



Site Audit Report
Extent of Contamination,
Proposed International
Convention Centre Hotel
Development, Darling Harbour

Prepared for:
Lend Lease Development Pty Limited

Prepared by:
ENVIRON Australia Pty Ltd

Date:
August 2013

Project Number:
AS121584

Audit Number:
GN 477A

22 August 2013

Our Ref: AS121584

Lend Lease Development Pty Limited
Attn: Warwick Bowyer
30 The Bond, 30 Hickson Rd
Millers Point NSW 2000

Dear Warwick

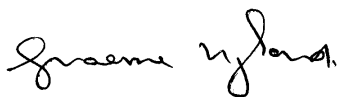
**Re: Site Audit Report - Extent of Contamination, Proposed International
Convention Centre Hotel Development, Darling Harbour**

I have pleasure in submitting the Site Audit Report for the subject site. The Site Audit Statement, produced in accordance with the NSW Contaminated Land Management Act 1997 follows this letter. The audit was commissioned by Lend Lease Development Pty Limited to assess the suitability of the site for its intended use.

This Site Audit Report is not currently required by regulation or legislation and is therefore a non-statutory audit.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8100 if you have any questions.

Yours faithfully,
ENVIRON Australia Pty Ltd



Graeme Nyland
EPA Accredited Site Auditor 9808

NSW Site Auditor Scheme SITE AUDIT STATEMENT



A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the Contaminated Land Management Act 1997 on 31st October 2012. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. GN 477A

This site audit is a ~~statutory audit~~/non-statutory audit* within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name: Graeme Nyland

Company: ENVIRON Australia Pty Ltd

Address: Level 3, 100 Pacific Highway (PO Box 560)

North Sydney NSW

Postcode: 2060

Phone: 02 9954 8100

Fax: 02 9954 8150

Site details

Address: International Convention Centre Hotel Development, Darling Drive, Darling Harbour, NSW
(see Attachment 1 at end of Part I of this statement).

Postcode: 2000

Property description (*attach a list if several properties are included in the site audit*)

Part Lot 1010 in DP 1147364 (as defined by black broken line on Attachment 2 at end of Part I of this statement)

Local Government Area: City of Sydney

Area of site (e.g. hectares): 0.4 Ha

Current zoning: The site is subject to the Darling Harbour Development Plan No. 1 which is deemed to be a State Environmental Planning Policy for the purposes of the Environmental Planning and Assessment Act 1979

To the best of my knowledge, the site ~~is~~/is not* the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

Declaration/Order/Agreement/Proposal/Notice* no(s): N/A

**Strike out as appropriate*

Site audit commissioned by

Name: Warwick Bowyer

Company: Lend Lease Development Pty Ltd

Address: The Bond, 30 Hickson Rd, Millers Point NSW Australia

Postcode: 2000

Phone: 9277 2069

Fax: 9383 8139

Name and phone number of contact person (if different from above)

Ricardo Prieto-Curiel 02 9277 2723

Purpose of site audit

☐ ~~A. To determine land use suitability (please specify intended use[s])~~

...

OR

- ☒ B(i) To determine the nature and extent of contamination, and/or
- ☒ B(ii) To determine the appropriateness of an ~~investigation/remedial~~
action/management plan*, and/or
- ☒ B(iii) To determine if the land can be made suitable for a particular use or uses by
implementation of a specified ~~remedial action plan/management plan*~~ (please specify
intended use[s]):

International Convention Centre Hotel

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

- Coffey Geotechnics Pty Ltd (Coffey)
- Coffey Environments Australia Pty Ltd (Coffey)
- AECOM Australia Pty Ltd (AECOM)

Title(s) of report(s) reviewed:

- 'Geotechnical Investigation, Proposed Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour,' 25 May 2012, Coffey Geotechnics Pty Ltd
- 'Stage 2 – Detailed Site Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney,' 1 June 2012, Coffey Geotechnics Pty Ltd
- 'Stage 1 – Preliminary Environmental Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney,' 8 June 2012, Coffey Geotechnics Pty Ltd
- 'SICEEP SAQP Summary', Revision 01, 22 October 2012, AECOM Australia Pty Ltd

- 'Supplementary Site Investigation: Factual Report, Sydney International Conference Exhibition and Entertainment Precinct, Darling Harbour,' 30 January 2013, Coffey Geotechnics Pty Ltd
- 'Sampling and Analysis and Quality Plan for Stage 2 Works for the Hotel Development Site, Darling Harbour, Sydney, NSW' 10 May 2013, Coffey Environments Australia Pty Ltd
- 'Detailed Site Investigation Report for SSDA6, International Convention Centre Hotel Development – Sydney International Convention, Exhibition & Entertainment Precinct' 14 August 2013, Coffey Geotechnics Pty Ltd
- Unexpected Finds Procedure, Appendix F of Coffey (14 August 2013).

Other information reviewed (including previous site audit reports and statements relating to the site)

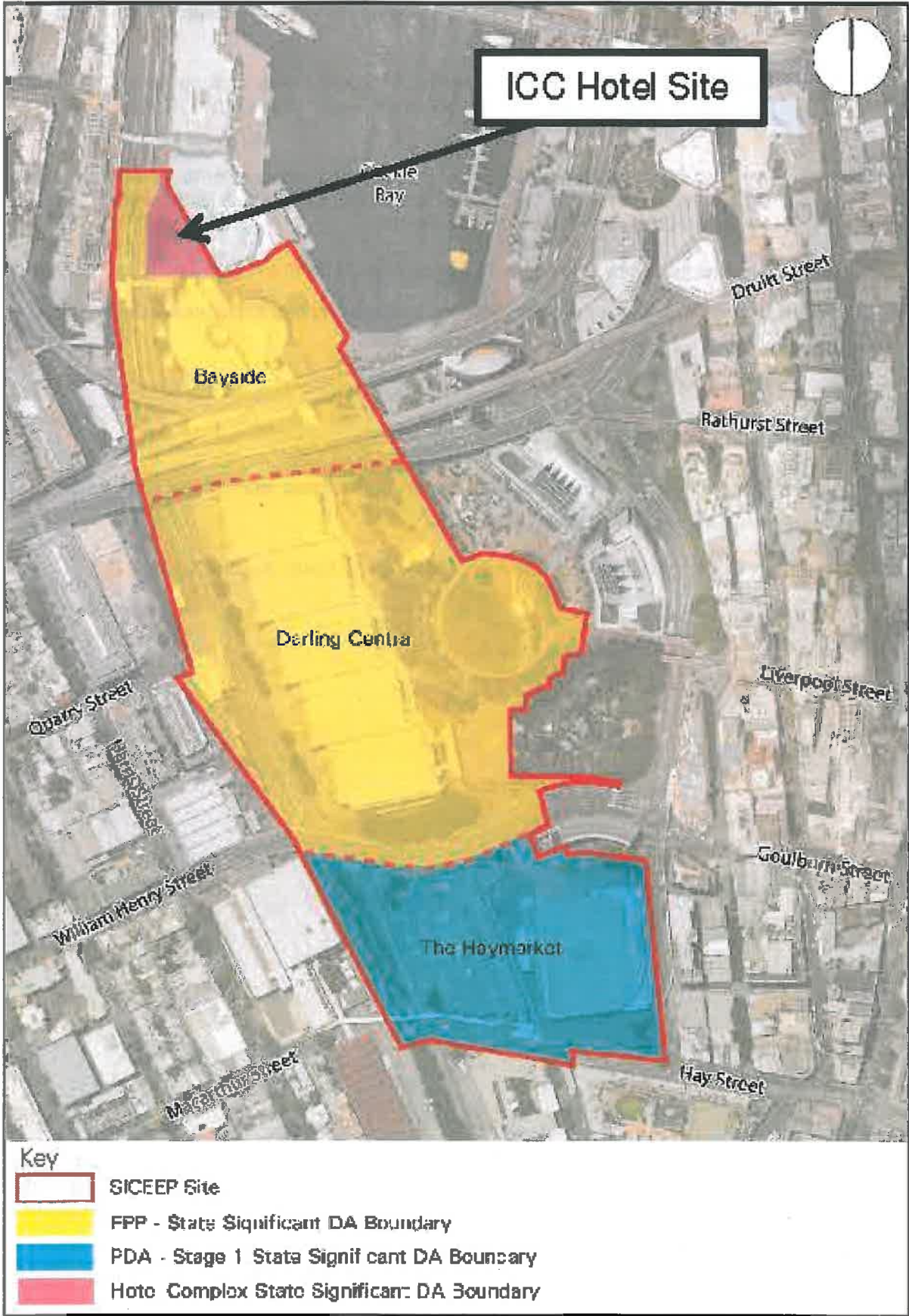
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Site audit report

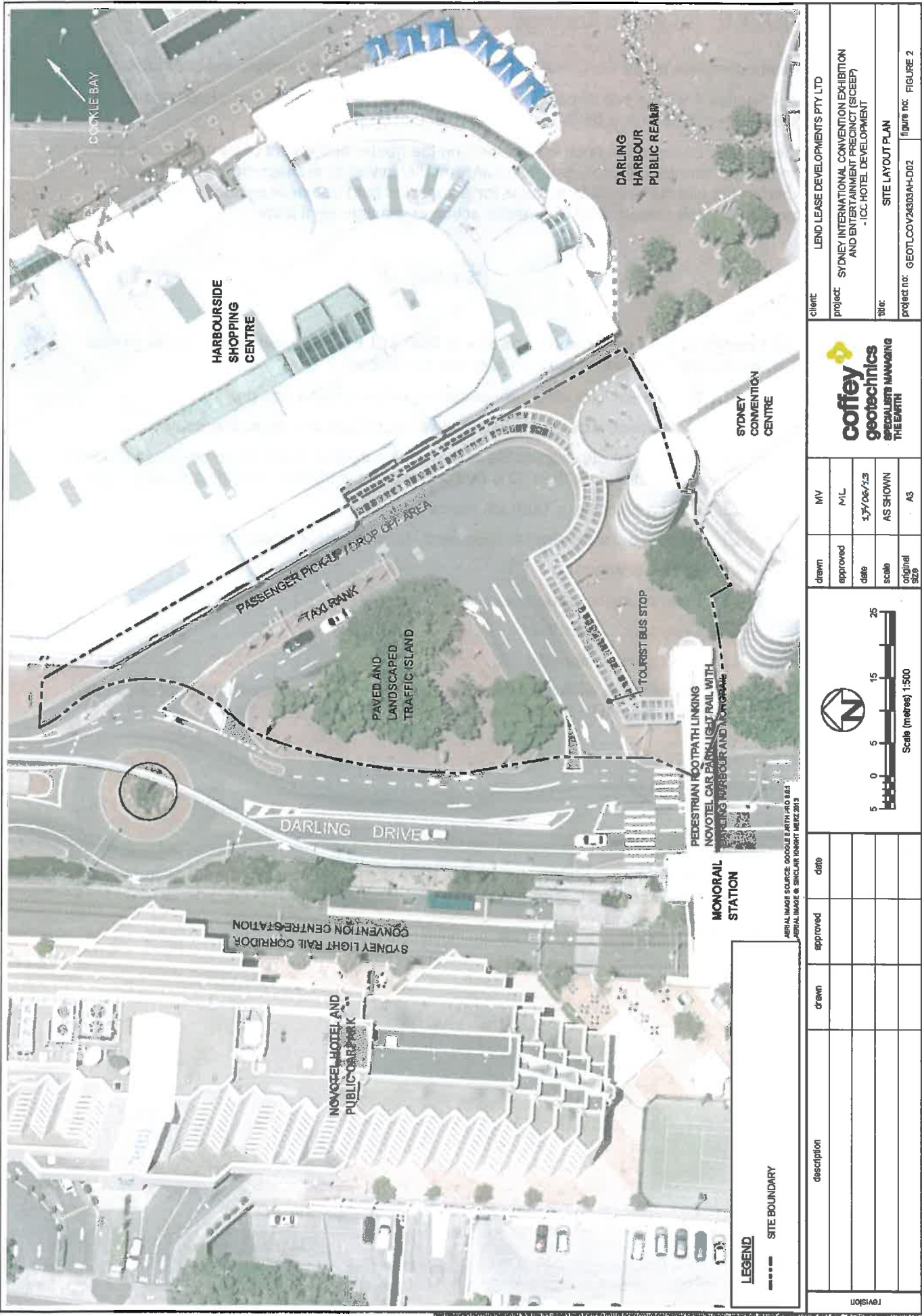
Title:... Site Audit Report – Extent of Contamination, Proposed International Convention Centre Hotel Development, Darling Harbour

Report no. GN 477A (ENVIRON Ref: AS121584)

Date: August 2013



**Strike out as appropriate*



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 was to assess the nature and extent of contamination to provide a framework to ensure that the site is suitable for the proposed use after 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)~~

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

- 'Unexpected Finds Procedure' included as Appendix F of 'Detailed Site Investigation Proposed International Convention Centre Hotel Development, Darling Harbour, Sydney NSW,' 22 July 2013, Coffey Geotechnics Pty Ltd

subject to compliance with the following condition(s):

- Appropriate confirmation and documentation that the Unexpected Finds Procedure is implemented during development
- Validation to appropriate ecological levels in areas (if any) where soil is exposed at or near the surface (such as landscaping areas).

Overall comments

The Unexpected Finds Procedure is to be implemented during development. The Auditor considers the following to be required to ultimately certify the suitability for the site for the proposed land use:

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

- Clearly defining roles and responsibilities in relation to implementing the Unexpected Finds Procedure (the current plan does not do this)
- Implementing and documenting the Unexpected Finds Procedure during development (including confirmation that there were no unexpected finds if applicable)
- Appropriate identification of contaminant conditions that vary in nature or extent to the contamination that has currently been characterised
- Appropriate response to the above including remediation/management and provision of a validation report to an EPA accredited auditor for audit if/where required
- The outcome of these key elements would need to be provided in a validation report to an EPA accredited auditor for audit if/when required to certify the suitability for the site for the proposed land use.

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...

22/8/2013

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.

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List of Abbreviations

ACM	Asbestos Containing Material
AECOM	AECOM Australia Pty Ltd
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
ARC	Asbestos Removal Contractor
ASET	Australian Safer Environment and Technology Pty Ltd. (Laboratory)
ASLP	Australian Standard Leaching Procedure
ASS	Acid Sulphate Soils
AASS	Actual Acid Sulphate Soils
ASS	Acid Sulphate Soils
BACM	Bonded Asbestos Cement Sheet
BaP	Benzo(a)pyrene
BGL	below ground level
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic Aromatic Hydrocarbons)
CCMR	Construction Contamination Management Report
CLM Act	NSW Contaminated Land Management Act 1997
CN	Cyanide (total or free)
COC	Chain of Custody
Council	City of Sydney Council
CT	Certificate of Title
DA	Development Application
DAF	Dilution Attenuation Factor
DEC	Department of Environment and Conservation (former)
DECCW	Department of Environment, Climate Change and Water (former)
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EMP	Environmental Management Plan
EnviroLab	EnviroLab Services Pty Ltd
EP&A Act	Environmental Planning and Assessment ACT 1979
EPA	Environment Protection Authority (NSW)
ESA	Environmental Site Assessment report
ESL	Ecological Screening Level
GME	Groundwater Monitoring Event
HHERA	Human Health and Ecological Risk Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
ha	Hectare
ICC	International Convention Centre
km	Kilometres
LOR	Limit of Reporting
LLD	Lend Lease Development Pty Limited
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
mbgl	Metres below ground level
µg/L	Micrograms per Litre

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
NSW	New South Wales
OCPs	Organochlorine Pesticides
OEH	Office of Environment and Heritage
OH&S	Occupational Health & Safety
OCPs	Organochlorine Pesticides
OPPs	Organophosphorus Pesticides
PASS	Potential Acid Sulphate Soils
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
pH	a measure of acidity, hydrogen ion activity
PDA	Project Delivery Agreement
PID	Photoionisation Detector
ppm	Parts Per Million
PPP	Public Private Partnership
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RPD	Relative Per Cent Difference
RWP	Remedial Works Plan
RfC	Reference Concentrations
SAQP	Sampling Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SCEC	Sydney Convention and Exhibition Centre
SICEEP	Sydney International Conference Exhibition and Entertainment Precinct
SILs	Soil Investigation Levels
SVOCs	Semi Volatile Organic Compounds
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TPHs	Total Petroleum Hydrocarbons
TV	Trigger Value
UCL	Upper Confidence Limit
UST	Underground Storage Tank
USEPA	United States Environment Protection Agency
VENM	Virgin Excavated Natural Material
VMP	Voluntary Management Proposal
VHCs	Volatile Halogenated Hydrocarbons
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or "not applicable"

1 Introduction

1.1 Background

A site contamination audit has been conducted in relation to part of the site known as the proposed Sydney International Conference Exhibition and Entertainment Precinct (SICEEP) at Darling Harbour, Sydney NSW. The site locality is shown on Attachment 1, Appendix A.

SICEEP is approximately 19.62 ha and has been divided into two development areas as follows:

- Public Private Partnership (PPP) Sector: includes current Sydney Convention Centre, Sydney Exhibition Centre and public areas including Tumbalong Park (approximately 17.2 ha).
- Project Delivery Agreement (PDA) Sector: This area is divided into PDA South (Entertainment Centre, car park rail corridor and Darling Drive) and PDA North (proposed hotel development precinct).

This audit report covers the PDA North Sector only which is the proposed International Convention Centre (ICC) Hotel development precinct. PDA North Sector is located at the northern end of the SICEEP within "Bayside" and the layout is shown on Attachment 2, Appendix A. The PDA North Sector is also referred to as "the site" or "PDA North site" for the purpose of this audit.

The audit was initiated to ultimately provide an independent review by an EPA Accredited Auditor of whether the land is suitable for any specified use or range of uses. However, this initial stage of the audit was conducted to review the suitability and appropriateness of a plan of management as defined in Section 4 of the NSW Contaminated Land Management Act 1997 (the CLM Act). The applicable plan of management is the Unexpected Finds Procedure discussed in Section 13 of this Site Audit Report.

Details of the audit are:

Requested by: Warwick Bowyer on behalf of Lend Lease Development Pty Limited

Request/Commencement Date: 18 February 2013

Auditor: Graeme Nyland

Accreditation No.: 9808

The scope of the audit included:

- Review of the following reports, which related to the wider SICEEP (including the site) with the exception of Coffey (2013b&c) which are specific to the site:

- ‘Geotechnical Investigation, Proposed Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour,’ 25 May 2012, Coffey Geotechnics Pty Ltd (Coffey 2012a)
- ‘Stage 2 – Detailed Site Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney,’ 1 June 2012, Coffey Geotechnics Pty Ltd (Coffey 2012b)
- ‘Stage 1 – Preliminary Environmental Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney,’ 8 June 2012, Coffey Geotechnics Pty Ltd (Coffey 2012c)
- ‘SICEEP SAQP Summary’, Revision 01, 22 October 2012, AECOM Australia Pty Ltd (AECOM 2012)
- ‘Supplementary Site Investigation: Factual Report, Sydney International Conference Exhibition and Entertainment Precinct, Darling Harbour,’ 30 January 2013, Coffey Geotechnics Pty Ltd (Coffey 2013a)
- ‘Sampling and Analysis and Quality Plan for Stage 2 Works for the Hotel Development Site, Darling Harbour, Sydney, NSW’ 10 May 2013, Coffey Environments Australia Pty Ltd (Coffey 2013b)
- ‘Detailed Site Investigation Report for SSDA6, International Convention Centre Hotel Development – Sydney International Convention, Exhibition & Entertainment Precinct’ 14 August 2013, Coffey Geotechnics Pty Ltd (Coffey 2013c)
- Unexpected Finds Procedure, Appendix F of Coffey (2013c).
- A site visit by the Auditor on 12 March 2013.
- Discussions with Lend Lease, AECOM and Coffey.

Coffey (2012a, 2102b, 2012c and 2013a) and AECOM (2012) were reviewed with respect to the PPP site as part of a Site Audit Report (SAR) titled “Remedial Works Plan, PPP Site, SICEEP” by Graeme Nyland of ENVIRON Australia Pty Ltd 13 March 2013 (ENVIRON 2013). The Remedial Works Plan provided a management framework to manage the “uncertainty” associated with the potential variation in the nature and extent of contamination (polycyclic aromatic hydrocarbons and petroleum hydrocarbons) in heterogeneous fill across the PPP site. Reviews completed for the SAR and Site Audit Statement (SAS) (ENVIRON 2013) have been relied on for this report where applicable.

1.2 The Audit Team

The audit team is summarised in Table 1.1.

Table 1.1: Audit Team		
Role	Company	Details
Site Auditor	ENVIRON Australia Pty Ltd	Graeme Nyland
Audit Assistant	ENVIRON Australia Pty Ltd	Xanthe Holford

2 Site Details

2.1 Location

The site locality is shown on Attachments 1 and 2, Appendix A.

The site details are as follows:

Street address:	Darling Drive, Darling Harbour, NSW 2000
Identifier:	Part Lot 1010 in DP 1147364 as defined by black broken line on Attachment 3, Appendix A.
Local Government:	City of Sydney
Owner:	NSW Government
Site Area:	0.4 ha approximately

The PDA North site is bounded by Harbourside Shopping Centre and Darling Drive to the north; Harbourside Shopping Centre to the east; the PPP site to the south; and Darling Drive to the west (which includes a portion of the PPP site as shown on Attachment 2 Appendix A).

The site boundaries are generally not well defined on the ground.

2.2 Zoning

The site is subject to the Darling Harbour Development Plan No. 1 which is deemed to be a State Environmental Planning Policy for the purposes of the Environmental Planning and Assessment Act 1979 (EP&A Act).

2.3 Adjacent Uses

The site is located within the Darling Harbour entertainment area and is surrounded by multistorey car parking, light rail, commercial, retail, residential and open space uses.

The PPP site is located adjacent to the site to the south and west and was the subject of the SAR and SAS (ENVIRON 2013) as discussed in Section 1.1.

Cockle Bay is located approximately 70 m to the west.

2.4 Site Condition

The site comprises a triangular piece of land and currently functions as a passenger pick-up/drop off area as an extension of Darling Drive (asphalt surfaced road). A triangular paved traffic island and taxi rank are located in the northern portion, containing several mature trees, a small covered waiting area for passengers and a refuse bin. A paved area, bus stop and the northern edge of the existing Sydney Convention Centre and elevated pedestrian walkway heading over Darling Drive are located in the southern portion of the site.

The site has a very gentle slope (essentially flat) to the south-west with an elevation of approximately 3.2 mAHD the north and 2.4 mAHD in the southwest, and consistent with Darling Drive and ground floor levels of the adjoining Harbourside Shopping Centre and Sydney Convention Centre.

An easement is located across the central part of the site associated with existing underground culverts and an underground seawater intake is located beneath the site in the northern portion of the site that will be retained during the proposed development.

2.5 Proposed Development

The site is being developed as the International Convention Centre Hotel. Based on indicative plans that formed part of the Lend Lease's development application the development will include a multi-storey hotel building with hard paved areas for guest drop-off, loading/service area and basement access points. A basement structure for lift core shaft, circulation areas and plant rooms is proposed in the southern portion of the site (to the south of the easement and culverts). No recreational/public open space is proposed within the site boundaries. However, some limited areas of landscaping may be provided.

The finished ground floor lobby floor level is proposed to be around 3.6 mAHD (compared to current elevations of approximately 2.4 to 3.4 mAHD) and the basement approximately 0.0 mAHD (i.e up to approximately 3 m below the existing ground level) .

Coffey (2013c) adopted a 'commercial/industrial land use scenario'. However, the NEPM (1999) [2013] states the commercial/industrial land use scenario "does not include more sensitive uses that may be permitted under relevant commercial or industrial zonings. These more sensitive uses include ... hotels".

For the purposes of this audit a residential with minimal opportunities for soil access including dwellings with fully and permanently paved yard space, such as high rise buildings and apartments exposure scenario has been adopted.

3 Site History

Coffey provided a site history based on heritage assessments completed by others, historical parish maps, aerial photographs, planning certificates, review of the Contaminated Land Register, search of the NSW WorkCover Licenses to Keep Dangerous Goods Database, and site walk over. The site history is summarised in Table 3.1.

Table 3.1: Site History	
Date	Activity
Circa 1860s	Progressive reclamation
Circa 1885-1890	Site within a railway goods yard. Rail sidings and corridors to the north and south linking the site with the wharves along the Cockle Bay and Pyrmont Bay etc.
Circa 1930-1982	Site has been developed (by the 1930s aerial photograph) to form part of a complex of three Goods Sheds associated with rail freight in the area, which remains up to and including 1982 aerial photograph. The former Pyrmont and Ultimo Power Stations were in proximity of the site.
1986 - present day	Development of Darling Harbour including current public uses

In the auditor's opinion, the site history provides an adequate indication of past activities for the purpose of the studies completed. Uncertainties include:

- Knowledge regarding filling history is limited but is likely to have occurred over a period of time prior to and during the establishment of the goods yard between the 1880s and 1950s.
- Knowledge regarding the potential use of fill materials sourced from the former power stations.
- Knowledge regarding the existence and/or location of potential above ground or underground fuel storage across the site is limited. Coffey (1 June 2012) stated "Information regarding the possible existence of underground fuel or chemical storage tanks was not available for the current Sydney Convention and Exhibition Centre [i.e. to the south of the audit site on the PPP site] ...the presence on the [SICEEP] site of this common potential contamination source remains uncertain and must not be disregarded." Also, (Coffey 8 June 2012) stated "there was potential for small quantity storage of diesel for use in emergency generators across the site. However, access to all areas of the site was not possible during the walk over and this was unable to be confirmed". Based on the nature of the site (i.e. largely roads/paved areas rather than building structures) the risk of unidentified fuel storage areas is likely to be lower on the PDA North site compared to other areas of SICEEP.

The uncertainties in relation to the site history were considered by the auditor when drawing conclusions in relation to evidence of contamination at the site.

4 Contaminants Of Concern

The Stage 1 Preliminary Environmental Investigation (Coffey 2012c) identified the contaminants of concern and potentially contaminating activities across the site. These have been reviewed by the auditor and summarised in Table 4.1.

Table 4.1: Contaminants of Concern

Activity	Potential Contaminants (identifieded by auditor based on Coffey reports)
Railway and associated ancillary activities (including potential fuel storage)	Metals, asbestos, fuels, lubrication oils (TPH, BTEX, PAHs), herbicides, pesticides, other organic contaminants (e.g. VOCs, VHCs, SVOCs)
Filling from unknown sources (may include material from the former Ultimo Power Station)	Metals, asbestos, fuels, lubrication oils (TPH, BTEX, PAHs), combustion products such as clinker and ash (TPH, PAHs, metals), acid sulphate soils, other organic contaminants (e.g. VOCs, VHCs, SVOCs)

The auditor considers that the analyte list assessed adequately reflects the site history and condition and generally considers the uncertainties identified in Section 3.

The contaminants of concern were assessed across the wider SICEEP during Coffey (2012b & 2013a). After these investigations the primary contaminants of concern were identified as metals, PAHs, TPH, BTEX and asbestos and these were the contaminants assessed by Coffey (2013c) which was considered by the auditor to be acceptable.

5 Stratigraphy and Hydrogeology

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology across the site was compiled as summarised in the following sections.

5.1 Stratigraphy

Table 5.1: Sub-surface profile			
Unit	Depth to top of Unit (m)	Thickness of Unit (m)	Material Description
Fill	0	0.4 to 3.9	Asphalt and concrete paving hardstanding, overlying FILL: Heterogeneous in nature but typically comprised sand and gravelly sand: fine to coarse grained, brown, orange and grey, gravel is fine to coarse. Anthropogenic inclusions observed within the fill included metal wire and rubber fragments (BH201); brick fragments (NBH1). Shell fragments were also observed in shallow fill materials from several boreholes, indicative of material derived from dredging activity.
Alluvium	Observed in discrete horizons at 2.5m, 2.9m and 3.0m	0.4 to 0.7	SAND: Medium to coarse, dark grey and brown, with a trace of clay and roots. Typically observed as loose to medium dense, and moist. Recorded in BH204, BH204a and BH208.
Residual Soil	0.6 to 3.4	0.2 to 0.5 with 1.5 m observed at one location	Silty SAND: fine to coarse, orange brown mottled grey, with a trace of fine to medium sandstone gravel. Typically observed as medium dense to dense.
Sandstone	0.8 to 4.1 Generally deepest at the southern boundary	Not proven	SANDSTONE: Fine to medium grained, orange brown mottled pale grey. Ranges from highly weathered to fresh with dark grey interlaminated shale seams up to 1m thick.

5.2 Hydrogeology

Groundwater at the site is expected to flow to the north or east towards Cockle Bay. Groundwater beneath SICEPP is tidal and generally reflects the level in the vicinity of Cockle Bay.

Groundwater was encountered at the site in fill/alluvium at depths ranging from approximately 2 m to 3.1 m in the wells installed during Coffey (2013c) and at similar depths in the wells to the south of the site installed by Coffey (2013a). Standing water levels were measured at the time of sampling (June 2013) between depths of 2.22 and 2.7 m.

A data logger installed in BH105 located in the PPP site approximately 50 m to the south east of the site boundary recorded change in groundwater level at BH105 of 1.94m due to harbour tidal movement with the shallowest depth recorded at approximately 1 m below top of casing (presumably close to ground level) and the deepest was approximately 3 m.

A number of large diameter culverts pass beneath the central parts of the site, and will continue operating following site redevelopment. Coffey (2013c) has identified that these conduits have the potential to act as a preferential flow paths for groundwater to migrate towards Cockle Bay.

5.3 Acid Sulphate Soils

Coffey (2013c) reports that the Section 149 certificates obtained from City of Sydney indicated that the land encompassing the SICEEP has been identified as being Class 1 or Class 2 risk of acid sulphate soils, where Class 1 has the highest risk for ASS and Class 5 the lowest risk.

5.4 Audit Opinion

Overall, the auditor is of the opinion that the stratigraphy and hydrogeology are adequately characterised for the purpose of this audit.

6 Evaluation of Quality Assurance and Quality Control

6.1 Data sources

The auditor has assessed the overall quality of the data by review of the information presented in the referenced reports. The data sources are summarised in Table 6.1. Soil investigation locations are shown as Attachment 3, Appendix A.

Investigation and Reporting	Field Investigations	Analytical data obtained
Coffey (2012a) Geotechnical Investigation	Geotechnical investigations across PPP and PDA sites. One borehole (NBH1) within site	No laboratory data relevant to contamination. Groundwater level data Geotechnical borehole logs and cross sections compiled
Coffey (2012b) Stage 2 – Detailed Site Investigation	Contamination investigations utilising the geotechnical investigation locations of Coffey (2012a) (NBH1). Auger drilling to 4.1m in sandstone	Two samples analysed from NBH1 (NBH1/0.5-0.6 m and NBH1/1.5-1.9 m) for PAHs, TPH, BTEX, metals.
Coffey (2012c) Stage 1 – Preliminary Environmental Investigation	Site walkover and desktop review across PPP and PDA sites.	Nil (desktop only)
Coffey (2013a) Supplementary Factual Report	Contamination investigations across PPP and PDA sites. Four boreholes (BH101, BH101A, BH102/MW102, BH103) within the site. Auger drilling to max. depth 3.25 m in sandstone.	Two to three samples per location (with six at BH103) including at the surface (approximately 0-0.2 m) and then approximately every 0.5 m to 1m. 11 samples analysed for BTEX, TPH, PAH and/or metals. Four samples for asbestos. BH102/MW102 did not make sufficient water for sampling.
Coffey (2013c) Detailed Site Investigation	Contamination investigations across PDA North site only. 9 boreholes (BH201 to BH209) plus BH204A and BH201A within the site. Also compiled and considered data from the five relevant boreholes from Coffey (2012b & 2013a) Auger drilling to maximum depth of 4.4 m in sandstone. Groundwater wells installed in BH203, BH204 and BH205.	Multiple samples per location including at the surface (approximately 0-0.2 m) and then approximately every 0.5 m to 1m. Approximately 23 samples analysed for BTEX, TPH, PAH and/or metals. Seven samples for asbestos. BH102/MW102 was confirmed as not making sufficient water for sampling and is not discussed further. Three groundwater samples were analysed for metals, PAH, TPH and BTEX.

6.2 Data Quality Review

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor Comments
Data Quality Objectives (DQO)	Coffey (2012b, 2012c and 2013c) Specific DQOs were defined in accordance with the seven step process outlined in DEC (2006). The auditor is of the opinion that these were generally consistent with industry standards and were generally appropriate for the investigations conducted. However, the auditor notes that the DQOs did not address the problem of collecting samples that were representative of the heterogeneous fill and variable conditions across the site with the exception of Coffey 2013c). Coffey (2013a) DQOs were not specified by Coffey. However, Coffey were implementing a sampling analysis and quality plan referred to as the “Summary SAQP” prepared by AECOM (22 October 2012). The Summary SAQP does not provide specific DQOs. However on the basis that the summary SAQP clearly stated the project objectives and AECOM designed effective sampling strategies to achieve them, overall the auditor considers that the omission of specific DQOs does not affect the outcome of the audit.
Sampling pattern, locations and density	Coffey (2012b, 2012c, 2013a and 2013c) Soil: Locations appear to be within accessible areas (with some restrictions associated with underground culverts, trees and vehicular traffic on roads) based on a systematic (or not targeted) pattern. Site area is approximately 0.4 hectares. Soil samples were analysed from 12 boreholes across the site. Minimum number recommended by EPA (1995) Sampling Design Guidelines is 11 locations for a site of this size. However, the auditor notes no locations were present within a strip approximately 20-30 m wide from the southern boundary of the that site and no samples were analysed from BH206 in the south west portion of the site. This leaves an area of the site of approximately 0.1 ha for which there is no data. However, the auditor notes that the fill across the site is likely to be heterogeneous and the risk and uncertainty associated with this would need to be managed during development (as with any similar site). Thus, the data gap does not significantly alter the outcomes at the site. The sampling pattern, location and density are adequate to provide a reasonable framework for decision making at the site. Samples were tested for the primary contaminants of concern as discussed in Section 4. Groundwater: Three groundwater wells were installed across the site during Coffey (2013c) in a triangular pattern clumped in the eastern central portion of the site rather than providing even coverage across the site. Two of the wells (BH203 and BH204) were located towards the eastern (downgradient) boundary and the third well (BH205) was located in central southern portion of the site. The wells have been installed in a relatively small portion of the

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	Auditor Comments
	site Overall Auditor Comment There is limited coverage in both soil and groundwater across parts of the site. This has been considered by the auditor when drawing conclusions from the data.
Sample depths	Coffey (2012b, 2012c, 2013a and 2013c) Range of depths as discussed in Table 6.1. The majority of samples (approximately three quarters) were analysed from fill materials. Approximately one quarter were analysed from the underlying alluvium, residual soils or sandstone. Generally there were no visual or olfactory indications of contamination so samples were analysed at systematic rather than targeted intervals. Anthropogenic inclusions were present at two locations only (wire and rubber at BH201 and brick fragments at NBH1). These appear to have been targeted for analyses at NBH1 but not at BH201. However, this is unlikely to have a significant impact on the quality of the data within the context of the site and the available data set. Overall Auditor Comment Adequate.
Well construction	Coffey (2013c) Wells were installed in fill and alluvial or residual soil to the top of the sandstone (i.e. to depths between 2.8 m and 4.25 m). Water ingress was generally noted on logs at a depth of approximately 2.5 to 3 m in alluvium (BH203 and BH204) or residual soil (BH205). Wells were screened over the level of water ingress in to fill materials. SWL was generally at least 1 m below top of screened interval. Bore logs indicate fine gravel was installed in the bore annulus to the top of the screen followed by 0.5 m of bentonite and then concrete, cuttings or sand. The auditor notes Some settling of sand may occur resulting in the level of sand dropping below the top of the screen. Lockable steel flush-fitting covers were used to complete each well at surface. Wells were developed by removing a minimum of three well volumes. Overall Auditor Comment Minimal well development was completed and is likely to result in entrained sediments in the wells. However, the auditor acknowledges that developing wells in low recharge aquifers can be difficult. So overall, this is acceptable and the presence of sediment has been considered when drawing conclusions from the data. The auditor is of the opinion the wells appear to have been constructed to a standard adequate for purpose and would generally be considered adequate

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor Comments
	to intercept PSH (if any) as long as potential tidal fluctuations and the potential for sand to settle below the top of the screen are considered.
Sample collection method	Coffey (2012b, 2012c, 2013a and 2013c) Soil: The majority of soil samples were collected from hand auger flights (near the surface) or solid flight augers. Samples were collected from split tube where practicable based on nature of materials). These tended to be from sandstone, residual or alluvial soils where drilling was easier rather than fill. However, a few samples of fill were collected from split tube where practicable. Other sampling equipment (if any) was not specified. Splitting techniques for duplicate samples off augers were not discussed. Splitting techniques from SPT samples were collected from one drive of the split tube and placing into two laboratory jars. Samples were reportedly placed quickly in in to laboratory supplied jars with minimal headspace to minimize volatile (if any) loss. Separate samples for asbestos analysis (approximately 50 g mass) were collected and placed in double zip lock bags. Groundwater: Wells were purged and sampled with low flow techniques and groundwater quality parameters were reportedly monitored during purging to assess for stability. However, data and field sheets were not provided for review. Duplicate samples were collected at each well by filling up two sample containers simultaneously. The duplicate samples were filtered in the laboratory for PAH analysis using a glass fibre 0.45µm filter. Samples collected for metals were filtered using 0.45µm filter paper in the field. Overall Auditor Comment Soil: Boreholes were generally advanced by auger drilling due to the nature of materials. This poses inherent difficulties in relation to accurately logging the nature and depths of the various lithological strata including variations in fill materials and observations of contamination indicators. This has been considered when interpreting data at the site. Samples were collected off the auger flights and from the SPT, with potential for loss of volatiles. However, volatiles were not identified at the site in soils and field observations and screening with a PID was consistent with the absence of significant volatile contamination. Thus, they are unlikely to be a significant COPC. Any further anomalies noted above in the review are not considered significant enough to have a material outcome of the quality of the data for the purpose of this audit. Groundwater: Minimal well development appears to have occurred. This is likely to have resulted in sediment being entrained in the wells during drilling. This is a common issue in low yield wells. Samples were filtered by the laboratory to assess whether sediment in the wells were potentially

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	Auditor Comments
	contributing to detectable levels of PAHs (if any). Any further anomalies noted above in the review are not considered significant enough to have a material outcome of the quality of the data for the purpose of this audit.
Decontamination procedures	Coffey (2012b, 2012c, 2013a and 2013c) Soil: The various reports indicate all non-dedicated sampling equipment was cleaned with detergent and tap water and then rinsed with tap water prior to sampling and between sampling events to prevent cross contamination. The auditor notes decontamination of augers between locations was not explicitly reported. The use of gloves was not reported. Groundwater: The various reports indicate dedicated sampling equipment was used for each well. The interface probe was decontaminated between wells as per soil above. The use of gloves was not reported. Overall Auditor Comment Adequate.
Sample handling and containers	Coffey (2012b, 2012c, 2013a and 2013c) The various reports indicate all samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the laboratories. Samples for organic analyses had Teflon lined lids. Sample receipt notification indicated samples arrived in appropriate condition at the laboratory with a few exceptions. The exceptions were reviewed by the auditor and considered to be minor and unlikely to impact quality of the data. Overall Auditor Comment Adequate.
Chain of Custody (COC)	Coffey (2012b, 2012c, 2013a and 2013c) Chain of custody forms signed and returned by the laboratory were provided in the various reports (and were provided separately for Coffey 2013a). Overall Auditor Comment Adequate.
Detailed description of field screening protocols	Coffey (2012b, 2012c, 2013a and 2013c) Details of how the screening was conducted were not provided for Coffey (2012b) and minimal details were provided for Coffey (2013a). More details were provided for Coffey (2013c) (i.e. for the majority of the data) which indicated sample material was placed inside a sealed plastic bag for headspace screening and allowed to equilibrate for up to 5 minutes at ambient temperature but not in direct sunlight. Resulting headspace gas was screened using a PID with a 10.6 eV lamp, which was calibrated at the start of each day using isobutylene calibration gas (100 ppm in air). Overall Auditor Comment

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	Auditor Comments
	In the absence of detailed methodologies PID readings may not be directly comparable between sampling events.
Calibration of field equipment	Coffey (2012b, 2012c, 2013a and 2013c) PID was reported to have been calibrated prior to use. Calibration records were not provided. PID readings are generally provided on the borehole logs. Field sheets for groundwater sampling were not provided Calibration of water quality meters was not discussed. Overall Auditor Comment Adequate, considering volatile contaminants were not detected at the site. Further anomalies noted above are not considered significant enough to have a material outcome of the quality of the data for the purpose of this audit.
Sampling logs	Coffey (2012b, 2012c, 2013a and 2013c) Soil logs are provided within the various reports, indicating sample depth, PID readings and lithology. Logs appear to report visual and olfactory indications of contamination where present (e.g. odour and anthropogenic inclusions). The auditor notes a separate sample register was not provided. The auditor notes groundwater field sampling records were not provided. Overall Auditor Comment Adequate. Although it is noted investigation locations are generally augured boreholes which are less conducive to allowing anthropogenic inclusions (including potential asbestos containing materials) than other methods such as test pitting. This is considered by the auditor when drawing conclusions from the data.

Table 6.3: QA/QC – Field and Laboratory Quality Assurance and Quality Control	
Field and Laboratory QA/QC	Auditor Comments
Coffey (2012b, 2012c and 2013a)	Field and laboratory quality control were assessed during ENVIRON (2013) and found to be appropriate and are applicable to the site.
Field quality control samples	Coffey (2013c) Soil: Two intra-laboratory duplicate samples, one trip blank and one trip spike for the approximately 23 primary samples. Two rinsate blank samples are indicated by the text but results not tabulated. Groundwater: One intra-laboratory duplicate sample. One trip blank, trip spike and one rinsate blank for three primary samples collected on the sample day.

Table 6.3: QA/QC – Field and Laboratory Quality Assurance and Quality Control	
Field and Laboratory QA/QC	Auditor Comments
	Overall Auditor Comment Adequate. Inter-laboratory duplicates were not collected, however the primary laboratory were NATA accredited to ISO17025 (Accreditation No 1261) and provided a summary of external proficiency testing undertaken by NATA, together with results of internal laboratory proficiency testing. The results were found to be acceptable.
Field quality control results	Coffey (2013c) Soil: Error in calculations by Coffey and primary samples compared to the wrong duplicate samples. This was rectified in a later draft of the report. Review by auditor suggest correlation of data between primary and duplicate samples was good for metals, PAHs, BTEX and TPH samples with the highest RPD being approximately 75% for arsenic where the total concentrations were low (where small differences have exaggerated impact on the RPD) and well below the assessment criterion. Trip blank results (TPH C6-C9 and BTEX) were all below the LOR indicating cross contamination unlikely to have occurred during transport and handling. Trip spike recoveries (TPH C6-C9 and BTEX) tabulated incorrectly by Coffey in mg/kg. Review of laboratory certificates by the auditor indicates percentage recoveries ranged from 111% to 114% suggesting significant loss of volatiles is unlikely to have occurred during transport with results likely to be over-estimated rather than underestimated (which is conservative). Rinsate blank data not tabulated by Coffey. Review of laboratory certificates by the auditor indicates significant cross contamination does not appear to have occurred for metals, TPH, BTEX, PAHs with results below LOR with exception of some metals in RB2 (zinc and copper detected). RB1 not analysed for metals so no comparison possible. However, significant cross contamination of metals between sampling events is unlikely and is not suggested by the data set. Groundwater: Review by auditor suggest correlation of data between primary and duplicate samples was generally good for metals, PAHs, BTEX and TPH with the exception of some metals. The highest RPD being 63% for copper where the total concentrations were low (where small differences have exaggerated impact on the RPD). The highest result of a duplicate pair was used by the auditor and potential heterogeneity has been considered by the auditor when drawing conclusions from the data. Trip blank results (TPH C6-C9 and BTEX) were all below the LOR indicating cross contamination unlikely to have occurred during transport and handling. Trip spike recoveries (TPH C6-C9 and BTEX) ranged from 78% (TPH C6-C9) to 120% and were generally close to or over 100% suggesting significant loss of volatiles is unlikely to have occurred and results likely to be overestimated except for TPH C6-C9. However, TPH C6-C9 was not detected above the LOR and any samples and is thus unlikely to be of significant concern at the site. Rinsate blank results below LOR for metals, PAH, TPH and BTEX.

Table 6.3: QA/QC – Field and Laboratory Quality Assurance and Quality Control	
Field and Laboratory QA/QC	Auditor Comments
	Overall Auditor Comment Adequate.
NATA registered laboratory and NATA endorsed methods	Coffey (2013c) Eurofins MGT, Lane Cove NSW (primary) ASET Pty Ltd, Hornsby NSW (asbestos) Laboratory certificates were NATA stamped and signed by an approved signatory. Certificates for asbestos analysis were signed by an approved identified/signatory. Overall Auditor Comment Adequate.
Analytical methods	Coffey (2013c) Analytical methods were included in the primary laboratory test certificates with in house method references that are understood to typically be based on internationally recognised and standardised methods. Samples for asbestos were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy in conjunction with Dispersion Staining method in accordance with an in-house method referred to as Safer Environment Method 1. Overall Auditor Comment Adequate.
Holding times	Coffey (2013c) Review of the COCs and laboratory certificates by the auditor indicate that the holding times had been met. Overall Auditor Comment Adequate.
Laboratory Limit of Reporting (LORs)	Coffey (2013c) LORs were all less than the threshold criteria for the contaminants of concern for soil. LORs for the groundwater assessment were sufficiently low. The LOR for asbestos was not specified. However, asbestos analysis was used as a general screen only and a positive result would be considered to exceed the “no asbestos detected in soil” criteria, and this would be applied by the auditor within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence and visual observations. Overall Auditor Comment Adequate.
Laboratory quality control samples	Coffey (2013c) Laboratory quality control samples including surrogate spikes, duplicates, laboratory control samples, method blanks, matrix spikes were undertaken

Table 6.3: QA/QC – Field and Laboratory Quality Assurance and Quality Control	
Field and Laboratory QA/QC	Auditor Comments
	by the laboratory at generally appropriate frequencies in general accordance with: • Laboratory Control Samples (at least 1 per process batch) • Matrix Spikes (one matrix for each soil type) • Surrogate Spikes (for chromatographic analysis of organics) • Blanks (at least 1 per process batch) • Duplicates (at least 1 per process batch or 1 per 10, whichever is smaller) Overall Auditor Comment Adequate.
Laboratory quality control results	Method blank results were below the LOR. Surrogate spike recoveries were within control limits. Laboratory control and spike sample recoveries were within control limits with the exception of one low recovery of 62% for benzo(b)fluoranthene & Benzo(k)fluoranthene suggesting results may be slightly underestimated for these parameters in some samples. This was not considered by the auditor likely to have a significant impact on the quality of the data in the context of the data set reported. Some slightly elevated RPDs for metals (ranging from 40% to 85%) which in the auditor's opinion is likely to be attributable to heterogeneity in the soil matrix (fill) rather than indicator of laboratory precision or accuracy. Matrix spike recoveries were within control limits. Overall Auditor Comment Adequate.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy)	Coffey (2013c) Predetermined data quality indicators (DQIs) were set by Coffey (2013b) for field duplicates, spikes and blanks. Reference was made to AS 4482.1-2005 and Appendix C in Schedule B2 (NEPC 1999) for both field and laboratory QA/QC samples. There was limited discussion regarding actions required if data do not meet the expected objectives. Coffey (2013c) concluded <i>"Based on an assessment of the field and laboratory QA/QC data, Coffey considers that the data obtained is generally representative of subsurface conditions at the sampling locations. Overall, it is assessed that the accumulated results are acceptable for the purposes of this investigation."</i>

There is limited coverage in both soil and groundwater across parts of the site and fill materials would be expected to be heterogeneous. This has been considered by the auditor when drawing conclusions from the data.

Overall, when considering the data as a whole the auditor concludes that the data are considered sufficiently precise, accurate, reproducible, comparable and complete to provide an adequate basis for decision making within the context of the objectives of this site audit.

7 Environmental Quality Criteria

A conservative set of environmental quality screening criteria were developed by the auditor for use in performing an initial review of the soil and groundwater analytical data for key contaminants. The screening criteria were used to gauge the general degree of contamination impact and distribution.

7.1 Auditor Screening Criteria - Soil

Table 7.1 presents a summary of the soil screening criteria used for the main contaminants of concern detected at the site. Equivalent screening criteria have been used for other potential contaminants. Although these criteria would generally be above background, they provide an overall indication of the degree of contaminant impact. They would be protective of most site uses, but not necessarily of leaching of contaminants to groundwater. However, it is generally acknowledged that the 'provisional phytotoxicity-based investigation levels' would likely be reasonably protective of groundwater.

Table 7.1: Summary of Auditor's Screening Criteria for Key Soil Contaminants		
Analyte	Screening Criteria (mg/kg)	Source
Arsenic	20	Soil Investigation Levels for Urban Redevelopment Sites in NSW in DEC (2006) 'Guidelines for the NSW Site Auditor Scheme, 2 nd Edition'. Lower of: - SIL Column 1 – 'residential with gardens and accessible soil' (HIL A) - SIL Column 5 – 'provisional phytotoxicity-based investigation levels' (PPIL) (except Cr (VI) HIL A). - EILs NEPC 1999 [2013] (delineated by *) Consideration has also been given to SILs relevant to the future land use as follows: - SIL Column 2 – 'residential with minimal access to soil including high-rise apartments and flats (HIL D)
Cadmium	3	
Total Chromium	100	
Copper	100	
Lead	300	
Nickel	60/55*	
Zinc	200/110*	
Mercury (inorganic)	1	
Total PAH	20	
Benzo(a)pyrene	1	
TPH C10-C36	1000	EPA (1994) 'Guidelines for Assessing Service Station Sites'
Other Organics	LOR	Laboratory limit of reporting

Further details of the sources adopted are provided in Appendix B.

7.2 Auditor Screening Criteria - Groundwater

The receptor is Cockle Bay. The auditor has assessed the groundwater data in reference to ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* for marine waters. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem and 'trigger' further investigation. The marine

95% level of protection have been adopted for the current review. Some have been modified based on bioaccumulation or acute-toxicity or potential toxicity to particular species.

A low reliability ANZECC (2000) TVs has been adopted for arsenic of 2.3 µg/L, conservatively assuming that arsenic detected in the groundwater is As(III), rather than As(V) (TV: 4.5 µg/L). Chromium has been assumed chromium (III) (27.4 µg/L) rather than chromium (VI) (rather than 4.4 µg/L)

Other low reliability ANZECC (2000) TVs have been adopted for toluene, ethylbenzene and the xylene isomers (collectively these are referred to as "BTEX"). Low reliability ANZECC (2000) TVs have been used where they exist for the individual PAHs at 99% protection levels (Appendix B). However, a trigger level for total PAHs within groundwater is not provided within the ANZECC (2000) guidelines. As such, the threshold level of 3 µg/L from the EPA (1994) *Guidelines for Assessing Service Station Sites* has been adopted.

ANZECC (2000) 99% protection level has been adopted for cadmium (0.7 µg/L), nickel (7 µg/L) and mercury (0.1 µg/L) due to the potential for bio-accumulation or acute toxicity to particular species and 99% protection level has also been adopted for nickel due to the potential toxicity to particular species.

There are no reliable Australian criteria for TPH in groundwater. The current NSW EPA position is that there should be no free phase product in groundwater, and that the aromatic components of dissolved-phase TPH in groundwater should be assessed using the ANZECC (2000) TVs where available. These guidelines include criteria for some BTEX compounds and for some polycyclic aromatic hydrocarbons.

The auditor has also considered groundwater investigation levels and health screening levels where applicable (NEPC 1999) [2013]. A GIL of 500 µg/L for benzene was adopted.

7.3 Consultants Environmental Quality Criteria Soil

Coffey adopted assessment criteria from NEPC (1999) [2013] National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) 2013 and Friebel and Nadebaum (2011); CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater. Based on NEPM Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater, the following criteria were adopted:

- Table 1A(1), Health-based Investigation Levels for Commercial/Industrial D.
- Table 1A(3) – Soil HSLs for vapour intrusion for Commercial / Industrial (HSL D).

For compounds where the allowable soil vapour HSL exceeds the chemical constituent saturation concentration, HSL for direct contact pathways listed in Table B4 of CRC CARE Technical Report No. 10 (Friebel and Nadebaum; 2011) were adopted as the health risk screening levels.

Management Limits were also proposed by Coffey (2013c) to assess whether the reported soil conditions has the potential to pose a potential risk to buried infrastructure, or the formation of non-aqueous phase liquids (NAPL).

Coffey (2013c) stated “On review of the development information provided by LLD, minimal landscaping is proposed and Coffey understand that no direct planting into site soils is planned as part of the redevelopment of the site. Because the concept for redevelopment of the site does not include areas of landscaping, Coffey considers that consideration of ecological investigation levels (EILs) for this site is not appropriate.”

The results of acid sulphate soil analysis were assessed against the values presented in Appendix 1 of the Acid Sulphate Soil Manual (ASMACC, 1998).

The auditor is of the opinion that the use of criteria based on commercial/industrial is not appropriate as NEPC (1999) [2013] stated the commercial/industrial land use scenario “*does not include more sensitive uses that may be permitted under relevant commercial or industrial zonings. These more sensitive uses include childcare, educational facilities, caretaker residences and hotels and hostels, etc*”. However, in the context of the data set reviewed this does not impact on the outcomes at the site as detected concentrations were sufficiently low to be below criteria for both exposure scenarios.

The auditor is of the opinion that appropriate ecological levels (such as EILs or ecological screening levels) would be relevant levels in areas (if any) where soils are to remain exposed at or near the surface (such as landscaping areas).

Groundwater

Coffey (2013c) assessed groundwater against NEPC (1999) [2013] which provides health screening levels for vapour intrusion associated with groundwater in a commercial/industrial setting. In accordance with NEPC (1999) [2013], the auditor is of the opinion that the use of these criteria is not appropriate where groundwater is at depths of less than 2 m (which may occur due to tidal fluctuations) and where the source of contamination is not a petroleum hydrocarbon and Coffey (2013c) did not discuss the source of the TPH and toluene detected in groundwater; and where a basement may be proposed (as is the case).

To assess potential ecological risk Coffey (2013c) adopted ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Protection of Aquatic Ecosystems. Marine trigger values for protection of 95% of species and DEC (2005); Marine Water Quality Objectives for NSW Ocean Waters – Sydney Metropolitan and Hawkesbury-Nepean. These were generally consistent with those adopted by the auditor and variations/anomalies (if any) were not considered by the auditor to have a significant impact on the outcomes at the site.

8 Evaluation of Soil Analytical Results

8.1 Field Observations

The auditor notes significant visual or olfactory indications of potential contamination were generally not observed within the lithology based on information recorded on the logs. No odour or staining were noted. Few anthropogenic inclusions were noted and these are described in Section 5.1.

PID readings from Coffey (2013c) were low ranging from 0 ppm to 1.7 ppm and were consistent with an absence of volatile contamination. PID readings from Coffey (2012 b & 2013a) were consistently higher and ranged from 3.9 to 33 ppm. Coffey (2013c) did not acknowledge/discuss these higher PID results. The auditor considers they may be attributable to different ambient conditions (e.g. weather, moisture), calibration/equipment differences and/or differences in field methodologies between sampling events. Samples with “higher” PID readings were analysed and generally did not appear to correlate to volatile organic contamination.

Gravelly sand “becoming black” was observed in BH204a but no samples were analysed from this material or from this borehole as a whole. No PID data were available for this borehole. This borehole was located directly adjacent to BH204 where similar material was not noted on the corresponding bore hole log. Coffey stated in an email dated 24 July 2013 that they “cannot provide further comment on whether the ‘black’ material was indicative of staining or indicators of contamination.” No bonded asbestos materials (ACM) were observed.

8.2 Soil Analytical Results¹

Soil analytical results for fill materials analysed during Coffey (2012b, 2013 a and 2013c) summarised in Table 8.1. Investigation locations are shown on Attachment 3, Appendix A.

Table 8.1: Evaluation of Soil Analytical Results for Fill Materials – Summary Table (mg/kg)					
Analyte	N	Detections	Maximum	n > Auditor Screening Criteria	n > SIL Column 2 (DEC 2006)
Asbestos	11	Nil	Not Detected	Nil	-
Arsenic	25	11	5.9	Nil	Nil
Cadmium	25	4	0.6	Nil	Nil
Total Chromium	25	12	60	Nil	Nil
Copper	25	23	80	Nil	Nil

¹ Note: The numbers presented in the tables in the following sections have been compiled and transcribed manually from data tabulated by the consultant and this some errors may be present. Any such errors are not considered by the auditor to be significant in the overall context of the data reviewed and conclusions drawn regarding the site during the audit.

Table 8.1: Evaluation of Soil Analytical Results for Fill Materials – Summary Table (mg/kg)					
Analyte	N	Detections	Maximum	n > Auditor Screening Criteria	n > SIL Column 2 (DEC 2006)
Lead	25	16	180	Nil	Nil
Nickel	25	21	150	10	Nil
Zinc	25	24	270	3	Nil
Mercury (inorganic)	25	6	35 (next highest 0.29)	1	Nil
TPH (C ₆ -C ₉)	25	Nil	<20	Nil	-
TPH (C ₁₀ -C ₃₆)	25	5	3400 (BH201A/0.5-0.6)	1	-
BTEX	25	Nil	<0.5	Nil	-
Total PAHs	25	Nil	<5	Nil	Nil
Benzo(a)Pyrene	25	Nil	<0.5 (<5 in BH201A/0.5-0.6)	Nil	Nil

n number of samples, - No criteria available/used

Based on the above the auditor notes:

- Some metals (especially copper, nickel and zinc) may potentially be elevated in relation to typical uncontaminated background but metals generally were not significantly elevated with respect to the conservative auditor screening levels or health based investigation levels.
- Coffey (2013c) did not discuss the petroleum hydrocarbon result of 3400 mg/kg detected at BH201A/0.5-0.6 m as this results was below the criteria adopted by Coffey (2013c)². The auditor agrees that this result is unlikely to pose a health risk at the site when considered in isolation. However, the auditor is interested in understanding the nature and extent of contamination in this area as it potentially has implications to a broader understanding of the heterogeneous nature of the fill. In this context the auditor notes that the laboratory report for the analyses of the 50 g subsample for asbestos reported bitumen fragments within BH201A/0.5-0.6 m. although the log for 201A did not confirm the presence of bitumen fragments. In the absence of other indications of contamination reported by Coffey (2013c), the presence of bitumen may account for the relatively elevated petroleum hydrocarbon results and is unlikely to be indicative of a health risk when considering the broader fill materials.

Overall, the results do not indicate significant contamination in fill materials.

² NEPC (1999) [2013] National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) 2013 (NEPM). Friebel and Nadebaum (2011) including Management Limits where applicable; CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.

Soil analytical results for alluvium, residual soils and sandstone analysed during Coffey (2012b, 2013a and 2013c) summarised in Table 8.2.

Table 8.2: Evaluation of Soil Analytical Results Alluvium, Residual Soils and Sandstone – Summary Table (mg/kg)					
Analyte	N	Detections	Maximum	n > Auditor Screening Criteria	n > SIL Column 2 (DEC 2006)
Asbestos	Nil	Nil	Not detected	Nil	-
Arsenic	7	4	4.5	Nil	Nil
Cadmium	7	Nil	<0.4	Nil	Nil
Total Chromium	7	5	60	Nil	Nil
Copper	7	6	11	Nil	Nil
Lead	7	5	35	Nil	Nil
Nickel	7	3	41	Nil	Nil
Zinc	7	6	270 (next highest 31)	1	Nil
Mercury (inorganic)	7	Nil	<0.05	Nil	Nil
TPH (C ₆ -C ₉)	7	Nil	<20	Nil	-
TPH (C ₁₀ -C ₃₆)	7	Nil	<50	Nil	-
BTEX	7	Nil	<1.5	Nil	-
Total PAHs	7	Nil	<1	Nil	Nil
Benzo(a)Pyrene	7	Nil	<0.5	Nil	Nil

n number of samples, - No criteria available/used

Based on the above the auditor notes:

- Results for metals were generally consistent with background levels. The concentration of zinc above the auditor screening criterion of 200 mg/kg was from a sample of alluvium (BH208/3-3.1 m). All other metals in this sample were below the LOR (except arsenic slightly above the LOR).

Overall, the results suggest the natural soils are not contaminated. The natural soils do not appear to have been contaminated prior to or after filling.

Table 8.3: Evaluation of Acid Sulphate Soil Screening Results – Summary Table				
Sample	Stratum	Field pH	pH _{FOX}	Field Peroxide pH Test
BH202_0.6-0.7m	Residual Soil	8.2	5.8	Low
BH203_1.8-2.0	Residual Soil	7.9	5.4	Low
BH206_1.1-1.4	Residual Soil	8.9	6.9	Low
BH204A_2.8-2.9	Fill	7.2	2.2	Low
BH204A_3.8	Fill	6.7	2.0	Low
BH204A_3.9	Alluvium	7.3	2.6	Volcanic
BH204A_4.0-4.1	Alluvium	7.5	5.5	High

Based on the above the auditor notes potential or actual acid sulphate soils are present in alluvium.

9 Evaluation of Groundwater Analytical Results

Groundwater samples were collected and analysed from the three wells in June 2013. Samples for PAHs were analysed on both a filtered and non-filtered basis with filtration undertaken by the laboratory using glass fibre 0.45 µm filter. The laboratory filtered samples analysed for PAHs are designated with an "F" in the table below. Samples for metals were analysed on a filtered basis and were filtered and preserved in the field.

Groundwater sampling locations are shown on Attachment 3, Appendix A.

Groundwater samples were brown and cloudy to turbid which was attributed by Coffey (2013c) to fine sediment suspended in solution. Coffey (2013c) stated no odours or sheens were observed in any of the groundwater purged from the monitoring wells or in samples submitted for laboratory analysis.

Water quality parameters (where available) indicate brackish to saline water, neutral to slightly acidic pH and slightly oxidising conditions. which is consistent with historical reclamation of the land and with the proximity of the site to Cockle Bay.

Table 9.1: Evaluation of Groundwater Analytical Results – Summary Table (µg/L)

Analyte	TV	BH20 3-F	BH203	BH204 -F	BH204	BH205 -F	BH205	DUP1 (BH205)
Arsenic	2.3	-	<1	-	<1	-	2	1
Cadmium	0.7	-	<0.1	-	<0.1	-	0.4	0.4
Total Chromium	27.4	-	<1	-	<1	-	<1	<1
Copper	1.3	-	1	-	<1	-	52	100
Lead	4.4	-	<1	-	<1	-	<1	<1
Nickel	7	-	5	-	<1	-	52	69
Zinc	15	-	17	-	<5	-	44	37
Mercury (inorganic)	0.1	-	<0.1	-	<0.1	-	<0.1	<0.1
TPH (C ₆ -C ₉)	LOR	-	<20	-	<20	-	<20	<20
TPH (C ₁₀ -C ₁₄)	LOR	-	<50	-	170/<50²	-	<50	<50
TPH (C ₁₅ -C ₂₈)	LOR	-	<100	-	100/100²	-	<100	<100
TPH (C ₂₉ -C ₃₆)	LOR	-	<100	-	<100/<100 ²	-	<100	<100
TPH (C ₁₀ -C ₃₆)	LOR	-	<100	-	300	-	<100	<100
TPH (C ₁₀ -C ₁₆) less naphthalene	-	-	<50	-	190	-	<50	-
C6-C10 less BTEX (F1)	-	-	<20	-	<20	-	<20	-
TPH (C ₁₀ -C ₁₆) (F2)	-	-	<50	-	190/<50 ²	-	<50	-
TPH (C ₁₆ -C ₃₄) (F3)	-	-	<100	-	100/200 ²	-	<100	-
TPH (C ₃₄ -C ₄₀) (F4)	-	-	<100	-	<100/<100 ²	-	<100	-

**Table 9.1: Evaluation of Groundwater Analytical Results – Summary Table
(µg/L)**

TPH (C ₆ -C ₁₀)	-	-	<20	-	<20	-	<20	-
TPH (C ₁₀ -C ₁₄)	-	-	<50	-	170	-	<50	-
TPH (C ₁₅ -C ₂₈)	-	-	<100	-	100	-	<100	-
TPH (C ₂₉ -C ₃₆)	-	-	<100	-	<100	-	<100	-
TPH (C ₁₀ -C ₃₆)	-	-	<100	-	300	-	<100	-
Benzene	500	-	<1	-	<1	-	<1	<1
Toluene	180	-	2	-	<1	-	<1	<1
Ethylbenzene	5	-	<1	-	<1	-	<1	<1
Xylenes (m & p)	75	-	<2	-	<2	-	<2	<2
Xylenes (o)	350	-	<1	-	<1	-	<1	<1
Xylenes Total	75	-	<3	-	<3	-	<3	<3
Benzo(a)pyrene	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Naphthalene	50	0.06	0.05	0.06	0.05	<0.05	<0.05	<0.05
Total PAHs	3	0.06	0.05	0.06	0.05	<0.05	<0.05	<0.05
Other PAHs	Various ¹	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

1 See appendix B and Section 7.2

2 result after silica gel clean up

- Not tested

Based on the above the auditor notes:

- Concentrations of zinc were comparable to those assessed at the adjacent PPP site (and reviewed in ENVIRON (2013) and were not found likely to pose a risk to Cockle Bay.
- Concentrations of copper and nickel in groundwater in B205 were generally higher than those detected on the PPP site and were approximately an order of magnitude higher than the adopted trigger value. Copper, nickel and zinc were also potentially elevated in relation to typical uncontaminated background levels in fill. The fill was placed during historical reclamation and would be widespread in the general area and would not be restricted to the site boundary.
- The source of the TPH, PAH and toluene detected in groundwater samples is unknown (Coffey suggested fill, historical activities and/or offsite sources) and there may be potential for unidentified contamination to be present between sampling locations. No apparent source/explanation was suggested by the soil investigations. The wells were clumped in a relatively small portion of the site. There are potential tidal fluctuations in groundwater levels and proposed basement structures. There has only been one round of groundwater monitoring. The use of a silica gel clean-up has not been well justified by Coffey and also did not reduce the TRH F3 fraction.

10 Evaluation of Remediation

No remediation has been recommended or conducted by Coffey. In the auditor's opinion, this is considered appropriate.

11 Contamination Migration Potential

11.1 Soils

Site soils are covered in hardstand or landscaping. Migration of soil offsite is considered unlikely subject to appropriate controls during any disturbance such as during construction.

11.2 Groundwater

PAHs, TPH and toluene were detected near the site boundary but are at levels that are not likely to represent a significant risk to the environment via contamination migration potential.

Metals (copper, nickel and zinc) have been detected above the assessment criteria in BH205. They were generally below levels of concern in the BH203 and BH204 on the eastern boundary (Cockle Bay side) of the site. However, Coffey (2013c) has noted the presence of large diameter culverts (including one in the vicinity of the BH205) which may act a preferential pathway for groundwater towards Cockle Bay. Thus, there may be some potential for migration of metals in groundwater offsite.

TCLP and ASLP results assessed at the PPP site (ENVIRON 2013) suggested copper, nickel and zinc do potentially leach from the soils at low levels. Thus, the regional fill materials may be contributing to the concentrations of metals in groundwater. The fill was placed during historical reclamation and would be widespread in the general area and would not be restricted to the site boundary.

Copper, nickel and/or zinc impact to groundwater is common in older urban environments, typical of the setting around Darling Harbour. The auditor agrees that the further assessment or remedial action for metals is unlikely to be of significant benefit.

12 Assessment of Risk

Contaminants detected within the soil would not pose a risk to human health under the proposed land use.

Contaminants detected within the groundwater in the wells sampled are not likely to pose a risk to ecological receptors in Cockle Bay of human health onsite via vapour intrusion or exposure pathways to maintenance workers as the detected impacts are at low concentrations. Abstraction and use on-site is not expected as a viable aquifer is not readily accessible.

The auditor notes the use of HSL for groundwater was not appropriate based on the depth to groundwater and the proposed basement and other reason discussed in Section 7.3. Coffey clarified in an email dated 24 July 2013 that "Based on the information provided by LLD, Coffey understands that the finished floor level of the basement will likely be below the groundwater table. As such, the basement would be constructed using concrete base and walls to form water tight structure. Furthermore, it is also assessed that any service penetrations would be appropriately lapped and sealed to prevent water ingress. In consideration of the low levels of these volatile and semi volatile compounds recorded, and the associated attenuation of vapour permeating through concrete slab, it is assessed that the potential health risks associated with vapour ingress to basement structure from groundwater are not significant enough to warrant further, more detailed assessment." The auditor is of the opinion that this is reasonable.

However, as discussed in Section 6, There is limited coverage in both soil and groundwater across parts of the site. Coffey (2013c) states "...the potential for unidentified soil and/or groundwater impact to be present between sampling locations cannot be discounted." The auditor must consider the potential risks posed to human health by unidentified impacts (e.g. between sampling locations). Based on the information provided, the auditor is of the opinion that these potential risks are likely to be sufficiently low to be adequately managed by an Unexpected Finds Procedure.

13 Ongoing Site Management

Coffey (2013c) states that the presence of both ASS and PASS require that soils are managed in accordance with an Acid Sulfate Soil Management Plan. The auditor agrees.

Coffey (2013c) stated that “Coffey’s investigations identified localised areas of the site where soils and/or groundwater reported concentrations of chemicals which may indicate the presence of potentially unidentified contamination between sampling locations...Coffey recommends that an Unexpected Finds Protocol is developed as part of the construction planning process. The Unexpected Finds Protocol should include procedures for identifying and managing risks and protecting human health and environment should unexpected contamination or hazardous materials (e.g. asbestos containing materials) are be discovered during excavation at the site.”

An Unexpected Finds Procedure was presented as Appendix F to Coffey (2013c) and is provided as Appendix D to this SAR.

The auditor is of the opinion that the Unexpected Finds Procedure is required to address the uncertainty associated with the following:

- Low soil sampling density in some areas of the site, particularly in the southern portion of the site and potential heterogeneity in fill materials such as exhibited across the wider SICEEP
- Presence of fill “becoming black” at BH204A for which there was no PID data; analytical data or other visual/olfactory observations
- Groundwater wells being placed in a relatively small portion of the site
- Detections of low levels of PAHs, petroleum hydrocarbons including toluene in groundwater for which there is no clear conceptual site model explaining the source of these detections (and thus whether these detections may be indicative of unidentified contamination in soil and groundwater).

The key elements of the Unexpected Finds Procedure addressing these uncertainties are as follows:

- Training and awareness of personnel in the recognition of potential unexpected finds to be undertaken as part of general site induction and refreshed periodically at toolbox meetings. Examples of potential unexpected finds at the site identified by Coffey included:
 - o Odour, staining or sheen such as may indicate petroleum hydrocarbon or other contamination
 - o Buried dry waste materials, including wood, plastic, metal fragments, building rubble (e.g. concrete, brick, asphalt, asbestos containing materials etc)
 - o Bonded asbestos containing materials, asbestos fines; and/or friable asbestos

- o Structures or conduits containing or being surrounded by deleterious materials including underground tanks
 - o Ash or slag deposits.
- Suspension of earthworks in the affected part of the site and isolation of the area where unexpected contamination is suspected.
- Assessment of the unexpected find by an environmental consultant to determine and undertake/direct appropriate action.
- Provision of relevant information and recommendations to the Site Supervisor by the environmental consultant.
- Resumption of works in the affected area when it is deemed safe to do so by the Site Superintendent (based on advice from the environmental consultant).

The auditor is of the opinion that key elements of the Unexpected Finds Procedure are appropriate. The auditor notes that the Unexpected Finds Procedure does not clearly identify who is responsible for implementing the various aspects of the plan. This will need to be clarified prior to construction.

14 Compliance with Regulatory Guidelines and Directions

Guidelines currently approved by the EPA under section 105 of the NSW Contaminated Land Management Act 1997 are listed in Appendix C. The Auditor has used these guidelines.

The investigation was generally conducted in accordance with SEPP 55 Planning Guidelines and reported in accordance with the EPA (1997) Guidelines for Consultants Reporting on Contaminated Sites. The checklist included in that document has been referred to. The EPA's Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 1998 (December 1999) has also been referred to.

Storage/disposal of extracted groundwater was not discussed. Coffey (2013c) does not state whether well licences were obtained from NSW Office of Water.

15 Conclusions and Recommendations

Coffey (2013c) concluded *“no unacceptable risks to human health or other aspects of the environment have been identified in the context of the proposed redevelopment of the site as described within information provided by LLD, other than the presence of Acid Sulfate Soil. Coffey concludes that no remediation is required and the site is suitable for the proposed development, provided that an appropriate ASS Management Plan is prepared and implemented for construction excavation and dewatering.”*

The auditor notes the fill across the site (as with any similar site) is likely to be subject to some variability and heterogeneity and there are parts of the site where the sample for soil and groundwater density is low. The auditor must consider the potential risks posed to human health by unidentified impacts (e.g. between sampling locations). Based on the information provided, the auditor is of the opinion that the nature and extent of contamination has been adequately characterised to conclude that the potential risks are sufficiently low to be adequately managed by the Unexpected Finds Procedure during development.

The auditor considers the following would be required to ultimately certify the suitability for the site for the proposed land use:

- Clearly defining roles and responsibilities in relation to implementing the Unexpected Finds Procedure
- Implementing and documenting the Unexpected Finds Procedure during development (including confirmation that there were no unexpected finds where applicable)
- Appropriate identification of contaminant conditions that vary in nature or extent to the contamination that has currently been characterised
- Appropriate response to the above including remediation/management and provision of a validation report to an EPA accredited auditor for audit if/where necessary.

Further, the auditor considers that validation should be undertaken to appropriate ecological levels in areas (if any) where soil is to remain exposed at or near the surface (such as landscaping areas).

16 Other Relevant Information

This audit was conducted on the behalf of Lend Lease for the purpose of assessing whether the land is suitable for the proposed uses i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the CLM Act.

This summary report may not be suitable for other uses. Coffey included limitations in its reports. The audit must also be subject to those limitations. The auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which he had some control or is reasonably able to check.

The auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing his opinion. If the auditor is unable to rely on any of those documents, the conclusions of the audit could change.

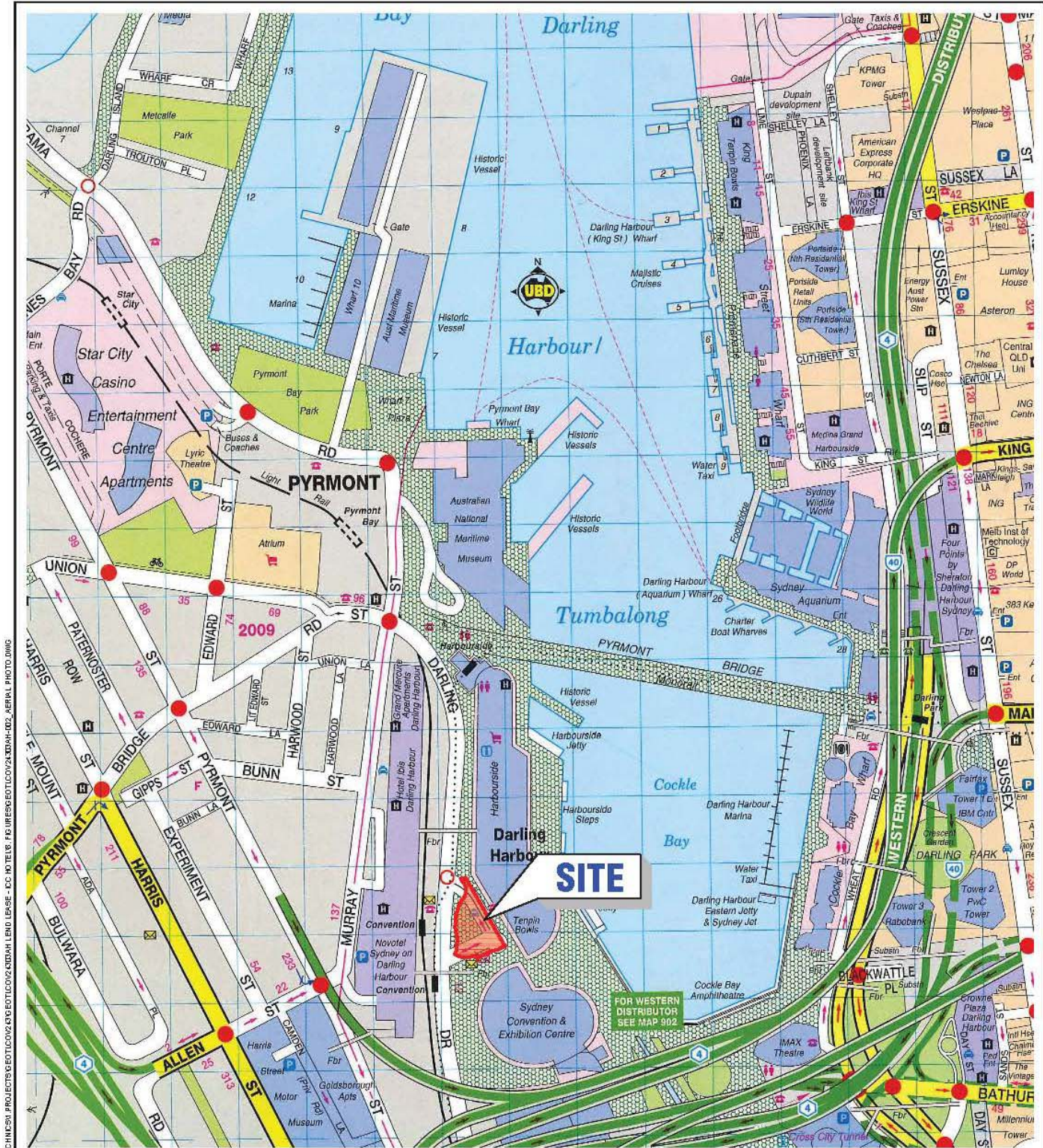
It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

Appendix A: Attachments

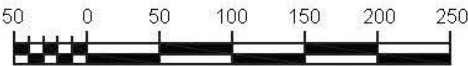
**Attachment 1: Site Location (Source: Figure 1
Coffey 2013c)**

**Attachment 2: SICEEP Layout (Source: Figure 1.1
within text Section 1.2 of Coffey 2013c)**

**Attachment 3: Site Layout and Soil and
Groundwater Investigation Locations (Source:
Figure 15 Coffey 2013c)**



SOURCE:UBD STREET DIRECTORY GREGORYS
SYDNEY, NEW SOUTH WALES
47TH EDITION, 2012, MAP:E



Scale (metres) 1:5000



PLOT DATE: 14/08/2013 09:08 P.M. DWG FILE: \CHARTER\01\COMP\COFFEY\COM\AUT\TA\90\EDITS\HMC51\PROJECTS\GEOTLCOV24303AH-02\LEND LEASE - CC HOTEL\FIGURE\GEOTLCOV24303AH-02_AERIAL PHOTO.DWG

drawn	MV
approved	ML
date	17/06/13
scale	NTS
original size	A4

coffey
geotechnics
SPECIALISTS MANAGING
THE EARTH

client	LEND LEASE DEVELOPMENTS PTY LTD	
project:	SYDNEY INTERNATIONAL CONVENTION EXHIBITION DARLING HARBOUR, SYDNEY, NSW	
title:	SITE LOCATION PLAN	
project no:	GEOTLCOV24303AH-D02	figure no: FIGURE 1



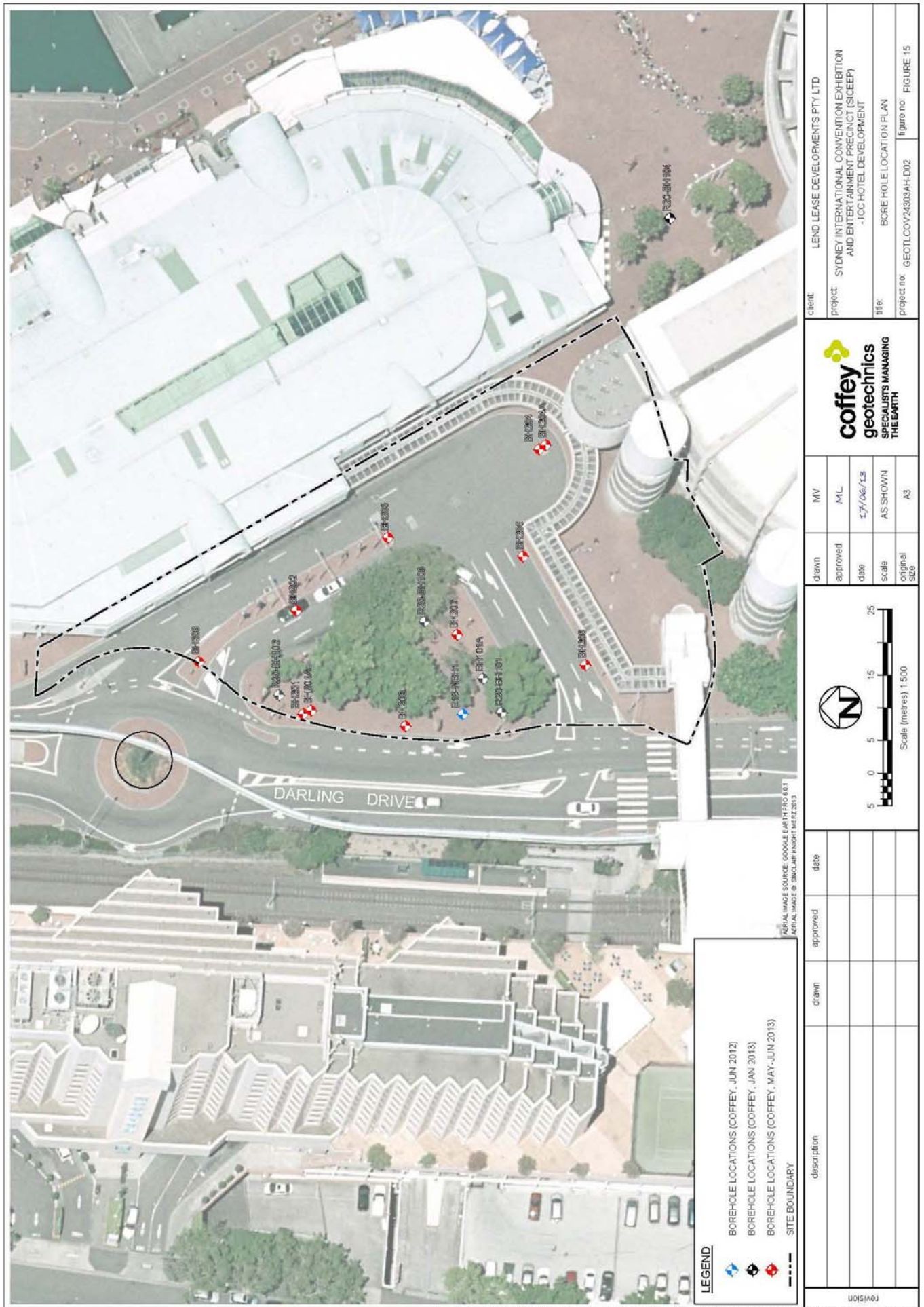
Picture extracted from 'Detailed Site Investigation Proposed International Convention Centre Hotel Development, Darling Harbour, Sydney NSW,' 22 July 2013, Coffey Geotechnics Pty Ltd

Lend Lease Development Pty Ltd

Site Audit Report - Extent of Contamination,
Proposed International Convention Centre
Hotel Development, Darling Harbour

SICEEP Layout

Attachment 3 Site Layout and Soil and Groundwater Investigation Locations



Appendix B: Soil and Groundwater Criteria

Soil investigation levels for urban development sites

Department of Environment and Conservation NSW (April 2006)

Substance	Health-based investigation levels ¹ (mg/kg)				Provisional phytotoxicity-based investigation levels ² (mg/kg)
	Residential with gardens and accessible soil (home-grown produce contributing < 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas (NEHF A) ³	Residential with minimal access to soil including high-rise apartments and flats (NEHF D)	Parks, recreational open space, playing fields including secondary schools (NEHF E)	Commercial or industrial (NEHF F)	
	Column 1	Column 2	Column 3	Column 4	Column 5
Metals and metalloids					
Arsenic (total)	100	400	200	500	20
Beryllium	20	80	40	100	—
Cadmium	20	80	40	100	3
Chromium (III) ⁴	12%	48%	24%	60%	400
Chromium (VI)	100	400	200	500	1
Cobalt	100	400	200	500	—
Copper	1,000	4,000	2,000	5,000	100
Lead	300	1,200	600	1,500	600
Manganese	1,500	6,000	3,000	7,500	500
Methyl mercury	10	40	20	50	—
Mercury (inorganic)	15	60	30	75	1 ⁵
Nickel	600	2,400	600	3,000	60
Zinc	7,000	28,000	14,000	35,000	200
Organics					
Aldrin + dieldrin	10	40	20	50	—
Chlordane	50	200	100	250	—
DDT + DDD + DDE	200	800	400	1,000	—
Heptachlor	10	40	20	50	—
PAHs (total)	20	80	40	100	—
Benzo(a)pyrene	1	4	2	5	—
Phenol ⁶	8,500	34,000	17,000	42,500	—
PCBs (total)	10	40	20	50	—
Petroleum hydrocarbon components⁷					
> C16–C35 (aromatics)	90	360	180	450	—
> C16–C35	5,600	22,400	11,200	28,000	—
> C35 (aliphatics)	56,000	224,000	112,000	280,000	—
Other					
Boron	3,000	12,000	6,000	15,000	— ⁸
Cyanides (complex)	500	2,000	1,000	2,500	—
Cyanides (free)	250	1,000	500	1,250	—

- 1 The limitations of health-based soil investigation levels are discussed in Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater and Schedule B(7a) Guidelines on Health-based Investigation Levels, *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 1999)
- 2 The provisional phytotoxicity-based investigation levels proposed in this document are single number criteria. Their use has significant limitations because phytotoxicity depends on soil and species parameters in ways that are not fully understood. They are intended for use as a screening guide and may be assumed to apply to sandy loam soils or soils of a closely similar texture for pH 6–8.
- 3 National Environmental Health Forum (NEHF) is now known as enHealth.
- 4 Soil discolouration may occur at these concentrations.
- 5 Total mercury
- 6 Odours may occur at these concentrations.
- 7 The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.
- 8 Boron is phytotoxic at low concentrations. A provisional phytotoxicity-based investigation level is not yet available.

Notes:

This table is adapted from Table 5-A in Schedule B(1): Guidelines on Investigation Levels for Soil and Groundwater to the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 1999).

Soil investigation levels (SILs) may not be appropriate for the protection of ground water and surface water. They also do not apply to land being, or proposed to be, used for agricultural purposes. (Consult NSW Agriculture and NSW Health for the appropriate criteria for agricultural land.)

SILs do not take into account all environmental concerns (for example, the potential effects on wildlife). Where relevant, these would require further consideration.

Impacts of contaminants on building structures should also be considered.

For assessment of hydrocarbon contamination for residential land use, refer to the *Guidelines for Assessing Service Station Sites* (EPA 1994).

Threshold Concentrations for Sensitive Land Use – Soils Guidelines for Assessing Service Station Sites (NSW EPA 1994)	
Contaminant	Threshold Concentration (mg/kg)
TPH (C ₆ -C ₉)	65
TPH (C ₁₀ -C ₃₆)	1,000
Benzene	1
Toluene	1.4 / 130
Ethylbenzene	3.1 / 50
Xylenes (total)	14 / 25

Trigger Values (TV) for Screening Marine Water Quality Data (µg/L) for Slightly to Moderately Disturbed Ecosystems (ANZECC 2000)

Contaminant	Threshold Concentration (µg/L)	Guideline Source
Metals and Metalloids		
Arsenic – As (III/V)	2.3/4.5	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Cadmium – Cd	0.7	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Mercury – Hg	0.1	
Nickel – Ni	7	ANZECC (2000) 99% protection level due to potential for toxicity.
Manganese – Mn	80	Low reliability trigger values (derived from the mollusc figure) from Volume 2 of ANZECC (2000)
Chromium – Cr (III/VI)	27.4/4.4	ANZECC (2000) 95% protection levels.
Copper – Cu	1.3	
Cobalt – Co	1	
Lead – Pb	4.4	
Zinc – Zn	15	
Aromatic Hydrocarbons		
Benzene	700	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Toluene	180	
Ethylbenzene	5	
o-xylene	350	
m-xylene	75	
p-xylene	200	
Polycyclic Aromatic Hydrocarbons		
Naphthalene	50	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Anthracene	0.01	Low reliability trigger values from Volume 2 of ANZECC (2000)
Phenanthrene	0.6	
Fluoranthene	1	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Benzo(a)pyrene	0.1	
Chlorinated Alkanes and Alkenes		
Tetrachloroethene (PCE)	70	Low reliability trigger values (95% level of protection)
1,1,2-Trichloroethene (TCE)	330	
Vinyl chloride (chloroethene)	100	
1,1,1-Trichloroethane	270	
1,1-Dichloroethene	700	
1,1-Dichloroethane	250	
1,2-Dichloroethane	1900	
1,1,2-Trichloroethane	1900	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Chloroform	370	Low reliability trigger value (95% level of protection)
Non-Metallic Inorganics		
Ammonia Total – NH ₃ (at pH of 8)	910	ANZECC (2000) 95% protection levels.
Cyanide (Free or unionised HCN)	4	

While the low reliability figures should not be used as default guidelines they will be useful for indicating the quality of groundwater migrating off-site.

Trigger Values (TV) for Screening Fresh Water Quality Data (µg/L) for Slightly to Moderately Disturbed Ecosystems (ANZECC 2000)		
Contaminant	Threshold Concentration (µg/L)	Guideline Source
Metals and Metalloids		
Arsenic – As (III/V)	24/13	ANZECC (2000) 95% protection levels.
Boron - B	370	ANZECC (2000) 95% protection levels (figure may not protect key test species from chronic toxicity)
Cadmium – Cd	0.2	ANZECC (2000) 95% protection levels.
Nickel – Ni	11	
Manganese – Mn	1900	ANZECC (2000) 95% protection levels (figure may not protect key test species from chronic toxicity)
Mercury – Hg	0.06	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Chromium – Cr (III/VI)	3.3/1.0	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000) for Cr (III) and Co
Cobalt – Co	2.8	
Copper – Cu	1.4	ANZECC (2000) 95% protection levels.
Lead – Pb	3.4	ANZECC (2000) 95% protection levels (figure may not protect key test species from chronic toxicity)
Zinc – Zn	8.0	
Aromatic Hydrocarbons		
Benzene	950	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Toluene	180	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Ethylbenzene	80	
m-xylene	75	
o-xylene	350	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
p-xylene	200	
Polycyclic Aromatic Hydrocarbons		
Naphthalene	16	ANZECC (2000) 95% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Anthracene	0.01	Low reliability trigger values from Volume 2 of ANZECC (2000)
Phenanthrene	0.6	
Fluoranthene	1	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Benzo(a)pyrene	0.1	
Organochlorine Pesticides		
Aldrin	0.001	Low reliability trigger values from Volume 2 of ANZECC (2000)
DDE	0.03	
Dieldrin	0.01	
Endosulfan α	0.0002	
Endosulfan β	0.007	ANZECC (2000) 95% protection levels
Chlordane	0.03	
DDT	0.006	
Lindane	0.2	
Endosulfan	0.03	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Endrin	0.01	
Heptachlor	0.01	
Organophosphorus Pesticides		
Azinphos methyl	0.01	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute

Trigger Values (TV) for Screening Fresh Water Quality Data (µg/L) for Slightly to Moderately Disturbed Ecosystems (ANZECC 2000)		
Contaminant	Threshold Concentration (µg/L)	Guideline Source
		toxicity to particular species.
Methoxychlor	0.005	Low reliability trigger values from Volume 2 of ANZECC (2000)
Dementon-S-methyl	4	
Chloropyrifos	0.01	
Diazinon	0.01	
Dimethoate	0.15	
Fenitrothion	0.2	
Malathion	0.05	
Parathion	0.004	
Non-Metallic Inorganics		
Total Ammonia as N (pH of 8)	900	ANZECC (2000) 95% protection levels
Cyanide (Free or unionised)	7	
Nitrate	700	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
NO _x	40	ANZECC (2000) Default trigger values for physical and chemical stressors for slightly disturbed ecosystems in lowland rivers of South-east Australia. The trigger values for TP and TN are 25 µg/L and 350 µg/L, respectively, for east flowing coastal rivers in NSW.
Total Nitrogen	500	
Total Phosphorous	50	
Ammonium (NH4 ⁺)	20	
Chlorine	3	
		ANZECC (2000) 95% protection levels.
Phenols		
Phenol	320	ANZECC (2000) 95% protection levels
2,4-dimethylphenol	2	Low reliability values (95% level of protection) from Volume 2 of ANZECC (2000)
Chlorinated Alkanes and Alkenes		
Tetrachloroethene (PCE)	70	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
1,1,2-Trichloroethene (TCE)	330	
Vinyl chloride (chloroethene)	100	
1,1,1-Trichloroethane	270	
1,1-Dichloroethene	700	
1,1-Dichloroethane	90	
1,2-Dichloroethane	1900	
Chloroform	370	
1,1,2-Trichloroethane	6500	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Chlorinated Aromatic Hydrocarbons		
1,3-dichlorobenzene	260	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
1,4-dichlorobenzene	60	
1,2,4-trichlorobenzene	85	
Hexachlorobenzene	0.05	Low reliability values (95% level of protection) from Volume 2 of ANZECC (2000). (QSAR derived)
Miscellaneous Industrial Chemicals		
Hexachlorobutadiene	0.04	Environmental Concern Level from Volume 2 of ANZECC (2000)

While the low reliability figures should not be used as default guidelines they will be useful for indicating the quality of groundwater migrating off-site.

Appendix C: EPA Approved Guidelines

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of 02 July 2013)

Section 105 of the Contaminated Land Management Act 1997 (CLM Act) allows the Environment Protection Authority (EPA) to make or approve guidelines for purposes connected with the objects of the Act. These guidelines must be taken into consideration by the EPA whenever they are relevant and by accredited site auditors when conducting a site audit. They are also used by contaminated land consultants in undertaking investigation, remediation, validation and reporting on contaminated sites.

Guidelines made by the EPA

- [Guidelines for Assessing Service Station Sites](#) (94119ServiceStnGuidelines.pdf, 1.2MB) (December 1994)
- [Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land](#) (2003028VerticalMixGuidelines.pdf, 148KB)(January 1995)
- [Sampling Design Guidelines](#) (9559samppgdline.pdf, 2MB) (September 1995)
- [Guidelines for Assessing Banana Plantation Sites](#) (bananaplantsite.pdf; 586KB)(October 1997)
- [Guidelines for Consultants Reporting on Contaminated Sites](#)(20110650consultantsglines.pdf; 428KB) (reprinted August 2011)
- [Guidelines for Assessing Former Orchards and Market Gardens](#) (orchardgdline.pdf; 172KB) (June 2005)
- [Guidelines for the NSW Site Auditor Scheme, 2nd edition](#) (auditorglines06121.pdf; 510KB) (April 2006)
- [Guidelines for the Assessment and Management of Groundwater Contamination](#) (groundwaterguidelines07144.pdf; 604KB) (March 2007)
- [Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997](#) (09438gldutycontclma.pdf; 1MB) (June 2009)

Note: All references in the EPA's contaminated sites guidelines to the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992) are replaced as of 6 September 2001 by references to the [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#)  (ANZECC and ARMCANZ, October 2000), subject to the same terms.

Guidelines approved by the EPA

ANZECC publications

- [Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites](#) , published by Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) (January 1992)
- [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#) , published by ANZECC and Agriculture and Resource Management Council of Australia and New Zealand, Paper No. 4 (October 2000)

EnHealth publications (formerly National Environmental Health Forum monographs)

- [Composite Sampling](#), Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide
- [Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards](#), Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (2012)

National Environment Protection Council publications

- [National Environment Protection \(Assessment of Site Contamination\) Measure 1999](#) (April 2013)

The NEPM consists of a policy framework for the assessment of site contamination, Schedule A (Recommended General Process for the Assessment of Site Contamination) and Schedule B (Guidelines).

Schedule B guidelines include:

Guideline on Investigation Levels for Soil and Groundwater

Guideline on Site Characterisation

Guideline on Laboratory Analysis of Potentially Contaminated Soils

Guideline on Site-specific Health Risk Assessment Methodology

Guideline on Ecological Risk Assessment

Guideline on Methodology to Derive Ecological Investigation Levels in Contaminated Soils

Guideline on Ecological Investigation Levels for Arsenic, Chromium(III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc

Guideline on the Framework for Risk-based Assessment of Groundwater Contamination

Guideline on Derivation of Health-based Investigation Levels

Guideline on Community Engagement and Risk Communication

Guideline on Competencies and Acceptance of Environmental Auditors and Related Professionals

Other documents

- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental (February 1996)
- [Australian Drinking Water Guidelines](#), NHMRC and Natural Resource Management Ministerial Council of Australia and New Zealand (2011)

Appendix D: Unexpected Finds Procedure

Appendix F

Unexpected Finds Procedure

**Detailed Site Investigation
Proposed International Convention Centre Hotel Development
Darling Harbour, Sydney NSW**

APPENDIX F: UNEXPECTED FINDS PROTOCOL

F.1 Context

Coffey's review of historic land uses indicated that the site was partially submerged and formed part of a tidal mudflat during the late 18th century (Coffey, July 2013). Land reclamation activities commenced in the 1860s and 1870s to extend the Darling Harbour branch railway line towards the Pyrmont Bay wharves, and enable the construction of the Darling Harbour Goods Yards and associated Iron Wharf. The site is located in the southern part of the goods yard. The site was subsequently redeveloped during the 1980s as a pedestrian and vehicle access immediately to the west of Harbourside and adjacent to the Convention Centre. Figure F1 provides an indication of the extent of historic land uses of the site.

Coffey investigated ground contamination across the site. In summary, these investigations identified no widespread contamination. The Detailed Site Investigation report (Coffey, July 2013) identified no unacceptable risks to human health or other aspects of the environment in the context of the ICC Hotel Development proposed by LLD for the site, other than the presence of Acid Sulfate Soil in natural alluvium.

Coffey's investigations identified localised areas of the site where soils and/or groundwater reported concentrations of chemicals which may indicate the presence of potentially unidentified contamination between sampling locations. As such, in the Detailed Site Investigation report Coffey recommended that an Unexpected Finds Protocol be prepared which includes procedures for identifying and managing potential risks and protecting human health and environment in the event that unexpected contamination or hazardous materials (e.g. asbestos containing materials) is discovered during excavation at the site.

F.2 Data Gaps & Uncertainties

Potential data gaps and uncertainties associated with ground contamination at the site include:

- The presence of potentially unidentified contamination between sampling locations, or where otherwise limited investigation data is currently available.
- Potential variability in groundwater quality over time.
- The presence of potentially unidentified contamination in fill materials surrounding large diameter culverts which pass beneath the central parts of the site.
- The extent of Acid Sulfate Soils in alluvium across the site.
- Potential for asbestos impacted soils.

The data gaps and uncertainties have been used to develop this Unexpected Finds Protocol.

F.3 Unexpected Finds Contingency Plan

F.3.1 Responsibilities for Implementation

LLD will retain the overall responsibility for implementing the unexpected finds contingency plan for the site. It is envisaged that LLD will assigning specific responsibilities to project personnel as part of the

construction planning process. Specific roles and responsibilities for this Plan shall be confirmed prior to construction works commencing.

F.3.2 Training and Awareness of Personnel

Personnel involved in earthworks on site are to be made aware of and trained in the recognition of potential unexpected finds. Training can be undertaken as a part of general site induction and refreshed periodically at toolbox meetings.

Training should provide general awareness for recognition of potential contamination and hazardous materials, so that works can be suspended temporarily to allow advice from an appropriate qualified consultant and effective management of the emergent condition. In general, a precautionary approach is employed through use of the unexpected finds procedure outlined in the following section.

Coffey notes that some forms of contamination may not be associated with any visual or olfactory indicators in the field. Although a precautionary approach is adopted, the unexpected finds procedure may not provide protection against such impacts.

F.3.2 Management of Unexpected Finds

Where unexpected contamination is suspected by personnel involved in earthworks on site, works will be temporarily suspended in the affected part of the site. This area will be isolated to minimise potential for disturbance to the affected soils/groundwater. LLD, their appointed sub-contractor and environmental consultant will be notified of the unexpected find.

Due to the potential variability in both the nature and extent of an unexpected find, Coffey is unable to define specific remedial strategies for contamination associated with an unexpected find. However, Coffey describes a process for identifying and evaluating feasible options to manage an unexpected find. Assessment and management of unexpected finds may be subject to Site Auditor review.

As noted within Section 12 of the Detailed Site Investigation Report (Coffey, July 2013), if wastes are likely to be generated as a result of managing or treating unexpected finds, these materials should be classified in accordance with the NSW EPA Waste Classification Guidelines (NSW DECCW; 2009).

F.3.3 Unexpected Finds Procedure

Should any unexpected actual or suspected contamination be encountered during excavation works, the following procedure should be implemented:

1. Stop work in the potentially hazardous area as soon as it is safe to do so and move to the upwind side of the area, or away from the area.
2. Assess the potential immediate risk to human health posed by the unexpected find and assess if evacuation or assistance of emergency services is required.
3. Delineate an exclusion zone around the affected area using fencing and/or appropriate barriers and signage. Additional control measures may be required for:
 - a) Odours and/or volatile compounds: odours suppression and no flames/sparks signage.
 - b) Potential asbestos containing materials: if area is small cover with weighted plastic sheeting or geofabric. For larger areas, use regular dust suppression as conditions require.

4. Contact the appointed environmental consultant for advice and request a site visit, as soon as practicable, to undertake an assessment of the unexpected find. The Site Auditor should be informed of the find after a preliminary assessment is made.
5. The environmental consultant should assess the unexpected find and provide:
 - a) Preliminary assessment of the suspected contamination and immediate management controls if needed;
 - b) What further assessment and/or remediation works are required and how such works are to be undertaken in accordance with contaminated site regulations and guidelines;
 - c) Provision of clean up advice, including classification of materials likely to be disposed off-site as waste (if necessary);
 - d) Supervision of remediation works required (where applicable, or considered necessary);
 - e) Validation works required following remediation works (if applicable).
6. When the environmental consultant is satisfied that the unexpected find has been properly addressed and that the site is suitable for resumption of works, the environmental consultant will provide relevant information and recommendations to the Site Supervisor, particularly for considering change to the Site Safety Plan and Site Management Plan.
7. If it is deemed safe to do so by the Site Superintendent, works may resume in the affected area.

F.4 Potential Unexpected Finds

Based on findings of previous investigations and site history, potential unexpected finds which could occur within the site are summarised in Table F.1.

Table F.1: Summary of Non-specific Unexpected Finds

Potential Unexpected Find	Observed Characteristic	Key Contaminants of Concern
Petroleum Hydrocarbons as Oil, Grease or Fuel residues	May be identified by either odour and/or visual indications of contamination. Hydrocarbon contamination may be identified by characteristic petrol, diesel or 'oily' odours which may vary in strength from weak (just detectable) to very strong (easily detectable at a distance from the source). The odour may or may not be accompanied by specific areas of dark staining (black-grey) or larger scale discolouration of strata from a previously identified 'natural colour' (e.g. staining of orange and brown clay to dark grey and green.) May also be visible as a distinct coloured sheen on water within an excavation.	TPH, BTEX, PAH, lead
Buried dry waste	May include a variety of waste materials including wood, plastic, metal fragments, building rubble (e.g. concrete, brick, asphalt, asbestos)	Asbestos, heavy

Potential Unexpected Find	Observed Characteristic	Key Contaminants of Concern
materials	containing materials etc.).	metals
Buried or surface bonded ACM, asbestos fines/friable asbestos	Cement bound ACM (fibro cement sheet) may be present in building waste or pipes. Friable forms of asbestos including lagging and insulation may be evidenced fibrous material which flakes and powders easily. Textured coatings and floor tiles may also contain asbestos. Asbestos fines and asbestos fibres are not visible to the unaided eye. Laboratory analysis by microscope is required to identify asbestos in soil.	Asbestos
Buried organic materials	Such materials may be associated with decomposed plant matter found within the natural alluvial soils.	Nutrients, gaseous emissions (CH ₄ , CO ₂ , H ₂ S)
Structures or conduits containing or being surrounded by deleterious materials	Could be identified as follows: • A buried tank or former pipelines; • Deeper sand fill sometimes with visual/olfactory indications of contamination • Presence of small concrete footings surrounding by odorous or visually impacted soils and/or groundwater.	TPH, BTEX, PAH, lead
Ash or slag deposits	Ash materials typically light weight, grey and white sand and gravel sized (1mm to 10mm) particles. Slag materials can be varied in consistency and colour and may comprise pale grey to blue/green/grey, and be loose or cemented. Slag gravels can be very angular and appear to have a vesicular (i.e. 'honeycomb') shape.	PAH, heavy metals
Other unusual odours	• Solvent odour • Acetone (nail polish remover) odour • Sulfur (rotten egg) odour (possibly associated with ASS) • Acidic (Acetic/Formic/Citric) odour. • Ammonia odour • Caustic odour	Various

E.3 Localised Contamination - Known

Investigations carried out within the site have identified localised areas of the site where soils and/or groundwater reported concentrations of contamination which were not sufficient to warrant remediation or other management. However, these results may indicate the presence of potentially unidentified contamination between sampling locations, or where investigation data is limited. Table F.2 provides a

summary of locations where low level contamination has been reported, and these are annotated on Figure F1.

Table F.2: Summary of Areas where indications of contamination has been previously identified

Sampling Location	Type of Impact	Likely Occurrences	Contaminants of Concern
BH204	Hydrocarbon compounds in soil and groundwater	Soils collected from BH204 reported low levels of hydrocarbon compounds at depths between 0.15-0.2mbgs. Soils collected from a depth of 0.8-0.9mbgs did not report petroleum hydrocarbons above the laboratory's LOR. Low level contamination has been identified within groundwater samples collected from BH204 at 2.5mbgs (approx. 0.5mAHD).	TPH and PAH.
BH204a	Possible hydrocarbon compounds in soil	Black staining was observed in soils from BH204a at depths between 0.8m and 1.1mbgs. No soil samples were collected from BH204a for chemical analysis. The observed staining may be an indicator that soils in the vicinity of BH204a have been locally impacted with hydrocarbon compounds.	TPH and PAH.
BH201a BH209	Hydrocarbon compounds in soil	Soils collected from BH201a reported low levels of petroleum hydrocarbon fractions at depths between 0.5-0.6mbgs. Soils collected from BH201a at a depth of 1.5-1.6mbgs did not report petroleum hydrocarbon fractions above the laboratory's LOR. Soils collected from BH209 also reported low levels of petroleum hydrocarbon fractions at depths between 0.2-0.3mbgs. BH209 terminated at 0.45mbgs on sandstone bedrock.	TPH and PAH.
BH203	Hydrocarbon compounds in groundwater	Toluene and naphthalene were detected at concentrations above the LOR (although below the adopted assessment criteria) in a groundwater sample collected from BH203.	BTEX and PAH.
ASS and PASS	Acidification of soils	ASS and PASS have been identified in natural alluvial soil, which were sampled from the southeastern corner of the site (i.e. BH204, BH204a). These alluvial materials may be encountered during deeper excavations associated with the proposed basement.	ASS and PASS

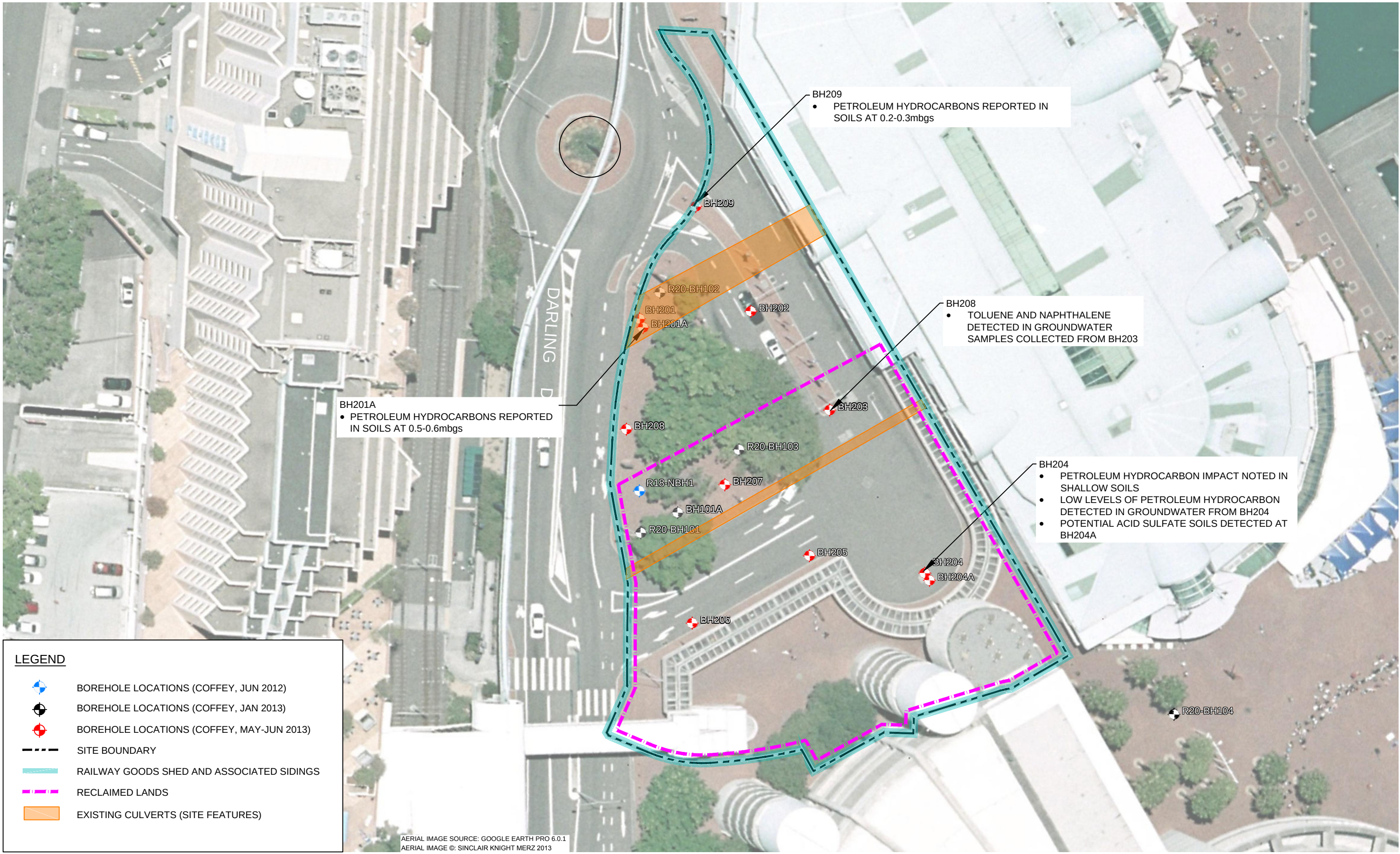
REFERENCES

1. Coffey (July 2013); Detailed Site Investigation, Proposed International Convention Centre Hotel Development, Darling Harbour, Sydney NSW (Ref: GEOTLCOV24303AH-AD)
2. NSW DECCW (2009); Waste Classification Guidelines - Part 1: Classifying Waste

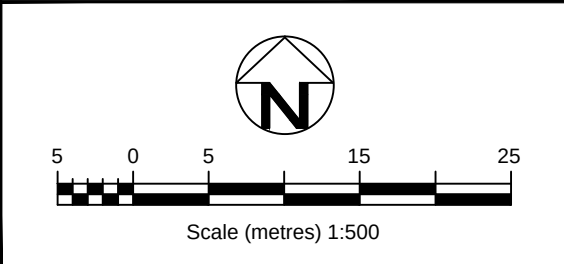
ACRONYMS

ACM	Asbestos Containing Materials
ASS	Acid sulphate soils
BTEX	Benzene, toluene, ethylbenzene, xylene
LLD	Lend Lease Development
LOR	Limit of reporting
mAHD	Metres above Australian Height Datum
mbgs	Metres below ground surface
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soils
TPH	Total petroleum hydrocarbons

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revision	description				drawn	approved	date



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approved	ML
date	17/06/13
scale	AS SHOWN
original size	A3



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SPECIALISTS MANAGING
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client: LEND LEASE DEVELOPMENTS PTY LTD	
project: SYDNEY INTERNATIONAL CONVENTION EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) - ICC HOTEL DEVELOPMENT	
title: SUMMARY OF AREAS WHERE INDICATIONS OF POTENTIAL CONTAMINATION HAVE BEEN IDENTIFIED	
project no: GEOTLCOV24303AH-D02	figure no: F1