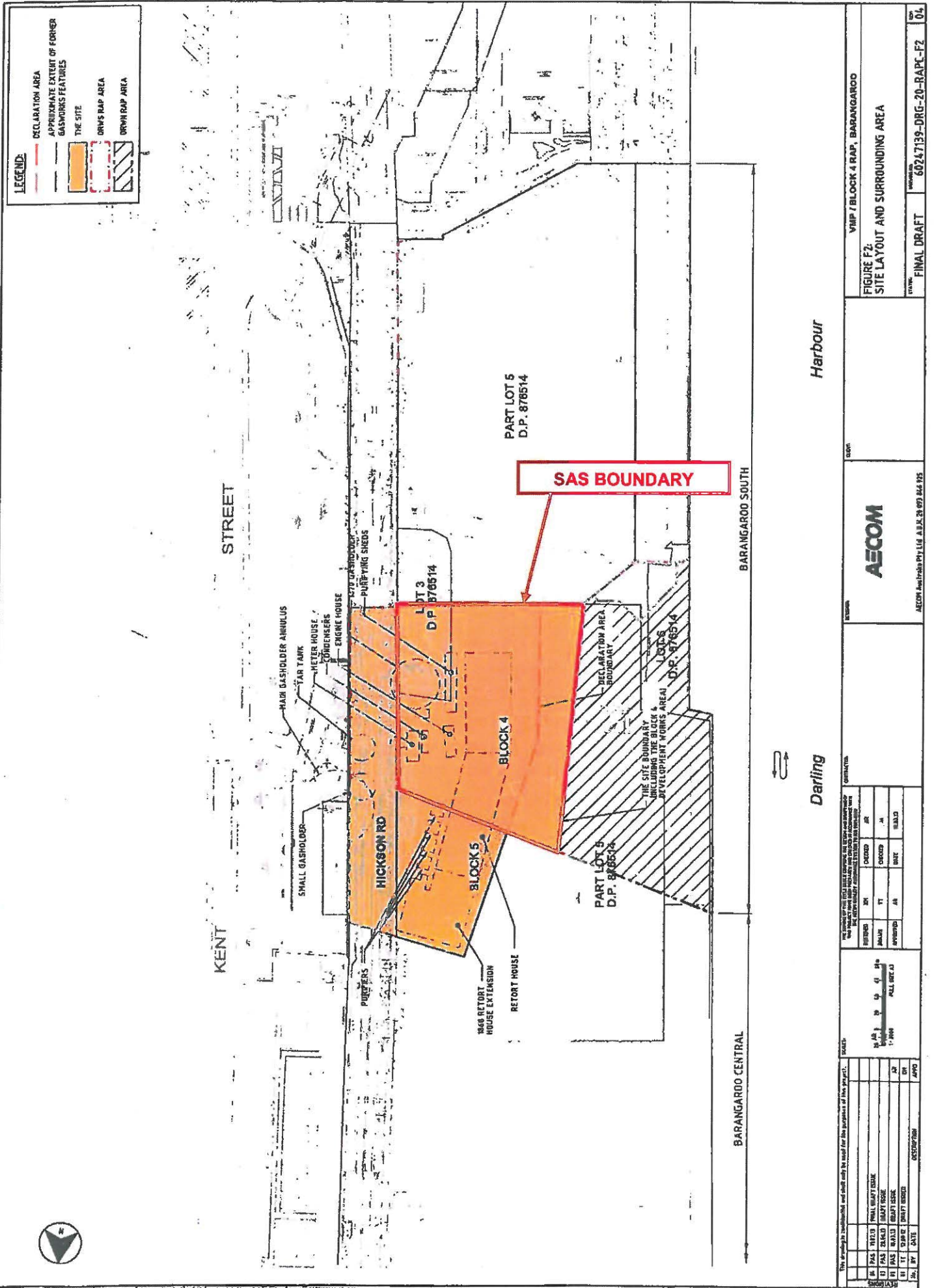




PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. (*Strike out the irrelevant section.*)

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

Section A

☐ I certify that, in my opinion, the site is **SUITABLE** for the following use(s) (*tick all appropriate uses and strike out those not applicable*):

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other (*please specify*)

subject to compliance with the following environmental management plan (*insert title, date and author of plan*) **in light of contamination remaining on the site: ...**

OR

☐ I certify that, in my opinion, the site is **NOT SUITABLE** for any use due to the risk of harm from contamination.

Overall comments...

Section B

Purpose of the plan¹ which is the subject of the audit: *To ensure that Block 4 is remediated to a standard suitable for the proposed development.*

I certify that, in my opinion:

- ☒ the nature and extent of the contamination HAS/HAS NOT* been appropriately determined

AND/OR

- ☒ the ~~investigation~~/remedial action plan/management plan* IS/IS NOT* appropriate for the purpose stated above

AND/OR

- ☒ the site CAN BE MADE SUITABLE for the following uses (tick all appropriate uses and strike out those not applicable):

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☒ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☒ Commercial/industrial
- ☒ Other (please specify) ...recreational open space located over basement....

if the site is remediated/managed* in accordance with the following remedial action plan/management plan* (insert title, date and author of plan)

'Remedial Action Plan, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW', dated 24 July 2013 by AECOM Australia Pty Ltd

~~subject to compliance with the following condition(s):~~

...

¹ For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

Overall comments

Block 4 comprises a portion of the site known as "Barangaroo", at Millers Point, NSW. The site is proposed to be developed for high density residential and commercial usage with recreational open space areas overlying a basement. Part of Block 4 was previously the location of a former gasworks which has been declared by NSW EPA as a Remediation Site (Declaration Number 21122; Area Number 3221). Removal of the declaration is required prior to development and is addressed by Site Audit Statement GN 447A.

Risk based remediation goals and remediation criteria have been developed based on the proposed site uses and development plans. Soil and groundwater investigations have been conducted and the results compared to the criteria to determine the extent of remediation required.

In the Auditor's opinion, the proposed remediation and validation approach described in the Remedial Action Plan (RAP) is appropriate. The proposed remediation strategies for Block 4 are generally consistent with the Overarching RAP for Barangaroo.

Site Auditor review of a number of additional remediation planning documents is required, including validation Sampling, Analysis and Quality Plans (SAQPs) and Groundwater Monitoring Programs (GMPs). These documents are to be prepared prior to commencement of remediation based on the project requirements and final design of the basement groundwater retention wall system. Review of a Site Management Plan (SMP) for future land owners is also required after remediation.

If significant changes are made to the development design, the RAP proposes to prepare Addendum documents, to be approved by the Site Auditor. This is considered an appropriate approach to management of significant changes to the development design.

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 9808).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997*, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed...



Date...

31/7/2013

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

EPA (NSW)

Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
nswauditors@epa.nsw.gov.au

AND

the **local council** for the land which is the subject of the audit.

Contents

1	Introduction	1
1.1	Introduction and Objective	1
1.2	Background	1
1.3	Voluntary Management Proposal	2
1.4	Scope of Work	3
1.5	Audit Team	8
2	Site Details	9
2.1	Location	9
2.2	Zoning	9
2.3	Adjacent Uses	9
2.4	Site Condition	10
2.5	Proposed Development	10
2.5.1	Block 4	10
2.5.2	Declaration Area	11
3	Site History	12
4	Contaminants Of Concern	14
5	Stratigraphy and Hydrogeology	16
5.1	Stratigraphy	16
5.2	Hydrogeology	17
6	Evaluation of Quality Assurance and Quality Control	18
7	Environmental Quality Criteria	29
7.1	Soil	29
7.1.1	Asbestos	29
7.1.2	Acid Sulfate Soils	30
7.2	Groundwater	30
8	Evaluation of Soil Analytical Results Against Screening Criteria	31
8.1	Introduction	31
8.2	Field Observations	31
8.2.1	Definitions of Contaminated Material	31
8.2.2	Soil (Fill and Natural)	31
8.2.3	Bedrock	32
8.3	Soil Analytical Results	33
8.3.1	Introduction	33
8.3.2	Declaration Area	33
8.3.3	Block 4	34
8.3.4	Heavy End TPH and PAH	36
8.3.5	Light End TPH, BTEX and Naphthalene	36
8.3.6	Heavy Metals	37
8.3.7	Asbestos	37
8.3.8	Other Analyses	38
8.4	Conclusion	38
9	Evaluation of Groundwater Analytical Results Against Screening Criteria	39
9.1	Introduction	39
9.2	Overview of Groundwater Monitoring	39
9.3	Groundwater Analytical Results	39
9.4	Separate Phase Observations	51
9.5	Contaminant Detections	51

9.6	Natural Attenuation	52
9.7	Conclusion	52
10	Assessment of Risk and Development of Remediation Goals	54
10.2.4	Ecological Risk Assessment	59
11	Determination of Remediation Extent for VMP Removal	68
11.1	Introduction	68
11.2	SPGWT and CIM Located Onsite	68
11.2.1	Blocks 4 and 5	68
11.2.2	Hickson Road	69
11.3	SPGWT and CIM Located Offsite	70
11.3.1	Offsite Downgradient	70
11.3.2	Offsite Upgradient	72
11.4	Proposed Remedial Extent	72
11.4.1	Lateral and Vertical Extent	72
11.4.2	SPGWT and CIM Not Addressed by Proposed Remediation Extent	73
11.5	Contaminant Mass Flux	74
11.6	Contaminant Mass Calculations	76
11.7	Conclusion	78
12	Determination of Remediation Extent for Block 4 Development	79
12.1	Introduction	79
12.2	SPGWT and CIM Located Onsite	79
12.3	Proposed Remedial Extent	81
12.3.1	Lateral and Vertical Extent	81
12.3.2	SPGWT and CIM Not Addressed by Proposed Remediation Extent	82
12.4	In Situ Validation of Groundwater Retention Wall Alignment	82
12.5	Conclusion	84
13	Evaluation of Proposed Remediation	85
13.1	Remediation Strategy and Methodology Overview	85
13.1.1	Block 4 – VMP and Development	85
13.1.2	Block 5 and Hickson Road – VMP	86
13.2	Excavation and Reuse Process	86
13.2.1	Overview	86
13.2.2	Retention Walls	86
13.2.3	Excavated Material Treatment	87
13.2.4	Materials Tracking	86
13.3	In Situ Treatment	87
13.4	Evaluation of Remedial Action Plan	88
13.5	Additional Remediation Documentation	100
13.6	Conclusion	101
14	Contamination Migration Potential	103
15	Residual Risk Following Remediation	104
16	Ongoing Site Management	105
17	Compliance with Regulatory Guidelines And Directions	106
18	Conclusions and Recommendations	108
19	Other Relevant Information	109

List of Tables and Figures

Table 1.1: Documents Reviewed
Table 3.1: Site History
Table 4.1: Contaminants of Concern
Table 5.1: Stratigraphy
Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment
Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control
Table 7.1: Summary of Auditor's Screening Criteria for Key Soil Contaminants
Table 8.1: Declaration Area - Fill Material, Evaluation of Analytical Results Summary Table (mg/kg)
Table 8.2: Declaration Area - Natural Material, Evaluation of Analytical Results Summary Table (mg/kg)
Table 8.3: Block 4, Summary of Soil Analytical Program and Maximum Concentrations Detected
Table 9.1: Monitoring Well Summary
Table 9.2: Declaration Area – Fill Material, Evaluation of Groundwater Analytical Results Summary Table (µg/L)
Table 9.3: Declaration Area – Natural Material, Evaluation of Groundwater Analytical Results Summary Table (µg/L)
Table 9.4: Block 4, Evaluation of Groundwater Analytical Results Summary Table (µg/L)
Table 11.1: Identification of SPGWT at Blocks 4 and 5
Table 11.2: Assessment of Blocks 4 and 5 Results Against SSTC
Table 11.3: Identification of SPGWT at Hickson Road
Table 11.4: Assessment of Hickson Road Results Against SSTC
Table 11.5: Identification of SPGWT Offsite to West
Table 12.1: Identification of SPGWT at Block 4
Table 12.2: Assessment of Block 4 Results Against SSTC
Table 13.1: Evaluation of Remedial Action Plan
Table 13.2: Summary of Proposed Validation
Table 17.1: Evaluation of Status of Stage 1 VMP Objectives

List of Appendices

Appendix A	Attachments
	Attachment 1: Site Location
	Attachment 2: Site Layout and Historical Gasworks Infrastructure Locations
	Attachment 3: Site Assessment Areas, Proposed Land Use and Basement Groundwater Retention Wall System
	Attachment 4: 2010 Site Survey
	Attachment 5: Former Layout of the Larger Barangaroo Site
	Attachment 6: Block 4 Proposed Development Cross Section
	Attachment 7: Indicative Bedrock and Marine Sediment Contours
	Attachment 8: Investigation Locations
	Attachment 9: Location of Separate Phase Gasworks Wastes and Tar
	Attachment 10a: Offsite Gasworks Related Impacts in Fill Material
	Attachment 10b: Offsite Gasworks Related Impacts in Marine Sediment
	Attachment 11: Conceptual Site Model for VMP Remediation
	Attachment 12: VMP Remediation Works – Unsaturated Soil SSTC Exceedances

Attachment 13: VMP Remediation Works – Groundwater SSTC Exceedances

Attachment 14: Proposed VMP Extent of Remediation - Unsaturated

Attachment 15: Proposed VMP Extent of Remediation - Saturated

Attachment 16: Transects Modelled in Mass Flux Discharge Memo, March
2013

Attachment 17: Zones Considered in Contaminant Mass Calculations

Attachment 18: Block 4 Development Remediation Works – Groundwater
SSTC Exceedances

Attachment 19: Proposed Block 4 Development Extent of Remediation -
Saturated

Appendix B Soil and Groundwater Screening Criteria

Appendix C EPA Guidelines

Appendix D Analytical Lists and Methods

Appendix E Proposed Risk Based Remediation Criteria (SSTCs) and Marine Water
Quality Criteria (MWQC)

Appendix F Contaminant Mass Calculations

Appendix G ENVIRON Letter "Review of Block 5 and Hickson Road Pilot Test, S-ISCO
and SEPR, Barangaroo" dated 13 October 2010

List of Abbreviations

AASS	Actual Acid Sulphate Soils
AC	asbestos cement
ACM	asbestos containing material
AECOM	AECOM Australia Pty Ltd
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ASET	Australian Safer Environment and Technology Pty Ltd. (Laboratory)
ASAC	Analyte Specific Acceptance Criteria
ASLP	Australian Standard Leaching Procedure
ASS	acid sulphate soils
ANZECC	Australian and New Zealand Environment and Conservation Council
BACM	Bonded asbestos containing material
BaP	Benzo(a)pyrene
BDA	Barangaroo Delivery Authority
BGL	below ground level
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic Aromatic Hydrocarbons)
CIM	Confirmed impacted material
CLM Act	NSW <i>Contaminated Land Management Act 1997</i>
COPC	Contaminants of Potential Concern
CPAH	carcinogenic PAHs and includes: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene
CRS	Chromium Reducing Sulfur
CUTEP	clean-up to the extent practicable
DAF	Dilution Attenuation Factor
DEC	NSW Department of Environment and Conservation (now OEH)
DECC	NSW Department of Environment and Climate Change (now OEH)
DGI	data gap investigation report
DNAPL	dense non aqueous phase liquid
DOP	Department of Planning (NSW)
DP	Deposited Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
ENM	excavated natural material
EnRisks	Environmental Risk Services Pty Ltd
EPA	Environment Protection Authority (NSW)
EPL	Environment Protection License
ESA	Environmental Site Assessment report
ESD	ecologically sustainable development
ERM	Environmental Resources Management Australia Pty Ltd
GDS	Groundwater Discharge Study
ha	Hectare
HHERA	Human Health and Ecological Risk Assessment
J&K	Jeffery & Katauskas Pty Ltd
km	Kilometres
LCS	Laboratory Control Sample
LLMP	Lend Lease (Millers Point) Pty Ltd
LOR	Limit of Reporting
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Fe: Iron, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury, Se: Selenium
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre

mBGL	Metres below ground level
MWQC	marine water quality criteria
µg/L	Micrograms per Litre
NAPL	non aqueous phase liquid
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
ng/L	Nanograms per Litre
NEHF	National Environmental Health Forum
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
n	Number of Samples
OEH	Office of Environment and Heritage, NSW Department of Premier and Cabinet
OCPs	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
ORWN	Other Remediation Works (North) Area
ORWS	Other Remediation Works (South) Area
PAHs	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulphate Soils
PCBs	Polychlorinated Biphenyls
PID	Photoionisation Detector
PIM	Potential impacted material
PQL	Practical Quantitation Limit
pH	a measure of acidity, hydrogen ion activity
QA/QC	Quality Assurance/Quality Control
RAP	remedial action plan
RPD	Relative Percent Difference
RWP	Remedial work plan
SAR	Site Audit Report
SEPR	surfactant enhanced product removal
S-ESCO	surfactant-enhanced ex situ chemical oxidation
S-ISCO	surfactant-enhanced in situ chemical oxidation
SILs	Soil Investigation Levels
SMP	site management plan
SPGWT	Separate Phase Gasworks Waste and Tar
SSESCs	site specific ecological screening criteria
SST	sandstone
SSTCs	site specific target criteria
SVOCs	Semi Volatile Organic Compounds
TCLP	Toxicity Characteristics Leaching Procedure
TCM	tar containing material
TPH	Total Petroleum Hydrocarbons
TSC	terrestrial soil criteria
TTM	Total toxicity of mixtures
TV	Trigger value
UCL	Upper Confidence Limit
VENM	virgin excavated natural material
VMP	Voluntary Management Proposal
VOCs	Volatile Organic Compounds
WAD	weak acid dissociable (cyanide)
-	On tables is "not calculated", "no criteria" or " not applicable"

1 Introduction

1.1 Introduction and Objective

A site contamination audit has been conducted in relation to part of the site known as "Barangaroo", at Millers Point, NSW, on behalf of Lend Lease (Millers Point) Pty Ltd (LLMP). Barangaroo is a large site to be developed in stages and for a variety of uses, with different portions subject to separate audits. The portion of Barangaroo that is the subject of this audit has been designated as the "the declaration area" and "Block 4" areas. The declaration area consists of a portion of Barangaroo which previously contained a manufactured coal gasworks and which has been declared by the Environment Protection Authority (NSW) (EPA) as a Remediation Site (No. 21122). The declaration area includes a portion of Hickson Road and a portion of Blocks 4 and 5 of the Barangaroo development. The remainder of Block 4 which includes additional land to the west of the declaration area is also the subject of this audit. The site location is shown on Attachment 1, Appendix A and the boundary of the declaration area and historical gasworks infrastructure locations is shown on Attachment 2, Appendix A.

For the purpose of this audit, the site has been considered in two portions, with two different objectives (refer Attachment 3, Appendix A), as follows:

- Declaration area – including portions of Hickson Road, Block 4 and Block 5, objective is to allow the EPA declaration to be revoked (Voluntary Management Proposal (VMP) removal).
- Block 4 – including part of the declaration area, objective is to allow development of Block 4.

The Audit was conducted to provide an independent review by an EPA Accredited Auditor of the suitability and appropriateness of a plan of management, long-term management plan or a voluntary management proposal i.e. a "Site Audit" as defined in Section 4 (1) (b) (v) of the *NSW Contaminated Land Management Act 1997* (the CLM Act). The relevant plan is a remedial action plan (RAP) prepared by AECOM Australia Pty Ltd (AECOM) which has been prepared to address the two different areas and two different objectives, above. Two separate site audit statements (SAS) have been prepared to accompany this site audit report (SAR).

1.2 Background

Details of the audit are:

Requested by: Warwick Bowyer on behalf of Lend Lease (Millers Point) Pty Ltd

Request/Commencement Date: 30 October 2009

Auditor: Graeme Nyland

Accreditation No.: 9808

A number of contamination investigations have been conducted at the larger Barangaroo site since 1996. As part of the audit, the Auditor has reviewed investigation results, risk-

based remediation criteria and remediation planning documentation relevant to the declaration area and Block 4.

Separate RAPs are to be prepared for each development stage at Barangaroo. As it is envisaged that remediation in different portions of Barangaroo will be linked, for example by re-use of material from one part in another, an Overarching RAP was prepared by Environmental Resources Management Australia Pty Ltd (ERM, 2010) to identify strategies and remedial options for remediation of the whole site. Review of the Overarching RAP was conducted for Barangaroo Delivery Authority (BDA) by the Auditor and a SAR prepared as follows:

- "Site Audit Report - Overarching Remedial Action Plan, Barangaroo", and Site Audit Statement GN 439A, dated 2 June 2010.

The RAP for the portion of Barangaroo adjoining the declaration area to the south, the Other Remediation Works South (ORWS) area, was reviewed by the Auditor on behalf of Lend Lease and a SAR prepared as follows:

- "Site Audit Report, Remedial Action Plan, Other Remedial Works (South), Barangaroo" and Site Audit Statement GN 439B-1, dated 14 July 2011.

During the course of the current audit, the Auditor has prepared a letter reviewing the pilot trial methodology for possible in-situ remediation technologies for the declaration area which include Surfactant-enhanced In Situ Chemical Oxidation (S-ISCO) and Surfactant Enhanced Product Recovery (SEPR). Tasks relating to S-ISCO and SEPR are included in the VMP for the declaration area, which is discussed in the following section. The review was documented in the following letter, which is included as Appendix G of this SAR:

- "Re: Review of Block 5 and Hickson Road Pilot Test, S-ISCO and SEPR, Barangaroo" dated 13 October 2010.

1.3 Voluntary Management Proposal

BDA has entered into a VMP with the EPA, Approval No. 20101719, dated 23 July 2010, which addresses those works required to remove the declaration. The contaminants identified in the VMP comprise TPH, BTEX, PAHs, ammonia, phenol and cyanide. The VMP is proposed in two stages, as follows:

(a) *"Stage 1: VMP in which:*

- (1) investigative works would be undertaken with the objective of identifying, and obtaining the Site Auditor's and the EPA's approval of a preferred remedial strategy to address the groundwater contamination on the Site;*
- (2) presenting the detailed design of the remedial strategy in a Remedial Action Plan ("RAP") and a Remedial Work Plan ("RWP"); and*
- (3) obtaining the Site Auditor's endorsement of or confirmation that he has no objection to the RAP, and obtaining the EPA's approval of the RAP.*

(b) *Stage 2: VMP in which the remedial measures set out in the RAP would be implemented".*

Objectives identified for stage 1 of the VMP are as follows:

- "O1. Conduct a Data Gap Investigation for the Site in order to adequately characterise the nature and extent of the Site contamination.
- O2. Prepare a Human Health and Ecological Risk Assessment ("HHERA") which would identify the Site specific soil and groundwater acceptance criteria for the Site and for the remediation works.
- O3. Conduct remediation technology trials to determine applicability and selection of proposed remediation technologies for the Site.
- O4. Prepare and submit a RAP (which outlines the agreed detailed design and specifications of the remedial measures and how these will be implemented, and is conditional upon a strategy to confirm the preferred remediation technologies (subject to completion of remediation technology trials)) to the Site Auditor and the EPA; obtain the Site Auditor's endorsement of the RAP or confirmation that he has no objection to the RAP; and obtain the EPA's approval of the RAP.
- O5. Based on the RAP, prepare and submit a RWP (which sets out the technical specifications of the remediation works on the Site) to the Site Auditor and the EPA; obtain the Site Auditor's endorsement of the RWP or confirmation that he has no objection to the RWP; and obtain the EPA's approval of the RWP".

The status of the VMP stage 1 objectives are discussed in Section 17. The VMP states that "The objectives of stage 2 will be defined in a separate voluntary management proposal upon completion of stage 1...".

1.4 Scope of Work

The scope of the audit included:

- Review of the documents listed in Table 1.1, below.

Table 1.1: Documents Reviewed

Document Type	Title	Date	Author	Relevance	Reference
Report	'Report to Sydney Harbour Foreshore Authority on Geotechnical Investigation for Proposed Redevelopment of Wharves 3-8 at Hickson Road, Darling Harbour East, NSW'	21 August 2006	Jeffery and Katauskas Pty Ltd (J&K)	Investigation data, whole of Barangaroo	J&K, 2006
Report	'Land at Millers Point, Ownership and Usage'	1 June 2007	Rosemary Broomham	Site history	Broomham, 2007
Report	'Environmental Site Assessment, East Darling Harbour, Sydney, NSW'	21 June 2007	Environmental Resources Management Australia Pty Ltd (ERM)	Investigation data, whole of Barangaroo	ERM, 2007
Draft Report	'Preliminary Environmental Investigation, 30-38	12 May 2008 (final	Coffey Environments	Investigation data, Hickson	Coffey, 2008

Table 1.1: Documents Reviewed

Document Type	Title	Date	Author	Relevance	Reference
	Hickson Road, Millers Point, NSW, 2000'	report dated 29 June 2009 publicly available)	Pty Ltd (Coffey)	Road	
Report	'Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW'	July 2008	ERM	Investigation data, whole of Barangaroo	ERM, 2008a
Report	'Draft Stage 2 Remedial Action Plan for Barangaroo, Hickson Road, Sydney'	September 2008	ERM	Draft overarching remediation of whole of Barangaroo	ERM, 2008b
Report	'Overarching Remedial Action Plan for the Barangaroo Project Site, Sydney'	1 June 2010	ERM	Overarching remediation of whole of Barangaroo	ERM, 2010 (the Overarching RAP)
Report	'Sampling, Analytical and Quality Plan [SAQP] Declaration Area – Issue 2 VMP and PDA Works, NSW EPA Declaration Area 21122, former Millers Point Gasworks'	6 July 2010 (and draft dated 2 March 2010)	AECOM Australia Pty Ltd (AECOM)	SAQP for declaration area	AECOM, 2010a
Report	'Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Hickson Road, Millers Point, NSW'	23 September 2010 (and drafts dated 16 April 2010 and 30 July 2010)	AECOM	Investigation data, declaration area	AECOM, 2010b (the DGI)
Report	'Treatability Study Recommendations for the Implementation of an In Situ Remedy, Barangaroo – Block 5 and Hickson Rd Site, Lend Lease (LL), Sydney, Australia'	23 September 2010 (and draft dated 16 June 2010)	VeruTEK Technologies Inc. (VeruTEK)	Laboratory treatability study of proposed treatment technologies	VeruTEK, 2010a
Report	'Work Plan, Surfactant Enhanced In Situ Chemical Oxidation, Surfactant Enhanced Product Recovery, Block 5 and Hickson Road, Pilot Trial'	7 October 2010 (and drafts dated June 2010, 27	VeruTEK	Describes the proposed pilot trial of in situ remediation technologies	VeruTEK, 2010b

Table 1.1: Documents Reviewed

Document Type	Title	Date	Author	Relevance	Reference
		August 2010 and 28 September 2010)			
Report	'Data Gap Investigation, Other Remediation Works North, Hickson Road, Millers Point, NSW'	20 October 2010 (and draft dated 3 June 2010)	AECOM	Investigation data, ORWN to the west	AECOM, 2010c (the ORWN DGI)
Report	'Groundwater Discharge Study, Stage 1 Barangaroo Development'	3 November 2010 (and draft dated 4 August 2010)	AECOM	Groundwater investigation onsite and down gradient	AECOM, 2010d
Report	'Revised Work Plan and Trial Management Plan, Surfactant Enhanced in Situ Oxidation (S-ISCO®) & Surfactant Enhanced Product Recovery (SEPR™), Block 5 and Hickson Road Pilot Trial'	May 2011 (and drafts dated 27 August 2010 and 7 October 2010)	VeruTEK	Update of proposed pilot trial of in situ remediation technologies, not reviewed in detail by Auditor	VeruTEK, 2011
Report	'Human Health and Ecological Risk Assessment, Declaration Site (Development Works) Remediation Works Area - Barangaroo'	9 June 2011 (and drafts dated 30 July 2010, 31 January 2011, 12 April 2011 and 6 May 2011)	AECOM	Development of site specific target criteria (SSTC) and site specific ecological screening criteria (SSESC) for redevelopment of declaration area	AECOM, 2011 (the Declaration Site HHERA)
Report	'Supplementary Data Gap Investigation, VMP Area, Hickson Road, Millers Point, NSW'	9 March 2012	AECOM	Investigation data, onsite and offsite	AECOM, 2012a (the Supplementary DGI)
Memorandum	'Contaminant Flux and Discharge Estimates for Natural Residual Soil and	14 March 2012	AECOM	Analysis of contaminant flux for	AECOM, 2012b