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

Overarching Remedial Action Plan
Haymarket Precinct, Darling Harbour, Sydney NSW

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

STAGE 1 - PRELIMINARY ENVIRONMENTAL INVESTIGATION SYDNEY INTERNATIONAL CONFERENCE EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP), DARLING HARBOUR, SYDNEY

Prepared for:

Infrastructure NSW
Level 15, 167 Macquarie Street
Sydney NSW 2000

Report Date: 8 June 2012
Project Ref: GEOTLCOV24303AC-AF

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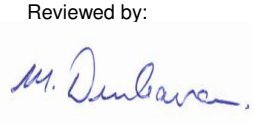

Michael Dunbavan
Senior Principal

8 June 2012

Infrastructure NSW
Level 15, 167 Macquarie Street
Sydney NSW 2000

Attention: Rene Malan

Dear Rene

RE: Stage 1 - Preliminary Environmental Investigation
Sydney International Conference Exhibition and Entertainment Precinct (SICEEP),
Darling Harbour, Sydney

Coffey Geotechnics is pleased to submit our draft Stage 1 - Preliminary Environmental Investigation for the above project.

The work was commissioned by Infrastructure NSW and was carried out in general accordance with our proposal GEOTLCOV24303AC-AA dated 21 March 2012, in response to your Service Brief for Geotechnical and Contamination Site Investigation Services.

Please contact the undersigned should you have any queries regarding this report.

For and on behalf of Coffey Geotechnics Pty Ltd

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ABBREVIATIONS

AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COPC	Contaminants of Potential Concern
LPG	Liquefied Petroleum Gas
NSW EPA	Environment Protection Authority of New South Wales
NSW OEH	New South Wales Office of Environment and Heritage
PAH	Polycyclic Aromatic Hydrocarbon
SCEC	Sydney Convention and Exhibition Centre
SEC	Sydney Exhibition Centre
SICEEP	Sydney International Conference Exhibition and Entertainment Precinct
SVOC	Semi-volatile Organic Compound
TPH	Total Petroleum Hydrocarbon
VHC	Volatile Halogenated Compound
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The proposed Sydney International Conference Exhibition and Entertainment Precinct (SICEEP) aims to reinforce Sydney's status as Australia's global city and will provide linkages to key activity centres including Sydney's historic CBD, Barangaroo, Chinatown, The Star and various educational services.

Coffey understands that the project comprises the redevelopment of the existing Entertainment Centre and car park, Exhibition Centre, Convention Centre and the public realm. It is envisaged that the project will involve a total redevelopment of the site with the construction of new building and the refurbishment of selected existing buildings. A Stage 1 - Preliminary Environmental Investigation has been carried out for the proposed SICEEP at Darling Harbour.

The site is bound by Darling Drive to the west and Hay Street to the south, Harbour Street to the east and Cockle Bay to the north.

This Stage 1 - Preliminary Environmental Investigation forms a part of the contamination investigations being undertaken for the SICEEP development and was commissioned by Infrastructure NSW in response to a proposal by Coffey Geotechnics Pty Ltd (Coffey) on 21 March 2012.

A contamination assessment is required to identify and mitigate any potential contamination risk that may be encountered during the proposed development. This Stage 1 – Preliminary Environmental Investigation aims to provide a framework for a contamination assessment which provides a reliable representation of the site.

The objectives of this Stage 1 – Preliminary Environmental Investigation were to:

- Identify current and historical activities that may have caused contamination of the soil and/or groundwater at the site;
- Assess the potential areas of environmental concern and contaminants of potential concern; and
- Assess the likelihood of the presence of significant soil and groundwater contamination at the site.

Coffey undertook the following scope of work as part of the Stage 1 - Preliminary Environmental Investigation:

- Site walkover to visually assess general site conditions and visible evidence of contamination at the site; and
- Research including a review of online databases and registers, aerial photographs, and geological maps pertaining to the site.

Research has confirmed historic land uses at the site generally includes maritime freight related infrastructure such as railway tracks and cargo sheds. Construction of the existing Convention and Exhibition Centres, and the Entertainment Centre, commenced in the early-1980s and was completed by 1988, in preparation for Australia's Bi-Centennial.

A review of available ground condition information indicates the likely geological sequence at the site comprises man-made fill used for reclamation of the original Cockle Bay foreshore. Geological maps indicate that the fill sits above Quaternary-aged alluvium, gravel, sand, silt and clay deposits which are underlain by residual soil and rock of Triassic-aged Hawkesbury Sandstone Formation.

Records provided by WorkCover indicate that the storage of dangerous goods within the site boundaries has been limited to liquefied petroleum gas (LPG), Natural Gas and Methane Gas. The storage of these substances on site is considered unlikely to cause ground contamination.

EXECUTIVE SUMMARY

Based on the findings of research, Coffey considers the likelihood of widespread, significant soil contamination within the site to be low. However, the localised presence of significant contamination however cannot be precluded. For these reasons, Coffey recommends ground investigation to characterise the quality of soil and groundwater conditions at the site. This investigation and associated ground contamination assessment would seek to inform the requirement for ground remediation works associated with the proposed future redevelopment of the site.

The investigation would involve drilling, sampling and analysis of soil within accessible portions of the site for the following contaminants of potential concern:

- heavy metals (As, Cd, Cu, Cr, Cd, Hg, Ni, Pb);
- total petroleum hydrocarbons;
- benzene, toluene, ethylbenzene, xylene;
- polycyclic aromatic hydrocarbons;
- volatile halogenated compounds;
- volatile organic compounds;
- semi volatile organic compounds;
- asbestos; and
- acid sulfate soil.

Coffey also recommends that a number of bores be completed as groundwater monitoring wells. Groundwater samples collected from each well will be analysed for a selection of the above contaminants, with the exception of asbestos and acid sulfate soils (ASS). Water quality indicators, including pH, electrical conductivity, dissolved oxygen, temperature and oxidation-reduction potential, will be measured using a portable meter during sampling activity.

If soil and/or groundwater contamination is observed that makes the site unsuitable for the proposed future uses, remediation may be required.

If ASS are identified on site, an Acid Sulfate Soils Management Plan should be prepared to minimise potential for acidification and harm to the environment during excavation works.

If groundwater contamination is identified, a Groundwater Management Plan should be prepared to manage groundwater during construction dewatering, if required.

1 INTRODUCTION

A Stage 1 - Preliminary Environmental Investigation has been carried out for the proposed Sydney International Conference Exhibition and Entertainment Precinct (SICEEP) at Darling Harbour (denoted herein as the 'site') and the findings are presented in this report. The site location is shown in Figure 1.

The site is bound by Darling Drive to the west and Hay Street to the south, commercial offices and Harbour Street to the east and Cockle Bay to the north. The study site boundaries are shown on Figure 2.

This Stage 1 - Preliminary Environmental Investigation forms a part of contamination investigations being undertaken for the SICEEP development and was commissioned by Infrastructure NSW in response to a proposal by Coffey Geotechnics Pty Ltd (Coffey) on 21 March 2012.

1.1 Background

The proposed SICEEP aims to reinforce Sydney's status as Australia's global city and will provide linkages to key activity centres including Sydney's historic CBD, Barangaroo, Chinatown, The Star and various educational services.

Coffey understands that the project comprises the redevelopment of the existing Entertainment Centre and car park, Exhibition Centre, Convention Centre and the public realm. It is envisaged that the project will involve a total redevelopment of the site with the construction of new building and the refurbishment of selected existing buildings. In addition, the development may also include:

- Below ground and/or multi-level car park structures;
- Reconfiguration of access points, loading areas and the local road network;
- Bridges and elevated structures linking the SICEEP to neighbouring areas and facilities;
- Multi-storey hotel and commercial buildings; and
- Extensive hard and soft landscaping of public areas within the SICEEP.

A contamination assessment is required to identify and mitigate any potential unacceptable contamination risk that may be encountered during the proposed development. This Stage 1 – Preliminary Environmental Investigation aims to provide a framework for a contamination assessment which provides a reliable representation of the site.

1.2 Objectives

The objectives of this environmental study were to:

- Identify current and historical activities that may have caused contamination of the soil and groundwater at the site;
- Assess the potential areas of environmental concern (AEC) and contaminants of potential concern (COPC); and
- Assess the likelihood of the presence of significant soil and/or groundwater contamination at the site.

1.3 Scope of Works

Coffey undertook the following scope of work as part of the Stage 1 - Preliminary Environmental Investigation:

- Site walkover by a Coffey environmental scientist to visually assess general site conditions and visible evidence of contamination at the site;
- Research including:
  - Reference to NSW Office of Environment and Heritage (OEH) register of contaminated sites by undertaking a search of EPA notices which may have been issued with respect to contamination;
  - Review of aerial photographs from the Land and Property Management Authority to assist in identifying historical activities with potential for contamination at the site or properties surrounding the site;
  - Reference to soils, geological and hydrogeological/groundwater maps pertaining to the site; and

The following reports were also considered by Coffey as part of this assessment:

- Coffey Geotechnics (July 2011); Environmental Desk Study – Sydney International Convention & Entertainment Centre;
- Coffey Environments (Aug 2011a); Contamination Investigation – Sydney International Convention and Entertainment Centre.
- Coffey Geotechnics (Aug 2011b); Geotechnical Investigation Report: Proposed Sydney International Convention and Entertainment Centre, Darling Harbour.

2 SITE DESCRIPTION

2.1 Site Identification

General information pertaining to the site is summarised in Table 2.1.

Table 2.1: Site Identification

Site Location:	Darling Harbour, Sydney
Site Identification:	The site comprises the following allotments: • Lot 104 DP 771839, Lot 1010 DP 1147364_Darling Harbour Cockle Bay area; • Lot 1 DP 612907; • Lot 205 DP 771841; • Lot 200 and 201 DP 1165804; • Lot 2 DP 827982; • Lot 2 DP 612907; • Lot 503 DP 812423; • Part Lot 1 DP 827982; • Lot 2 DP 868663; • Lot 1 DP 812344; • Lot 800 DP 1164281; • Lot 901 DP 1132344; • Lot 210 DP 771841; • Part Lot 2 DP 1048307; • Lots 302-320, 323, 327, 335 and 337 DP 836419; and • Pedestrian access way only (monorail overhead). Further details are provided in Section 3.3 of this report.
Zoning:	The site is affected by the Darling Harbour Development Plan No. 1, which is deemed a regional environmental plan under the EP&A Act
Current Land use:	Commercial, recreational and open space land use

2.2 Site Condition and Infrastructure

The following features were identified during a site walkover survey:

- A substation is located adjacent to the western boundary of the Sydney Entertainment Centre within a fenced compound. No evidence of emergency fuel storage was observed in this location;
- A waste management area is located adjacent to the northwest corner of the Sydney Entertainment Centre;
- A large stormwater retention tank is located adjacent to the northwest corner of the Sydney Entertainment Centre car park;
- A fenced compound beneath the Pier Street overpass is used as a control and administration centre of the Darling Harbour precinct. The compound is also used for the storage of signage, maintenance equipment, vehicles and small plant; and
- Several loading docks are present throughout the site, however access was largely restricted. It is thought that a loading dock beneath the SEC may be used for waste management purposes.

Coffey also considered there to be the potential for small-quantity storage of diesel for use in emergency generators across the site, however given that access to all areas of the site was not possible during the site walkover, this is unable to be confirmed.

Overall, no evidence of contamination such as oil staining or odours was observed during the site walkover.

On-site vegetation comprises introduced managed landscaping including mature trees within designated tree pits to the east and south of the SEC, and around the western perimeter of the SCEC, grass cover throughout Tumbalong Park, and scattered garden and flower beds. No evidence of vegetation stress or die-back attributable to contaminated soil or groundwater was observed.

2.3 Surrounding Land Use

The land use immediately surrounding the site includes the following:

North: Cockle Bay and Harbourside Shopping Centre.

East: Chinese Garden of Friendship, commercial office buildings, and entertainment facility (IMAX Theatre) and Cockle Bay Wharf and Sydney Central Business District beyond Harbour Street.

South: Paddy's Market and Market City Shopping Centre.

West: Darling Drive, monorail and light rail line, a museum, an aquatic centre and hotels, commercial offices and apartment buildings.

2.4 Topography and Hydrology

Inspection of the site revealed that the site is a relatively level parcel of land.

Review of the 1:25,000 Botany Bay Topographic Map (91302-3-S) indicates that the site lies at an elevation of between 0m and 10m Australian Height Datum (AHD). The surrounding land generally exhibits an increasing elevation towards the south and west. Surface water runoff from rain events is directed to the site's stormwater collection system which discharges into Cockle Bay to the north.

The nearest surface water body is Cockle Bay which adjoins the site to the north and is part of Sydney Harbour. There are a number of artificial water features within the site and the adjoining Chinese Garden of Friendship site however these water features hold aesthetic value and are believed to be hydraulically separated from the underlying ground.

No other waterways are located in close proximity to the site.

2.5 Geology and Hydrogeology

Based on MacQuarie's Map of 1822, the site is situated over what was originally known as Cockle Bay. The former bay and its tributaries originally extended almost 1km inland southeast from the southern boundary of the existing harbour.

The existing shoreline has been progressively formed by reclamation since the 1820s. Review of 1:250,000 Sydney Geological Series Sheet (S1 56-5) indicates that the fill covers natural Quaternary-aged alluvium, gravel, sand, silt and clay deposits. These sediments are underlain by residual soil and rock of Triassic-aged Hawkesbury Sandstone Formation which comprises sandstone, quartz and shale.

The geology at the site is complex, comprising an infilled palaeochannel, high groundwater level and an igneous dyke. The infill materials overlying the eroded sandstone valley floor comprise slopewash, estuarine deposits and manmade filling. Coffey (Aug 2011b) reports that the thickness of the fill materials surrounding the SEC are between 2m and 4.5m thick.

Underlying the fill materials, estuarine sediments and natural alluvial deposits which are likely to comprise clayey sands and clays with occasional shell layers. Beneath the estuarine deposits, there may be variable thickness of slopewash/colluvial deposits and residual soils overlying the eroded Sandstone rock surface. The slopewash is expected to comprise a mixture of clayey sand, sandy clay, and clays.

Coffey (Aug 2011b) reported that rock levels vary significantly between 1m and 14m below ground levels surrounding the SEC. Similar variation is expected surrounding the SCEC complex.

The SEC footprint is intersected by The Great Sydney Dyke, which comprises a dolerite intrusion through the surrounding Sandstone. The dyke is orientated in a southeast-northwest direction through the southern part of the site, has a width of between 3m and 8m, and its upper zone has been weathered to a stiff clay down to depths of 20m to 28m (Coffey, Aug 2011b). The interface of the dyke and adjacent sandstone rock may be affected during the intrusion process, and associated shear zones may form potential water flow conduits.

A review of the New South Wales Natural Resource Atlas (http://nratlas.nsw.gov.au) indicated that no registered groundwater bores are located within a 500m radius of the site.

Given the location of the site, is it anticipated that underlying groundwater would range between -0.5m and 1.5m AHD and may be subject to tidal influence from Cockle Bay.

2.6 Acid Sulfate Soil

A review of acid sulfate soil (ASS) risk maps presented on the Australian Soil Resource Information System (ASRIS) website (http://www.asris.csiro.au) indicate a low probability for the presence of ASS beneath the site.

The maps indicate, however that there is a high probability of ASS in the sediments in Darling Harbour and Sydney Harbour. Further, Section 149 Planning Certificates obtained from City of Sydney (refer to Section 3.4) indicated that the land encompassing the SICEEP has been identified as being on an ASS map as being Class 1 or Class 2, where Class 1 has the highest risk for ASS and Class 5 the lowest risk.

3 REVIEW OF HISTORICAL INFORMATION

3.1 Reclamation of Darling Harbour

Historical parish maps (Appendix A) encompassing the site were obtained from the Land and Property Management Authority (http://www.lpma.nsw.gov.au/survey_and_maps/maps_and_imagery/parish_maps).

Review of the 1880 Parish of St. Andrew maps indicated that Darling Harbour, initially called Long Cove, extended south beyond Hay Street and to the west in the area currently occupied by Harbourside and the SCEC.

Review of the 1970 (?) Parish of St. Andrew map indicated that, following reclamation of the foreshore of Darling Harbour, these areas were occupied by railway and maritime freight related infrastructure including railway tracks, several goods sheds, and wharves along the foreshore.

A search of historical newspaper articles pertaining to the reclamation of Darling Harbour found that an article published in the Daily Telegraph on 12 May 1894 stated the following:

> "The portion of the harbour which it is proposed to reclaim will give an area of 14.5 acres available for railway or other business purposes.
>
> The material for reclamation, sand and silt, would be obtained by dredging in various parts of the harbour, the material being deposited where possible..."

The harbour sediments have a high probability of occurrence of ASS as noted in Section 2.6, and therefore it is possible that some of the fill material at the site contains ASS. However, as the sediments were exposed to the air following dredging, it is likely that oxidisation of any potential ASS would have occurred prior to placement on-site.

3.2 Aerial Photographs

Current and historical aerial photographs of the site were obtained from the Land and Property Management Authority to identify changes in land use over the second half of the 20th century (Appendix B). Table 3.1 provides a summary of the changes in land use observed on the site and in the immediate surrounding area.

Table 3.1: Summary of Aerial Photographs

Year	Site Observations	Surrounding Area
1942	The site is heavily industrialised with the presence of what appears to be significant railway related infrastructure including railway tracks, sheds and	Reclamation of the southern end of Darling Harbour has occurred and the land to the south and east of the site appears to be occupied for rail related purposes. Commercial/industrial land use

Year	Site Observations	Surrounding Area
	buildings. Three long narrow sheds are located immediately south of Piermont Bridge over the footprint of the current SCEC complex.	is visible to the west of the site including the Ultimo Power Station[1]. Several wharves are present along the southern and eastern foreshores of Darling Harbour.
1955	No significant change to the site is visible.	No significant change to the surrounding area is visible.
1961	No significant change to the site is visible.	Additional commercial/industrial buildings have been constructed to the immediate west of the site. The Ultimo Power Station ceases operations.
1965	Long narrow sheds that have been constructed within the central and southern portions of the site.	Long narrow sheds have been constructed in current the location of the Sydney Entertainment Centre and car park, extending into the southern and central portions of the site. No other significant changes to site features are noted.
1978	No significant change to the site is visible.	No significant change to the surrounding area is visible.
1982	The Western Distributor elevated roadway has been constructed through the centre of the site. The Sydney Entertainment Centre and associated car park have been constructed on the south of the site. No other significant changes to site features are noted.	No significant change to the surrounding area is visible.
1986	Railway related infrastructure previously located on-site has been removed and redevelopment of the	The area to the east of the site has been cleared as part of the Darling Harbour/Cockle Bay Wharf precinct redevelopment. Construction in these

[1] The Ultimo Power Station was commissioned in 1900 to supply electrical power for Sydney's trams. The power station remained in operation until c.1961. (Source: History of the Powerhouse Museum; available: http://www.powerhousemuseum.com/about/aboutHistory.php)

Year	Site Observations	Surrounding Area
	entire Darling Harbour precinct has commenced, including construction of the SCEC and SEC.	areas has not commenced although the majority of wharves along the Cockle Bay waterfront have been removed.
1991	Construction of the SCEC and surrounding landscaping including Tumbalong Park are established. The Sydney Entertainment Centre car park has been extended.	The Exhibition Centre monorail stop has been constructed to the immediate west of the site. The Chinese Garden of Friendship has been constructed to the east of the site. Construction of Cockle Bay Wharf area to the north east of the site continues.
1994	No significant change to the site is visible.	Construction of the Cockle Bay Wharf appears to be complete. The building the immediate west of the southern end of the SEC appears to have been demolished and the site remains vacant.
1997	No significant change to the site is visible.	The IMAX theatre and SEGA World complex have been constructed to the east of the site.
2004	No significant change to the site is visible.	No significant change to the surrounding area is visible.
2009	No significant change to the site is visible.	The Ian Thorpe Aquatic Centre has been constructed to the immediate west of the southern end of the SEC. The former SEGA World complex has been demolished.

The above information obtained from the review of the aerial photography is considered consistent with the historical information obtained from other sources.

3.3 Planning Certificates

Planning certificates, issued under Section 149 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), for the site were obtained from City of Sydney for review for the Lots listed in Table 2.1. A copy of the planning certificates is presented in Appendix C.

The Section 149 planning certificates for the above lots indicate that the land is owned by the Sydney Harbour Foreshore Authority.

The planning certificates state that the site is affected by the Darling Harbour Development Plan No. 1, which is deemed a regional environmental plan under the EP&A Act.

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).

3.4 Contaminated Land Register

A search of the NSW Environment Protection Authority (EPA) Contaminated Land Record (http://npws.nsw.gov.au/prclmapp/searchregister.aspx) indicated that the site and immediately surrounding area are not subject to any notices under the CLM Act.

A search of the List of NSW Contaminated Sites Notified to EPA (http://www.environment.nsw.gov.au/clm/publiclist) indicates that the site and immediately surrounding area have not been notified to EPA under Section 60 of the CLM Act as a potentially contaminated site.

3.5 Dangerous Goods Storage

A search of the NSW WorkCover Licenses to Keep Dangerous Goods database was carried out in May 2012. Available records indicate that dangerous goods stored at the site were referenced under Dangerous Goods Licences 35/026302, 35/034374 and 35/032414.

Dangerous Goods License 35/026302

Dangerous Goods License 35/026302 relates to the storage of dangerous goods at Darling Drive, Sydney Convention and Exhibition Centre.

The earliest record pertaining to License 35/026302 is dated June 1996 and permits one 144m^3 cylinder containing compressed natural gas.

Amendment to the license, dated April 2001, permitted an additional two cylinder stores. These included a 150kg and a 380kg store for LPG.

The most recent record, dated November 2011, permits the storage of LPG as per the following:

- 1 x 850L cylinder store (Depot 1);
- 1 x 1,788L decanting cylinder (Depot 2); and
- 3 x 1,512L cylinder stores (Depot 3 to 5).

Dangerous Goods License 35/034374

Dangerous Goods License 35/034374 relates to the storage of dangerous goods at 1 Exhibition Place.

The earliest record pertaining to License 35/034374 is dated January 2000 and permits one 144m^3 cylinder containing compressed methane gas.

The license was renewed in April 2001 and May 2003.

Dangerous Goods License 35/032414

Dangerous Goods License 35/032414 relates to the storage of dangerous goods at 50 Darling Drive.

The earliest record pertaining to License 35/032414 is dated June 1999 and permits two 210kg decanting cylinders containing LPG.

The license was renewed in January 2001 and January 2004.

Dangerous Goods documentation is presented in Appendix D.

4 AREAS AND CONTAMINANTS OF CONCERN

4.1 Areas of Environmental Concern

Although information discovered during research has not identified specific areas of environmental concern within the site, description of historical uses of the site has indicated the following land uses which may have resulted in ground contamination:

- Historic reclamation of Darling Harbour which appears to have occurred throughout the late 19th and early 20th Centuries. Reclamation activities sourced materials dredged from unknown areas of Sydney Harbour, which have a high probability of ASS occurrence. However, given that potential ASS is likely to have oxidised prior to placement on-site, the likelihood of ASS in fill soils is considered to be low; and
- Earliest available aerial photography indicates the site was developed with extensive railway and port related infrastructure including railway sidings, sheds and associated buildings, and wharves. Contaminants typically associated with such land uses comprise heavy metals, asbestos, fuels and lubrication oils. The storage of goods and other ancillary activities (e.g. heating) may also represent secondary contamination sources, where particularly where uncontrolled spillages, leaks occurred. The former Ultimo Power Station is located adjacent to the western boundary of the site and may represent a potential source of contamination. Specifically, contaminants associated with this land use may include TPH, PCBs, PAHs, heavy metals and asbestos used for insulation purposes.

Coffey considers that it is likely that the above land uses have the potential to have resulted in ground contamination although the probability of significant, widespread soil contamination at the site is considered to be low given the relatively recent development of parts of the site.

The presence of contaminants in soil may affect the waste classification of fill materials likely to be excavated and disposed off-site to landfill for construction purposes, thereby potentially increasing the cost of disposal of that material.

The natural alluvial deposits along the eastern half of the site may contain ASS. If ASS is present, it should be managed appropriately to control acid generation. Any ASS should be treated prior to disposal off-site as General Solid Waste. If ASS is likely to be disturbed during construction, then an acid sulfate soil management plan should be prepared to manage the ASS.

Groundwater in the Sydney city area typically contains concentrations of heavy metals and organic compounds (e.g. petroleum hydrocarbons) associated with diffuse urban pollution sources. Nonetheless, it is considered possible that historic land uses may have resulted in some impact to groundwater locally. Groundwater quality and flow direction should be assessed to provide information for construction dewatering, if required.

4.2 Contaminants of Potential Concern

Based on the above desk study, together with knowledge of potential contamination associated with subsurface filling and land reclamation, Coffey considers that COPC for the site are as follows:

- heavy metals (As, Cd, Cu, Cr, Cd, Hg, Ni, Pb);
- total petroleum hydrocarbons (TPH);

- benzene, toluene, ethylbenzene, xylene (BTEX);
- polycyclic aromatic hydrocarbons (PAH);
- volatile organic compounds (VOC);
- volatile halogenated compounds (VHC)
- semi volatile organic compounds (SVOC);
- asbestos; and
- acid sulfate soil.

5 SUMMARY AND CONCLUSIONS

The site currently comprises the Sydney Convention and Exhibition Centre within the northernmost portion of the site, the Sydney Exhibition Centre within the central portion, and the Sydney Entertainment Centre in the southern portion. The remainder of the site comprises public open space that is either paved with a combination of concrete, asphalt and brick paving, except for Tumbalong Park which is predominantly grass covered.

A review of available ground condition information indicates the likely geological sequence at the site comprises imported fill of unknown origin used for reclamation of the foreshore. Geological maps indicate that natural sediments beneath the fill comprise Quaternary-aged alluvium, gravel, sand, silt and clay deposits which are underlain by residual soil and rock of Triassic-aged Hawkesbury Sandstone Formation.

Research has confirmed historic land uses at the site largely includes railway and port related infrastructure including tracks, sheds and wharves. Construction of the existing Convention and Exhibition Centres, and the Entertainment Centre, commenced in the early-1980s and was completed by 1988.

Records provided by WorkCover indicate that the storage of dangerous goods within the site boundaries has been limited to LPG, Natural gas and methane gas. The storage of these substances on site is considered unlikely to cause ground contamination.

Based on this environmental study, Coffey considers the likelihood of widespread, significant soil contamination to be low. However, the localised presence of significant contamination however cannot be precluded. For these reasons, Coffey recommend ground investigation to characterise the quality of soil and groundwater conditions at the site. This investigation and associated land contamination assessment would seek to inform the requirement for remediation works associated with the proposed redevelopment of the site.

The investigation would involve drilling, sampling and analysis of soil within accessible portions of the site. Based on the environmental desktop study, Coffey recommend that representative soil samples are analysed for one or more of the following COPC:

- heavy metals (As, Cd, Cu, Cr, Cd, Hg, Ni, Pb);
- total petroleum hydrocarbons (TPH);
- benzene, toluene, ethylbenzene, xylene (BTEX);
- polyaromatic hydrocarbons (PAH);
- volatile halogenated compounds (VHC);
- volatile organic compounds (VOC);
- semi volatile organic compounds (SVOC);
- asbestos; and
- acid sulfate soil.

Coffey also recommends that a number of soil bores are completed as groundwater monitoring wells. Groundwater samples collected from each well will be analysed for a selection of the above COPC, with

the exception of asbestos and acid sulfate soils, together with other water quality indicators such as pH, electrical conductivity, dissolved oxygen, temperature and oxidation-reduction potential.

If soil and/or groundwater contamination is observed that precludes the site from the proposed future uses remediation may be required to render the site to be suitable for that proposed land use. In this case, a Remediation Action Plan should be prepared by a suitably qualified environmental consultant, in accordance with *Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011).

If ASS are identified on site, an Acid Sulfate Soils Management Plan should be prepared to minimise potential for acidification and harm to the environment during excavation works.

If groundwater contamination is identified, a Groundwater Management Plan should be prepared to manage groundwater during construction dewatering, if required.

6 REFERENCES

Coffey Geotechnics (July 2011) *Environmental Desk Study – Sydney International Convention & Entertainment Centre*.

Coffey Environments (Aug 2011a) *Contamination Investigation – Sydney International Convention and Entertainment Centre*.

Coffey Geotechnics (Aug 2011b) *Geotechnical Investigation Report: Proposed Sydney International Convention and Entertainment Centre, Darling Harbour*.

NSW OEH (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

Appendix A
Historical Parish Maps

Stage 1 - Preliminary Environmental Investigation
Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney

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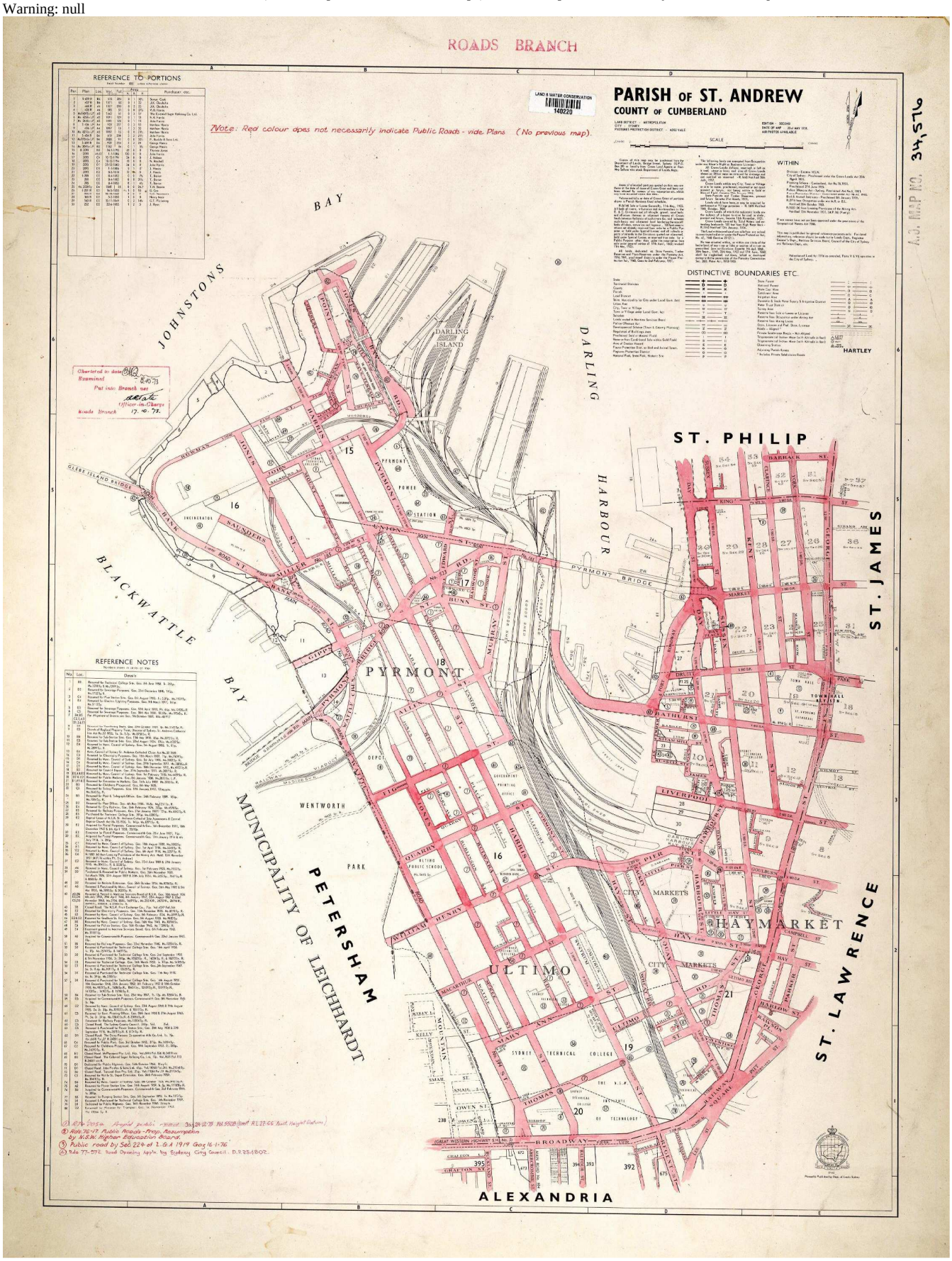
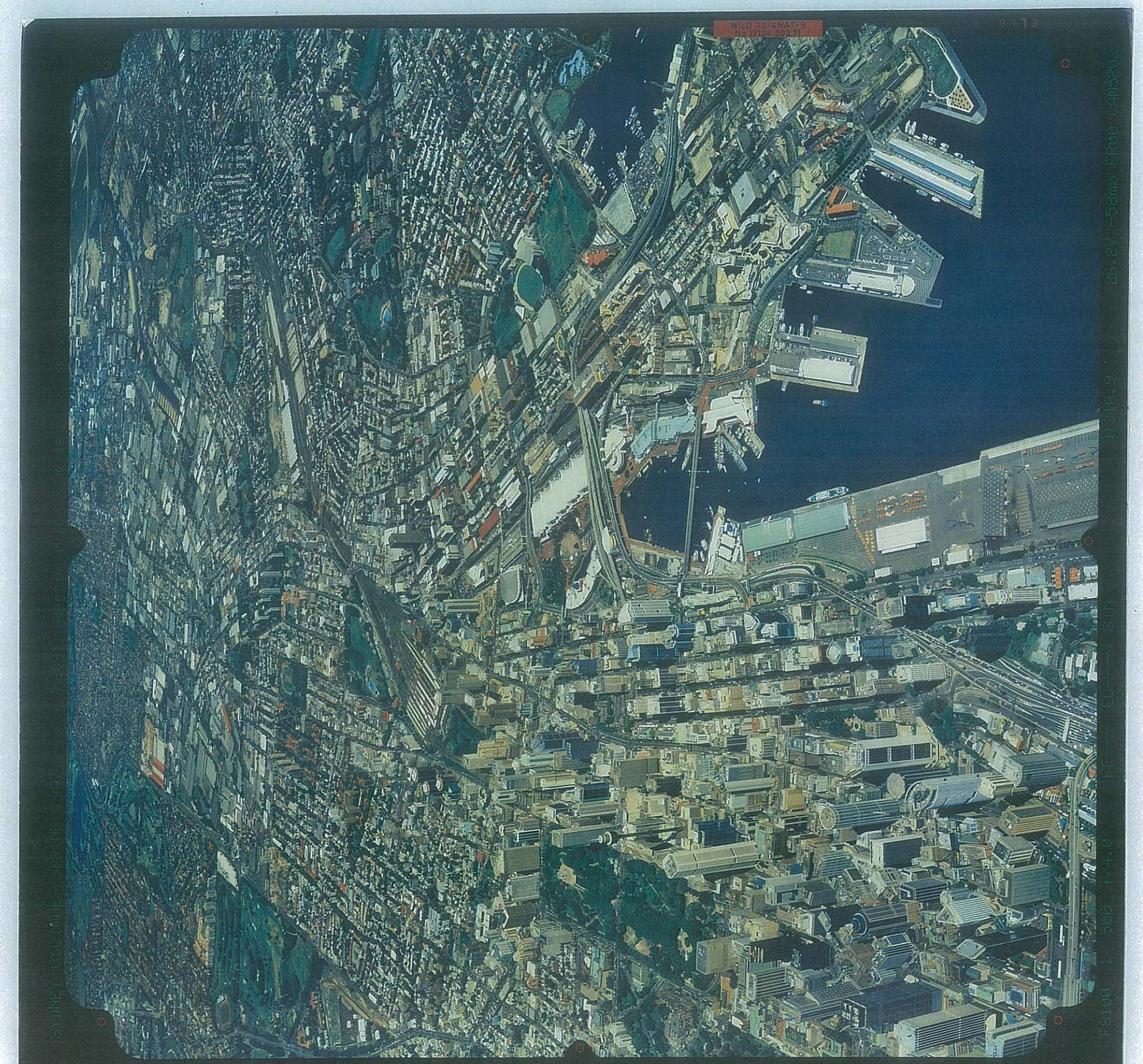


Appendix B
Historical Aerial Photographs

Stage 1 - Preliminary Environmental Investigation
Sydney International Conference Exhibition and Entertainment Precinct (SICEEP), Darling Harbour, Sydney

1999 ✓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