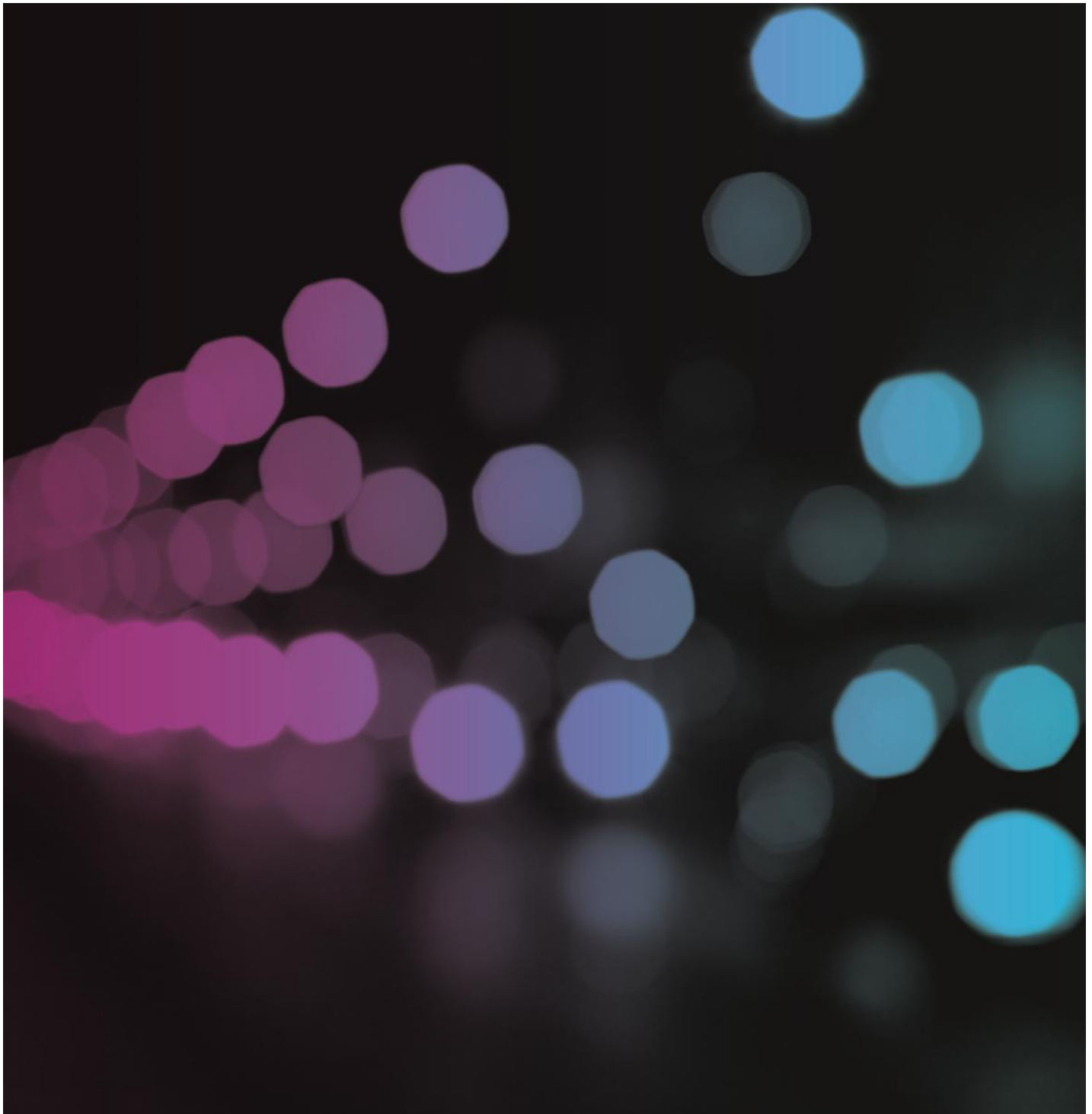


# Waste Management Plan

Remediation and Landforming Development Application SSD 5897-2013, Barangaroo Block 4, Hickson Road, Millers Point, NSW



## Waste Management Plan

Remediation and Landforming Development Application SSD 5897-2013, Barangaroo Block 4, Hickson Road, Millers Point, NSW

Client: Lend Lease (Millers Point) Pty Ltd

ABN: 15 127 727 502

Prepared by

**AECOM Australia Pty Ltd**

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 [www.aecom.com](http://www.aecom.com)

ABN 20 093 846 925

01-Oct-2013

Job No.: 60247139

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

Printed on environmentally responsible paper. Made from 100% recycled post consumer waste.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

This document was prepared by AECOM Australia Pty Ltd (AECOM) for the sole use of Lend Lease (Millers Point) Pty Ltd, the only intended beneficiary of our work. Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current to the date of this document. Any other party should satisfy themselves that the scope of work conducted and reported herein meets their specific needs before relying on this document. AECOM cannot be held liable for any third party reliance on this document, as AECOM is not aware of the specific needs of the third party. No other party should rely on the document without the prior written consent of AECOM, and AECOM undertakes no duty to, nor accepts any responsibility to, any third party who may rely upon this document.

This document was prepared for the specific purpose described in our proposal dated 9 January 2012 and as agreed to by Lend Lease (Millers Point) Pty Ltd. From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water and chemical movement. Uncertainties may also affect source characterisation assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance.

AECOM's professional opinions are based upon its professional judgement, experience, and training. These opinions are also based upon data derived from the testing and analysis described in this document. It is possible that additional testing and analysis might produce different results and/or different opinions. AECOM has limited its investigation to the scope agreed upon with its client. AECOM believes that its opinions are reasonably supported by the testing and analysis that have been done, and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at the date of this document. That standard of care may change and new methods and practices of exploration, testing, analysis and remediation may develop in the future, which might produce different results. AECOM's professional opinions contained in this document are subject to modification if additional information is obtained, through further investigation, observations, or validation testing and analysis during remedial activities.

All rights reserved. No section or element of this document may be removed from this document, extracted, reproduced, electronically stored or transmitted in any form without the prior written permission of AECOM

## Quality Information

Document Waste Management Plan

Ref SSD 5897-2013\_60153531\_RPT290\_WMP\_20131001

Date 01-Oct-2013

Prepared by Kelly Pearsall / Andrew Rolfe

Reviewed by Scott Jeffries

### Distribution

Copies	Recipient	Copies	Recipient
1	Mark Burns Lend Lease (Millers Point) Pty Ltd. The Bond 30 Hickson Road Millers Point NSW 2000	1	AECOM Australia Pty Ltd. <b>File Copy</b>

### Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
Revision A	10-Dec-2010	Draft for Lend Lease Review	Scott Jeffries Associate Director	
Revision B	31-Mar-2011	Final Draft for Lend Lease Review	Scott Jeffries Associate Director	
Revision C	17-Oct-2012	Final	Debbie Midwinter Associate Director	
Revision D	19-Nov-2012	Final revised to address Lend Lease comments	Debbie Midwinter Associate Director	
Revision E	10-Jan-2013	Final addressing BDA comments	Debbie Midwinter Associate Director	
Revision F	22-Jul-2013	Final - Updated Planning Details	Debbie Midwinter Associate Director	
Revision G	31-Jul-2013	Final – Updated Project Details	Debbie Midwinter Associate Director	
Revision H	04-Sep-2013	Final - Revised Project Scope	Michael Jones Technical Director	
Revision I	01-Oct-2013	Final - Revised Site Layout	Debbie Midwinter Associate Director	

## Table of Contents

Glossary		i
1.0	Introduction	3
	1.1	Barangaroo
	1.2	EPA Declaration Area (#21122)
	1.3	Summary Site History and Key Contaminants
	1.4	Definition of the Site
	1.5	Remedial Action Plan
	1.5.1	Separate Phase Gasworks Waste and Tar
	1.6	Objectives of this Plan
2.0	Project Description	10
	2.1	Block 4 Remediation Area – Ex-situ Remediation
	2.2	Infrastructure and Chemical Details
	2.2.1	Schedule
	2.3	Water Treatment
3.0	Legislative Requirements	14
	3.1	Legislation, Regulation and Guidelines
	3.1.1	Waste Classification Guidelines
	3.1.2	NSW Government’s Waste Reduction and Purchasing Policy
	3.1.3	NSW EPA “Construction and Demolition Waste Reduction Action Plan”
	3.1.4	NSW Government’s Waste Hierarchy
4.0	Waste Types and Sources	15
	4.1	Waste Types and Characteristics
	4.2	Waste Sources
	4.2.1	General Wastes
	4.2.2	Block 4 VMP Remediation Works
	4.2.3	Additional Excavation of Block 4 Development Works
	4.2.4	Liquid Treatment
5.0	Waste Management and Reuse	20
	5.1	Waste Classification
	5.1.1	Classification of Materials to be Disposed Off-site
	5.1.2	Validation of Treated Materials for Potential Reuse on the Barangaroo Site
	5.2	Stockpiling
	5.2.1	Stockpile Locations
	5.2.2	Stockpile Area Preparation
	5.2.3	Cross-contamination
	5.3	Handling and Storage
	5.3.1	General Solid Waste
	5.3.2	Trackable Waste
	5.4	Liquid Waste Management
	5.4.1	Surface Water Management
	5.4.2	Groundwater Management
	5.4.3	Water Treatment Plant
	5.4.4	Waste Oil, Grease and Lubricants
	5.5	Solid Waste Management
	5.5.1	Trackable Solid Waste (Restricted Waste)
	5.5.2	Uncontaminated Spoil Material
	5.6	Documentation
6.0	Reuse and Waste Disposal	29
	6.1	Waste Avoidance and Reduction
	6.2	Reuse and Recycling
	6.2.1	Spoil Reuse
	6.2.2	Recyclable Materials
	6.3	Waste Disposal
	6.4	Off-site Transport Routes
	6.5	Internal Haul Roads

7.0	Monitoring, Inspection, Auditing and Reporting Program	32
7.1	Monitoring	32
	7.1.1 Waste Register	32
	7.1.2 Waste Management	32
	7.2 Inspections and Audits	32
	7.3 Reporting	32
8.0	Roles and Responsibilities	33
	8.1 Training and Awareness	33
9.0	Conclusion	34
10.0	References	35
Appendix A		
	Waste Management Forms	A
Appendix B		
	Transport Route Maps and Waste Facility Contact Details	B

### List of Figures

Figure 1	Barangaroo Site Location	7
Figure 2	EPA Declaration Area and Block 4 Remediation Area	8

### List of Tables

Table 1	DGR 3 – Waste Management	3
Table 2	DECCW Recommended Approval Conditions MP 10_0023 - Waste	4
Table 3	Indicative Stabilisation On-site Chemical Register	11
Table 4	S-ESCO™ On-site Chemical Register	12
Table 5	Indicative Water Treatment On-site Chemical Register	13
Table 6	General Wastes	16
Table 7	Excavated Waste resulting from VMP Remediation Works	17
Table 8	Additional Excavation Waste – Block 4 Development Remediation Works	18
Table 9	Liquid Waste	18
Table 10	Indicative stockpile locations and dimensions by Material Type	23
Table 11	Indicative Waste disposal and storage strategy for classified wastes (subject to design development)	30
Table 12	Appropriately Licensed Waste Management Facilities	31
Table 13	Key Roles and responsibilities	33

## Glossary

Term	Description
ASS	Acid Sulfate Soils include actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS). Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons.
ASSMP	Acid Sulfate Soil Management Plan
BDA	Barangaroo Delivery Authority
Block 4 Remediation Area	A portion of the Site included under SSD 5897-2013-8 including: <ul style="list-style-type: none"> <li>- Development Block 4 (both within and outside the EPA Declaration Area);</li> <li>- The area immediately south of Development Block 4 and north of the Stage 1A basement groundwater retention wall system.</li> </ul> With reference to <b>Figure 2</b> , the Block 4 Remediation Area includes the area labelled as: <ul style="list-style-type: none"> <li>- Site Remediation Area; and</li> <li>- Excavation for stormwater diversion and remediation to address the EPA Declaration (where required).</li> </ul>
DECCW	NSW Department of Environment, Climate Change and Water (now Environment Protection Agency)
EPA Declaration Area	Remediation Site Declaration 21122 (formerly DECCW Declaration Area). Refer to <b>Figure 2</b> .
EPA	Environment Protection Authority
Ex-situ Remediation Methodology	Excavation of contamination followed by above-ground treatment on-site, then either off-site disposal of treated material or re-use on-site (where applicable).
Lend Lease	Lend Lease (Millers Point) Pty Limited
MSDS	Material Safety Data Sheets
PASS	Potential Acid Sulfate Soils are soils which contain iron sulfides or sulfidic material which have not been exposed to air and oxidised. The field pH of these soils in their undisturbed state is pH 4 or more and may be neutral or slightly alkaline; however, they pose a considerable environmental risk when disturbed.
PDA	Project Development Agreement
RAP	Remedial Action Plan
RE	Remediation Enclosure (also referred to as a Soil Treatment Area by <b>Figure 2</b> )
RWP	Remediation Works Plan
Site	Area required for the purpose of Development Application SSD 5897-2013-8 identified as: <ul style="list-style-type: none"> <li>- Block 4 Remediation Area</li> <li>- Any other areas of Barangaroo or Hickson Road required for staging and undertaking the remediation works and stormwater diversion.</li> </ul> Refer to <b>Figure 2</b>
Site Remediation Area	The part of Development Block 4 Remediation Area that is within the proposed basement groundwater retention wall system. Refer to <b>Figure 2</b> .

Term	Description
S-ESCO™	Surfactant Enhanced Ex-situ Chemical Oxidation® It is the process of using a catalyst, surfactant (to emulsify contamination) and oxidant (to chemically react with and destroy contamination) to treat contamination in extracted soil and groundwater. The soil is mixed with the treatment chemicals in a pugmill and then stockpiled for a period of time until the chemical reactions have been completed.
SPGWT	Separate Phase Gasworks Waste and Tar
SROH	significant risk of harm
VMP	Voluntary Management Proposal
WTP	Water Treatment Plant

## 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Lend Lease (Millers Point) Pty Limited (Lend Lease) to prepare a Waste Management Plan to accompany a Project Development Application (SSD\_5897-2013-8) for Barangaroo Block 4 Remediation and Land Forming Works to be submitted to the Minister for Planning pursuant to the arrangements of Part 4 of the *Environmental Planning and Assessment Act 1979*.

The Waste Management Plan has been prepared to respond to the Director-General's Requirements (DGRs) issued in respect of SSD 5897-2013-8 Remediation and Land Forming Works dated 20 May 2013, specifically DGR 3 Waste Management, as described in **Table 1**.

**Table 1 DGR 3 – Waste Management**

Requirement	Where Addressed in Document
<i>Provide details of the quantity and type of liquid and non-liquid waste generated, handled, processed or disposed of on-site. Waste must be classified according to the OEH Waste Classification Guidelines 2008.</i>	Section 4
<i>Provide details of the quantity, type and specifications for all output products proposed to be produced. The description should include the physical, chemical and biological characteristics (including contaminant concentrations) of those output products as well as relevant accredited standards against which the products would comply.</i>	Section 5
<i>Provide details of intended (or potential) end uses for output products and the relevant product standards used against which those products would be assessed.</i>	Sections 2, 4 and 5
<i>Provide details of the layout, the treatment process and the environmental controls of the proposal.</i>	Sections 2 and 5
<i>Provide details of liquid waste and non-liquid waste management, including:</i> <ul style="list-style-type: none"> <li>- <i>the transportation, assessment and handling of waste arriving at or generated at the site;</i></li> <li>- <i>any stockpiling of wastes or recovered materials at the site;</i></li> <li>- <i>any waste processing related to the proposal, including reuse, recycling, reprocessing or treatment both on- and off-site;</i></li> <li>- <i>the method for disposing of all wastes or recovered materials;</i></li> <li>- <i>the emissions arising from the handling, storage, processing and reprocessing of waste; and</i></li> </ul> <i>the proposed controls for managing the environmental impacts of these activities.</i>	Section 5 Section 5 Section 2 Sections 4 and 5 Sections 2 and 5 Sections 2 and 5
<i>Provide details of spoil disposal (if applicable) with particular attention to:</i> <ul style="list-style-type: none"> <li>- <i>the quantity of spoil material likely to be generated;</i></li> <li>- <i>proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil;</i></li> <li>- <i>the need to maximise reuse of spoil material in the construction industry;</i></li> <li>- <i>identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material; and</i></li> </ul> <i>designation of transportation routes for transport of spoil.</i>	Section 4 Section 5 Section 3 Section 2 Section 5
<i>Provide details of procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of, in addition to the requirements for liquid and non-liquid wastes.</i>	Sections 2 and 5
<i>Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.</i>	Section 2

In addition, AECOM considered the “waste management” issues raised by DECCW (now EPA) in its MP 10\_0023 submission letter dated 12 August 2010 in the context of SSD 5897-2013-8 as relevant.

The DECCW Recommended Conditions of Approval for MP 10\_0023 are reproduced in **Table 2**, and reference to where the relevant conditions are addressed in this document is provided.



Table 2 DECCW Recommended Approval Conditions MP 10\_0023 - Waste

Condition	Where Addressed in Document
<b>The Waste Management Plan must include (but not be limited to):</b>	
<p>1. A stockpile, contamination soil and sediment management plan including (at a minimum):</p> <p>a) The exact locations where contaminated waste material (including Acid Sulphate Soils) and non-contaminated waste material will be stockpiled. Contaminated and non-contaminated waste material must be stockpiled separately and the designated areas must be clearly marked and labelled (on the plans and on the ground);</p> <p>b) Details of how stockpiled contaminated waste material will be kept separate from non-contaminated waste material;</p> <p>c) Details of how runoff from stockpiled contaminated waste material will be kept separate from non-contaminated runoff;</p> <p>d) Details of measures to be employed to manage leachate runoff from all stockpiles, including bunding, sediment ponds and hay bales. The Plan should include locations of each control measure, its specifications and its capacity to cope with runoff from a designed storm event (to be determined in consultation with DECCW);</p> <p>e) The maximum proposed heights and volumes for each stockpile to reduce the potential for dust and odour and greater detail on stockpile stabilisation and covering to minimise odour and vapour emissions;</p> <p>f) Procedures for minimising the movement of waste material around the site and double handling; and</p> <p>Additional information detailing how materials proposed to be recycled / reused will be segregated on the site during operations. Particularly in relation to those wastes categorised as "Building" waste.</p>	<p>Section 5</p> <p>Section 5</p> <p>Section 5</p> <p>Section 5</p> <p>Section 5</p> <p>Section 5</p> <p>Section 6</p>
2. A detailed plan for in situ classification of waste material, including the sampling locations and sampling regime that will be employed to classify the waste, particularly with regards to the identification of 8 contamination hotspots.	Section 2
3. A commitment to retaining all sampling and classification results for the life of the project to demonstrate compliance with DECCW's Classification Guidelines.	Section 5
<p>4. Details in relation to the "Concrete Crushing and Screening Plant" to be installed at the site and its use, including (at a minimum):</p> <p>a) Location and specifications of the concrete crushing and screening plant;</p> <p>b) Estimated quantities of concrete to be crushed per day;</p> <p>c) Measures that will be employed to prevent or minimise the emission of dust from the crushing activity; and</p> <p>Measures that will be employed to prevent or minimise the emission of noise from the crushing activity.</p>	Not proposed as part of SSD 5897-2013
<p>5. Details in relation to the transport of waste material around the site (on-site) and from the site, including (at a minimum):</p> <p>a) A traffic plan showing transport routes from the southern to the northern end of the site;</p> <p>b) Location of the stockpiles at each stage as they migrate from the southern end of the site to the northern end of the site;</p> <p>c) Details of any garden waste mulching processes and garden waste stockpiles, including considerations for odour generation;</p> <p>d) A commitment to retain waste transport details for the life of the project to demonstrate compliance with the POEO Act; and</p> <p>The name and address of each licensed facility that will receive waste from the Barangaroo site (if appropriate);</p>	<p>Section 6</p> <p>Section 5</p> <p>Section 5</p> <p>Section 6</p> <p>Appendix B</p>
6. Details of the de-watering process, including the specifications for any on-site water treatment plant.	Sections 2 and 5
7. A contingency plan for any event that may affect excavation and contaminated soil treatment operations at the site, particularly in relation to the expected volumes of materials excavated/generated at the site.	Refer to the RAP (AECOM, 2013d)

## 1.1 Barangaroo

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half); the Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development dominated by large CBD commercial tenants.

The 22 ha Barangaroo site is roughly rectangular in shape and has frontage to the harbour foreshore of 1.4 km. Hickson Road delineates the eastern boundary.

The NSW Government held an international urban design competition for the site in 2005 and the winning entry was used as the basis for the original Barangaroo Concept Plan which was approved in February 2007 and sets out the urban design and policy initiatives to be employed in the redevelopment of the site.

The Concept Plan (as modified) is the statutory planning approval to guide the urban renewal of Barangaroo and currently provides for the development of mixed use precinct comprising commercial, retail, residential and community development and new public open space / public domain.

The Barangaroo Delivery Authority is the state government authority that manages and delivers the development of Barangaroo.

Lend Lease has been appointed by the Barangaroo Delivery Authority as the Proponent to undertake the development for Barangaroo South. Lend Lease has also been contracted by the Barangaroo Delivery Authority to undertake remediation of Block 4 of Barangaroo which includes part of the EPA Declaration Area.

## 1.2 EPA Declaration Area (#21122)

In May 2009, the NSW Environment Protection Authority (EPA) determined that a portion of land at Millers Point (part of the Barangaroo Site and an adjacent portion of Hickson Road), was contaminated in such a way as to present a significant risk of harm (SROH) to human health and the environment. As a consequence the EPA declared the area to be a remediation site (Declaration Number 21122; Area Number 3221) under the Contaminated Land Management Act 1997.

The Remediation Site Declaration 21122 indicates that the area of the Declaration coincides with the known footprint of the former Millers Point gasworks facilities. This area is located on part of Barangaroo and part of Hickson Road adjacent to Barangaroo.

In accordance with Declaration Number 21122, the Declaration Area comprises:

- Part Lot 5 and Part Lot 3 DP 876514, Hickson Road, Millers Point, NSW 2000.
- Part of Hickson Road adjacent to:
  - 30-34 Hickson Road (Lot 11, DP1065410)
  - 36 Hickson Road (Lot 5, DP873158)
  - 38 Hickson Road (SP72797) Millers Point

Refer **Figure 2** for location of the Declaration Area as gazetted by the NSW EPA.

The Barangaroo Delivery Authority has entered into a Voluntary Management Proposal (VMP) with the EPA associated with EPA Declaration Area (Approval No. 20101719). Phase 1 of the VMP involves investigative works and undertaking remedial design to determine and obtain agreement on a proposed remediation methodology. Phase 2 of the VMP (to be finalised following Phase 1) will involve the implementation of the agreed remediation works.

An independent, EPA-accredited Site Auditor has been appointed to undertake review of proposed remediation works, and prepare statutory audit statements prior to and following completion of remediation.

## 1.3 Summary Site History and Key Contaminants

The Millers Point gasworks operated on the Declaration Area between 1840 and 1921 (**Figure 2**). The Site has subsequently been used for various activities, but predominantly a commercial port facility and public road.

When EPA declared parts of Barangaroo and Hickson Road a "Remediation Site", it described the nature of contamination as gasworks waste, with the following particular substances: polycyclic aromatic hydrocarbons (PAHs); benzene, toluene, ethylbenzene and total xylenes (BTEX); total petroleum hydrocarbons (TPH); ammonia and cyanide.

The Remedial Action Plan (RAP) (AECOM, 2103c) provides more specific details regarding the type, magnitude and location of ground contamination as identified in previous site investigations.

## 1.4 Definition of the Site

For the purposes of Development Application SSD 5897-2013, the Site (refer to **Figure 2**) includes the area of land to be remediated (the Block 4 Remediation Area) plus any adjacent land used for the staging and undertaking of the proposed remediation works and proposed stormwater diversion. The Block 4 Remediation Area includes: Development Block 4 (both within and outside the EPA Declaration) and the area immediately south of Development Block 4 and north of the Stage 1A basement groundwater retention wall system. With reference to **Figure 2**, the Block 4 Remediation Area includes the areas labelled as: 'Site Remediation Area'; and 'Excavation for stormwater diversion and remediation to address the EPA Declaration (where required)'.

Development Application SSD 5897-2013 seeks approval for:

- Remediation of the Block 4 Remediation Area such that the EPA Declaration can be revoked (here-in referred to as the Block 4 VMP Remediation Works). It should be noted that areas of the EPA Declaration Area that are outside the Block 4 Remediation Area (i.e. Block 5 and Hickson Rd) will be the subject of separate development applications;
- Construction of a basement groundwater retention wall system within part of the Block 4 Remediation Area (refer to **Figure 2**);
- Remediation within the perimeter of the basement groundwater retention wall for future development use (here-in referred to as the Block 4 Development Works);
- Diversion/augmentation of stormwater drainage infrastructure within the proposed basement groundwater retention wall system and to the south of the proposed basement groundwater retention wall and north of the existing Stage 1A basement; and
- Bulk excavation.

## 1.5 Remedial Action Plan

The proposed remediation of the Site is detailed in the RAP (AECOM, 2013c). The RAP (AECOM, 2013c) details the remediation works required to enable the NSW EPA's declaration to be revoked from the Block 4 Remediation Area and to enable future development of the area within the proposed basement groundwater retention wall system (the Site Remediation Area, refer to **Figure 2**). To this end, the RAP (AECOM, 2103c) describes the extent of remediation required, and the validation testing and monitoring to be undertaken to confirm completion of remediation works.

The RAP (AECOM, 2013c) also addresses remediation of Block 5 and Hickson Road (which will be the subject of separate Development Applications).

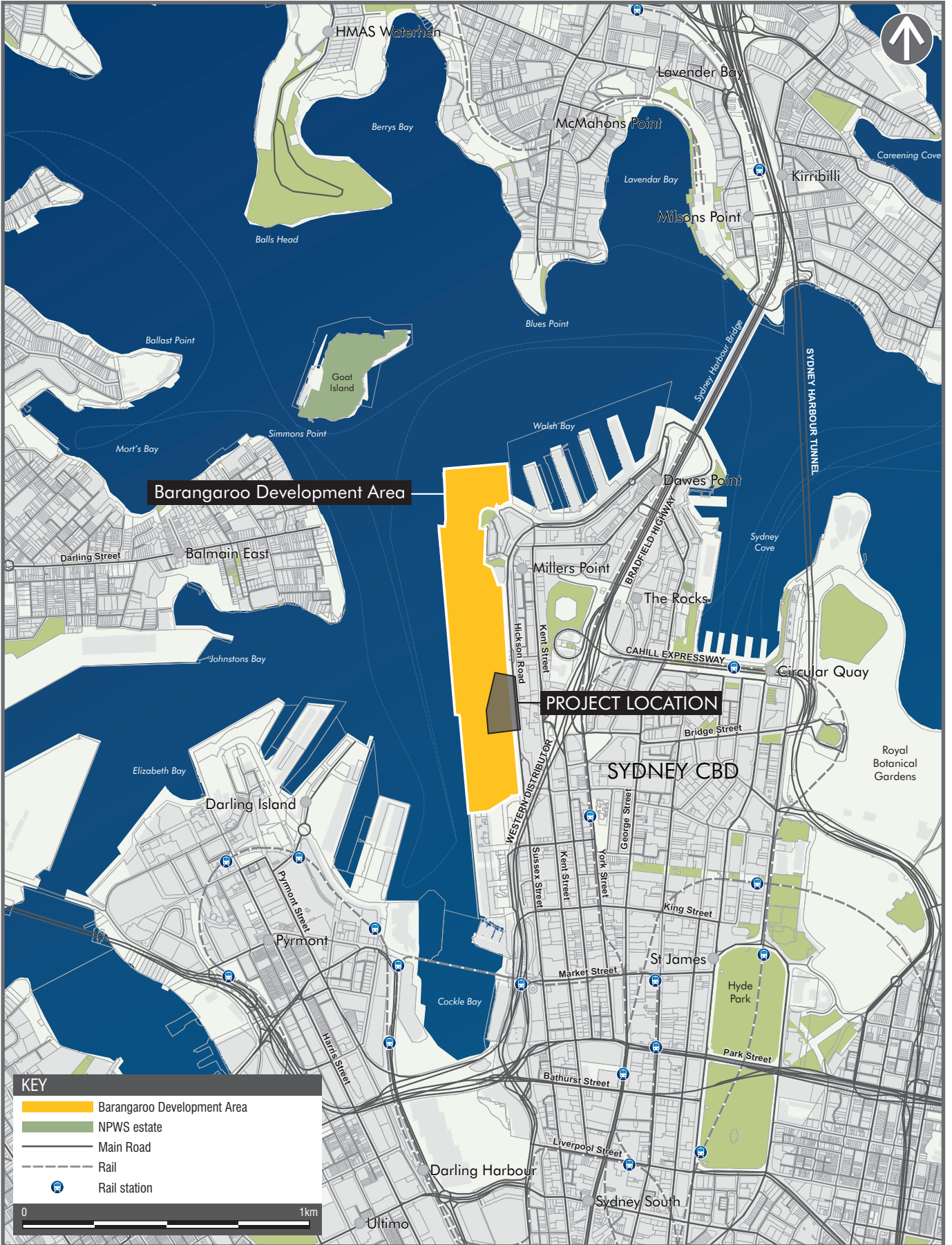
The proposed remediation methodology is ex-situ methodology within the Block 4 Remediation Area.

The proposed works also include the augmentation and diversion of existing stormwater drainage infrastructure within the Site. This will involve decommissioning existing pipes and the construction of a new pipe network and associated water treatment system to connect to the existing Sydney Water Pipeline in the western part of the Site.

### 1.5.1 Separate Phase Gasworks Waste and Tar

For the purposes of this report, and as referred to in the RAP, gasworks related contaminated materials will be referred to as Separate Phase Gasworks Waste and Tar (SPGWT) which includes the following materials:

- Tar Containing Materials (TCM), as per the following definition:
  - greater than 10% visible coal tar (where coal tar is a phase separated hydrocarbon by-product from coal gasification); and/or
  - contaminant concentrations exceeding the following limits:
    - Polycyclic Aromatic Hydrocarbons (PAHs) - 2,000 mg/kg; or
    - Benzo(a)pyrene (B[a]P) - 150 mg/kg.
- Dense Non Aqueous Phase Liquids (DNAPLs).



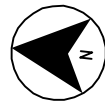
G:\Projects\602 Projects\60247139 Barangaroo\FIGURES\Waste Management Plan\60247139 F1 Barangaroo Site Location 11.10.2012.TO



**BARANGAROO SITE LOCATION**  
 Waste Management Plan  
 Barangaroo - Hickson Road  
 Millers Point, New South Wales

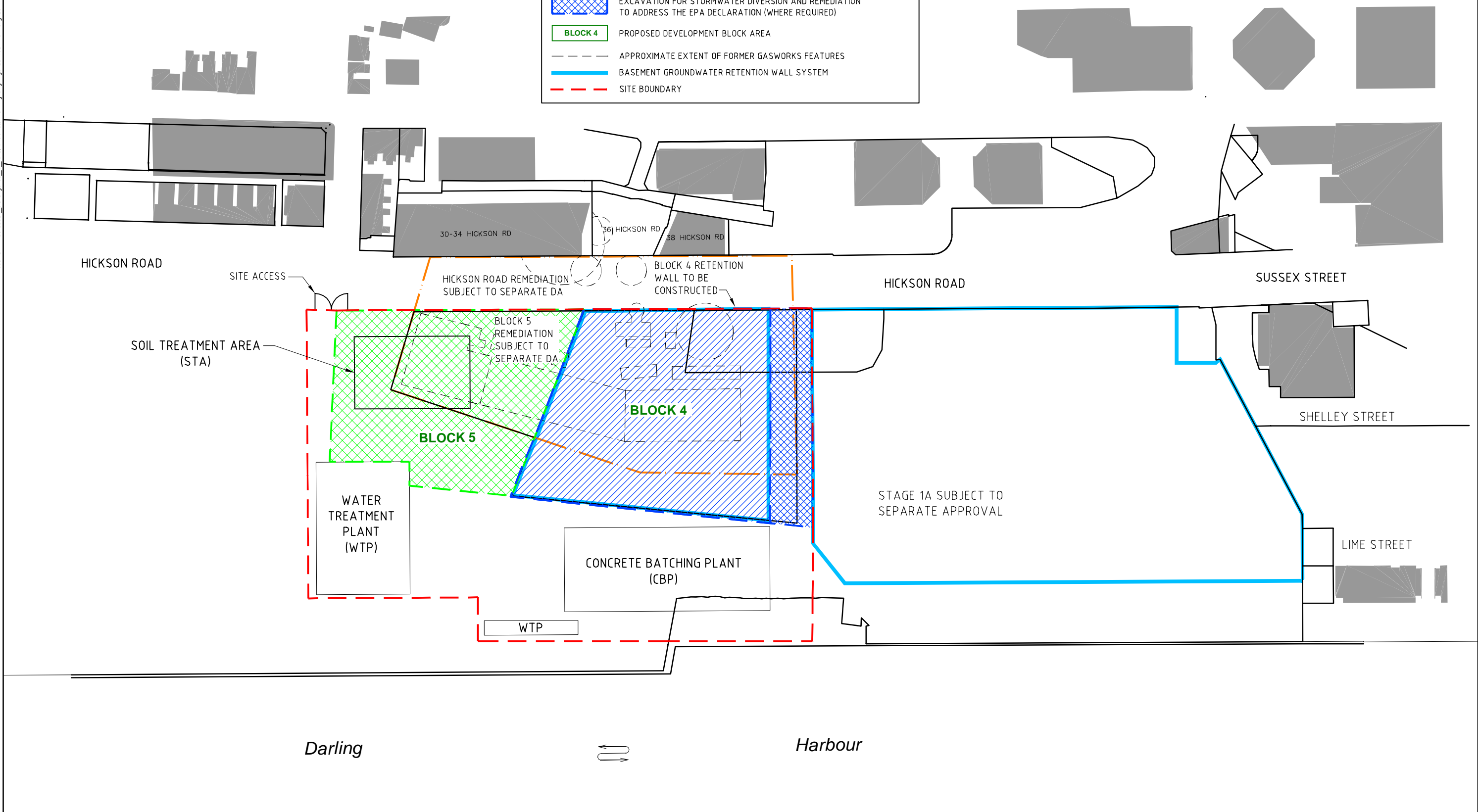
**FIGURE 1**





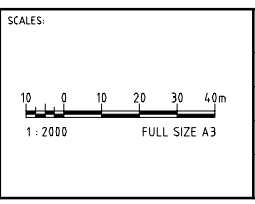
**LEGEND:**

- DECLARATION AREA
- SITE REMEDIATION AREA
- INDICATIVE EXTENT OF LOGISTICS, STORAGE AND DECONTAMINATION AREA (THIS AREA WILL INCLUDE MINOR EXCAVATION BUT WILL EXCLUDE REMEDIATION WORKS)
- EXCAVATION FOR STORMWATER DIVERSION AND REMEDIATION TO ADDRESS THE EPA DECLARATION (WHERE REQUIRED)
- BLOCK 4** PROPOSED DEVELOPMENT BLOCK AREA
- APPROXIMATE EXTENT OF FORMER GASWORKS FEATURES
- BASEMENT GROUNDWATER RETENTION WALL SYSTEM
- SITE BOUNDARY



This drawing is confidential and shall only be used for the purposes of this project.

REVISIONS				
No.	BY	DATE	DESCRIPTION	APPD
05	PAS	01.10.13	ISSUED FOR FINAL REPORT	DM
04	PAS	30.08.13	ISSUED FOR FINAL REPORT	MAJ
03	PAS	19.07.13	ISSUED FOR FINAL REPORT	DM
02	TR	11.01.13	ISSUED FOR FINAL REPORT	DM
01	TT	15.10.12	DRAFT ISSUED	DM



THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED	KP	CHECKED	
DRAWN	PAS	CHECKED	
APPROVED	DM	DATE	15.10.12



DESIGNER: **AECOM**

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

CLIENT:

**WASTE MANAGEMENT PLAN, BARANGAROO**

**FIGURE 2:  
EPA DECLARATION AREA AND  
SITE REMEDIATION AREA**

STATUS: <b>FINAL</b>	DRAWING NO: <b>60247139-DRG-20-WMP-F2</b>	REV: <b>05</b>
----------------------	---	----------------

## 1.6 Objectives of this Plan

This Waste Management Plan has been prepared in accordance with Lend Lease's overall environmental requirements and the requirements of the NSW *Protection of the Environment Operations Act 1997* (POEO Act), the NSW *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) and the National Waste Minimisation and Recycling Strategy. In all its on-site activities, Lend Lease will undertake initiatives to target elimination of the creation of waste and to use recycling and reuse procedures to reduce the amount of waste being directed to landfill.

The specific objectives of the waste management processes outlined in this Waste Management Plan are as follows:

- to avoid whenever possible, and to minimise and/or reduce at all other times, the generation of wastes;
- to maximise recycling of "general" classed waste generated, thus minimising waste sent to landfill;
- to follow the preferred waste-reduction hierarchy of avoidance/reduction, re-use, recycle, treat and dispose;
- to attain local, State and Commonwealth waste minimisation legislation and environmental standards; and
- to prevent pollution and damage to the environment.

The remediation works propose to utilise the services of specialist contractors. Details of the proposed remediation works are provided in the Development Application SSD 5897-2013-8, which includes the Construction Management Plan (CMP) to be prepared for the works, which can be read in conjunction with this report.

The proposed remediation works have been detailed in the RAP (AECOM, 2013c) for the Site.

## 2.0 Project Description

The Development Application seeks approval to remediate the Block 4 Remediation Area; part of which has been declared by the EPA as part of a remediation site under the *Contaminated Land Management Act 1997*. Refer also to **Section 1.4**. It is noted that remediation of the remaining parts of the EPA Declaration Area (Block 5 and Hickson Road) will be subject to separate DAs.

The Development Application proposes ex-situ methodology within Block 4.

The works proposed also include the augmentation and diversion of existing stormwater drainage infrastructure within the Site, involving decommissioning existing pipes, and construction of a new pipe network and associated water treatment to connect to the existing Sydney Water Pipeline in the western part of the Site.

For the purposes of this plan, reference to remediation works includes stormwater diversion works on the Site.

This Waste Management Plan provides the processes to be followed during remediation. The staging, infrastructure and chemical requirements of the remediation process are detailed in the following sections.

### 2.1 Block 4 Remediation Area – Ex-situ Remediation

Work on the Block 4 Remediation Area will involve the installation of a perimeter basement groundwater retention system (refer to refer to **Figure 2**) to manage groundwater infiltration from the proposed bulk excavation. The groundwater control and retention walls are subject to further design development, but are expected to vary in construction detail and in width up to approximately 1 m. The groundwater control and retention walls are expected to be filled with materials such as bentonite, concrete and steel reinforcement bars, and keyed into to the underlying bedrock (all subject to design development).

The majority of fill material requiring excavation (and remediation) is located in the eastern portion of the Block 4 Remediation Area where the fill material is relatively shallow (i.e. generally shallower than 10 m below ground level [bgl]). The depth to bedrock in the western portion of the Block 4 Remediation Area is in the order of 16 m bgl.

Materials excavated from the Block 4 Remediation Area would comprise heterogeneous fill materials, soil, and bedrock. Materials would typically be excavated using dozers and hydraulic excavators and loaded to trucks by front end loaders and hydraulic excavators. Material would generally be classified *in-situ* to determine whether it requires treatment or is suitable for reuse without treatment.

The three material types likely to be formed during the excavation process under Development Application SSD 5897-2013-8 are as follows:

- **Material not requiring treatment** (for landfill disposal), which may be:
  - reused on other parts of the Barangaroo site where possible (subject to compliance with the applicable criteria), or
  - transported off-site for reuse under a waste exemption approved by the EPA, and/or
  - disposed off-site to a licensed landfill (as general solid waste or restricted solid waste).
- **Material requiring treatment**, which would be transferred to the Remediation Enclosure (RE) and associated Emission Control System (ECS) (refer to the RAP [AECOM, 2013c]), or transported directly off-site to a licensed treatment facility. For the option of on-site treatment, the treatment works will either involve stabilisation/solidification of the fill materials or Ex-situ Chemical Oxidation (for example S-ESCO™). Both technologies would be implemented using a pug mill located within the RE.

The treated material may then be:

- Transported (as applicable) offsite for reuse by others under a separate approval or waste exemption approved by the EPA; or
  - Transported (as applicable) for reuse on other parts of Barangaroo site (subject to compliance with the applicable criteria) under a separate Development Application; and/or
  - disposed off-site to licensed landfill under Development Application SSD 5897-2013.
- **Highly contaminated material (referred to as ‘Separate Phase Gasworks Waste and Tar’ [SPGWT])** will be treated in the RE on-site or transported directly off-site to a licensed treatment facility before being either:

- stabilised and disposed of at an appropriately licensed landfill, as part of Development Application SSD 5897-2013; or
- treated on-site under S-ESCO™ as part of Development Application SSD 5897-2013 and:
  - transported (as applicable) for reuse on other parts of the Barangaroo site (subject to compliance with the applicable criteria) under a separate Development Application; or
  - transported for off-site for reuse by others under a separate approval or waste exemption approved by the EPA; and/or
  - disposed off-site to an appropriately licensed landfill under Development Application SSD 5897-2013.

## 2.2 Infrastructure and Chemical Details

If on-site treatment is undertaken, the on-site temporary RE will be established adjacent to the Block 4 Remediation Area prior to the commencement of remediation excavation works (note that the RE is also referred to as the Soil Treatment Area by **Figure 2**). The RE shall be generally constructed of impervious material creating a seal between the internal and external atmosphere.

Temporary RE's are proposed to be constructed to span each excavation (where practicable) to minimise the release of malodorous and potentially harmful emissions during treatment and remediation excavation operations. This structure is referred to as the 'Excavation Enclosure' in the RAP (AECOM, 2013d). RE filtration systems will be designed to reduce emissions to concentrations compliant with the relevant environmental standards and/or approved site emission criteria, and will primarily comprise of a granular activated carbon (GAC) filter with particulate pre-filters.

Surface slab demolition will be undertaken in a staged manner to maximise utilisation of current hardstand areas to reduce the extent of exposed surfaces. The temporary remediation work area and RE's may be modular in design to enable progressive excavation of the contaminated materials. The final design and configuration of all temporary soil treatment and RE's and all associated plant and equipment, will be subject to further design development.

Structure dimensions have been developed based on three primary goals:

- 1) Cover and isolate potentially odorous works areas;
- 2) Ensure adequate size to facilitate production rates sufficient to maintain the remediation works program; and
- 3) Encapsulate a volume of air able to be reasonably ventilated and filtered.

RE's will be constructed of impervious material and include stormwater interception devices.

### Stabilisation

**Table 3** provides a list of the Dangerous and Hazardous Goods (chemicals) that would be required for on-site Ex-situ treatment via stabilisation of soil and groundwater in the Site.

**Table 3 Indicative Stabilisation On-site Chemical Register**

Substance	Hazardous material	Class	Form	Indicative Amount	Storage Location	Concentration	Total Required for Remediation
Cement	Y	--	Dry powder	125-150 tonnes	Within and outside RE	100%	10,000-15,000 tonnes
Hydrated Lime	Y	--	20 mm granules	10 tonnes	Outside RE	100%	800 tonnes
Aglime	N	--	Dry powder	10 tonnes	Outside RE	100%	800 tonnes
Diesel	Y	3	Liquid	Up to 2000L	Tanks/ Drums	N/A	Up to 500,000L
Petrol	Y	3	Liquid	Up to 1000L	Tanks/ Drums	N/A	Up to 250,000L



### Ex-situ Chemical Oxidation (for example S-ESCO™)

**Table 4** provides a list of the Dangerous Goods (chemicals), their classification information, relative amounts, transport and storage locations that would be required for on-site Ex-situ treatment via S-ESCO™ of soil. The *Preliminary Hazard Analysis* prepared for the proposed remediation and land forming works (AECOM, 2013a) details the handling, storage and transport requirements for these Dangerous Goods.

**Table 4 S-ESCO™ On-site Chemical Register**

Chemical	UN No.	Class	Packing Group	Form	Indicative Amount	Storage Location	Concentration	Indicative Total Required for Remediation
VeruSOL® / VerEX® (surfactant)	2319	3	III	Liquid	3,000 kg	55 gallon (208 L) drums (x 15)	Pure VeruSOL® / VerEX®	140,200 kg
Hydrogen Peroxide	2014	5.1	II	Liquid	16,000 L	10,000 L poly tanks	50%	1,194,100 L
Sodium Persulfate	1505	5.1	III	Dry powder	19,000 kg /delivery	Dry storage	--	450,000 kg
				Batched liquid	~ 3,000-5,000 L batched	10,000 L tanks	34%	
Sodium Hydroxide	1823	8	II	Liquid	12,700 kg (10,000 L)	10,000 L tank	25%	360,000 L
Iron Chloride to prepare GnA solution	--	--	--	Dry powder	320 kg	Dry storage	--	29,300 L (GnA 0.66 mM solution)
				Batched liquid		55 gallon (208 L) drums (x 4)	42%	

#### 2.2.1 Schedule

The indicative duration of the Block 4 ex-situ remediation is 28 months. It is important to note that the schedule is subject to detailed remediation design development, works staging and required approvals.

### 2.3 Water Treatment

Groundwater flowing into the excavations made during ex-situ remediation options, as well as groundwater removed as part of dewatering operations will be pumped via a dewatering system to an on-site water treatment plant located to the north west of the Block 4 Remediation Area.

#### Water Treatment Plant

All additional sources of contaminated water, including dewatering of treated materials within the RE structure, wheel-wash water and water used in the decontamination of plant and machinery, would similarly be pumped to the on-site extracted groundwater treatment plant for processing prior to disposal.

The on-site extracted groundwater treatment plant is expected to consist of an oil/water separator, clarifier, sludge thickener and settlement/balance tanks. The maximum estimated flow rate of the on-site extracted groundwater treatment plant is expected to treat in the order of 105 litres per second, with an average flow rate of 90 L/s throughout a 24 hour period, though the exact size and running capacity of the plant may be subject to change based on selected works staging.

As the total volume of treated water may exceed 100 megalitres/year, the works can be undertaken in accordance with an Environment Protection Licence (EPL) issued by the EPA for the water treatment works. Appropriate licences/permits would also be gained for the discharge of the treated water to the local stormwater system, which discharges into Sydney Harbour. The Barangaroo Delivery Authority (BDA) has an existing EPL (13336) which permits contaminated groundwater treatment and discharge in accordance with the Licence conditions.

**Table 5** provides a list of the Dangerous and Hazardous Goods (chemicals), their classification information, relative amounts and storage locations that will be used within the on-site extracted groundwater treatment plant at any given time during the proposed remediation and land forming works.

The final design, process and configuration of the on-site extracted groundwater treatment plant will be the subject of further design development.

**Table 5 Indicative Water Treatment On-site Chemical Register**

Expected Substance	Hazardous material	Class	Form	Indicative Amount	Storage Location	Concentration
Acid	Y	8	Liquid	up to 2 tonnes	IBCs in WTP DGs storage area	98%
Flocculent	Y	-	Dry powder	up to 2 tonnes	IBCs in WTP DGs storage area	83-85%
Coagulant	N	-	Liquid	up to 2 tonnes	IBCs in WTP DGs storage area	100% polymer
Hydrogen Peroxide	Y	8	Liquid	up to 2 tonnes	IBCs in WTP DGs storage area	50 %

## 3.0 Legislative Requirements

### 3.1 Legislation, Regulation and Guidelines

Key legislation relevant to waste management in NSW includes:

- *Environmental Planning and Assessment Act 1979;*
- *Protection of the Environment Operations Act 1997;*
- *Waste Avoidance and Resource Recovery Act 2001;*
- *Environmentally Hazardous Chemicals Act 1985;*
- *Dangerous Goods (Road and Rail Transport) Act 2008;*
- *Environmental Planning and Assessment Regulation 2000;*
- *Protection of the Environment Operations (Waste) Regulation 2005;* and
- *Protection of the Environment Operations (General) Regulation 2009.*

#### 3.1.1 Waste Classification Guidelines

Appropriate reference is made throughout this Waste Management Plan to the *Waste Classification Guidelines* (DECCW, 2009). The Guidelines reflect current waste management legislation, specifying requirements for the storage, handling and disposal of certain types of waste, the classification of waste and the environmental obligations for licensed and non-licensed premises.

#### 3.1.2 NSW Government's Waste Reduction and Purchasing Policy

The Waste Reduction and Purchasing Policy (WRAPP) requires all State agencies to develop a Waste Reduction and Purchasing Plan to demonstrate procedures to minimise waste generation in four areas: paper products, office equipment and components, vegetation, and construction and demolition material. It also requires priority to be given to purchasing items with recycled content and the recycling of certain wastes. The main aim of WRAPP is to reduce waste into the State's landfills.

This Waste Management Plan is based on similar principles to the WRAPP.

#### 3.1.3 NSW EPA "Construction and Demolition Waste Reduction Action Plan"

This plan contains a comprehensive program of steps to divert construction and building waste from landfill through reduction, recycling and minimisation principles.

It is the aim of this plan to align waste management for the Project construction with the principles of this plan.

#### 3.1.4 NSW Government's Waste Hierarchy

The Waste Hierarchy describes an approach to waste management to ensure the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of environmentally sustainable development (ESD).

The following hierarchy for managing waste, from most desirable to least desirable includes:

- avoid unnecessary resource consumption;
- recover resources (including reuse, reprocessing, recycling and energy recovery); and
- dispose (as a last resort).

It is on these principles that this Waste Management Plan also rests.

## 4.0 Waste Types and Sources

### 4.1 Waste Types and Characteristics

The following types of waste are considered within this Waste Management Plan:

- impacted soils (i.e. potentially contaminated and/or treated soils removed from site, including sediment collected from sediment control devices);
- process wastes, including hazardous materials;
- Virgin Excavated Natural Material (VENM) and Treated Potential acid sulfate soils (PASS);
- VENM bedrock;
- groundwater (including treated groundwater, by-products and wastes);
- stormwater; and
- general refuse.

The characteristics of the above waste types may be any of the following:

- Inert;
- Volatile;
- Toxic;
- Corrosive; and/or
- Ignitable.

The types and sources of waste to be generated are listed in **Sections 4.2** and **4.3**.

**Tables 5 to 8** quantify the wastes identified and provide a preliminary classification (classification will be confirmed based on testing of waste materials, as appropriate) in accordance with the *Waste Classification Guidelines Part 1: Classifying Waste* (DECCW, 2009). A bulking factor of 30% has been assumed for all excavated material.

### 4.2 Waste Sources

#### 4.2.1 General Wastes

General waste and recyclables sources that are expected to be generated on-site during treatment are estimated in **Table 6**.

Table 6 General Wastes

Source / Activity	Indicative Waste Types	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
Site Office and Work site Wastes / Recyclables	Domestic wastes and organic food scraps	Up to 2 x 240 litre Mobile Garbage Bins (MGB) / week	General Solid Waste (putrescible)	Dispose to landfill
	Potentially recyclable containers – glass / plastic / cans	Up to 2 x 240 litre MGBs / week	General Solid Waste (non-putrescible)	Recycle
	Plastic wrapping, assorted non-recyclable containers and packaging	Up to 2 x 240 litre MGBs / week	General Solid Waste (non-putrescible)	Recycle
	Paper /cardboard and other office based recyclables	Up to 2 x 240 litre MGBs / week	General Solid Waste (non-putrescible)	Recycle
	Printer Cartridges	As required (minimal quantities expected)	Hazardous waste	Recycle
	Decommissioned sediment control devices, etc.	Up to 1 x skip bins / month	General Solid Waste (non-putrescible)	Dispose to landfill
	Miscellaneous work site wastes (cables, parts, etc.)	Up to 1 x skip bins / month	General Solid Waste (non-putrescible)	Dispose to landfill
	Domestic sewage (port-a-loos)	As required	Liquid waste	Contractor collection/disposal
Chemical Storage, Use and Management, Environmental Management	Drums and containers (empty, containing no residue)	As required	General Solid Waste (non-putrescible)	Recycle
	Waste oil, grease, lubricants	As required	Liquid waste	Recycle
	Oily rags and filters	As required	General Solid Waste (non-putrescible)	Dispose to landfill
	Used spill management materials e.g. absorbent pads / booms from potential water pollution hydrocarbon incidents, used absorbent materials used to mop up spills	As required	General Solid Waste (non-putrescible)	Dispose to landfill
	Contaminated material collected in sediment control devices	As required	Treated material (to be re-used on-site) *	Dispose to landfill
	Used containment devices and plastic spoil covers	As required	General Solid Waste (non-putrescible)	Dispose to landfill
	Scrap timber / scrap metal	As required	General Solid Waste (non-putrescible)	Recycle

Source / Activity	Indicative Waste Types	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
	Sediment fences	As required	General Solid Waste (non-putrescible)	Dispose to landfill
Demolition waste	Asbestos	As required	Special Waste	Disposed to licensed landfill (trackable)
	Soil / footings / concrete (contaminated)	As required	General Solid Waste (non-putrescible)	Stabilised material to be removed off-site to landfill (trackable)
	Bricks / concrete / steel (uncontaminated)	As required	General Solid Waste (non-putrescible)	Recycle
Spoil generated during excavation for stormwater works	Soil / rock (contaminated / potentially with asbestos)	3,532 m <sup>3</sup>	Treated material (to be re-used on-site)* or disposed off-site as General Solid Waste (non-putrescible) or Special Waste (asbestos) if contaminated with asbestos	Potential reuse as fill on the Barangaroo Site (excluding Headland Park) or Treated material to be removed off-site and disposed to landfill (trackable)
	Concrete / asphalt / steel (not contaminated)	150m <sup>3</sup>	General Solid Waste (non-putrescible)	Recycle

\* For materials not considered waste and therefore not subject to EPA Waste Classifications Guidelines (2009).

#### 4.2.2 Block 4 VMP Remediation Works

Wastes likely to be generated during the ex-situ remediation Block 4 VMP Remediation Works (refer to **Section 1.4**) based on the requirements of the RAP (AECOM, 2013c) are quantified in **Table 7**.

**Table 7 Excavated Waste resulting from VMP Remediation Works**

Source / Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
Demolition of hardstand	Concrete / asphalt (not contaminated)	2,100 m <sup>3</sup>	General Solid Waste (non-putrescible)	Recycle
Excavate to extent for VMP Remediation Works (up to 10m bgl)	Soil (not requiring treatment for landfill disposal)	26,000 m <sup>3</sup>	Likely General or Restricted Solid Waste if off-site disposal is required	Potential reuse as fill on the Barangaroo site (subject to compliance with applicable criteria) or off-site disposal to landfill or off-site disposal under an EPA waste exemption.
	Soil (requiring treatment for landfill disposal)	7,000 m <sup>3</sup>	Likely Hazardous Waste requiring treatment under an Immobilisation Approval as per RAP (AECOM, 2013c)	Treated material to be disposed off-site to landfill (trackable).
	Soil (TCM highly contaminated - requiring treatment for landfill disposal)	8,000 m <sup>3</sup>	Restricted Waste following treatment as per RAP (AECOM, 2013c)	Treated material to be disposed off-site to landfill (trackable).
	PASS	Unknown	Virgin excavated natural	Disposed under water

Source / Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
			material (VENM) PASS	within 24hrs at a licensed landfill
			Treated material (to be re-used on-site) or disposed off-site	Treated on-site and reused as fill or disposed off-site
Odour filtration system	Filters	Two filters every 2-3 months	General Solid Waste (non-putrescible)	Dispose to landfill

#### 4.2.3 Additional Excavation of Block 4 Development Works

Estimates of additional wastes likely to be generated during the further excavation of fill for the Block 4 Development Works (refer to **Section 1.4**) based on an indicative Block 4 basement depth of up to 18 m bgl are presented in **Table 8**. This additional fill in Block 4 (above that already removed to address the EPA Declaration as part of the Block 4 VMP Remediation Works) that will be excavated to accommodate the area of the future basement.

**Table 8 Additional Excavation Waste – Block 4 Development Remediation Works**

Source / Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
Additional excavation of fill to create future basement at Block 4 (up to 18m bgl in areas outside VMP Remediation Works)	Soil / concrete / asphalt (not requiring treatment for disposal to landfill)	Up to 110,000 m <sup>3</sup>	Likely General or Restricted Solid Waste if off-site disposal is required	Potential reuse as fill on the Barangaroo site (subject to compliance with applicable criteria) or off-site disposal to landfill or offsite disposal under an EPA waste exemption
	PASS	Unknown	VENM PASS or Treated material *	Disposed within 24hrs at a licensed landfill as VENM PASS or treated on-site and potentially reused as fill on the Barangaroo site
Odour filtration system	Filters	Two filters every 2-3 months	General Solid Waste (non-putrescible)	Dispose to landfill

\* Not waste, therefore not subject to EPA Waste Classifications Guidelines (2009).

#### 4.2.4 Liquid Treatment

Liquid wastes likely to be generated during remediation are quantified in **Table 9**.

**Table 9 Liquid Waste**

Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
Potentially contaminated stormwater or other potentially contaminated water, after appropriate	Trackable liquid wastes (contaminated stormwater, wheel wash and decontamination)	240,000 L	Liquid waste	Treat and discharge in accordance with EPL or Trade Waste Permit, or dispose off-site

Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
treatment	water)			
Contaminated groundwater extraction – Block 4	Trackable liquid wastes	~2,500,000 L	Liquid waste	Treat and discharge in accordance with EPL or Trade Waste Permit, or dispose off-site



## 5.0 Waste Management and Reuse

The key issues with respect to waste management that are addressed in this Plan are as follows:

- waste materials generated on-site will be managed so that recycling is maximised and the volume of waste transported to landfill is minimised, within the bounds of legislative and statutory approval requirements;
- wastes will be separated, characterised and properly disposed of to minimise the potential for impacts to the environment;
- liquid wastes will be managed and treated (where practicable) on-site to minimise off-site disposal requirements; and
- the volumes, plans for use and methods for disposal, including recycling and re-use initiatives, of all materials brought onto the Site will be listed, tracked and reported (where appropriate).

All workers on the Site will receive appropriate instruction and training, during their site induction program, in the required methods and procedures for waste segregation. Appropriate instructions will also be included in all relevant Safe Work Method Statements (SWMS). Signage on bin/waste areas (where appropriate) will indicate the type of waste that may be placed in that bin/area. Responsibility for correct waste and recyclable disposal and the overall success of waste management practices will be shared by all personnel at the Site.

### 5.1 Waste Classification

Materials to be excavated for potential reuse will be selectively excavated based on:

- the findings of the Data Gap Investigation (DGI) (AECOM 2010a, AECOM 2010b and AECOM 2012a)
- requirements of the RAP (AECOM, 2013c);
- an *in situ* characterisation / validation program (if required); and
- field observations (visual and olfactory).

Wherever possible, this material will be transported off-site to a facility that is approved to receive it under a waste exemption approved by the EPA or elsewhere on the Barangaroo site for reuse.

If field observations during the bulk excavation works indicate that some excavated material is significantly different to that determined by the DGI and an *in-situ* characterisation / validation program (if required), the material will be stockpiled and additional discrete validation samples collected and analysed from each stockpile at a sampling frequency appropriate to the material fate.

#### 5.1.1 Classification of Materials to be Disposed Off-site

Materials to be excavated, treated and taken off-site for reuse/disposal will be pre-classified based on:

- the findings of the Data Gap Investigation (DGI) (AECOM 2010a, AECOM 2010b and AECOM 2012a)
- an *in-situ* characterisation / validation program (if required); and
- field observations (visual and olfactory).

Similarly, if field observations during the bulk excavation works indicate that some excavated material is significantly different to that determined by the DGI and an *in situ* characterisation / validation program (if required), the material will be stockpiled and additional discrete classification samples collected and analysed from each stockpile at a sampling frequency appropriate to the material fate.

All wastes generated as a result of the project will be classified in accordance with the DECCW's *Waste Classification Guidelines* (DECCW, 2009) and those disposed off-site will be transported to a facility that can lawfully receive that waste.

#### 5.1.2 Validation of Treated Materials for Potential Reuse on the Barangaroo Site

If material is treated in an on-site facility and proposed for potential on-site reuse, samples will be taken of the soil at a sampling frequency of one per 400 m<sup>3</sup> of stockpiled material and submitted for analysis.

If stabilised material is considered for re-use, it is recommended that a suitable leachate test for stabilised monolithic material be developed and approved by the Site Auditor and other interested stakeholders for use in demonstration of the final acceptance criteria.

A less stringent sampling frequency will be adopted if the analytical results for the treated soil are confirmed to be statistically reliable.

Material that is suitably validated and complies with the Barangaroo Central RAP may be reused in Barangaroo Central. Material from the EPA Declaration Area cannot be reused at Headland Park.

#### **Validation Laboratory Analysis**

Treated soil validation samples will be submitted for selected chemical analysis for the contaminants of concern identified for the Site including:

- Inorganics (heavy metals and cyanide);
- TPH;
- BTEX; and
- PAHs.

In addition, the 5% of samples with the highest total concentrations will also be selected for leachability (ASLP) analysis. Once sufficient analytical data is obtained regarding the leachability of similar fill materials, this sampling frequency may be reduced in consultation with the Site Auditor.

If field observations during the bulk excavation works indicate that asbestos containing materials are present within the Site's fill materials, soil validation samples will also be analysed for asbestos in appropriate areas.

#### **Analytical Methods**

Two laboratories will analyse original, duplicate and triplicate soil samples using NATA registered methods. Both laboratories must undertake the required analytical testing in accordance with the requirements of the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPC, 1999a). Details regarding the analytical methods to be used will be discussed with the Site Auditor and the appropriate analytical laboratory engaged to undertake the works.

## **5.2 Stockpiling**

Due to space constraints and the associated environmental impacts associated with stockpiling, it is essential to the ongoing efficiency of the project that stockpiling of materials either inside RE structures or upon external surfaces (soils for reuse/recyclables) is maintained at a minimum. Limiting the quantity of material stockpiled on-site at any given time will also reduce the pressure on environmental controls, thereby reducing the risk of potential adverse environmental impacts.

It is proposed that with the exception of recyclables and treated materials to be transported and reused at a site approved to receive it under a waste exemption approved by the EPA, waste materials will generally be stockpiled inside RE structures where appropriate.

Where possible, *in situ* characterisation / validation testing of material will be undertaken prior to excavation, to pre-classify materials and minimise interim stockpiling requirements.

### **5.2.1 Stockpile Locations**

Stockpiles of contaminated material excavated during the works will be minimised through the sequential works staging and treatment.

It is proposed that with the exception of recyclables and site reuse materials, all materials will be stockpiled inside RE structures prior to disposal or reuse.

If required during Ex-situ remediation excavation works, material may be placed in temporary stockpiles within the RE structures prior to treatment, however these stockpiles would need to be removed within 1-2 days of excavation to prevent delays caused by overcrowding within the RE structures.

Temporary stockpiles of treated material are proposed within the RE structure, if on-site treatment is undertaken. Temporary stockpiles of soils for reuse/recyclables may be formed adjacent to the on-site RE structure to enable validation prior to transfer to other Barangaroo Public domains for reuse or further treatment (as required).

The stockpiled treated excavated material will then be transported directly from the stockpile area to either (a) other areas of Barangaroo if material meets site re-use criteria; or (b) to off-site licensed landfill or other off-site location that is approved to receive it (e.g. site that has a waste exemption approved by the EPA). If required for tracking material transfer on-site, the location of stockpiles will be confirmed via GPS as part of the Materials Tracking System.

Treated PASS must be kept wet at all times during excavation and subsequent handling, transport and storage until it can be disposed of/reused safely. The material must be received at the proposed pick up point within 16-hours of being excavated.

### 5.2.2 Stockpile Area Preparation

If on-site treatment is undertaken, the stockpile of treated material is proposed primarily within the RE structures, though additional stockpiles of soils for reuse/recyclables may be required external to these structures.

Stockpile areas will be prepared using the following methods:

- noting that the majority of the Site is covered by an existing hardstand surface, works will be undertaken initially to clear the area of rubbish, rubble, structures and vegetation;
- diversion drains and bunds will be constructed around the perimeter of the stockpile areas to the extent necessary. Additional sediment and erosion control measures including silt fencing and hay bales may also be installed where necessary;
- signs will be erected at the entrance to the stockpile area and at locations around the stockpile specifying individual stockpile numbers and the type of materials stored; and
- buffer zones will be established around each stockpile area to enable access to the stockpiles and minimise impacts of the stockpile area on the surrounding facilities.

For treatment of PASS in an open area, neutralisation should be carried out on a treatment or liming pad. A guard layer of neutralising agent should be spread onto the surface of the treatment pad prior to the placement of soils. This will reduce risk by neutralising acidic leachate generated in the treatment pile and not neutralised during the treatment process. Management procedures to be utilised for treatment of acid leachate generated from exposure of PASS material and stormwater runoff are detailed in the *Acid Sulfate Soils Management Plan* (AECOM, 2013b).

Stockpile Construction and Maintenance Where appropriate, drainage, sediment and erosion control measures would be installed within excavation and stockpiling areas at the commencement of the project, and maintained, repaired and replaced where necessary for the duration of the stockpiling activities. Stockpiles are to be established within a bunded area to capture and direct any leachate or runoff to a suitably sized pond for settlement (if appropriate) and, in the case of contaminated material stockpiles, treatment in the on-site extracted groundwater treatment plant.

Where appropriate, temporary spoil stockpile areas external to the on-site RE structures may be lined with an impermeable HDPE plastic liner (or similar), surrounded by HDPE lined bund around the perimeter and covered by impermeable HDPE plastic covers/tarps, prior to transfer to the area RE structure.

Where required, long-term soil stockpiles would be on areas lined with an impermeable HDPE plastic liner (or similar), surrounded by HDPE lined bund around the perimeter, and will be covered or stabilised by suitable dust/erosion/odour reduction measures such as:

- containment within RE structures;
- tarping stockpiles with impermeable coverings when not in use;
- application of surfactant to exposed stockpile surfaces; and/or
- application of odour masking agent to air.

Stockpiles will be maintained in a tidy and safe condition with stable batter slopes typically of 2H:1V. Maximum heights of typical stockpiles will be as defined in **Table 10**.

Table 10 Indicative stockpile locations and dimensions by Material Type

Material Type/waste stream	Stockpile location	Height (m)	Max. Volume (m <sup>3</sup> )
Green Waste (mulched)	External temporary stockpile	2-4	150
Clean recyclables	Remediation work area RE structure or external temporary stockpile	2-4	250
Reuse material	Remediation work area RE structure or external temporary stockpile	2-4	250
Untreated waste	Soil treatment area RE structure	3	400
Screened oversize	Soil treatment area RE structure	3	150
Crushed oversize	Soil treatment area RE structure	2	50
Treated Waste (if treated on-site)	Soil treatment area RE structure	4.5	4500
Total maximum volume of stockpiled material at any given time			5000-6000

Accurate tracking of stockpiles will be undertaken throughout the proposed works to ensure the traceability of each treated soil stream, including the origin, destination and approximate volume of each stockpile and the confirmation of stockpile locations via registered survey.

### 5.2.3 Cross-contamination

A number of sediment control and tyre cleaning devices will be constructed at the site to minimise the potential for cross-contamination. Cross-contamination prevention measures may include the following:

- establishment of decontamination units at the primary entrance/exit to each RE structure.
- cleaning of vehicle tyres prior to relocation to new area;
- inspection by access control personnel of vehicles or plant prior to entry to new area;
- installation of shaker grids at exits to structures;
- utilisation of crushed rock and/or geofabric armouring for exposed surfaces;
- covering loads; and/or
- correct classification and tracking of materials across the site.

## 5.3 Handling and Storage

Lend Lease (through the specialist remediation contractors) will be responsible for safely handling, segregating and temporarily storing wastes and maintaining waste storage locations on-site.

Procedures will be prepared prior to construction by the specialist remediation contractors to ensure that double handling and the movement of waste material around the site is minimised.

The handling and storage of waste will be dictated by the various waste streams identified in **Section 4**. These various waste streams have been grouped into types for which the handling and storage of waste is common. These waste types are:

- General solid waste (non-putrescible) and General solid waste (putrescible), including:
  - amenities waste, office-generated waste, plastic packaging materials and food and beverage containers; and
  - recyclable wastes, consisting of green waste, cardboard and paper, concrete drilling spoil and other sundry amounts of broken concrete and/or asphalt and steel during demolition of buildings and hardstand areas;
- Trackable liquid wastes, consisting of contaminated stormwater, groundwater collected from monitoring activities and water used to decontaminate equipment;
- Trackable solid waste, consisting of contaminated soil from intrusive activities, such as drilling, trenching and sampling, TCM and PASS which cannot be appropriately treated or stabilised for reuse on-site, and asbestos; and
- VENM and treated PASS, potentially excavated during works.

### 5.3.1 General Solid Waste

A dedicated bin system will be used to manage the general solid waste - both putrescible and non-putrescible. That is, all recyclable, green waste and non-recyclable "general" classed waste materials will be generally separated into specifically allocated bins. Materials contained within these bins will be stored within the bins for collection, transport and re-processing / recycling or disposal, as soon as practicable.

A weekly collection service is recommended for initial operations, however appropriate adjustments to this collection regime should be allowed for and implemented, on an as needs basis. Collection of the contents of all general waste and recycling bins will be managed by a licensed transport and disposal contractor where required. The contractor will administer the supply, delivery, removal and certified disposal (as required) of all general wastes generated at the Site.

### 5.3.2 Trackable Waste

Restricted, immobilised and liquid waste types classify as category 1 trackable wastes under the EPA *Protection of Environment Operations (Waste) Regulation 2005*. Trackable wastes are those to which waste tracking requirements apply, as defined in either Part 1 or 2 of Schedule 1 to the *Protection of the Environment Operations (Waste) Regulation 2005*. Waste characterisation samples will be collected for all trackable waste and be classified according to the *Waste Classification Guidelines* (DECCW, 2009).

Off-site transport of any trackable waste types will require tracking in accordance with EPA waste tracking legislation. Each load of trackable waste will be accompanied by an appropriately completed transport certificate prior to exiting the Site.

Trackable waste streams include treated TCM disposed off-site, restricted waste and some liquid waste, contaminated groundwater and waste oils, and are to be containerised and stored on-site within containment areas. Maximum estimated quantities of trackable waste streams are presented in **Section 4**.

Both solid and liquid trackable wastes will either be containerised for disposal, as appropriate, or (in the case of liquids) treatment discharge to sewer under a Trade Waste Agreement. Wastes within containers will be classified by extracting samples from the material. This will take place when the container is full or when work is complete. The amount of waste stored within containers on-site will be recorded.

## 5.4 Liquid Waste Management

To the greatest extent possible, liquid waste material will be treated within on-site storage containers to reduce the amount of material requiring off-site disposal. Treated liquid waste will be reused as part of the remediation and land forming work (if it meets the criteria specified in an EPL or other permit) or discharged to stormwater/harbour (in accordance with appropriate licence conditions) or disposed off-site if it fails these criteria.

If a suitable Trade Waste Agreement is able to be negotiated with Sydney Water Corporation (SWC) then agreed volumes and maximum concentrations of chemicals / contaminants may be disposed directly to SWC's sewer, in accordance with the terms of that Agreement with SWC.

### 5.4.1 Surface Water Management

Currently the Site is hardstand and relatively flat, with stormwater runoff being captured on-site and treated at the Site water treatment plant. The treated water from the plant is then discharged to Darling Harbour under the Site EPL (13336).

Surface water flows and stormwater will be managed by segregating clean water from impacted water and preventing the inflow of surface water to excavation areas using surface bunds and drainage diversions. The preferred hierarchy for management of stormwater on-site is as follows:

- minimise volume of contaminated water during the works wherever possible by:
  - directing surface water away from the Site, excavations, depressions, pits and stockpiles by the construction of drainage works such as bunds, diversion drains and stormwater control measures. Control measures may include the manipulation of off-site, upstream, stormwater inlets / grates to enable increased quantity of the incoming stormwater flow to be received. This can be achieved through the placement of geotextile sandbag (or similar) bunds on the downstream edge of the inlet / grate, and / or, through the enlargement of inlet / grate opening to facilitate this. These measures will minimise the flow of clean water into areas of the Site that contain contaminated materials.
  - another measure that may be employed to limit off-site stormwater entering the Site is through the installation of an impermeable bund (e.g. geotextile gravel / sandbag bund, covered with a HDPE plastic liner) around the Site perimeter (on the inside of the perimeter fence) to minimise stormwater

entering the Site. This perimeter bund also has the advantage of controlling any potential on-site water or sediments exiting the Site. Due to the remediation being completed in stages (refer to staging plans), the perimeter bund will only encompass the portion of the Site that is actively being remediated. The extent and detail of any proposed bunding will be the subject of further design development.

- staging works in a sequential manner to minimise the area of exposed soils and stockpiles.
- recycling water where possible by using on-site as dust suppression for other site operations including wheel washing and truck washing. To ensure that the use of recycled water does not impact on surrounding areas, the following data will be obtained prior to undertaking these activities:
  - chemical data which demonstrates that the water to be recycled complies with the reuse criteria, including consideration of potential for odour generation;
  - definition of the area where the water is to be discharged;
  - details of environmental protection measures installed to ensure that the use of recycled water will have no adverse environmental impact; and
- appropriate tracking of recycled water reused at the Site.
- containment and on-site treatment of contaminated stormwater falling on treatment areas and excavations within the extracted groundwater treatment plant. Surface water drainage will also be arranged so that surface water run-off from disturbed or contaminated areas does not enter remediated or undisturbed areas;
- discharge to stormwater or sewer, with or without treatment, as per regulatory guidelines and in accordance with an EPL and/ or Trade Waste Permit to be obtained for the project; and
- off-site disposal if liquid wastes do not meet EPL or Trade Waste Agreement criteria.

Undisturbed surface water runoff will continue to follow existing drainage patterns, unless diversion from active site areas is warranted.

Stormwater control devices will be inspected daily. Inspections of control devices during rain / storm events, will be undertaken at a higher frequency (to be determined based on the magnitude of the event), and on completion of the storm event to monitor the effectiveness of mitigation techniques. If warranted, the inspections will involve cleaning and/or replacement of devices if deemed that they are compromised.

Clean water captured on-site and used to the maximum extent possible for dust suppression. To assist in the collection of surface waters from undisturbed areas, a sediment basin may be constructed in a suitable location to be determined during site establishment, if practicable. The location of the basin might be selected to provide for the whole remediation works. Excess clean water will be discharged to stormwater or sewer in accordance with the conditions of an EPL and/ or Trade Waste Agreement, respectively. If this water does not meet EPL or Trade Waste Agreement criteria it will be disposed off-site as liquid waste.

Further detailed explanation of the management and monitoring of surface water is addressed in the *Ex-situ Soil and Water Impact Assessment* (Worley Parsons, 2013).

#### **5.4.2 Groundwater Management**

Groundwater will be removed from the excavated remediation areas via installation of a dewatering system to be designed and managed by a specialist contractor. Groundwater extracted via this system will be treated in the on-site extracted groundwater treatment plant.

Extracted groundwater will be tested to ascertain contamination and treated to meet the criteria specified in the EPL or Trade Waste Agreement, or discharged to stormwater (in accordance with appropriate licence conditions) or disposed off-site if it fails to meet these criteria.

Groundwater collected during performance monitoring activities will be stored in containers on-site. This water will be tested and classified according to the *Waste Classification Guidelines* (DECCW, 2009) for appropriate off-site disposal. Testing will be conducted prior to disposal. The results of testing and the amounts disposed will be recorded and reported, as required, in waste disposal documentation.

#### **5.4.3 Water Treatment Plant**

An on-site treatment plant will be located to the west of Block 5 and will be used to treat contaminated stormwater, wheel wash water, decontamination water, groundwater dewatered during the works and the like.

It is acknowledged that stormwater discharges are to meet appropriate licence limits based on the ANZECC (2000) marine trigger values (or other criteria approved by EPA), and that EPA may require compliance with limits for other chemicals used in the process if there is a chance they could spill to stormwater systems. The exact size

and running capacity of the plant will be based on selected works staging, with a likely maximum estimated flow rate in the order of 105 litres per second.

As the total volume of treated water may exceed 100 mega litres/year, the works will require an EPL to be issued by the EPA under the POEO Act for the water treatment works. Appropriate licences/permits must also be gained for the discharge of the treated water to the local stormwater system, which discharges into Darling Harbour. It is noted that the existing EPL 13336 for Barangaroo includes for water treatment and discharge from the site, so it is intended that water treatment for these remediation works would be undertaken in accordance with this license (including any approved variations, where required).

All contaminated and treated water will be containerised and stored on-site within a secondary containment area, while collected water will be analysed at the on-site laboratory or off-site NATA approved laboratory, to determine if the water meets the appropriate acceptance criteria specified in the EPL or Trade Waste Agreement.

Before any on-site collected water is discharged, to stormwater drains or sewer, approval, permits and/or licences from relevant authorities will be secured. Water that fails to meet the criteria of the applicable permits and/or licences will be pumped into waste storage containers for off-site disposal at a licensed waste management facility. The approximate amounts of stormwater either released or containerised for off-site disposal will be recorded, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form. These disposal documents will be retained by the Site Manager and reported, as required, with monthly waste generation reports.

#### **5.4.4 Waste Oil, Grease and Lubricants**

Small amounts of waste oil, grease, lubricants are expected to be generated from on-site maintenance of plant and machinery. These will be stored, as required, within containers within a bunded area for later off-site recycling by an appropriately licensed waste oil recycler.

In addition, any chemical and fuel spills that take place outside of the containment areas will be cleaned up, as detailed in a CMP, to prevent contamination of run-off.

Sanitary wastes will be contained in the sumps of portable toilet facilities and removed via a licensed contractor and disposed at a licensed waste facility as liquid waste.

## **5.5 Solid Waste Management**

On-site solid waste management encompasses trackable contaminated waste, uncontaminated spoil material and demolition rubble, and PASS material.

A separate *Acid Sulfate Soils Management Plan* (AECOM, 2013b) has been developed to manage any treatment or disposal of PASS material which may be excavated during the remediation and land forming works and should be read in conjunction with this Waste Management Plan.

### **5.5.1 Trackable Solid Waste (Restricted Waste)**

To the greatest extent possible, solid waste material from the Block 4 Remediation Area will be treated and reused on the Barangaroo Site to reduce the amount of material requiring off-site disposal.

The materials to be excavated for the works comprise typically heterogeneous fill materials, soil, bedrock, TCM, PASS, as well other potential gas works related waste (for example ash). Therefore, prior to commencement of excavations, detailed excavation plans will be prepared outlining the anticipated classification of materials based on the additional *in situ* characterisation sampling of fill materials (if required) and the results of the preceding site investigations. Correlations between field observations (both visual and olfactory) and analytical data will also be used to guide the visual characterisation of fill materials during excavation.

All remediation excavation works will be undertaken in accordance with the following procedures, in sequence:

- prior to commencement of excavations on each work shift, all necessary environmental, OH&S measures and related equipment will be established and all worker PPE and respiratory controls will be checked to ensure they are in full working order in accordance with the OH&S Management Plans;
- all excavation plant operators, haulage operators and supervisors will be made familiar with the excavation strategy, and all workers will be made aware of their responsibilities prior to the commencement of each shift;
- prior to the commencement of excavation, stockpile areas will be prepared with adequate capacity to receive the excavated contaminated materials;

- exclusion zones will be set up around the active remediation works areas as required;
- all internal truck haulage roads will be made suitable for transportation and haulage of the excavated materials;
- all haulage trucks will be covered prior to exiting the exclusion zone/excavation area and will be decontaminated at the end of each shift of haulage operations in accordance with the environmental management plan (EMP). All haulage trucks will be fitted with liquid seals which will be inspected daily to ensure their integrity; and
- all personnel, vehicles and equipment leaving the excavation enclosure will be decontaminated in accordance with the EMP.

All excavated materials handled during the remediation works will be tracked in order to allow verification of the correct movement and handling. The system will track materials from excavation-to-disposal, and will provide detailed information on the location and quantity of all material movements both on and off-site. The tracking system shall include accurate tracking of stockpiles throughout the material handling stage and may include confirmation of stockpile locations via GPS to reduce the risk of cross-contamination between stockpiles.

As part of this process, accurate records shall be kept to ensure that backfilling of excavations (where required) and reuse of material only occurs following the successful validation of the subject materials. Plans will be made with respect to the extent of each excavation. A register of all analytical results for stockpiles and excavations will be maintained throughout the validation works.

Excess treated contaminated spoil, TCM or PASS will then be disposed at an appropriate licensed facility, in accordance with all relevant requirements for that classification.

#### **5.5.2 Uncontaminated Spoil Material**

Demolition rubble will be placed into skip bins for characterisation prior to being disposed at a licensed recycling facility. Alternatively, demolition rubble may be transported off-site for reuse under a waste exemption, subject to approval by the EPA.

Uncontaminated non-PASS excavated material will be transported off-site via trucks for reuse under a waste exemption, subject to approval by the EPA.

### **5.6 Documentation**

Copies of all reuse and disposal documentation will be supplied to Lend Lease and filed with all other site records.

Lend Lease will keep records of recycling and waste management which will form part of the monthly environmental management and health and safety performance indicators. The Site Manager will be responsible for the production of monthly reports and statistical information that includes all the following:

- number, waste type and size of bins / containers / trucks (tonnage and volume, in litres for liquid waste and cubic metres for solids) removed from the Site;
- total tonnage and volume generated of each waste type (volume in litres for liquid waste and cubic metres for solids);
- copies of an appropriately completed transport certificate for each load of trackable waste transported off-site in accordance with EPA waste tracking legislation;
- total tonnage and volume of spoil transported within the Barangaroo Site for reuse (volume in cubic metres);
- final on-site location of reused spoil by volume;
- classification letters and validation testing results;
- approximate amounts of stormwater either released or containerised for off-site disposal, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form;
- PASS testing and treatment validation results;
- total tonnage and volume of each waste type recycled (in litres for liquid waste and cubic metres for solids); and
- The final destination of waste material.

Details of waste types, volumes and destinations will be recorded on Waste Management Forms, including a Monthly Recycling and Waste Management Statistics form (refer to **Appendix A**).



This information will be collated for record keeping and appropriate communication to any relevant authorities, where required. During the works, all trackable wastes will be transported and tracked in accordance with the POEO Act.

Citations of non-conformance issued in accordance with the protocols of this Waste Management Plan, as well as with respect to any breaches of government and/or other regulatory stipulations will be recorded. The Site Manager will review and analyse the cause of detected non-conformances and develop a corrective action to prevent recurrence. Details of the non-conformance, including any immediate corrective actions undertaken will be recorded, reviewed and accepted by the Site Manager.

## 6.0 Reuse and Waste Disposal

The following is a summary of the measures proposed for appropriately avoiding, reducing, reusing, recycling and/or disposing of all wastes during remediation.

### 6.1 Waste Avoidance and Reduction

Where possible, the on-site waste management system to be established will utilise waste avoidance through the on-site treatment of excavated materials (contaminated and PASS) and reuse on the Barangaroo Site, and/or transported off-site for reuse under a waste exemption approved by the EPA. The proposed works will also treat and discharge surface and groundwater.

### 6.2 Reuse and Recycling

Waste separation and segregation will be promoted on the Site, to facilitate reuse and recycling as a priority of the waste management program. Waste streams that are the subject of this Plan, will generally be separated on-site into dedicated bins/ areas where practicable, for either reuse on-site or collection by a waste contractor and transport to off-site recycling facilities.

Wherever allowable under the requirements for that classification, empty drums or bins will be cleaned for re-use again for the same purpose for this Project, if required, and/or for a similar purpose for other projects.

#### 6.2.1 Spoil Reuse

Where possible, some of the Site's uncontaminated and treated spoil will be reused and/or transported off-site for reuse under a waste exemption approved by the EPA.

#### 6.2.2 Recyclable Materials

Wastes will be segregated to enable the off-site recycling of demolition rubble, office wastes and general wastes, including the recycling of waste steel, paper, cardboard, timber, oil, concrete, asphalt and green waste.

### 6.3 Waste Disposal

Where waste is required to be handled and stored on-site prior to any on-site reuse or off-site recycling or disposal, the following measures will apply:

- liquid wastes will be stored in appropriate containers in bunded areas until they can be appropriately disposed of. Bunded areas will have the capacity to hold 110% of the volume of the largest container;
- hazardous waste will be managed by appropriately qualified and licensed contractors, in accordance with the requirements of the *Environmentally Hazardous Chemicals Act 1985*. It should be noted that these will comprise minimal quantities of site office printer cartridges and other "E-waste" (electronic waste), only; and
- all other recyclable or non-recyclable wastes and liquids are to be stored in appropriate receptacles (e.g. bins or skips) in appropriate locations on-site and covered where required. Appropriate waste / recycling contractors will be commissioned to regularly remove/empty the bins to approved disposal or recycling facilities. All appropriately separated, potentially recyclable materials will only be transported to its relevant recycling facility that can guarantee appropriate recycling, re-use and re-processing for future re-use.

Waste storage strategies for classified wastes prior to their off-site disposal are outlined in **Table 11**. Waste disposal will be in accordance with the *Protection of the Environment Operations Act 1997* and the *Waste Avoidance and Resource Recovery Act 2001*. Wastes that are unable to be reused or recycled will be disposed of off-site at an EPA-approved waste management facility following classification. Details of waste types, volumes and destinations are to be recorded in the Waste Management Forms (**Appendix A**).

The nominated disposal contractor will be responsible for providing dockets to the Site Manager for the removal and appropriate disposal of all trackable waste from the Project.

If required, a list of potential waste oil recycling companies endorsed by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities can be found on the website [www.oilrecycling.gov.au](http://www.oilrecycling.gov.au).

Table 11 Indicative Waste disposal and storage strategy for classified wastes (subject to design development)

Key Waste Stream	Indicative Segregation Areas / Containers Commonly Available
<b>Site Office and Work Site Wastes</b>	
Organic food scraps	240L MGB
Food packaging / cans / bottles / wrappers	240L MGB
Paper and / or other office based wastes	240L MGB
Glass/plastic/ cans/paper/ cardboard – potentially recyclable	240L bins specified for 'Recyclables Only' as per domestic recycling bins
Plastic wrapping/containers– collected and littered	240L bins – general waste or into recycling bin as appropriate
Printer Cartridges	Bin provided (capacity of up to 20 – 25 standard cartridges)
Miscellaneous construction wastes (cables, parts, etc.)	10m <sup>3</sup> skip bins – to be combined with other miscellaneous construction wastes
Scrap timber / scrap metal	10m <sup>3</sup> skip bins
Sediment fences	Timber in timber bins / shade cloth stored on-site
<b>Chemicals Storage and Management</b>	
Drums and containers (empty and containing no residue)	Stored in bunded areas
Waste oil, grease, lubricants	Sealed drums / containers stored within bunded area
Oily rags and filters	200L (or thereabouts) bins
Used spill management materials such as absorbent pads / used absorbent materials used to mop up oil spills / any soil contaminated from dripping machinery or other hydrocarbon / chemical sources	Bins and / or tanks suitably bunded
<b>Other Site Waste</b>	
Trackable solid wastes	Sealed in drums and stored within bunded area
Broken concrete / asphalt	10m <sup>3</sup> skip bins
Sediment build up behind erosion and sediment control devices	Regularly cleared from behind control structures, before they are at capacity
Treated liquid waste	Stormwater, extracted groundwater and other potentially contaminated liquids will be containerised, where appropriate, stored within the containment area and tested to determine appropriate disposal methods.
Trackable liquid wastes (waters and fluid unable to be treated for discharge, waste oils)	Sealed in drums and stored within bunded area

## 6.4 Off-site Transport Routes

All disposal methods and transport routes will be documented in accordance with all relevant legislation.

A number of licensed waste management facilities are available to accept the various types of wastes that will be generated by the proposed works, as detailed in **Table 12**.

Table 12 Appropriately Licensed Waste Management Facilities

Waste Type	Appropriate Waste Management Facilities
General Solid Waste (putrescible)	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions)
General Solid Waste (non-putrescible)	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Erskine Park Landfill (Transpacific) Horsley Park Waste Management Facility (Veolia) Kemps Creek Landfill Facility (SITA Environmental Solutions)
Asbestos Waste <sup>1</sup>	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Erskine Park Landfill (Transpacific) Horsley Park Waste Management Facility (Veolia) Kemps Creek Landfill Facility (SITA Environmental Solutions)
Liquid Waste	Worth Recycling South Windsor Site
Hazardous Waste/Restricted Waste	Kemps Creek Landfill Facility (SITA Environmental Solutions)
Green Waste	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Horsley Park Waste Management Facility (Veolia)
Timber	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Horsley Park Waste Management Facility (Veolia)
Untreated PASS Material classified as VENM	Kurnell Landfill Company
Contaminated Soil	Erskine Park Landfill (Transpacific) <sup>2</sup> Kemps Creek Landfill Facility (SITA Environmental Solutions) <sup>2</sup>

**Notes:**

1. According to the *Waste Classification Guideline: Part 1 – Classifying Waste* (DECC, 2008), Asbestos Waste refers to any waste that contains asbestos including Asbestos Containing Material.
2. An analytical test-work report is required prior to the acceptance of contaminated soils at the Erskine Park Landfill and Kemps Creek Landfill Facility.

Transport routes to appropriately licensed landfill sites will be as per designated routes shown on the transport route maps presented in **Appendix B**.

The contact details of the various licensed waste management facilities are also provided in **Appendix B**.

Trucks must adhere to all applicable road rules when exiting the Site, and follow only approved transport routes to minimise impacts on external traffic. All loads must be inspected and clean prior to leaving the Site, and must be covered with water proof tarps to reduce potential odour and dust emissions.

## 6.5 Internal Haul Roads

The Site is currently covered in hardstand; which would be retained wherever possible. As such, haul roads between the excavation and reuse areas would generally be paved, while roads within these excavation and reuse areas could potentially be unpaved.

Regular cleaning/sweeping of the paved haul roads will be required as part of the excavation activities to ensure silt build up does not occur.

Lend Lease proposes to cover haulage trucks with tarps prior to exiting the Site, and trucks would be decontaminated (where required) prior to leaving site and/or at the end of each shift of haulage operations in accordance with the EMP.

Truck movements will generally be limited to the nominated internal roadways to provide greater control over vehicle emissions and accidental spillage of materials (should it occur).

## 7.0 Monitoring, Inspection, Auditing and Reporting Program

### 7.1 Monitoring

#### 7.1.1 Waste Register

Contractors performing works on the Site will complete the Waste Management Forms (**Appendix A**) for all wastes generated and/or subject to disposal from the Site. The appropriate completion of these Forms is the responsibility of the Site Manager / Contractors.

Dockets / receipts / manifests will also be retained for waste tracking to record the date of waste removal and identify the waste transport contractor and destination of the wastes from each worksite. These registers will be submitted to Lend Lease on a monthly basis.

#### 7.1.2 Waste Management

Waste control, management and the status of general site litter is to be monitored by the Site Manager daily.

### 7.2 Inspections and Audits

Daily inspections will be undertaken to ensure that waste management and environmental controls are functioning correctly and are well maintained.

Routine Site Audits would be undertaken on a weekly to fortnightly basis, depending on the on-site activities and specific environmental issues. The outcomes of these audits are to be reported to Lend Lease.

### 7.3 Reporting

Monthly compliance reports will be prepared and submitted to Lend Lease. The issues to be included in compliance reports have been discussed in the preceding sections of this Plan. A summary of those issues is also provided below.

Monthly reports and other statistical information collected and reported will include the following:

- number, waste type and size of bins / containers / trucks (tonnage and volume, in litres for liquid waste and cubic metres for solids) removed from the Site;
- total tonnage and volume generated of each waste type (volume in litres for liquid waste and cubic metres for solids);
- copies of an appropriately completed transport certificate for each load of trackable waste transported off-site in accordance with EPA waste tracking legislation;
- total tonnage and volume of spoil transported within Barangaroo for reuse (volume in cubic metres);
- final on-site location of reused spoil by volume;
- classification documents and validation testing results;
- approximate amounts of stormwater either released or containerised for off-site disposal, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form;
- PASS testing and treatment validation results;
- total tonnage and volume of each waste type recycled (in litres for liquid waste and cubic metres for solids); and
- the final destination of waste material.

All issues of non-compliances and the response to relevant waste management, disposal and/or recycling issues, and any perceived non-compliance with any of the intent of this Waste Management Plan will also be reported and all such issues addressed appropriately.

## 8.0 Roles and Responsibilities

Key responsibilities for waste management are summarised in **Table 13**.

**Table 13 Key Roles and responsibilities**

Role	Responsibility
Site Manager	Responsible for compliance with all applicable legislation and contract obligations. Responsible for day to day site management, including ensuring that appropriate waste management measures are implemented and maintained on-site.
Site Workers	Responsible for undertaking and maintaining mitigation measures listed in this Plan when undertaking site work and informing the Site Manager of any potential waste management impacts to the Site and/or to the surrounding environment or community.
Health & Safety Manager	Responsible for conducting Site inductions for all workers and visitors, including discussion of the requirements of this Waste Management Plan.
Environment Manager	Responsible for compliance with all applicable environmental legislation and licences and agreement conditions. Responsible to ensure a qualified environmental scientist is present during the construction of wells, trenches and throughout the <i>in situ</i> remediation, to ensure the environmental management plan is adhered too, and inspections recorded.

### 8.1 Training and Awareness

In order to encourage full participation of all staff in the effective implementation of this Plan, employee awareness and training will include the following:

- introduction to general waste reduction principles;
- introduction to the Waste Hierarchy principles; and
- all relevant site specific waste storage and recycling methods implemented on-site, including recycling bin locations, waste separation processes (to be communicated via during toolbox talks, etc.).

Employees with managerial and supervisory responsibilities in terms of organising work site activities, rubbish removal logistics and waste register and reporting responsibilities will be trained appropriately in these procedures.

Signage on each bin/waste area will indicate the type of waste that may be placed in that bin/area. Responsibility for correct waste and recyclable placement and the overall success of waste management practices will be shared by all personnel at the Site.

## 9.0 Conclusion

AECOM has been engaged by Lend Lease to prepare a Waste Management Plan to accompany a Development Application (SSD 5897-2013) for Remediation and Land Forming Works at Block 4 Barangaroo to be submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979*. The Waste Management Plan was prepared to respond to the modified DGRs issued in respect of SSD 5897-2013 Remediation and Land Forming Works dated May 20, 2013, specifically DGR 3 Waste Management.

This WMP concludes that:

- Lend Lease (through the specialist remediation contractors) will be responsible for safely handling, segregating and temporarily storing wastes and maintaining waste storage locations on-site, and will be dictated by the various waste streams identified.
- The on-site waste management system to be established at the Site will aim to maximise waste avoidance through reuse on-site or at off-site locations under a waste exemption approved by the EPA and/or the Barangaroo Site, where possible
- Materials separation and segregation will be promoted on the Site, to facilitate reuse and recycling as a priority of the waste management system.
- All wastes generated as a result of the project will be classified in accordance with the EPA *Waste Classification Guidelines* (DECCW, 2009) and those disposed off-site will be transported to a facility that can lawfully receive that waste.
- Details of waste types, volumes and destinations will be recorded on Waste Management Forms, including a Monthly Recycling and Waste Management Statistics form. This information will be collated for record keeping and appropriate communication to any relevant authorities, where required.

## 10.0 References

AECOM Australia, 2010. Data Gap Investigation. EPA Declaration Area (Parts of Barangaroo Site and Hickson Road, Millers Point, NSW. 23 September.

AECOM. (2010b). Data Gap Investigation, Other Remediation Works (North) Area. 20 October, 2010. AECOM Australia Pty. Ltd.

AECOM (2011a). Human Health and Ecological Risk Assessment, Declaration Site (Development Works) Remediation Works Area - Barangaroo. 9 June 2011.

AECOM (2012a). Supplementary Data Gap Investigation, VMP Area, Hickson Road, Millers Point, NSW. 9 March (Final).

AECOM (2012b). Human Health and Ecological Risk Assessment VMP Remediation Works Area (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point). 25 October 2012.

AECOM Australia, 2013a. Preliminary Hazard Analysis, Barangaroo Declaration Area Number 21122, Hickson Road, Millers Point, NSW. September 2013

AECOM Australia, 2013b. Acid Sulfate Soils Management Plan, Barangaroo Declaration Area Number 21122, Hickson Road, Millers Point, NSW. September 2013

AECOM Australia, 2013c. Remedial Action Plan NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW. July 2013

AECOM Australia, 2013d. VMP Remediation Extent, VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road), Millers Point, NSW. July 2013

Australian and New Zealand Environment and Conservation Council, 2000. Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters.

Department of Environment, Climate Change and Water, 2009. *Waste Classification Guidelines Part 1: Classifying Waste*. December 2009.

Worley Parsons, 2013. Ex-situ Soil and Water Impact Assessment.



## Appendix A

# Waste Management Forms



<b>Monthly Recycling and Waste Management Statistics</b>					
<b>Month</b>					
<b>Number of Bins:</b>					
<b>For each bin, list its weight, volume and waste type</b>					
<b>Bin</b>	<b>Bin Tonnage</b>	<b>Bin Volume</b>	<b>Waste Type</b>		
<b>Total Tonnage of Waste Generated</b>	<b>Total Volume of Waste Generated</b>	<b>Tonnage of Waste Recycled</b>	<b>Volume of Waste Recycled</b>	<b>% Recycled (by weight)</b>	<b>% Recycled (by volume)</b>
<b>Description of Reuse/Recycling initiatives</b>					

## Appendix B

# Transport Route Maps and Waste Facility Contact Details

## Appendix B Transport Route Maps and Waste Facility Contact Details

### **Eastern Creek Waste & Recycling Centre – WSN Environmental Solutions**

Wallgrove Road  
Eastern Creek NSW 2766  
Phone: (02) 9934 7091

### **Erskine Park Landfill – Transpacific**

50 Quarry Road  
Erskine Park NSW 2759  
Phone: (02) 9834 3411  
Fax: (02) 9834 3306

### **Horsley Park Waste Management Facility – Veolia**

716-52 Wallgrove Road  
Horsley Park NSW 2164  
Phone: (02) 9620 1944  
Fax: (02) 9620 2867

### **Kemps Creek Landfill Facility – SITA Environmental Solutions**

1725 Elizabeth Drive  
Kemps Creek NSW 2171  
Phone: (02) 9756 6899  
Fax: (02) 4774 9385

### **Worth Recycling South Windsor Site**

Corner Blackman Cres and Fairey Road  
South Windsor NSW 2222  
Phone: (02) 4577 6900  
Fax: (02) 4577 6708

### **Kurnell Landfill Company**

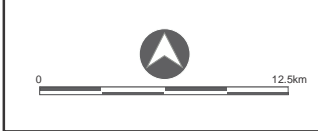
330 Captain Cook Drive  
Kurnell NSW 2231  
Phone: (02) 9668 8539  
Fax: (02) 9668 9978

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, omissions, or misstatements in this information.



PROJECT ID: 60153531 MP10\_0026  
 CREATED BY: TO  
 LAST MODIFIED: TO 11 03 2011

**AECOM**  
 www.aecom.com



Site	Material Accepted
Kurnell Landfill Company:	VENM PASS material
Kemps Creek Waste Landfill Facility:	Restricted waste, asbestos waste, general solid waste (non-putrescible)
Horsley Park Waste Management Facility:	Asbestos waste, general solid waste (non-putrescible)
Eastern Creek Waste Management Centre:	Asbestos waste, general solid waste (putrescible and non-putrescible)
Worth Recycling South Windsor Site:	Liquid waste truck haulage route

**Truck Haul Routes to the various Waste Management Facilities**

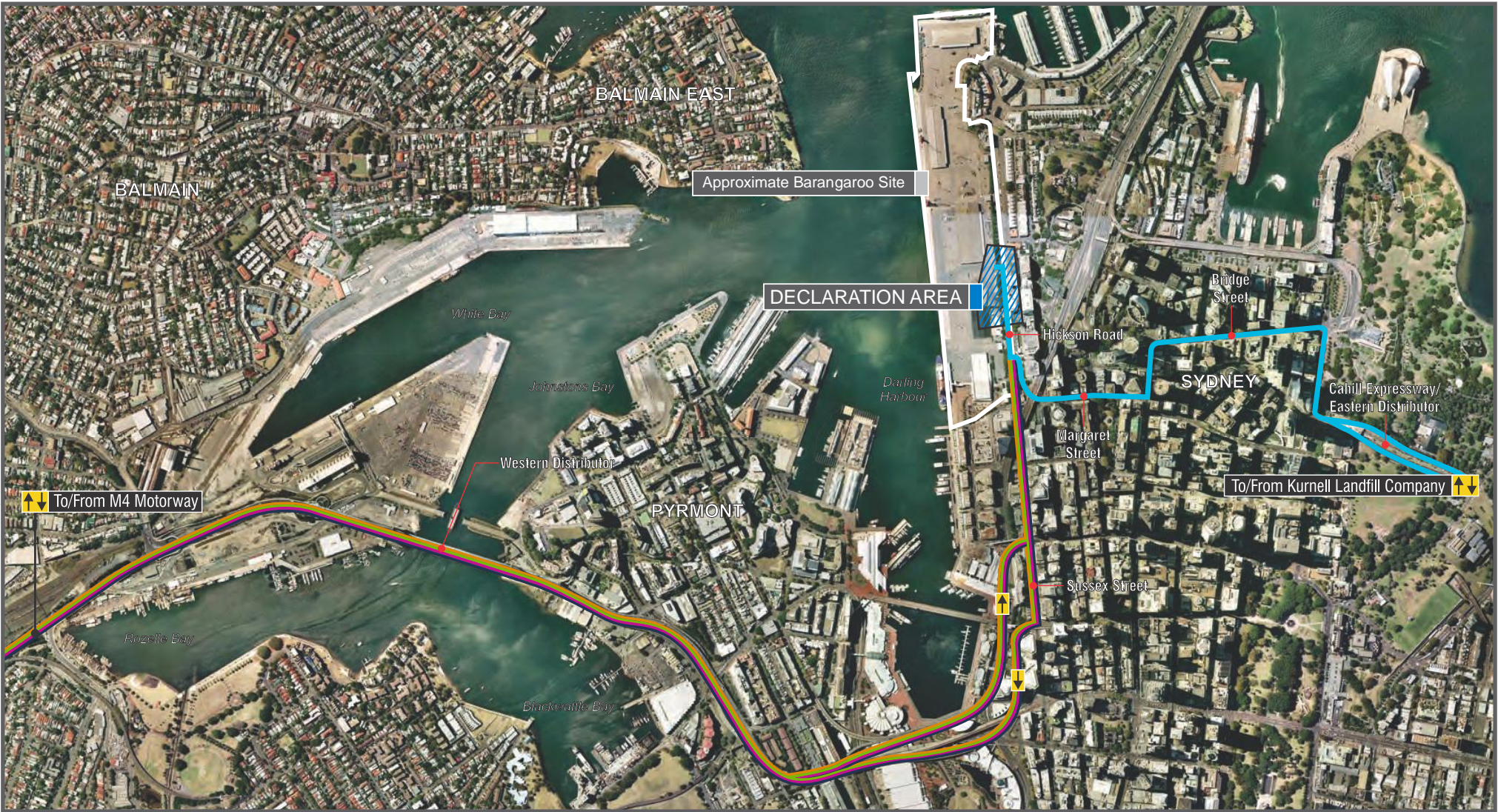
**Lend Lease (Millers Point) Pty Ltd**  
 Waste Management Plan  
 Barangaroo Declaration Area No. 21122,  
 Hickson Road, Millers Point NSW

**Figure F3**

**Remediation and Land Forming Works Project Application MP 10 0026**



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, omissions, or inaccuracies in this information.



PROJECT ID: 60153531 MP10\_0026  
 CREATED BY: TO  
 LAST MODIFIED: TO 11 03 2011  
**AECOM**  
 www.aecom.com



- VENM PASS truck haulage route
- Liquid waste truck haulage route
- Restricted waste, asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (putrescible and non-putrescible)

**Remediation and Land Forming Works Project Application MP 10 0026**

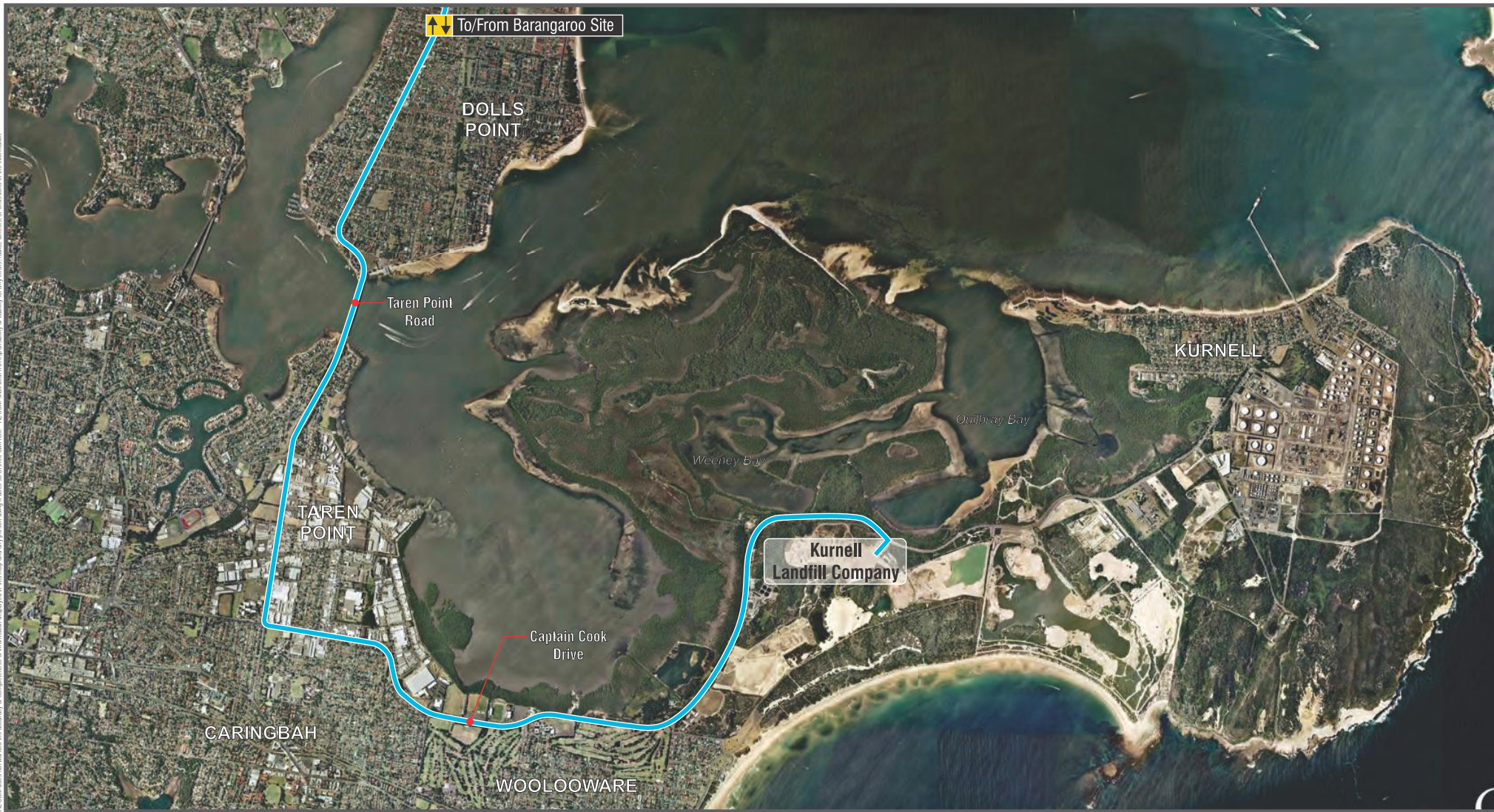
**Detailed Truck Haul Routes from the Site for all Waste Types**

**Lend Lease (Millers Point) Pty Ltd**  
 Waste Management Plan  
 Barangaroo Declaration Area No. 21122,  
 Hickson Road, Millers Point NSW

**Figure**  
**F4**



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, omissions, or misstatements in this information.



PROJECT ID: 60153531 MP10\_0026  
 CREATED BY: TO  
 LAST MODIFIED: TO 11 03 2011  
**AECOM**  
 www.aecom.com

VENM PASS truck haulage route



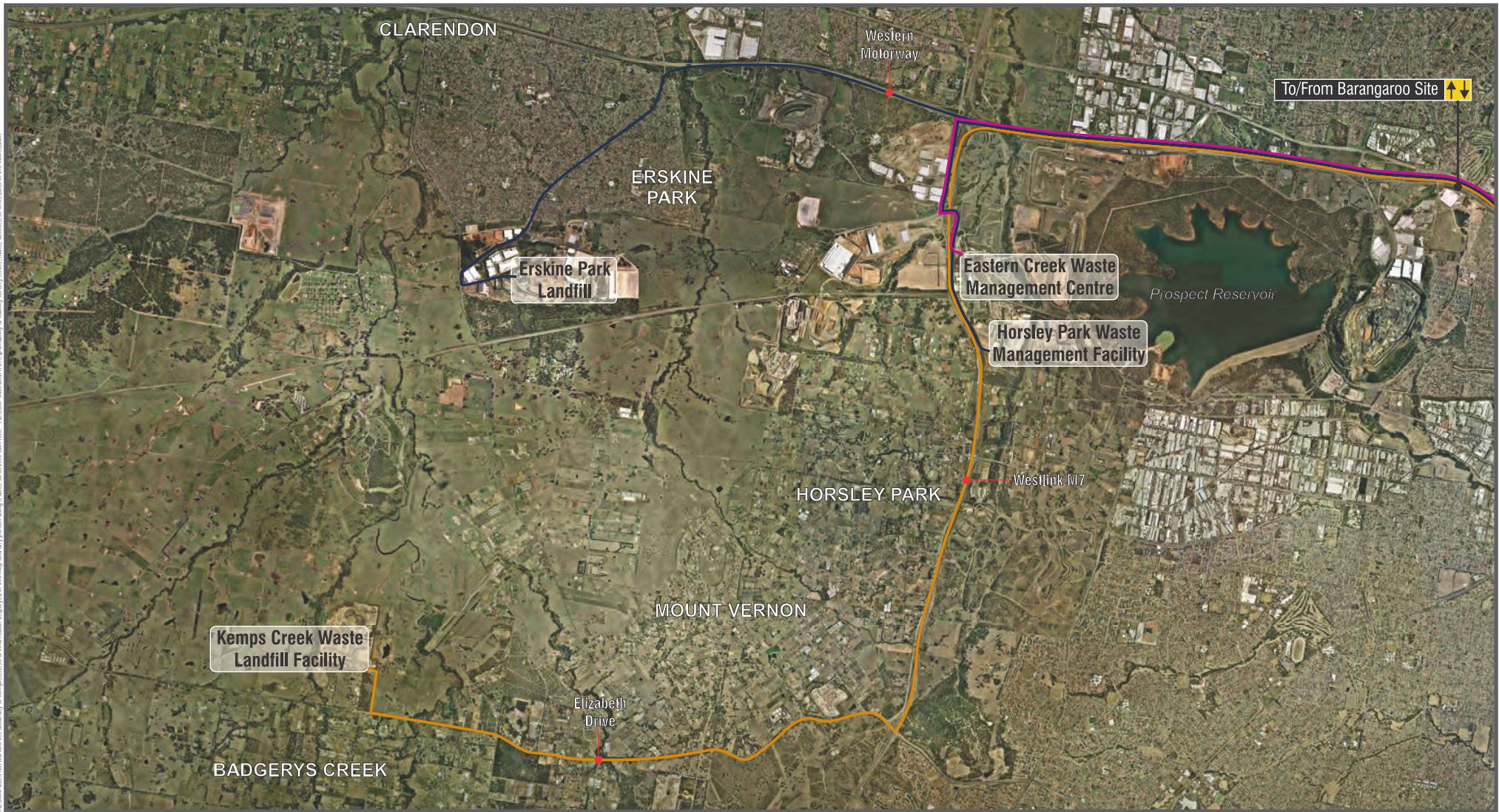
**Remediation and Land Forming Works Project Application MP 10 0026**

**Detailed Truck Haul Route for PASS Material transport to Kurnell Landfill Company**

Lend Lease (Millers Point) Pty Ltd  
 Waste Management Plan  
 Barangaroo Declaration Area No. 21122,  
 Hickson Road, Millers Point NSW

**Figure F5**





AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, omissions, or misstatements in this information.

PROJECT ID: 60153531 MP10\_0026  
 CREATED BY: TO  
 LAST MODIFIED: TO 11 03 2011  
**AECOM**  
 www.aecom.com



- Restricted waste, asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (putrescible and non-putrescible)

Remediation and Land Forming Works Project Application MP 10 0026

**Truck Haul Route to Eastern Creek Waste Management Facility, Kemps Creek Landfill Facility, Erskine Park Landfill and Horsley Park Waste Management Facility**

Lend Lease (Millers Point) Pty Ltd  
 Waste Management Plan  
 Barangaroo Declaration Area No. 21122,  
 Hickson Road, Millers Point NSW

Figure  
**F6**



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, omissions, or inaccuracies in the information.



PROJECT ID: 60153531 MP10\_0026  
 CREATED BY: TO  
 LAST MODIFIED: TO 09 02 2011  
**AECOM**  
 www.aecom.com

 Liquid waste truck haulage route



Remediation and Land Forming Works Project Application MP 10 0026

**Truck Haul Route for Liquid Waste to Worth Recycling South Windsor Site**

Lend Lease (Millers Point) Pty Ltd  
 Waste Management Plan  
 Barangaroo Declaration Area No. 21122,  
 Hickson Road, Millers Point NSW

Figure  
**F7**