consultant or the Ordnance Contractor identifies contamination, or a stockpile is observed to be contaminated, then the Environmental Consultant will assess the stockpile in accordance with **Section 9** to delineate the contamination and assess the extent of remediation, if required. In the event the stockpile contains asbestos the stockpile will be covered to minimise dust and potential asbestos release.

In the event that covers are required, they shall extend beyond the perimeter 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. 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).

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 F 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, and contaminated material will be covered to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission.

9.11 Soil Classification and Treatment

All soils will be managed in accordance with this CMP, the CEMP, sub-plans (SIMTA 2018a) and the EPBC Act conditions of approval for 2011/6086.

No hazardous or regulated wastes would be disposed of onsite.

²⁰ Construction Environmental Management Plan, Sydney Intermodal Terminal Alliances, 05 April 2018 (SIMTA 2018a).

The handling, stockpiling and assessing any impacted materials from the Site will be done in a Contamination Assessment and Treatment Area (CATA), to be established. The CATA will be capable of receiving, assessing and subsequently treating impacted soils. The process undertaken at the CATA will include:

- Stockpiling for initial materials classification;
- Sorting based on initial assessments;
- Potential treatment – including but not limited to emu picking for bonded asbestos, bioremediation of hydrocarbon impacted soils and fixation or encapsulation (lead, PFAS, PAHs); and
- Dispatching materials classified for offsite disposal or onsite isolation. Contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities.
- offsite disposals will be carried out by approved transport operators and to approved facilities

The material processed through the CATA can be reused on the site subject to being classified as suitable to be reused onsite. Before the reuse of any material on-site, it would be validated so that the lateral and vertical extent of the contamination is defined.

Materials Tracking

A Materials Tracking Plan (MTP) will be implemented during the development works. 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 final 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.

10 Contamination Management Plan Periodic Review

10.1 Periodic Review

A periodic review of the CMP will be undertaken in accordance with the following:

- In accordance with the conditions of consent the CMP will be revised:
 - Where required, following the UXO/EO investigations required under condition B136.
 - Where required following any additional PFAS investigations under condition B131.
- The CMP will be reviewed and potentially revised if there are any regulatory changes relevant to the implementation of the CMP.
- The CMP will be reviewed if there is any significant change in land use or development of the Site.
- Any revisions to the CMP must be approved by the appointed NSW EPA Accredited Auditor in accordance with condition B135 (**Section 1.2**) and in accordance with the EPBC Act approval (EPBC 2011/6229).
- Where the CMP is revised, copies will be provided to all current stakeholders, training provided and induction procedures updated where necessary.
- Where 2-years have passed since the commencement of the works.

10.2 Managing and Reporting

Incidents and Non-compliances

Incidents and non-compliances will be managed in accordance with the CEMP (SIMTA 2018a). Additionally, the Pollution Incident Response Management Plan (PIRMP, CARAS 2019²¹) will also be followed.

Where contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal) this will constitute a non-compliance to be managed under the CEMP and PIRMP.

Where contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal) 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;

²¹ Moorebank Logistics Park Pollution Incident Response Management Plan (PIRMP), Construction and Remediation Advisory Services (CARAS), June 2019 (CARAS 2019).

- Implementation the Unexpected Finds Protocol Included in this CMP, 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.

Complaints

All complaints will be managed in accordance with the CEMP sub-plan *Community Communication Strategy Moorebank Precinct East Stage 2* (SIMTA 2018b, Section 2.5, Section 3.3.5, Section 3.3.5.3, Appendix B, Table 2, Table 3, Table 7, Table 10, Table 11 and Table 8).

Non-Compliances with statutory requirements

Non-compliances with statutory requirements will be managed in accordance with the Conditions of Consent, Conditions of Approval and the CEMP (SIMTA 2018a).

Continual Improvement

Review and improvement of this CMP will be undertaken in accordance with Section 4.5 of the CEMP and **Section 10.1**. 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 as specified in the CEMP and this CMP.

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

10.3 Environmental Monitoring

Environmental monitoring will generally be conducted as per the CEMP Section 4. However, environmental monitoring specific to this CMP, discussed throughout the document is summarised in **Table 11** below.

Table 11 – Summary of Environmental Monitoring under the CMP

Monitoring Type	Frequency	Responsibility	Relevant Standards	Technique, Location and Installation Requirements	Sample Collection Requirements	Calibration and Maintenance Requirements	Record
Stormwater - PFAS	Prior to stormwater discharge	Environmental Consultant	In accordance with EP Risk (2019b) (Appendix B). NSW EPA Environment Protection License (EPL) 21054				Letter Report
Asbestos Air Monitoring	Where remedial works are required for the management of asbestos impacted soils or during asbestos removal works.	Licensed Asbestos Assessor	Detailed in Section 8.6 . NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition (NOHSC:3003 [2005]). How to Safely Remove Asbestos (2018).				Daily Letter Report where required.
Asbestos Removal	Where remedial works are required for the management of asbestos impacted soils or during asbestos removal works.	Remediation Contractor	A Class A (friable) or Class B (non-friable) licensed asbestos removal contractor shall be engaged if ACM is identified. Completion of required Safework NSW permits (friable asbestos removal) or notifications (non-friable asbestos removal).				Copies of licences and permits maintained on project file.
Asbestos Clearances	Where ACM are removed from buildings, infrastructure or soils.	Licensed Asbestos Assessor	Detailed in Section 8.6 and 8.7 .				Letter Report.
Validation Sampling	Where remedial works are required for the management of USTs and lead and asbestos impacted soils.	Environmental Consultant	The adopted sampling approach will be consistent with NEPM (2013) and AS4482.1 (2005).				Validation Report as per OEH 2011 and/or EPA 2014b.
Waste Classification	Where materials require disposal to an appropriately licensed waste facility.	Environmental Consultant	Must be completed in accordance with <i>Waste Classification Guidelines Part 1: Classifying Waste</i> EPA 2014a Detailed in Section 9.8 .				Classification Report as per EPA 2014a.
Chemical unexpected Finds Sampling	Where a chemical unexpected find is located.	Environmental Consultant	Detailed in Section 9 . The adopted sampling approach will be consistent with NEPM (2013) and any NSW EPA endorsed guidelines.				Report as per OEH 2011.
Ordnance unexpected Finds	Where an ordnance unexpected find is located.	Qualified contractor listed on the Defence Environment and Heritage Panel (DEHP) as a D2 and F2.	The UXO, EO and EOW Management and Remediation Plan is provided in Appendix B – Section 8 .				Report as per Appendix B and D
Materials Tracking	During the movement of bulk excavated materials within and off the Site.	Principal Contractor	Detailed in Section 9.11				Daily Tracking Sheets.

11 References

Aecom 2016a, Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016.

ANZG 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Arcadis 2016, Moorebank Precinct East – Stage 2 Proposal Contamination Summary Report, JBS&G Australia Pty Ltd c/o Arcadis, December 2016.

CARAS 2018, Moorebank Precinct East (MPE) Imported Fill Protocol (IFP), Construction and Remediation Advisory Services, 5 February 2018.

CARAS 2019, Moorebank Logistics Park Pollution Incident Response Management Plan (PIRMP), Construction and Remediation Advisory Services (CARAS), June 2019.

DEC 2007, Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, NSW DEC, March 2007.

DEC 2017, Guidelines for the NSW Site Auditor Scheme (Third Edition).

EP Risk 2018, Contamination Management Plan Moorebank Precinct East Site 400 Moorebank Ave Moorebank NSW, EP Risk Management Pty Ltd, 23 May 2018.

EP Risk 2018a, Environmental Management Plan Moorebank Precinct East, 400 Moorebank Avenue, Moorebank NSW, EP Risk Management Pty Ltd, January 2018.

EP Risk 2018b, Building 26 Supplementary Per- and Poly- Fluoroalkyl Substances (PFAS Assessment) MPE Stage 2, EP Risk Management Pty Ltd, 20 December 2018 v4.

EP Risk 2018c, Moorebank Precinct West Site Wide Per- and Poly Fluoroalkyl Substances (PFAS) Assessment Moorebank Precinct West, Moorebank Ave, Moorebank, NSW, EP Risk Management Pty Ltd, 22 August 2018.

EP Risk 2018d, Addendum: Qualitative Human Health Risk Assessment Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW, EP Risk Management Pty Ltd, 5 September 2018.

EP Risk 2019a, PFAS Groundwater Characterisation Assessment Moorebank Precinct Stage 2, 400 Moorebank Avenue, Moorebank, NSW, EP Risk Management Pty Ltd, 29 April 2019.

EP Risk 2019b, Per- and Poly- Fluoroalkyl Substances (PFAS) Stormwater Management Strategy v2 Moorebank Precinct East, Moorebank Ave, Moorebank, NSW, EP Risk Management Pty Ltd, 2 April 2019.

EP Risk 2019c, DRAFT PFAS Contamination Management Plan Moorebank Precinct West, Moorebank Avenue, Moorebank, NSW, EP Risk Management Pty Ltd, 26 March 2019.

EPA 2014a, Waste Classification Guidelines Part 1: Classifying Waste, NSW Environment Protection Authority, November 2014.

EPA 2014b, Technical Note: Investigation of Service Station Site, NSW Environment Protection Authority, April 2014.

Enviroview 2016, Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan, Enviroview Pty Ltd, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.

Enviroview 2019, Site Audit Report Northwest Limited Works Stage Moorebank Precinct East, Sydney Intermodal 400 Moorebank Avenue, Moorebank, Enviroview Pty Ltd, May 2019.

Enviroview 2019a, Site Audit Report IMEX Terminal Moorebank Precinct East, Sydney Intermodal 400 Moorebank Avenue, Moorebank, Enviroview Pty Ltd, August 2019.

GHD 2015b, DNSDC Moorebank – Refuelling Area Remedial Action Plan. Report Ref. PRECQPMS- EN-RPT-0007, November 2015.

GHD 2016, Department of Defence Former DNSDC, Moorebank, NSW Environmental Management Plan, GHD, September 2016.

GHD 2016a, Former DNSDC Refuelling Area Remediation Validation Report – Phase A, GHD, October 2016.

GHD 2016b, Former DNSDC Refuelling Area, Moorebank, NSW Human Health and Ecological Risk Assessment, GHD, October 2016.

GHD 2018a, Former DNSDC Refuelling Area, Moorebank, NSW Validation Report – Phase C, GHD, March 2018.

GHD 2018b, Former DNSDC Refuelling Area, Moorebank, NSW Environmental Management Plan, GHD, October 2018.

Golder 2016a, Moorebank Avenue Site Management Plan. Report Ref. 147623070_052-Rev1, 4 July 2016.

Golder 2016c, Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan, Golder Associates, 9 August 2016.

GMRRW 2008, National Health and Medical Research Council (NHMRC) Guidelines for Managing Risk in Recreational Waters, 2008.

G-tek 2019, Unexploded Ordnance (UXO) Risk Review and Management Plan Moorebank Precinct West Stage 2 (MPW2) incorporating Moorebank Avenue Upgrade Works (MAUW) Moorebank, NSW, G-tek Australia Pty limited, 9 October 2019.

HEPA 2018, Heads of EPAs Australia and New Zealand (HEPA), *PFAS National Environmental Management Plan*, January 2018.

JBS&G 2016a, Site Audit Statement and Report 0503-1611 Part Lot 1 in DP 1048263 Former Defence National Storage and Distribution Centre (DNSDC), Moorebank Avenue Moorebank NSW, JBS&G Australia Pty Ltd, 12 October 2016.

JBS&G 2016b, Site Audit Report and Site Audit Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW. Report Ref. 51732-105413, 13 October 2016.

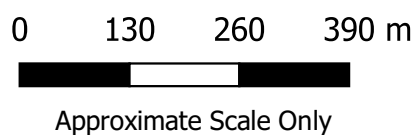
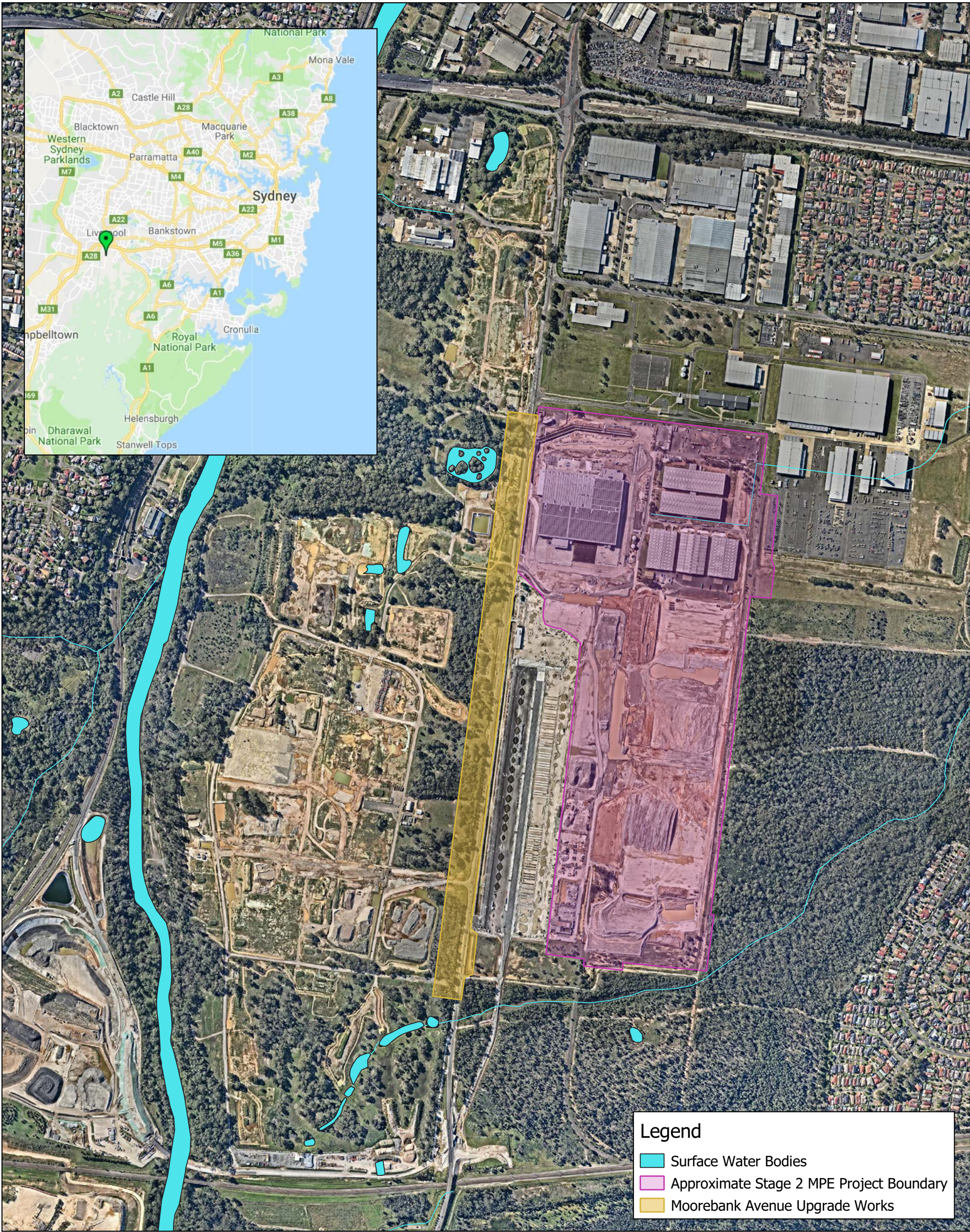
JBS&G 2018, Site Audit Report and Statement 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW, JBS&G Australia Pty Ltd, 30 October 2018.

NEPM 2013, National Environment Protection Council (NEPC) 2013, National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra.

SIMTA 2018a, Construction Environmental Management Plan Moorebank Precinct East Stage 2, Sydney Intermodal Terminal Alliances, 5 April 2018.

SIMTA 2018b, Community Communication Strategy Moorebank East Stage 2, Sydney Intermodal Terminal Alliances, 2 March 2018.

Figures





**Figure 2 - Project Plan and
Boundary**

Appendix A

MOOREBANK AV SMP (GOLDER 2016A)



4 July 2016

MOOREBANK INTERMODAL COMPANY

Moorebank Avenue - Site Management Plan

Submitted to:

Moorebank Intermodal Company
Suite 2, Level 27
1 O'Connell Street
Sydney NSW 2000

REPORT

Report Number. 147623070-052-Rev1

Distribution:

MIC - 1 electronic
AECOM - 1 electronic





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1.0 INTRODUCTION

Golder Associates Pty Ltd (Golder) was engaged by Moorebank Intermodal Company (MIC) to prepare a Site Management Plan (SMP) for the portion of Moorebank Avenue located adjacent to the former Defence National Storage and Distribution Centre (DNSDC) Refuelling Facility located on the SIMTA Property, east of Moorebank Avenue at Moorebank, NSW.

The SMP has been prepared to document the management of the identified Light Non-aqueous Phase Liquid (LNAPL) contaminated groundwater located beneath Moorebank Avenue (the site) downgradient (west) of the former DNSDC refuelling facility, as identified in this SMP as the “*Exclusion Zone*”. The position of the Exclusion Zone is shown in the Figures attached in **Appendix A**.

1.1 Background

The Moorebank Intermodal Logistic Precinct (the Precinct) Project (the Project) involves the development of approximately 220 hectares (ha) of land. Moorebank Avenue bisects the Precinct which is comprised of the MIC property (including Moorebank Avenue) and the Sydney Intermodal Terminal Alliance (SIMTA) Property (including the former DNSDC) to the east of Moorebank Avenue (refer to **Figures 1 and 2**).

For clarity, the following terminologies will be applied throughout this document:

- Butchers Knife: the cleared land dividing the former DNSDC site (the SIMTA Property) from the vacant “*boot land*” located to the south (part Lot 4 DP1197707).
- Moorebank Avenue: The Moorebank Avenue Roadway, formally identified as Lot 2 DP 1197707;
- The SIMTA Property: the land situated to the east of Moorebank Avenue, owned by the Sydney Intermodal Terminal Alliance;
- The MIC Property West: the land situated to the west of Moorebank Avenue formerly occupied for Steele Barracks (including the School of Military Engineering [SME]) and Moorebank Barracks, leased by the Moorebank Intermodal Company;
- The MIC Property East which is also eased by the Moorebank Intermodal Company and encompasses:
 - the land designated for the Moorebank Avenue re-alignment to the east of the SIMTA property (part Lot 4 DP1197707); and
 - the *Boot Land* which is designated as an ecological conservation area (part Lot 4 DP1197707); and
 - the *Rail Access Corridor* which is designated for the development of a rail line connecting a portion of the Precinct development with the Southern Freight Corridor (part Lot 4 DP1197707).
- The Precinct: The land occupied by the proposed Moorebank Intermodal Logistical Precinct encompassing both the SIMTA property, the MIC Property West and the MIC Property East.

1.2 Requirement

Investigations of the potential contamination risks associated with the Moorebank Avenue identified LNAPL on the groundwater beneath Moorebank Avenue in the vicinity (west) of the former DNSDC Refuelling Facility. The presence of LNAPL necessitated the preparation of a site management plan (SMP) to allow ongoing use of Moorebank Avenue as a publically accessible road alignment (i.e. open space) and to facilitate the future development of the site for commercial/industrial land use until such time that the LNAPL and associated dissolved phase groundwater contamination can be remediated for the proposed commercial / industrial land use. The risks associated with the identified LNAPL are discussed within Section 4.1.

1.3 Purpose

The SMP has been prepared to document the management of the identified LNAPL contaminated groundwater located beneath Moorebank Avenue (the site) downgradient of the former DNSDC refuelling facility, as identified in this SMP as the “*Exclusion Zone*” (refer to **Figure 3**). This SMP documents the type



and extent of contaminated groundwater identified, and the controls to be implemented to minimise potential exposure and health risks associated with the identified LNAPL. The SMP also documents the responsibilities of Moorebank Intermodal Company as the organisation responsible for the future development and operation of the site.

The SMP has been prepared to manage the risks associated with LNAPL contamination until such time that the remediation activities proposed by Defence have been completed¹. At this time, this SMP will be revised on the knowledge of the outcomes of the proposed remediation actions. Where required, the management controls stipulated within this SMP will be incorporated in the wider Long Environmental Term Management Plan (LTEMP) scheduled to be developed for the Precinct.

The SMP has been prepared assuming ongoing open space use of the site as a publically accessible road alignment and the future development into commercial/industrial use. The SMP would require review and may require modification if:

- It is proposed to erect structures in the vicinity of the Exclusion Zone which would result in the potential for vapour intrusion into the structures and increased risk to site occupants; or
- It is proposed to change site usage to a more sensitive use.

¹ It is understood that the nominal schedule for the Defence remediation activities is 12 . 18 months commencing in June 2016.



2.0 SITE DESCRIPTION

2.1 Site Identification

The site locality and layout are presented in **Figure 1** and **Figure 2**, respectively. **Table 1** summarises the site identification.

Table 1: Site Identification

Item	Details
Address	Moorebank Avenue, Moorebank, NSW
Title Identification Details/ Legal Description	Lot 2 DP 1197707
Local Government Authority (LGA)	Liverpool
Site Area	Approximately 5.8 hectares
Exclusion Zone	Approximately 1,500 m ²

The site is owned by the Australian Government and will be leased to MIC under a 99 year lease, and MIC as Head Lessee will holder overarching responsibility for the development and operation of the site. On 4 June 2015, MIC, with the approval of the Commonwealth Government, entered an agreement with the Sydney Intermodal Terminal Alliance (SIMTA) under which SIMTA will obtain approvals, build and operate all stages of the Intermodal Terminal Development. SIMTA, is a consortium comprising Qube Holdings and Aurizon.

2.2 Description of Site and Surrounding Area

The site follows the alignment of Moorebank Avenue and is bound by Anzac Road in the north and the East Hills Railway Line in the south. The site bisects the Precinct separating the MIC Property West from the SIMTA Property and the MIC Property East.

Surrounding land includes, the MIC Property West which was formerly occupied by the Australian Army School of Military Engineering (SME) on Steele Barracks. While the majority of the buildings and infrastructure remains in place, the property is now unoccupied in preparation for the proposed redevelopment. The MIC Property East is land delineated for the Moorebank Avenue re-alignment. It is currently occupied by bushland and a service corridor to the east of the site. The SIMTA Property was formerly occupied by the Defence National Storage and Distribution Centre (DNSDC). Similarly to the MIC property, the SIMTA Property has retained the majority of its buildings but is currently unoccupied.

The site is relatively flat with the exception of a filled embankment in the southern portion which has been constructed to direct Moorebank Avenue over the railway line. The elevation at the northern end of the site is approximately 14 metres Australian Height Datum (m AHD) while elevations in the southern end of the site are approximately 15 m AHD. The filled embankment rises to an elevation of approximately 25 m AHD at the southern periphery of the site (Nearmap, 2016).

2.3 Summary of Site Assessments

A number of geotechnical and geochemical investigations have been previously carried out across the Precinct. These reports have been prepared primarily for the designated portions of the MIC Property East, the MIC Property West and the SIMTA Property.

Table 2 identifies the investigations which included information relevant to the Site and the former DNSDC refuelling facility.



Table 2: Previous Investigations

Author	Report Title
Groundwater Technology (1994)	Environmental Site Assessment
Dames and Moore (1996)	Environmental Management Plan and Environmental Audit
Egis Consulting Australia (2000)	Stage 1 Preliminary Site Investigation, Moorebank Defence Site
HLA Envirosciences (2002)	Soil & Groundwater Investigation Precinct H (DNSDC) Moorebank Defence Land
HLA Envirosciences (2005)	AST and UST Management Plan, Volume 10, Sydney West Defence Region
GHD (2015a)	DNSDC Moorebank Intrusive Site Investigations (21/24133/207651)
GHD (2015b)	DNSDC Moorebank Additional site investigations and remedial options evaluation (21/24133/209789)
GHD (2015c)	DNSDC Moorebank . Refuelling Area Remedial Action Plan (21/24133/211259)
Golder (2010)	Phase 1 Environmental Site Assessment, Stage 1A of Moorebank Intermodal Freight Terminal Development ((document no. 107623148-001-R-RevA)
Golder (2015b)	Remediation and Demolition Specification Moorebank Intermodal Terminal (document reference: 147623070-023-Rev1)
Golder (2015c)	Validation Plan - Principles Moorebank Intermodal Terminal (document reference: 147623070-022-Rev0)
Golder (2015d)	Onsite Quantitative Human Health Risk Assessment Moorebank Intermodal Terminal (document reference: 147623070-043-R-Rev1)
Golder (2016)	Preliminary Site Investigation . Moorebank Ave Moorebank Intermodal Terminal (document reference 147623070-50-R-Rev1)
JBS&G (2015a)	Phase 2 Environmental Site Assessment, SIMTA Intermodal Terminal Facility . Stage 1 (document no. 50342-60868 Rev3)
JBS&G (2015b)	Remedial Action Plan, SIMTA Intermodal Terminal Facility . Stage 1 (document no. 50342-61155 Rev1)

2.3.1 Review of Previous Investigations

For clarity, it is noted that two contamination investigations were undertaken on the SIMTA Property by JBS&G and GHD concurrently and independently. JBS&G were engaged by Tactical Group to conduct a Phase 2 Environmental Site Assessment (JBS&G 2015a) and Remediation Action Plan (JBS&G 2015b) that would meet the requirements of the planning application process for the first stage of development at the SIMTA property. GHD were engaged by the Department of Defence to conduct intrusive site investigations (GHD 2015a and GHD 2015b) and Remedial Action Plan (GHD 2015c) to satisfy the requirements for the Department of Defence to relinquishing their lease of the SIMTA Property.

Former DNSDC Refuelling Area – DNSDC Building 21

JBS&G (2015a) completed intrusive investigations at a number of areas of interest at the Stage 1 site and Rail Corridor on the SIMTA Property. During this investigation, JBS&G identified the former DNSDC refueling area within the Stage 1 site as having significant contamination in the form of LNAPL. Groundwater monitoring wells MW03 and BHHP34011 recorded 2.865 m and 0.684 m of LNAPL in the January 2015 gauging event.

JBS&G (2015b) developed a Remediation Action Plan (RAP) Stage 1 site of the SIMTA Property and particularly in relation to the contamination identified at the refueling area. The RAP recommended the following in relation to the contamination associated with the refueling area:



- Removal of the fuel from the six underground storage tanks (USTs) located on the site (*completed in July 2015*);
- The removal of LNAPL to the extent practicable via multi-phase extraction (MPE);
- The removal of fuel storage and distribution infrastructure including excavation and onsite bioremediation of hydrocarbon impacted soils;
- The reuse of validated bioremediation material for the backfilling of excavations; and
- Groundwater monitoring for residual groundwater contamination in the refueling area.

Concurrently with the JBS&G investigations, GHD (2015a) completed an intrusive investigation program around former DNSDC refueling area. The investigations initially included the installation of 11 new groundwater wells within the vicinity of the former DNSDC refueling area and a groundwater monitoring event. During the April-May 2015 groundwater monitoring event, LNAPL was observed in nine wells (GW002B, DNSDC2 (inferred to be MW3, installed by JBS&G 2015a), BHHP34011, GW113, GW115, GW116, GW118, GW119 and GW120).

The initial GHD investigation was augmented with an additional investigation and remediation option assessment GHD (2015b). The investigation included the installation of 28 new groundwater wells, on former DNSDC refuelling facility and further six monitoring wells were installed offsite within on the adjacent MIC West property (within the former School of Military Engineering [SME]) and within the Moorebank Avenue site. The LNAPL impact was identified offsite to the west of Tank 6 in monitoring wells GW119 and GW120, however, was delineated by a perimeter of groundwater wells not impacted by LNAPL. GHD concluded that the pattern of LNAPL distribution supports the suggestion that there are multiple sources of hydrocarbon release from the refuelling infrastructure, and the impacts identified beneath Moorebank Avenue were likely sourced from Tank 6 which contained diesel at the time of the investigations. GHD also concluded that distribution of dissolved phase impact in groundwater demonstrates significant attenuation of hydrocarbon concentrations in groundwater towards the perimeter wells.

Based on the conditions encountered on the former DNSDC refuelling area, Defence's obligations with respect to the termination of the lease agreement and the presence of off-site LNAPL (i.e. contamination present beneath Moorebank Avenue), GHD classified the DNSDC Refuelling Area as a high risk site+ (spreading LNAPL). GHD recommended a remedial approach with the goal of achieving containment with aggressive remediation of mobile LNAPL (GHD, 2015b).

Subsequent to the two rounds of investigations, GHD (2015c) developed a RAP for the refueling area. The RAP details the protocols of the proposed remediation works required to remediate the hydrocarbon and LNAPL contamination on the former DNSDC refueling area. In addition, GHD summarised the interim management measures that had been undertaken:

- Bail down tests were undertaken on DNSDC2 (MW3) and BHHP34011 in April 2015. GHD reported that LNAPL recoverability was relatively quick and Multi Phase Vacuum Extraction (MPVE) was recommended as an interim option for management of the LNAPL.
- A two day MPVE trial was completed from 9 to 10 June 2015. Over the course of the two day trial, an estimated total mass of 150.9 kg of hydrocarbon was recovered in 10 wells.
- A five day MPVE event was completed from 13 July to 17 July 2015. Over the course of the five day MPVE event, an estimated total mass of 359 kg of hydrocarbon was recovered from nine wells.
- LNAPL finger print analyses were conducted on samples collected from separate impacted areas identified by GHD. The analyses indicated that the impacted areas represented by BHHP34011, DNSDC2 (MW3) and GW120 were predominately comprised of diesel product. The impacted area represented by GW121 (up gradient of the refueling area) was a mix of petrol (15% ± 5%) and diesel (85% ± 5%).



GHD (2015c) recommended the remediation of the dissolved phase hydrocarbon and LNAPL contamination is carried out in three phases:

- Phase A . Source Removal (tanks and soils) : Removal of six USTs in the two tank farms and associated field delivery infrastructure and bio-remediation of the contaminated soils;
- Phase B . Risk Assessment: Human health risk assessment and fate and transport modelling; and
- Phase C . Source Removal (groundwater): GHD recommended further removal of LNAPL in the form of MVPE post completion of Phase A and B.

It is understood GHD have been commissioned by Defence, to undertake the remediation of the former DNSDC Refuelling Facility in accordance with the RAP (Golder, 2015c). And these works are scheduled to be completed over a 12 - 18 month period commencing in June 2016 (Defence, 2016 *pers. Comm.* 16 May). Currently there is no active remediation proposed within the Exclusion Zone, however, it is understood² that this will be reviewed at the completion of second phase of the remediation works (i.e. Phase B . Risk Assessment). If warranted, the proposed MPVE will be extended to the off-site impacts (H. Milne, GHD 2016 *pers. Comm.* 28 April). It is also understood the remediation works will be reviewed by Accredited Contaminated Site Auditor (Andrew Lau), and a Site Audit Statement will be prepared at the completion of the works. It is understood the current scope of the Audit is limited to the SIMTA property, however, at the time of reporting Defence has not received comment from the Auditor in regards to management of the offsite contamination (Defence, 2016 *pers. Comm.* 16 May).

² Based on communication with Helen Milne of GHD on 28 April 2016.



3.0 REGULATORY REQUIREMENTS

3.1.1 Commonwealth Framework

All works must comply with the Commonwealth statutory requirements in the planning and delivery of the works.

3.1.2 NSW Contaminated Land Legislative Framework

In broad terms the NSW legislative framework for contaminated lands consists of two tiers.

- The principal legislative vehicle is the *Contaminated Land Management Act 1997 (CLM Act)* which deals with site contamination that is significant enough to warrant regulation under the *CLM Act* given the sites current or approved use.
- The second tier is focused on departments (i.e. local councils or the NSW Department of Planning) who deal with contamination under the planning legislative framework, including State Environmental Planning Policy No. 55 . Remediation of Land and the Managing Land Contamination . Planning Guidelines (DUAP, 1998). These provide the framework for determining what remediation is needed to make land suitable for the intended use.

For the purpose of implementing this SMP, legislation, regulations and guidelines which may affect management or works within the Exclusion Zone include, but are not limited to the following:

- *NSW Contaminated Land Management Act 1997;*
- *NSW Protection of the Environment Operations Act 1997;*
- *NSW Protection of the Environment Operations Regulations 2014;*
- *NSW Work Health and Safety Act 2011; and*
- *NSW Work Health and Safety Regulation 2011.*



4.0 RISKS AND CONTROL MEASURES

4.1 Conceptual Understanding of Contamination

The current investigation has not included the installation of groundwater monitoring wells within Moorebank Avenue (the site), and the actual conditions within the Exclusion Zone have not been assessed directly. The conditions within the Exclusion Zone have been inferred based on the results of investigations undertaken on the adjacent properties which included the installation of monitoring wells immediately west of Moorebank Avenue, on MIC West, and immediately to the east, on the SIMTA owned former DNSDC refuelling facility. The following presents a summary of the conditions encountered on the adjacent properties, and is considered representative of the conditions likely to be encountered within the Exclusion Zone.

The investigations have identified the former DNSDC refuelling facility as the source of hydrocarbon contamination in the area. The historic use of the facility for vehicle refuelling has resulted in the release of hydrocarbons into the underlying groundwater and the hydrocarbons have migrated beneath Moorebank Avenue (the site) and beneath the eastern portion of the MIC West property (near the former entrance to the SME). The primary contaminants of potential concern include (GHD, 2015a) and are associated with typical Australian petroleum mixtures:

- Total reportable hydrocarbons (TRH);
- Benzene, toluene, ethyl benzene, xylene (BTEX);
- Naphthalene;
- Lead; and
- Poly-cyclic Aromatic Hydrocarbons

The GHD investigations have determined that the LNAPL below Moorebank Avenue is likely to be associated with diesel fuels. The extent of the LNAPL plume has been delineated and includes the foot print of the former refuelling station, portions of the SIMTA property to the east of the refuelling station, a portion of Moorebank Avenue (the Exclusion Zone) and a small portion of the MIC West property. Based on the Golder investigations in 2016 (which were completed approximately eight months after the MPVE trials were completed in the area) the LNAPL was measured at approximately 1.76 m apparent thickness in monitoring well GW120 located near the former entrance to the SME (MIC West) at approximately 6.5 m depth below ground (Golder, 2016).

The extent of LNAPL contamination, as delineated by GHD is presented in Figure 4 (Appendix A) and the maximum concentrations of dissolved phase contaminants reported on the DNSDC refuelling facility are summarised in Table 3.



Table 3: Summary of maximum dissolved phase contaminant concentrations (from GHD, 2015b)

Parameter	Health Levels Commercial / Industrial (mg/l) ^a	Screening Health Levels Open Space (mg/l) ^b	Maximum Concentration (mg/l) / Location
TRH . C ₆ -C ₁₀ (F1)	NL	NL	33 (GW121)
TRH . >C ₁₀ -C ₁₆ (F2)	NL	NL	2,100 (GW116)
Benzene	30	NL	21 (GW121)
Toluene	NL	NL	19 (GW121)
Ethyl benzene	NL	NL	0.96 (GW121)
Xylene	NL	NL	1.9 (GW121)
Total xylene	NL	NL	6 (GW121)
Naphthalene	NL	NL	0.99 (GW116)

A . Commercial / industrial land use, HSL(D) for vapour intrusion . clay . groundwater depth 4 -8m

B . Open space land use, HSL (C) for vapour intrusion . clay . groundwater depth 4 -8m

NL . Non-limiting³.

During the GHD well installation program, the groundwater encountered was between 9.5 m and 10.5 m depth, indicated the groundwater in the area is semi confined and is actually present at depths lower than that measured in the monitoring wells. Based on the GHD logs and previous Golder investigations the geology in the area is clay with some horizontal sandy clay lenses. The water within the impacted wells was reported by GHD as being present in low plasticity red / grey clay. The inferred groundwater flow direction is west towards the Georges River, however the presence of LNAPL around the refuelling station has limited the interpretation of flow directions.

The soil assessments completed by Golder (2016) and GHD (2015a and 2015b) did not indicate impacted soils within the shallow soil profile (i.e. <1m depth). Furthermore, the GHD (2015a and 2015b) investigations did not identify soil impacts either on the site, nor offsite which exceeded the investigation levels for vapour intrusion or direct exposure for commercial workers and intrusive maintenance workers.

It is noted that, the NEPM HSLs (2013) for groundwater beneath an open space / recreational land use are non-limiting for all groundwater depths and geologies. Furthermore, the vapour intrusion modelling completed by Fiebel and Nadebaum (2011), included the assessment of shallow intrusive maintenance workers and also derived HSL which were non-limiting for all groundwater depths and geologies. On this basis, the vapour intrusion modelling used to inform the NEPM (2013) and that completed by Fiebel and Nadebaum (2011) indicates that the presence of LNAPL is unlikely to present an unacceptable risk to the current site users. However, the vapour intrusion modelling completed by Fiebel and Nadebaum is based on soil vapour equilibrium calculations based on Henry's law constant, and does not fully consider partitioning of vapours from LNAPL. Best practice is to estimate soil vapour concentrations from LNAPL using equations based on Raoult's Law for the mole fractions of the various constituents of the NAPL, or collect soil vapour samples to allow comparison with the soil vapour HSLs. As such, further assessment of the potential vapour risks associated with the LNAPL plume is required. However, as aggressive remediation activities are proposed, it is expected that these assessments will be completed (if required) at the completion of the remediation activities.

4.2 Exposure Pathways / Hazards

The current use of the site is as a publically accessible road alignment, with a concrete footpath located on the western side of the road. There are also several underground services which travel through the road alignment. Subsequently the current users of the site are considered to include the following:

³ When a Non Limiting HSL is derived it indicates that based on the defined solubility limits, a soil vapour source could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.



- Members of the public using Moorebank Avenue, including persons travelling in vehicles, bicycles and walking; and
- Maintenance workers, including shallow intrusive maintenance workers requiring access to the underground services located in the area.

Based on the review of the investigation results it is considered that the principal exposure route and potential hazard from the identified groundwater contamination for the current users of the site is via inhalation of vapours potentially emanating from the LNAPL plume. Based on the LNAPL depth (>6 m depth), and that no impacts were detected in the shallow soils within the road reserve, a direct exposure pathway is considered incomplete and unlikely to present a potential risk to the current users of the road reserve.

Due to the open space environment, the general day to day site activities are unlikely to result in exposure of site users, or the general public to the vapours potentially emanating from the LNAPL plume in the Exclusion Zone. This includes general grounds maintenance workers undertaking non-intrusive grounds maintenance on activities. There is an increased hazard for workers performing shallow underground utility maintenance works within the exclusion zone, as there is potential for vapour emanating from the LNAPL plume to accumulate within the service trenches. There is also an increased hazard for workers performing shallow excavation works within the Exclusions Zone.

Following the redevelopment of the Precinct, it is expected that portion of the site impacted with LNAPL will become part of the wider commercial / industrial development. The area is proposed to include open space rail infrastructure, and no buildings are proposed for this portion of the land. Subsequently, the potential future users are considered to include:

- Workers involved in the development of the precinct, particularly those involved in excavation activities including possible piling works;
- Future workers employed on the property, including shallow intrusive maintenance workers requiring access to underground services potentially installed in the area.

The potential exposure of future workers on the site will be subject to the outcomes of the remediation actions proposed by Defence. As the outcomes of the remediation works are not yet known, it has conservatively assumed that LNAPL will remain within the Exclusions Zone at the completion of the proposed remediation action. And based on this assumption, the principal exposure route and potential hazard for future users of the site is also via inhalation of vapours potentially emanating from the LNAPL plume. However, in regards to future site users there is also potential for workers to be directly exposed to contaminated groundwater and or soils should deep excavation (>5 m depth) and /or groundwater extraction be required during the redevelopment works. Deep excavation works, and or extraction of impacted groundwater from within in the Exclusion Zone will also increase the potential for workers to be exposure to vapours.

The potential extraction of impacted soil and or groundwater during the future development activities, also presents a potential hazard to ecological receptors if the cuttings and/or extracted is not appropriately controlled. Without appropriate containment the contaminated materials may be dispersed across the site or off-site, and present a risk to ecological receptors on the site and offsite.

4.3 Control Measures

4.3.1 Rationale

For the purpose of this SMP a worst case scenario has been assumed, with a complete exposure pathway is present via the inhalation of vapours emanating from the LNAPL plume for both the current and future users of the site.

Additional controls are also presented to address potential direct exposure risks that future construction workers undertaking deep excavation work and or undertaking groundwater extraction from within the Exclusion Zone.



4.3.2 Management Controls

Controls are required to create awareness of the presence of contamination and where possible restrict activities in the Exclusion Zone (refer **Figure 3**), such that potential vapour exposure risks are managed and that activities resulting in the disturbance of the identified LNAPL plume are minimised.

The proposed management controls are identified in Table 4 below.

Table 4: Management Controls

Management task	Commentary
Objective	Administrative controls are required to alert users of the site to the potential vapour inhalation risks and to restrict un-necessary disturbance of the contaminated groundwater located at depth in the Exclusion Zone.
Performance criteria	Uncontrolled sub surface activities are not to be undertaken in the Exclusion Zone. Uncontrolled groundwater extraction activities are not to be undertaken in the Exclusion Zone.
Management controls	<p>Prepare a training and induction process notifying all employees and contractors on the hazards associated with the Exclusion Zone, and implement as appropriate prior to works commencing.</p> <p>Notify the owners and/or managers of sub-surface utilities within the Exclusion Zone of the potential petroleum hydrocarbon vapour exposure risks.</p> <p>Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of any sub-surface utility maintenance activities. The JSA should include as a minimum the following control measures:</p> <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours;■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours; and■ Definitions of appropriate person protective equipment requirements. <p>No excavation or disturbance to site soils and no extraction of groundwater from within the Exclusion Zone without written authorisation by the Site Owner or Site Manager.</p> <p>Where possible, the future redevelopments are to be designed that that the potential disturbance of the groundwater within the Exclusions Zone is minimised. This may include the consideration of designs and or construction methods which minimise deep excavations (including piling) and / or groundwater extraction within the Exclusion Zone.</p> <p>Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of excavation and /or groundwater extraction activities. The JSA must include as a minimum the following control measures:</p> <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours;■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours;



Management task	Commentary
	<ul style="list-style-type: none"> ■ Definitions of appropriate person protective equipment requirements; ■ Appropriate controls on personal hygiene to minimise ingestion by hand to mouth of potentially impacted soils and /or groundwater; and ■ Appropriate personnel decontamination procedures. <p>Prepare and implement a Construction Environmental Management Plan (CEMP) prior to commencement of excavation and /or groundwater extraction activities. The CEMP must include as a minimum the following control measures for the following aspects:</p> <ul style="list-style-type: none"> ■ Surface water discharge of contaminated materials; ■ Dust/vapour and odour emissions emanating from contaminated materials; ■ On-site remediation and / or treatment of extracted contaminated soils and groundwater; ■ Waste classification, haulage and offsite disposal; ■ Spillage of contaminated materials; and ■ Appropriate equipment decontamination procedures; <p>Permanent or temporary structures are not to be erected within the Exclusion Zone, without the consideration of potential vapour intrusion risk, and may require the installation of appropriately designed passive or active vapour management infrastructure (such as vapour barriers, or active sub-slab ventilation systems).</p> <p>Initiate corrective actions as soon as practicable and within two weeks of identification of non-conformance.</p>
Long Term Environmental Management	<p>Six monthly groundwater gauging will be undertaken, until such time that the remediation activities proposed by Defence have been completed. At this time, this SMP will be revised on the knowledge of the outcomes of the proposed remediation actions.</p> <p>A Job Safety Analysis (or equivalent) is to be prepared and implemented prior to commencement of groundwater gauging activities. The JSA should include as a minimum the following control measures:</p> <ul style="list-style-type: none"> ■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours; ■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours; and ■ Definitions of appropriate person protective equipment requirements. <p>Where required future activities associated with this SMP will be incorporated in the wider Long Environmental Term Management Plan (LTEMP) scheduled to be developed for the Precinct. It is expected that the LTEMP will include details on any ongoing groundwater monitoring activities required in the proposed Exclusion Zone.</p>
Record keeping and reporting	Maintain a log of inspections, non-conformances and corrective actions.
Responsibility	Head Lessee or delegate



MIC MOOREBANK AVENUE SMP

Management task	Commentary
Corrective Actions	<p>Corrective actions will be required if any of the above mentioned management controls are not complied with.</p> <p>The Non-conformance and complaints register presented as Appendix D identifies the requirement for corrective action and recommendations for preventative actions. Corrective and preventative actions are to be reviewed and implemented by the Site Manager or his/her delegate.</p>



5.0 RESPONSIBILITY

This SMP is to be implemented for the on-going use of the Exclusion Zone, or until it is proven to the satisfaction of the accredited NSW EPA contaminated site auditor (the Auditor) that the SMP is no longer required and can be revoked.

The implementation of this SMP is the responsibility of the Head Lessee (MIC) under the obligations imposed under Clause 6.1(b)(1) of the Head Lease from the Commonwealth to MIC, where:

“remediating all Contamination on, in or in respect of the Premises to the standard required under any applicable Environmental Law from time to time irrespective of who caused the Contamination and irrespective of whether the Contamination first occurred or was first caused or was first disturbed prior to the Commencement Date or the date of the Tenant’s first occupation of the Land.”

To clarify, in respect of this SMP the abovementioned term ~~%remediation+~~includes the implementation of a management approach where appropriate.

The responsible person for the overall implementation of the SMP is the Head Lessee and/or their nominated representative or delegate. Implementation of the SMP during specific works is the responsibility of the works supervisor, considered to be the delegate of the Site Manager.

The roles and responsibilities for the implementation of the SMP are identified in Table 5 below.

Table 5: Roles and Responsibilities

Role	Responsibility
Head Lessee (MIC) or delegate	<p>Approve the SMP.</p> <p>Advise persons working at the site of the requirements of the SMP.</p> <p>Ensure appropriate consents and licences (as required) are obtained for the works.</p> <p>Provide training and induction of employees and contractors before and during the works, as appropriate.</p> <p>Provide a copy of the SMP to the supervisor or person-in-charge of employees and/or contractor/s who are undertaking the works.</p> <p>Ensure implementation of the SMP. Maintain a log of Project Personnel.</p> <p>Ensure staff and contractors comply with the requirements of the SMP.</p> <p>Ensure staff and contractors clearly understand the requirements of the SMP and ensure that compliance with the SMP is a condition of any agreement with contractors.</p> <p>Update the SMP if the condition of the site is changed, and, if necessary, inform other parties of the changes.</p> <p>Ensure the site is maintained in accordance with the SMP.</p> <p>Provide the SMP for inclusion on the relevant records maintained by MIC and others (including owners and /or agents responsible for the management of assets within the Exclusion Zone).</p> <p>Ensure an inspection of the site is undertaken at six-monthly intervals or at another intervals as decided by MIC and record the results of the inspections in Appendix B of the SMP.</p> <p>Ensure all non-conformance and/or complaints are recorded in Appendix C of the SMP.</p>
Site Manager	<p>Implement the SMP to ensure compliance.</p>



MIC MOOREBANK AVENUE SMP

Role	Responsibility
	<p>Complete the registers, databases and records required by the SMP.</p> <p>Conduct works in an environmentally responsible manner.</p> <p>Meet relevant WH&S regulatory requirements.</p> <p>Implement the works in a safe and responsible manner.</p> <p>Ensure that environmental protection measures are in place and are functioning correctly during the works and after completion of the works, if required.</p> <p>Complete non-conformance and corrective action reports as required and undertake follow-up corrective actions, as required.</p> <p>Conduct monitoring as required in the SMP.</p> <p>Undertake audits of activities in accordance with the requirements of the SMP.</p> <p>Ensure non-conformance and/or complaints are reported to the Site Manager and Site Owner.</p> <p>Undertake corrective actions in response to requests regarding specific environmental or safety issues.</p> <p>Ensure all works comply with relevant regulatory requirements.</p> <p>Inform the Site Manager if conditions change significantly from those documented in the SMP.</p>
Site Developer	<p>Provide the SMP to any maintenance worker or contractor (who is engaged under the direction of the site developer).</p> <p>Comply with the SMP during development of the site, including being aware of and accommodating the requirements of the Exclusion Zone within the design redevelopment.</p> <p>Prepare and implement a Construction Environmental Management Plan, for any activities proposed within the Exclusion Zone, and ensure the CEMP addresses the risks identified in this SMP.</p> <p>Ensure potential risks are managed through implementation of the SMP.</p> <p>Monitor adherence to the SMP.</p> <p>Initiate and undertake corrective actions for non-conformance under the SMP.</p> <p>Inform the Site Owner and Site Manager if in-ground conditions change significantly from those documented in the SMP.</p>
Maintenance Work / Contractor	<p>Comply with the SMP, including relevant legislation and guidance when conducting works at the site.</p> <p>Ensure tasks are approved by the Site Owner their delegate (Site Manager or Site Developer) prior to commencing work.</p> <p>Inform the Site Owner/ Site Manager/Site Developer if ground conditions differ and/or change significantly from those documented in the SMP.</p>



6.0 CONTINGENCY ACTIONS

Table 6 identifies contingency actions to be performed in the event of unexpected exposure of site occupants or visitors to contamination on the site occurs or the potential for exposure occurs.

Table 6: Contingency Actions

Trigger	Action
Unauthorised underground utility maintenance (including those not requiring excavation), or installation works occurring in the Exclusion Zone.	<p>If works are in process:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.■ Site Manager to engage an experienced environmental consultant⁴ to assess exposure of workers to potentially contaminated materials. <p>If excavations have occurred and the area has been reinstated:</p> <ul style="list-style-type: none">■ Assess condition of surface soils in the work area against appropriate land use criteria to confirm contaminated soils do not remain on the site surface.■ Site Manager to engage an experienced environmental consultant to assess if excavation works have increased the potential risks associated petroleum hydrocarbon vapour migration (i.e. generation of a preferential migration pathway).■ Instigate preventative action to limit the potential for reoccurrence.
Unauthorised excavations in the Excavation Exclusion Zone.	<p>If excavations are in process:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.■ Site Manager to engage an experience environmental consultant and /or occupational hygienist to assess exposure of workers to potentially contaminated materials. <p>If excavations have occurred and the area has been reinstated:</p> <ul style="list-style-type: none">■ Assess condition of surface soils in the work area against appropriate land use criteria to confirm contaminated soils do not remain on the site surface.■ Instigate preventative action to limit the potential for reoccurrence.
Identification of unexpected contaminated materials during excavation works within the Exclusion Zone.	<p>If unexpected contamination⁵ is encountered during shallow excavation works the following actions should be taken:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.

⁴ For example a member of the Australian Contaminated Land Consultants Association (ACLCA) or equivalent

⁵ Contamination may include, but not be limited to, hydrocarbons, poly cyclic aromatic hydrocarbons and asbestos.



MIC MOOREBANK AVENUE SMP

Trigger	Action
	<ul style="list-style-type: none">■ Site Manager to engage an experience environmental consultant to assess potentially contaminated materials.■ Update the SMP. <p>Adverse conditions which may warrant action include;</p> <ul style="list-style-type: none">■ highly malodours soils or seepage water (e.g. strong residual petroleum odours);■ hydrocarbon sheen on surface water;■ discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;■ large monolithic deposits of materials (e.g. gypsum as powder, or plaster board);■ presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste;■ presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items; and■ presence of asbestos containing materials (ACM).
Other	Liaise with Site Manager / Site Owner to determine appropriate actions to mitigate adverse impacts from the event.



7.0 SMP REVIEW AND TIMEFRAME

7.1 Review of SMP

This SMP must be reviewed annually by a competent person and assessed against any changes in site conditions, work requirements, legislation, environmental conditions and other relevant factors including the result of corrective and preventative action reports. Where relevant, preventative actions should be incorporated into the SMP.

If revision of this SMP is considered necessary then the revision should be agreed by at least the following:

- The Site Owner; and
- The Site Manager.

7.2 Timeframe for SMP

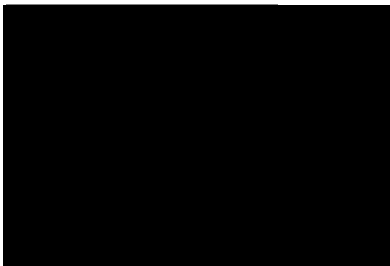
This SMP, or any subsequent revision, should apply in perpetuity or until:

- Investigations indicate the concentrations of the contaminants of concern in soil and or groundwater have attenuated or have been remediated to levels below the below endorsed criteria for the commercial/industrial and open space land use; or
- Reassessment of contaminant concentrations against future revisions of land use criteria indicates the measured concentrations are below endorsed criteria for the relevant land use (i.e. commercial/industrial land use or open space); or
- The redevelopment and or remediation of the Exclusion Zone has been completed, and it is agreed with the Auditor that the controls of this SMP are to be incorporated into the wider LTEMP when developed; or
- The land use changes to a more sensitive land use and reassessment of potential risks to site occupants is required.

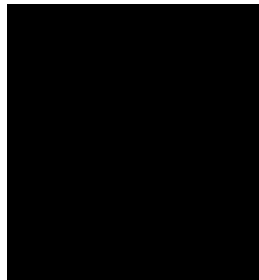


Report Signature Page

GOLDER ASSOCIATES PTY LTD



Environmental Engineer



Principal Environmental Scientist

GVS/AH/gvs

A.B.N. 64 006 107 857

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8.0 REFERENCES

- AECOM 2014 *Site Audit Report and Site Audit Statement, Moorebank Intermodal Terminal, Moorebank, NSW* (document no. 60327260_SAR_10JUL2014), AECOM, 2014.
- ANZECC 2000 *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*; Australian and New Zealand Environment and Conservation Council and Agriculture and Resources Management Council of Australia and New Zealand, 2000.
- ASSMAC 1998 *Acid Sulfate Soils Assessment Guidelines*, Acid Sulfate Soils Management Advisory Committee, August 1998.
- BOM 2014 Australian Government Bureau of Meteorology, (<http://www.bom.gov.au>), 2014.
- CMPS&F 1998 *School of Military Engineering (SME) and adjoining areas, Preliminary Environmental Investigation*, July 1998.
- CRC 2011 *Technical Report No. 10 HSLs for petroleum hydrocarbons in soil and groundwater*; Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, 2011.
- CRC 2009 *Technical Report No. 13 – Field Assessment of Vapours*, Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, August 2009.
- D&M 1996 *Environmental Management Plan and Environmental Audit*, Dames and Moore, 1996
- Dear *et al* 2014 *Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0*, Dear, S-E., Ahern, C. R., O'Brien, L. E., Dobos, S. K., McElnea, A. E., Moore, N. G. & Watling, K. M., Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government, 2014.
- DECCW 2009 *Waste Classification Guidelines: Part 1 Classifying Wastes*, NSW Department of Environment, Climate Change and Water, 2009.
- D&M 1996 *Environmental Management Plan and Environmental Audit*, Dames and Moore, 1996.
- Earth Tech 2006 *Stage 2 Environmental Investigation*, Earth Tech, 2006.
- Egis 2000 *Stage 1 Preliminary Site Investigation, Moorebank Defence Site*, Egis Consulting Australia, 2000.
- enHealth 2004 *Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards*, enHealth, June 2014
- ERM 2006 *Technical Advice Document, related to Earth Tech (2006) Stage 2 Environmental Investigation*, ERM, 2006.
- GHD 2003 *Asbestos Report and Register for the Liverpool Military Area, Updated Registers*, GHD, 2003.
- GHD 2004a *Estimated Asbestos Removal and Reinstatement Costs, Liverpool Military Area*, GHD, 2004a.
- GHD 2004b *Groundwater Investigation of the North Western Portion of the Moorebank Defence Land*, GHD, 2004b.
- GHD 2005 *Proposed Intermodal Freight Hub, Moorebank, Summary of Environmental Planning Reports*, GHD, 2005.
- GHD 2006 *Proposed Inter-modal Freight Hub Moorebank – Summary of Environmental Planning Reports*, GHD, 2006.



Golder 2014a *Sampling Analysis and Quality Plan* (SAQP; doc ref 147623070-002-R-Rev2). Golder Associates, 2014.

Golder 2014b *Geotechnical Data Report* (GDR, doc ref. 147623070-010-R-Rev0), Golder Associates, 2014.

Golder 2014c *Geotechnical Interpretive Report* (GIR, doc ref. 147623070-011-R-Rev0), Golder Associates, 2014.

Golder 2014d *Validation Plan* (doc ref. 147623070-022-R-Rev0), Golder Associates, 2014.

Golder 2014e *Remediation Specification* (doc ref. 147623070-023-R-Rev0), Golder Associates, 2014.

Golder (2015a) *Remediation and Demolition Specification Moorebank Intermodal Terminal* (document reference: 147623070-023-Rev1), Golder Associates, 2015

Golder (2015b) *Post Phase 2 Environmental Site Assessment – Moorebank Intermodal Terminal* (document number 147623070-019-R-Rev1), Golder Associates, 2015

Golder (2015c) *Validation Plan - Principles Moorebank Intermodal Terminal* (document reference: 147623070-022-Rev0), Golder Associates, 2015

Golder (2015d) *Onsite Quantitative Human Health Risk Assessment Moorebank Intermodal Terminal* (document reference: 147623070-043-R-Rev1), Golder Associates, 2015

GT 1994 *Environmental Site Assessment*, Groundwater Technology, 1994.

G-tek 2011 *Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal – Post Activity Report*, G-tek, 2011.

Harrison, S. Department of Primary Industries and Energy, Commonwealth of Australia, http://www.chem.unep.ch/pops/pops_inc/proceedings/bangkok/harrison.html viewed on 12 November 2014.

HLA 2002 *Soil & Groundwater Investigation Precinct H (DNSDC) Moorebank Defence Land*, HLA Envirosciences, 2002.

HLA 2003 *Preliminary Groundwater Study, Moorebank Defence Land*, HLA, 2003.

HLA 2005 *AST and UST Management Plan, Volume 10, Sydney West Defence Region*, HLA Envirosciences, 2005.

HLA 2006 *Defence Integrated Distribution System (DIDS) Baseline Investigation*, HLA Envirosciences, 2006.

ITRC 2007 *Vapour Intrusion Pathway: A Practical Guideline*. Interstate Technology & Regulatory Council, January 2007.

JBS&G (2015a) *Phase 2 Environmental Site Assessment, SIMTA Intermodal Terminal Facility – Stage 1* (document no. 50342-60868 Rev3), JBS&G, 2015

JBS&G (2015b) *Remedial Action Plan, SIMTA Intermodal Terminal Facility – Stage 1* (document no. 50342-61155 Rev1), JBS&G, 2015

NEPC 1999 *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environmental Protection Council, 1999.

NEPC 2013 *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council, 2013.

NSW DoM 1991 NSW Department of Minerals 1:100 000 Geological Series Sheet for Penrith (1st edition) . Sheet 9030.

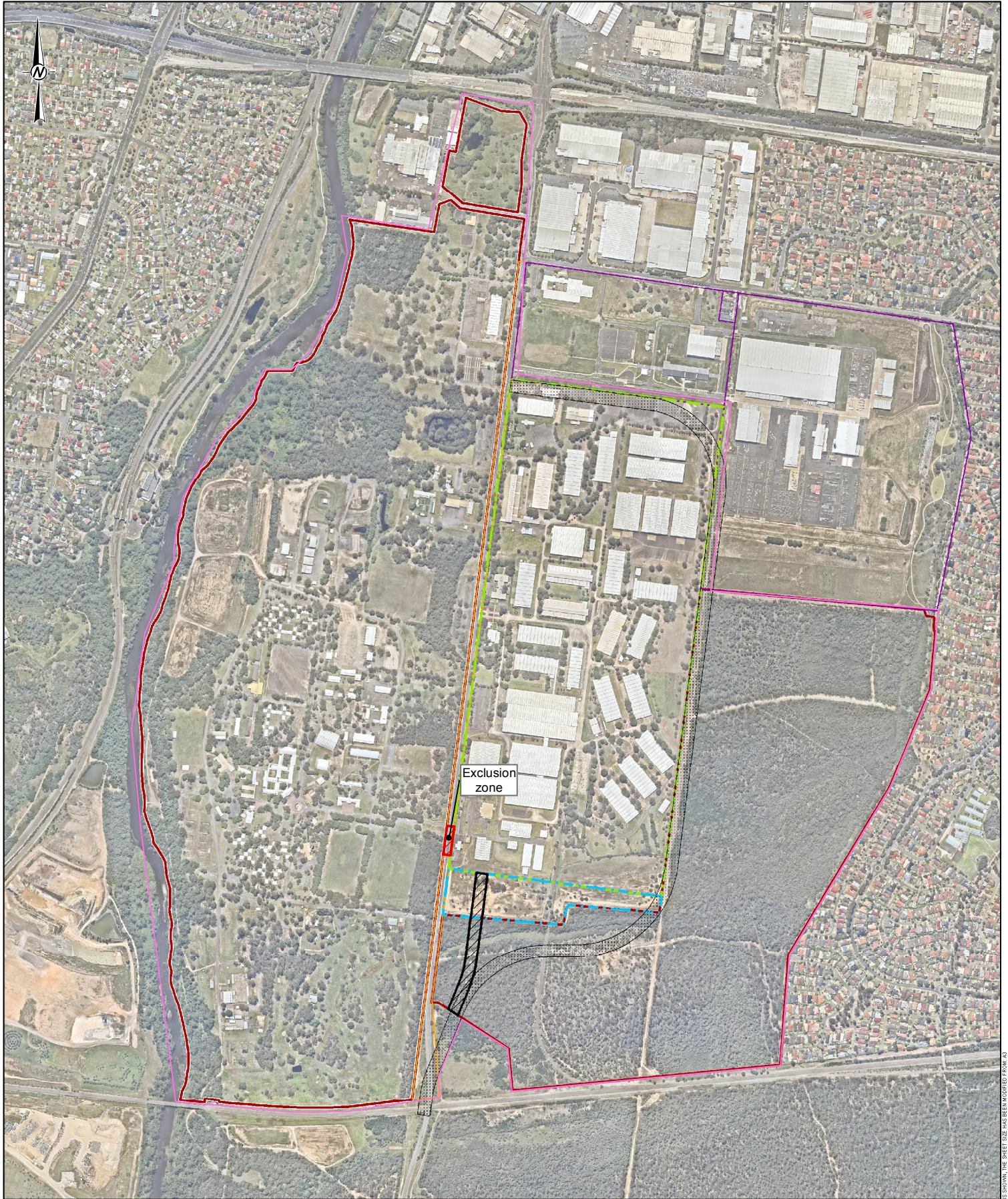


NSW EPA 2004	<i>Chemical Control Order in Relation to Scheduled Chemical Wastes</i> , NSW Environment Protection Authority, June 2004.
NHMRC 2008	<i>Guidelines for Managing Risk in Recreational Waters</i> , National Health and Medical Research Council, 2008.
NHMRC 2011	<i>Australian Drinking Water Guidelines</i> , National Health and Medical Research Council and Natural Resource Management Ministerial Council, 2011.
PB 2011	<i>Moorebank Intermodal Terminal - Geotechnical Investigation Report (document no. 2103829A_PR_036)</i> , Parsons Brinckerhoff 2011.
PB 2013	<i>Steele Barracks Moorebank – Dust Bowl Asbestos Management Plan</i> , Parsons Brinckerhoff 2013.
PB 2014a	<i>Phase 2 Environmental Site Assessment, Moorebank Intermodal Terminal (document no. 2103829A-CLM-REP-1 Rev B)</i> , Parsons Brinckerhoff 2013, Parsons Brinckerhoff 2014.
PB 2014b	<i>Preliminary Remedial Action Plan (RAP), Moorebank Intermodal Terminal (document no. 2189293C-CLM-REP-2 Rev C)</i> , Parsons Brinckerhoff 2014.
PB 2014c	<i>Phase 1 Environmental Site Assessment, Moorebank Intermodal Terminal (document no. 2103829C-CLM-REP-3321 Rev C) – included within PB 2014a</i> , Parsons Brinckerhoff 2014.
URS 2003	<i>Investigation of Suspected Sources of TCE, North West Precinct of Moorebank Defence Lands</i> , URS, 2003.
USEPA 2008	<i>Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review</i> , US Environment Protection Agency, Reference: EPA-540-R-08-01, June 2008.
USEPA 2010	<i>Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review</i> , US Environment Protection Agency, Reference: EPA 540-R-10-011, January 2010.
WA DoH, 2009	Western Australia Department of Health, <i>Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia</i> , 2009.



APPENDIX A

Figures



LEGEND

- Exclusion zone (LNAPL)
- The Precinct (approximate)
- MIC Property West
- Bootland (MIC Property East)
- Butchers Knife
- SIMTA Property
- Joint Defence Logistics Complex Moorebank
- Moorebank Ave
- Moorebank Ave Realignment
- Rail Access Corridor

NOTE(S)
LNAPL - Light Non Aqueous Phase Liquid


REFERENCE(S)
1. Lot boundaries provided by Land and Property Information NSW

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MOOREBANK INTERMODAL COMPANY

PROJECT
SITE MANAGEMENT PLAN -PART LOT 2 DP 1197707

TITLE
SITE OVERVIEW

CONSULTANT


YYYY-MM-DD	2016-06-24
PREPARED	KJS
DESIGNED	####
REVIEWED	GVS
APPROVED	GVS

PROJECT NO. 147623070 **CONTROL** 052 **REV.** 1 **FIGURE** 001

0 420 840
1:10,000
PROJECTION: GDA 1994 MGA Zone 56
METRES

— Drainage Lines

TABLE 1. *Continued*

0 50 100
1:1,250 METRES
PROJECTION: GDA 1994 MGA Zone 56

APPROVED	GVS
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FIGURE
002



LEGEND

- Exclusion zone (LNAPL)
- MIC Property West
- Butchers Knife
- SIMTA Property
- Moorebank Ave
- Rail Access Corridor

NOTE(S)

1. Exclusion zone digitised from G : D Groundwater Impacts summary report Figure 5

2. LNAPL - Light Non Aqueous Phase Liquid

REFERENCE(S)

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PROJECT

SITE MANAGEMENT PLAN - PART LOT 2 DP 1197707

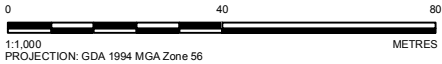
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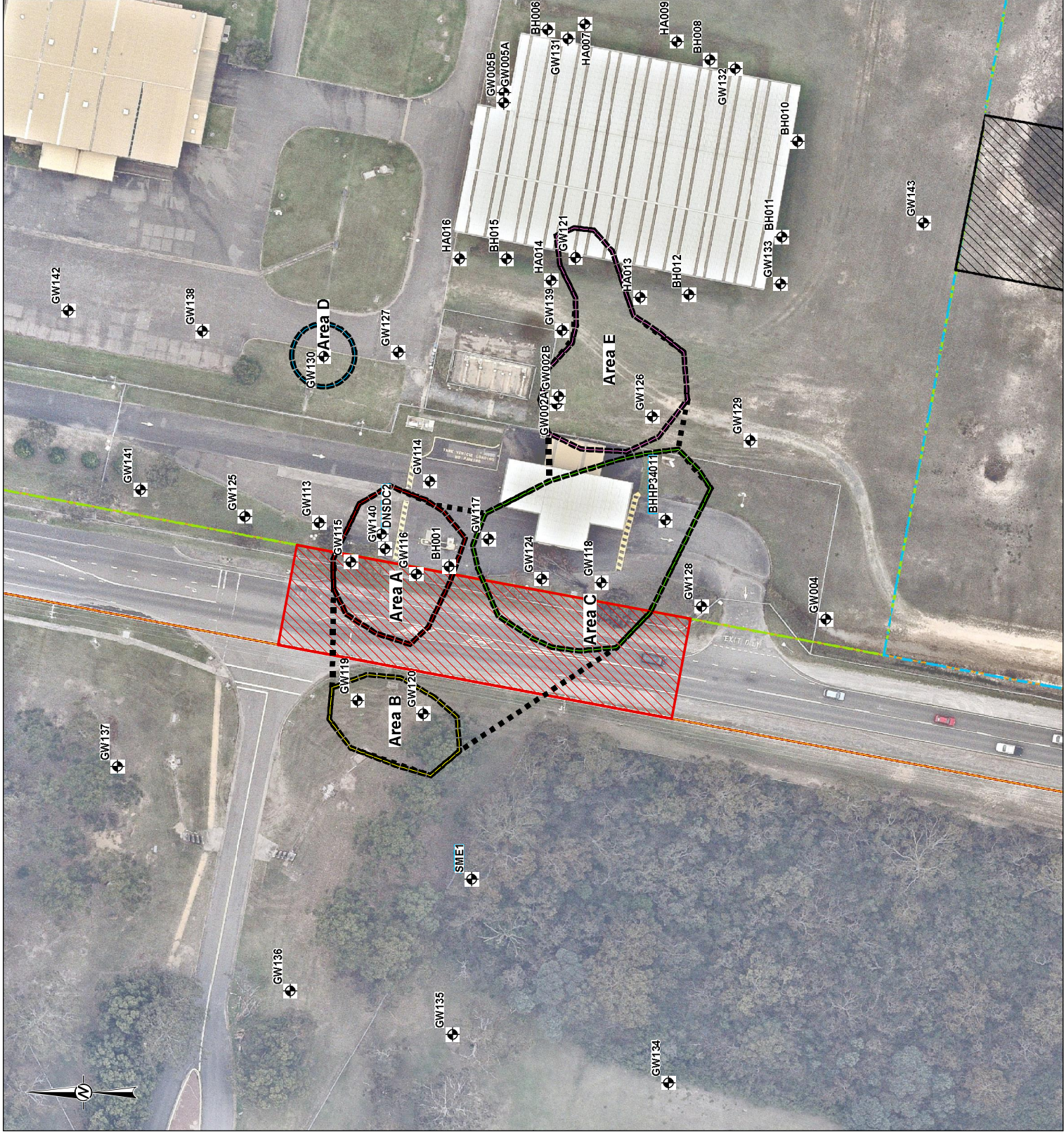
MOOREBANK INTERMODAL COMPANY EXCLUSION ZONE

CONSULTANT	YYYY-MM-DD	2016-06-24
	PREPARED	KJS
	DESIGNED	####
	REVIEWED	GVS
	APPROVED	GVS

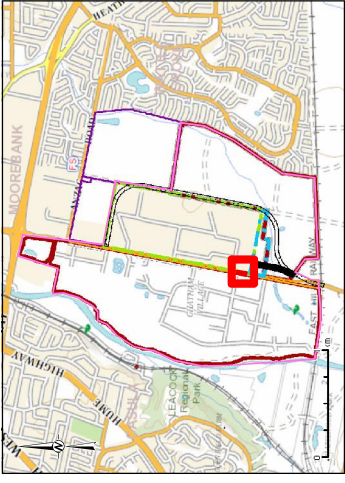
Golder Associates

PROJECT NO.	CONTROL	REV.	FIGURE
147623070	052	1	003





LOCATION MAP



Legend

- Investigation Locations**
- Observed existing groundwater wells
 - Groundwater well location (GHD, 2015)
 - Groundwater Extraction well location (GHD, 2015)
 - Soil Borehole location (GHD, 2015)
 - Hand Auger location (GHD, 2015)
 - Potential groundwater LNAPL areas (approximate)
 - Exclusion zone (LNAPL)
 - MIC Property West
 - Butchers Knife
 - SIMTA Property
 - Moorebank Ave
 - Rail Access Corridor

NOTES

1. Exclusion zone digitised from GHD Groundwater Impacts summary report Figure 5

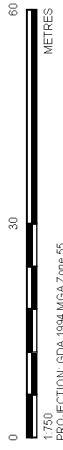
2. Investigation locations and potential groundwater LNAPL areas provided by GHD as displayed in Groundwater Impacts Summary report Figure 5

REFERENCE(S)

1. Lot boundaries provided by Land and Property Information NSW

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SITE MANAGEMENT PLAN - PART LOT 2 DP 1197707

TITLE

POTENTIAL GROUNDWATER IMPACT AREAS

CONSULTANT	YYY-AM-20	2016-06-24
PREPARED	KJS	
DESIGNED	###	
REVIEWED	GVS	
APPROVED	GVS	



APPENDIX B

SMP Inspection Report



APPENDIX B SMP INSPECTION REPORT

The purpose of this Inspection Report is to facilitate maintenance of a record of inspections undertaken at the Moorebank Avenue %Exclusion Zone+, and to record the results of the inspections including a record of any corrective actions required.

The Inspection Report is to be reviewed and signed by the site manager following completion of the inspection and corrective actions (if any).

Date:	
Time:	
Inspector (name & signature):	
Observations:	
Problems (if observed):	
Report to:	
Corrective action (if required):	
Corrective action completed (signed & dated by site manager):	
Preventative action to limit future occurrences:	
Site manager review (signed & dated):	

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APPENDIX C

Complaints and Non Conformance Register



APPENDIX D COMPLAINTS AND NON CONFORMANCE REGISTER

The purpose of this Complaints and Environmental Incident Register is to maintain a register of complaints from local residents or stakeholders, which will include a record of any action taken with respect to the complaints.

Entries into the Complaints and Environmental Incident Register are commence immediately following the receipt of any complaints associated with works undertaken on the Moorebank Avenue "Exclusion Zone".

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position



APPENDIX D COMPLAINTS AND NON CONFORMANCE REGISTER

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position

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APPENDIX D

Limitations



LIMITATIONS

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This Document has been prepared for the particular purpose outlined in Golder's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

The scope and the period of Golder's Services are as described in Golder's proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.

Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.

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Appendix B

PFAS STORMWATER MANAGEMENT STRATEGY V2 (EP
RISK 2019B)



Per- and Poly-Fluoroalkyl Substances (PFAS) Stormwater Management Strategy v2

Moorebank Precinct East, Moorebank Ave, Moorebank, NSW

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

Tactical Group Pty Ltd

EP0733.007 v2 2 April 2019



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

Attention: [REDACTED]

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

INTRODUCTION

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

The second stage of construction works is underway at the Site which includes the bulk earthworks and construction of the Intermodal Terminal ('the Works'). The Works include construction erosion and sediment controls ('ERSED') comprising temporary swales and sediment basins which will remain during the various stages of construction. The location of the sediment basins at the Site are provided as **Attachment 1**.

A former building (Building 26) was identified in the southern portion of the Site to have historically been used to store aqueous film forming foam (AFFF). EP Risk (2018)¹ has previously undertaken an assessment of the area near Building 26 where PFAS was detected in sediment samples from drainage channels and groundwater in this portion of the Site. Additional site wide PFAS assessment of groundwater has also been completed (EP Risk 2018a²).

JBS&G (2018)³ has undertaken sampling and testing of stormwater that has accumulated in the sediment basins in the southern portion of the Site. JBS&G (2018) reported concentrations of perfluorooctane sulfonate ('PFOS') + perfluorohexane sulfonate ('PFHxS') in excess of the Heads of EPAs Australia and New Zealand (HEPA) and the Australian Government Department of the Environment and Energy (DoEE) PFAS National Environmental Management Plan ('PFAS NEMP 2018') health-based guidance values for recreational and drinking water.

¹ EP Risk (2018) Building 26 Supplementary Per- and Poly- Fluoroalkyl Substances (PFAS) Assessment, Moorebank Precinct East Stage 2, 400 Moorebank Avenue, Moorebank NSW, dated 27 July 2018 (ref: EP0733.002 v3).

² EP Risk (2018a) PFAS Groundwater Characterisation Assessment Moorebank Precinct East Stage 2, 400 Moorebank Avenue, Moorebank, NSW, 23 November (ref: EP0947.002 v1).

³ JBS&G (2018) Basin and Swale Surface Water PFAS Assessment, PFAS water results (ref: 54834_PFAS).



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The PFAS NEMP 2018 states that:

‘...an exceedance of the screening values should trigger further investigation such as site-specific risk assessment to refine the likely degree of possible risk (as opposed to the assumption that harm will have occurred).’

Based upon exceedance of the Tier 1 criteria, a site-specific risk assessment was required (based on HEPA 2018⁴).

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

RESULTS OF ANALYTICAL TESTING

The results of sampling and analytical testing of stormwater collected from each sediment basin after the recent rainfall event in September 2018 is provided as **Attachment 2**.

Based on analytical results reported by JBS&G (2018) PFOS + PFHxS concentrations from Basin-01, Basin-02 and Basin-03, Swale-A-01 and Swale-C-03 reported concentrations above the adopted criteria.

PREVENTATIVE MEASURES

Based upon the analytical results, leaching of PFAS from exposed soil has generated PFAS impacted stormwater within the sediment basin catchments. EP Risk recommends capping of sediment basin catchments where PFAS concentrations have been reported above the adopted criteria.

It is understood the capping of these catchments forms part of the Works and construction of capping is underway and has been almost completed.

Once capping has been completed, concentrations of stormwater collected within the basins should be assessed to inform the requirement for additional management which may include lining of swales with a geotextile liner and lining of the basins.

SHORT-TERM MANAGEMENT

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

- Discharge of stormwater that meets the JBS&G (2018)⁵ discharge criteria to the Georges River.
- Use of stormwater for dust suppression within the same catchment.

⁴ PFAS National Environmental Management Plan, The Heads of EPAs Australia and New Zealand, January 2018 (HEPA 2018).

⁵ JBS&G (2018) Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR. Moorebank. NSW, dated 18 April 2018 (ref: L145 (Qualitative PFAS Assessment for Temporary Stormwater Discharge) Rev A, Draft).

Discharge of stormwater to temporary storage locations

JBS&G (2018) has undertaken a qualitative assessment for PFAS stormwater discharge from MPW to the Georges River and developed the temporary PFAS stormwater discharge criteria provided in **Table 1**.

Table 1 – Temporary PFAS Stormwater Discharge Criteria	
Analyte	Temporary Stormwater Discharge Criteria
PFOS + PFHxS	0.7 µg/L
PFOA ⁶	5.6 µg/L

It is noted stormwaters which meet the discharge criteria would likely be discharged to Anzac Creek. Given Anzac Creek is a tributary of the George River the above stormwater discharge criteria also applies to Anzac Creek.

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

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

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

EP Risk (2018)⁷ undertook a review of the JBS&G (2018) Qualitative Review and was in general agreement with the stormwater disposal criteria that had been developed, however considered that the adoption of the 90% species protection values of 2 µg/L and 632 µg/L for PFOS and PFOA, respectively was more appropriate due to the ability of PFAS to bioconcentrate, bioaccumulate and biomagnify in aquatic food chains. However, as the lower of the human health and aquatic ecosystem criteria was adopted, this difference does not affect the temporary PFAS stormwater discharge criteria provided in **Table 1**.

On the 9 August 2018, the National Health and Medical Research Council ('NHMRC') released Draft Guidance on PFAS in recreational water for public consultation, which closes on 27 September 2018. Based upon the draft guidance, NHMRC is proposing to revise the PFOS + PFHxS and PFOA recreational water criteria to 2 µg/L and 14 µg/L, respectively. It is anticipated that the revision of the guidance

⁶ PFOA - Perfluorooctanoic acid.

⁷ Review of the Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR, Moorebank, NSW, dated 12 July 2018 (ref: EP0745.001).

levels will be finalised later this year and the temporary PFAS stormwater discharge criteria in **Table 1** should be revised when it is published.

All basins where PFAS concentrations were reported below the adopted stormwater disposal criteria provided in **Table 1** are suitable for discharge to the Georges River, subject to meeting all other applicable discharge criteria for other analytes / physical parameters.

Re-use of stormwater for dust suppression

An assessment of the reuse of stormwater which exceeds the adopted PFAS stormwater disposal criteria provided in **Table 1**, has been undertaken with consideration to the following:

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

Assessment of health-risk to construction workers

EP Risk (2018a)⁸ has prepared an addendum to the EP Risk (2018)⁹ health risk assessment to assess the risk to construction workers at the Site who may contact PFAS impacted stormwater via the transport, handling and management of stormwater (including dust suppression).

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

Based on dermal risk to construction workers being managed through mandatory use of waterproof gloves and boots, stormwater at the Site with concentrations less than **270 µg/L (PFOS and PFOS Grouped¹⁰)** and **2,200 µg/L (PFOA and PFOA Grouped¹¹)**, respectively are considered suitable for transport, handling and on-site management (including dust suppression) from a human health risk perspective.

A copy of addendum to the health risk assessment is provided as **Attachment 3**.

Assessment of soil mass flux

The reported PFAS mass in stormwater within the sediment basins was generated by leaching from surface soils within the sediment basin catchment. Therefore, the application of the PFAS impacted stormwater to surface soils within the catchments from where it was sourced via dust suppression will

⁸ EP Risk (2018a) Addendum #3 to the Human Health Risk Assessment – Construction Workers Handling PFAS Containing Stormwater, dated 21 September 2019 (re: EP0733.006).

⁹ EP Risk (2018a) Literature Review, Criteria for Assessment of PFAS and Risk Assessment

¹⁰ PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-EtFOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS – Perfluorodecane sulfonic acid.

¹¹ PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDdA - Perfluorododecanoic acid; PFTnA - Perfluorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

return the PFAS mass to the media from where it was generated. This will result in a zero-net mass flux to soil from a site-wide perspective. Dust suppression rates should be managed to limit runoff and infiltration at the Site.

Wash down of tanker trucks, pumps and equipment

EP Risk recommends that tankers pumps and other equipment should be thoroughly rinsed after coming into contact with PFAS impacted surface water. A trial should be undertaken to determine the number of rinses required to reduce rinsate water concentrations below the recreational water criteria provided in **Table 1**.

LONG-TERM MANAGEMENT

Long-term management of PFAS impacted stormwater can be achieved via confirmation of the effectiveness of preventative measures. Once capping has been completed, concentrations of stormwater collected within the basins should be assessed to inform the requirement for additional management which may include lining of swales with a geotextile liner and / or lining of the basins.

Effectiveness of preventative measures

EP Risk considers that the preventative measures outlined in EP Risk (2018) should be effective in reducing PFAS stormwater concentrations to below the adopted PFAS stormwater disposal criteria provided in **Table 1**.

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

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

Water Treatment Contingency

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

Although implementation of the prevention measures will reduce long-term PFAS stormwater concentrations in the sediment basins, it is considered that additional soil disturbance works during construction may result in the ongoing generation of PFAS impacted stormwater during the proposed Stage 2 Works program.

Therefore, an on-site water treatment system could be designed and commissioned at the Site as a contingency to treat stormwater which that exceeds the adopted PFAS stormwater disposal criteria during prolonged rain events. The system should be designed to treat PFAS concentrations to below the adopted PFAS stormwater disposal criteria. The proposed Water Treatment Methodology is in **Attachment 4**.

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

Water Treatment Plant (WTP) Capacity

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

- Catchments generating PFAS impacted surface water.
- Run off from unexpected finds of PFAS and dewatering (if required) of any PFAS remediation works.
- A treatment rate of 2 to 5 litres per second.

Water Treatment

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

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

WTP Compliance Testing

Compliance testing is to be undertaken to confirm concentration of PFAS are below the adopted HEPA (2018) recreational criteria (**Table 1**). The compliance sampling frequency will involve:

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

Discharging Water

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

Subsequently, the environment advisor must authorise the discharge by signing the Discharge or Reuse Water Approval.

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

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

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

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

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

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

WTP Waste Management

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

CONCLUSION

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

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

Prevention

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

Short-term Management

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

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

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

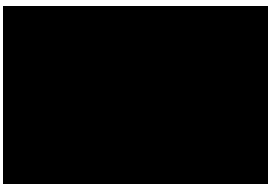
Long-term Management

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

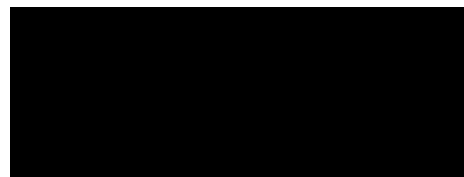
CLOSURE

EP Risk recommends that the preventative, short-term and long-term strategies that have been provided should be implemented during the Works to ensure that the health and ecological risks of PFAS impacted stormwater at the Site are appropriately managed through the construction process.

Yours sincerely

A solid black rectangular box used to redact the signature of the Principal Environmental Engineer.

Principal Environmental Engineer
EP Risk Management Pty Ltd

A solid black rectangular box used to redact the signature of the Principal Environmental Scientist.

Principal Environmental Scientist
EP Risk Management Pty Ltd

Attachments

Attachment 1 – Sediment Basin Drawings

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

Attachment 3 – Addendum to the Human Health Risk Assessment

Attachment 4 – Synergy Water Treatment Methodology - Moorebank

QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1	██████████	28.09.2018	██████████	28.09.2018	██████████	28.09.2018
V2	██████████	01.04.2018	██████████	01.04.2019	██████████	01.04.2019

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
V2	02.04.2019	EP0733.007 Qube MPE PFAS Stormwater Management v2	Qube c/o Tactical

LIMITATIONS

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

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

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

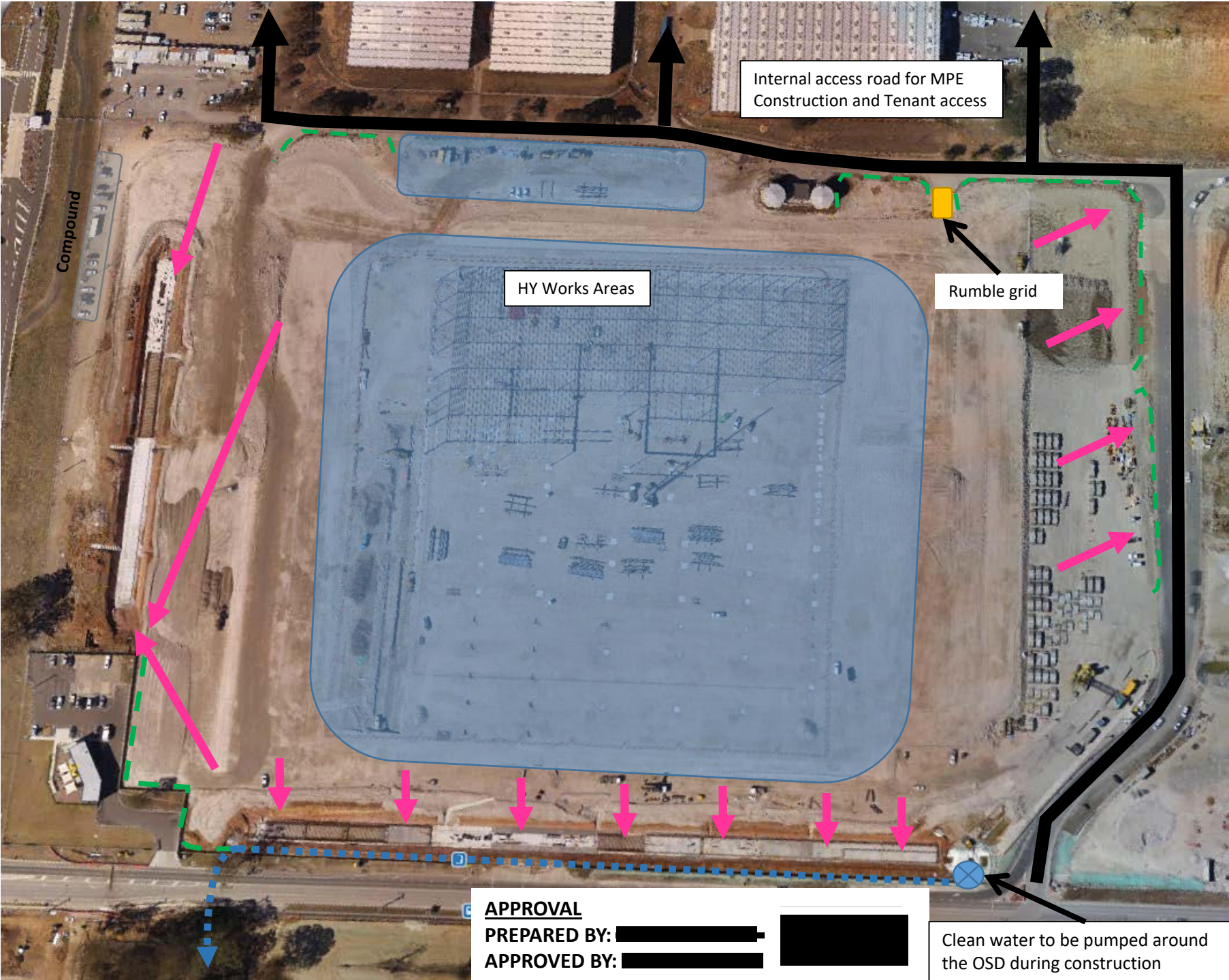
Inaccessible areas are omitted from the assessment including beneath concrete slabs, beneath the subsurface, within the soil or fill, beneath floorboards, in the crawlspace of the building inside the walls of the structures and inside the roof cavity not in immediate.

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

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Attachment 1 – Sediment Basin Drawings



Internal access road for MPE
Construction and Tenant access

HY Works Areas

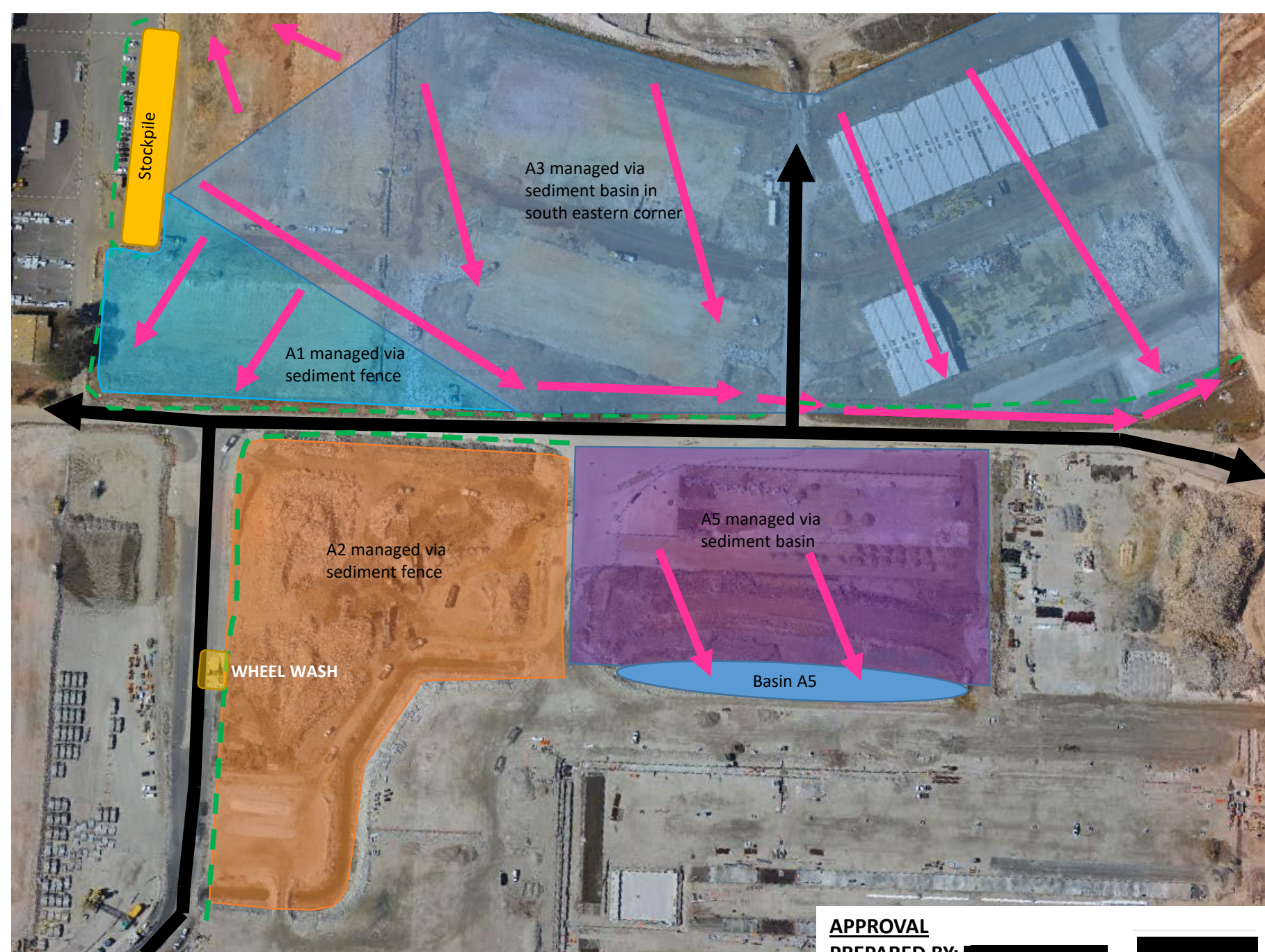
Rumble grid

APPROVAL
PREPARED BY: [Redacted]
APPROVED BY: [Redacted]

Clean water to be pumped around
the OSD during construction

LEGEND	
Site boundary	-----
Sediment Fence/Geofabric Fence	-----
Earth Bund	-----
Catch Drain/ Geofabric Lined	- - - - ->
Rock Check Dam	⤿
Sandbag Check Dam	⤿
Protective Fencing (Clearing Limit/ Sensitive Area)	- - - - -
Clean water flow path	- - - - ->
Coarse sediment trap	⌊
Stockpile	■
Construction Water Flow Direction	➡
Rock outlet /Geofabric Lined	⤿

NOTES:
This PESCP should be read in conjunction with previous revisions and the project CEMP. All sizing's and locations are indicative only and should be reviewed onsite. This PESCP has been prepared in accordance with Blue Book Volume 1 (Landcom, 2004).
The plan specifically addresses the management of site waters during the earthworks and drainage stages construction of WP1. The catchments will be managed through sediment basins which in general are shown on the plan in the location of OSD9. All site waters will be diverted and managed in the sediment basin. All controls will be reviewed following wet weather and during construction to address any improvements required to the catchment.

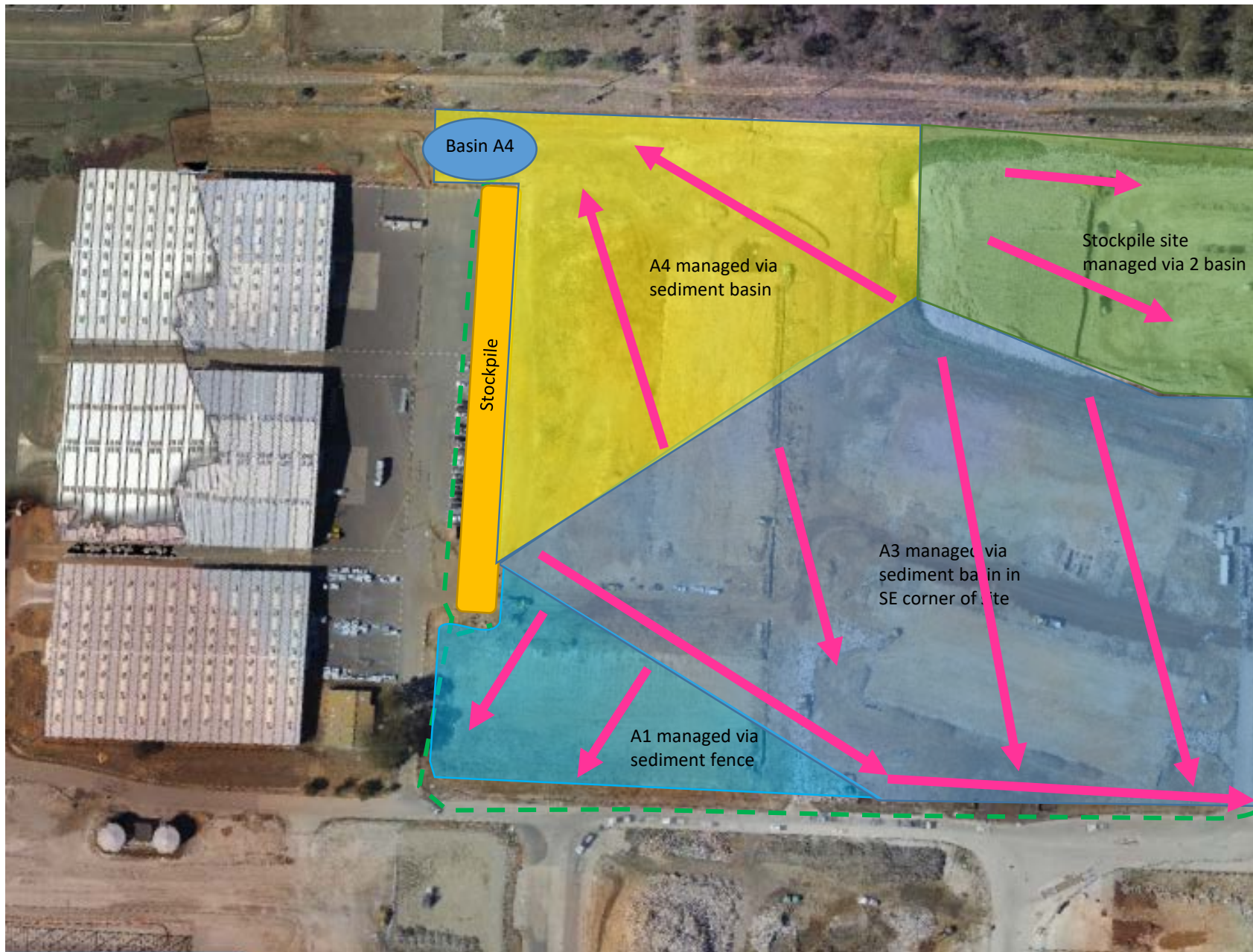


LEGEND	
Site boundary	-----
Sediment Fence/Geofabric Fence	—————
Earth Bund	—————
Catch Drain/ Geofabric Lined	- - - - ->
Rock Check Dam	⤿
Sandbag Check Dam	⤿
Protective Fencing (Clearing Limit/ Sensitive Area)	- - - - -
Clear water flow path	- - - - ->
Coarse sediment trap	⌊
Stockpile	■
Construction Water Flow Direction	➡
Rock outlet /Geofabric Lined	⤿

NOTES:
 This PESCP should be read in conjunction with previous revisions and the project CEMP. All sizing's and locations are indicative only and should be reviewed onsite. This PESCP has been prepared in accordance with Blue Book Volume 1 (Landcom, 2004).
 The plan specifically addresses the management of site waters during the earthworks and drainage stages construction of Warehouses 3, 4 & 5. The catchments will be managed through sediment basins which in the location of South Eastern corner of the site and below WH5 (A5 Area). All site waters will be diverted and managed in the sediment basin.
 All controls will be reviewed following wet weather and during construction to address any improvements required to the catchment.

Revision 3
 Date: 14/09/2018

APPROVAL
PREPARED BY: [REDACTED]
APPROVED BY: [REDACTED]



LEGEND	
Site boundary	-----
Sediment Fence/Geofabric Fence	—————
Earth Bund	—————
Catch Drain/ Geofabric Lined	- - - - ->
Rock Check Dam	⤿
Sandbag Check Dam	⤿
Protective Fencing (Clearing Limit/ Sensitive Area)	- - - - -
Clear water flow path	- - - - ->
Coarse sediment trap	⌞
Stockpile	■
Construction Water Flow Direction	➡
Rock outlet /Geofabric Lined	⤿

NOTES:

This PESCP should be read in conjunction with previous revisions and the project CEMP. All sizing's and locations are indicative only and should be reviewed onsite. This PESCP has been prepared in accordance with Blue Book Volume 1 (Landcom, 2004).

The plan specifically addresses the management of site waters during the earthworks and drainage stages construction of Warehouse 3, 4 & 5. The catchments will be managed through sediment basin which in general are shown on the plan. All site waters will be diverted and managed in the sediment basin. All controls will be reviewed following wet weather and during construction to address any improvements required to the catchment.

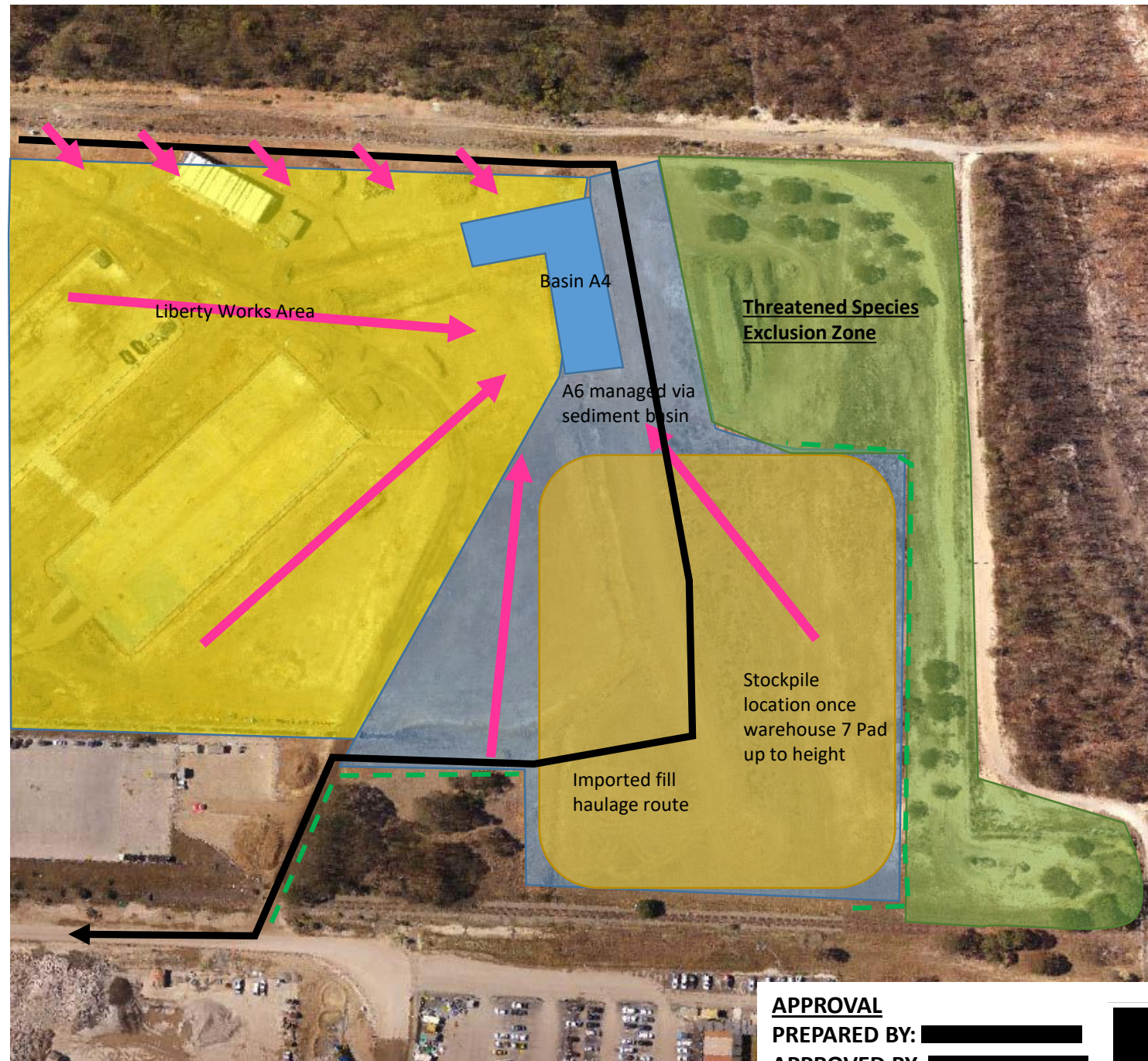
APPROVAL

PREPARED BY: [REDACTED]

APPROVED BY: [REDACTED]

Revision 3

Date: 14/09/2018



LEGEND	
Site boundary	-----
Sediment Fence/Geofabric Fence	-----
Earth Bund	-----
Catch Drain/ Geofabric Lined	----->
Rock Check Dam	⤿
Sandbag Check Dam	⤿
Protective Fencing (Clearing Limit/ Sensitive Area)	-----
Clear water flow path	----->
Coarse sediment trap	⤿
Stockpile	⤿
Construction Water Flow Direction	----->
Rock outlet /Geofabric Lined	⤿

NOTES:

This PESCP should be read in conjunction with previous revisions and the project CEMP. All sizing's and locations are indicative only and should be reviewed onsite. This PESCP has been prepared in accordance with Blue Book Volume 1 (Landcom, 2004).

The plan specifically addresses the management of site waters during the earthworks and drainage stages construction of Warehouse 7 and Stockpiling. The catchments will be managed through sediment basin which in general are shown on the plan. All site waters will be diverted and managed in the sediment basin. All controls will be reviewed following wet weather and during construction to address any improvements required to the catchment.

APPROVAL

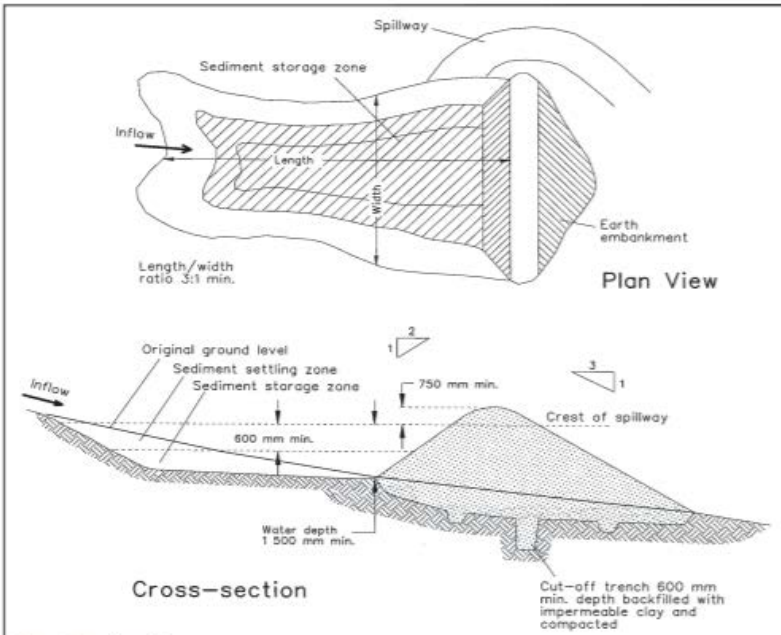
PREPARED BY: _____

APPROVED BY: _____

Revision 3

Date: 14/09/2018

Sediment Basin detail



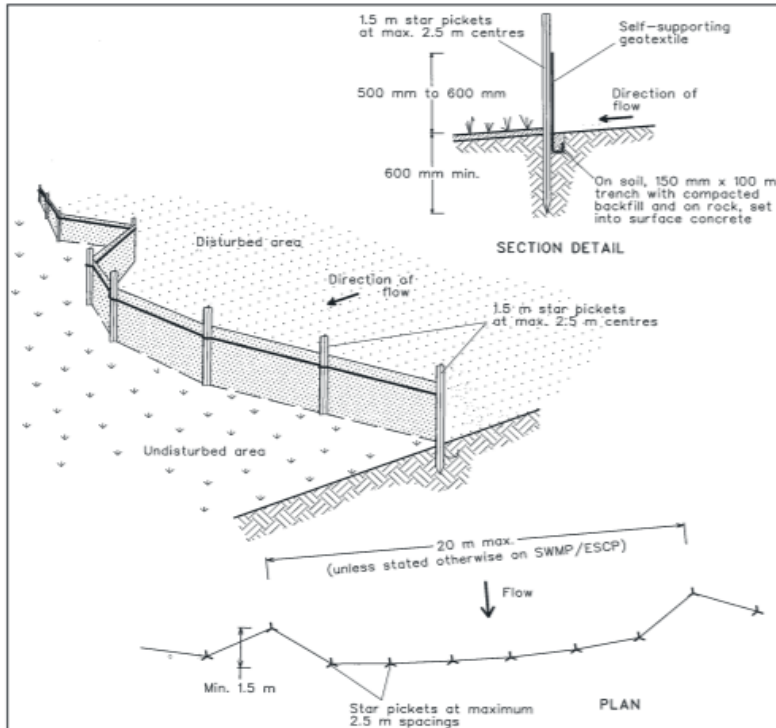
Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1 200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

EARTH BASIN - WET
(APPLIES TO TYPE D' AND TYPE F' SOILS ONLY)

SD 6-4

Sediment Fence detail



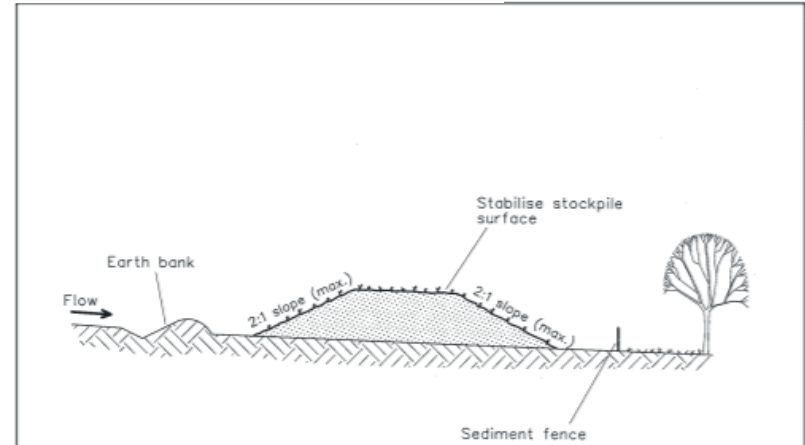
Construction Notes

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

SEDIMENT FENCE

SD 6-8

Stockpile detail



Construction Notes

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

STOCKPILES

SD 4-1

1. Erosion Hazard and Sediment Basins

Site Name: MPE Stage 2

Site Location: Warehouse 3, 4, 5 & 7

Precinct/Stage: Earthworks

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	A1	A2	A3	A4	A5	A6	
Total catchment area (ha)	1	2.53	8	3	2.1	3	
Disturbed catchment area (ha)	1	2.53	8	3	2.1	3	

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:							From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	20	20	20	20	20	20	Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)	20	20	20	20	20	20	
% clay (fraction finer than 0.002 mm)	40	40	40	40	40	40	
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F	F	F	F	F	F	Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5	5	5	5	5	See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	80	80	80	80	80	80	
x-day, y-percentile rainfall event (mm)	24.4	24.4	24.4	24.4	24.4	24.4	
Rainfall R-factor (if known)	2540	2540	2540	2540	2540	2540	Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	10.8	10.8	10.8	10.8	10.8	10.8	

RUSLE Factors

Rainfall erosivity (<i>R</i> -factor)	2540	2540	2540	2540	2540	2540	Auto-filled from above
Soil erodibility (<i>K</i> -factor)	0.048	0.048	0.048	0.048	0.048	0.048	RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	80	80	80	80	80	80	
Slope gradient (%)	2	2	5	5	2	2	
Length/gradient (<i>LS</i> -factor)	0.41	0.41	1.19	1.19	0.41	0.41	
Erosion control practice (<i>P</i> -factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (<i>C</i> -factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	6	6	6	6	6	6	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.5	0.5	0.5	0.5	0.5	0.5	See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	65	65	188	188	65	65	
Soil Loss Class	1	1	2	2	1	1	See Table 4.2, page 4-13
Soil loss (m ³ /ha/yr)	50	50	145	145	50	50	Conversion to cubic metres
Sediment basin storage (soil) volume (m ³)	25	63	579	217	52	74	See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m ³)	122	309	976	366	256	366	See Sections 6.3.4(i) for calculations
Sediment basin total volume (m ³)	147	372	1555	583	308	440	

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

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

Basin and Swale Surface Water PFAS Assessment

Project Number: 54834_PFAS

Project Name: MPE Stage 2



	PFAS			
	Perfluorohexanesulfonic acid (PFHxS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L
EQL	0.01	0.01	0.01	0.01
PFAS NEMP (HEPA 2018) - Recreational Water			5.6	0.7
NHMRC Draft Guidance on PFAS in Recreational Water			14	2

Field ID	Sample Date	Report Number				
BASIN-01	14/09/2018	617681	0.33 ^{#1}	1.2 ^{#1}	0.02 ^{#1}	1.53
QA20180914-DH	14/09/2018	617681	0.31 ^{#1}	1.2 ^{#1}	0.02 ^{#1}	1.51
QC20180914-DH	14/09/2018	200877	0.22	0.84	0.02	1.1
BASIN-02	14/09/2018	617681	0.34 ^{#1}	1.3 ^{#1}	0.02 ^{#1}	1.64
BASIN-03	14/09/2018	617681	0.32 ^{#1}	1.4 ^{#1}	0.02 ^{#1}	1.72
SWALE-A-01	14/09/2018	617681	0.46 ^{#1}	0.9 ^{#1}	0.03 ^{#1}	1.36
SWALE-C-01	14/09/2018	617681	0.23 ^{#1}	0.33 ^{#1}	0.03 ^{#1}	0.56
SWALE-C-02	14/09/2018	617681	0.26 ^{#1}	0.19 ^{#1}	0.03 ^{#1}	0.45
SWALE-C-03	14/09/2018	617681	0.25 ^{#1}	0.74 ^{#1}	0.02 ^{#1}	0.99
BLANK20180914	14/09/2018	617681	<0.01	<0.01	<0.01	<0.01
RINSATE20180914	14/09/2018	617681	<0.01	<0.01	<0.01	<0.01

Data Comments

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

Attachment 3 – Addendum to Health Risk Assessment



**Addendum #3 to the Human Health Risk
Assessment - Construction Workers
Handling PFAS Containing Stormwater**

Moorebank Precinct East, Moorebank Ave, Moorebank, NSW

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

Tactical Group Pty Ltd

EP0733.006 21 September 2018



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

Attention: [REDACTED]

Addendum #3 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater Moorebank Precinct East, Moorebank Intermodal Terminal Development

INTRODUCTION

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') engaged EP Risk Management Pty Ltd ('EP Risk') to assess the potential health-risk associated with the handling and management (including dust suppression) of PFAS impacted stormwater at Moorebank Precinct East ('MPE') portion of the Moorebank Intermodal Terminal Development, Moorebank NSW ('MITD') (the 'Site').

PURPOSE

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

OBJECTIVE

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

REVIEW OF ANALYTICAL RESULTS

The results of recent stormwater sampling of Basin A4 at MPE by JBS&G on 14 September 2018 (**Attachment 1**) reported concentrations of PFOS¹ + PFHxS² greater than the Heads of EPAs Australia and New Zealand (HEPA) and the Australian Government Department of the Environment and Energy (DoEE) PFAS National Environmental Management Plan ('PFAS NEMP 2018') health-based guidance values for recreational and drinking water. The PFAS NEMP 2018 states that:

¹ PFOS - Perfluorooctane sulfonate.

² PFHxS - Perfluorohexane sulfonate.



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109/283 Alfred Street
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3/19 Bolton Street
Newcastle, NSW, 2300
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‘...an exceedance of the screening values should trigger further investigation such as site-specific risk assessment to refine the likely degree of possible risk (as opposed to the assumption that harm will have occurred).’

Based upon exceedance of the Tier 1 criteria, a site-specific risk assessment was required.

HUMAN HEALTH RISK ASSESSMENT

EP Risk has prepared the following related reports for the Moorebank Precinct West (‘MPW’):

- EP Risk (2018)³ Literature Review, Criteria for Assessment of PFAS and Risk Assessment;
- EP Risk (2018a)⁴ Addendum to Qualitative Human Health Risk Assessment; and
- EP Risk (2018b)⁵ Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater.

This letter report acknowledges that the (EP Risk 2018c) Addendum #2 letter report for MPW also applies to the handling and management (including dust suppression) of PFAS impacted stormwater at MPE due to the following:

- Contaminants of concern per- and poly-fluoroalkyl substances (‘PFAS’), receptors (construction workers), the contamination media (stormwater) and exposure pathways are the same for both sites.
- Addendum #2 to the Human Health Risk Assessment report calculated the maximum allowable concentrations for stormwater handling. Therefore, the differences in contamination concentrations in the media of both sites do not make any difference for the outcome of the work.

Therefore, the maximum allowable concentrations for stormwater handling of construction workers in **Table 1** and the following conclusions and recommendations are applicable for the MPE site.

Table 1 – Maximum Allowable Stormwater Concentrations for Identified Receptors		
Receptors and Exposure Scenarios	PFOS and PFOS Grouped ⁶ µg/L	PFOA and PFOA Grouped ⁷ µg/L
Construction Worker		
<i>Ingestion</i>	270	2,200
<i>Dermal Contact</i>	0.67	5.4

³ EP Risk (2018) Literature Review, Criteria for Assessment of PFAS and Risk Assessment, dated 16 March 2018 (ref: EP0488.001_v4).

⁴ EP Risk (2018a) Addendum to Qualitative Human Health Risk Assessment, dated 5 September 2018 (ref: EP0745.016_v1).

⁵ EP Risk (2018b) Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater, dated 19 September 2018 (ref: EP0745.019).

⁶ PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-Et-FOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS - Perfluorodecane sulfonic acid.

⁷ PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDdA - Perfluorododecanoic acid; PFTnA - Perfluorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

DISCUSSION

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

- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately three orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion exposure indicating that the risk to workers is at an acceptable level for the incidental ingestion. Therefore, no extra management is necessary for the incidental ingestion pathway of exposure.
- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately an order of magnitude greater than the calculated maximum allowable concentrations for the dermal exposure indicating that the risk to workers is not acceptable for the dermal exposure. Therefore, prevention of dermal exposure through use of waterproof gloves and boots are necessary as management of dermal exposure. However, this dermal exposure risk in calculations is related to the adoption of highly conservative dermal penetration coefficient factor. It should be noted here that the current industry practice assumes the dermal exposure to PFAS is negligible.
- The reported stormwater concentrations of PFOA and PFOA grouped chemicals are approximately 5 to 7 orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion and dermal exposure indicating that the risk to workers are in acceptable level for the both exposure pathways. Therefore, no extra management is necessary for the incidental ingestion and dermal exposure regarding to the PFOA and PFOA grouped chemicals in stormwater.

CONCLUSION

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

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

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

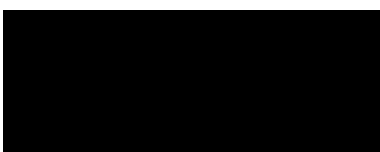
RECOMMENDATIONS

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

CLOSURE

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

Yours sincerely



Principal Toxicologist and Risk Assessor
EP Risk Management Pty Ltd

Attachment 1

JBS&G Basin and Swale Surface Water PFAS Assessment

QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1	[REDACTED]	21.09.2018	[REDACTED]	21.09.2018	[REDACTED]	21.09.2018

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
v1	21.09.2018	EP0733_Qube MPE Addendum 3 to HHRA	Qube c/o Tactical

LIMITATIONS

This Addendum #3 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater was conducted on the behalf of Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') for the purpose/s stated in the **Objective** section.

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

It is not possible in an Addendum #3 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

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

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

All work conducted, and reports produced by EP Risk are based on a specific scope and have been prepared for Addendum #3 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater and therefore cannot be relied upon by any other third parties unless agreed in writing by EP Risk.

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

Basin and Swale Surface Water PFAS Assessment
 Project Number: 54834_PFAS
 Project Name: MPE Stage 2



	PFAS			
	Perfluorohexanesulfonic acid (PFHxS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L
EQL	0.01	0.01	0.01	0.01
PFAS NEMP (HEPA 2018) - Recreational Water			5.6	0.7
NHMRC Draft Guidance on PFAS in Recreational Water			14	2

Field ID	Sample Date	Report Number				
BASIN-01	14/09/2018	617681	0.33 ^{#1}	1.2 ^{#1}	0.02 ^{#1}	1.53
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QC20180914-DH	14/09/2018	200877	0.22	0.84	0.02	1.1
BASIN-02	14/09/2018	617681	0.34 ^{#1}	1.3 ^{#1}	0.02 ^{#1}	1.64
BASIN-03	14/09/2018	617681	0.32 ^{#1}	1.4 ^{#1}	0.02 ^{#1}	1.72
SWALE-A-01	14/09/2018	617681	0.46 ^{#1}	0.9 ^{#1}	0.03 ^{#1}	1.36
SWALE-C-01	14/09/2018	617681	0.23 ^{#1}	0.33 ^{#1}	0.03 ^{#1}	0.56
SWALE-C-02	14/09/2018	617681	0.26 ^{#1}	0.19 ^{#1}	0.03 ^{#1}	0.45
SWALE-C-03	14/09/2018	617681	0.25 ^{#1}	0.74 ^{#1}	0.02 ^{#1}	0.99
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RINSATE20180914	14/09/2018	617681	<0.01	<0.01	<0.01	<0.01

Data Comments

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

***Attachment 4 – Synergy Water Treatment
Methodology - Moorebank***

Synergy Water Treatment Methodology - Moorebank

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

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

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

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

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

The proposed water treatment methodology is summarised below:

PHASE ONE (Pre- and Primary treatment – Clarification)

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

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

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

PHASE THREE (Waste Management - Minimise system waste)

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

PHASE ONE

Pretreatment
 Stage A Physical separation with Lamellar plate separators
 Stage B (Optional) PFAS adsorption to proprietary Powdered Activated Carbon (PAC)
 Stage C Addition of three reagents, coagulation, flocculation & pH adjustment

Primary Treatment
 Stage A Settlement stage

PHASE TWO

Secondary Treatment
 Stage A & B Deep-bed media filters containing a proprietary gravel blends

Tertiary Treatment
 Stage A, B, C & D pH adjustment followed by Deep-bed media filters containing two types of proprietary Anion Exchange Resin (AIX) and two types of Granular Activated Carbon (GAC) media blend

PHASE THREE

Discharge System
 Stage A pH adjustment and fully treated water discharged

Waste Management
 Waste Tracking and Disposal, Belt Press Sludge Dewatering and Resin Maintenance and Regeneration Fluid Treatment

The diagram illustrates the flow of water and sludge through various stages of treatment, including storage tanks, filtration units, and discharge systems.

The equipment for this WTP broadly:

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

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

PHASE ONE

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

Primary Treatment

Primary Stage A Addition of reagents 1 coagulation 2 flocculation and sedimentation

The chemical component of the pre-treatment stage aims to help optimise the suspended solids removal process with a key focus on metals removal, dissolved hydrocarbons and dissolved organics. Flocculant type, coagulant type, dose rate, raw mix concentration and dosed pH value will not be constant and will vary from time to time as the characteristics of the influent changes.

Primary Stage B Sedimentation

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

PHASE TWO

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

Secondary Treatment

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

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

The purpose of the multi-filtration approach is;

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

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

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

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

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

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

- ✦ Deep binding agglomeration, or 'mudballing' of the media grains, particularly at the bottom (downstream side) of the filter vessel. Once a media has thoroughly mudballed the filter vessel will be blocked and traditional backflush procedures will be unable to rehabilitate it. The only way to re-instate the filter is completely remove and discard the old media and replace with new material – a time consuming, expensive operation and one which produces much needless waste.
- ✦ Filtration compromise, or 'breakthrough' of particulate material to downstream processes. Breakthrough particulates (turbidity) present a significant risk to the integrity of the overall treatment process because turbidity can tightly bind contaminants of concern. This will render the contaminants difficult to remove by other physico-chemical treatment processes such as ion exchange and adsorption – ultimately leading to possible contaminant breakthrough to final discharge.

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

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

Tertiary Treatment

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

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

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

Teriary Stage C – optional Coal based granular Activated Carbon in a lead/lag configuration

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

Teriary Stage D – optional Coconut based granular Activated Carbon in a lead/lag configuration

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

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

Discharge System

Discharge Stage A – adjustment and discharge of full treated water

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

PHASE THREE

Waste Management

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

Stage A – assessment and disposal of Defence and legacy liabilities

Synergy will conduct analysis and reporting of all waste material requiring disposal using the relevant Defence, State and Territory legislation and guidelines. Classification of the materials will be through laboratory analysis of representative samples for potential contaminants of concern.

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

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

Stage B Better Sludge Dewatering System – Reduction of solid waste stream

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

Appendix C

UXO RISK REVIEW AND MANAGEMENT AND
REMEDICATION PLANS (G-TEK 2019 AND 2019A)



BETTER BY DEFINITION

REVIEW

**UNEXPLODED ORDNANCE (UXO)
RISK REVIEW AND
MANAGEMENT PLAN**

**MOOREBANK PRECINCT WEST STAGE 2
(MPW2)
INCORPORATING
MOOREBANK AVENUE UPGRADE WORKS
(MAUW)
MOOREBANK, NSW**

V1.01

e Au ralia imi ed
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Purpose of This Report

This report was commissioned for the purpose of detailing the activities undertaken by G-tek regarding the Client's site and the results of those activities (The Purpose).

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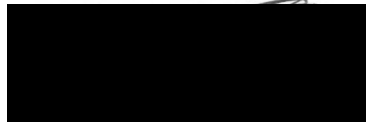
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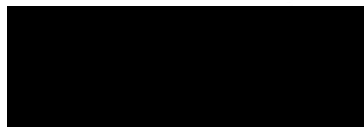
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Prepared by:



Chief Operating Officer

Reviewed by:



Senior Project Manager

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Version	Date	Prepared By	Reviewed By
1.01	9 October 2019	[Redacted]	[Redacted]

DOCUMENTATION CONTROL

Copy Number	Issued To
1	Tactical Group Pty Ltd c/o EP Risk Management Pty Ltd
2	G-tek Australia Pty Limited

The following Definitions may apply within this Risk Assessment:

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.

Ammunition Produce: Non-explosive stores and components used in the assembly or the initiation of ammunition.

As Low as Reasonably Practical (ALARP): The ALARP principle is that the residual risk shall be as low as reasonably practical. For a risk to be ALARP it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

Drill Ammunition (DA): An inert replica of ammunition specifically manufactured for display or instructional purposes

Explosive: A substance or mixture of substances which, under external influences, is capable of rapidly releasing energy in the form of gases and heat.

Explosive Ordnance (EO): All munitions containing explosives, nuclear fission and fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; demolition charges; pyrotechnics; clusters and dispensers; cartridges and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature.

Explosive Ordnance Waste (EOW): Inert material remnant from the initiation or functioning of explosive ordnance.

Field Validation Survey (FVS): A percentage field sampling activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also UXO Assessment).

Fragmentation: Metallic fragments of the fractured casing of IA resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Free from Explosives (FFE): Explosive ordnance waste, fragmentation and related material that has been inspected and certified by a competent authority as containing no remnant explosive or energetic material.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO/UXO hazard within the boundaries of an affected area (see also UXO Remediation).

Inert Ammunition (IA): An item of ammunition that contains no explosive, pyrotechnic, lachrymatory, radioactive, chemical, biological or other toxic components or substances. Note: Inert ammunition differs from drill ammunition in that it has not necessarily been specifically manufactured for instructional purposes. The inert state of the munition may have resulted from a render safe procedure or other process to remove all hazardous components and substances. It also refers to the state of the munition during manufacture prior to the filling or fitting of explosive or hazardous components and substances.

Military Produce: Any item identified as military in origin that is not ammunition-related.

Small Arms: All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

Small Arms Ammunition (SAA): Ammunition for small arms, i.e. all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

Small Arms Ammunition Waste (SAAW): Inert material remnant from the transport, packaging, preparation, and use of SAA.

Unexploded Ordnance (UXO): 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 by members of the public.

UXO Assessment: An activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also Field Validation Survey).

UXO Remediation: An operation designed to reduce the EO/UXO hazard within the boundaries of an affected area (see also Hazard Reduction Operation).

UXO Safeguarding (Safeguarding): Protecting individuals or equipment from harm or damage by using appropriate measures to ensure no contact or interaction with UXO during traversing or conducting testing or minor works within an area potentially contaminated with UXO.

UXO Technical Survey: A percentage field sampling activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also UXO Assessment and Field Validation Survey).

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1.0 EXECUTIVE SUMMARY

Site Address	<p>Moorebank Avenue, Moorebank, NSW,</p> <p>The Site is generally bound in the:</p> <ul style="list-style-type: none"> • North, by the M5 Motorway, • East, by Moorebank Avenue or MPE, • South, by the East Hills Railway Line, and, • West, by the Georges River. 	
UXO Threat Sources	<p>Close training activities resulted in remnant blank small arms ammunition (SAA) widely across the Site. Some SAA have the potential to contain an unfired primer and unburned propellant and are, by definition, unexploded ordnance (UXO).</p>	
IA Threat Sources	<p>Remnant inert ammunition (IA) training items have the potential to be remnant at varying depths in areas described as SW0182 – former Practice Mine and Bomb Disposal Area, SW0190 – former Bomb Disposal Training Area and SW0192 – potential Explosive Ordnance Drowning Area</p>	
UXO Risk Pathways	<p>Intrusive construction activities within the southern (former SME) portion of the Site.</p>	
IA Risk Pathways	<p>Engineering or levelling works with plant within areas SW0182, SW0190 and SW0192</p>	
Consequences/Receptors	<p>Consequences of UXO initiation could include:</p> <ul style="list-style-type: none"> • Lost time hand or eye injury to personnel. • Perceptual risk from visible items of inert ordnance. <p>Consequences of IA interaction could include:</p> <ul style="list-style-type: none"> • Delays to process in identifying and ensuring item is Free from Explosives (FFE). • Perceptual risk as an item is uncovered. • Damage to reputation or finances. 	
Key Findings	<p>The northern portion of the Site is free of UXO/IA Risk.</p> <p>The former School of Military Engineering (SME) has UXO risk from unfired blank small arms ammunition (SAA) within close training areas (non-building) of the Site.</p> <p>The former School of Military Engineering (SME) has IA risk from inert training material from surface levels to greater depths within areas SW0182, SW0190 and SW0192.</p>	
UXO Risk Calculation Rating (Human Health)	LOW / MEDIUM	
IA Risk Calculation	Environmental Testing	LOW
– Specified Areas	Landscaping	LOW / MEDIUM
(Delay / Perception)	Excavations	HIGH
	Re-contouring	LOW / MEDIUM



Risk Mitigation	<p>UXO Management Plan/Protocol in place for action required in the event of a potential item of UXO/IA being discovered.</p> <p>UXO/IA potential included as part of Site-specific inductions and safety awareness training.</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to conduct remediation works in Areas SW0182, SW0190 and SW0192.</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to conduct safeguarding in areas where intrusive activities are required as part of Site works in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.</p>
Final UXO Risk Rating	LOW
Final IA Risk Rating	LOW



2.0 ASSESSMENT METHODOLOGY

Approach

This UXO risk assessment is based on the UK Construction Industry Research and Information Association (CIRIA) Guide C681 UXO which advocates a four (4) phase approach to managing UXO related risk on construction sites. Phase 1 – Preliminary Assessment, Phase 2 – Detailed Risk Assessment, Phase 3 – Risk Mitigation Design, Phase 4 – On Site Mitigation Works.

G-tek aims to meet the requirement of Phase 1 and Phase 2 assessment within this document, and has developed preliminary Phase 3 Risk Mitigation Design, which would need to be developed further for particular activities in particular parts of the Site.

Preliminary assessment is conducted through desktop review of available material including air photographs, files, records and maps from sources including, in this instance, Preliminary Site Investigation, Moorebank Defence Lands (*egis consulting, August 2000*), Heritage Assessment, Moorebank Defence Site, Moorebank (*Graham Brooks and Associates Pty Ltd, May 2004*), Stage 2 Environmental Investigations, Moorebank, NSW (*EarthTech, July 2006*), Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal, Moorebank, NSW (*G-tek Australia Pty Limited, May 2011*) and, Phase 2 Environmental Site Assessment, Moorebank Intermodal Terminal (*Parsons Brinckerhoff, May 2014*).

Field Validation Survey is conducted on Site through sampling surface and sub-surface areas of the Site to prove or disprove data discovered through preliminary assessment. Field validation has been variously conducted through formal investigation and in the process of environmental, geotechnical, heritage and other intrusive works across the Site (EarthTech, G-tek, Golder, GHD and others).

The assessment of the Risk Rating [RR] of a Site is a measure of the Probability [P] of an item of UXO being remnant within the Site, based on the Site History [SH] and then being both encountered and initiated as a result of Investigation Methodology [IM] being utilised times the Consequence [C] (or severity) of any such initiation. Consequence [C] is a factor of both the potential Depth [D] of the UXO and the Proximity of Sensitive Receptors [PSR] to the UXO at time of initiation.

From the Risk Rating developed, risk Mitigation Measures are developed to reduce the risk on Site for its intended use to as low as reasonably practical [ALARP].

Important Notes

The Risk Rating has been developed using available source material at the time of preparation; every endeavour has been made to obtain the widest range of appropriate material; key data is referenced and lesser material is available for review if required.

Should additional material become available from the client or other sources which may affect Probability of UXO within the Site, the Risk Rating and Mitigation Measures should be recalculated and reviewed based on the new data.

3.0 STAGE ONE – SITE LOCATION AND DESCRIPTION

Site Address

Moorebank Avenue, Moorebank, NSW

Site Description



The Site is currently vacant land previously occupied by Department of Defence units with the primary tenant being the School of Military Engineering, (SME) which occupied the southern two thirds of the Site in the area known as Steele Barracks.

The Site is generally bound in the:

- North, by the M5 Motorway,
- South, by the East Hills Railway Line,
- West, by the Georges River, and,
- East, by the current Moorebank Avenue alignment or MPE.

Buildings and compounds of various design and have generally been removed from the Site.

The northern portion of the Site contains stormwater retention ponds, and is thickly vegetated around the ponds.

The developable portion of the Site is indicated as the Blue hatched area; lands in the immediate proximity of the Georges River are non-developable (Green hatch) and the Moorebank Avenue Upgrade area is included as Yellow.

Site Characteristics

The Site is generally cut and fill from previous adaption of the land form to suit development of required Defence infrastructure, lower along the Georges River frontage and higher along Moorebank Avenue.

General terrain, buildings, soil types and associated heritage, geological, geotechnical and environmental characteristics of the Site have been discussed in previous and reviewed Reports and fall outside the scope of this unexploded ordnance (UXO) Review

Proposed Site Works

The Developable portion of the Site is the location of a proposed intermodal transfer facility, utilising rail, road and storage infrastructure to transfer containerised bulk goods between producers/users within Australia and ships loading/unloading at the Port facilities at Botany Bay. These works will require major redevelopment of the Site landforms and infrastructure including Moorebank Avenue.

4.0 STAGE TWO – DATA REVIEW

4.1 REVIEW OF HISTORICAL DATA

Site History

General Site history is well documented in Heritage Assessment, Moorebank Defence Site (*Graham Brooks and Associates Pty Ltd May 2004*).

Military Activity

The records indicate potential various military use of the area from the late 1800's, but direct use of the Site really began during World War Two (WWII) when the School of Military Engineering (SME) was first developed on the Site and remained until recently transferred to new facilities at Holsworthy.



Site Area 1950's (*Graham Brooks and Associates Pty Ltd May 2004 p24*)

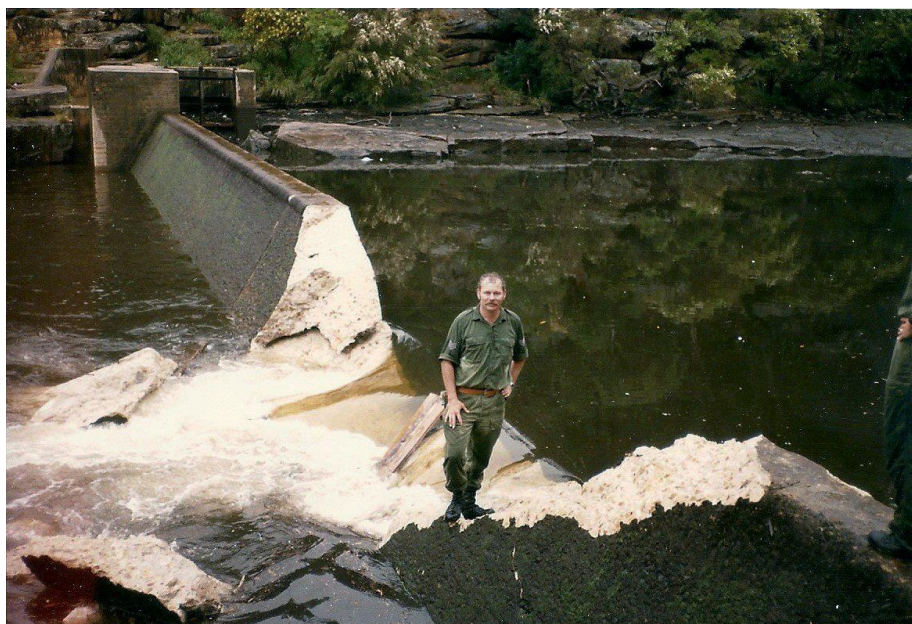
"To maintain optimal military capability the Army has to be highly mobile and able to be supplied with provisions, ammunition and equipment. At the same time mobility must be denied to hostile forces. In this diverse and demanding role you'll be trained to carry out the activities and infrastructure projects that support these needs, such as demolition and clearance, minefield clearance, field defence system construction, road and bridge-building and airfield construction."

(<http://www.defencejobs.gov.au/army/jobs/CombatEngineer>)

Training within SME occurred for base and supervisory field engineering roles, and explosive ordnance related activities included mine laying and recovery, demolition to create and deny access to areas, destruction of infrastructure and disposal of UXO in battlefield clearance and bomb disposal roles in time of war.

Introductory training was conducted within SME using primarily training or practice items containing propellant, pyrotechnics or particular simulant materials. Training was highly regulated and monitored and specified competency levels needed to be achieved prior to moving to higher level training using explosives.

Training using explosives was conducted away from SME, generally on an authorised demolitions range within a Defence range such as Holsworthy, or where a task was available for appropriate training outside a Defence area.



Sappers from 8 Troop performing a controlled demolition of the Weir on the Woronora River at Engadine, New South Wales in 1982. Sergeant Phil Palazzi after the demolition.
([https://en.wikipedia.org/wiki/17th_Construction_Squadron_\(Australia\)\)](https://en.wikipedia.org/wiki/17th_Construction_Squadron_(Australia))))

Stage 2 Environmental Investigations, Moorebank, NSW (*EarthTech, July 2006*) indicated four (4) areas of particular explosives related interest within the Site, three (3) remain within the Developable portion of the Site, and are detailed below.

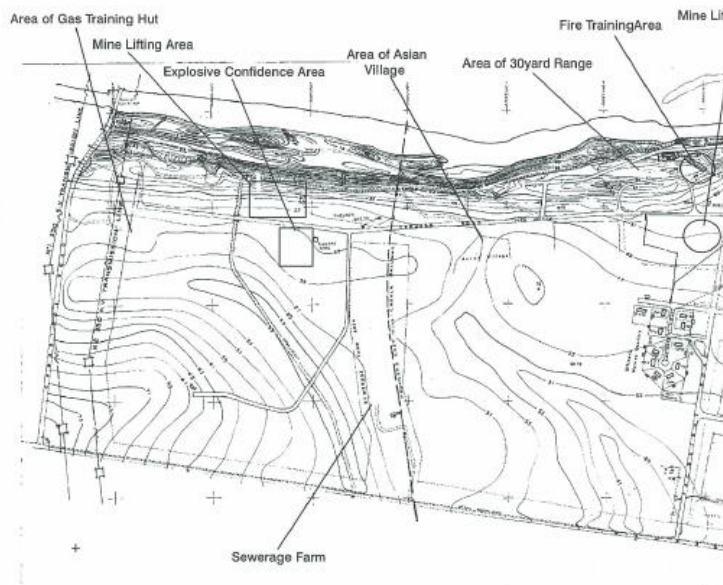
Practice Mine and Bomb Disposal (SW0182)



SW0182 Location (*EarthTech, July 2006*)

Assessed Risk Band/Priority Pre Remediation	Low 210
Remediation Warranted	No
Remediation is not considered to be warranted. (<i>EarthTech, July 2006</i>)	

This area was previously identified in 2000 as a mine/minefield training area, and was associated with an explosives confidence course nearby. A second area was noted at that time further to the north, but the second area was not subsequently re-identified.



Area Map 1 (egis consulting, August 2002, Appendix C UXO Report p20)

This location still contained remnant practice (inert) anti-personnel and anti-tank mines at the time of G-tek Assessment in 2011 and, as these items could cause concern or alarm if located during construction works and/or removed from the site and used for criminal or other purposes. There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

G-tek does not agree with EarthTech that remediation be not considered to be warranted.

Bomb Disposal Training Area (SW0190)



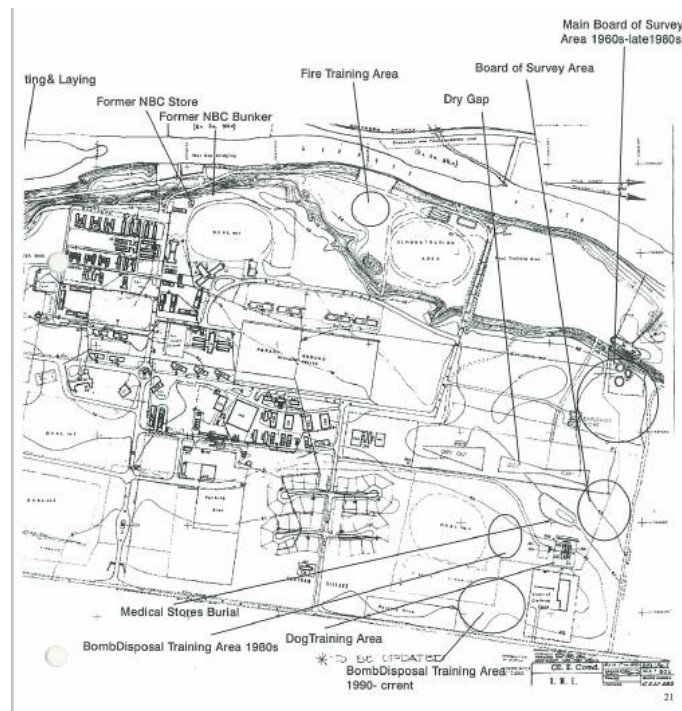
SW0190 Location (EarthTech, July 2006)

Assessed Risk Band/Priority Pre Remediation
Remediation Warranted

High 155
Yes

A comprehensive UXO clearance required, including excavation of all potential targets identified by subsurface imaging survey. Clearance of waste metal contained within the fill in the area north of the dog agility training area is likely to be required to facilitate the UXO clearance (EarthTech, July 2006).

This area was identified in 2000 as earlier and current Bomb Training Areas (below).



Area Map 2 (egis consulting, August 2002, Appendix C UXO Report p21)

G-tek agrees with EarthTech that Remediation is warranted in areas of excavation.

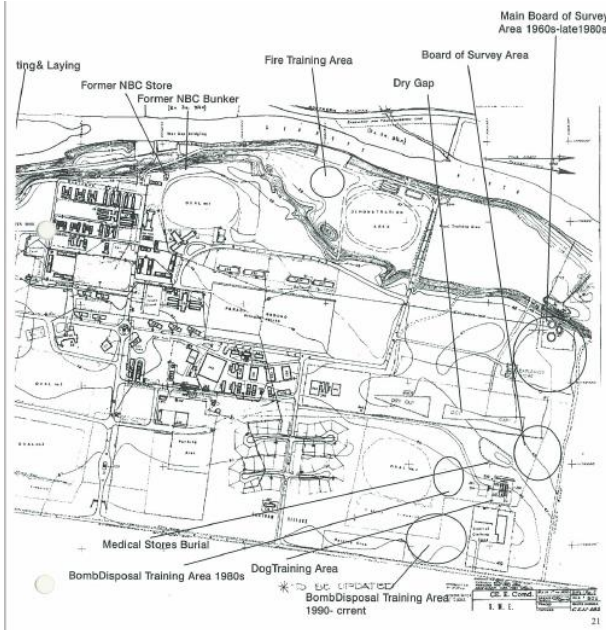
Potential Explosive Ordnance Drowning Area (SW0192)



SW0192 Location (EarthTech, July 2006)

Assessed Risk Band/Priority Pre Remediation	Low 185
Remediation Warranted	No
Remediation is not considered to be warranted (EarthTech, July 2006)	

This area was previously identified as a medical stores burial area, adjacent to the dam, which, in 2000, contained minimal water.



Area Map 2 (egis consulting, August 2002, Appendix C UXO Report p21)

This location is contained within area SW0190 and the indicated dam was in all probability used as a bomb disposal training area and general dumping area for training items, including large aircraft munitions; such items could cause concern or alarm if located during construction works and/or removed from the site and used for criminal or other purposes.

G-tek does not agree with EarthTech that remediation be not considered to be warranted.

4.2 REVIEW OF FIELD VALIDATION DATA

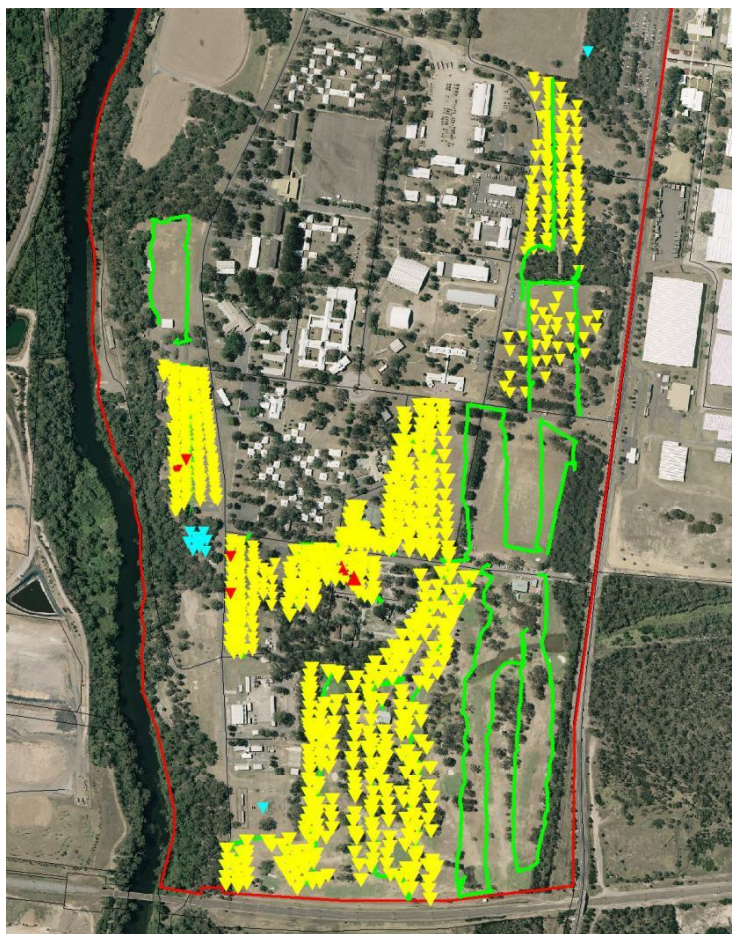
Conduct of Field Validation Survey (FVS)

G-tek has conducted UXO Field Validation Survey (FVS) and Safeguarding tasks within the Site. The primary task was reported in May 2011 [Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal, Moorebank, NSW (G-tek Australia Pty Limited, May 2011)]; subsequent Safeguarding tasks have been conducted within the Site in support of environmental and geotechnical investigations including of surface sampling, hand auguring, drilling and test pitting tasks.

No explosive ordnance related finds were identified in the northern portion of the Site during G-tek Safeguarding tasks and all areas north of the former SME are considered free of potential IA/UXO contamination.

Outcomes of FVS

Findings of the FVS are summarised in the figure below, where **Yellow** indicates small arms ammunition (primarily empty fired blank cartridge cases), **Blue** inert training/practice items (IA) and **Red** inert explosive ordnance waste (EOW), primarily smoke grenade related.



G-tek FVS Finds (G-tek Australia Pty Limited, May 2011 p9)

The areas of the Site containing little built infrastructure have been widely used for field training in the use of personal weapons and equipment, presumably in both offensive and defensive roles. This activity included firing of blank ammunition and the use of pyrotechnic devices including smoke, flares and battle noise simulators. While the FVS focused on accessible areas, it is anticipated that the vegetated areas of the Site would have been similarly used.

The G-tek FVS reinforced the findings of aegis and EarthTech in EarthTech areas SW0182 – former Practice Mine Field and Bomb Disposal Area and SW0190 – Bomb Disposal Area.



Practice Anti-tank Mine – SW0182
(G-tek Australia Pty Limited, May 2011 p15 and p17)



Practice 500lb Aircraft Bomb – SW0190

The FVS did not confirm the findings of aegis and EarthTech in EarthTech area 25mSAR which was not accessible at the time of the FVS. G-tek however did identify a large quantity of small arms ammunition fired projectiles on the eastern side of the Site, including .30, .303 and .45 calibre; which would indicate that there had been a live firing small arms range somewhere in the area and that the rear stopbutt of the range had been dismantled and the soil and material spread in this area. The material may have come from the indicated 25mSAR and are indicated as the **Yellow** items in images below.



Small arms ammunition projectile finds (G-tek Australia Pty Limited, May 2011 p11)

The FVS did not confirm the findings of aegis and EarthTech in EarthTech area SW0192 – Potential Explosive Ordnance Drowning Area which was not accessible at the time of the FVS because of active Military dog training within the area. Subsequent Safeguarding tasks in the area indicated a high level of water in the dam, precluding investigation at that time.



5.0 STAGE THREE – DATA ANALYSIS

Have UXO been previously recovered from this Site?

No records have been located that indicate UXO have previously been recovered from this Site.

Is there data to indicate that IA may have been stored on this Site?

There is data to indicate use of the Site for the storage of EO within designated Explosive Storage Areas.

Is there data to indicate that IA may have been disposed in this Site?

There is no data to indicate that EO containing remnant explosive material may have been disposed within this Site.

Are there any other potential sources of IA/UXO that may have impacted on this Site?

The Site has been widely used for Combat Engineering training since WWII. That training has included the use of live small arms ammunition (SAA) and various pyrotechnic devices including signals, flares, smoke grenades and battle noise simulators, all widely used in the training of all soldiers for offensive and defensive operations as part of their duties.

The Site has also been widely used for the training of Combat Engineers in their specialist roles in construction, bridging, watermanship, minefield laying, recovery and breaching, explosives detection using canines, explosives use in construction and denial operations and battlefield clearance of explosive remnants of war (ERW), particularly clearance of air delivered munitions (bombs).

Because of the training nature of the Site, limited, controlled quantities of high explosives were stored or used on the site; these included electric and non-electric detonators, plastic explosive, gelignite, primers and both commercial and “home-made” explosives to allow both human and canine trainees to become familiar with the texture, smell and application of the material.

Mines

In addition to minor explosives stores, Combat Engineers were responsible for the laying, lifting and breaching of offensive and defensive minefields. Australia was an original signatory of the “Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction” and in December 1998 the Australian Parliament passed the Anti-Personnel Mines Convention Act. This legislation gives effect under Australian law to the provisions of the Mine Ban Convention. It creates offences relating to the placement, possession, development, production, acquisition, stockpiling and transfer of anti-personnel landmines by Australian citizens or members of the Australian Defence Force or on territory under Australian jurisdiction or control. In keeping with Australia's obligations under the Anti-Personnel Mine Ban Convention, the Australian Defence Force has destroyed Australia's stockpile of antipersonnel landmines. A small number of mines have been retained, as permitted by the Convention, for research and training purposes in support of Australia's work in humanitarian demining.

(<http://dfat.gov.au/international-relations/security/non-proliferation-disarmament-arms-control/conventional-weapons-missiles/Pages/convention-prohibition-use-stockpiling-production-transfer-anti-personnel-mines.aspx>)



The items used within SME for training Combat Engineers in mine actions activities were either inert replica items for classroom/display use, or practice items for field training use; these generally emitted a coloured smoke to indicate that they had been activated.

Training on disposal of items containing high explosive was restricted to recognized Defence training ranges, such as Holsworthy.

Area SW0182 has the potential to contain remnant training mines.

Air Delivered Munitions

Combat Engineers conduct battlefield clearance tasks of ERW to assist mobility of combat forces and as a humanitarian responsibility. Battlefield clearance of air delivered munitions, particularly large aircraft bombs, may include the location of the item, excavation of pits or shafts to access the item and the construction of bunds or revetments to minimise the effects of blast or fragmentation if an item detonates.

From EarthTech 2006, it is understood that "The EOD training area was subject to partial clearance as part of the Stage 2 Investigation. However, the geophysical survey of the area was limited by the presence of existing buildings and several stands of bushland. Further, the geophysical survey was unable to identify specific anomalies in the northern portion of the EOD training area due to the presence of wide spread buried metal waste, and where specific anomalies were identified, only 20 of the 143 identified were investigated." (*EarthTech, July 2006 p374*)

The items used within SME were inert and, once recovered, were stored and re-used for subsequent exercises and training courses.

There is a potential for remnant inert air delivered munitions to have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.

Other Explosive Remnants of War

Battlefield clearance activities will also require familiarisation and training with a range of allied and "enemy" land ordnance, including rocket, grenade, mortar and artillery ammunition, and it is anticipated that inert examples of a wide range of such items would also have been used for both classroom and field training activities, again for both human and canine trainees.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.



6.0 STAGE FOUR – RISK ASSESSMENT

Items of UXO threat	Blank small arms ammunition (SAA) with unfired primer and propellant.
Maximum UXO penetration	Likely restricted to surface and near surface (10 mm) over the majority of the site but with the potential for some Unexpected Finds at greater depth in areas where surface re-grading or waste disposal pits have incorporated SAA.
Items of IA threat	<p>Inert practice and training anti-personnel and anti-tank mines.</p> <p>Inert practice and training air delivered munitions, including rockets and bombs</p> <p>Inert practice and training land munitions, including rockets, mortars, grenades, and artillery projectiles</p>
Maximum IA depth	Will vary across the Site according to training objectives; 0 – 10cm for mines, 0 – 5m for aircraft bombs, 0 – 2m for other air and land delivered munitions.
Risk pathways	<p>Vegetation Reduction.</p> <p>Intrusive engineering or levelling works with plant.</p>
Consequences/Receptors	<p>Consequences of UXO initiation could include:</p> <ul style="list-style-type: none"> • Lost time hand or eye injury to personnel. • Perceptual risk from visible items. <p>Consequences of IA interaction could include:</p> <ul style="list-style-type: none"> • Delays to process in identifying and ensuring item is Free from Explosives (FFE). • Perceptual risk as an item is uncovered. • Damage to reputation or finances.



UXO RISK CALCULATION – Health of Human Receptor

Activity	Probability [P] [SH x IM = P]	Consequence [C] [D x PSR = C]	Risk Rating [RR] [P x C =RR]
Environmental Testing	3x1=3	2x2=4	3x4=12
Landscaping	3x1=3	1x1=1	3x1=3
Excavations	3x1=3	1x1=1	3x1=3
Re-contouring	3x1=3	1x1=1	3x1=3
Risk Abbreviations: SH – Site History [1-3], IM – Investigation Methodology [1-3], D – Depth of Encounter [1-3], PSR – Proximity to Sensitive Receptors [1-3], RR – Risk Rating [1-81], ALARP – As Low as Reasonably Practical			
Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]			

IA RISK CALCULATION – Delay/Perception

Activity	Probability [P] [SH x IM = P]	Consequence [C] [D x PSR = C]	Risk Rating [RR] [P x C =RR]
Environmental Testing	3x1=3	2x1=2	3x2=6
Landscaping	3x1=1	2x2=4	3x4=12
Excavations	3x2=6	3x2=6	6x6=36
Re-contouring	3x1=3	2x2=4	3x4=12
Risk Abbreviations: SH – Site History [1-3], IM – Investigation Methodology [1-3], D – Depth of Encounter [1-3], PSR – Proximity to Sensitive Receptors [1-3], RR – Risk Rating [1-81], ALARP – As Low as Reasonably Practical			
Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]			



7.0 STAGE FIVE – RISK MITIGATION

Is the Site suitable for further UXO investigations

The current levels of remnant metallic contamination makes the Site unsuitable for further analogue or digital UXO investigation. Additional surface search in close training areas would reduce the number of blank cartridge cases and pyrotechnic ordnance waste in these areas and reduce potential for encounter.

Is the Site suitable for further IA investigation

Areas SW0182, SW0190 and SW0192 can be investigated with applied vegetation reduction and surface metallic debris removal requirements specific to each area.

Balance of the Site requires no further IA investigation

Activity	Mitigation Measures to Reduce RR to ALARP	Final Risk Rating
General	<p>UXO Management Plan/Protocol in place for action required in the event of a potential item of UXO/IA being discovered.</p> <p>UXO/IA potential included as part of Site-specific inductions and safety awareness training.</p> <p>IA Remediation works in areas SW0182, SW0190 and SW0192.</p>	LOW
Environmental Testing	<p>General, plus:</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard testing if surface search not conducted prior to requirement.</p>	LOW
Landscaping	<p>General, plus:</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where holes are required for fencing or tree/shrub planting or trenches are required for irrigation or similar systems in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.</p>	LOW
Excavations	<p>General, plus:</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where excavation is required as part of Site works in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.</p>	LOW
Re-contouring	<p>General, plus:</p> <p>Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where re-contouring is required as part of Site works in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.</p>	LOW
<p>Final Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]</p>		

8.0 MANAGEMENT PLAN



Based on the UXO Risk Review conducted, the overall developable area of the Site can be divided into two (2) portions, Northern and Southern (former SME). The current alignment of Moorebank Avenue is not considered to contain any UXO or IA risk and upgrade works, where they impinge onto the Southern portion developable area, should be managed in the same way as the portion they fall into.

Northern Portion

The Northern portion is considered free of UXO and IA risk.

Southern Portion (SME)

The Southern portion, the area of the former School of Military Engineering (SME) is considered to contain UXO risk (primarily unfired blank small arms ammunition) generally across the portion.

Within the Southern portion, three (3) areas of IA risk are considered to be remnant:

SW0190 – Bomb Disposal Training Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190.

SW0192 – Potential Explosive Ordnance Drowning Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ within Area SW0192.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ within Area SW0192.

SW0182 – in Practice Mine and Bomb Disposal

There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

Objective

The objective of this Management Plan (MP) is to provide a framework for addressing any discovery of potential unexploded ordnance (UXO) or Inert Ammunition (IA) to ensure a safe environment for all project staff, visitors and contractors within the Site.

This MP will be included within any hierarchy of management plans for works within the Site.

Unexploded Ordnance (UXO)

Risk assessment has indicated that the most likely item of UXO to be encountered within the Site is unfired small arms ammunition (SAA), particularly 5.56mm blank cartridges. Items will generally be on or near the surface and the majority of visible items will be empty/fired, containing no primer or propellant. Individual unfired items may be interspersed with the fired.



Blank SAA of various calibres

Any personnel travelling on the current natural surface of the Site will have a potential to encounter blank SAA, but the areas of the Site where blank SAA UXO encounter with a human receptor is most likely to occur is previously open or vegetated areas not in close proximity to the footprints of previous buildings or infrastructure which was in regular use when SME was occupied.

Inert Ammunition (IA)

Risk assessment has indicated inert ammunition of various calibres and natures is likely to be encountered in specific areas of the Site; inert air and land delivered munitions, including aircraft bombs, rockets, mortar and artillery projectiles are likely to be encountered at various depths with the former EOD Training and Ordnance Drowning Areas (SW0190 SW0192) while inert mines of various types are likely to be encountered in the former practice mine and bomb disposal area (SW0182).

Personnel with the highest potential for encountering remnant inert mines are those engaged in surface and near surface activities in area SW0182, while those with the highest potential for encountering other natures of IA in areas SW0190 and SW0192 are personnel conducting:

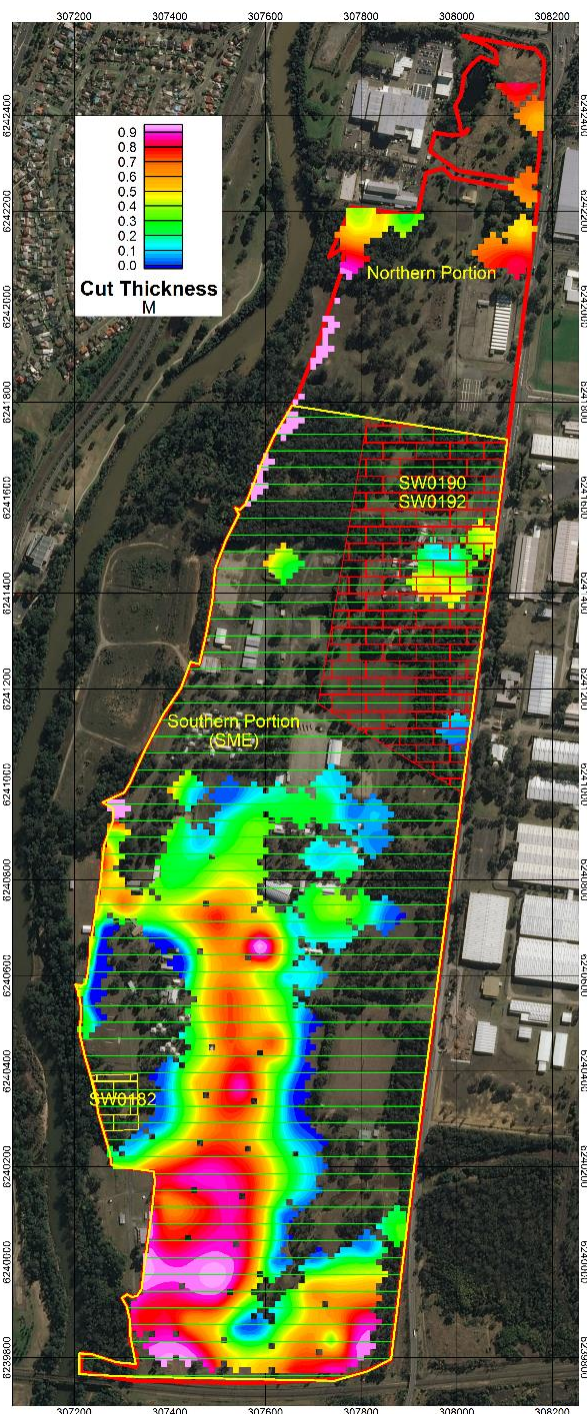
- Excavation and re-contouring.
- Unexploded Ordnance remediation.

This management plan documents the ongoing management actions necessary should remnant UXO/IA items be exposed as a consequence of fire, land clearing, survey, investigation or earthworks.

8.1 MANAGEMENT PLAN IMPLEMENTATION

The overall Site has been further reviewed in line with Client information received in relation to the boundaries of the Developable area and the anticipated cut/fill requirements within the Site; Management Plan implementation is based on this review. As Moorebank Avenue Upgrade Works impinge into the indicated Developable area, they are considered to have the same potential as the area they impinge into, and the same implementation process is to apply.

The Figure below indicates the Development area only and levels where cutting into the current natural levels is required as part of the development process; the balance of the area will have fill applied as part of the development.



Southern Portion (SME)

The Southern portion is considered to contain UXO risk (unfired blank small arms ammunition) generally across the portion.

Within the Southern portion, three (3) areas of IA risk are considered to be remnant:

SW0182 – Practice Mine and Bomb Disposal

There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

It is anticipated that this area will be filled as part of the development process, but, as any remnant practice mines will be remnant very close to the current natural surface level and will be disturbed/observed when any vehicles disturb the surface.

Because of the nature of the items, it is recommended that Remediation of this area occur prior to development.

SW0190 – Bomb Disposal Training Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190.

The areas east and south of the fill contour line will require remediation if cut occurs greater than for topsoil removal.

SW0192 – Potential Explosive Ordnance Drowning Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ within Area SW0192.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ within Area SW0192.

It is anticipated that this area will be filled and requires no prior remediation.



8.1.1 – Identify relevant personnel

As part of the preparatory planning for site works, appropriate management personnel should be designated with particular responsibilities in the event of EO/EOW being identified within the Site during works and, where necessary, appropriately qualified contractors/consultants are engaged to provide technical support.

An EO Contact List will be maintained as part of this MP detailing the name, position, responsibility and contact details of each individual who may need to be involved in any EO related matters on this Site. A suggested contact list format is included as Appendix 1 and specific contact details may be included in Site OHS signage and induction cards.

8.2.2 – Site inductions

The implementation of this management plan will involve EO awareness training as part of the overall induction for Site personnel. The procedures included in this management plan should be included in the safety induction for all staff engaged in Site works regardless of whether they are directly involved in intrusive investigation or excavation activities and are also relevant to the long-term operation of infrastructure within the Site.

Induction information should include:

- Overview of past military usage of the Site.
- Overview of potential EO that may be remnant within the Site.
- Name/details of designated responsible personnel to be contacted in event of the discovery of potential EO.
- Process to be followed in the event of locating potential EO during site works.

8.3.3 – Management process

The management process to be adopted should EO material be discovered during future site works is presented below and in the flowchart at Appendix 2.

8.3.3.1 Discovery of potential EO

If potential EO material is discovered during the course of Site works, such discovery is to be notified to the EO Manager as soon as practical. Material discovered will not be touched or moved and works that could move or disturb the items should not continue in their immediate vicinity; an exclusion zone of 5 m radius in all directions will be established and enforced, and the occupants of any buildings in close proximity to the exclusion zone will also be notified in case future evacuation of the building/s is required.

8.3.3.2 Assessment by the EO Manager

The EO Manager will assess the material and determine whether it is miscellaneous debris, inert EOW, a potential component from EO, or potential EO. Where the EO Manager can identify the item as non-munitions debris or harmless fragments of debris, the material should be removed from its location and disposed of appropriately. Works within the vicinity will resume on removal of the material.

Where the EO Manager considers the material to be potential EO, access restrictions will be maintained or the exclusion zone increased and the Site Manager shall be informed. The EO Manager will contact the appointed EO Contractor who will attend the Site and assess the material.

8.3.3.3 Classification and management by EO Contractor

On arrival at the site, the EO Contractor will be met and briefed by the EO Manager and will proceed to review and assess the discovered material. Such material will be classified by the EO Contractor as either:

- Category A – EO items which contain or potentially contain energetic material and could cause harm or injury;
- Category B – IA items which are easily recognised as inert items such as an empty cartridge cases or empty/expended flares which, while not dangerous, may cause alarm to a worker or member of the public, or works delay on discovery; or
- Category C – Non EO related waste or debris.



Should the EO Contractor assesses the Material to be Category C, the EO Contractor will inform the EO Manager and the material will be removed and appropriately disposed. Any access restrictions will be lifted and normal activities resumed in the vicinity.

If the EO Contractor identifies the Material to be Category B, the EO Contractor will inform the EO Manager and ensure appropriate dispose of the Material. Any access restrictions will be lifted and normal activities resumed in the vicinity.

If the EO Contractor identifies the material as Category A, the EO Contractor will inform the EO Manager, review and potentially extend exclusion zones and/or cause physical access barriers to be erected, and will liaise with the Department of Defence to ensure the timely and appropriate disposal of the material.

8.3.4 – Documentation

The designated EO Manager will maintain an EO incident log and record any reported EO finds, the outcomes of any assessments by both the EO Manager and the EO Contractor and the final disposition of the material that initiated the actions. These records should be maintained as Project Quality Records and available for Audit.

Appendices to Management Plan:

1. Explosive Ordnance Contact List (Suggested Format)
2. Explosive Ordnance Management Process Flow Chart



Appendix 1

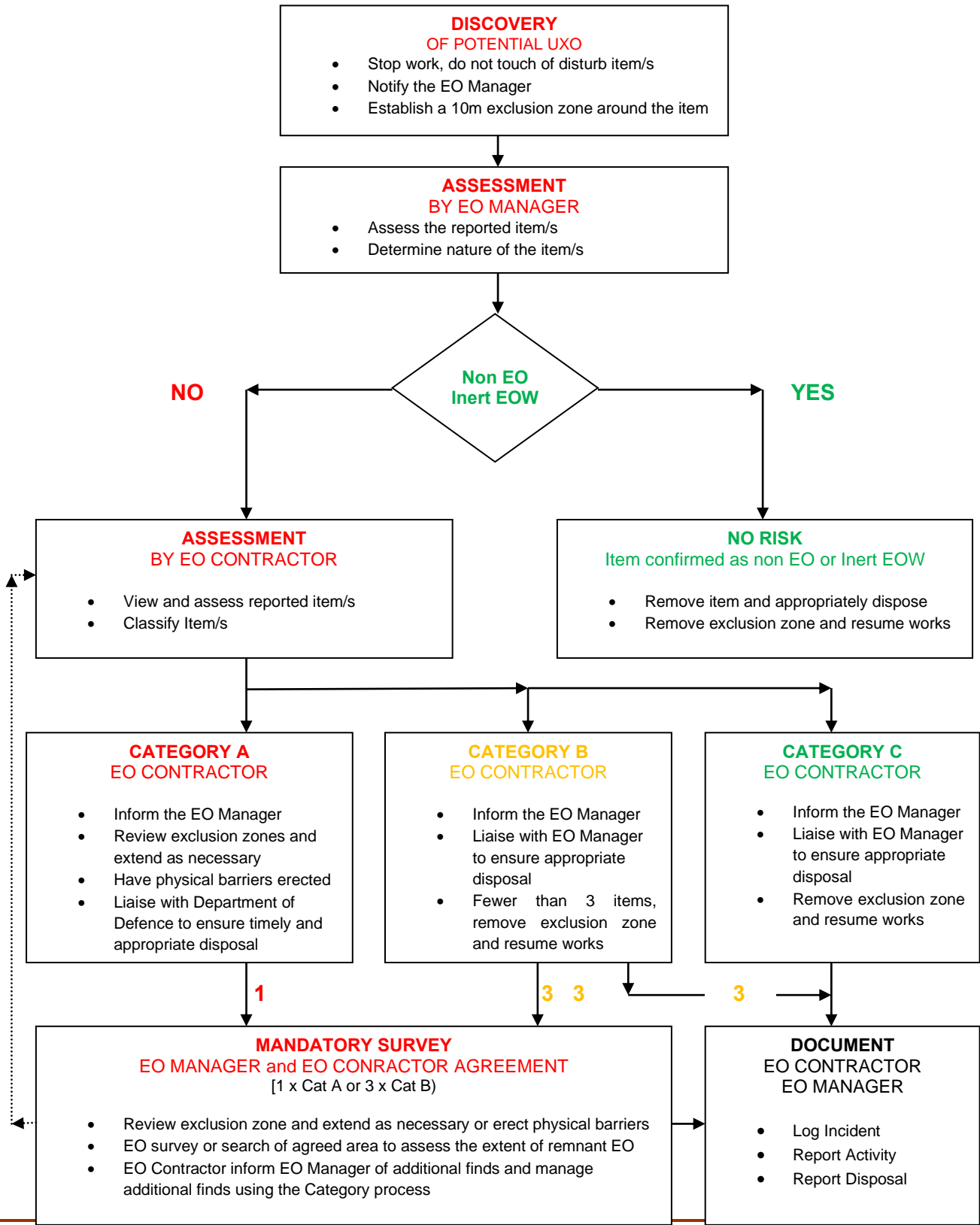
Explosive Ordnance Contact List (Suggested Format)

Designation	Name	Company	Telephone/Radio
Senior Manager			
Project Manager			
Site Manager			
EO Manager			
First Aid			
Emergency			
EO Contractor			
Environmental			
Heritage			
Vegetation			
Excavation			
As Required			
As Required			



Appendix 2

Explosive Ordnance Management Process Flow Chart





BETTER BY DEFINITION

REMEDIATION ACTION PLAN

RAP

UNEXPLODED ORDNANCE MOOREBANK PRECINCT WEST MOOREBANK AVENUE UPGRADE WORKS [MPW_MAUW]

V1.02

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DOCUMENT VERSION CONTROL

Version	Date	Raised By	Released By
1_01	07 November 2019		
1_02	08 November 2019		

DOCUMENTATION CONTROL

Copy Number	Issued To
1	Tactical Group c/- EP Risk Management Pty Ltd
2	G-tek Australia Pty Limited

Copy 1 of 2



EXECUTIVE SUMMARY

Moorebank Precinct West and Moorebank Avenue are being redeveloped as part of the Moorebank Intermodal Terminal Project to provide a rail “port shuttle” service for containerised goods between Port Botany and the Moorebank Precinct.

Unexploded Ordnance Risk Review and Management Plan for Moorebank Precinct West Stage 2 incorporating Moorebank Avenue Upgrade Works (G-tek Australia Pty Limited 17114EPRI dated 9 October 2019) indicated a potential for inert air delivered ammunition and other explosive remnants of war (IA) to have been left in-situ as a result of previous training activities within areas of the former Army School of Military Engineering (SME).

The Risk Review and Management Plan indicates that, to ensure a final risk rating of Low where Excavations are required as part of Site works within Areas SW0182, SW0190 and SW0192, a member of the Department of Defence Environmental and Heritage Panel F2 stream is to be engaged to Safeguard works if Remediation is not completed prior to works.

Based on the historical use, the potential nature of remnant material i.e. IA rather than UXO or ERW with a potential to contain energetic material, and the differing types/potential locations of IA, it is considered that the most appropriate Strategy for each area is:

- Area SW0182 – Remediation prior to any intrusive works, including landscaping, excavation or recontouring; and,
- Areas SW0190 and SW0192 – Safeguarding during intrusive excavation works.

At the completion of required Safeguarding and/or Remediation works, the UXO consultant will issue a Works Area Release or other required document indicating that Area SW0182 and designated excavation Sites within Areas SW0190 and SW0192 are suitable for the proposed redevelopment within that Area in accordance with any required consent conditions.



The following Definitions and Acronyms may apply within this Report:

Ammunition (Ammo): 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.

Ammunition Produce: Non-explosive stores and components used in the assembly or the initiation of ammunition.

Banksman: A suitably qualified and experienced UXO Technician that is on site, to instrument survey and/or watch excavations being conducted, ready to respond to any UXO chance find.

Dummy (Drill) Ammunition: A completely inert replica of ammunition used for training in handling, laying, loading, fusing and drill purposes.

Explosive: A substance or mixture of substances, which, under external influences, is capable of rapidly releasing energy in the form of gases and heat.

Explosive Ordnance (EO): All munitions containing explosives, nuclear fission and fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; demolition charges; pyrotechnics; clusters and dispensers; cartridges and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature.

Explosive Ordnance Waste (EOW): Inert material remnant from the initiation or functioning of explosive ordnance.

Field Validation Survey (FVS): A percentage field sampling activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also UXO Assessment).

Fragmentation: Metallic fragments of the fractured casing of EO resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO hazard within the boundaries of an affected area (see also UXO Remediation).

Inert Ammunition (IA): An item of ammunition that, by process or design, contains no energetic material.

Military Produce: Any item identified as military in origin that is not ammunition-related.

Munitions of Concern (MOC): Collective term explosive ordnance waste (EOW) and inert training ordnance (TO) that has the appearance of UXO/EO and which may cause concern if located; health and safety risk from MOC is perceptual rather than actual.

Safeguarding: Having a suitably qualified and experienced UXO Technician on site, to conduct instrument and/or visual inspection of intrusive or other works being conducted; where potential UXO is encountered, the works location is generally move to an adjacent "clear" position.

Small Arms: All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

Small Arms Ammunition (SAA): Ammunition for small arms, i.e. all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

Small Arms Ammunition Waste (SAAW): Inert material remnant from the transport, packaging, preparation, and use of SAA.

Unexploded Ordnance (UXO): 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 by members of the public.

UXO Assessment: An activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see Field Validation Survey).

UXO Remediation: An operation designed to reduce the EO hazard within the boundaries of an affected area (see also Hazard Reduction Operation).

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1.0 INTRODUCTION

1.1 General

Unexploded Ordnance Risk Review and Management Plan for Moorebank Precinct West Stage 2 incorporating Moorebank Avenue Upgrade Works (G-tek Australia Pty Limited 17114EPRI dated 9 October 2019) indicated a potential for inert air delivered ammunition and other inert explosive remnants of war (IA) to have been left in-situ as a result of previous training activities within areas of the former Army School of Military Engineering (SME). Areas identified as SW0182 – Practice Mine and Bomb Disposal, SW0190 – Bomb Disposal Training Area and SW0192 – Potential Explosive Drowning Area (Figures 1, 2 and 3 below) are to be subjected to cutting and excavation as part of MPW_MAUW and require unexploded ordnance (UXO) remediation and/or safeguarding to allow the required works to be safely and efficiently conducted.

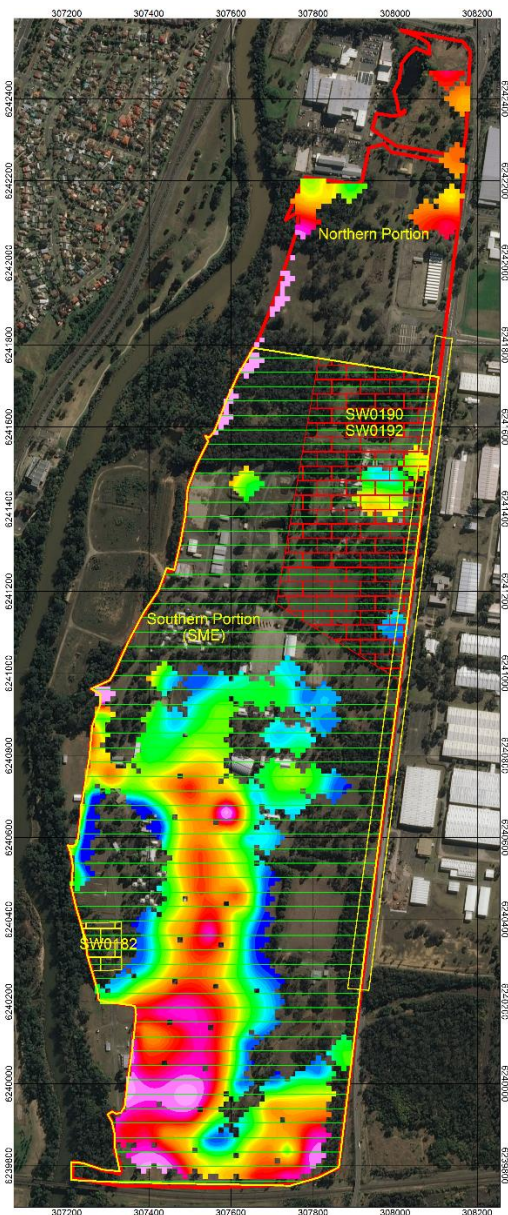


Figure 1 – MPE MAUW Overview



Figure 2 – SW0190 SW0192 Detail

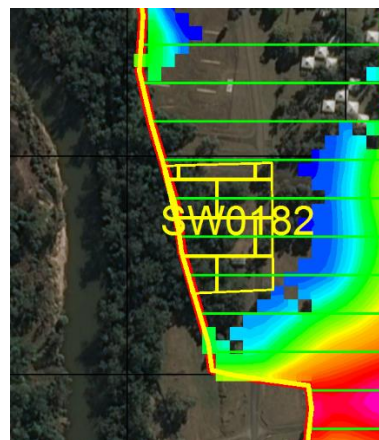


Figure 3 – SW0182 Detail



1.2 Purpose

The Purpose of this Remediation Action Plan (RAP) is to facilitate the proposed development works within Areas SW0182, SW0190 and SW0192 as part of the overall MPW_MAUW development.

1.3 Goals

The goal of this RAP is to ensure that appropriate action on potential risk from remnant explosive ordnance related material is taken to ensure that human health is protected prior to and during required intrusive development works.

2.0 SITE CONTEXT

Moorebank Precinct West and Moorebank Avenue are being redeveloped as part of the Moorebank Intermodal Terminal Project to provide a rail "port shuttle" service for containerised goods between Port Botany and the Moorebank Precinct.

2.1 Site History Summary

Records indicate potential various military use of the Moorebank and Holsworthy area from the late 1800's, but direct use of the MPW_MAUW really began during World War Two (WWII) when the School of Military Engineering (SME) was first developed on the Site. Training within SME occurred for base and supervisory field engineering roles, and explosive ordnance related activities included mine laying and recovery, demolition to create and deny access to areas, destruction of infrastructure and disposal of UXO in battlefield clearance and bomb disposal roles in time of war.

Introductory training was conducted within SME using primarily training or practice items containing propellant, pyrotechnics or particular simulant materials. Training was highly regulated and monitored and specified competency levels needed to be achieved prior to moving to higher level training using explosives.

Training using explosives was conducted away from SME, generally on an authorised demolitions range within a Defence range such as Holsworthy, or where a task was available for appropriate training outside a Defence area.

3.0 CONTAMINATION SUMMARY

The Risk Review and Management Plan indicates that within the former SME:

Combat Engineers conducted battlefield clearance tasks of ERW to assist mobility of combat forces and as a humanitarian responsibility. Battlefield clearance of air delivered munitions, particularly large aircraft bombs, may include the location of the item, excavation of pits or shafts to access the item and the construction of bunds or revetments to minimise the effects of blast or fragmentation if an item detonates. The items used within SME were inert and, once recovered, were stored and re-used for subsequent exercises and training courses. There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192, and

Battlefield clearance activities also require familiarisation and training with a range of allied and "enemy" land ordnance, including rocket, grenade, mortar and artillery ammunition, and it is anticipated that inert examples of a wide range of such items would also have been used for both classroom and field training activities, again for both human and canine trainees. There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.

The items used within SME for training Combat Engineers in mine actions activities were either inert replica items for classroom/display use, or practice items for field training use; these generally emitted a coloured smoke to indicate that they had been activated. Area SW0182 has the potential to contain remnant training mines.

4.0 REMEDIATION OPTIONS AND STRATEGY

The Risk Review and Management Plan indicates that, to ensure a final risk rating of Low where Excavations are required as part of Site works within Areas SW0182, SW0190 and SW0192, a member of the Department of Defence Environmental and Heritage Panel F2 stream is to be engaged to Safeguard works if Remediation is not completed prior to works.

4.1 Options

Options for Areas SW0182, SW0190 and SW0192 are considered to be:

1. Define areas where excavation is required and conduct IA Remediation of those areas, or
2. Conduct IA Safeguarding of excavation works as they occur.

4.2 Strategy

Based on the historical use, the potential nature of remnant material i.e. IA rather than UXO or ERW with a potential to contain energetic material, and the differing types/potential locations of IA, it is considered that the most appropriate Strategy for each area is:

- Area SW0182 – Remediation prior to any intrusive works, including landscaping, excavation or recontouring; and,
- Areas SW0190 and SW0192 – Safeguarding during intrusive excavation works.

5.0 WORKS PROGRAM AND PROCEDURES

5.1 Areas SW0190 and SW0192

Prior to the commencement of any required excavation works within Areas SW0190 or SW0192, the Client is to engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to provide a UXO Safeguarding presence on site as a Banksman to observe and monitor excavations within these Areas and appropriately evaluate any potential ordnance related material located for disposal.

5.1.1 Work Plan

Prior to the conduct of excavation works, all personnel directly involved in the works are to be inducted onto the Site and briefed on the excavation procedure planned, risk assessment conducted and a Safe Work Method Statement (SWMS) developed and endorsed.

Daily safety briefs are to be conducted prior to the commencement of excavation works and the SWMS reviewed and updated on a regular basis.

5.1.2 Works Procedure

Where practical, excavations are to be conducted in layers of not more than 300mm and the outcomes of each layer confirmed by the Banksman as being free from exposed IA prior to the next layer being removed.

Direct contact (visual and/or radio) is to be maintained between the plant operator and the Banksman and where any potential item of IA is observed by either excavation will stop and the blade/bucket placed on the ground to allow the Banksman to safely enter the works area and inspect the item.

On direction from the Banksman the observed item may be moved/relocated to an appropriate stockpile area for subsequent disposal.

All IA and IA related material identified during excavation works is to be photographed and recorded in an IA log by the Banksman.

Any IA item recovered will need to be certified by the Banksman as “Free from Explosives” (FFE) and disfigured prior to entering a recycling waste stream.

5.1.3 Validation

At the completion of excavation works to required levels and prior to any reinstatement or filling, 100% of the excavated area is to be visually checked for remnant IA material by the Banksman. Where additional/potential IA material is identified during final visual check, additional excavation may be required to allow full identification and recovery/removal of the material.



At the completion of any required additional works, the Banksman will repeat the final visual check process. At the completion of excavation within an Area, a Works Area Release or appropriate required document will be raised and any IA recovered will be suitably disposed.

5.2 Area SW0182

Prior to the commencement of any required excavation works within Area SW0182, the Client is to engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to provide a UXO Remediation team to conduct remedial search within this Area and appropriately evaluate any potential ordnance related material located for disposal.

5.2.1 Work Plan

Prior to the conduct of remediation works, all personnel directly involved in the works are to be inducted onto the Site and briefed on the remediation procedure planned, risk assessment conducted and a Safe Work Method Statement (SWMS) developed and endorsed.

A safety brief is to be conducted prior to the commencement of remediation works and the SWMS reviewed and updated as required.

5.2.2 Works Procedure

Remediation with Area SW082 is to be conducted by 100% shallow search of the Area using Minelab F3 metal detectors using a team led by a Defence trained UXO technician. The Minelab F3 provides an aural cue to the operator in the presence of metal; each cue will be intrusively investigated and, if ordnance related, will be recorded.

All IA and IA related material identified during remediation works is to be photographed and recorded in an IA log and any IA item recovered will need to be certified as "Free from Explosives" (FFE) and disfigured prior to entering a recycling waste stream.

5.2.3 Validation

At the completion of 100% search, the team leader will conduct a minimum of a 10% QC search of Area SW0182; where IA is located during QC, 100% re-search of the Area and QC will be repeated until remediation of the Area is considered to be complete.

At the completion of remediation, a Works Area Release or appropriate required document will be raised and any IA recovered will be suitably disposed.

6.0 ENVIRONMENTAL MANAGEMENT

Client/Site Environmental Management Plans and requirements during excavation/intrusive works are to be adhered to at all times during IA related remediation and safeguarding works.

Item of IA contain no materials that may cause environmental harm when disfigured or disposed and, once disfigured can be disposed in an appropriate waste stream.

7.0 HEALTH AND SAFETY

Client/Site Health and Safety requirements are to be fully adhered to during excavation works and a task specific works plan and SWMS developed.

Accidents/Incidents and near misses are to be reported in accordance Client and Workcover (NSW) requirements.

8.0 QUALITY

All processes are to be in accordance with Project Plans and this RAP.

All excavations are to be fully Safeguarded and all excavated surfaces visually searched for items of potential IA.

Final visual search is to be conducted and Works Area Release raised prior to any filling or restoration of excavated areas.



100% search is to be subjected to a minimum 10% QC check and repeated as required.

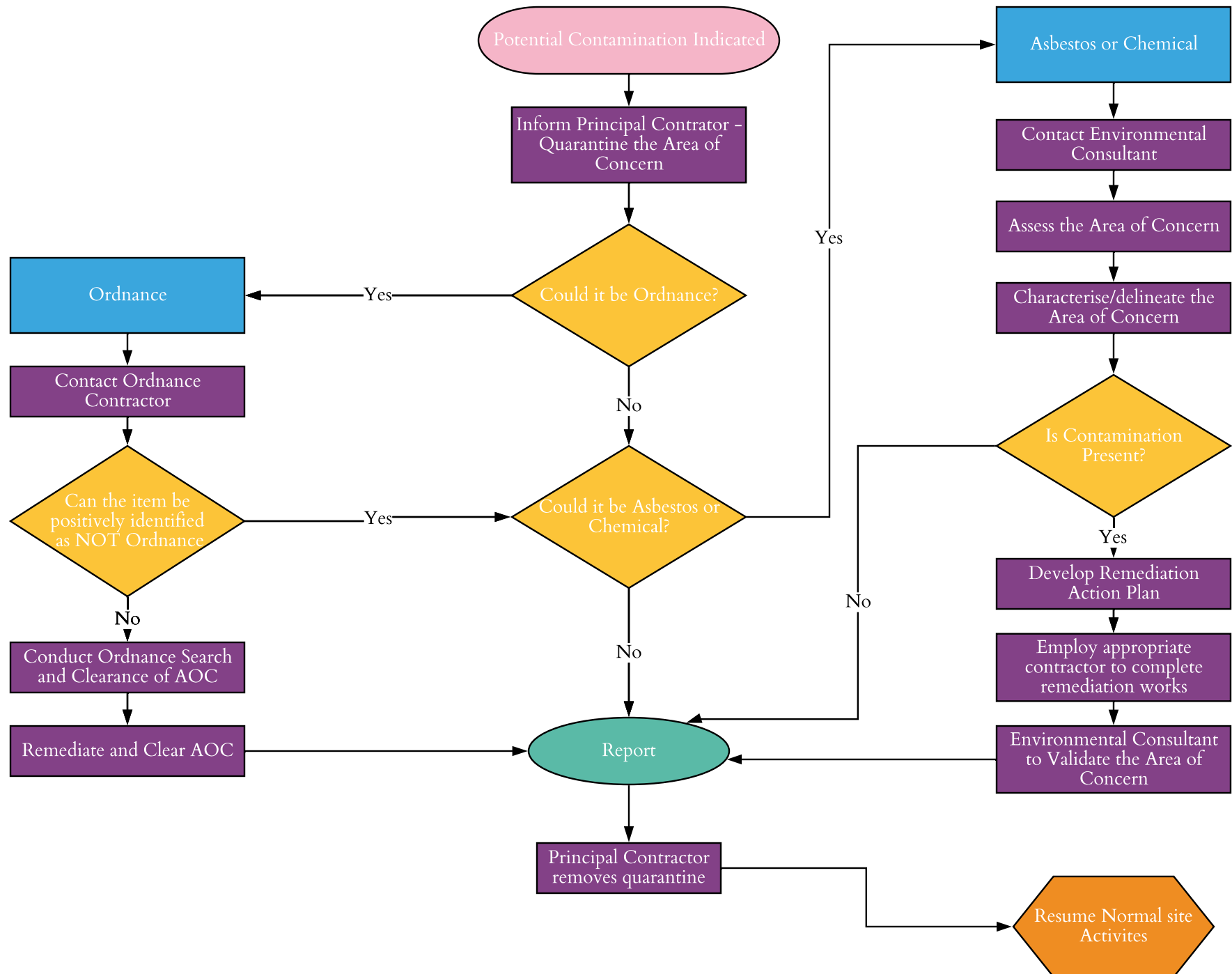
All IA finds are to be photographed and logged prior to raising of FFE certification and appropriate disposal.

9.0 OUTCOMES

At the completion of required Safeguarding and/or Remediation works, the UXO consultant will issue a Works Area Release or other required document indicating that Area SW0182 and designated excavation Sites within Areas SW0190 and SW0192 are suitable for the proposed redevelopment within that Area in accordance with any required consent conditions.

Appendix D

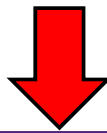
UFP FLOW CHARTS



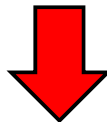
Potential Site Hazards



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

Appendix E

NSW EPA ACCREDITED SITE AUDITOR
ENDORSEMENT

29th October 2019

[REDACTED]
Tactical Group/Qube
Level 15, 124 Walker Street
NORTH SYDNEY NSW 2060

[REDACTED]
Dear [REDACTED],

RE: Site Audit Interim Advice – Review of the revised Contamination Management Plan (CMP) for the Moorebank Avenue Upgrade, 400 Moorebank Avenue, Moorebank, NSW.

[REDACTED] of Enviroview Pty Ltd has been engaged to provide the services of a NSW EPA Contaminated Land Accredited Site Auditor, to conduct a Site Audit in relation to the land to be developed for the Moorebank Intermodal Terminal located at Moorebank Avenue, Moorebank, NSW, in accordance with the *Contaminated Land Management Act 1997* and relevant guidelines made or approved under s.105 of that Act.

The objective of the Site Audit is to provide a Site Audit Report and Site Audit Statement to certify, in relation to contaminated land, the Auditor's opinion of whether the site is suitable for the proposed commercial/industrial development.

A Site Audit Interim Advice is provided by a Site Auditor to assist in the management of contamination issues regarding the requirements of the Audit at a stage, prior to issuing the Site Audit Statement. An interim advice does not constitute a Site Audit Statement or a Site Audit Report and does not pre-empt the final Site Audit conclusions. A Site Audit Report and Site Audit Statement will be prepared at the conclusion of the Site Audit.

The purpose of this interim advice is to provide approval of the Contamination Management Plan (CMP) that has been submitted to the Site Auditor for review as required by condition B135 of the State Significant Development approval SSD 7628:

EP Risk (March 2018) *Contamination Management Plan Moorebank Avenue Upgrade Works, 400 Moorebank Avenue, Moorebank NSW, 400 Moorebank Avenue, Moorebank NSW Report*. Ref: EP1280.002_CMP01 v1, 9 September 2019.

In order to provide approval several assessment and associated reports have been made available to the Site Auditor.

The CMP also includes, as appendices the following additional management plan:

Golder (July 2016) *Moorebank Avenue Site Management Plan*. Report Ref. 147623070_052-Rev1, 4 July 2016

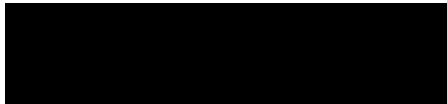
The Site Auditor approves the CMP, with consideration to contamination issues identified at the site defined in the CMP, for the works area of the Moorebank Avenue Upgrade.

The inclusion of the abovementioned management plan applicable to what is described as the 'exclusion zone' identified within Moorebank Avenue remains relevant. Whilst a Site Audit

Statement has been prepared in relation to the Import-Export (IMEX) terminal where the former refuelling terminal was located, this was subject to the implementation of a separate management plan specifically relating to impact to groundwater within that site. Specific management of that area of Moorebank Avenue continues to be required during construction works within that area.

Thank you for your time regarding this matter. If you require additional information or clarification, please do not hesitate to contact me.

Yours sincerely



NSW EPA Contaminated Land Site Auditor
Enviroview Pty Ltd

Appendix F

MANAGEMENT COMMITMENTS

Qube makes the following management commitments in respect of hydrocarbons and waste materials, in particular natural gas, liquid natural gas and flammable and combustible liquids.

Conditions of Approval (CoA) – EPBC 2011/6086 – Management Commitments		
CoA	Reference	Condition Requirement
8b) and c)	REMM 7A	<p>Minimise the risk of leakages involving natural gas, liquid natural gas (LNG) and flammable and combustible liquids to the atmosphere:</p> <ul style="list-style-type: none"> - 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.
	REMM 7B	<p>Minimise the risks of leakage of LNG and liquid petroleum gas (LPG) and flammable liquids during transport:</p> <ul style="list-style-type: none"> - 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
	REMM 7C	<p>Minimise hazards associated with venting of natural gas, LNG and LPG:</p> <ul style="list-style-type: none"> - 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
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
	REMM 7E	Standby or emergency generators and transformers would all have secondary containment
	REMM 7F	Oil coolers would generally be located in areas where leaks and runoff are appropriately controlled at source or in a retention basin.
	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 migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.

