



**DETAILED SITE INVESTIGATION REPORT
FOR SSDA6**

**INTERNATIONAL CONVENTION CENTRE
HOTEL DEVELOPMENT - SYDNEY
INTERNATIONAL CONVENTION,
EXHIBITION & ENTERTAINMENT
PRECINCT**

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ABBREVIATIONS

µg/L	micrograms per litre
ACM	Asbestos Containing Materials
AEC	Area of Environmental Concern
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulfate Soil
bgs	below ground surface
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
C6-C36	Hydrocarbon chainlength fraction
COPC	Chemicals of Potential Concern
DA	Development Application
DBYD	Dial Before You Dig
DO	Dissolved Oxygen
DOPI	NSW Department of Planning & Infrastructure
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EC	Electrical Conductivity
EPA	Environmental Protection Authority of NSW
eV	Electron Volt
GIL	Groundwater Investigation Level
HIL	Health Investigation Level
HSL	Health Screening Level

ICC	International Convention Centre
IP	Interface Probe
LLD	Lend Lease Development
LNAPL	Light Non-Aqueous Phase Liquids
LOR	Limit of Reporting
mbgs	Metres below ground surface
mbtoc	Metres Below Top of Casing
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mV	millivolt
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure as revised 2013
NHMRC	National Health & Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
OEH	Office of Environment & Heritage of NSW
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soils
PID	Photoionisation Detector
RPD	Relative Percent Difference
SICEEP	Sydney International Convention, Exhibition & Entertainment Precinct
SOP	Standard Operating Procedure

SSDA	State Significant Development Application
SVOC	Semi Volatile Organic Compounds
TC	Tungsten Carbide
TCLP	Toxicity Characteristic Leaching Procedure
VOC	Volatile Organic Compounds

1 INTRODUCTION

1.1 General

Coffey Geotechnics Pty Ltd (Coffey) was engaged by Lend Lease Developments (LLD) to carry out a phase of supplementary ground investigation and prepare a Detailed Site Investigation (DSI) report of the proposed International Convention Centre (ICC) Hotel Development. The proposed ICC Hotel Development (herein referred to as the 'site') comprises a triangular parcel of land within the northern part of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) which is bound by Darling Drive to the west, the Sydney Convention Centre to the south and the Harbourside Shopping Centre to the east.

The work was commissioned by Mr. Michael Antonelli on behalf of LLD. The commission was in response to a proposal submitted by Coffey dated 20th March 2013 (ref: ENAURHOD04498AA-P05).

This report supports a State Significant Development Application (SSDA) submitted to the Minister for Planning and Infrastructure pursuant to Part 4 of the NSW *Environmental Planning and Assessment Act 1979*.

The Application (referred to as SSDA6) seeks approval for the construction of the ICC Hotel component of the SICEEP at Darling Harbour.

This SSDA follows SSDA1, which seeks approval for the core convention, exhibition and entertainment facilities of the SICEEP Project; SSDA2, a staged application that sets out a Concept Proposal for a new mixed use neighbourhood at Darling Harbour known as 'The Haymarket'; and a number of detailed proposals (SSDA3, SSDA4, and SSDA5) for use of development plots within The Haymarket. SSDAs 1 and 2 were submitted to the Department of Planning and Infrastructure (DoPI) in March 2013, and the SSDAs 3-5 were submitted in May 2013.

1.2 Project Background

The NSW Government considers that a precinct-wide renewal and expansion of the existing convention, exhibition and entertainment centre facilities at Darling Harbour is required, and is committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of the Sydney International Convention, Exhibition and Entertainment Precinct.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless was announced by the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create SICEEP.

Key features of the Preferred Precinct Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
 - Up to 40,000m² exhibition space;
 - Over 8,000m² of meeting rooms space, across 40 rooms;
 - Overall convention space capacity for more than 12,000 people;
 - A ballroom capable of accommodating 2,000 people; and

- A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing a hotel complex at the northern end of the precinct, immediately adjacent to the new International Convention Centre.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, called 'The Haymarket', including apartments, student accommodation, community facilities, shops, cafes and restaurants.
- Renewed and upgraded public domain that has been increased by a hectare, including an outdoor event space for up to 27,000 people at an expanded Tumbalong Park.
- Improved pedestrian connections linking to the proposed Goods Line (formerly Ultimo Pedestrian Network) drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

1.2.1 SICEEP – Site Description

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the Light Rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south.

The SICEEP Site has been divided into three redevelopment areas – Bayside, Darling Central and The Haymarket.

The ICC Hotel Site is located within the northern end of the Bayside precinct as shown in Figure 1.1

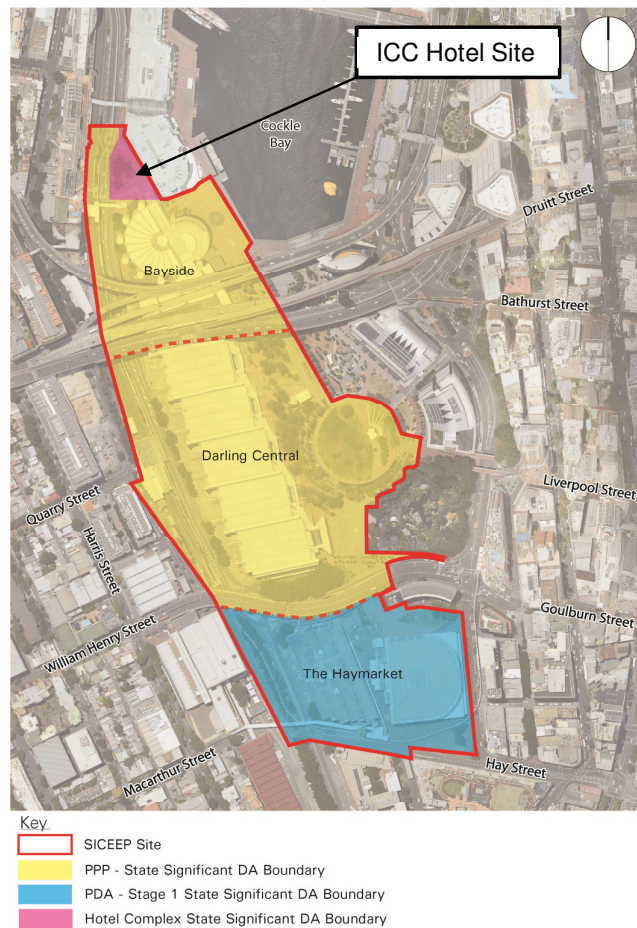


Figure 1.1: Plan illustrating the location of proposed ICC Hotel Development site relative to other areas within the SICEEP

1.2.2 Overview of Proposed Development

The report relates to a SSDA for the ICC Hotel component of the SICEEP Project. The proposed hotel is located at the northern end of the precinct and comprises a single building with up to 650 keys (i.e. rooms). The hotel is being developed by LLD and is consistent with Darling Harbour Live's Preferred Precinct Plan.

More specifically, this SSDA seeks approval for the following components of the development:

- Demolition of existing site improvements (e.g. roads, footpaths, median strips etc.);
- Associated tree removal and replanting;
- Construction and use of a single hotel tower providing for up to 650 keys and including guest facilities, restaurant and ballroom;
- Public domain improvements including integration with existing / proposed works; and
- Extension, realignment and augmentation of physical infrastructure / utilities as required.

1.3 Objectives

In general, the DSI has been prepared to characterise ground conditions at the site and assess the suitability of the site in accordance with the requirements set out under State Environmental Planning Policy No. 55 Remediation of Land and Managing Land Contamination: Planning Guidelines (DUAP/EPA; 1998).

Following our initial review of investigation data available for the site, Coffey considered that the sampling density did not meet the minimum sampling density recommended in the NSW EPA Sampling Design Guidelines (1995). Coffey proposed to address this information gap through conduct of a Detailed Site Investigation (DSI) designed specifically for the site. To support the DA approval process, the specific objectives of the DSI were to:

- Establish the historical uses of the site through the review of information from readily available sources, including relevant parts of previous desk studies and investigation reports prepared by Coffey.
- Identify Areas of Environmental Concern (AEC) and associated Chemicals of Potential Concern (COPC)
- Carry out supplementary investigation works to address identified data gaps and adequately characterise ground conditions within the vicinity of the AECs identified.
- Interpret relevant desk study and investigation data to assess land contamination on the site in the context of the scheme proposed by LLD and requirements of SEPP55.
- Determine the need for further, more detailed assessment or remediation in the context of the proposed land uses.

1.4 Scope of Work

To meet the above objectives, Coffey undertook the following works:

1.4.1 Site Walkover and Initial Desktop Review

Works undertaken to identify the AEC and COPC in relation to the site were:

- Review readily available desk studies and investigation reports that are relevant to the site and surrounding area.
- Carry out a site walkover to observe potential onsite contamination sources and surrounding land uses.

1.4.2 Soil and Groundwater Investigation

The findings from the desktop review and site walkover were used to design an investigation to assess the potential contamination associated with each AEC. The investigation comprised:

- Location and clearance of underground services, and set out of proposed soil bores at cleared locations;
- Drilling of 11 soil bores (BH201, BH201a, BH202, BH203, BH204, BH204a, BH205, BH206, BH207, BH208 and BH209) that were progressed using hand auger, continuous split tube sampling and/or auger techniques to the top of bedrock. The majority of these boreholes were subsequently progressed into bedrock to gather additional geotechnical data.
- Observation and logging of the sub-surface lithology encountered in each bore and collection of soil samples for field screening and analysis;
- Installation of groundwater monitoring wells at three locations (BH203, BH204 and BH205) and development of these wells;
- Purging and sampling of groundwater from the three new wells and confirming that one existing well (BH102) continued to have insufficient water for sampling;
- Laboratory analysis of soil and groundwater samples for the Contaminants of Potential Concern (COPCs);
- Implementation of a Quality Assurance/ Quality Control (QA/QC) program for the investigation, including collection and analysis of field replicate samples (duplicates and triplicates), field blank, field spike and equipment rinsate samples;
- Preparation of this DSI report generally in accordance with relevant sections of NSW EPA 'Guidelines for Consultants Reporting on Contaminated Sites' NSW OEH (2011).

Description of the scope of work carried out, including detailed methodologies applied in the investigation is provided in Section 6.

1.5 Current Land Use

The site currently comprises a taxi stand, bus stop and associated access roads. The southern and eastern boundaries of the site comprise paved footpaths which provide links to the adjoining retail centre, convention centre and surrounding public realm. The central part of the site comprises a triangular paved traffic island where several mature trees are growing.

1.6 Proposed Development

Coffey was provided with the following drawings which form the basis of LLD's DA for site, and which generally describe the proposed development on the site:

- Lend Lease Drawing No. DA003 'Building Works Boundary Plan' (Rev. A)

- Lend Lease Drawing No. DA004 'Ground Plane with Immediate Context (Rev. A)
- Lend Lease Drawing No. DA090 'Basement Plan (Rev. A)
- Hyder Drawing No. HO-CI-0701: Combined Services Plan (dated 9 August 2013; Rev. 06)

A copy of these listed drawings is provided in Appendix A.

With reference to these listed drawings, the proposed development on the site comprises:

- A multi-storey hotel building with hard paved areas for guest drop-off, loading/service area and basement access points. The indicative ground floor layout of the proposed hotel comprises a lobby/reception area, restaurant/bar area, lift core and service areas (i.e. for electrical substation, switch room, communications, waste management area etc.).
- Basement structure for lift core shaft, circulation areas and plant rooms. The basement footprint comprises approximately half the area of the hotel's ground floor footprint, and is positioned to the south of an easement across the northern part of the site associated with existing underground culverts that will be retained. Coffey understands that the basement will not be used as a car park or other uses where regular occupation of the basement space would be required.
- No provision for areas of recreational/public open space within the site boundaries.

Coffey understands that LLD proposes to establish minimal landscaping within the site, which is likely to comprise a number of trees and shrubs established within engineered tree pits and imported soil, maintaining minimal access to existing fill materials on the site.

Coffey understands that the finished ground floor lobby floor level is proposed to be around 3.6m AHD and the basement approximately 0.0m AHD. The general basement slab thickness will be approximately 250mm to 300mm thick, increasing to approximately 500mm around the core slab. An allowance of approximately 150mm below the slab will also be provided for blinding and aggregate.

1.7 Available Information

Information from the following reports was used to prepare this DSI:

- Coffey Geotechnics (June 2012a); Stage 1 – Preliminary Environmental Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney.
- Coffey Geotechnics (June 2012b); Stage 2 – Detailed Site Investigation: Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney.
- Coffey Geotechnics (August 2012); Supplementary Site Investigation: Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney
- Coffey Geotechnics (January 2013); Supplementary Site Investigation: Factual Report, Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour.

1.8 Applicable Regulations & Guidelines

This assessment has been prepared having regard to the following regulations and guidance documentation:

- State Environmental Planning Policy No 55 - Remediation of Land
- DUAP/EPA (1998); Managing Land Contamination: Planning Guidelines

- DEC (2006); Guidelines for the NSW Site Auditor Scheme, 2nd edition
- NSW EPA (1995); Guidelines for Consultants Reporting on Contaminated Sites
- DEC (2007); Guidelines for the Assessment and Management of Groundwater Contamination
- DECC (2009); Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997
- 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)
- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPM) (No. 1) as registered and amended in 2013, and associated Schedule B guidelines.

2 SITE LOCATION & DESCRIPTION

2.1 Site Location

The site is located at the northern end of Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), and immediately to the east of Darling Drive. The location of the site is shown in Figure 1.

The site is within the City of Sydney Local Government Area and is identified as the following land title:

- Part Lot 1010 in DP 1147364

2.2 Site Description

The site comprises a triangular parcel of land covering an area of approximately 3,710m². Figure 2 provides a plan of the current layout and boundaries of the site. A site walkover was undertaken by Matthew Locke, an experienced Coffey environmental consultant, on 14th May 2013. The key observations made during the site walkover are noted in Figure 2 and are summarised as:

- The site currently functions as a passenger pick-up/drop off area, with a central area of public open space.
- Available topographic survey data indicates that site levels range from 3.2mAHD in the north to 2.4mAHD in the southwestern corner of the site. Site levels are relatively consistent with levels of Darling Drive to the west and ground floor levels of the adjoining Harbourside Shopping Centre and Sydney Convention Centre to the east. The light rail corridor to the west of Darling Drive has been cut into the sandstone bedrock. The western face of this cutting rises sharply so that the ground level of the public car park immediately to the west is several metres above site level.
- The southern and eastern boundaries of the site comprise paved footpaths providing access to the adjoining Harbourside Shopping Centre, Sydney Convention Centre, monorail/light rail transport connections and surrounding public realm of the SICEEP.
- The central part of the site comprises a triangular paved traffic island where several mature trees are growing. Other than a small covered waiting area for passengers and a refuse bin, no other above ground structures are present in this area of the site.
- A two-way asphalt surfaced road provides vehicle access on to the site from Darling Drive. The road runs parallel with the eastern and southern boundaries of the site. Limited short-term vehicle parking is present surrounding the central island and along the eastern boundary of the site.

2.3 Surrounding Land Uses

The site is situated in an area characterised by various commercial and retail land uses which are summarised in Table 2.1.

Table 2.1: Surrounding Land Uses

Direction	Land Uses
North	<ul style="list-style-type: none"> • Darling Drive and Harbourside Shopping Centre. • The elevated monorail track currently passes to the north of the site and runs parallel

Direction	Land Uses
	to Darling Drive.
East	<ul style="list-style-type: none"> • Harbourside Shopping Centre beyond which lies an area of public open space with Cockle Bay as its eastern boundary.
South	<ul style="list-style-type: none"> • Sydney Convention Centre
West	<ul style="list-style-type: none"> • Darling Drive beyond which lies the Convention Centre Light Rail Station and associated light rail corridor. • Further west lies a car park for general public and hotel patrons. The Novotel Hotel is above the car park. • Convention Centre Monorail Station is located to the southeast of the site. A pedestrian crossing extends across Darling Drive from the mororail station to the southwestern corner of the site.

3 GEOLOGY, HYDROGEOLOGY & HYDROLOGY

3.1 Geology

A review of the Sydney 1:100,000 Geological Sheet (Sheet No. 9130; dated 1983) produced by the NSW Geological Survey indicates the site is underlain by medium to coarse grained sandstone with very minor shale and laminite lenses. The published geological records indicate that Quaternary alluvial sediments comprising silty to peaty quartz sand, silt and clay encroach the southern extent of the site.

Previous investigations (Coffey, Jun 2012b; Jan 2013) installed four boreholes within the central traffic island. A summary of the ground conditions recorded within these boreholes is presented in Table 3.1.

Table 3.1: Summary of ground conditions recorded previously within the site

Unit	Top of Strata (mbgs)	Thickness (m)	Description
Fill Materials	0.0	0.6 – 1.4	Sandy Gravel to Gravelly Sand typically comprising fine to coarse grained brown to dark gravel with trace of clay and occasional brick fragments.
Residual Soils	0.6 – 1.4	1.1 - 2.65	Clayey Sand comprising fine to medium grained, yellow brown sand with pale yellow/grey to mottled red-brown clay.
Bedrock	1.1 – 3.25	More than 20m	Sandstone comprising medium to coarse grained, yellow brown, with some quartz grains.

3.2 Hydrogeology

Groundwater was not encountered during previous investigations within the site. Groundwater monitoring at BH104 and BH105 located approximately 30m and 50m southeast of the site boundary recorded groundwater levels of 2.55mbgl and 1.98mbgl respectively.

A data logger was installed in monitoring well BH105 between 10th and 14th January 2013 recorded change in groundwater level at BH105 of 1.94m due to harbour tidal movement (Coffey, Jan 2013). On this basis, it is considered likely that groundwater levels beneath the site are likely to be tidally influenced. Based on previous investigations and monitoring undertaken by Coffey throughout the SICEEP, net groundwater flow direction is anticipated to be towards Cockle Bay.

3.3 Hydrology

No water bodies are located within the site and Cockle Bay is the nearest surface water body which is situated approximately 60m east of the site .

3.4 Acid Sulfate Soils

With reference to the Acid Sulfate Soil Risk Map available in the Australian Soil Resource Information System, the site is noted as 'Disturbed Terrain' which relates to the reclamation of low lying areas for urban development. Section 149 certificates obtained from City of Sydney indicated that the land

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encompassing the SICEEP has been identified as being Class 1 or Class 2, where Class 1 has the highest risk for ASS and Class 5 the lowest risk (Coffey, June 2012b).

4 SITE HISTORY REVIEW

4.1 Review of Available Heritage Assessments

The following heritage assessments prepared for the wider SICEEP site were reviewed to supplement information presented within the Environmental Desk Study report (Coffey, June 2012a), particularly the period between 1830 and 1920 relating to the former Darling Harbour Goods Yards and associated land reclamation activities:

- Tanner Kibble Denton Architects (Feb 2013); Statement of Heritage Impact – Sydney International Convention Centre, Exhibition & Entertainment Precinct (SICEEP), Darling Harbour.
- Casey & Lowe (March 2013); Non-Indigenous Archaeological Assessment and Impact Statement for SSDA1; Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP).

Table 4.1 presents a summary of historical uses of the site and surrounding land.

Table 4.1: Chronological summary of historical uses of site and surrounds

Period	Description of Historic Land Uses
1794	The first grants of land on the western side of Cockle Bay were made to John Malone and William Mitchell (TKD, Feb 2013). Land uses at this time are not specified.
1836	Casey & Lowe (March 2013) present a plan from circa 1836 which shows much of the site remained partially or entirely submerged at this time. 'Burns House' is established immediately to the north of the site, although the use of this building is unknown. The remainder of the land does not appear to be developed.
1850s	In 1853, a proposal was made to connect Darling Harbour to the main Sydney railway line. An additional 7½ acres (3.04 ha) was resumed for a goods terminus at Pyrmont. The Darling Harbour Branch Line opened c.1859, which saw areas surrounding the Haymarket connected to Sydney Terminus.
1860s	Reclamation also took place on the western shore of Darling Harbour where spoil excavated from the railway terminus yard was placed and by 1865 an embankment was formed east of Pyrmont Street, extending between Allen Street and a point just south of Fig Street (Casey & Lowe, Mar 2013). It is also reported that reclamation it is likely to have used 'old wharf and pier structures' incorporated in the fill.
1870 – 1890	Further reclamation took place during the 1870s to enable the construction of the Darling Harbour Goods Yards and associated Iron Wharf. The Iron Wharf was constructed between 1874 and 1876 and comprised a substantial iron structure which extended along the western shore of Cockle Bay between Liverpool Street (east) and Pyrmont Bridge. The wharf was constructed with tubular cast iron columns with hard wood decking. A stone retaining wall was constructed adjoining the iron wharf and fill materials were placed behind. The construction of the Darling Harbour Goods Yard took place between 1874 and 1888. These yards were extended north between 1888 and 1891 in a second phase of

Period	Description of Historic Land Uses
	construction to connect with the Pyrmont Bay wharves and Darling Island.
1890 - 1920	The Darling Harbour Goods Yards went through a further period of rapid expansion where two additional Goods Sheds and associated offices were established in 1902. Construction of two-tier outwards goods shed completed between 1906-1922
1920 to 1980	As waters south of Pyrmont Bridge were becoming too shallow for increasing size of commercial vessels, this triggered a decline of wharf operations resulting the gradual dismantling of the Iron Wharf during the 1920s. The Darling Harbour Goods Yard remained operational until circa 1980s and was eventually dismantled to enable to construction of the Sydney Convention Centre, Harbourside Shopping Centre and associated public realm, which opened c.1988.

4.2 Historic Map Extracts

4.2.1 Shields Plan of Sydney – 1845

Shield's Plan of Sydney (refer Figure 3) shows the western foreshore of Cockle Bay remained undeveloped.

4.2.2 Trigonometric Survey Plan – City of Sydney: Section W – 1865

The Trigonometric Survey Plan (refer Figure 4) indicates the western foreshore of Cockle Bay had been developed with a rail corridor. The map shows an area on the map which is broadly coincident with the site, where land reclamation appears to have occurred to establish the rail corridor. The plan shows a number of structures established within the area although the specific land uses were not identified.

4.2.3 Atlas of Suburbs of Sydney – 1885-1890

Review of the historic maps for the Suburbs of Sydney for the period between 1885 and 1890 (refer Figure 5), indicates the site falls within a substantial railway goods yard. Land uses to the south of the site comprise a rail corridor linking the site with the wharves along the southern Cockle Bay foreshore and Sydney Terminus to the south and a Meat Market. Land uses to the north comprise rail sidings that link to Railway Wharves fronting onto Pyrmont Bay. Pyrmont Bridge has been established to the north of the site connecting the western and eastern shores of Cockle Bay.

4.2.4 Civic Survey of Pyrmont – 1938 – 1950

The Civic Survey of Pyrmont (refer Figure 6) shows the site has been developed and forms part of a complex of three Goods Sheds associated with rail freight in the area. Land use to the south remains rail sidings. Land use to the west appears to comprise commercial-type buildings, including the following referenced businesses:

- Pitt, Son & Badgery – stock and station agency associated with the transportation of livestock to the various Sydney Markets
- Yellow Express Carriers – freight transportation business
- Goldsborough Mort & Coy – woolstore and various warehousing/storage uses

4.3 Aerial Photography

A summary of the findings of the aerial photograph review is presented in Table 4.2. Aerial photographs are provided as Figures 7 to 13.

Table 4.2: Aerial Photograph Summary

Date	Comments
June 1942	<p>The site forms part of a large Goods Yard which comprises three rectangular goods sheds with associated rail sidings. The goods sheds appears to extend over which is currently the site, adjoining Harbourside Shopping Centre to the east, Light Rail corridor to the west and Sydney Convention Centre to the south and Pyrmont Bridge to the north.</p> <p>Several Wharf structures are also evident along the foreshore of Cockle Bay to the east. Development to the west appears to comprise commercial-type structures with a pocket of low-rise (possibly residential dwellings) located between Pyrmont Street and Wentworth Park.</p> <p>Land use to the south comprises large area covered by rail sidings. Further south, the Ultimo Power Station is evident.</p> <p>The Pyrmont Bridge is established to the north of the site and land in this area also appears to be used for commercial activities. The Pyrmont Power Station is evident to the north beyond the Pyrmont Bridge.</p>
August 1955	No significant change to uses of the site and surrounding land is noted.
May 1978	No significant change to uses of the site and surrounding land is noted.
August 1982	No significant change to uses of the site and surrounding land is noted.
August 1986	<p>The Rail Goods Sheds and associated rail sidings have been demolished. Similarly, existing infrastructure on land to the east, south and north of the site has also been removed and construction in these areas is apparent.</p> <p>Land uses to the west of the site appear to have remained substantially unchanged from the previous aerial photograph.</p>
October 1994	Shows the site developed in its current formation. Land immediately surrounding the site also reflects the current configuration.

4.4 Dangerous Goods Records

Coffey (June 2012a) reported findings of a search of the stored chemical information database records held by WorkCover NSW in May 2012 for the entire SICEEP. In summary, no Dangerous Goods Licences were identified for the site.

The search identified three current Dangerous Goods Licences relating to other areas of the SICEEP. These licences relate to the storage of compressed gases including Liquid Petroleum Gas and methane.

4.5 Section 149 Planning Certificates

Planning certificates for the site, issued under Section 149 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), are presented in Coffey (June, 2012a). In summary, The Section 149 planning certificate indicates that the site is owned by the Sydney Harbour Foreshore Authority. The planning certificates also state that the land encompassing the site currently has no matters arising under the NSW *Contaminated Land Management Act 1997* (CLM Act).

4.6 NSW EPA Records

Coffey undertook a search of the NSW EPA online contaminated land register on 19 June 2013. The search identified that no notices, management or maintenance orders that have been issued by the NSW EPA under the CLM Act in relation to the site.

The search identified several sites within Ultimo and Pyrmont that have been declared Significantly Contaminated Land by the NSW EPA. Coffey note that all of these sites are several kilometres from the site.

The search identified that a management order is in place in relation to the former Pyrmont Power Station (i.e. current Star City Casino site) approximately 400m north of the site. This relates to the 'potentially PAH contaminated soil in the south east corner of this site'.

4.7 Summary of Site History

The first land grants on the western side of Cockle Bay were made to John Malone and William Mitchell in 1794. At this time, it appears that the site remained submerged or formed part of a tidal mudflat. Land reclamation activities commenced in the 1860s to extend the Darling Harbour branch railway line towards the Pyrmont Bay wharves.

Further land reclamation took place during the 1870s to 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. During the late 1800s, land surrounding the site comprised various commercial uses (i.e. warehouses, livestock agencies, meat market) which relied on the adjoining goods yards.

The Darling Harbour Goods Yard went through a period of expansion between the 1880s and 1920 when two additional goods sheds were established. Larger industrial land uses including the Pyrmont and Ultimo Power Stations were established to the north and south of the site respectively at this time. The Darling Harbour Goods Yards remained operational until circa 1980s and were eventually dismantled to enable to construction of the Sydney Convention Centre, Harbourside Shopping Centre and associated public realm, which opened for Australia's Bicentennial celebrations in 1988.

4.8 Integrity Assessment of Historical Data

The following sources of historical data were referred to for this assessment:

- Readily available historic map extracts and heritage assessments;
- Selected aerial photographs;
- Dangerous Goods certificates;
- Local Council Section 149 planning certificates;
- NSW EPA register for listings of contaminated sites;

- Previous reports relating to the site and land surrounding the site as noted in Section 5.

An extensive review of readily available records was undertaken to develop an understanding of the historical uses of the site. As the developed historical use of this site was known to extend considerably beyond the period that records are typically available through certain information sources (e.g. planning certificates, aerial photographs etc.) a review of historic map extracts and available heritage assessments covering the site was undertaken to characterise historic land uses, particularly in relation to the early establishment of the Darling Harbour Goods Yards and associated land reclamation activities.

As such, Coffey considers that the time period for the historical review is appropriate for this particular site. In general, there appears to be good correlation between the historic map extracts reviewed and heritage assessments available for the site although the latter provides far greater detail on the history of the area rather than the specific historic uses of the site. Coffey does not believe this to be a substantial data gap.

The review of planning certificates and dangerous goods licenses was based upon information presented within the Environmental Desk Study report (Coffey; June 2012a). Although these searches were carried out some 12 months ago, given that observations made during the site walkover were generally consistent with the previous reports prepared by Coffey, this elapsed period does not result in a data gap.

In summary, the data reviewed is considered to be generally accurate, representative and usable for the purposes of interpretation within the context and objective of this assessment.

5 SUMMARY OF PREVIOUS INVESTIGATIONS

5.1 Summary

Coffey has completed two previous phases of investigation within the SICEEP where boreholes were established within the site boundary. The locations of these boreholes are shown on Figure 14. A summary of findings from the previous investigations is provided below.

5.2 Stage 2 – Detailed Site Investigation: SICEEP, Darling Harbour, Sydney (Coffey Geotechnics; June 2012b).

Coffey Geotechnics was appointed by Infrastructure NSW (INSW) to conduct a DSI on the SICEEP, which included the site. As part of these investigations one borehole (NBH1) was drilled within the site. During drilling of NBH1, no olfactory or visual indications of contamination were noted. Soil headspace readings ranged between 3.9ppm to 16.1ppm, which indicates low potential for presence of volatile organic compounds.

Two soil samples were collected from NBH1 and analysed for Contaminants of Potential Concern (COPC) identified through an earlier phase of desk study (Coffey, June 2012a) including asbestos, heavy metals, Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and Polycyclic Aromatic Hydrocarbons (PAH). In summary, the results indicated:

- Concentrations of BTEX, TPH and PAH were below the laboratory's limit of reporting (LOR)
- Concentrations of heavy metals were detected and were below the health based investigation levels for a generic commercial/industrial land use.
- No asbestos was detected in the single soil sample submitted for asbestos analysis

No groundwater samples were collected from the site during this investigation.

5.3 Supplementary Site Investigation: Factual Report, SICEEP, Darling Harbour (Coffey Geotechnics, Jan, 2013)

Coffey Geotechnics was appointed by Infrastructure NSW (INSW) to carry out a supplementary investigation across the SICEEP, including the site. As part of this supplementary investigation four boreholes (BH101, BH101A, BH102 and BH103) were drilled within the site. BH101 was terminated at 0.3m due to the presence of a concrete obstruction and the drilling rig was repositioned and drilled BH101A as a replacement.

During drilling of these boreholes, no olfactory or visual indications of contamination were noted in BH101A or BH102. Grey to black staining was noted in BH103 at 2.5mbgl although no odour was detected at this location. Soil headspace readings ranged between 3ppm to 33ppm indicating low potential for presence of volatile organic compounds.

Fifteen soil samples were collected from boreholes BH101A, BH102 and BH103 and analysed for COPC consistent with the earlier phases of investigation (Coffey, June 2012a; June 2012b) including asbestos, heavy metals, TPH, BTEX and PAH. Where visual, olfactory and/or soil headspace readings indicated the presence of contamination, samples were also scheduled for Volatile Organic Compounds (VOC) and Semi-volatile Organic Compounds (SVOC). In summary, results from the supplementary investigation indicated that:

- Concentrations of BTEX, TPH, and PAH were below the laboratory's limit of reporting (LOR).

- A sample from BH103 (2.5-2.6mbgl) corresponding with the observed grey to black staining was submitted for analysis of a broad range of VOC and SVOC and concentrations were reported below the LOR.
- Concentrations of heavy metals were detected and were below the health based investigation levels for a generic commercial/industrial land use.
- No asbestos was detected in four soil samples submitted for asbestos analysis

No groundwater samples were collected from the site during this investigation.

One groundwater monitoring well (MW102, at location BH102) was installed during this phase of investigation. Well MW102 was observed to be dry during the subsequent groundwater monitoring event.

During this investigation, TPH was detected in soil samples obtained from BH104, approximately 30m southeast of the site boundary. Low concentrations of PAH were also detected in groundwater samples from this location. The extent of this impact has not been delineated.

5.4 Investigation Data Gaps and Uncertainties

Based on a review of available data, data gaps and uncertainties are considered to include the following:

- Adequate sampling density for characterisation of the fill material across the site.
- Insufficient data to assess groundwater quality
- Data to confirm the presence of acid sulfate soils within the site.
- The variability of the COPC within the fill material.
- The extent of TPH impact noted within BH104 located approximately 30m southeast of the Hotel site has not been delineated.
- Waste classification of the potentially surplus fill and natural soils excavated as part of the proposed Hotel development.

6 FIELDWORK TO ADDRESS DATA GAPS

6.1 Additional Works Completed

Site investigation works were undertaken by Coffey between 14 May and 7 June 2013. Groundwater sampling was carried out on the 7th June 2013. The investigation locations are shown in Figure 14.

In summary, additional field works comprised:

- Location and clearance of underground services, and set out of proposed soil bores at cleared locations;
- Drilling of 11 boreholes (i.e. BH201, BH201a, BH202, BH203, BH204, BH204a, BH205, BH206, BH207, BH208, BH209) to depths ranging between 0.45m and 20.8m below ground surface (mbgs). Groundwater monitoring wells were installed in BH203, BH204 and BH205. It is noted that BH201 was aborted due to the presence of an in-ground obstruction. BH204 was terminated at the top of bedrock as the drill rig did not dig the correct casing to core into bedrock. BH204a was positioned adjacent to BH204. Samples collected from BH204 were submitted for chemical analysis. Apart from discrete sampling of alluvial soils for acid sulphate soil analysis, no soil samples from BH204a were submitted for chemical analysis.
- Well development, purging and sampling of the three monitoring wells installed within the site, and check of the condition of MW102 to confirm whether this well installed previously had remained dry.
- Chemical analysis of 28 primary soil samples from 11 boreholes, and three groundwater samples for a range of COPC.
- Implementation of a QA/QC program including chemical analysis of two blind duplicate samples, three equipment rinse samples (two during the soil sampling programme; one during the groundwater sampling event), one trip blank and one trip spike samples.
- Collection and analysis of four soil field duplicate samples to assess the variability of COPC within the fill material.
- Analysis of filtered and unfiltered groundwater samples for PAH to assess the proportion of PAH concentrations attributable to fine sediment suspended in groundwater samples.

6.2 Sampling and Analysis Plan

6.2.1 Rationale for Soil Sampling Pattern and Density

A detailed appraisal of the site's historical uses has not identified particular point sources of potential contamination within the site, rather several historic activities and land uses which covered the entire site which may have resulted in a randomly distributed contamination throughout the soil profile. As such, boreholes were positioned to provide a regular sampling pattern across the site where this was practicable given existing site constraints, traffic flow and buried services.

With reference to the delineation of TPH and PAH contamination reported previously in BH104 located approximately 30m southeast of the site boundary, BH204 was positioned close to the southeastern site boundary to assess if contamination reported at BH104 extended on to the site.

6.2.2 Investigation & Soil Sampling Methodology

In general, the investigation and soil sampling methodology is outlined in Table 6.1.

Table 6.1: Summary of Investigation and Soil Sampling Methodology

Activity	Detail / Comments
Below Ground Service Clearance	A DBYD Underground Services Check was carried out prior to commencement of works. Investigation locations were also scanned by an underground service clearance sub-contractor.
Borehole Drilling	<p>Where present, asphalt surfacing was cored using a large diameter circular cutting bit and removed. Similarly, block paving was removed using hand tools.</p> <p>Once the surface layer was removed, hand auguring was used initially to progress each borehole to a suitable depth to avoid the potential for undetected below ground services.</p> <p>Boreholes were drilled using a tracked mounted rig equipped with continuous flight augers and a Tungsten Carbide (TC) drill bit. Where practicable (dependent upon the nature of the fill materials), continuous split tube sampling was employed to collect relatively undisturbed soils samples for chemical analysis and to observe soil stratigraphy. Where continuous split tube sampling was not practicable (i.e. where densely compacted fill materials were encountered or an obstruction is encountered within the fill materials), the borehole was progressed using the auger, followed by resumption of split tube sampling until bedrock was encountered. Each borehole was subsequently progressed into bedrock to gather additional geotechnical data.</p> <p>Drilling locations were recorded by the Coffey engineer supervising the drilling works.</p>
Soil Logging	Soil logging was undertaken by a suitably qualified and experienced engineer/scientist in accordance with Coffey's Standard Operating Practices (SOP), which is consistent with AS 1726-1993, Geotechnical Site Investigations. Where practical, soil stratigraphy was logged from undisturbed samples collected from the split tube, as recommended in Schedule B2, Section 7.2.2 (NEPC 1999).
Soil Sampling	<p>All drilling works were directed by the engineer supervising the works. All borehole logging, field screening sampling works were carried out by the engineer/scientist.</p> <p>In general, soil samples were collected to target different horizons within fill materials and then at approximately each half metre thereafter or at changes in soil horizon or lenses of potential contamination based on field observations or screening. Samples were also collected to target fill materials or any visual/olfactory indications of contamination noted during drilling works.</p> <p>Soil samples collected from the split tube or auger bit were placed as quickly as practicable into sample jars. Sample jars were filled to the top to minimise headspace. Visual, olfactory, and field screening data were recorded (refer Borehole Logs; Appendix B). Separate samples for asbestos analysis (approximately 50g mass) were collected and placed in double zip lock bags.</p>
Soil Splitting	<p>Duplicate samples were collected by dividing soils collected from one drive of the split tube and placing into two laboratory jars.</p> <p>Blind duplicate samples were denoted 'DUP' (e.g. DUP1, DUP2 etc.). Field duplicate samples were labelled with the suffix 'A' (e.g. BH204 0.8-0.9m and BH204 0.8-0.9m A).</p>
Soil Screening	Field headspace screening using a Photoionisation Detector (PID) was undertaken to assess the potential presence of volatile organic compounds (VOCs) to guide scheduling of chemical testing.

Activity	Detail / Comments
	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 10.6eV lamp. This method is consistent with Schedule B2, Section 7.4 (NEPC 1999). PID calibration certificate is provided within Appendix E.
Sample Handling and Transportation	Sample collection, storage and transport were conducted in general accordance with the relevant Coffey Standard Operating Procedure (SOP). Soil samples were immediately placed into laboratory supplied glass jars, with Teflon lined seals to limit possible volatile loss and placed into an ice chilled cooler. The samples were dispatched to the laboratories under chain of custody control.
Decontamination of sampling equipment	Sampling equipment was decontaminated by scrubbing with Decon 90 solution and rinsed with potable water between samples. Rinsate blank samples were collected by pouring potable water over non-disposable sampling equipment to assess the efficiency of field decontamination procedures and assess the potential for cross contamination to occur between sampling positions. Two rinsate blank samples were collected off the spilt tube during soil sampling programme following decontamination. One rinsate blank sample was collected off the interface probe during the groundwater monitoring event following decontamination.
Disposal of soil cuttings	In general, boreholes were backfilled with drill cuttings and the top 200mm was plugged with concrete.

On review of the available investigation data for the site, Coffey notes the following:

- Table A of the Sampling Design Guidelines (NSW EPA, 1995) recommends a minimum of 11 sampling positions for a 0.4ha site.
- Sixteen (16) borehole locations have been established within the site, of which soil samples were obtained and analysed from 13 boreholes. Soil samples recovered from boreholes BH201, BH204a and BH206 were not scheduled for chemical analysis.
- Boreholes BH201 and BH201a were too closely spaced to qualify as a separate sampling location on a broadly regular sampling grid. Thus, the number of independent sampling locations reduces to 12.
- Spacing between borehole locations range between 5m and 20m within the central part of the site with the large distances between sampling locations attributable to a large diameter culvert that currently passes beneath the central traffic island. The distances between sampling locations within this part of the site are generally consistent with that recommended in Table A of the Sampling Design Guidelines (NSW EPA, 1995).
- Spacing between borehole locations within the roads and southern parts of the site range between 15m and 30m. The distances between sampling locations within this part of the site are either consistent or slightly more than that recommended in Table A of the Sampling Design Guidelines (NSW EPA, 1995). The increased distance between investigation locations and the southern boundary resulted from a revision of the site boundary following completion of fieldworks.

- In summary, Coffey considered that the investigation density achieved across the site is greater than the recommended minimum investigation density in Table A of the Sampling Design Guidelines (NSW EPA, 1995).

6.2.3 Rationale for Groundwater Investigation & Sampling

The rationale for the establishment of groundwater monitoring well locations was:

- Establish wells within the site to intercept the groundwater table for recovery of representative water samples for chemical analysis.
- A groundwater monitoring well was established at BH204 to assess groundwater quality in the southeast part of the site because of potential connection with contamination previously identified in BH104 (approximately 30m southeast of the site).

6.2.4 Groundwater Sampling Methodology

The methodology to install, develop and sample groundwater monitoring wells on the site is outlined in Table 6.2.

Table 6.2: Groundwater Well Installation, Development and Sampling Methods

Activity	Detail / Comments
Well Installation	Three boreholes were installed with new monitoring wells. Each well was constructed with lengths of 50mm diameter screw threaded casing. A length of machine slotted casing was positioned to intercept groundwater, with lengths of solid casing extended to the surface. The well annulus was backfilled with fine gravel to the top of the screened interval. A 0.5m thick bentonite seal placed over the gravel pack. The remaining well void was backfilled with selected cuttings from the drilling. Bolted steel flush-fitting covers were used to complete each well at surface.
Well development	Well development was undertaken shortly after well installation. Each well was developed using a disposable bailer.
Groundwater Level & NAPL Measurements	Groundwater levels and the presence of Light Non Aqueous Phase Liquids (LNAPL) were recorded using an oil/water interface probe (IP).
Well Purging	Groundwater was purged from each monitoring well using a low flow peristaltic pump with disposal bladder and tubing for each well in accordance with Coffey SOP. During purging, groundwater was monitored for pH, Temperature, Dissolved Oxygen, Electrical Conductivity and Redox Potential. Groundwater sampling was conducted following the stabilisation of groundwater parameters.
Sampling Method	Groundwater samples were recovered from each of the monitoring wells using a low flow peristaltic pump in accordance with Coffey SOP. Groundwater sampling sheets are provided in Appendix E.
Sample Splitting	Duplicate samples were collected by filling up two sample containers simultaneously. PAH analysis of both filtered and unfiltered groundwater samples was undertaken to assess the proportion of reported PAH attributable to fine sediment suspended in groundwater samples. Filtration of groundwater samples for PAH analysis was undertaken within the laboratory using glass fibre 0.45µm filter.

Activity	Detail / Comments
Decontamination Procedure	<p>The IP meter was decontaminated by scrubbing with Decon 90 solution and rinsed with potable water between wells.</p> <p>As disposable pump bladder and tubing were used to recover samples from each well, no decontamination of this groundwater sampling equipment was necessary.</p>
Sample Preservation	<p>Samples were placed in laboratory supplied bottles containing appropriate preservatives with minimal headspace. Samples collected for metals were filtered using 0.45µm filter paper. Sample containers were immediately capped and placed in an insulated container filled ice. The samples were dispatched to NATA accredited laboratories under chain of custody control.</p>

6.3 Quality Assurance/Quality Control

A quality assurance/quality control plan was designed to achieve predetermined data quality objectives (DQOs) and to demonstrate accuracy, precision, comparability, representativeness and completeness of the data generated and the procedures for assessing the DQOs are met. The results of the laboratory quality control are discussed in Section 7.

6.4 Laboratory Details

Analysis was carried out by the following NATA accredited laboratories:

- MGT Environmental, Lane Cove
- ASET Laboratory, Hornsby

6.5 Analytical Results

Soil and groundwater analytical results are summarised in Tables 1 to 9 which are provided Appendix C. Certified laboratory reports and Chain of Custody records are included in Appendix D.

7 QUALITY ASSURANCE/QUALITY CONTROL TESTING

7.1 QA/QC Indicators

QA/QC indicators are based on the assessment of field and laboratory quality control sample results, and in accordance with AS 4482.1-2005 and Appendix C in Schedule B2 (NEPC 1999). Specific indicators for field and laboratory QA/QC samples are shown in Table 7.1.

Table 7.1: QA/QC Indicators

Type of Quality Control Sample	Control Limit
Duplicate Samples	Relative Percent Difference (RPD) within 30% and 50% for inorganic and organic analytes respectively. Where the reported soil concentration was less than 10 times LOR, no limit applies. For groundwater samples, the following will apply: <ul style="list-style-type: none"> • If the reported concentration is less than 4 times the LOR, then no limit applies and reasonableness of RPDs will be considered; • If the recorded concentration is 4 or more times LOR then an RPD of 50% will apply.
Spikes	Recoveries within the following ranges: 70% - 130% for inorganics / metals 60% - 140% for organics
Trip Blanks and Equipment Rinsate Samples	Analytes not detected.

7.2 Field QA/QC

The primary sample/ duplicate combinations are summarised in Table 7.2.

Duplicate sample results are provided in Table 3 and Table 8 in Appendix C, along with their calculated RPD values.

Table 7.2: Duplicate Samples

Primary Sample	Sample Type	Duplicate Sample
BH204 (1.2-1.6m)	Fill	DUP1
BH202 (0.5-0.6m)	Fill	DUP4
BH205	Groundwater	DUP1

Coffey notes that no inter-laboratory triplicate samples were collected for analysis as part of this investigation due to the low number of primary samples.

7.2.1 Soil

Soil samples were submitted for analysis for a selection of the COPC listed in Table 6.1.

Two duplicate soil samples were analysed for QC purposes as outlined above. In summary, the duplicate samples scheduled for analysis equate to 8.7% of the total primary soil samples scheduled for analysis, which is slightly lower than the target of 10% stated in AS4482.1-2005.

Primary and QC sample results and calculated RPD values are listed in Table 3 in Appendix C. Due to exaggerated percentage difference results, RPD calculations were not performed for QC sample pairs where one sample reported a detectable concentration and the alternate sample reported a concentration below the laboratory LOR. RPD for all primary/duplicate sample pairs were below the control limits set out within Table 8.1 with the exception of:

- BH202 (0.5-0.6m) – Arsenic (75%).

The elevated RPD for the above result is considered to be attributable to heterogeneity in the soil, and is exaggerated by the low concentration reported for the primary and duplicate samples. Coffey notes that the concentrations for both the primary and duplicate soil samples were less than 10 times the LOR. As the maximum reported concentration of 5.5mg/kg is lower than the corresponding health and ecological investigation levels adopted for this assessment, this difference in reported concentrations is considered not to affect the integrity of the results. On this basis, Coffey concludes that the variability expected due to heterogeneity in soil is unlikely to affect the outcome of the assessment.

7.2.2 Groundwater

One duplicate groundwater sample was analysed for QC purposes. No triplicate groundwater samples were collected.

RPD for all primary/duplicate sample pairs were below the control limits set out within Table 7.1 with the exception of Copper. As the concentrations of copper in both the primary and duplicate samples were reported above the assessment criteria, this potential variation does not affect the assessment outcome.

As outlined above, RPD calculations were not performed for QC sample pairs where one sample reported a detectable concentration and the alternate sample reported a concentration below the laboratory LOR.

The RPD results are presented in Table 8 in Appendix C.

7.2.3 Other Field QA/QC

One trip blank sample (TB130513-1) and one trip spike sample (TS130513-1) and two rinsate samples (RB1 and RB2) were collected during soil sampling. One trip blank sample (TB) and one trip spike sample (TS) and one rinsate sample (RB) were collected during the groundwater sampling event.

The results of the laboratory analysis for these QC samples are summarised in Tables 4 and 9 in Appendix C and indicated that trip spike samples included in the soil and groundwater sampling programme reported percent recoveries within the acceptable ranges.

Trip blank samples included in the soil and groundwater sampling program reported concentrations less than the laboratory LOR.

Equipment rinse samples were all reported below the LOR with the exception of concentrations of Copper (0.003mg/l) and Zinc (0.039mg/L) reported in RB2. Coffey notes that both copper and zinc were reported in groundwater samples from the majority of monitoring wells on the site and notes similar impacts reported for other samples representing groundwater across the SICEEP. It is assessed that reported concentrations of copper and zinc within sample RB2 are unlikely to affect the outcome of this assessment

7.3 Laboratory QA/QC

In accordance with NATA accreditation requirements, the project laboratories performed an internal QA/QC assessment. The assessment is typically described as a multi-level approach whereby standard laboratory control procedures are implemented, including laboratory duplicates, method blanks, matrix spikes and surrogate spikes.

Laboratory QC analytical results for soil and groundwater are summarised below:

- Laboratory analysis of samples was undertaken by NATA accredited environmental testing laboratories.
- The laboratory confirmed that samples were received in an insulated container where the attempt to chill was evident. The following comment is made with regard sample preservation:
 - Analysis for BH204 ASS1_3.1-3.2m was cancelled as samples could not be frozen between collection and analysis. Soils were resampled from BH204a, which was positioned close to BH204 and also intercepted the alluvium.
- Samples were supplied in the correct type of laboratory supplied sample container with Teflon liners and minimal headspace for samples requested for analysis of volatile compounds. The following is noted with regard sample containers:
 - Sample BH207 (1.5-1.92m) was received by the laboratory as 'cracked but intact' following transit. In discussion with the laboratory, damage to the sample jar was considered minor and therefore, chemical analysis proceeded on this sample.
- Samples were received, extracted and analysed within the appropriate holding time.
- No target analytes were detected in any of the method blanks.
- RPDs for laboratory duplicate soil samples were within the acceptable range for all samples when consideration of the LOR is taken into account, with the exception of the following samples:
 - Chromium (42%) and Copper (49%) in laboratory report 379367-S, and Copper (46%) in laboratory report 380677-S. In relation to these analyses, the laboratory reports that 'as at least 80% have passed the QC can be released. All other QC has passed in this test batch'
 - Chromium (49%) in laboratory report 380011-S and Nickel (44%) in laboratory report 380366-S. The laboratory reports that this analysis passes internal acceptance criteria as results <10 times the LOR.
- Percentage recovery results for laboratory control samples were within the acceptable range with the exception of:

- Benzo(b&k)fluoranthene (62%) in laboratory report 379021-W. In relation to this analysis, the laboratory reports that 'as at least 80% have passed the QC can be released. All other QC has passed in this test batch'
- Percentage recovery results for surrogate samples were within the acceptable range.
- Percentage recovery results for matrix spikes were within the acceptable range.

7.4 Data Quality Assessment

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.

8 GROUND CONDITIONS

8.1 Generalised Subsurface Conditions

The generalised subsurface conditions encountered across the site during the investigation comprised Fill material directly below hardstanding surface (i.e. either asphalt or block paving). Fill materials were underlain locally by alluvial soils and residual soils over Hawkesbury Sandstone at depth across the site. Borehole logs are presented in Appendix B.

Table 8.1 summarises subsurface conditions encountered in the boreholes.

Table 8.1 – Summary of Typical Subsurface Conditions

Unit	Depth to Top of Unit (mbgs)	Approx. Unit Thickness	Material Description
Fill	0m	0.4m to 3.9m	Asphalt and concrete paving hardstanding, overlying FILL with the consistency of sand and gravelly sand: fine to coarse grained, brown, orange and grey, gravel is fine to coarse.
Alluvium	Observed in discrete horizons at 2.5m, 2.9m and 3.0m	0.4m to 0.7m	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	0.6m to 3.4m	0.2m to 0.5m with 1.5m 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	0.8m to 4.1m. 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.

Fill material encountered during this investigation was heterogeneous in nature but typically comprised sand and gravelly sand. Anthropogenic inclusions observed within the fill included metal wire and rubber fragments (BH201). Shell fragments were also observed in shallow fill materials from several boreholes, indicative of material derived from dredging activity in Sydney Harbour.

Groundwater inflow was encountered in a number of boreholes within the fill/alluvium at depths ranging from 2.4mbgs (BH204a) to 3.1mbgs (BH203).

8.2 Visual/Olfactory Indications of Contamination

No olfactory or visual evidence of contamination was found in any of the boreholes.

Soil samples were collected from above sandstone bedrock using a split tube sampler from the majority of borehole locations. PID readings for headspace screening of soil samples recorded on-site ranged from <0.1ppm to 1.7ppm which indicates that there is negligible potential for volatile organic compounds to be present in those soil samples. PID readings for headspace screening are shown in borehole logs provided in Appendix B.

On the basis of the soil headspace screening results and lack of visual/olfactory indications of contamination, no soil samples were scheduled for analysis of VOC or SVOC.

8.3 Groundwater Conditions

Groundwater samples were a brown colour and cloudy to turbid which was attributed to fine sediment suspended in solution. No odours or sheens were observed in any of the groundwater purged from the monitoring wells or in samples submitted for laboratory analysis. On this basis, no groundwater samples were submitted for analysis of SVOC and VOC.

Groundwater depths below surface were measured using an electronic dual phase interface meter to detect the presence of Light Non Aqueous Phase Liquids (LNAPL). No LNAPL was detected during the monitoring event. A summary of the groundwater depths measured across the site is presented in Table 8.2.

Table 8.2: Summary of groundwater depths measured across the site

Groundwater Monitoring Well	Top of Casing (mAHD) ¹	Depth to Groundwater (mbTOC)	Groundwater Level (mAHD)
BH203	3.1	2.70	0.4
BH204	3.0	2.46	0.54
BH205	2.8	2.22	0.58
BH102	3.05	No groundwater detected on 7 th June 2013	Below 2.2 (as represented by total depth of casing)

Notes:

1. Estimated based on Lend Lease Drawing DA003 'Building Works Boundary Plan'(Rev. A) provided in Appendix A
2. mbTOC = metres below Top of Casing

Based on local topography and sandstone formations, Coffey expects that groundwater would flow generally in an easterly direction towards Cockle Bay although some variation in groundwater gradients may occur over the tidal cycle.

Table 8.3 provides a summary of the water quality parameters measured from monitoring wells installed across the site.

Table 8.3: Summary of Water Quality Parameters

Parameter	Range	Comment
Dissolved oxygen (DO)	0.95ppm (BH204) to 5.03ppm (BH203)	Indicative of low to typical oxygen content in groundwater
Electrical conductivity (EC)	3.49mS/cm (BH203) to 43.2mS/cm (BH205)	Indicative of brackish to saline water
Redox Potential	-83mV (BH204) to 40mV (BH205)	Indicative of slightly oxidising conditions
pH	6.7 (BH205) to 7.2 (BH203)	Indicative of slightly acidic to neutral conditions
Temperature	20°C to 22.5°C	-

9 CONCEPTUAL SITE MODEL

In accordance with Section 4, Schedule B2 of NEPC (1999), this section of the report considers the potential contamination sources and associated human and ecological exposure pathways relevant to the proposed redevelopment on the site.

9.1 Sources of Contamination

Following a site walkover and a detailed review of information about historical site uses, potential contamination sources and associated Chemicals of Potential Concern (COPCs) were identified and are listed in Table 9.1:

Table 9.1: Potential Sources of Contamination and Chemicals of Potential Concern

Potential Sources of Contamination	Chemical of Potential Concern	Comments
Fill Materials of unknown origin present across the site and surrounding land	TPH, BTEX, PAH and Metals	<p>Historical records indicate that the site was reclaimed during the 1860s for establishment of rail corridor and the Darling Harbour Goods Yards and the adjoining Iron Wharf. The source and quality of fill is understood to derive from spoil generated from the Sydney rail terminus although records suggest this may have also included 'old wharf and pier structures'.</p> <p>The site was redeveloped in c.1980 in its current configuration. During this period, a proportion of these historic fill materials may have been removed and/or additional fill materials introduced to the site.</p>
Former Darling Harbour Goods Yards	TPH, PAH, BTEX, VOC/SVOC, Metals, Asbestos	<p>Available records indicate that the site was within the footprint of the former Darling Harbour Goods Yards, which operated between c.1870 and 1980. No records were available to confirm the specific types of materials stored within the former Goods Yards.</p> <p>Maintenance activities (e.g. on-site machining of metals, degreasing, painting etc.) potentially represent a source of heavy metal, TPH, PAH and VOC/SVOC contamination. Localised contamination may have also been caused through leaks or spillage from drums or bulk tanks stored on site during transit or as part of the historic goods yards.</p>
Acid Sulfate Soils	N/A	Potential and actual acid sulfate soils derived within naturally occurring alluvial soils present along the former paleochannel of Cockle Bay.

9.2 Exposure Pathways

The key environmental pathways and exposure routes by which potential contaminants identified at the site may reach environmental and/or human receptors include:

- Ingestion of soils – construction workers and maintenance workers involved in excavation.
- Dermal contact with soil – construction workers and maintenance workers involved in excavation.
- Inhalation of dusts, vapours and fibres – construction workers and maintenance workers involved in excavation.
- Infiltration and leaching from unsaturated soils to shallow groundwater – aquatic species in Cockle Bay.
- Vertical and lateral contaminant migration through the saturated zone – aquatic species in Cockle Bay.
- Contaminant migration along preferential flow pathways (e.g. existing service corridors, building foundations etc.) – aquatic species in Cockle Bay.
- Surface runoff / overland flow – aquatic species in Cockle Bay.
- Excavation dewatering – aquatic species in Cockle Bay (if discharged to Cockle Bay).

9.3 Receptors

9.3.1 Human Receptors

The redevelopment of the site will introduce the following receptors:

- Construction workers during redevelopment.
- Future workers within the proposed hotel - an employee who is predominantly involved in office/light industrial-type work (i.e. the ground floor layout of the proposed hotel comprises a lobby/reception area, restaurant/bar area, lift core and service areas. The basement will comprise a service area and will not be used as a car park or other uses where regular occupation of the basement space would be required)
- Future guests of the proposed hotel – comprise both adult and child visitors to the site; noting that minimal landscaping and no other area is assigned for recreational activity on the site outside of the hotel building.
- Maintenance workers where excavation is required

9.3.2 Ecological Receptors

The primary ecological receptor currently identified in relation to the site is aquatic species within Cockle Bay, which is located approximately 60m east of the site. Groundwater within the fill and natural alluvium is considered to be hydraulically connected to Cockle Bay.

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 establishing landscaping in existing soils, Coffey considers that consideration of EILs for this site is not appropriate.

9.4 Plausible Exposure Pathways

The following sections present a discussion of the plausible exposure pathways associated with potential sources of contamination identified for the proposed redevelopment.

Table 9.2 provides a summary of the plausible exposure pathways relevant to the human receptors.

Table 9.2: Summary of plausible exposure pathways for human receptors

Receptor	Media	Plausible Exposure Pathway (No Mitigation)				Comments
		Inhalation Indoors	Inhalation Outdoors	Ingestion	Dermal Contact	
Construction Workers during redevelopment	Soil / Groundwater	n	P	P	P	Workers during the redevelopment of the site and during future maintenance events may be exposed to potentially contaminated fill materials via direct exposure routes, inhalation/ingestion of dust, and inhalation of vapours.
Maintenance worker (future maintenance event)	Soil / Groundwater	n	P	P	P	
Future hotel workers	Soil	P	p	n	n	<p>Based on the proposed development, the dominant exposure pathway relates to the inhalation of vapours indoors following the construction and occupation of the proposed hotel buildings.</p> <p>Hotel workers will be present within the hotel during a working day, which would include access to ground floor (reception, restaurant etc.) and service areas within the basement. As such, the indoor vapour inhalation pathway is considered to be a plausible and complete.</p> <p>Based on information provided by LLD, hard surfaces are proposed in areas surrounding the building footprint with minimal provision for landscaping and much of the area surrounding the footprint of the hotel will comprise access roads and drop-off/pick up areas. As such opportunities for direct access to existing soil by employees are likely to be negligible. On this basis, direct exposure pathways are considered incomplete.</p>

Receptor	Media	Plausible Exposure Pathway (No Mitigation)				Comments
		Inhalation Indoors	Inhalation Outdoors	Ingestion	Dermal Contact	
Future hotel occupants	Soil	p	p	n	n	<p>Based on the proposed development, the dominant exposure pathway relates to the inhalation of vapours indoor following construction and occupation of the proposed hotel buildings.</p> <p>Future hotel guests are expected to be present within the hotel for short periods, typically being up to several days per year. Hotel guests would have access to the reception and restaurant areas but no access to basement. As no hotel rooms are proposed at ground level, the indoor vapour inhalation pathway is considered to be only partially complete with reasonable maximum exposure periods being substantially lower than those for hotel workers.</p>

Notes:

P = plausible complete pathways

p = partially complete pathway depending on site conditions/exposure scenario

n = pathway not complete

9.4.1 Ecological Receptors

Coffey considers that potentially impacted soils and groundwater within the site could adversely affect aquatic receptors within Cockle Bay via soil leaching and lateral groundwater transport.

During construction, the removal of existing hardstanding ground cover may enable soils to be transported via surface water runoff/overland flow into existing stormwater drainage that drains into Cockle Bay.

A number of large diameter culverts pass beneath the central parts of the site, and will continue operating following site redevelopment (refer Hyder Drawing No. HO-CI-0701; Rev. 06 provided in; Appendix A). These conduits have the potential to act as a preferential flow path for contamination within the site to migrate towards Cockle Bay.

Construction dewatering has the potential to expose acid sulfate soils, which may result in acidification of materials exposed to air.

10 ASSESSMENT CRITERIA

10.1 General

Assessment criteria were selected with consideration of the Conceptual Site Model presented in Section 9 and the development proposed by LLD; namely, a multi-storey hotel building with hard paved areas for guest drop-off, loading/service area and a single storey basement structure for core shaft, circulation areas and plant rooms.

The criteria presented below are intended to apply to a Tier 1 risk assessment based on certain site-specific characteristics. Where concentrations of a COPC exceed the generic assessment criteria, then further consideration of the specific exposure pathway is required which may warrant further investigation, assessment or the development of a strategy to mitigate the potential risks identified.

10.2 Health Investigation Levels

Schedule B7 of NEPC (1999) states that the generic commercial/industrial setting (HIL D) '*does not include more sensitive uses that may be permitted under relevant commercial or industrial zonings. These more sensitive uses include ... hotels*'. NEPC (1999) states that where these more sensitive uses are proposed, Health Investigation Levels (HIL) for generic residential settings (i.e. HIL A or HIL B)¹ '*should be considered*'.

Schedule B1 of NEPC (1999) also states that '*the selection and use of investigation levels should be considered in the context of the iterative development of a Conceptual Site Model*'. Based on information describing the proposed development, Coffey considers the proposed use of the site is aligned within the generic commercial/industrial setting (HIL D) defined in Schedule B7 of NEPC (1999) given that:

- The primary human receptor within the proposed development will comprise an adult employee who is predominantly involved in office/light industrial-type work within the ground floor which will comprise a lobby/reception area, restaurant/bar area, lift core and service areas.
- The basement will comprise a service area and will not be used as a car park or other uses where regular occupation of the basement space would be required.
- The outdoor areas surrounding the proposed hotel will be largely covered by hard surface materials. Coffey understands that minimal landscaping will be provided in engineered tree pits established imported soil or above ground pots, and a large proportion of the area surrounding the footprint of the hotel will comprise access roads and drop-off/pick up areas. As such, it is assessed that opportunities for direct access to soil by employees are likely to be negligible.

¹ HIL A is defined as a residential land use scenario with garden/accessible soil (defined as the presence of a sufficiently large area of soil in a garden that may be accessible on a daily basis by young children and adults). HIL B is defined as a residential land use scenario with minimal opportunities for soil access. Both generic residential scenarios assume the primary receptor to be infants, children and adults who spend the majority of their time within the residential properties.

In consideration of the development proposed by LLD, Coffey considers that the adoption of HIL consistent with a commercial/industrial setting is reasonable and appropriate. As such, HIL D values were adopted for the assessment of potential health risks from soils within the site.

10.2.1 Soils

The assessment criteria proposed for this project were sourced from:

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

Schedule B1 of NEPC (1999) provides health and ecological based soil investigation levels for various exposure settings. With reference to information provided to Coffey by LLD describing the proposed development, we consider that the exposure setting for the proposed hotel development is reasonably represented by that for commercial/industrial land use described in Section 3 in Schedule B7 of NEPC (1999). Similarly Coffey considers that the exposure setting for workers on the site during construction of the proposed hotel development is also represented by a generic commercial/industrial land use.

With reference to Schedule B1, Guideline on the Investigation Levels for Soil and Groundwater (NEPC (1999), the following criteria were adopted:

- Table 1A(1), Health-based Investigation Levels for Commercial/Industrial (HIL 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) have been adopted as the health risk screening level for this assessment. The values adopted assume conservative characteristics regarding site conditions; namely, sandy soil profile and contamination occurring within the upper 1m of soil.

Coffey considers that the HSL presented within CRC CARE Technical Report No. 10 were developed on a scientifically defensible basis and have been subject to independent and expert peer review prior to publication. Consequently, Coffey considers that the approach described in CRC CARE Technical Report No. 10 may be adopted for health risk screening for worker exposure by direct contact regarding the presence of petroleum hydrocarbons in the subsurface, within the limitations of that report.

Coffey notes that laboratory data presented within the previous investigations (Coffey; June 2012b, January 2013) present TPH concentrations using hydrocarbon fractions in use before issue of the NEPM. For clarity in this report, reference to hydrocarbon fractions from previous and current laboratory data for comparison with investigation criteria is presented in Table 10.1.

Table 10.1: Reference to Hydrocarbon Fractions

Hydrocarbon Fractions presented in Previous Investigations (Coffey June 2012b & Jan 2013),	Hydrocarbon Fractions presented in current investigation	NEPM Hydrocarbon Fraction Number
TPH C6 – C9	TRH C6 – C9	F1
TPH C10 – C14	TRH C10 – C16	F2

TPH C15 – C28	TRH C16 – C34	F3
TPH C29 – C36	TRH C34 – C40	F4

NEPC (1999) provides guidance on the assessment of soils impacted by asbestos, including health screening levels for asbestos in soil for a range of land uses. Coffey notes that previous soil sampling for the assessment of asbestos was not consistent with that recommended in Section 11 in Schedule B2, Guideline on Site Characterisation of NEPC (1999), in that bulk samples (10L volume recommended) were not collected for sieving and inspection for ACM and FA and samples for analysis of asbestos fibres (AF) were approximately 50g mass compared with the recommended 500g mass. For this reason, a preliminary assessment criterion of 'no asbestos detected' for all forms of asbestos was adopted.

This approach was considered appropriate given that intrusive investigation was constrained by site conditions to the use of auger drilling which is typically less conducive to the assessment of anthropogenic inclusions (including potential asbestos containing materials) in comparison with other investigation methods (e.g. pit excavation). The potential for unexpected finds associated with asbestos is considered further in Appendix F.

A summary of the adopted health-based soil investigation levels is provided in Table 10.2. Table 1 in Appendix C provide a summary of the laboratory data against the adopted health based soil investigation levels.

Table 10.2: Soil Investigation Levels – Human Health

Chemical Constituent	Construction Workers & Future Commercial Workers Adopted from HIL D & HSL D ¹ (mg/kg)
Arsenic	3,000
Cadmium	900
Chromium (VI)	3,600 ⁵
Copper	240,000
Nickel	6,000
Lead	1,500
Zinc	400,000
Mercury	730
F1 (TRH C ₆ -C ₉ excluding BTEX)	260 ²
F2 (TRH C ₁₀ -C ₁₆ excluding Naphthalene)	20,000 ³
F3 TRH C ₁₆ -C ₃₄	27,000 ³
F4 TRH C ₃₄ -C ₄₀	38,000 ³
Benzene	3 ²
Toluene	99,000 ²
Ethylbenzene	2,700 ³

Chemical Constituent	Construction Workers & Future Commercial Workers Adopted from HIL D & HSL D ¹ (mg/kg)
Total Xylene	230 ²
Naphthalene	11,000
Carcinogenic PAH as Benzo(a)pyrene TEQ ⁴	40
Total PAHs	4,000
Asbestos (as Bonded ACM, Asbestos fines and fibres)	No asbestos detected

Notes:

1. Table 1A(1) - Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
2. Table 1A(3) - Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
3. Table A4 – Soil Health Screening Levels for Direct Contact (CRC Care Technical Report No.10 (Friebel and Nadebaum; 2011)
4. TEQ = Toxicity Equivalent Quotient
5. Soils were tested for Total Chromium, which comprises both Chromium (III) and Chromium (VI) valence states. The HIL for Chromium (VI) has been adopted as a conservative assessment threshold.

10.2.2 Groundwater

The nature of the proposed development will restrict human exposure to groundwater via direct pathways (e.g. incidental ingestion, dermal contact). Coffey understands that groundwater abstraction is not proposed as part of the hotel development.

NEPC (1999) provides health screening levels for vapour intrusion associated with groundwater in a commercial/industrial setting. These criteria have been developed for volatile hydrocarbon compounds including BTEX and volatile petroleum hydrocarbon fractions and are considered appropriate for parts of the site where no basement is proposed. Table 10.3 summarises the groundwater health screening levels adopted for this assessment.

The southern proportion of the proposed hotel development will contain a basement structure. Based on the information provided by LLD describing the proposed development, it is anticipated that the floor level of the basement structure will intersect the water table. The HSL presented within NEPC (1999) and summarised in Table 10.3 have been derived assuming the distance between floor slab and groundwater is greater than 2m. As such, these HSLs may not be adequately protective of potential health risks associated with vapour ingress. A discussion on the specific exposure scenario is presented within Section 11.1 herein.

Table 10.3: Summary of groundwater HSL for vapour intrusion

Chemical Constituent	Health Screening Levels for Vapour Intrusion from Impacted Groundwater Commercial/Industrial (HSL D ^{1,2}) (mg/L)
Benzene	5
Toluene	NL
Ethylbenzene	NL

Chemical Constituent	Health Screening Levels for Vapour Intrusion from Impacted Groundwater Commercial/Industrial (HSL D ^{1,2}) (mg/L)
Total Xylene	NL
Naphthalene	NL
F1 (TRH C ₆ -C ₉ excluding BTEX)	6
F2 (TRH C ₁₀ -C ₁₆ excluding Naphthalene)	NL

Notes:

1. Table 1A(4) - Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
2. HSLs assume a Sandy soil and groundwater occurs between 2m and 4m below ground surface.
3. NL = No Limit

10.3 Ecological Investigation Levels

10.3.1 Groundwater Investigation Levels (GIL)

Given the site's historical commercial and industrial use of reclaimed land, Coffey considers that the site is not located above a water bearing zone which has the potential for use as a drinking water resource. Consequently, the adoption of Australian Drinking Water Guidelines (NHMRC & NRMCC, 2011) is not considered appropriate as groundwater investigation levels. Coffey notes that the salinity of the groundwater ranges between brackish and saline generally precludes its consideration as a potential drinking water resource. NSW Office of Water records showed that no registered groundwater bores are located within a 500m radius of the site.

Groundwater from the site is expected to flow to the east and discharge into Cockle Bay, which is considered to be a highly modified marine habitat. Thus, protection of marine species and aesthetic quality for recreational waters are identified as relevant environmental values, and groundwater quality has been assessed against the following criteria:

- 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.
- DEC (2005); Marine Water Quality Objectives for NSW Ocean Waters – Sydney Metropolitan and Hawkesbury-Nepean

ANZECC/ARMCANZ (2000) advocates a site-specific approach to developing guideline trigger values based on such factors as local biological affects data, the current level of disturbance of the ecosystem, etc. The ANZECC/ARMCANZ (2000) guidelines present 'low risk guidelines trigger values' which are defined as concentrations of key performance parameters below which there is a low risk that adverse biological effects will occur. It is important to note that these are not threshold values at which an environmental problem is likely to occur if exceeded. Rather, if the trigger values are exceeded, then further action is required which may include either additional site-specific investigations to assess whether or not there is an actual problem, or the implementation of management / remedial actions.

It is understood that NSW EPA's policy is that the trigger values for the protection of 95% of aquatic ecosystems should be used except where contaminants are potentially bioaccumulative in which case the trigger values for protection of 99% of species recommended. Therefore, we have selected trigger

values for protection of 95% of marine water species for the majority of contaminants, and 99% of marine water species for bioaccumulative contaminants for comparison purposes.

ANZECC/ARMCANZ (2000) states that there is currently insufficient data to derive high reliability trigger values for a number of COPC for the site. For these contaminants, low reliability trigger values have been adopted.

ANZECC/ARMCANZ (2000) states that there is currently insufficient data to derive a high reliability trigger value for TPH but propose a low reliability trigger value for TPH of 7µg/L. This guideline is generally considered by industry to be overly conservative and is also well below the TPH detection limit that most laboratories can achieve. Therefore the laboratory limit of reporting (LOR) is adopted as appropriate practical screening value for TPH assessment (NSW DEC, 2007).

NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* states that where the generic groundwater investigation level (GIL) is below the laboratory LOR, the LOR should be used instead of the existing generic GIL.

The Marine Water Quality Objectives considered relevant for Cockle Bay (i.e. the nearest receiving waters near to the site) include aquatic ecosystems (i.e. aquatic ecosystem health), secondary contact recreation (i.e. boating and wading) and visual amenity.

A summary of the adopted groundwater investigation levels for chemical stressors is presented in Table 10.4.

Table 10.4: Summary of Groundwater Investigation Levels (chemical stressors)

Analyte	Laboratory Limit of Reporting (µg/L)	ANZECC 2000 ⁽¹⁾ (µg/L)	Adopted GIL (µg/L)
pH	-	-	7.0 – 8.5
Arsenic	1	2.3	2.3
Cadmium	0.2	0.7	0.7
Chromium (Total)	1	4.4 ^(c)	4.4
Copper	1	1.3	1.3
Lead	1	4.4	4.4
Mercury	0.1	0.1	0.1
Nickel	1	7	7
Zinc	1	15	15
Benzo(a)pyrene	0.01	0.1	0.1
Naphthalene	0.05	50	50
Anthracene	0.01	0.01	0.01
Phenanthrene	0.05	0.6	0.6
Fluoranthene	0.05	1.0	1.0
TRH C ₆ -C ₉	20	-	20 ^(a)

Analyte	Laboratory Limit of Reporting (µg/L)	ANZECC 2000 ⁽¹⁾ (µg/L)	Adopted GIL (µg/L)
TRH C ₁₀ -C ₁₄	50	-	50 ^(a)
TRH C ₁₅ -C ₂₈	100	-	100 ^(a)
TRH C ₂₉ -C ₃₆	100	-	100 ^(a)
Benzene	1	500	500
Toluene	1	180	180
Ethylbenzene	1	5	5
Xylene (m & p)	2	75 ^(b)	75
o-Xylene	1	350	350

Notes:

1. Australian and New Zealand Environment and Conservation (2000) National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Where insufficient data is available to derive a reliable trigger value, low reliability values have been adopted from Section 8.3.7 of ANZECC/ARMCANZ (2000).

(a) In the absence of a nominated guideline value, the laboratory LOR has been taken as the nominal trigger value for the presence of TPH compounds in groundwater as will be used as the GIL (NSW DECC, 2007).

(b) Adopted assessment criteria for m&p Xylene is based on the m-Xylene, which is the lowest trigger value for the two Xylene isomers.

(c) Groundwater Investigation Level for Chromium (VI) adopted for Chromium (Total) as a conservative assessment measure.

10.4 Management Limits

In accordance with Section 2.9 of NEPM Schedule B1, consideration of Management Limits has been undertaken 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). A summary of the adopted management limits for this site is provided in Table 10.5.

Table 10.5: Summary of site management limits considered within this assessment

TRH Fraction	Soil Type	Management Limit for Commercial/Industrial Land Use (mg/kg)
F1: TRH C ₆ -C ₁₀	Coarse	700
F2: TRH C ₁₀ -C ₁₆	Coarse	1,000
F3: TRH C ₁₆ -C ₃₄	Coarse	3,500
F4: TRH C ₃₄ -C ₄₀	Coarse	10,000

11 ASSESSMENT RESULTS

The following sections present a discussion on laboratory results obtained from the ground investigation works undertaken.

11.1 Assessment of Potential Health Risks

Soil and groundwater laboratory results were compared to the assessment criteria presented in Section 10.2. The results are summarised in Tables 1 and 7 in Appendix C. Forty-seven (47) soil samples and three (3) groundwater samples were submitted for laboratory analysis of a range of COPC. In summary, the findings of current and previous investigations on the site with respect to potential health risks indicate:

- Reported concentrations of COPC were below the health investigation levels (Table 10.2) in soil samples.
- No bonded asbestos materials (ACM) were observed during the previous or recent investigation works. Asbestos fines (FA)/asbestos fibres (AF) were not detected in the 12 samples analysed.
- Concentrations of TRH F1 and F2 were below LOR, and maximum concentrations of TRH F3 and F4 (BH204) were substantially below the HSLs for direct contact for construction workers.
- Low concentrations of volatile hydrocarbon compounds including toluene (BH203), naphthalene (BH203 and BH204) and F2: TRH C₁₀-C₁₆ (BH204) were reported in groundwater samples. These were below the health screening levels for exposure through vapour intrusion (Table 10.3). Benzene, ethylbenzene, xylenes and TRH F1 were reported below the laboratory's Limit of Reporting (LOR).
- As noted in Section 10.2.2, the HSL presented within Table 10.3 may not be suitably protective of potential risks associated vapour ingress to the proposed basement structure. 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 insufficient to warrant further, more detailed assessment.

Given the above findings, Coffey considers that the soil and groundwater present beneath the site do not pose unacceptable potential health risks to future construction workers or to future users of the proposed hotel development.

11.2 Assessment of Ecological Risks

11.2.1 Acid Sulfate Soils

Laboratory results for acid sulfate soil (ASS) screening are summarised in Table 11.1.

Table 11.1: ASS Screening Results

Sample Location_ Sample Depth (Lab Report Ref.)	Stratum	Field pH	pH _{FOX}	Reaction Description
BH202_0.6-0.7m (380167-S)	Residual Soil	8.2	5.8	Low
BH203_1.8-2.0 (380366-S)	Residual Soil	7.9	5.4	Low
BH206_1.1-1.4 (380524-S)	Residual Soil	8.9	6.9	Low
BH204A_2.8-2.9 (382020-S)	Fill	7.2	2.2	Low
BH204A_3.8 (382020-S)	Fill	6.7	2.0	Low
BH204A_3.9 (382020-S)	Alluvium	7.3	2.6	Volcanic
BH204A_4.0-4.1 (382020-S)	Alluvium	7.5	5.5	High

Notes:

1. Field Peroxide Reaction Descriptions are qualitative descriptions provided by the laboratory. These descriptions are provided to indicate the strength of reaction between soils and peroxide, and hence the presence of unoxidised sulfides.

The laboratory results for field pH (pH_F) and pH after oxidation (pH_{FOX}) indicated that sample BH204A from a depth of 3.9m to 4.1m indicated a high likelihood for the presence of ASS given:

- a) the samples were alluvium being dark grey silty Sand with some shells;
- b) The difference between the pH_F and the pH_{FOX} values; and
- c) The vigorous chemical reactions that were observed during testing.

Coffey notes that a large difference between the pH_F and pH_{FOX} was also reported in the deeper fill materials within BH204A may also be indicative of potential acid sulfate soils (PASS).

Based on these results and the site geology, Coffey considers that ASS/PASS is present in other locations where alluvial soils are present.

11.2.2 Groundwater

With reference to the GILs in Table 10.4, Coffey found that the concentrations of COPC were reported below relevant GILs in groundwater samples collected from BH203, BH204 and BH205, except for:

- Concentrations of TRH F2 (0.17mg/L) and TRH F3 (0.1mg/L) which were reported above the default GILs (i.e. laboratory LOR) in the sample from BH204 (refer Laboratory Report 38020-W). Although low levels of TRH were reported within a soil sample collected at 0.15-0.2mbgs from BH204 (i.e. TPH C10-C36 was reported at concentration of 240mg/kg), given that the groundwater was encountered within natural alluvial sediments, and no other significant petroleum sources were identified within the desktop review, it was considered appropriate to carry out further analysis of this

sample using the silica gel clean up method to exclude non-petroleum compounds from the quantitative TRH results. The site is known to be reclaimed land, originally part of the western margin of Cockle Bay (initially known as Long Bay). This earlier habitat is reasonably likely to have supported a variety of marine plant and animal species, and those species which were not mobile would have been trapped in the reclaimed area. Coffey suggests that this organic material is a likely source of non-petroleum hydrocarbon compounds reported in the groundwater sample from BH204, and use of this analytical technique is not uncommon in assessment of groundwater quality in areas influenced by natural organic materials, such as peat.

- Following silica gel clean-up (refer Laboratory Report 383108-W), the reported concentrations for TRPH F2 and TRH F3 were <0.05mg/L and 0.1mg/L respectively. The associated chromatograms of the samples pre and post silica gel clean-up have been also been provided in Appendix D.
- Concentrations of Copper (0.052mg/L and 0.1mg/L) and Nickel (0.052mg/L and 0.069mg/L) were reported above the GILs in samples from BH205 (primary sample and blind duplicate DUP1).
- Concentrations of Zinc were reported above the GIL in samples from BH203 (0.017mg/L) and BH205 (0.044mg/L) respectively.
- Toluene was reported at concentrations of 2µg/L in a sample collected from BH203. Similarly, naphthalene was reported at concentrations of 0.00005mg/L and 0.00006mg/L within groundwater samples collected from BH203 and BH204 respectively. The reported concentrations of these constituents did not exceed the GIL.

11.3 Assessment against Management Limits

The concentrations of TRH in soil samples were reported below the management limits (Table 10.5). On this basis, Coffey considers that:

- Hydrocarbon impacts in soils within the site present a low risk to buried infrastructure,
- Concentrations of TRH reported within the soils would be very unlikely to result in the formation of NAPL.

12 PRELIMINARY WASTE CLASSIFICATION

Laboratory results for soil indicate that the fill materials underlying the site reported chemical concentrations below the thresholds for General Solid Waste in accordance with the waste classification procedure using toxicity characteristics leaching procedure (TCLP) in accordance with Waste Classification Guidelines (DECCW; 2009). Coffey considers that this represents a preliminary waste classification because investigation methods used drilling only and observations may not represent the type and extent of inclusions which could remain undetected by drilling.

For forty-seven (47) samples listed in Table 5 in Appendix C, the large majority of results reported chemical concentrations below the Contaminant Threshold (CT1) for classification as General Solid Waste. The CT1 value was exceeded for a concentration of:

- Lead in one sample, which was subsequently shown to be well below the specific and TCLP thresholds;
- Mercury in two samples, which were subsequently shown to be well below the specific and TCLP thresholds; and
- Nickel in eleven samples, which were subsequently shown to be well below the specific and TCLP thresholds.

Coffey recommends that the waste classification of fill materials be confirmed by observation of the appearance of fill materials during excavation for basement construction.

Should any unexpected contamination be discovered during excavation works, assessment of that material should include waste classification.

13 CONCLUSIONS AND RECOMMENDATIONS

13.1 Summary of Site Conditions & History

The site is a triangular parcel located immediately to the east of Darling Drive at the northern end of the SIGEEP. The site is currently used as a passenger pick-up/drop off area, with a central area of public open space. The site is flat and predominantly covered by asphalt or block paving with localised areas of landscaping within the central area of public open space. The site is approximately 60m west of the current Cockle Bay foreshore.

Historically the site appears to have been submerged or formed part of a tidal mudflat during the 1790's when the first land grants were made along the western foreshore of Cockle Bay. Land reclamation activities took place during the 1860s and 1870s for extension of the Darling Harbour branch railway line towards the Pyrmont Bay wharves, and to enable the construction of the Darling Harbour Goods Yards and associated Iron Wharf. The entire site fell within the southern part of the Darling Harbour Goods Yards and surrounding land was used for various commercial and warehouse operations, livestock agencies and a meat market. The Darling Harbour Goods Yards remained operational until circa 1980s and were eventually dismantled to enable construction of the Sydney Convention Centre, Harbourside Shopping Centre and associated public realm, which opened for the Bicentennial celebrations in 1988. The site has remained substantially unchanged since 1988.

The desk study identified the following potential sources of ground contamination:

- Fill materials of unknown quality associated with historic land reclamation activities
- Former Darling Harbour Goods Yards and associated potential contamination sources linked to the storage of fuels and freight, ash and asbestos containing materials from coal fired boilers and locomotives, and maintenance activities carried out within the goods yards.
- Spillage/leaks of oils/fuels associated with current use of the site.
- Acid sulfate soils

Investigations were undertaken to target the above potential sources of contamination and assess the recorded ground conditions in the context of the proposed multi-storey hotel building with hard paved areas for guest drop-off, loading/service area and a single storey basement structure for core shaft, circulation areas and plant rooms.

13.2 Assessment Findings

Coffey developed a conceptual site model identifying the key human and ecological receptors and associated plausible exposure pathways and given the results and discussion presented in this report, Coffey's key findings are summarised below.

13.2.1 Assessment of Potential Human Health Risks

With reference to the health investigation and screening levels presented within NEPC (1999) for a generic commercial/industrial land use, Coffey concludes that the soil and groundwater present beneath the site does not pose unacceptable potential health risks to future construction workers or the future users of the hotel development proposed by LLD.

13.2.2 Assessment of Potential Ecological Risks

Undisturbed alluvial deposits beneath the site are almost certainly Potential Acid Sulfate Soil (PASS) and some are likely to be actual Acid Sulfate Soil (ASS). Coffey notes that the proposed basement excavation and associated dewatering may expose PASS or ASS. Similarly, foundation piling and pile cap excavations may also expose PASS or ASS. Exposure of these soils may result in the acidification of surrounding environment without prior consideration and appropriate management. Consequently, Coffey recommends that an ASS Management Plan be prepared and implemented for the proposed excavation and dewatering, as applicable

In general, concentrations of the majority of potential contaminants reported within groundwater samples did not exceed the adopted groundwater investigation levels.

TRH F3 was reported at a concentration of 0.1mg/L from a sample obtained from BH204. This concentration equals the laboratory's LOR and the default investigation level for this constituent. Other TRH fractions were reported below the LOR in this sample following silica gel clean-up. Given the distance between BH204 and Cockle Bay (i.e. the nearest receptor) is approximately 60m, it is assessed that the reported concentration of TRH F3 is unlikely to pose an unacceptable risk to aquatic receptors when considering attenuation mechanisms such as dispersion and dilution within the aquifer down hydraulic gradient of the site.

Samples from monitoring wells BH203 and BH205, which were positioned within close proximity and up/cross hydraulic gradient from BH204, reported concentrations of TRH below the laboratory's LOR. On this basis, Coffey concludes that the low concentration of TRH reported at BH204 is a localised occurrence and does not warrant further delineation.

The source of dissolved TRH and low levels of naphthalene and toluene reported in groundwater sample collected from BH204 and BH203 has not been identified and may derive from fill material placed within the site or historic land uses. Given that groundwater is tidally influenced beneath the site, the source of impact may derive from materials beyond the site boundary. It is noted that only one round of groundwater sampling has been carried out within the site and that monitoring wells amendable to sampling cover only a small part of the site. As such, the potential for unidentified soil and/or groundwater impact to be present between sampling locations cannot be discounted.

Concentrations of copper and nickel were reported in samples BH205 and its duplicate DUP1 which exceeded the groundwater investigation levels. Concentrations of zinc were reported in groundwater samples from BH203 and BH205 above the groundwater investigation levels. Copper and nickel were also reported in the groundwater sample obtained from BH203 although the concentrations were below the groundwater investigation levels.

Copper, nickel and/or zinc impact to groundwater is commonly encountered in older urban environments, typical of the setting around Darling Harbour. Coffey notes that similar copper and zinc concentrations were reported in groundwater samples collected across the SICEEP (Coffey, June, 2012b, Jan 2013). Coffey concludes that the reported impact to groundwater by copper, nickel and zinc are diffuse and further assessment on the site for potential sources of this impact to groundwater is not warranted.

13.3 Recommendations

13.3.1 Acid Sulfate Soils

The presence of both ASS and PASS require that soils are managed in accordance with an Acid Sulfate Soil Management Plan. Treatment of ASS is typically achieved by neutralisation by addition of lime and subsequent disposal of treated material to a licensed landfill as General Solid Waste. Natural soils that contain PASS or actual ASS do not classify as VENM.

13.3.2 Unexpected Finds

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 is presented within Appendix F.

13.3.3 Preliminary Waste Classification

Available soil data indicates that the fill material on the site would classify as General Solid Waste in accordance with the Waste Classification Guidelines (DECCW; 2009).

Coffey recommends that the waste classification of fill materials be confirmed by observation of the appearance of fill materials during excavation for basement construction.

Should any unexpected contamination be discovered during excavation works, assessment of that material should include waste classification.

13.4 Summary

Based on the findings of the previous and recent investigation completed within the site, 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 commercial/industrial development, provided that an appropriate ASS Management Plan is prepared and implemented for construction excavation and dewatering.

The reader should refer to limitations outlined in the 'Important Information about Your Coffey Environmental Report' at the end of the document.

14 REFERENCES

ANZECC (1992) Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment & Conservation Council. ISBN 0-642-18297-3.

Australian Standard AS 4482.1-2005: Guide for the Investigation of Sites with Potential Contaminated Soil

Coffey Geotechnics (June 2012a); Stage 1 – Preliminary Environmental Investigation, Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney.

Coffey Geotechnics (June 2012b); Stage 2 – Detailed Site Investigation: Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney.

Coffey Geotechnics (August 2012); Supplementary Site Investigation: Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney

Coffey Geotechnics (January 2013); Supplementary Site Investigation: Factual Report, Sydney International Convention Exhibition and Entertainment Precinct (SICEEP), Darling Harbour.

Friebel and Nadebaum (2011); CRC CARE Technical Report No. 10: Health Screening Levels for Petroleum Hydrocarbons in Soil – Part 2: Application Document

NEPC (1999) National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPM) (No. 1) as registered and amended in 2013, and associated Schedule B guidelines.

NSW DEC (2005); Marine Water Quality Objectives for NSW Ocean Waters – Sydney Metropolitan and Hawkesbury-Nepean.

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination. ISBN 978 1 74122 366 8

NSW DECCW (2009); Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA (1995) Sampling Design Guidelines. ISBN 0-7310-3756-1.

NSW EPA (2011) Guidelines for Consultants Reporting on Contaminated Sites. ISBN 0 7310 3892 4.

Olszowy, H., et.al (1995); Trace Element Concentrations in Soils from Rural and Urban Areas of Australia [Contaminated Sites Monograph Series No.4]

Important information about Coffey Environmental Report

Uncertainties as to what lies below the ground on potentially contaminated sites can lead to remediation costs blow outs, reduction in the value of the land and to delays in the redevelopment of land. These uncertainties are an inherent part of dealing with land contamination. The following notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report has been written for a specific purpose

Your report has been developed on the basis of a specific purpose as understood by Coffey and applies only to the site or area investigated. For example, the purpose of your report may be:

- To assess the environmental effects of an on-going operation.
- To provide due diligence on behalf of a property vendor.
- To provide due diligence on behalf of a property purchaser.
- To provide information related to redevelopment of the site due to a proposed change in use, for example, industrial use to a residential use.
- To assess the existing baseline environmental, and sometimes geological and hydrological conditions or constraints of a site prior to an activity which may alter the sites environmental, geological or hydrological condition.

For each purpose, a specific approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible, quantify risks that both recognised and unrecognised contamination pose to the proposed activity. Such risks may be both financial (for example, clean up costs or limitations to the site use) and physical (for example, potential health risks to users of the site or the general public).

Scope of Investigations

The work was conducted, and the report has been prepared, in response to specific instructions from the client to whom this report is addressed, within practical time and budgetary constraints, and in reliance on certain data and information made available to Coffey. The analyses, evaluations, opinions and conclusions presented in this report are based on those instructions, requirements, data or information, and they could change if such instructions etc. are in fact inaccurate or incomplete.

Subsurface conditions can change Interpretation of factual data

Subsurface conditions are created by natural processes and the activity of man and may change with time. For example, groundwater levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project and/or on the property.

Interpretation of factual data

Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from indirect field measurements and sometimes other reports on the site are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of Coffey through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered with redevelopment or on-going use of the site. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. In particular, a due diligence report for a property vendor may not be suitable for satisfying the needs of a purchaser. Your report should not be applied for any purpose other than that originally specified at the time the report was issued.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other professionals who are affected by the report. Have Coffey explain the report implications to professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs

(assembled by field personnel), field testing and laboratory evaluation of field samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Contact Coffey for additional assistance

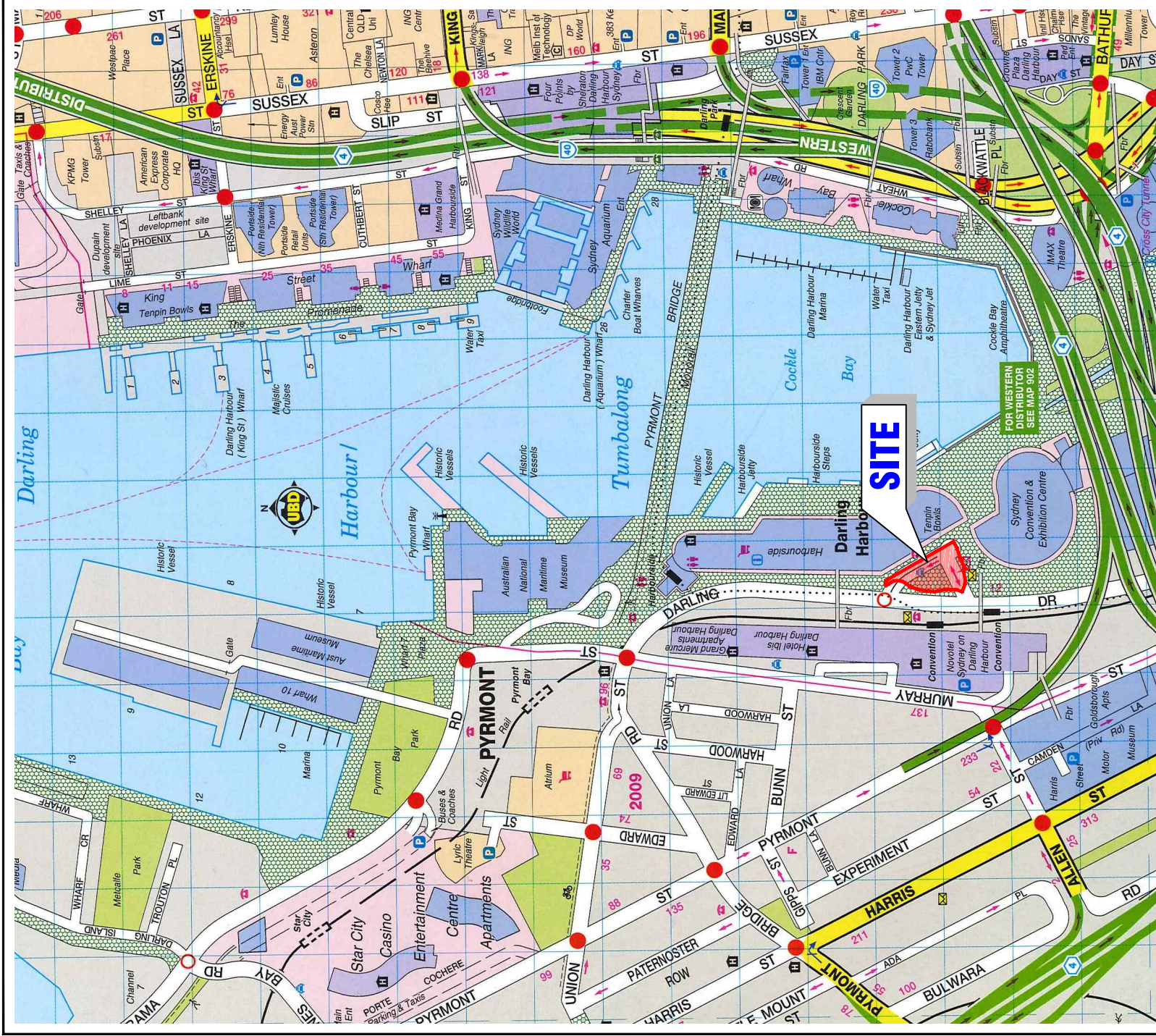
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to land development and land use. It is common that not all approaches will be necessarily dealt with in your environmental site assessment report due to concepts proposed at that time. As a project progresses through planning and design toward construction and/or maintenance, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Environmental reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Figures

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



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

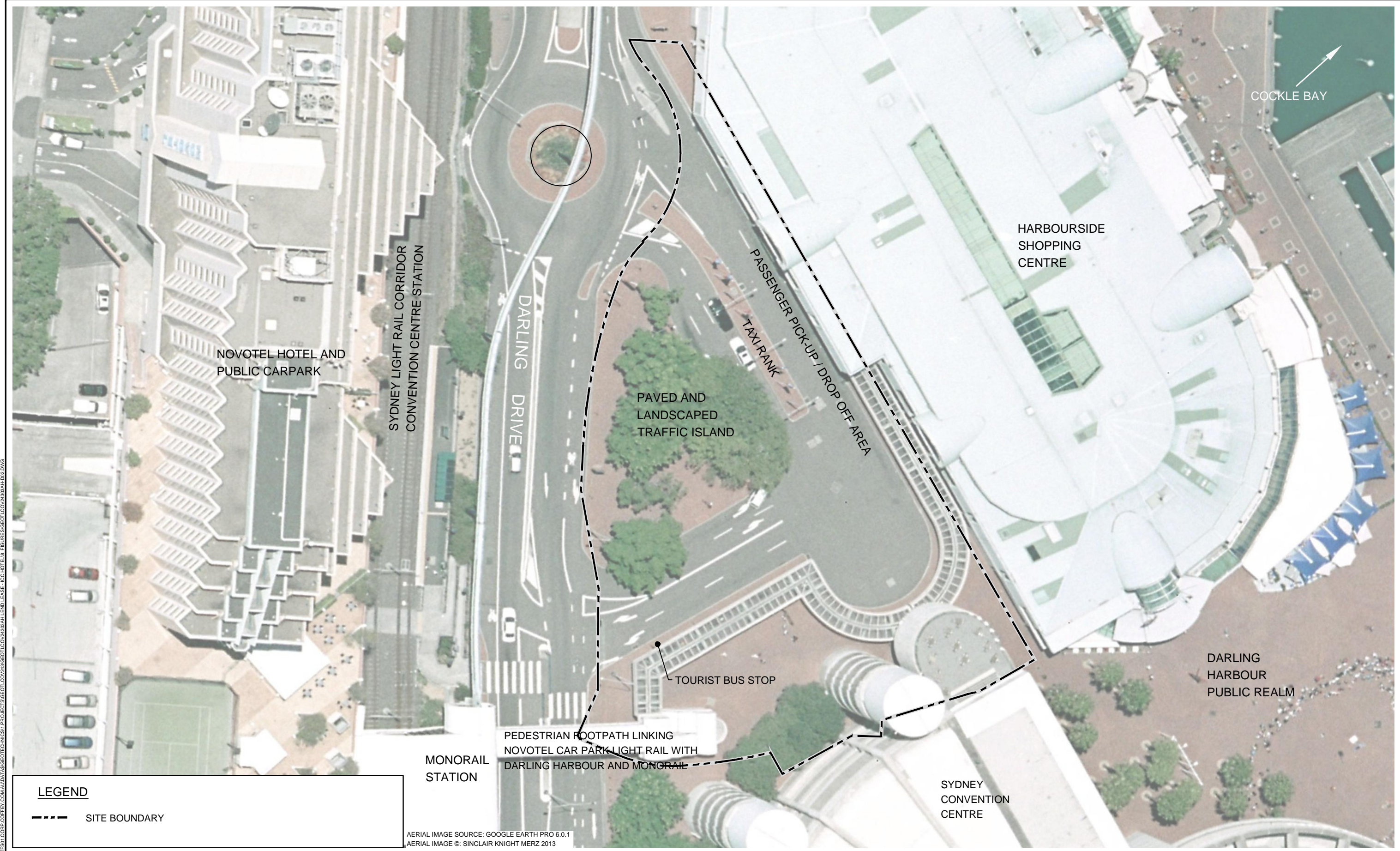


Scale (metres) 1:5000



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

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



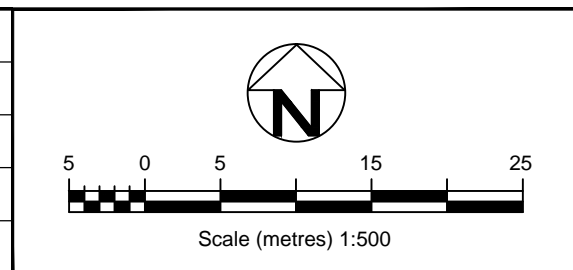
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LEGEND

----- SITE BOUNDARY

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 6.0.1
AERIAL IMAGE ©: SINCLAIR KNIGHT MERZ 2013

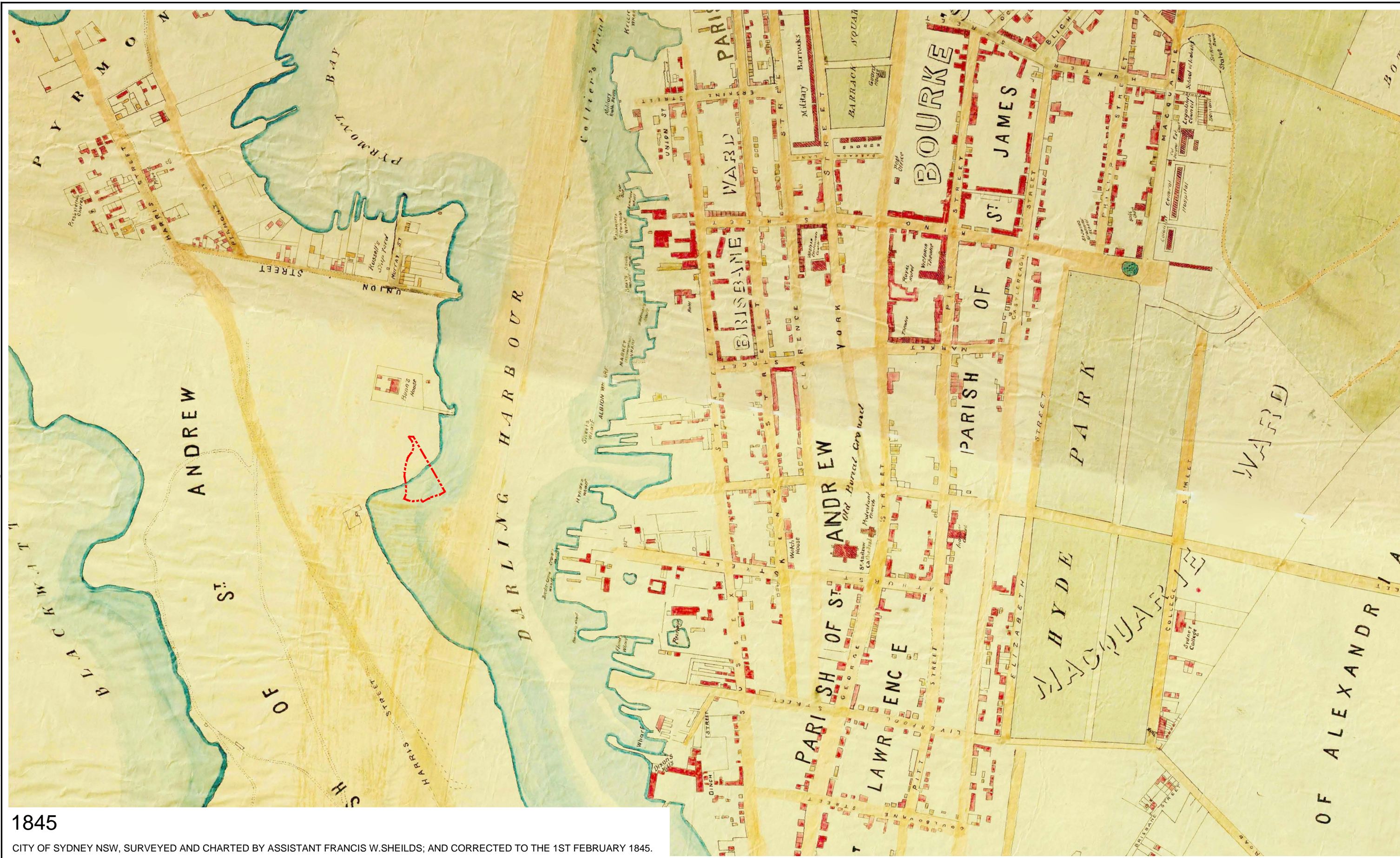
revision	description	drawn	approved	date



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



client:	LEND LEASE DEVELOPMENTS PTY LTD
project:	SYDNEY INTERNATIONAL CONVENTION EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) - ICC HOTEL DEVELOPMENT
title:	SITE LAYOUT PLAN
project no:	GEO\LCOV24303AH-D02
figure no:	FIGURE 2



1845

CITY OF SYDNEY NSW, SURVEYED AND CHARTED BY ASSISTANT FRANCIS W.SHEILDS; AND CORRECTED TO THE 1ST FEBRUARY 1845.

revision	description	drawn	approved	date



LEGEND

- - - - APPROXIMATE SITE FOOTPRINT

drawn	MV
approved	ML
date	17/06/13
scale	NTS
original size	A3



client:	LEND LEASE DEVELOPMENTS PTY LTD	
project:	SYDNEY INTERNATIONAL CONVENTION EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) - ICC HOTEL DEVELOPMENT	
title:	HISTORICAL MAP EXTRACT - 1845	
project no:	GEOTLCOV24303AH-D02	figure no: FIGURE 3

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1885-1890

CITY OF SYDNEY PARISHES OF ST PHILIP, ST JAMES, ST ANDREW, ST LAWRENCE & ALEXANDRIA.

revision	description	drawn	approved	date



LEGEND

APPROXIMATE SITE FOOTPRINT

drawn	MV
approved	ML
date	17/06/13
scale	NTS
original size	A3



client:	LEND LEASE DEVELOPMENTS PTY LTD	
project:	SYDNEY INTERNATIONAL CONVENTION EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) - ICC HOTEL DEVELOPMENT	
title:	HISTORICAL PHOTOGRAPH - 1885-1890	
project no:	GEOTLCOV24303AH-D02	figure no: FIGURE 5

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