

Transport for New South Wales

PRELIMINARY SITE INVESTIGATION

Sydney Harbour Bridge Cycleway Northern Access

09 November 2022

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Preliminary Site Investigation

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Acronyms and Abbreviations

Acronym	Details
ASS	Acid Sulphate Soils
CSM	Conceptual Site Model
BTEXN	Benzene, Toluene, Ethyl Benzene, Xylenes and Naphthalene
CEMP	Construction Environmental Management Plan
DSI	Detailed Site Investigation
DP	Deposited Plan
EMP	Environmental Management Plan
EPL	Environmental Protection License
EPA	Environmental Protection Authority
Mgbl	Meters Below Ground Level
NEPM	National Environmental Protection Measure
NSW	New South Wales
PACM	Potential Asbestos Containing Material
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Perchloroethene
PFAS	Per- and Polyfluoroalkyl Substances
POEO	Protection of the Environment Operations
PSI	Preliminary Site Investigation
REF	Review of Environmental Factors
SMP	Soil Management Plan
SPR	Source-Pathway-Receptor
SWL	Standing Water Level
TEC	Trichloroethylene
TRH	Total Recoverable Hydrocarbon
VOC	Volatile Organic Compound

Executive Summary

Arcadis Australia Pacific Pty Ltd (Arcadis) was engaged by Transport for NSW to complete a desktop Preliminary Site Investigation (PSI) at the proposal boundary, located on Cammeraygal land and is in Milsons Point within the North Sydney Local Government Area (LGA). The proposal is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the South and Alfred Street to the west (the proposal boundary).

Arcadis understands that Transport for NSW requires this investigation to:

- Identify all past and present potentially contaminating activities
- Identify potential contamination types
- Discuss the proposal boundary condition
- Provide a preliminary assessment of site contamination
- Assess the need for further contamination investigations.

The objective of this PSI is to review current and historical proposal boundary information, identify and assess potential areas of environmental concern related to site use and assess overall contamination potential and risks to human health and ecological receptors. The assessment will provide information on the overall suitability of the proposal boundary for the proposed upgrade of the existing cycleway connection between the Sydney Harbour Bridge cycleway and the bike network in Milsons Point (the proposal) from a contamination perspective, as well as to inform the Review of Environmental Factors (REF).

The purpose of conducting the PSI is to provide Transport for NSW with sufficient information to assess potential risks posed by on-site contamination and to inform on the suitability for the proposed future upgrade.

The following scope of work was completed for the PSI:

- A review of publicly available current and historical information relating to the proposal boundary
- Completion of a detailed site walkover, with visual assessment of surrounding land uses to identify potentially contaminating activities
- Preparation of this PSI report.

Based on the review of the available information detailed in this PSI report, Arcadis has drawn the following conclusions about the proposal boundary:

- The proposal boundary was utilised for low density residential and minor retail land uses prior to its compulsory purchase in 1925/1926 by Minister for Public Works for the construction of the adjacent Sydney Harbour Bridge
- While no specific evidence was noted in the information reviewed, it is considered possible that the proposal boundary was utilised as a staging area for equipment and construction materials during construction of the Sydney Harbour Bridge
- Since completion of construction of the Sydney Harbour Bridge, the proposal boundary has been mostly utilised as a park (from the 1930s) and bowling green (from the 1950s)
- It is considered likely that fill material of unknown origin was placed on the proposal boundary associated with general leveling and the construction of the bowling green
- Adjacent to the proposal boundary, the land has been used for a combination of commercial and residential land uses (including automotive workshop and dry cleaners), some of which may have caused contamination that potentially could migrate and impact proposed cycleway construction areas
- In addition to the known and suspected potentially contaminating land uses identified on and off-site, it is considered that general site and parks maintenance activities at the proposal boundary may have led to minor contamination.

Despite the above, it is considered unlikely that significant contamination is present on the proposal boundary as a result of the historical land use. Furthermore, current conditions on-site being mostly covered with hardstand and grassed soils, limit exposure pathways to the current land user.

Based on the preliminary assessment undertaken, Arcadis makes the following recommendations for further works within the proposal boundary once the final design option is awarded, prior to onsite construction works:

- Develop an Unexpected Finds Protocol to be implemented during onsite soil disturbance works in the event of the identification of any unforeseen contaminated land evidence
- A targeted proposal boundary investigation in accordance with the requirements of NEPM 2013 should be undertaken during detailed design at the proposal boundary to assess site condition and current contamination status, focusing on those areas of proposed future disturbance associated with the proposed development
- The investigation should include in-situ waste classification of soils as any soils requiring off-site disposal will require classification prior to excavation and removal within the proposal boundary, in accordance with the NSW EPA. 2014. *Waste Classification Guidelines – Part 1: Classifying Waste*
- A Construction Environmental Management Plan (CEMP) and Soil and Water Management Plan (SWMP), if required, should be developed for the proposal boundary based on the findings of the investigation and in-situ waste classification, to inform on the appropriate management, handling and/or disposal of excess soils arising from the proposed development.

1 Introduction

1.1 Project background

Transport for NSW ('Transport') proposes to upgrade the existing cycleway connection between the Sydney Harbour Bridge cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South ('the proposal').

The proposal is located on Cammeraygal land and is in Milsons Point, within the North Sydney Local Government Area (LGA). The proposal is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west.

The proposal would consist of a three-metre-wide elevated linear bike ramp that extends 200 metres from Bradfield Park North, near Burton Street, interfacing with the Sydney Harbour Bridge cycleway south of the existing stair access. The ramp would connect to a new cycle path which would extend along the east side of Alfred Street South, between Middlemiss Street and Burton Street, and include a new street crossing on Alfred Street South. The two-way cycle path would be 2.5 metres wide and connect to the existing bike network in Milsons Point. Figure 1 shows the proposal and its location in a regional context.

Key features of the proposal would include:

- A design-led approach to the integration of new cycling infrastructure with its existing important open space and heritage setting
- A new elevated linear bike ramp, with deck mostly about three metres wide, and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
 - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
 - Precast columns carefully sited within Bradfield Park North and Central
 - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
 - A gathering space, lighting, seating and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
 - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new crossing near 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
 - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located at 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street
 - Low speed shared path and verge widening on the north side of Lavender Street
 - Adjustments to the Lavender Street roundabout
 - New street tree planting, shrub planting and footpath paving
 - Relocation of an existing bus stop on Alfred Street South near Lavender Street about 60 metres to the south of its current location
 - Permanent removal of up to 15 metered parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage.
- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

This PSI was required to evaluate potential risks from on-site contamination to construction / maintenance workers and site users during the development and subsequent use of the proposal boundary.

1.2 Objectives and purpose

The objectives of this PSI were to:

- Review available current and historical information to assess potentially contaminating activities both on and within the vicinity of the proposal boundary
- Identify and assess Potential Areas of Concern (PAoC) or evidence of gross contamination
- Assess potential risks that may be posed by any identified potential contamination to proposal boundary workers during construction and/or site end users.

The purpose of conducting this PSI was to assess current and historical potentially contaminating activities which may have occurred on or near the proposal boundary and may impact the construction activities for the cycleway.

1.2.1 Scope of works

To meet the objectives and purpose detailed in Section 1.2, Arcadis completed the following scope of works complying with the following regulatory framework:

- NSW Environment Protection Authority, 2020. *Consultants reporting on contaminated land - Contaminated land guidelines* (NSW EPA 2020)
- NSW Environment Protection Authority, 1997. *Contaminated Land Management Act* (CLM Act, 1997)
- NSW Government, 1997. *Protection of the Environment (Operations) Act*, (POEO Act, 1997)
- NSW Department of Planning and Environment, 1979. *Environmental Planning and Assessment Act*. (EP&A 1979).

Further details are provided from sections 1.2.2 to 1.2.4 below.

1.2.2 Desktop study

Arcadis completed a detailed desktop study of available information within the proposal boundary (prior to conducting a site walkover), to assess for potentially contaminating activities. The desktop study included:

- Review of available reports within the proposal boundary provided by Transport for NSW and sourced directly from the proposal boundary. These documents include historical environmental site assessments, groundwater monitoring programs and site plans, including:
 - Preliminary Environmental Investigation: Sydney Harbour Cycleway Connection, Milsons Point 2015 (Hills Environmental, 2015)

- Preliminary DRAFT Contamination Risk Assessment: Proposed Geotechnical Boreholes, Alfred Street, Milsons Point NSW (Coffey Pty Ltd, 2018)
- *Bradfield Park Plan of Management* North Sydney: North Sydney Council (North Sydney Council, 2008)
- Commissioning of a LotSearch Enviro Professional report for the proposal boundary (LotSearch. 2022. *LotSearch, 41 Alfred Street South, Milsons Point, NSW 2061 (LotSearch 2022)*). This report collated the majority of publicly available information for the proposal boundary from a variety of sources, including:
 - Geology, hydrology, and hydrogeology
 - EPA contaminated sites register and list of Audit sites
 - Landfills and waste facilities
 - Heritage and cultural sensitivity
 - Local historical business directories
 - Section 10.7 Council Certificates (2 and 5)
 - Historical Titles
 - Historical aerial imagery (typically 1 image/10 years from c.1940 onward)
- Detailed review and collation of pertinent information from the LotSearch 2022 report
- Identification of key information, potential risks and areas for further assessment within the proposal boundary, to inform the proposal boundary walkover inspection.

1.2.3 Site walkover inspection

As part of the desktop study, an experienced member of the Arcadis Environmental Restoration (ER) team attended site on 18 January 2022 to conduct a detailed site walkover inspection. The proposal boundary walkover inspection comprised:

- Detailed visual inspection and assessment of all accessible areas of the proposal boundary
- Assessment of items of interest or concern identified within the proposal boundary in the desktop study
- On-site discussion/interview with appropriate Transport for NSW representatives who have site-specific experience and history
- Verification of proposal boundary plans and layout.

The findings from the proposal boundary walkover inspection can be found on **Section 3.1** of this report.

1.2.4 Preliminary site investigation

On completion of the desktop study and the proposal boundary walkover inspection, Arcadis compiled this report. The report complies with the requirements outlined in National Environment Protection Council. 2013. *National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013)* and NSW Environmental Protection Agency. 2020. *Contaminated Land Guidelines: Consultants reporting on contaminated land (NSW EPA 2020)* guidelines. The PSI includes:

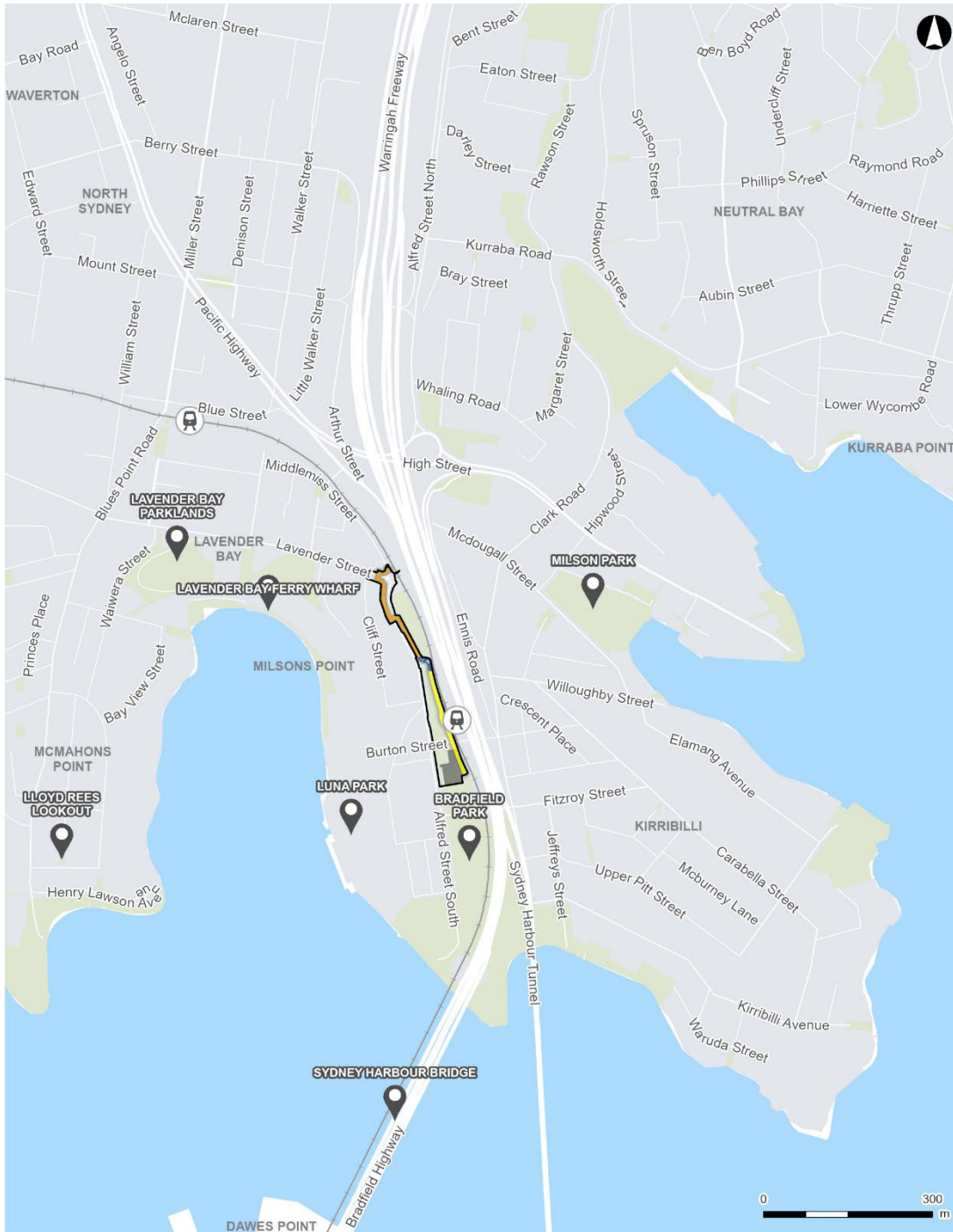
- Project background information
- Objective and purpose
- Summary of desktop study findings
- Summary of proposal boundary walkover inspection findings

- Statement on the current environmental risk posed by known or potential contamination within the proposal boundary
- Identification of potential areas and contaminants of concern, if applicable
- Provision of conclusions and recommendations for further works, where required.

2 Site settings

A summary of key available information regarding the proposal boundary, collated from the LotSearch 2022 report found in **Appendix A** and other publicly available information sources is provided in the following sections.

The regional context of the proposal and the location of proposal boundary are provided in **Figure 1** and **Figure 2** respectively.



- Legend**
- Proposal boundary
 - Project design
 - Elevated linear bike ramp
 - Linear bike ramp
 - Alfred Street South cycle path and pedestrian upgrade
 - Ancillary facility
 - Railway
 - Key precinct
 - Train station



1:10,000 at A4
 Coordinate System: GDA2020 MGA Zone 56
 Date issued: November 9, 2022
 Path: C:\Users\gcaz2278\ARCADIS\30119208 - SHB Northern Cycleway REF - 05 GIS\A_Current\B_Maps\SHBNC_EIS_AIP\SHBNC_EIS_AIP_v5.aprx
 Created by: TK Updated by: XX QA by: GC

Figure 1 Location of proposal



- Legend
- Proposal boundary
 - Project design
 - Elevated linear bike ramp
 - Linear bike ramp
 - Alfred Street South cycle path and pedestrian upgrade
 - Ancillary facility
 - Railway



1:6,000 at A4
 Coordinate System: GDA2020 MGA Zone 56
 Date issued: November 9, 2022
 Imagery: Nearmap 2022
 Created by: TK Updated by: XX QA by: GC

Figure 2: The proposal and proposal boundary

2.1 Site details

A summary of the proposal boundary details is provided in **Table 2-1**.

Table 2-1 Summary of site details

Parameter	Details
Address / Location	Bradfield Highway and North Shore Railway, Milsons Point Sydney. The proposal boundary extends approximately 40m to the west from Milsons Point Station, and is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west.
Site Coordinates (centre of the proposal boundary) (GDA 94 UTM 56s)	Latitude: -33.845405 Longitude: 151.211465
Local Government Area	North Sydney Council
Current Owner/Occupier	North Sydney Council / Transport for NSW
Current Land Use	Road, public parkland and recreational land
Current Zoning/ Planning Information	The proposal boundary is currently zoned for a mixture of land uses: <ul style="list-style-type: none"> • RE1 - Public Recreation • SP2- Infrastructure (Classified Road) (Railway) • B4 - Mixed Use.
Surrounding land uses	<ul style="list-style-type: none"> • North – High density residential buildings, commercial buildings • South – Sydney Harbour • East - Significant infrastructure, the Sydney Harbour Bridge railway and Sydney Harbour Bridge. • West – Set of commercial retail in B4 mixed use zoned lots, followed by Luna Park

2.2 Environmental settings

A description of the environmental setting of the proposal boundary is provided in **Table 2-2**. Information is sourced from the LotSearch 2022 report unless otherwise specified. The LotSearch 2022 report included one-kilometre radius from the centre of the proposal boundary (report buffer).

Table 2-2 Summary of environmental settings

Parameter	Details
Topography	The proposal boundary is relatively flat, with elevations varying between 38m and 32m (Australian Height Datum), sloping downhill slightly towards the south, and terracing down at the southern end at the bowling greens.

Parameter	Details
Soil Profile	<p>The entirety of the proposal boundary is underlain with the following soil landscape:</p> <ul style="list-style-type: none"> • Gymea soil landscape which occurs through the Hornsby Plateau along the foreshores of the Sydney Harbour, Parramatta and Georges Rivers • The Gymea soil landscape is characterised by gleyed podzolic soils and yellow podzolic soils on shale lenses.
Hydrology	<p>No surface water bodies were observed on-site.</p> <p>Sydney Harbour is located to the south of the proposal boundary and the proposal boundary is within the Sydney Harbour Catchment. Stormwater drain inlets located on-site and along Alfred Street South (east of the proposal boundary) connect to the Sydney Harbour and may contain contaminants from the road and surrounding urban infrastructure.</p>
Geology	<p>The Department of Planning, Industry & Environment. 2009. <i>Soil Landscapes of the Sydney 1:100 000 sheet</i> indicates that the proposal boundary is underlain by medium to coarse grained quartz sandstone with very minor shale and laminate lenses aged to be Triassic.</p> <p>Man-made fill overlying silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers, aged to be quaternary are located 196m north-east of the proposal boundary.</p>
Hydrogeology	<p>The proposal boundary is located in an area of porous, extensive aquifers of low to moderate productivity (sandstone).</p> <p>A total of forty-three registered groundwater bores were identified within a 2km radius of the proposal boundary. Two are listed for domestic use, while the remaining are registered as monitoring bores. The registered bores were installed to depths between 2.0m and 20.12m below ground level (mbgl). The closest registered bore was located 612m north from the proposal boundary, as follows:</p> <ul style="list-style-type: none"> • GW105415 for Monitoring purposes • Standing water level (SWL) was recorded at 15 of registered groundwater bores, with depths ranging from ranging between 0.4 and 13.0 mbgl • Based on available topographical data of the area and recorded SWL, groundwater is considered likely to flow toward the north-west.
Acid Sulphate Soils (ASS)	<p>The Atlas of Australian ASS map identified no data on the presence of ASS to be present at the proposal boundary.</p>

Parameter	Details
	The map indicates that there is a low probability of occurrence in several parcels of land encroaching Sydney Harbor approximately 125m west of the proposal boundary.
Dryland Salinity	No Dryland Salinity National Assessment data was available for the proposal boundary.
Ecological Constraints	<p>No ecological restraints were identified via the desktop review for the proposal boundary. However, the following vegetation exists nearby:</p> <ul style="list-style-type: none"> • Urban/Exotic Native, 67m north-east of the proposal boundary • Weeds and Exotics, 112m north-west of the proposal boundary • Seagrass Meadows, 334 m north-west of the proposal boundary • No groundwater dependent ecosystems were identified within the report buffer of 1km.
Cultural Heritage Constraints	<p>The following National Heritage Listed sites are within the report buffer:</p> <p>Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway</p> <ul style="list-style-type: none"> • Lavender Bay, Milsons Point Foreshore, on-site • Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway, on-site • Luna Park, 88m south-west of the proposal boundary. <p>The following State Heritage registered sites are within the report buffer:</p> <ul style="list-style-type: none"> • Milsons Point Railway Station Group, on-site • Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway, on-site • Luna Park Precinct, 122 metres south-west of the proposal boundary • Brett Whitely House and Visual Curtilage, 142 metres west of the proposal boundary • Idlemere, 438m west of the proposal boundary.
Potentially Sensitive Environments	<p>Potentially sensitive environments within 500m of the proposal boundary are as follows:</p> <ul style="list-style-type: none"> • Christian Church, 39m north-west of the proposal boundary • Anglican Church, 108m south-east of the proposal boundary • St Aloysius College Junior School, 136m east of the proposal boundary • Kirribilli Club, 169m north-west of the proposal boundary • Luna Park, 191m south-west of the proposal boundary • Catholic Church, 220m north-east of the proposal boundary • Loretto Kirribilli, 449m east of the proposal boundary

Parameter	Details
	<ul style="list-style-type: none"> Anglican Church, 454m north-west. of the proposal boundary.
Previous Environmental Site Assessments	<ul style="list-style-type: none"> Hills Environmental, September 2015. Sydney Harbour Bridge cycleway connection Milsons Point: Preliminary Environmental Investigation Coffey, March 2018. DRAFT Preliminary Contamination Risk Assessment: Proposed Geotechnical Boreholes, Alfred Street, Milsons Point NSW DRAFT.

3 Regulatory records

3.1 Council record review

A summary of the council records review within a one-kilometre radius from the centre of the proposal boundary (the 'report buffer') (unless otherwise noted) is provided in **Table 3-1** Information is sourced from the LotSearch 2022 report unless otherwise specified.

Table 3-1 Summary of council record review

Site Characteristic	Description
Defence Sites	None identified on-site or within the report buffer.
Gasworks Sites	One former gasworks has been located within the report buffer: <ul style="list-style-type: none"> Highstreet, North Sydney, 418m north-east of the proposal boundary.
Waste Management and Liquid Fuel Facilities	None identified on-site or within the report buffer.
Per- and polyfluoroalkyl substances (PFAS) Investigation and Management Sites	None identified on-site or within the report buffer.
Naturally Occurring Asbestos Potential	None identified on-site or within the report buffer.
Properties Affected by Loose-Fill Asbestos	None identified on-site or within the report buffer.
Potentially Contaminating Activities	<p>Eight historical potentially contaminating activities were identified within 500m of the proposal boundary.</p> <ul style="list-style-type: none"> Dry Cleaners, Pressers &/or Dyers 1972, 16m west of the proposal boundary Motor garage/service station between 1978 and 1983, 38m north-west of the proposal boundary Dry Cleaners, Pressers &/or Dyers 1972- 1988, 47m east of the proposal boundary

Site Characteristic	Description
	<ul style="list-style-type: none"> • Dry Cleaners, Pressers &/or Dyers 1983- 1985, 92m south-east of the proposal boundary • Motor garage/service station between 1975 and 1980, 98m north-west of the proposal boundary • Dry Cleaners, Pressers &/or Dyers 1983- 1985, 92m south-east of the proposal boundary • Motor garage/service station between 1948 and 1952, 230m north of the proposal boundary • Motor garage/service station between 1972 and 1976, road matched to the proposal boundary. <p>The North Sydney Council. 2008. <i>Bradfield Park Plan of Management, North Sydney (NSC 2008)</i>. indicates that two potentially contaminating activities were identified within 500 metres of the proposal boundary, as follows:</p> <ul style="list-style-type: none"> • Sydney Harbour Bridge, on- site • Milsons Point Railway Station, 16m east of the proposal boundary. <p>The extent of which these activities could contaminate are outlined in the NSC 2008 document which cites those investigations carried out in 1992 detailed that leaded paint, train brake dust, and vehicle emissions were potential sources of soil pollution.</p> <p>A review of the Artefact Heritage, 2018. <i>Sydney Harbor Bridge Cycle Ramp – Geotechnical Works, Historical (non-Aboriginal) Statement of Heritage Impacts</i> identifies a reference made to the HLA</p> <p>Envirosciences Pty Limited. 2003 <i>Statement of Heritage Impact, Sandstone Walls; Bradfield Park North, Milsons Point</i>. Prepared for North Sydney City Council the report indicates Bradfield Park was utilised by the Royal Australian Air force as a mobilisation and demobilisation depot temporarily during World War II. It is also noted that after World War II, the park was made to be a reception centre for European migrants.</p>
Former Potentially Contaminated Land	<p>Five sites from the NSW Contaminated Sites Notified to the EPA records, found within the LotSearch 2022, were identified in the report buffer:</p> <ul style="list-style-type: none"> • Iora Complex – Gasworks, 418m north-east of the proposal boundary • Sub Base Platypus (previously HMAS Platypus) - Gasworks, 475m north-east of the proposal boundary • Neutral Bay Sediments – Gasworks, 544m north-east of the proposal boundary • SRA Land – Unclassified activity, 732m west of the proposal boundary • Dawes Point Park – Other Industry, 847m south of the proposal boundary.

Site Characteristic	Description
Underground Storage Systems (UST) and Tanks	None identified on-site or within the report buffer.
Aboveground Storage Tanks (AST)	None identified on-site or within the report buffer.
Mining Subsidence Districts	None identified on-site or within the report buffer.
Mining and Exploration Titles	<p>No current mining and exploration titles identified on-site or within the report buffer.</p> <p>11 historical mining and exploration titles were identified within the report buffer, all of which were on-site, as follows:</p> <ul style="list-style-type: none"> • The Electricity Commission of NSW (Trading as Pacific Power) for petroleum, between 1990 and 1993, on-site • North Bulli Collieries Pty Ltd, AGL Petroleum Operations Pty Ltd, The Australian Gaslight Co for petroleum, between 1981 and 1993, on-site • Dart Energy (Apollo) Pty Ltd for minerals, date not listed, on-site • AGL Upstream Investments Pty Ltd for minerals, date not listed, on-site • John Strevens (Terrigal) NL for petroleum, date not listed, on-site • Australian Oil and Gas Corporation Ltd for petroleum, date not listed, on-site • Dart Energy (Apollo) Pty Ltd for petroleum, between 2008 and 2015 on-site • Macquarie Energy Pty Ltd for petroleum, between 2007 and 2008 on-site • Continental Oil Co of Australia Ltd for minerals, between 1967 and 1968 on-site • Laksan Minerals Ltd for petroleum, no date listed, on-site.
Heritage Sites	<p>One world heritage listing within the vicinity of the proposal boundary:</p> <ul style="list-style-type: none"> • UNESCO world heritage buffer for the Sydney Opera House, 7 metres south of the proposal boundary. <p>No Commonwealth Heritage Listed items identified on-site or within the report buffer.</p> <p>Three National Heritage Listed items were identified within the report buffer, as follows:</p> <ul style="list-style-type: none"> • Lavender Bay, Milsons Point foreshore, on the proposal boundary • Sydney Harbour Bridge, on the proposal boundary • Luna Park, 88m south-west of the proposal boundary. <p>Five State Heritage registered sites are within 500m of the proposal boundary, as follows:</p> <ul style="list-style-type: none"> • Milsons Point Railway Station Group, also recognised as state significant, on the proposal boundary

Site Characteristic	Description
	<ul style="list-style-type: none"> • Sydney Harbour Bridge, along with its approach viaducts, arches, and bays underneath the Warringah Freeway, also recognised as state significant within the proposal boundary. • Luna Park Precinct, 122m south-west of the proposal boundary • Brett Whitely House and Visual Curtilage, 142m west of the proposal boundary • Idlemere, 438m west of the proposal boundary. <p>248 Environmental Planning Instrument Heritage Items of local significance were identified within 500m of the proposal boundary. The closest five locally significant are within 52m of the proposal boundary, as follows:</p> <ul style="list-style-type: none"> • Bradfield Park (including northern section), locally significant on-site • Chinese Christian Church, locally significant, 18m north-west of the proposal Boundary • Camden House, locally significant 52m south of the proposal boundary.
Bush Fire Prone Land	None identified on-site or within the report buffer.
Flood Hazard	None identified on-site or within the report buffer.
Land Reservation Acquisitions	None identified on-site or within the report buffer.
Major Easements	<p>Seven major easements were identified within the report buffer, as follows:</p> <ul style="list-style-type: none"> • A primary right of way easement, 211m north-east of the proposal boundary • A primary undefined easement, 382m north-east of the proposal boundary • A primary right of way easement, 388m south-east of the proposal boundary • A primary undefined easement, 429m north-east of the proposal boundary • A primary undefined easement, 430m west of the proposal boundary • A primary undefined easement, 447m north of the proposal boundary • A primary undefined easement, 722m south-east of the proposal boundary.

3.2 Planning certificates

Copies of the planning certificates prepared under Section 10.7(2) and Section 10.7(5) of the Environmental Planning and Assessment Act 1979 are provided in **Appendix B** and summarised in **Table 3-2**.

Table 3-2 Summary of Planning certificates

Site Characteristic	Description
State and Regional Environmental Planning Policies	<p>There are several State Environmental Planning Policies (SEPPs) or Regional Environmental Plans applicable within the North Sydney LGA, three of these may be relevant to the PSI:</p> <ul style="list-style-type: none"> State Environmental Planning Policy (Resilience and Hazards) 2021: Prior to development consent a contamination assessment of the proposal boundary is required to assess the suitability of the proposal boundary for the proposed land use. If the land is found to be unsuitable, remediation is required prior to development SEPP State Significant Precincts – Developments must deliver the highest standard of architectural, urban and landscape design whilst not impacting view corridors on National Heritage Sites, including the Sydney Opera House and Sydney Harbour Bridge Sydney Regional Environmental Plans (REP) – Sydney Harbour Catchment: Development should protect, maintain, and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores, public access should be increased, maintained, and improved whilst minimising its environmental impacts.
Local Environmental Plan	North Sydney Council. 2013. <i>North Sydney Local Environment Plan (LEP 2013)</i> .
Development Control Plans	North Sydney Council. 2013. <i>North Sydney Development Control Plan (DCP 2013)</i> .
Minimum Land Dimensions for the Erection of a Dwelling House	None identified.
Critical Habitat	None identified.
Conservation Area	None identified.
Complying Development	North Sydney Council. 2013. <i>North Sydney Local Environment Plan, Section 2.3 (LEP 2013)</i> .
Coastal Protection	None identified.
Mine Subsidence	None identified.
Road widening and road realignment	None identified.
Council and Other Public Authority Hazard Risk Restrictions	None identified.
Flood Related Development Controls	Council is currently preparing a <i>Floodplain Risk Management Study and Plan</i> which will identify whether the proposal boundary will

Site Characteristic	Description
	adhere to any Flood Planning Area and flood related development controls.
Land Reservation Acquisition	None identified.
Contributions Plans	A draft Voluntary Planning Agreement has been made for land at 50-56 Atchison Street St Leonard's.
Biodiversity Certified Land	None identified.
Biodiversity Stewardship Sites	None identified.
Native Vegetation Clearing Set Asides	None identified.
Bushfire Prone Land	None identified.
Property Vegetation Plans	None identified.
Orders Under Trees (Disputes Between Neighbours) Act 2006	None identified.
Directions under Part 3A	The proposal boundary is identified as an item of environmental heritage, therefore complying development types specified within the Rural Housing Code cannot be undertaken on the proposal boundary.
Site Compatibility Certificates	None identified.
Paper Subdivision Information	None identified.
Site Verification Certificates	None identified.
Affected Building Notices	None identified.
Matters Prescribed by Section 59(2) of the Contaminated Land Management Act 1997	Council is not aware of any matters prescribed by section 59(2) of the Contaminated Land Management Act 1997 at the proposal boundary.

3.3 NSW EPA records

A search of various NSW EPA registers was taken from the LotSearch 2022 report. A summary of the results is provided in **Table 3-3**.

Table 3-3 Summary of NSW EPA records

Site Characteristic	Description
NSW EPA Records	<p>Five sites in the records from the NSW EPA Contaminated Land list were identified within the report buffer:</p> <ul style="list-style-type: none"> • Iora Complex – Gasworks, 418m north-east of the proposal boundary • Sub Base Platypus (previously HMAS Platypus) - Gasworks, 475 metres north-east of the proposal boundary

Site Characteristic	Description
	<ul style="list-style-type: none"> • Neutral Bay Sediments – Gasworks, 544m north-east of the proposal boundary • SRA Land – Unclassified activity, 732m west of the proposal boundary • Dawes Point Park – Other Industry, 847m south of the proposal boundary.
NSW EPA Notices	<p>Two sites with records of notices were identified within the report buffer:</p> <ul style="list-style-type: none"> • Sub Base platypus (previously HMAS platypus) with 1 former notice, 475m north-east of the proposal boundary • Neutral Bay Sediments with two former notices, 544m north-east of the proposal boundary.
Site Regulated under the Contaminated Land Management Act 1997	None identified on-site or within the report buffer.
PFAS Investigation	None identified on-site or within the report buffer.
Environmental Protection License (EPL)	<p>Six current licensed activities under the Protection of the Environment Operations (POEO) Act 1997 were identified within the report buffer:</p> <ul style="list-style-type: none"> • Sydney Trains for railway system activities, on-site • John Holland Pty Ltd for road construction, 17m north of the proposal boundary • Royal Sydney Yacht Squadron for boat construction/maintenance, 645m east of the proposal boundary • Sydney Harbour Tunnel Company for miscellaneous licensed discharge to waters (at any time), 658m north of the proposal boundary • Metro Trains Sydney Pty Ltd for railway systems activities, 694m west of the proposal boundary • CPB Contractors Pty Ltd for railway systems activities, 694m west of the proposal boundary. <p>One delicensed activity was identified within the report buffer: Roads and Traffic Authority of NSW for Hazardous, Industrial or Group A Waste Generation or Storage, located at Lower Fort Street Dawes Point. The EPL identifies storage areas for the material under the EPL to be “<i>northern approach, southern approach and main span and the areas labelled 'storage area' and 'compound' as shown on the drawing titled 'sydney harbour bridge alliance - south approach project compound', dated 08/01/2008</i>”. Roads and Traffic Authority of NSW gained this license for the purpose of carrying out waste activities for Sydney Harbour Bridge maintenance. The license</p>

Site Characteristic	Description
	<p>stipulated that the following hazardous and/or industrial and/or Group A waste were allowed to be generated and/or stored at the premises:</p> <ul style="list-style-type: none"> • Lead; or lead compounds • Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnishes (F100) • Waste mineral oils unfit for their original intended use • Waste oil/water, hydrocarbons/water mixtures or emulsions • Containers which are contaminated with residues of the above substances. <p>A waste audit undertaken in 2007 determined that the activity stored and generated wastes other than the license permitted, this notice was dealt with through a negotiation to change the license conditions. The last recorded EPA amendment of the license was made on 31 January 2008, with a review due date of 9 February 2010, inferring that the license was not renewed beyond 2010.</p>
Environmental Protection Licence (EPL)	<p>Seven licensed activities under the POEO Act 1997 that have been revoked or surrendered exist within the report buffer:</p> <ul style="list-style-type: none"> • Luhrmann Environment Management Pty Ltd for Other Activities/Non-Scheduled Activity – Application of Herbicides, 183m south of the proposal boundary • Robert Orchard for Other Activities/Non-Scheduled Activity – Application of Herbicides, 183m south of the proposal boundary • Sydney Weed & Pest Management Pty Ltd for Other Activities/Non-Scheduled Activity – Application of Herbicides, 183m south of the proposal boundary • North Sydney Council for miscellaneous licensed discharge to waters at any time), 230m south of the proposal boundary • Cogent Energy Pty Ltd for generation of electrical power from gas, 563m north-west of the proposal boundary • John Holland Pty Ltd for concrete works, railway systems activities, 697m north-west of the proposal boundary • Darkrow Pty Ltd for Hazardous, Industrial or Group A Waste Generation or Storage, 759m west north-west of the proposal boundary.
National Pollutant Inventory	None identified on-site or within the report buffer.
National Liquid Fuel Facilities	None identified on-site or within the report buffer.

4 Site history

4.1 Historical title search

A historical title search for the proposal boundary was completed in January 2022. The findings are summarised in **Table 4-1**, with copies of the Historical Title Search documentation and Cadastral Records Map provided in **Appendix C**.

Table 4-1 Summary of historical title search

As Regards	Year	Description
8904-3000R (Part 1 & 2)	1925	Acquired by Minister for Public Works (Resumed for Harbour Bridge purposes).
	1935	Acquired by Council of the Municipality of North Sydney (for the purposes of parks and recreation).
Lot 1 DP 236183	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge purposes).
	1935	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Parks and Recreation).
	1967	Acquired by Sydney County Council (for the supply of electricity).
	1981 (to date)	Acquired by Council of the Municipality of North Sydney.
Lot 3 DP 904848	1878	Acquired by John Jones (Freeholder).
	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge Purposes).
	1935 (to 1967)	Acquired by Council of the Municipality of North Sydney (for the purposes of parks and recreation).
Lot 1 DP 743859	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge purposes).
	1935 (to 1967)	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Parks and Recreation).
Lot 18 DP 54205	1877	Acquired by William Sparkes (Hay and Corn Dealer).
	1921	Acquired by Charles Hercules Waterhouse (Commission Agent).
	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge Purposes).
	1935 (to date)	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Parks and Recreation).
Part of Burton Street	1932	Acquired by Minister for Public Works (Resumed for Harbour Bridge Purposes).

As Regards	Year	Description
	1935 (to date)	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Road and Highway).
Lot 1 DP 873687	1911	Acquired by John Frey (Freeholder).
	1912	Acquired by John Adam Butler (Gentleman).
	1913	Acquired by Walter Henry Gors (Gentleman).
	1919	Acquired by Elfie May Marriskill (Spinster).
	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge Purposes).
	1935 (to date)	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Road and Highway).
Point 2 on the Cadastral Records	1926	Acquired by Minister for Public Works (Resumed for Harbour Bridge Purposes).
	1935	Acquired by Council of the Municipality of North Sydney (for the purposes of Public Road and Highway).

4.2 SafeWork NSW Schedule 11 Hazardous Chemicals (Dangerous Goods) Search

A SafeWork NSW Dangerous Goods Search has not been completed as part of this scope of works. The purpose of a Dangerous Goods Search is to check a register of known registered stored dangerous chemicals held by SafeWork NSW as per 2017 SafeWork NSW *Work Health and Safety Regulation; Schedule 11 Placard and Manifest Quantities* (SafeWork NSW 2017). It is used as a useful method of cross checking the Site historical land use with possible onsite contaminates of concern.

Given the requirement for the Site occupier to notify SafeWork NSW (and the relevant previous agencies) it is not always a reliable source of information, as not all Site land users registered onsite chemical storage. Similarly, it is entirely possible to undertake a register search and not received any notification, and still find evidence of chemical storage later in Site works.

The lack of completing a Dangerous Goods Search is not considered to be of significant detriment to the preliminary assessment of the Site, as it is common to not have records for past Site activities. Where possible, other lines of evidence such as historical aerial photography, title search and field observations can be utilised to provide details of possible onsite dangerous good storage.

Overall, a review of other historical factors, coupled with the implementation of a robust Unexpected Finds Protocol (UFP) during construction works would be considered suitable to mitigate the lack of desktop records.

4.3 Aerial photography review

Aerial photographs were sourced from the LotSearch 2022 report for 1930, 1943, 1951, 1955/1956, 1961, 1965, 1970, 1978, 1982, 1986, 1991, 1994, 2000, 2005, 2011, 2016, 2021. These photos were reviewed to

assess the historical use within the proposal boundary. A review of the aerial photography is summarised in **Table 4-2** and the aerial photographs are provided within the LotSearch 2022 Report in **Appendix A**.

It is noted that conclusions drawn from the aerial photographs must be treated with caution as the interpretation is subjective and is often limited by the quality of the photo.

Table 4-2 Summary of aerial photographs

Date	Description of the Proposal Boundary	Description of Surrounding Land
1930	The proposal boundary image is low resolution and does not allow for clear identification of site features. The proposal boundary appears to contain two building structures on the northern section of the proposal boundary, and two structures to the southern section of the proposal boundary.	To the west of the proposal boundary there appears to be a main road (Alfred Street South), with building structures further west. The main road has a crossroad heading south-west (Glen Street). The south-eastern corner appears to be undeveloped land. To the east of the proposal boundary it is hard to discern what the feature is due to the low resolution of the image, however the feature stretches from north to south, and covers a large portion of the surrounding land to the proposal boundary. This is likely land reserved / under construction for the development of the Sydney Harbour Bridge and rail corridor. There are various structures scattered throughout the feature. Further east of the feature there is a main road (Broughton Street), with three other crossroads heading east. The eastern lots appear to all be occupied by buildings.
1943	The proposal boundary contains no structures and appears to be an undeveloped lot or park. The centre of the proposal boundary shows vegetation, and there appears to be boundary lines within the proposal boundary at various sections throughout.	Along the western side of Alfred Street South, the buildings appear to be a combination of commercial and residential type buildings. Further west of the buildings is a railway track/sliding adjacent to the bay. The south-western corner is now developed and contains a rollercoaster track, and various buildings (Luna Park). Immediately east of the proposal boundary now appears to be developed with a large multi lane road, Sydney Harbour Bridge followed by Broughton Street. Lots maintain to be developed and look to be residential housing.
1951	No major changes to the proposal boundary are observed in this photo.	No major changes to the proposal boundary are observed in this photo apart from the construction of a building immediately east of the Bradfield Highway, north-east of the proposal boundary.
1955/1956	Trees have been planted along the western border of the proposal boundary. The triangular path formation remains. It	The surrounding land remains largely unchanged.

Date	Description of the Proposal Boundary	Description of Surrounding Land
	appears that the bowling greens at the southern end of the proposal boundary have been built, with landscaping and retaining walls built to level the southern end of the proposal boundary The lawn bowl club house has been constructed.	
1961	The proposal boundary remains largely unchanged.	The surrounding land remains largely unchanged with only the minor changes to a limited number of individual buildings along the western side of Alfred Street South.
1965	No significant changes to the proposal boundary. It appears vehicles are parked on the northern end of the “Bowling Green” site immediately south of Burton Street.	Some dwellings along the western side of Alfred Street South opposite Bradfield Park North have been demolished and a newer larger building constructed over multiple lots. No other changes are recognised.
1970	The proposal boundary image is low resolution and does not allow for clear identification of more site features. It appears to remain largely unchanged.	The building to the west of the proposal boundary, along the shoulder of Alfred Street South and Glen Street have been redeveloped into larger taller buildings. This is also the case for the residential buildings that were once located in the north-eastern corner of the image. East of the proposal boundary remains largely unchanged.
1978	The proposal boundary remains largely unchanged.	Residential buildings in the south-west of the proposal boundary have been developed. The rest of the surrounding land remains largely unchanged.
1982	The proposal boundary remains largely unchanged.	Minor redevelopment of individual buildings is observed, however generally the surrounding land remains largely unchanged.
1986	The proposal boundary remains largely unchanged.	Several individual lots on the western side of Alfred Street South opposite Fitzroy Street at the southern end of the proposal boundary have been cleared and the lot appears vacant or under early construction. No other significant changes to surrounding lands are observed.
1991	The proposal boundary remains largely unchanged.	The proposal boundary that appeared to be cleared in 1986 appears to now contain a structure. More construction north along Alfred Street South has also occurred, resulting in a new high density building.

Date	Description of the Proposal Boundary	Description of Surrounding Land
		Luna Park located west of the proposal boundary appears to have been dismantled.
1994	The proposal boundary remains largely unchanged.	Construction activities appear to be occurring in the Luna Park location. No other significant changes are observed.
2000	The proposal boundary remains largely unchanged.	Luna Park has been redeveloped with new structures, and rollercoasters. A building to the west of the proposal boundary appears to be under construction at the corner of Alfred and Glen Street. A roundabout has been constructed at the intersection of Lavender and Alfred Street South, north of the site.
2005	The footpaths on the proposal boundary have been extended and all sealed with concrete, the concrete structure in the southern portion has been replaced by a new pathway east-west.	Various high-rise buildings to the east of the proposal boundary have had new roofs put in place. Luna Park appears to have expanded north, with a large new structure as well as various circus tents.
2011	Vegetation (shrubbery/trees) has been planted on the proposal boundary. The northern part of the bowling green site that was previously overlain by grass has now been removed and appears to have hardstand applied (possibly with crushed granite as it is currently).	The train depot along the western boundary of the aerial image has been upgraded. The rest of the surrounding land remains largely unchanged.
2016	The proposal boundary remains largely unchanged.	The surrounding land remains largely unchanged.
2021	The proposal boundary remains largely unchanged.	The layout of Luna Park has changed. A commercial building to the east of the northern section of the proposal boundary has a roof upgrade. The western lanes of the Sydney Harbour Bridge have been upgraded with new road markings. The rest of the surrounding land remains unchanged.

5 Site walkover inspection

5.1 General site observations

An experienced Arcadis environmental scientist undertook a site walkover inspection of the proposal boundary on 18 January 2022.

The proposal boundary is shown in **Figure 2** with copies of photographs from the proposal boundary walkover inspection provided in **Appendix D**.

Observations made by Arcadis field staff during the proposal boundary walkover inspection identified the following key information:

- The northern portion of the proposal boundary currently proposed to be disturbed for the construction of the cycleway consists mainly of road corridor and footpath. These areas were sealed under concrete or asphalt hardstand at the time of inspection
- The majority of the proposal boundary consisted of Bradfield Park, which comprised a combination of landscaped and paved areas with mature trees and established gardens
- Grass cover across the proposal boundary was well established with limited bare soil patches observed
- Exposed soils were in areas of shade and likely as a result of environmental factors such as moisture and shade rather the impact from on-site contamination
- No odours, staining or other evidence of contamination was observed on-site during the walkover
- Multiple historically significant items were identified to be present, most marked with public signage and commentary within the park area. Transport for NSW has engaged a consultant to address matters of historical value to be reported in a separate report and to inform the REF for the proposal
- The northern end of the bowling green (on the southern border of Burton Street) was covered with crushed rock and is used for weekend markets
- Filling of the bowling greens has occurred in the past, as the finished height of the southern of the greens is approximately 1.5 -2.0 metres higher than the surface level of Fitzroy Street (site southernmost boundary).

5.2 Hazardous materials

No evidence of USTs or ASTs were identified during the proposal boundary walkover inspection. The Client (Transport for NSW) anecdotally informed Arcadis that there could be a history of part of the proposal boundary being used as a storage depot during World War 1. Further investigation is required to ascertain the details of this in the form of the council title and dangerous goods search results that are still pending.

No Potential Asbestos Containing Material (PACM) was visually identified on the surface of the proposal boundary; however, a detailed asbestos survey was not included as part of this scope of works. The Client was not aware of PACM being on-site. Arcadis did not identify any hazardous materials assessments conducted for the proposal boundary.

6 Potential contamination identified

6.1 Potential Sources of Contamination

Based on the information detailed in **Section 3.1** to **Section 4.3** and the additional information obtained during the proposal boundary walkover inspection as detailed in **Section 5.1**, a summary of the identified potential sources of contamination at the proposal boundary is shown in **Table 6-1** below.

Table 6-1 Identified potential contamination

Source	Evidence	Potential Contaminants
On-Site		
Presence of potentially contaminated fill material	<ul style="list-style-type: none"> Aerial photographs (showing historical development and filling of the proposal boundary) site walkover inspection. 	<ul style="list-style-type: none"> Total recoverable hydrocarbons (TRH) Benzene, toluene, ethylbenzene, xylene, and naphthalene (BTEXN) Polycyclic aromatic hydrocarbons (PAHs) Heavy metals (Arsenic, Cadmium, Chromium (III+VI), Copper, Lead, Mercury, Nickel, Zinc) Polychlorinated biphenyls (PCB) Potentially Asbestos Containing Material (PACM).
Garden maintenance	<ul style="list-style-type: none"> On-site maintained gardens observed onsite. 	<ul style="list-style-type: none"> Pesticides Herbicides Heavy Metals.
On-site		
Nearby current and historical potentially contaminating commercial/ industrial activities	<ul style="list-style-type: none"> Historical business records for nearby properties including: <ul style="list-style-type: none"> Dry cleaners Automotive garages Aerial photographs indicating: <ul style="list-style-type: none"> Possible staging area during major construction of the rail corridor and Sydney Harbour Bridge Ongoing maintenance of the nearby Rail corridor and Sydney Harbour Bridge Land zoning of the area as mixed use (B4). 	<ul style="list-style-type: none"> TRH BTEXN PAHs Heavy metals Volatile organic compounds (VOCs), e.g., trichloroethylene (TCE) and perchloroethene (PCE) PACM Lead paint flakes.

6.2 Potential Areas of Concern

While a limited number of potentially contaminating activities were identified on and off-site through the desktop study and site inspection walkover, no specific evidence of potential contamination was noted on the proposal boundary at this time. The potential concerns include:

- Anecdotal evidence provided by Transport for NSW indicates that there is a chance that part of the proposal boundary was used as a storage depot during World War II.

Therefore, no PAoCs were identified for the proposal boundary, beyond general potential for presence of potentially contaminated imported Fill material and historical surface application of potential contaminants including pesticides, herbicides, lead paint fragments from painting of the Sydney Harbour Bridge and asbestos from the rail corridor.

7 Preliminary Conceptual Site Model

Arcadis has developed a conceptual site model (CSM) for the proposal boundary, based on the information collated from the desktop study, the proposal boundary walkover and the results of the desktop assessment completed for the proposal boundary.

A CSM assesses potential sources, pathways and receptors at a site and the connections between these. For a potential risk to exist to human health and/or ecological receptor there must be a clear or suspected source-pathway-receptor (SPR) linkage between the known or potential source(s), via a known or potential pathway(s) to a known or potential receptor(s) in relation to the proposal boundary.

The following sections provide a summary of the identified (or potential) sources, pathways, and receptors at the proposal boundary from both current and historical use on and around the proposal boundary.

7.1 Sources

The identified (or potential) sources of contamination within the proposal boundary are:

- **S1** – Potentially contaminated fill material – arising from historical usage and filling of the proposal boundary
- **S2** – Current and historical activities associated with land as a park / garden – application of pesticide and/or herbicides
- **S3** - Off-site sources – cross contamination of the proposal boundary from nearby land uses including commercial / industrial activities
- **S4** – Groundwater contamination – groundwater that could be potentially contaminated as a result of onsite activity, or offsite migration onto the proposal boundary.

7.2 Pathways

The identified (or potential) pathways for contamination to move from the identified sources to the identified receptors within the proposal boundary are:

- **P1** – Ingestion and dermal contact
- **P2** – Vapour / dust Inhalation.

7.3 Receptors

The identified (or potential) receptors of contamination at the proposal boundary are:

- **R1** – Site users (staff and visitors)
- **R2** – On-site ecological receptors (limited)
- **R3** – Construction / Intrusive Maintenance Workers.

7.4 Potentially complete SPR linkages

Table 7-1 provides a summary of the identified potentially complete SPR linkages at the proposal boundary.

Table 7-1 Summary of potentially complete SPR linkages

Potential Source	Pathway	Receptor	Likelihood
S1 - Potentially contaminated fill material – arising from historical usage and filling within the proposal boundary	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R1 – Site users (staff and visitors) • R2 – On-site ecological receptors (limited). 	<ul style="list-style-type: none"> • Low - – The proposal boundary is covered in a combination of Concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to potentially contaminated soils onsite.
	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R3 – Construction / Intrusive Maintenance Workers. 	<ul style="list-style-type: none"> • Possible – intrusive activities onsite that disturb or expose underlying soils may uncover Potentially contaminated fill material.
S2 – Current and historical activities associated with land as a park / garden – application of pesticide and/or herbicides	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R1 – Site users (staff and visitors) • R2 – On-site ecological receptors (limited). 	<ul style="list-style-type: none"> • Low - – The proposal boundary is covered in a combination of Concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported garden soils of a standard suitable for that use. The proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R3 – Construction / Intrusive Maintenance Workers. 	<ul style="list-style-type: none"> • Possible – intrusive activities onsite that disturb or expose underlying soils may uncover contamination as a result of surface application of pesticide and/or herbicides.
S3 - Off-site sources – cross contamination within the proposal	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R1 – Site users (staff and visitors) • R2 – On-site ecological 	<ul style="list-style-type: none"> • Low - – The proposal boundary is covered in a combination of Concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well

Potential Source	Pathway	Receptor	Likelihood
boundary from nearby land uses		receptors (limited)	established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported garden soils of a standard suitable for that use. The proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact. • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R3 – Construction / Intrusive Maintenance Workers. 	<ul style="list-style-type: none"> • Possible – intrusive activities onsite that disturb or expose underlying soils may uncover contamination as a result of offsite migration. This contamination is expected to be located at depth due to migration from neighbouring sites would not only act in a lateral direction, it will migrate down at the same time. Therefore, it is not likely a significant hazard for shallow soil disturbance.
S4 – Groundwater contamination – groundwater that could be potentially contaminated as a result of onsite activity, or offsite migration onto the proposal boundary	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R1 – Site users (staff and visitors) • R2 – On-site ecological receptors (limited) 	<ul style="list-style-type: none"> • Low – – The proposal boundary is covered in a combination of Concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported garden soils of a standard suitable for that use. The proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	<ul style="list-style-type: none"> • P1 – Ingestion and dermal contact • P2 – Vapour / dust Inhalation. 	<ul style="list-style-type: none"> • R3 – Construction / Intrusive Maintenance Workers. 	<ul style="list-style-type: none"> • Possible – While groundwater may not be encountered during any proposed future works onsite, there is a potential for contaminated groundwater to be present. It is possible that, if

Potential Source	Pathway	Receptor	Likelihood
			present, impacted groundwater may be encountered by construction workers, while maintenance staff are unlikely to encounter groundwater as a result of day-to-day maintenance activities.

7.5 Exposure assessment

Given the current status of the proposal boundary, i.e., the area is not enclosed, is open aired, soils are covered with intermittent paved hardstand or well vegetated soils, it is unlikely that there are any significant exposure pathways present on-site at this time.

During construction of the proposal however, it is expected that contact with potentially contaminated soils may occur and will require management at the time.

8 Conclusions and recommendations

8.1 Conclusions

Based on the review of the available information obtained as part of the desktop study and the proposal boundary walkover inspection for the proposal boundary, Arcadis draws the following conclusions:

- The proposal boundary was utilised for low density residential and minor retail land uses prior to its compulsory purchase in 1925/1926 by Minister for Public Works for the construction of the adjacent Sydney Harbour Bridge
- While no specific evidence was noted in the information reviewed, it is considered possible that the proposal boundary was utilised as a staging area for equipment and construction materials during construction of the Sydney Harbour Bridge
- Since completion of construction of the Sydney Harbour Bridge, the proposal boundary has been mostly utilised as a park (from the 1930s) and bowling green (from the 1950s)
- It is considered likely that fill material of unknown origin was placed on the proposal boundary associated with general leveling and the construction of the bowling green
- Adjacent to the proposal boundary, the land has been used for a combination of commercial and residential land uses, some of which could possibly have caused contamination that potentially could migrate (including Automotive workshop and dry cleaners) that could impact proposed cycleway construction areas
- In addition to the known and suspected potentially contaminating land uses identified on and off-site, it is considered that general site and parks maintenance activities at the proposal boundary may have led to minor contamination through the application of pesticides, herbicides or accidental spills of chemicals.

Despite the above, it is considered unlikely that significant contamination is present on the proposal boundary as a result of the historical land use. Furthermore, current conditions on-site being mostly covered with hardstand and grassed soils, limit exposure pathways to the current land user.

Future development of the proposal boundary for the proposal is considered unlikely to cause significant disturbance to the proposal boundary, as it is expected that:

- Soil disturbance would be limited to defined locations and not widespread across the proposal boundary as identified in the winning cycleway proposal design details and construction plans
- Excavations would either be relatively shallow (for construction of pathways) or limited in their extent where deeper (e.g., bored piles, etc.), limiting potential exposure and interaction with site soils.

Excavated soils will be managed through off-site disposal and a Construction Environmental Management Plan (CEMP).

8.2 Recommendations

Based on the conclusions detailed in **Section 8.1**, Arcadis makes the following recommendations for further works within the proposal boundary to facilitate the proposed development:

- Develop an Unexpected Finds Protocol to be implemented during onsite soil disturbance works in the event of the identification of any unforeseen contaminated land evidence
- A targeted site investigation in accordance with the requirements of NEPM 2013 should be undertaken at the proposal boundary to assess site condition and current contamination status, focusing on those areas of proposed future disturbance associated with the proposed development

- The investigation should include in-situ waste classification of soils as any soils requiring off-site disposal will require classification prior to excavation and removal from the proposal boundary, in accordance with the NSW EPA. 2014. *Waste Classification Guidelines – Part 1: Classifying Waste*
- A CEMP and Soil and Water Management Plan (SWMP), if required, should be developed for the proposal boundary based on the findings of the investigation and in-situ waste classification, to inform on the appropriate management, handling and/or disposal of excess soils arising from the proposed development.

9 Limitations

The findings of this report are based on the scope of work described in this report, consistent with a Primary Site Investigation report. Arcadis performed the services in a manner consistent with the standard of care and expertise exercised by members of the environmental profession. That standard of care may change, and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results. No warranties, express or implied, are made. Subject to the scope of work, Arcadis' assessment is limited strictly to identifying typical environmental conditions associated with the subject property. While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Arcadis, or developments resulting from situations outside the scope of this project. Arcadis prepared this report for the sole and exclusive benefit and use of Transport for New South Wales (the Client). Notwithstanding delivery of this report by Arcadis or the Client to any third party, any copy of this report provided to a third party is provided for informational purposes only, without the right to rely. Arcadis cannot accept any responsibility for any use of or reliance on the contents of prepared reports by any third party except where expressly agreed via an agreed and properly executed reliance letter. Subject to the terms of the reliance letter, Arcadis would disclaim all and any liability to any third person in respect of anything or in consequence of anything done or omitted to be done by that person in reliance, whether whole or partial. Information from samples collected by Arcadis or historical data reviewed relating to soil, groundwater, soil vapour, surface water, sediment or other matrix conditions in this document is considered to be accurate at the date of issue. Surface, subsurface, and atmospheric conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the proposal boundary that may exist. Subsurface conditions including contaminant concentrations can change in a limited period of time and typically have a high level of spatial heterogeneity. From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic, and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement. Arcadis' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the proposal boundary walkover and review of data described in this report. It is possible that additional testing and analysis might produce different results and/or different opinions. Arcadis has limited its investigation(s) to the scope agreed upon with the Client.

10 References

- Coffey, March 2018. *DRAFT Preliminary Contamination Risk Assessment: Proposed Geotechnical Boreholes, Alfred Street, Milsons Point NSW DRAFT*.
- Department of Planning, Industry & Environment, *Soil Landscapes of the Sydney 1:100 000 sheet, 2009*.
- Hills Environmental, September 2015. *Sydney Harbour Bridge cycleway connection Milsons Point: Preliminary Environmental Investigation*.
- Artefact Heritage, 2018. *Sydney Harbor Bridge Cycle Ramp – Geotechnical Works, Historical (non-Aboriginal) Statement of Heritage Impacts*. Report to Roads and Maritime Services, March 2018 (Artefact Heritage, 2018)
- LotSearch Enviro Professional, 2022. *LotSearch, 41 Alfred Street South, Milsons Point, NSW 2061, 2022*.
- North Sydney Council, 2008. *Bradfield Park Plan of Management North Sydney: North Sydney Council*.
- NSW Government, North Sydney Council Local Environment Plan, 2013.
- NSW Environment Protection Authority, 2020. *Consultants reporting on contaminated land - Contaminated land guidelines, (NSW EPA 2020)*.
- NSW Environment Protection Authority, 1997. *Contaminated Land Management Act. (CLM Act, 1997)*
- NSW Government. 1997. *Protection of the Environment (Operations) Act, (POEO Act, 1997)*.
- NSW Department of Planning and Environment. 1979. *Environmental Planning and Assessment Act. (EP&A 1979)*.

Appendix A

LotSearch 2022 Report

Appendix B

**Planning Certificates prepared under Section 10.7(2) and
Section 10.7(5)**

Appendix C

Historical Title Search documentation and Cadastral Records Map

Appendix D

Site Walkover Photographs

