Arup

AMP Circular Quay Precinct

Multi-Disciplinary Engineering Services
Planning Justification Report

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Contents

Appendices

1 Introduction

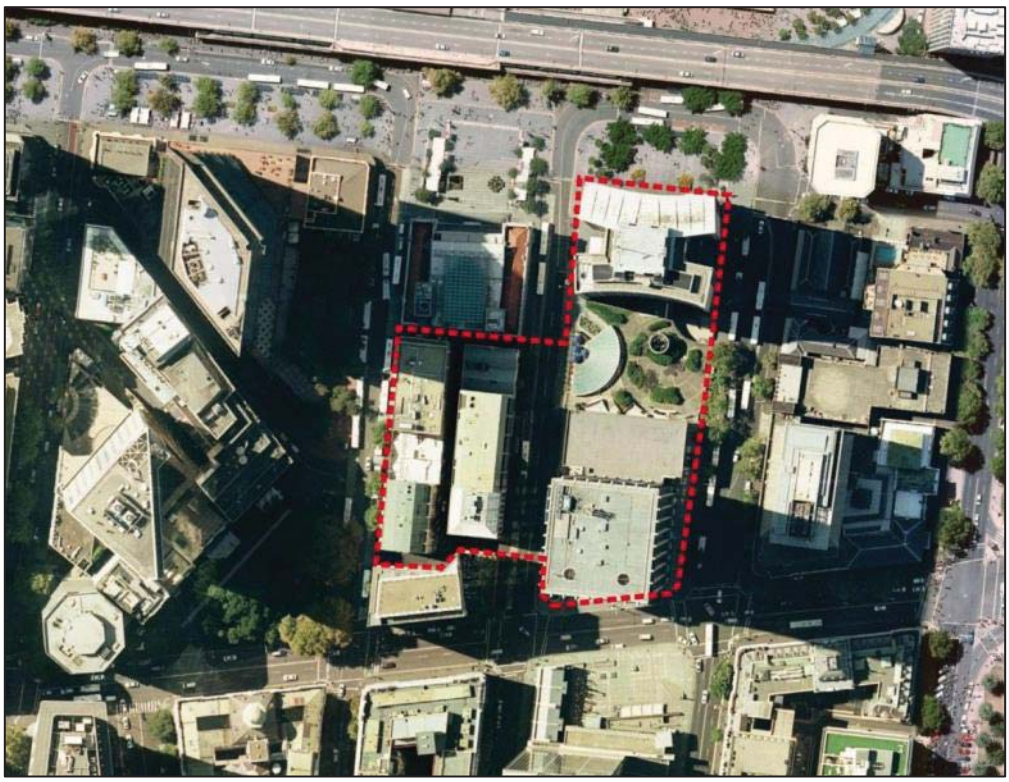
This report has been prepared in support of a formal request to the City of Sydney for an amendment to the Sydney LEP 2012 (SLEP) and Sydney DCP 2012 (DCP) and forms part of the Planning Justification Report submission. This report illustrates the site's capability to realise the proposed future redevelopment of the AMP Circular Quay Precinct (the Precinct) in relation to:

- Geotechnical engineering
- Phase 1 contamination assessment
- Noise impact assessment
- Utilities services

The proposed amendments to the SLEP and DCP seek to facilitate a significant redevelopment of the AMP Circular Quay Precinct by enabling a reduction of achievable development density on the Young and Loftus block and a corresponding increase in achievable development density on the Bridge Street and Alfred Street block. The project will enable a significant transformation, reinforcing the economic viability and functionality of one of the key precincts of the City.

1.1 Site Description

The AMP Circular Quay Precinct is located within an area of the City bounded by Alfred, Loftus, Bridge and Phillip Streets, but excluding land to the north of Customs House Lane and south of the east/west leg of Loftus Lane, as illustrated in the figure below.



The Precinct comprises the properties listed below:

- 33 Alfred Street
- 50 Bridge Street
- 5-7 Young Street (known as Hinchcliff House)
- 9-13 Young Street
- 15-17 Young Street
- 2-10 Loftus Street
- 12 Loftus Street (known as the Gallipoli Club)
- 16-20 Loftus Street

The Precinct contains within it some streets and laneways which are intended to be retained and enhanced. The Precinct also contains three heritage items.

1.2 The Master Plan Concept

The Master Plan Concept seeks to redistribute the built form within the Precinct from the Young and Loftus block to the Bridge & Alfred Street block in order to provide an enhanced urban outcome and provide an overall net public benefit.

The design of the Young & Loftus block will comprise development with diversity in form, scale and materiality, with a mix of uses potentially comprising residential, commercial, education, retail, bars and restaurants. The existing heritage items being Hinchcliff House and the Gallipoli Club will be retained and enhanced. Loftus Lane will be retained and ideally pedestrianised with activated frontages.

The existing overall floor area within the Young & Loftus block will be reduced as a result of reducing the current built form. The reduced built form on the 2-10 Loftus Street site will create a material public benefit by improving sunlight access to Macquarie Place across the winter months as well as enhancing the juxtaposition with Customs House to the immediate north.

It is proposed to redevelop the Bridge and Alfred block with an extension to the existing 50 Bridge Street tower and improved integration with the original AMP Tower at 33 Alfred Street. The existing tower would be retained but substantially altered to create a landmark tower in the Sydney CBD. AMP Tower at 33 Alfred Street as a heritage item would be refurbished and enhanced with improved connections through to 50 Bridge Street. Improved loading and vehicle access arrangements are also proposed.

The proposal involves the transfer of all unrealised floor space within the Young & Loftus block (approximately 22,000sqm GFA) for development within the Bridge & Alfred block. This transferred floor space will be accommodated within the proposed tower extension and new built form connections through to 33 Alfred Street.

The regeneration project will cement the precinct as a corporate headquarters and will assist in the global competitiveness and identity of Sydney.

2 Geotechnical Statement

The following geotechnical desktop study has been provided as a geotechnical statement including:

- Literature search and review of geotechnical, geological, and hydro-geological information including published resources.
- Identification of potential ground-related risks and associated issues that may influence the design.
- Preliminary geotechnical recommendations, including foundations, to permit conceptual proportioning of feasible supports.
- Recommendation for preliminary ground investigation, for execution at a future stage targeting ground-related risks identified in this study.

The information contained in this report represents data gathered from various third party sources. This information had been provided for the purpose of informing preliminary design efforts and to highlight potential issues, the impact of which further design and investigation will seek to quantify at subsequent stages.

2.1 Site Conditions

2.1.1 General

This section introduces particular ground-related conditions considered relevant to the design and construction of the Precinct. These include:

- Geology Setting
- Structural Geology
- Sydney Cove and Tank Stream
- Historic Geotechnical Data / Recent Observations

The nature and expectations regarding these conditions, their specific engineering significance to the Precinct are presented in the subsections below.

2.1.2 Geologic Setting

The 1:100,000 Geological Map of the Sydney Region [1] indicates the site is underlain by man-made fill, and variable extents of peaty quartz sands, silts, and clay. Soils are underlain by Hawkesbury Sandstone which is described as being a medium to coarse-grained quartz sandstone with very minor shale and laminate lenses. The sandstone is generally well-cemented by quartz/siderite overgrowth and clay. The Hawkesbury Sandstone is generally massive or cross-bedded, near horizontally bedded. Regional geologic context is illustrated below in Figure 1.

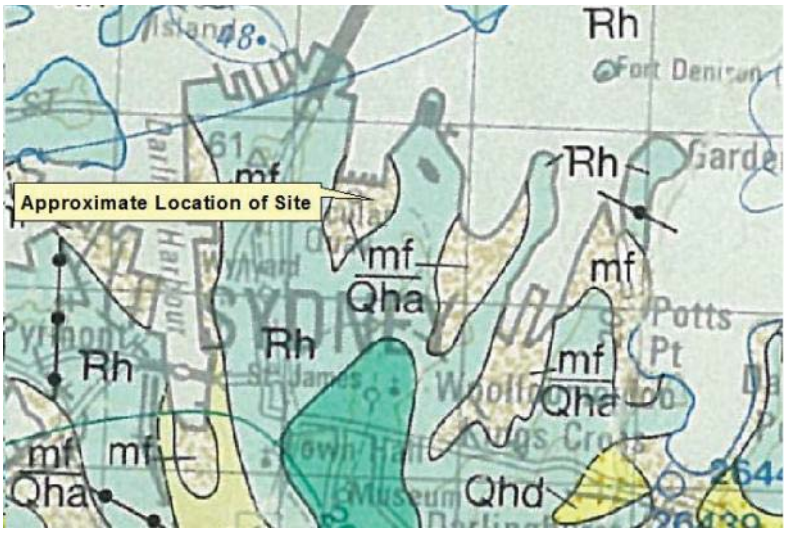


Figure 1 – 1:100,000 Geological Map of the Sydney Region

2.1.3 Structural Geology

The presence of geologic structures could impact the design and engineering of the Precinct. The presence of fractures and defects, including major structures such as faults and dykes, may reduce allowable bearing capacities for foundations, increase groundwater inflow, and present unstable conditions for vertical excavation faces. Furthermore, the release of high in-situ horizontal stresses during excavation can result in ground movement that may affect adjacent properties.

The "Map and selected details of near vertical structural features in the Sydney CBD" [2], illustrated below in Figure 2, indicates that the GPO Fault Zone is likely to transverse the Precinct south-north, and the east-west trending Pittman LIV dyke is just south of the Precinct at Bridge Street.

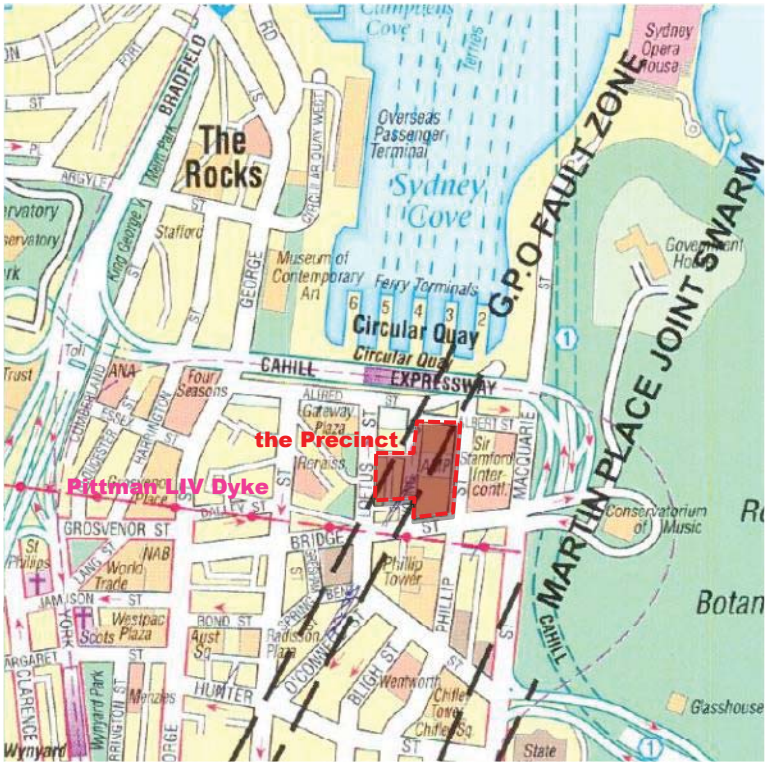


Figure 2 – Structural Geology in Sydney CBD

Common Defects

Widely spaced, vertical and sub-vertical joint sets with joint spacing of up to 3m are common in the Hawkesbury Sandstone. The angle of joint surfaces may vary in the range of 30° on either side of vertical. Joints are usually open, with surfaces mostly rough and iron stained. Major jointing orientations in the Sydney region are NNE-SSW and ESE-WNW. Other common defects include weathered seams, bedding partings, shale/sandstone interfaces and shear zones.

Faults

The GPO Fault trends in a NNE direction across the Sydney CBD, and is shown in Figure 2 to cross both Young and Loftus Block and Bridge and Alfred Block. The GPO Fault has been observed further south at O'Connell Street, and was encountered in geotechnical drilling for 33 Bligh Street, both generally in agreement with the orientation indicated.

The GPO Fault comprises multiple crush zones and closely spaced jointing and faulting with normal and reverse fault offsets. The width of the principle shear zones of the fault likely vary from under 10m to over 20m width, with a greater frequency of fracturing possible for some distance from the interface. Hydraulic permeability values on the order of 100 Lugeon or greater may be associated with such faults.

A previous illustration of the fault based on observations in an excavation at the corner of Sussex and Druitt Streets is indicative of the fault's general arrangement, and is presented below as Figure 3.

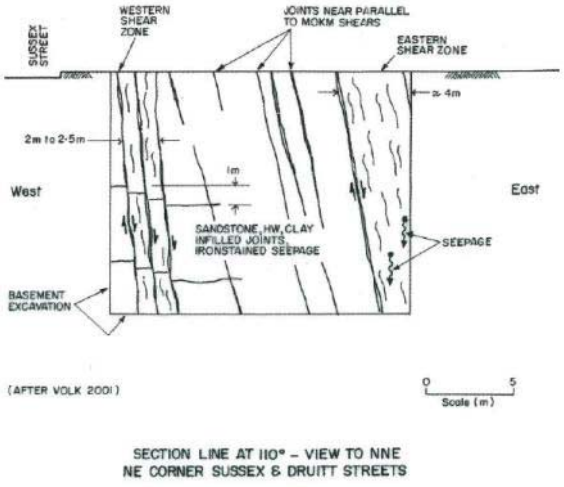


Figure 3 – Illustration of observed GPO fault at NE corner of Sussex & Druitt Street

Dykes

The Pittman LIV dyke runs east-west across the Sydney CBD, and is shown in Figure 2 to be at Bridge Street near Young and Loftus Block, and trending south of Bridge Street at Bridge and Alfred Block. However, it should be noted that the dyke is expected to gently undulate and may intersect 38-42 Bridge Street south of Loftus Lane.

The Pittman LIV Dyke is known to comprise a sub-vertical intrusion of dolerite that ranges from weathered residual clay near surface to mostly fresh rock from depths of approximately 30m. Dolerite is likely weaker and more weathered near boundaries, whilst sandstone at the interface may be partially metamorphosed and closely jointed for several metres.

In-situ Stress of Hawkesbury Sandstone

The Hawkesbury Sandstone of the Sydney Basin is known to have relatively high magnitudes of in-situ horizontal stress that may be several times greater than the vertical overburden. In-situ stresses tend to be greatest in one direction, and the orientation of the principle horizontal stress in the Sydney CBD is generally north-south to slightly northeast. The magnitude and direction of in-situ stress may vary locally with topography.

Notable published documentation regarding in-situ stresses in the Sydney area include Pells [7][8], McQueen [10], and Enever [11]. Speechley [9] presents estimates of likely stress relief on hillside slopes.

2.1.4 Sydney Cove and Tank Stream

Originally the freshwater supply that prompted early settlement of Sydney Harbour, the Tank Stream was ultimately abandoned as a source of fresh water for Sydney as population growth of the colony led to its tainting with drainage and sewage. The Tank Stream now operates as a stormwater channel entirely within drainage culverts between George and Pitt Street, discharging through an outlet in the seawall at the western end of Circular Quay wharves as shown in Figure 4.

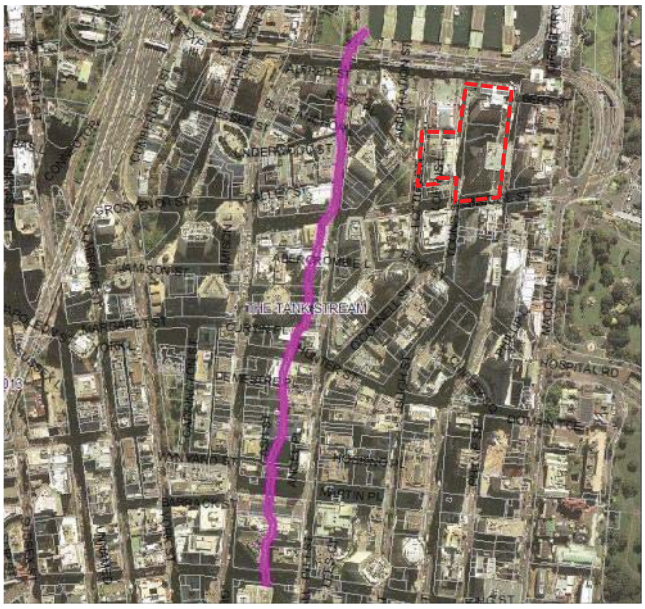


Figure 4 – Present day alignment of channelized Tank Stream (Sydney Water 2006)

The Tank Stream drains the small catchment formed by two ridges straddling a narrow inlet running south from Sydney Harbour, as indicated in the historic map in Figure 5. The original creek was small and the watercourse was weak and intermittent at best, terminating at the start of the cove near present day Bridge Street.

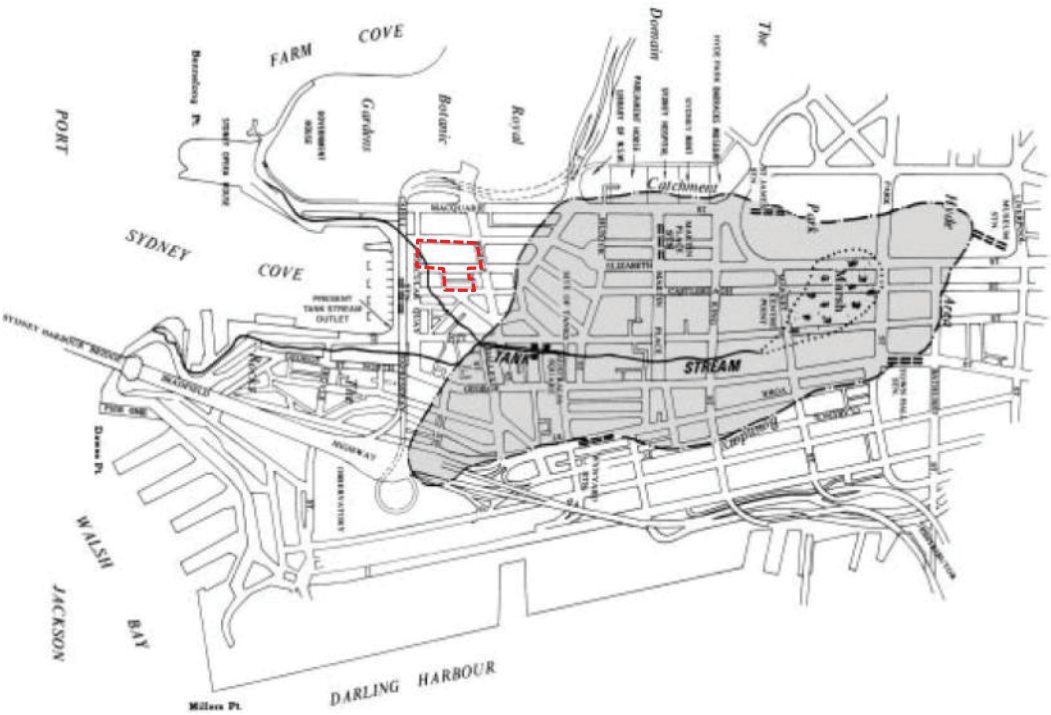


Figure 5 – Tank Stream (http://www.sydneywater.com.au)

The path of the original water course route and bed superimposed beneath the urban Sydney in 1964 is illustrated in Figure 6, indicating that the water line may have curved outward toward the harbour from Alfred Street, just north of the Precinct.

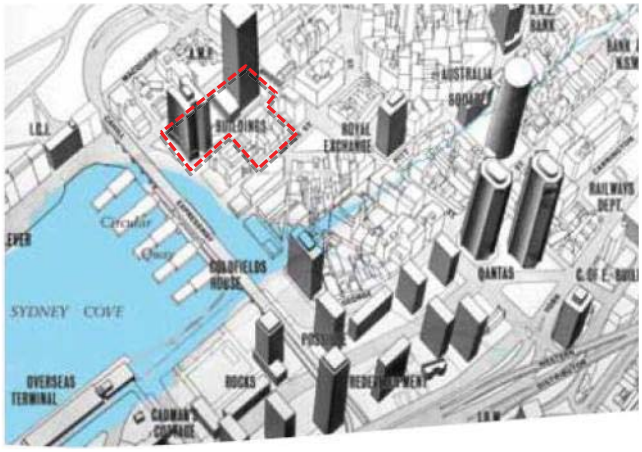


Figure 6 – Tank Stream (Sydney Water Board Journal, 1964:121)

2.1.5 Future Metro Tunnel

Interim Rail Corridor CBD Rail Link & CBD Metro Map 6 of 9 indicates that CBD Rail Link Zone B crosses the southwest corner of the Precinct as indicated below in Figure 7.

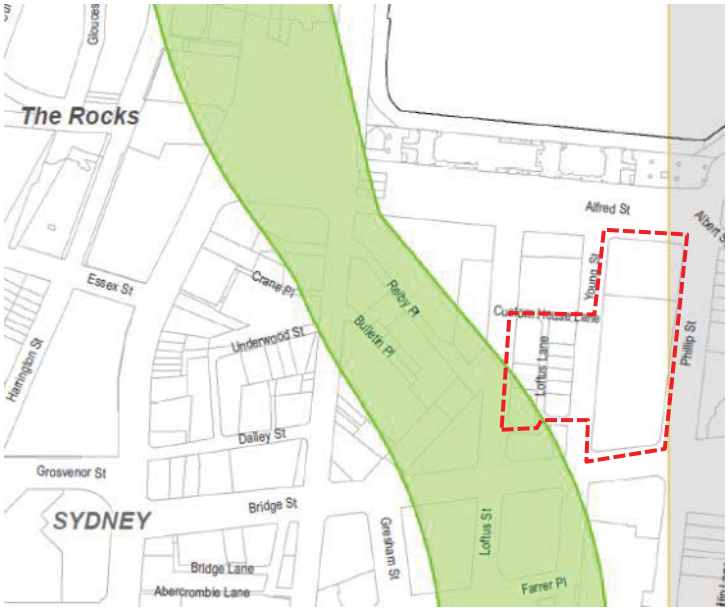


Figure 7 – CBD Rail Link corridor relative to the Precinct (NSW Dept. of Planning, 2007)

It is unlikely that the Precinct will impose any significant engineering challenge to development of the future rail corridor. However it is anticipated that review and approval by the relevant authorities will be necessary for any proposed works in the immediate vicinity.

2.1.6 Historic Geotechnical Data

No drilling records pertinent to the specific properties within the Precinct have been found. Competent sandstone is generally expected from shallow depths, however, experience at First Government House indicates the presence of sub-vertical faulting and shear zones of weaker strength rock.

Site observations of exposed sandstone in the basement of 2-10 Loftus Street indicate the sandstone is competent and self-supporting. It was noted that considerable seepage was observed and is understood from building management to be continuous, though greater during periods of rainfall.

2.2 Recommendations

This section presents engineering advice to inform preliminary design concepts for the Precinct. Refer to the Master Plan Concept documentation for the configurations and extents of existing and proposed conditions, including basements, within the Precinct.

Detailed design will require site-specific investigation to provide a basis for further design and to clarify the ground related-risks identified in this report.

2.2.1 Foundations

A suitable basis for the preliminary proportioning of foundations can be found in the classification system for foundations on sandstone in the Sydney region recommended by Pells [5]. The system is based on the primary criteria of rock strength, fracture frequency, and the extent of weathered seams; competence of rock increases with decreasing 'class' (e.g. Class V is represents the poorest quality rock).

Recommended parameters for preliminary design are provided below in Table 1.

Table 1 –Typical Presumptive Bearing Capacities for Sandstone

Class of Sandstone	Ultimate End Bearing [1] (MPa)	Serviceability End Bearing [1] (MPa)	Ultimate shaft adhesions [3] (kPa)
Class V	>3	1	150
Class IV	8	2	300
Class III	20	4	1000
Class II	60	8	1500
Class I	>120	12	3000

[1] Ultimate values occur at large settlements (>5% of minimum footing dimensions).

[2] End-bearing pressure to cause settlement of <1% of minimum footing dimension.

[3] Clean socket of roughness category R2 of better.

Young and Loftus Block

Proposed excavations at Young and Loftus Block will likely extend into at least medium strength sandstone, and it is expected that support of foundation loads on shallow footings will be suitable. It would be appropriate for preliminary purposes to assume bearing conditions of CL III Sandstone.

Bridge and Alfred Block

New foundations will be required to support the additional superstructure tower north of existing 50 Bridge Street, and may comprise large footings or bored piles.

The construction of new foundations within the existing basement will likely require alterations to the internal configuration of the existing basement. It is

expected that the works will present opportunities to accommodate suitable excavation equipment or construction rigs intermittently during or following demolition works. This will be further developed at subsequent design phases.

Shallow footings for new vertical bearing members could be mined underneath the existing basement. Loads and/or ground conditions may require the deepening of footings, or the use of bored piles if required.

It is anticipated that CL III Sandstone will be encountered from below the existing basement of Bridge and Alfred Block. However, it is possible that CL II or better Sandstone may be encountered, and optimisation of the foundation design will benefit from investigation of conditions at specific load bearing locations.

2.2.2 Excavations and Retention

Issues associated with excavation and retention are primarily of relevance to the proposed new basement for Young and Loftus Block, but will also be applicable to any temporary retention that may be necessary at Bridge and Alfred Block, including local excavations associated with new foundation construction.

Preliminary comments regarding excavation and retention are as follows. The items raised below will form the basis of ongoing detailed design at subsequent stages of the project:

1. The nature and extent of existing shallow retention support along the boundaries requires investigation and coordination during construction such that adequate support is provided.

    a. Excavation at Young and Loftus Block will require a retention system to support street boundaries, and the foundation conditions of adjacent buildings will require inspection and possible underpinning to transfer loads to more competent rock below, if required.

    b. It is expected that a suitable retention system would comprise soldier piles with shot crete infill panels. Piles may extend over the full retained height, or be socketed into suitable rock at a shallower depth if conditions permit. Shoring piles will require lateral support that could be provided by inclined ground anchors. The use of temporary ground anchors requires planning to secure easements and to avoid conflict with buried services and basements of adjacent properties.

2. Construction will involve regular inspections by a qualified geotechnical engineer or engineering geologist to assess in-situ conditions and determine the need for local supports, such as rock bolts, to stabilise fractured areas.

3. Excavation may induce ground movements (including the release of in-situ horizontal stress) which can adversely affect adjacent properties. Detailed design will implement mitigation measures following a risk assessment of the likelihood and impact of estimated movements on sensitive structures in the zone of influence of excavations. Particular attention will be focused on the Gallipoli Club, which will experience new excavation on three sides, and the Bennelong Stormwater Channel. Condition reports and regular survey/monitoring of adjacent properties will occur throughout construction.

4. The presence and extents of proximate geologic structures, most notably the Pittman LIV dyke and GPO Fault, will undergo further assessment and investigation to ascertain possible impacts on design and construction. The presence of such features may considerably reduce allowable bearing capacities for foundations, increase groundwater inflow, and present local or global kinematic instabilities to vertical excavations.

5. Noise and vibration assessments will be required to determine impact of construction works on adjacent areas. It is expected that saw cutting of sandstone at property boundaries would be necessary to avoid over-breaking and to de-couple vibrations caused by mechanical excavation from nearby buildings.

6. The design will weigh up the costs and benefits of adopting either a drained or tanked basement. Further investigation of groundwater levels will occur to inform such a decision.

2.2.3 Ground Investigation

The recommendations provided above are conceptual and represent estimations and expectations based on experience and local practice. Further investigations will occur at subsequent stages to inform ongoing design with such work seeking to address the following:

1. Identify design stratigraphy, including extent of surface material requiring retention.

2. Identify key defects in rock mass that may affect stability of the excavation face. Specifically, clarify the presence of any geologic structures such as the GPO Fault and Pittman LIV dyke within influence of the proposed works.

3. Determine the founding conditions and design bearing capacities at locations and depths of key foundations.

4. Determine groundwater levels and fluctuations/variability.

The above is likely to be achieved by drilling vertical and inclined boreholes in suitable locations, utilising an acoustic televiewer for down-hole visualisation, installation of piezometers for ongoing groundwater measurement, and conducting laboratory testing on rock and soil samples. Any investigation works should be consolidated with other testing requirements for the project.

Drilling locations must be chosen to provide the good site coverage, target critical locations, and respect site constraints. As much as possible, drilling at Young and Loftus Block could be undertaken from peripheral streets such as Loftus and Customs House Lanes. Targeting new foundations for Bridge and Alfred Block may require a low-headroom rig and drilling from within existing basement.

In advance of any drilling work, geotechnical mapping of exposed sandstone in existing building basements will be undertaken. This could be combined with saw-cutting of slots into existing basement walls at key locations, if necessary, to permit visual inspection of existing shallow retention.

2.3 References

[1] Geological Series Sheet 9130 – Sydney 1983, Geological Survey of NSW, Department of Mineral Resources

[2] Pells, Braybrooke, Och, 2004, Map and Selected Details of Near Vertical Structural Features in the Sydney CBD

[3] Woolacott Hale Corlett & Jumikis Consulting Engineers, 1989, Governor Phillip Tower Sydney, Structural Solution for temporary and final support of masonry Oviform Sewer Main at corner of Young Street and Bridge Street, Project Number 555600

[4] Pells, Braybrooke, Och, 2004, Map and Selected Details of Near Vertical Structural Features in the Sydney CBD

[5] Pells, P.N.J., Mostyn, G. and B.F. Walker, 1998, Foundations on Sandstone and Shale in the Sydney Region. Australian Geomechanics, December 1998, pp17-29.

[6] Pells, P.N.J., 1985, Engineering Properties of the Hawkesbury Sandstone

[7] Pells, P.N.J., 1990, Stresss and Displacements around Deep Excavations in the Sydney Area. Proceedings of the 7th Australian Tunelling Conference, pp241-249. Institution of Engineers Australia

[8] Pells, P.N.J. Developments in the design of tunnels and caverns in the Triassic rocks of the Sydney Region. International Journal of Rock Mechanics and Mining Sciences, Vo. 39, 569-587, 2002.

[9] Speechley, L. Walker, B. Scholey, G. Some examples of variability within the Hawkesbury Sandstone, Australian Geomechanics Journal, Volume 39 No. 3, 2004.

[10] McQueen L. In-situ rock stress and its effects in tunnels and deep excavations in Sydney. Australian Geomechanics, Volume 39 No. 3, 2004.

[11] Enever J.R. Near surface in-situ stress and its counterpart at depth in the Sydney metropolitan area. Australian Geomechanics Journal, 34(2): 65-76.

3 Phase 1 Contamination Assessment

The following Phase 1 Contamination Assessment includes a desktop study, site walkover and interviews in accordance with the following:

- NSW Office of Environment and Heritage, *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites*, 2011
- Department of Urban Affairs and Planning and NSW EPA *Managing Land Contamination: Planning Guidelines: SEPP55 - Remediation of Land*, 1998
- ANZECC, NHMRC, Australian and New Zealand *Guidelines for the Assessment and Management of Contaminated Sites*, 1992.
- NEPC, National Environment Protection (Assessment of Site Contamination) Measure Schedule B (2), 1999;
- Relevant City of Sydney planning documentation.

The assessment has focused on identifying the history of uses of the site and specifically on the existence of any potential sources for contamination or hazardous substances. The assessment has included a desktop review, site walkover and interview of appropriate AMP Capital staff.

This Phase 1 Contamination assessment has been made at a level of detail appropriate for the proposed LEP modification, and not with the level of detail required for a Development Application. Features of the new Precinct master plan such as additional excavation in basement areas, access points, land use typology and location of new built form are not finalised at this time so this assessment has focussed on site history and any potential barriers to future development.

This desktop review has been largely informed by a search of supplied documentation on the existing sites within the Precinct.

This assessment has been made on the basis of this desktop review, a single site inspection in October 2012, the details supplied in the *AMP Circular Quay Precinct Masterplan 19 October 2012* documentation and without any previous records of contamination testing or sampling.

3.1 Legislation and Guidelines

The following legislation and guidelines are applicable to the proposed development.

3.1.1 Environmental Planning and Assessment Act 1979

When assessing development applications, Section 79C (1) of the Environmental Planning and Assessment Act 1979 requires the consent authority to consider ‘the suitability of the site for the development’. The risk to health and the environment from contamination is included in this assessment.

3.1.2 State Environmental Planning Policy(SEPP)55 - Remediation of Land 1998

In some situations, the use of land can result in its contamination by chemicals, posing a risk to human health or the environment and precluding later development of a site for particular uses. The purpose of SEPP55 is to establish 'best practice' for managing land contamination through the planning and development control process.

The provisions of Section 6 of SEPP55 are relevant to instances where rezoning would permit a change in use (to a more sensitive land use), requiring the consent authority to consider contamination issues. The existing and proposed zoning of the Precinct allows for a broad range of uses including residential, however, a change to a more sensitive land use within this zone would require guidance from SEPP 55.

Clause 7 of SEPP 55 is relevant to the Precinct and states that a consent authority will not consent to the carrying out of any development on land unless:

- It has considered whether the land is contaminated.
- If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out.
- If the land requires remediation to be made suitable for any purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

3.1.3 Contaminated Land Management Act 1997

The general object of this *Contaminated Land Management Act* 1997 is to establish a process for investigating and (where appropriate) remediating land that the Environmental Protection Authority (EPA) considers to be contaminated significantly enough to require regulation.

The *NSW Office of Environment and Heritage, Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites,* 2011 along with the *Contaminated Land Management Act* 1997 have been used to guide this Phase 1 Contamination Assessment.

3.1.4 City of Sydney Contaminated Land DCP 2004

This DCP is designed to provide a procedure for dealing with contamination issues as they arise in the City's planning, assessment and administrative roles and to ensure that the Council of the City of Sydney carries out its legal responsibilities.

This report has been produced to cover the requirements of a Stage 1 Preliminary Investigation as defined by the Sydney Contaminated Land DCP.

3.1.5 Draft Sydney Development Control Plan 2012

The proposed modification to the Precinct is being made under the Draft Sydney Development Control Plan 2012. This Phase 1 Contamination assessment is being produced in regards to this proposed modification.

The Draft DCP 2012 has been made in accordance with Section 74C of the Environmental Planning & Assessment Act 1979 (the Act) and must be read in conjunction with the provisions of Draft Sydney Local Environmental Plan 2011. Contamination issues are primarily addressed within the City of Sydney Contaminated Land DCP and not within the Draft Sydney DCP 2012.

3.1.6 Draft Sydney Local Environmental Plan 2011

This Phase 1 Contamination Assessment is being produced to inform the proposed LEP amendment to the current Draft Sydney Local Environmental Plan (2011) in regards to contamination.

The entirely of the Bridge and Alfred Block and the Young and Loftus Block are zoned B8 ‘Metropolitan Centre’ under Sheet 14 of the Zoning Map of the Draft Sydney Local Environmental Plan (LEP) 2011. The Precinct adjoins land zoned RE1 Public Recreation to the north.

Any land use is permitted with consent within the Metropolitan Centre zone with consent.

A number of the sites within the Precinct are heritage listed and for these sites the City of Sydney Heritage Development Control Plan 2006 is also applicable. The Heritage DCP requires for the preservation of existing heritage and does not include specific guidance on contamination.

3.1.7 Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (UPSS Regulation)

The Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulations 2008 ‘UPSS Regulation’ focusses on a preventative approach to minimise the risk to soil and surface groundwater contamination. The objectives of the UPSS Regulation are;

- to reduce the environmental risks and harm from leaking UPSS
- to provide a mechanism to ensure early detection of leaks from UPSS
- to ensure the implementation of an appropriate operational management system for consistent record keeping, investigation and reporting of leaks.

The *Guidelines for implementing the POEO (Underground Petrol Storage Systems) Regulation* 2008 have been reviewed as part of this contamination assessment. These guidelines are applicable for future maintenance, modification, use, groundwater monitoring, decommissioning, reporting etc regarding underground storage tanks.

3.2 Phase 1 Assessment

3.2.1 Site Characteristics

Site characteristics including location information and the legal description are presented in the tables below for each of the component sites within the Bridge and Alfred Block and the Young and Loftus Block.

Bridge and Alfred Block

Table 2 50 Bridge Street Site Characteristics

Address	**50 Bridge Street Sydney**
Owner	AMP Capital Investors Ltd
Legal Description	Lot 2 DP1073376
Area	The site encompasses an area of approximately 5,400 m^2
Surrounding land use	North – Commercial tower of 33 Alfred Street (Local heritage listed) South – Museum of Sydney East – Intercontinental Hotel West – Commercial and retail comprising of the Young and Loftus Block
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent.
Heritage	None

Table 3 33 Alfred Street Site Characteristics

Address	**33 Alfred Street**
Owner	AMP Capital Investors Ltd
Legal Description	Lot 1 DP1073376
Area	The site encompasses an area of approximately 2136 m^2
Surrounding land use	North – Cahill Expressway and Circular Quay South – Commercial offices of AMP Centre East – Restaurants and Museum West – Mixed use of Customs House (state heritage listed)
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent. The AMP Building as part of 33 Alfred Street is also heritage listed and The Heritage DCP 2006 regarding use of a heritage item is applicable.
Heritage	Local Heritage Listed

Young and Loftus Block

Table 4 9-13 Young Street Site Characteristics

Address	**9-13 Young Street Sydney**
Owner	Kent Street Pty Ltd
Legal Description	Lot 1, 2, 3, 4 DP 1374760
Area	The site encompasses an area of approximately 587 m^2
Surrounding land use	North- Hinchcliff House and Mixed use of Customs House (state heritage listed) South- Restaurants and Mixed Use East- Commercial offices of AMP Centre West- Loftus Lane and Mixed use of Gallipoli Club
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent.
Heritage	None

Table 5 15-17 Young Street Site Characteristics

Address	**15-17 Young Street**
Owner	Kent Street Pty Ltd
Legal Description	Lot 1 DP 810463
Area	The site encompasses an area of approximately 248 m^2
Surrounding land use	North – Mixed use of 9-13 Young Street and Hinchcliff House South - Restaurants and Mixed Use East - Commercial offices of AMP Centre West- Loftus Lane and Mixed use of Gallipoli Club
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent.
Heritage	None

Table 6 16-20 Loftus Street Site Characteristics

Address	**16-20 Loftus Street Sydney**
Owner	Kent Street Pty Ltd
Legal Description	Lot 1 DP 134861
Area	The site encompasses an area of approximately 440m^2
Surrounding land use	North- Mixed use of Gallipoli Club South- Restaurants and Mixed Use East- Loftus Lane and Mixed Use of 9-17 Young Street West- Public Space- Macquarie Place Park
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the

	Sydney LEP 2012, with any land use permitted with consent.
Heritage	None

Table 7 2-10 Loftus Street Site Characteristics

Address	**2-10 Loftus Street**
Owner	Kent Street Pty Ltd
Legal Description	Lot 501 DP709624
Area	The site encompasses an area of approximately 582 m^2
Surrounding land use	North- Mixed use of Customs House (state heritage listed) South- Mixed use of Gallipoli Club East- Loftus Lane and Mixed Use of 9-17 Young Street West- Public Space- Macquarie Place Park
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent.
Heritage	None

Table 8 Gallipoli Club Site Characteristics

Address	**12-14 Loftus St**
Owner	Gallipoli Club Ltd
Legal Description	Lot 1 DP87960
Area	The site encompasses an area of approximately 297m^2
Surrounding land use	North- Mixed use of 2-10 Loftus St and Customs House (state heritage listed) South- Mixed use of 16-20 Loftus St and Restaurants East- Loftus Lane and Mixed Use of Hinchcliff House West- Public Space- Macquarie Place Park
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent. The Gallipoli Club is heritage listed and the Heritage DCP 2006 regarding use of a heritage item is applicable.
Heritage	Local Heritage Listed

Table 9 Hinchcliff House Site Characteristics

Address	**5-7 Young Street**
Owner	Kent Street Pty Ltd
Legal Description	Lot 1 DP104784, Lot 1 DP723381
Area	The site encompasses an area of approximately 313m^2
Surrounding land use	North- Mixed use of Customs House (state heritage listed) South- Mixed use of 9-17 Young Street East- Commercial offices of AMP Centre

	West- Loftus Lane and Mixed Use of 2-10 Loftus St
Zoning	The site is zoned B8 'Metropolitan Centre' under the Draft Sydney Local Environmental Plan 2011. Development within the Metropolitan Centre is determined by the Sydney LEP 2012, with any land use permitted with consent. Hinchcliff House is heritage listed and the Heritage DCP 2006 regarding use of a heritage item is applicable.
Heritage	State Heritage Listed

Topography

The topography of the site is gently sloping from south to north, in the direction of Bridge Street towards Alfred Street and Circular Quay. The natural ground surface is completely covered by the built form and roads. Vegetation is limited to recently introduced plantings within the AMP Plaza and street trees along Loftus Street, Phillip Street and Young Street.

Geology

The presence of geologic structures could impact the design and engineering of the Precinct. The presence of fractures and defects, including major structures such as faults and dykes may reduce allowable bearing capacities for foundations, increase groundwater inflow, and present unstable conditions for vertical excavation faces. Furthermore, the release of high in-situ horizontal stresses during excavation can result in ground movement that may affect adjacent properties.

No drilling records pertinent to the specific properties within the Precinct have been found as part this desktop review. Local experiences in the vicinity suggest competent sandstone will be encountered from shallow depths.

Site observations of exposed sandstone in the basement of 2-10 Loftus Street indicate the rock is competent and self-supporting as shown in Figure 8.

Figure 8 Exposed sandstone of 2-10 Loftus Street

Hydrogeology

Groundwater in the Sydney city area is typically impacted with heavy metals and sometimes organic compounds such as petroleum hydrocarbons, which could likely be due to regional influences.

A search of the NSW Groundwater bore database has been undertaken (31/10/12). Two groundwater monitoring bores were found within the Sydney city area, being Sydney Water GW109085 at Darling Harbour and Sydney Ports Corporation GW111571 at Walsh bay. Results from these bores are not expected to be indicative of groundwater conditions at the AMP Precinct.

Site observations of exposed sandstone in the basement of 2-10 Loftus Street included considerable groundwater seepage, as shown in Figure 9. It is understood from building management to be continuous seepage, with variation in its rate depending on periods of rainfall.

Detailed groundwater assessment has not been undertaken onsite at this stage and future groundwater assessment will require a series of groundwater sampling wells to be installed.

If groundwater contamination is identified, a Groundwater Management Plan should be prepared to manage groundwater during the dewatering process.

Figure 9 Groundwater seepage 2-10 Loftus Street

3.2.2 Site History

Aerial Photography

Aerial photography for the site has been examined for the years 1930, 1943, 1951 and 1982. Prior to 1930, a series of hand drawn maps of Sydney back to 1822 have been examined to draw conclusions on the gradual development of the street layout and land use type of Sydney Cove and the Precinct in particular. Historical aerial photography and historical plans are included as Appendix A to this report, with interpretation of aerial photography included in this report. The present day location of the Precinct is highlighted on historical photography from 1930 and 1951 in Appendix A.

Early History

Circular Quay is the site of first European settlement in Australia has a long and varied history. Construction work on what was then known as Semi-Circular Quay commenced in 1837[1].

Large numbers of convicts were used on this major work which was completed in 1844. During the construction of the Quay, a substantial portion of present day East Circular Quay was used as the 'Quarry and Works of the Circular Quay'.

Economic depression between 1841 and 1844, sparked by a major reduction of British demand for wool and a decline in investment in the wool industry, meant

[1] *Ralph Sutton, 'George Barney re (1792–1862), First Colonial Engineer', The Engineering Conference 1984: Conference Papers, Institution of Engineers, Australia, 1984, pp 13–17. http://www.dictionaryofsydney.org/entry/east_circular_quay#page=8&ref=notes*

that investment was not readily attracted to the allotments which became available on the eastern side of Sydney Cove. Few of the allotments in the east of Sydney Cove had been purchased by the mid-1850s.

Wool and bond stores and warehouses began to be constructed east of the Tank Stream and on land now comprising the Precinct around the mid-1860s. From the second half of the 1870s and throughout the 1880s, the wool industry underwent a relatively even period of growth and much of the Precinct would have been designated to wool stores and other warehousing throughout this period.

Towards the end of the nineteenth century a shift of commercial focus from Sydney Cove to Darling Harbour and the Pyrmont-Ultimo peninsula may have taken pressure off East Circular Quay, and the area remained relatively undeveloped.

Post 1950's

The demolition of the wool and bond stores typical of Precinct to this point commenced in the 1950s, and made way for buildings such as Unilever House, the first 'modern' office block to be built on the site of the wool and bond stores between 1956 and 1957, and the AMP Building, completed in 1962, which forms part of the modern day Bridge and Alfred Block[2].

Aerial photography from 1930 indicates the Precinct as being fully developed with what would be typical low rise commercial, wool stores and warehousing. Much of this built form is maintained in the 1951 aerial photography, indicating that that the built form of 1930 was largely unchanged through to 1951.

Bridge and Alfred Block

A site plan showing the 1958 layout of the Bridge and Alfred Block is shown in Figure 10. The site marked as AMP Society on this plan is the site of the AMP building of 33 Alfred Street. This site was occupied until 1957 by a brick and stone Wool Store (as seen on 1930, 1943 and 1951 aerial photography) which was constructed in the 1860's by Thomas Sutcliffe Mort, one of the founders of AMP. This building had been constructed on six town allotments and a number of smaller allotments.

The AMP Building was constructed between 1957 and 1962 and is shown on later aerial photography.

The site plan of the Bridge and Alfred Block in 1958, in the Appendices, names some of the more significant buildings as being History House, Malloch House, Tennyson Textiles and Southern Cross fronting Young Street and two sites fronting Bridge Street, being Winchcombe Carson and Co and the Department of Public Works. These and other smaller lots were later fully removed in the mid 1970's[3] construction of the current AMP Centre fronting Bridge Street and its associated podium, retail and basement areas fronting Young and Phillip Streets.

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[2] *Andrew Andersons, 'Macquarie Street: Sydney's Premier Street from 1810 to the Bicentenary', in P Weber (ed), The Design of Sydney, Law Book Company, Sydney, 1988, p 163–164*

[3] JBA Planning Development Application Statement of Environmental Effects (SEE) Land Subdivision 50 Bridge Street and 33 Alfred Street Sydney Oct 2003

Young and Loftus Block

Historical Title searches has identified that the Young and Loftus Block has had many title holders and subsequent uses since the early 1900's.

In the late 1950's 9-13 Young Street was owned by Scott Henderson Ltd and according to the historical records the Australian Wool Testing Authority established a private laboratory for testing of wool on the site. It is unknown whether wool scouring which is a scheduled activity in regards to contamination was undertaken. Australian Mutual Provident Society (AMP) bought the title for this land in 1967.

15-17 Young Street were bought in 1904 by the London Bank of Australia which later became a part of Australia and New Zealand Banking Group Limited (ANZ). In 1927 to 1955 John Walker and Sons Ltd owned the title, however, it is unknown the use of the site at this time although as the company brewed whisky it could have potentially been a licenced pub or an office. From 1955- 1977 the title of land was held by a variety of insurance companies. In 1977 Concrete Construction Pty Ltd took ownership of the title and according to records this company was integral in erecting the Sydney Tower in the early 1980's. AMP bought the title for this land in 1991.

16-20 Loftus Street was owned in 1950-1960s by a variety of title holders including Taminga Units Pty Ltd, potentially converting 16-20 Loftus street into a residential area. In the 1970's Asahi Development Australian Pty Ltd (also owner of Schweppes Australia Pty Ltd) owned 16-20 Loftus Street however the use of the site during this time is unknown. AMP bought the title for this land in 1999.

2-10 Loftus Street was owned from 1955-1983 by Tooth and Co Pty Ltd, a Brewery Company who purchased real estate and numerous hotels throughout the 1900's. According to historical records Tooth and Co leased the site to a Geoffrey Scharer with a Licenced Publican (Pub) known as "North British Hotel". The historical title records do not indicate the date which AMP purchased the land.

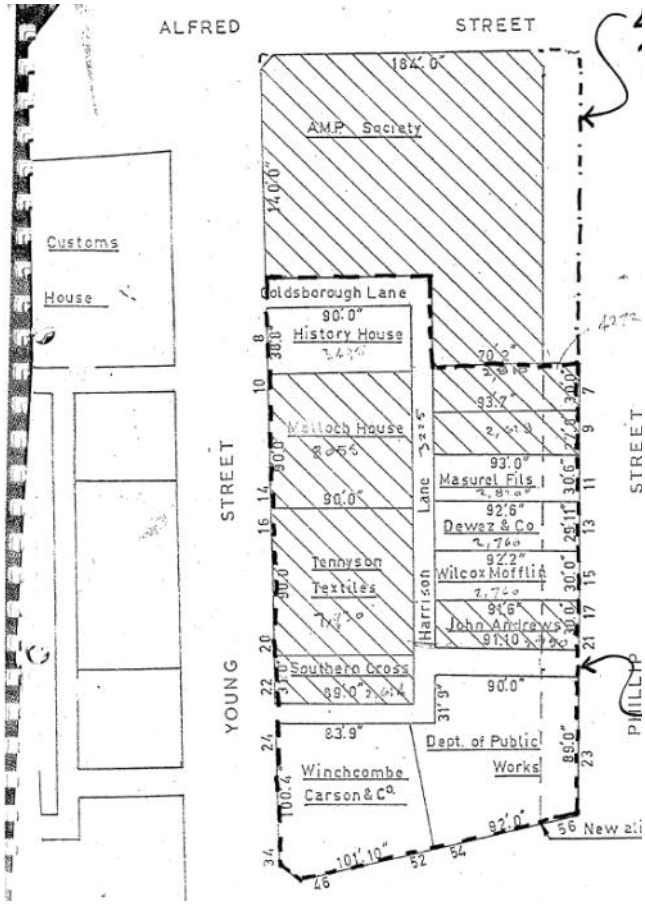


Figure 10 Bridge and Alfred Block 1958

3.2.3 Previous Investigations

Previous investigations have been carried out on the site of the Precinct and have been reviewed as part of this Phase 1 Contamination Assessment to further inform our analysis as listed below.

- JBA Planning Development Application Statement of Environmental Effects (SEE) Land Subdivision 50 Bridge Street and 33 Alfred Street Sydney Oct 2003.
- Godden Mackay Logan Heritage Impact Assessment Report 50 Bridge Street and 33 Alfred Street Sydney, October 2003.

Numerous site plans and planning documentation associated with the subdivision of 50 Bridge Street from 33 Alfred Street in 2004 have also been reviewed.

3.2.4 Site Inspection

Arup attended a site visit on 11 October 2012 at the Precinct. Arup met with building managers in the basement areas for each of the Bridge and Alfred block and the Young and Loftus block. Notes from the site inspection are included below.

Bridge and Alfred Block

- Pits and services are located along the northern wall of basement beneath AMP Centre.
- Disused in-ground petrol and diesel tanks (approximately 20,000L) are located on Level B3 of 50 Bridge Street as shown in Figure 11. Tanks were used for refuelling of private vehicles as part of a vehicle service provided approximately 20 years ago. Sub surface contamination from spillages expected to be very likely.
- Operational sewage pit beneath Chiller Room.
- Dual vehicle access points from Young Street.

Figure 11 Location of Fuel Storage Tanks- Bridge and Alfred Block

Young and Loftus Block

9-13 Young St

- Two underground diesel tanks were located adjacent to the wall adjoining 15-17 Young Street. Diesel tanks are on street level. AMP plans to pump out the remaining fuel and undertake soil testing, classification and sign off of these tanks by end of 2012.

15-17 Young St

- One underground diesel tank at street level adjacent to the vehicle entry from Loftus Lane.

16 – 20 Loftus Street

- Entry via Loftus Lane. One above ground diesel tank on basement level 2. The tank has been recently assessed, a plan exists for its removal.

2 – 10 Loftus Street

- Exposed sandstone walls were observed within the Level 3 Basement of 2-10 Loftus Street as shown on Figure 9. Groundwater seepage through the wall was found on the lower level adjacent to the Gallipoli Club. The building manager advised the level of seepage increases in wet weather, decreases to a trickle or is non-existent during dry periods.

Loftus lane

- Existing use is as loading vehicle access and plant rooms etc. Existing access to 9-17 Young Street 16-20 Loftus Street and 2-10 Loftus Street.

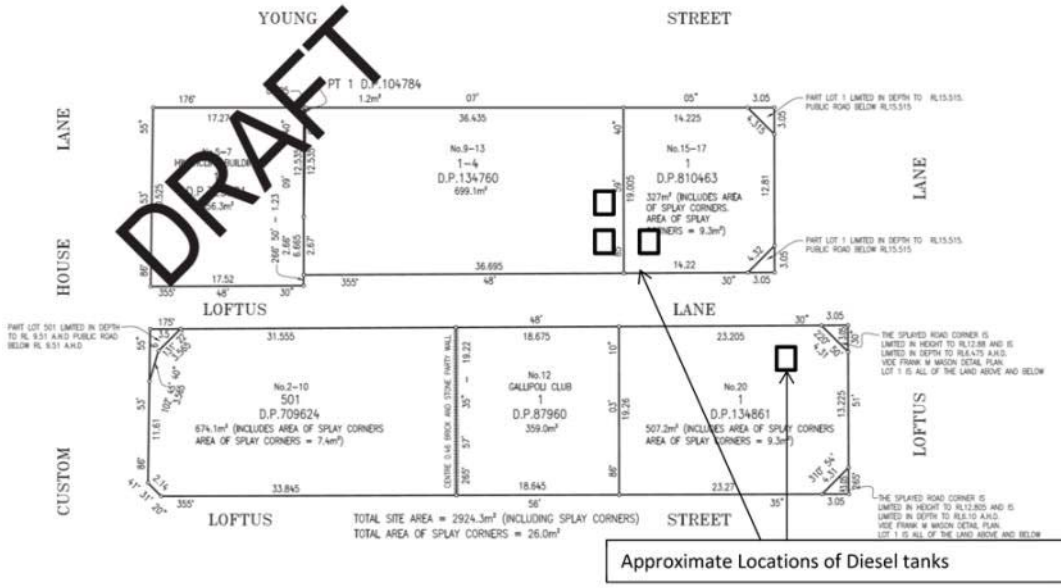


Figure 12 Location of Fuel Storage Tanks- Young and Loftus Block

3.2.5 Certificate of Title Review

A historical title search has been carried out for the Bridge and Alfred Block and the Young and Loftus Block. Results of this historical title search are summarised in the tables below.

Bridge and Alfred Block

Table 10 Certificate of Title Review 50 Bridge Street

Year	Proprietor
2005- Present	AMP Capital Investors Ltd and ACPP Office Pty Ltd
2004-2005	AMP Life Ltd & AMP Capital Investors Ltd
1970-2004	Australian Mutual Provident Society
1943- 1970	W P Martin and Co Pty Ltd

Table 11 Certificate of Title Review 33 Alfred Street

Year	Proprietor
2005- unknown	AMP Capital Investors Ltd
2004-2005	AMP Life Ltd & AMP Capital Investors Ltd
1970-2004	Australian Mutual Provident Society
1943- Gap in information	W P Martin and Co Pty Ltd

Young and Loftus Block

Table 12 9-13 Young Street Certificate of Title Review

Year	Proprietor
Current owner	Kent Street Pty Ltd
1967- unknown	Australian Mutual Provident Society (AMP Capital Investors Ltd)
1946-1967	Scott Henderson Pty Ltd
1930-1946	Albert Littlejohn
1853-1930	Granted to William Long & Thomas Wolley

Table 13 15-17 Young Street Certificate of Title Review

Year	Proprietor
Present	Kent Street Pty Ltd
1991- unknown	Australian Mutual Provident Society (AMP Capital Investors Ltd)
1984-1991	Perpetual Trustee Company Ltd
1981-1984	Earlstoke Pty Ltd
1977-1981	Concrete Construction Ltd
1972-1977	Abby Orchard Property Investments
1970-1972	Four Millbank Nominees Ltd
1969-1970	Kilmannack House Pty Ltd
1959-1969	Manufactures Mutual Insurance Custodian Trustees (Canberra) Ltd
1959	Loftus Pty Ltd
1955-1959	The London Assurance
1927-1955	John Walker & Sons Limited
1915-1927	George Stanley Littlejohn and Albert Littlejohn
1904-1915	London Bank of Australia
1903-1904	Robert Matcham Pitt

Table 14 16-20 Loftus Street Certificate of Title Review

Year	Proprietor
Present	Kent Street Pty Ltd
2004- unknown	AMP Capital Investors Ltd
1999-2004	AMP Life Ltd
1996-1999	HSH Hotels Australia
1991-1996	West Australian Trustees Ltd
1972-1991	Asahi Development Australia Pty Ltd
1971-1972	Taminga Units Pty Ltd
1965-1971	Loftus House Pty Ltd
1953-1965	Malvern Building Pty Ltd

Table 15 2-10 Loftus Street Certificate of Title Review

Year	Proprietor
Present	Kent Street Pty Ltd

1983- (gap in information)	Huztown Pty
1955-1983	Tooth & Co Limited
1920-1955	Kuglingu & Fernau Ltd
1848-1920	Benny Eldred Hindson & William Innes
1845-1848	Jeremiah Donovan

Table 16 Gallipoli Club (12-14 Loftus Street) Certificate of Title Review

Year	Proprietor
Present	Gallipoli Club Ltd

Table 17 Hinchcliff House (5-7 Young Street) Certificate of Title Review

Year	Proprietor
Present	Kent Street Pty Ltd

3.2.6 Spills, Loss or Discharge History

A search of NSW EPA records for notices under Section 58 of the Contaminated Land Management Act have been undertaken with no records found for sites within the Precinct.

Present and Past Contaminating Processes

The historical ownership of each site has been summarised in Section 3.5. A Planning Certificate under Section 149 of the Environmental Planning and Assessment Act 1979 has been obtained from the City of Sydney Council for each site within the Precinct and has been reviewed.

Where a previous land use of the Precinct is listed in Appendix 1 of the Sydney Contaminated Land DCP 2004 a Stage 2 detailed site investigation regarding contamination will be carried out at subsequent design stages in accordance with the NSW EPA Guidelines. While a potential 'brewery' land use may be associated with 2-10 Loftus Street (Tooth and Co Limited occupied the site from 1955-1983) which is a land use listed on Appendix 1, it is assumed this land use was more likely a Public House or office of Tooth and Co (which was a brewing company) as opposed to a brewery.

In the late 1950's 9-13 Young Street was owned by Scott Henderson Ltd and according to the historical records the Australian Wool Testing Authority established a private laboratory for testing of wool on the site. This purpose most likely required the use and storage of some chemicals but not chemical manufacture.

None of the previous land uses for the Bridge and Alfred Block or the Young and Loftus Block are expected to be of high risk for contamination, with previous ownership and land use being a combination of wool storage, warehousing, public houses and more recently commercial and retail purposes.

Underground Storage Tanks

Approximately six diesel and petrol fuel storage tanks are known to occur throughout the basement areas of the Precinct, refer to Figure 11, Figure 12 and

Table 18. These tanks are known to have been used for refuelling purposes and as such are likely to be associated with some surrounding soil and groundwater contamination. Tanks are located below ground at 50 Bridge Street (2 x Diesel or Petrol), 9-13 Young Street (2 x Diesel), 15-17 Young Street (1 x Diesel) and aboveground at 16-20 Loftus Street (1 x Diesel).

AMP Capital recently engaged Ross Mitchell and Associates for the abandonment of diesel fuel storage infrastructure at three properties within the AMP Precinct (October 2012). The scope of this abandonment work is the remediation of underground and above ground tanks by:

- Removal of the residual diesel from the storage tanks and disposal to a licensed waste handling facility.
- Abandonment of the underground tanks using Benefil foam filling product.
- Disconnecting of pipe work to the aboveground tank.
- Environmental investigation of the diesel fuel storage tanks.
- Preparation of a report detailing the findings of the investigation and necessary certificates.

The results of this abandonment work would be of use for any future contamination assessment associated with the Precinct.

Table 18 Summary of all fuel tanks within the Precinct

Site	Fuel Type	Location	Size of Tank	Current Status
50 Bridge Street	Diesel or Petrol	Below ground	20,000 L	Disused
	Diesel or Petrol	Below ground	20,000 L	Disused
	Diesel or Petrol	Below ground	20,000 L	Disused
9-13 Young Street	Diesel	Below ground	unknown	To be decommissioned/ abandoned 2012
	Diesel	Below ground	unknown	To be decommissioned/ abandoned 2012
15-17 Young Street	Diesel	Below ground	unknown	To be decommissioned/ abandoned 2012
16-20 Loftus Street	Diesel	Above ground	unknown	To be decommissioned/ abandoned 2012

Underground Services

The Precinct is serviced and intersected by a network of underground services including the Bennelong Stormwater Channel, sewer, trade waste, potable water, natural gas, electrical cables and conduits and optic fibre. Underground service lines may be associated with contamination due to possible leaks from pipelines and the fill material within service trenches.

The Bennelong Stormwater Channel is a heritage-listed structure under the jurisdiction of Sydney Water. The channel is understood to be cast iron cement lined within its historic brick-lined oviform section. It is known to cross the Precinct diagonally, as well as underneath Loftus Street, Young Street, and Phillip Street as depicted in Figure 13.

The Bennelong Stormwater Channel crosses Young and Loftus Block diagonally from the boundary of Gallipoli Club and 2-10 Loftus to the edge of 9-13 Young Street near Hinchcliff House. A connection underneath the sewer is proposed, joining the new basements. The channel continues across Bridge and Alfred Block, underneath existing basement structure just south of 33 Alfred Street.

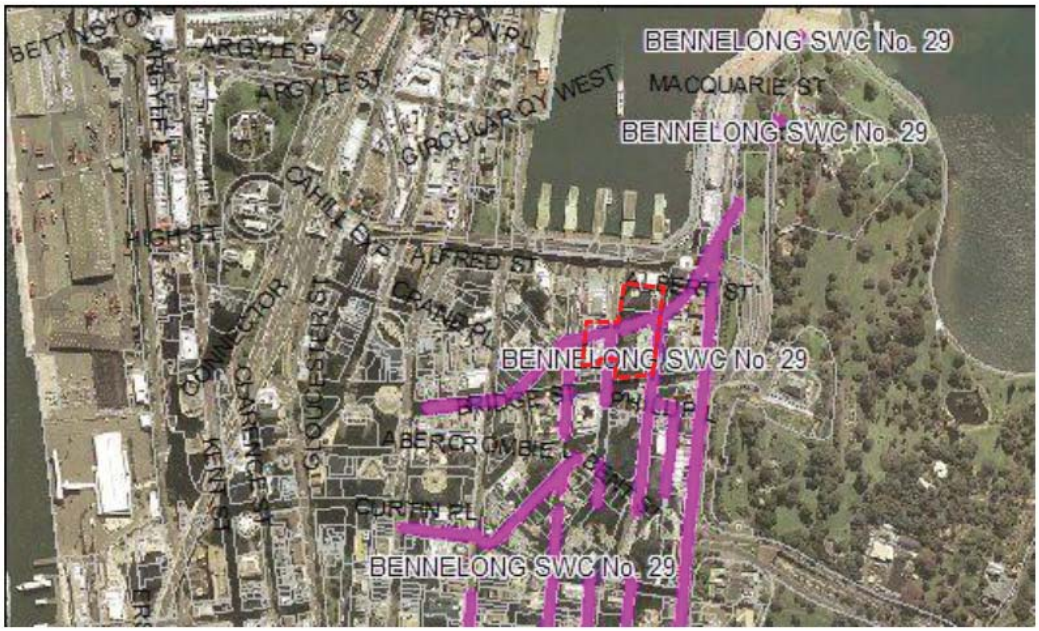


Figure 13 – Physical curtilage plan for Bennelong Stormwater Channel No.29. (Sydney Water, 19-06-2006)

Soils and Fill

Any existing fill material on the site, as displayed by other harbour front sites in Sydney, is likely to be a mixture of natural soils, dredged estuarine sand and mud, excavated rock and demolition and waste materials. Fill is often a heterogeneous mixture of sand, sandy gravel and sandy clay with cobbles and boulder sized rock fragments.

The fill material is unlikely to be able to be beneficially re-used and will be required to be disposed of offsite in accordance with the NSW Office of Environment and Heritage *Waste Classification Guidelines* (2011). To determine whether the fill is classified as general waste or restricted solid waste will require further understanding of the contaminant concentrations through environmental sampling and analysis.

Experience at several harbour foreshore and reclaimed sites in and around the city has shown that excavated soil containing low level contamination that precludes it from being reused as fill elsewhere is common.

Acid Sulfate Soils (ASS) are likely to be present in any harbour sediments that may be used as fill on the site, and in any alluvial soils present. If ASS is identified, it should be managed in accordance with an ASS Management Plan to minimise the risk of acid generation. Identified ASS should also be treated prior to disposal off-site.

Classification of spoil from residual soils as Virgin Excavated Natural Material (VENM) is unlikely due to the site history, however there may be potential for any excavated natural soils to be classified as Excavated Natural Material and be beneficially reused (e.g. as bulk fill) if validated correctly.

Validation of ENM would require a classification process in accordance with the *Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A.*

Sampling must be undertaken in accordance with *Australian Standard 1141 Methods for sampling and testing aggregates* (or equivalent). Sampling and information on sample storage and preparation must be detailed in a written sampling plan.

3.3 Results of Phase 1 Assessment

3.3.1 Area of Potential Environmental Concern

For Areas of Potential Environmental Concern, or hotspots, a grid based soil sampling regime (boreholes or test pits with multiple samples from each) would be required to meet the minimum standard of site characterisation (AS4482.1). It should be noted that the number of sampling points required would depend on the size or shape of hotspots, results from initial sampling points, or the division of the site into separate areas. The actual number of sampling points for hotspot detection will be determined by an investigator on a site specific basis. Depending on final land uses a more closely spaced grid pattern of sampling may be required than the minimum requirements.

Fuel storage and refuelling activities associated with diesel storage tanks is known to have occurred in the past beneath both the Bridge and Alfred Block and the Young and Loftus Block, therefore a series of hotspot testing may be required here as part of future detailed investigations. This hotspot testing may also be required for lane way areas in particular Loftus Lane in the vicinity of 9-17 Young Street.

3.3.2 Next Steps

Prior to any redevelopment of the Precinct which is likely to include some excavation and modification of land uses there will be requirement to undertake future sampling and testing across the site. This sampling and testing is required in order to adequately determine the extent of contamination as existing information on contamination across the site is limited.[4]

[4] Australian Standard AS4482.1 – 2005 Guide to the investigation and sampling of sites with potentially contaminated soil

The results of the site historical search indicate that no land uses listed on Appendix 1 Schedule of Potentially Contaminating Activities of the *Sydney Contaminated Land DCP* 2004 are likely to have been undertaken at the Precinct. A Stage 2 Detailed Site Inspection as described in the Sydney Contaminated Land DCP 2004 will form part of the next steps as the Stage 1 preliminary investigation demonstrates the potential for, or existence of contamination that may not be suitable for the proposed use of land without remediation. This potential contamination includes diesel contamination of subsoils associated with known historical basement fuel storage and refuelling activities. Elements of a Stage 2 Detailed Site Investigation, including soil testing will form part of the abandonment contract currently being undertaken by Ross Mitchell and Associates for diesel tanks at 9-13 Young Street, 15-17 Young Street and 16-20 Loftus Street.

The area of Loftus Lane has a number of diesel tanks within close proximity and due to the importance of laneways and public use of these areas in the proposed Masterplan, this area as a potential contamination hotspot will require detailed site investigation as part of Phase 2 investigation.

Testing of groundwater quality in basement areas should also be undertaken due to the potential for contaminated groundwater infiltration into any future excavations or demolitions.

3.4 Conclusions and Recommendations

The study indicates the following issues with respect to contamination:

- Fill material may contain heavy metals and organic contaminants that are typically present in Sydney Harbour sediments.
- Acid Sulfate Soils may be present in any fill used at the site.
- Experience at several harbour foreshore and reclaimed sites in and around the city has shown that excavated soil containing low level contamination that precludes it from being reused as fill elsewhere is common. However, portions of the site, subject to testing, may have potential for excavated natural soils to be classified as Excavated Natural Material and be beneficially reused (e.g. as bulk fill) if validated correctly.
- The contamination status of groundwater on the site is to be determined. Testing of groundwater quality is basement areas should also be undertaken due to the potential for contaminated groundwater and infiltration of this water into any future excavations or demolitions.
- It is considered likely that any site contamination will be limited to hotspot soil contamination at various locations across the site, and in particular associated with the former fuel storage activities. Where these fuel storage facilities are decommissioned in accordance with the 2008 UPSS Regulation, we expect that any residual contamination issues will be minor in nature and likely represent insignificant constraints to development.
- Prior to redevelopment it is likely that a detailed site assessment will need to be undertaken in accordance with *NSW Office of Environment and Heritage*

Guidelines for Consultants Reporting on Contaminated Sites (2009) and the Sydney Contaminated Land DCP 2004 as part of the development application for the site. Following this, a Site Remedial Action Plan may also be required to be produced and approved before construction can commence.

Table 19 Summary of conclusions

Location	Activity/Observation	Potential contaminant of concern
All	Contaminated fill material typically present in Sydney Harbour sediments	Heavy metals/ Organic Contaminants consisting of; Asbestos, Arsenic, Cadmium, Total Chromium, Copper, Lead, Nickel, Zinc, Mercury (inorganic), Sulphate, Total Cyanide, Speciated Phenols, PCBs, OCP/OPP, Total Petroleum Hydrocarbon ($C_6 – C_9$, $C_{10} – C_{36}$), Benzene, Toluene, Ethyl benzene, Xylene, Total PAHs, Benzol(a)Pyrene).
All	Acid Sulfate Soil fill material potentially used on site	Acid Sulfate Soils
Sites mentioned in section 3.4.	Disused Diesel/Petrol Tanks	Total Petroleum Hydrocarbons, Benzene, Toluene, Ethyl benzene, Xylenes
9-13 Young Street	Wool testing laboratory	Heavy metals/ Organic Contaminants
Young and Loftus Block	Wool storage practices	Heavy metals/ Organic Contaminants

3.5 References

Andrew Andersons, *'Macquarie Street: Sydney's Premier Street from 1810 to the Bicentenary', in P Weber (ed), The Design of Sydney, Law Book Company, Sydney,* 1988, p 163–164

ANZECC, NHMRC, *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites,* 1992.

Australian Standard AS4482.1 – 2005 *Guide to the investigation and sampling of sites with potentially contaminated soil*

Australian Standard 1141 *Methods for sampling and testing aggregates*

City of Sydney Council *Sydney Contaminated Land DCP* 2004

Department of Urban Affairs and Planning and NSW EPA *Managing Land Contamination: Planning Guidelines: SEPP55 - Remediation of Land*, 1998

Geological Survey of NSW, Department of Mineral Resources, *Geological Series Sheet 9130 – Sydney* 1983,

Godden Mackay Logan *Heritage Impact Assessment Report 50 Bridge Street and 33 Alfred Street Sydney,* October 2003.

Hassall, *AMP Circular Quay Precinct Masterplan* 19 October 2012

JBA Planning *Development Application Statement of Environmental Effects (SEE) Land Subdivision 50 Bridge Street and 33 Alfred Street Sydney* Oct 2003.

NEPC, *National Environment Protection (Assessment of Site Contamination) Measure Schedule B (2*), 1999;

NSW Natural Resources Atlas (Groundwater bore database) accessed 31/10/12. *http://waterinfo.nsw.gov.au/gw/*

Office of Environment and Heritage NSW, *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites*, 2011

Office of Environment and Heritage NSW, *Guidelines for Consultants Reporting on Contaminated Sites* (2009)

Office of Environment and Heritage NSW, *Guidelines for implementing the POEO (Underground Petrol Storage Systems) Regulation* 2008 Draft

Ralph Sutton, 'George Barney re (1792–1862), *First Colonial Engineer', The Engineering Conference 1984: Conference Papers, Institution of Engineers, Australia,* 1984, pp 13–17.
http://www.dictionaryofsydney.org/entry/east_circular_quay#page=8&ref=notes
Sydney Water, *Physical curtilage plan for Bennelong Stormwater Channel No.29* (19-06-2006)

4 Noise Impact Assessment

The following identifies acoustic considerations relating to the proposed Precinct development including:

- Ambient noise survey to assess the existing noise environment
- Potential impacts from the development to the community
- Potential impacts from the existing noise environment on the development

The acoustic analysis has been based upon:

- An unattended and attended noise survey undertaken at the site
- Analysis and review of noise data
- Latest architectural drawings provided by Hassell dated 22 October 2012
- Preliminary information regarding building services provided by Arup

The acoustic design targets have been derived from the following regulations and Australian Standards:

- NSW Industrial Noise Policy, Environmental Protection Authority (INP), January 2000
- AS 2107:2000: Acoustics – Recommended design sound levels and reverberation times for building interiors
- City of Sydney standard conditions of development consent, sections (62) Noise-General and (67) Noise-Mechanical plant and equipment
- New South Wales Environment & Heritage Road Noise Policy (RNP), March 2011

For the purposes of our assessment, we have classified all noise sensitive receivers associated with the Precinct as residential and commercial. This is to assess the relative impacts on the different land uses.

A glossary of the acoustic terminology used in this document is presented in the Appendix B.

4.1 Criteria

4.1.1 Industrial Noise Policy (INP)

This section outlines applicable noise criteria. Noise criteria are provided to maintain on site acoustic amenity and avoid adverse acoustic impacts to the surrounding environment.

The INP covers noise emissions from the proposed operation of a facility and from other plant and equipment affecting the proposed facility. Noise from traffic movements on a site (i.e. not on public roads) is assessed as being operational noise under the INP.

The objective of the INP is to protect sensitive receivers, such as residences, from noise generated by commercial, industrial or trade premises. Noise limits are set based on land use in the area and existing background noise levels. Compliance is

achieved if the adjusted L_{Aeq} noise level at any sensitive receivers affected by noise from the facility is below the noise limit. The adjusted L_{Aeq} is determined by applying corrections for such noise characteristics as duration, intermittency, tonality, and impulsiveness.

The assessment of noise emission under the INP is based on the calculation of a noise limit at a receiver position, taking into account the land-use in the surrounding area and the existing background noise level.

The INP separates the 24 hour day into three different time periods – day, evening and night. These time periods are detailed below in Table 20.

Period	Day of Week	Time period
Day	Monday-Saturday Sunday, Public Holidays	7:00 am-6:00 pm 8:00 am-6:00 pm
Evening	Monday-Sunday	6:00 pm -10:00 pm
Night	Monday-Saturday Sunday, Public Holidays	10:00 pm -7:00 am 10:00 pm -8:00 am

Table 20 Standard INP time periods

The INP states that background noise levels should be determined over the "days and times of operation of the project". When setting criteria, only the measured data from the hours of operation of the project should be included.

The INP provides guidance on acceptable noise levels from the introduction of new industrial noise sources to an area. The assessment procedure for industrial noise sources has two components:

- Controlling intrusive noise impacts in the short term for residences.
- Protecting noise level amenity for particular land uses such as residences and commercial offices etc.

Both of these components result in noise criteria that should not be exceeded in order to avoid any adverse noise impacts on the affected areas. Both criteria have been taken into account when assessing the noise impact of industrial source(s) associated with the project, and where the intrusiveness and the amenity criterion differ, the most stringent of the noise criteria has been adopted as the project-specific noise criterion.

Although not required to restrict noise to buildings located within the Precinct, for the notion of 'best practice' we have applied the Industrial Noise Policy, of which is described below to all buildings affected by noise emanating from the Precinct, both internal and external.

A summary of the environmental noise criteria is presented in Table 21 below. Refer to Appendix B for complete noise survey results and derivation.

Noise Sensitive Receiver	Classification	Time Period	Project Specific Criterion, dB $L_{Aeq,15min}$
Young & Loftus Precinct	Residential	Day	**56**
		Evening	**55**
		Night	**51**
Young & Loftus Precinct	Commercial	Day	**57**
		Evening	**57**
		Night	**63**
33 Alfred Street	Commercial	Day	**57**
		Evening	**59**
		Night	**63**
117 Macquarie Street (Intercontinental Hotel)	Residential	Day	**55**
		Evening	**54**
		Night	**51**
1 Farrer Place (Governor Phillip tower)	Commercial	Day	**61**
		Evening	**59**
		Night	**53**

Table 21 Project Specific Noise Levels at Noise Sensitive Receivers, dB L_{Aeq}

All levels noted in Table 21 above are applicable at the point on the respective façade nearest to the point of noise generation.

4.1.2 Road Noise Policy (RNP)

The RNP provides noise criteria for both residential and other non-residential noise sensitive receivers. The RNP provides both absolute noise level limits, dependent upon road category, and limits to control the relative increase in road traffic noise.

The following sections provide a summary of project specific acoustic criteria for noise sensitive receiver types and land uses as stipulated in the RNP.

Residential Receivers

Table 22 is an excerpt from the RNP Section 2.3.1 Noise assessment criteria – residential land uses, summarising noise criteria for residential receivers relevant to this project.

Road Category	Type of Project/Land Use	Assessment Criteria (dB)	
		Day 0700 – 2200 hours	Night 2200 – 0700 hours
Freeway / arterial / sub-arterial roads	1. Existing residences affected by noise from new freeway / arterial / sub-arterial road corridors	L_{Aeq}, 15 hour 55 (external)	L_{Aeq}, 9 hour 50 (external)
Freeway / arterial / sub-arterial roads	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	L_{Aeq}, 15 hour 60 (external)	L_{Aeq}, 9 hour 55 (external)

Table 22 Road traffic noise assessment criteria for residential land uses

Relative Increase Criteria

Table 23 is an excerpt from the RNP Section 2.4 Relative increase criteria, stipulating the allowable increase above existing traffic noise for residential receivers. These criteria are to be assessed in addition to those mentioned above.

Road Category	Type of Project/Land Use	Assessment Criteria (dB)	
		Day 0700 – 2200 hours	Night 2200 – 0700 hours
Freeway / arterial / sub-arterial roads	New road corridor / redevelopment of existing road / land use development with the potential to generate additional traffic on existing road	Existing Traffic L_{Aeq}, 15 hour + 12 (external)	Existing Traffic L_{Aeq}, 9 hour + 12 (external)

Table 23 Relative increase criteria for residential land uses

4.1.3 Internal Design Criteria

Design levels for steady-state internal noise levels within the building are given in Australian Standard AS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors.

These recommended noise levels apply to all steady-state noise sources within the development. Accordingly, the internal noise levels from the following sources should be controlled to meet the AS 2107 noise levels:

- Noise from the ventilation system (expected to be present in all areas of the development)
- Break-in noise from mechanical plant within the development.
- Traffic noise break-in through the façade.
- Plant located on adjacent and surrounding buildings, including noise sources emanating from both the Precinct and from plant associated with building located adjacent to the Precinct.

AS2107 gives both ‘satisfactory’ and ‘maximum’ noise levels for different areas within building interiors. For offices and residential, the criteria are summarised below in Table 24.

Internal Area	Recommended design sound level L_{Aeq} dB(A)	
	Satisfactory	Maximum
Residential Sleeping Areas (Houses and apartments near major roads)	30	40
General Office Areas	40	45

Table 24 Applicable recommended design sound levels.

4.2 Ambient Noise Survey

4.2.1 Methodology

As required for planning purposes, an ambient background noise survey was conducted in accordance with the procedures given in the NSW INP.

The noise loggers used to monitor the ambient noise were Acoustic Research Laboratories Ngara Type 2 Environmental Noise Loggers (serial no's. 8780D0, 87807F, 878 0D1). The loggers recorded L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} noise parameters at 15 minute intervals continuously for the measurement period. Weather observations were undertaken during this period and where noise levels were affected the data was not used. The logger was checked for calibration before and after the monitoring period and no significant deviation had occurred.

Ambient noise levels were recorded for a period of 8 consecutive days from 19 October – 30 October 2012. The data for 22 October was omitted due to rain.

To supplement and verify the unattended noise measurements some attended measurements were undertaken at the logger locations during setup the up the loggers. The same L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} noise parameters were measured for 15-minute periods. A Bruel & Kjaer 2250 Sound Level Meter was used to take the attended measurements. The sound level meter was checked for calibration before and after the measurements and no significant deviation occurred.

4.2.2 Logger Locations

The noise logger locations are described below in Figure 14 and Table 25

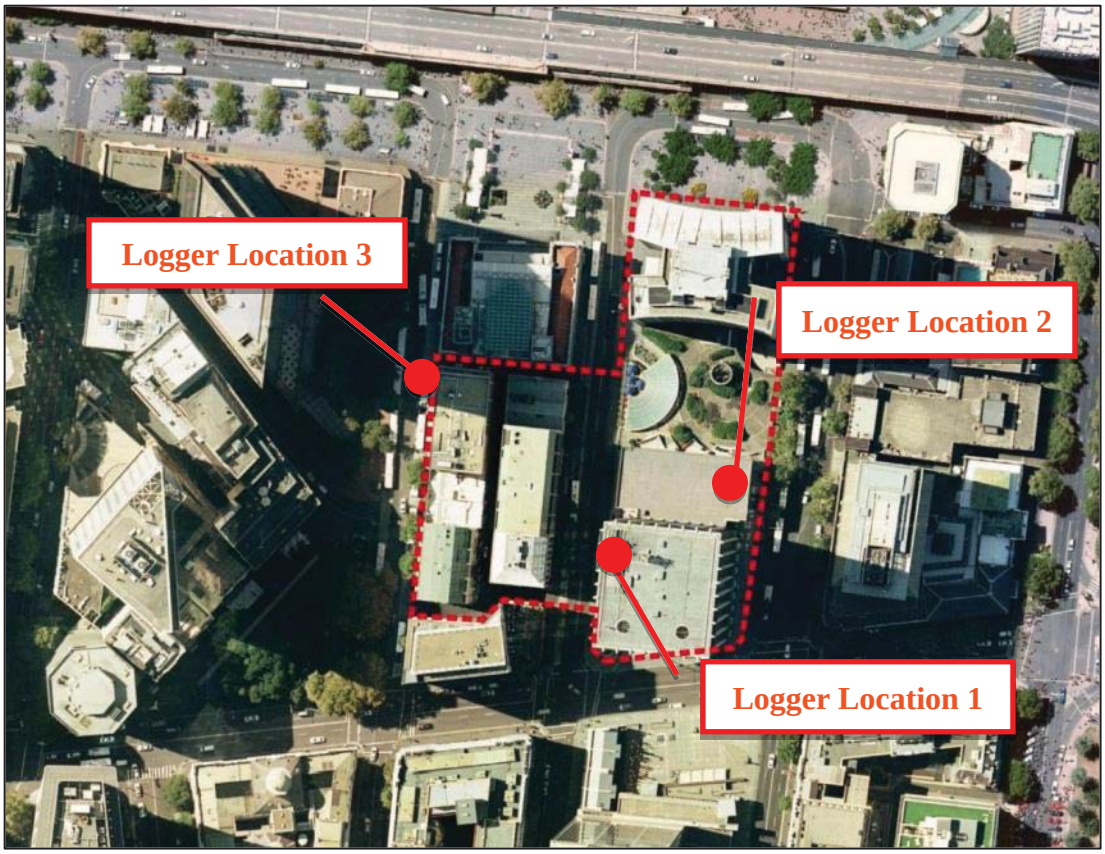


Figure 14 Noise Logger Locations

Description	Image
Logger Location 1 On the level 47 plant room of the 50 Bridge Street building, positioned on the North-West corner overlooking 33 Alfred Street and Circular Quay.	

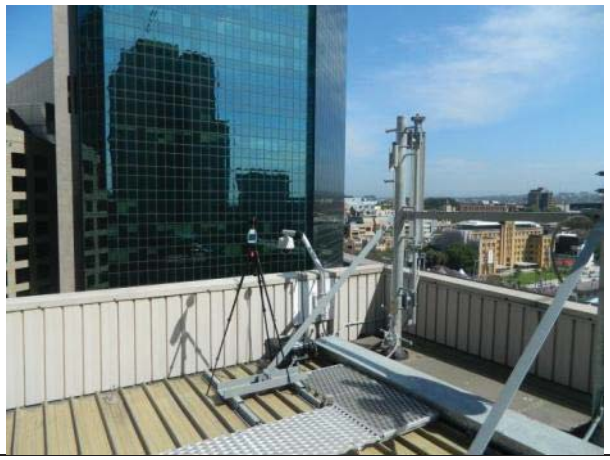
Logger Location 2 On the level 4 podium of the 50 Bridge Street Building, positioned on the North-East corner overlooking Phillip Street.	
Logger Location 3 On the roof of the 2-10 Loftus Street Building, positioned two thirds along the eastern side overlooking Loftus Street.	

Table 25 Individual noise logger locations

The noise environment is dominated by plant and mechanical noise omitted from the both the surrounding buildings plant located within the Precinct, generally within office hours. Traffic noise from the Cahill expressway and adjoining streets contribute to the overall ambient environment although due to the distance from the logger is not dominant over the measured plant noise.

During the evening and night time noise levels decrease slightly from the daytime levels, but still remain relatively high due to the urban/commercial location close to busy roads, and where plant from other businesses often run continuously.

4.2.3 Noise Logger Results

The entire measurement period for the three loggers has been split into weekdays and weekends with the 15 minute measurement intervals averaged over the days. These are presented graphically Figure 15 to Figure 20. The full data set including results for each individual day of logging is available upon request.

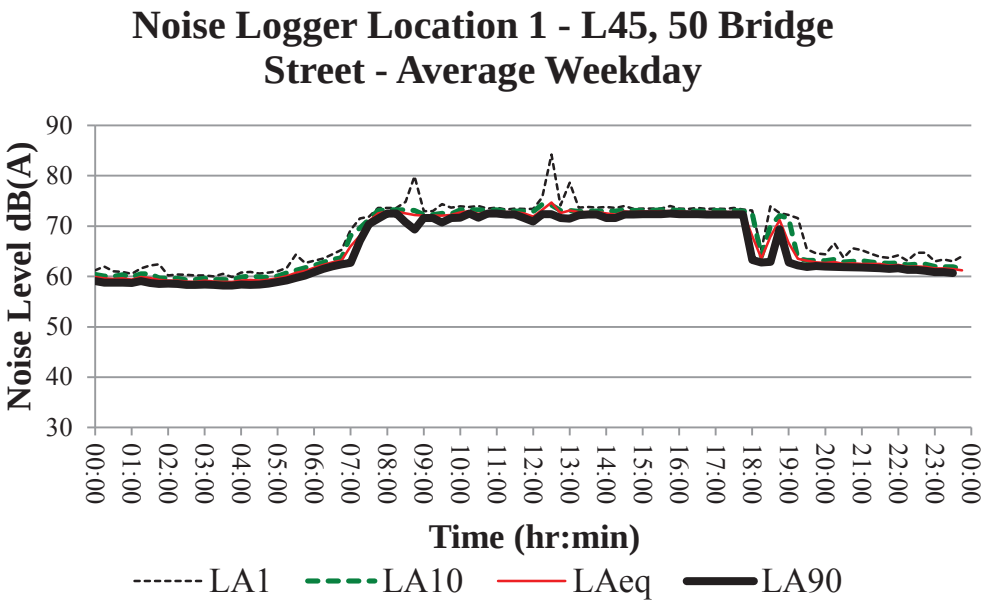


Figure 15 Average weekday for Logger Location 1, dB re 20 µPa.

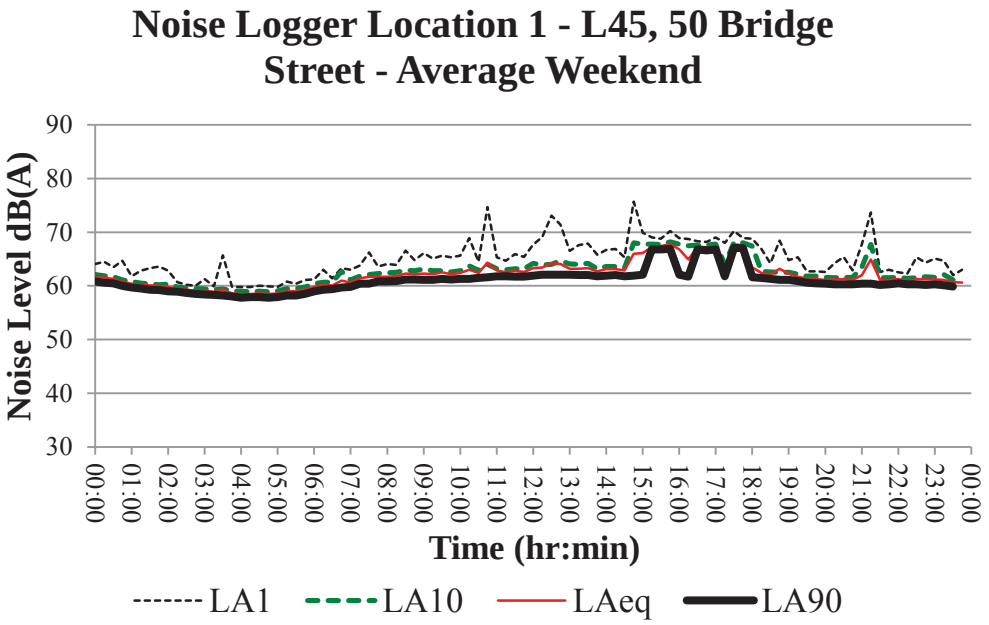


Figure 16 Average weekend for Logger Location 1, dB re 20 µPa.

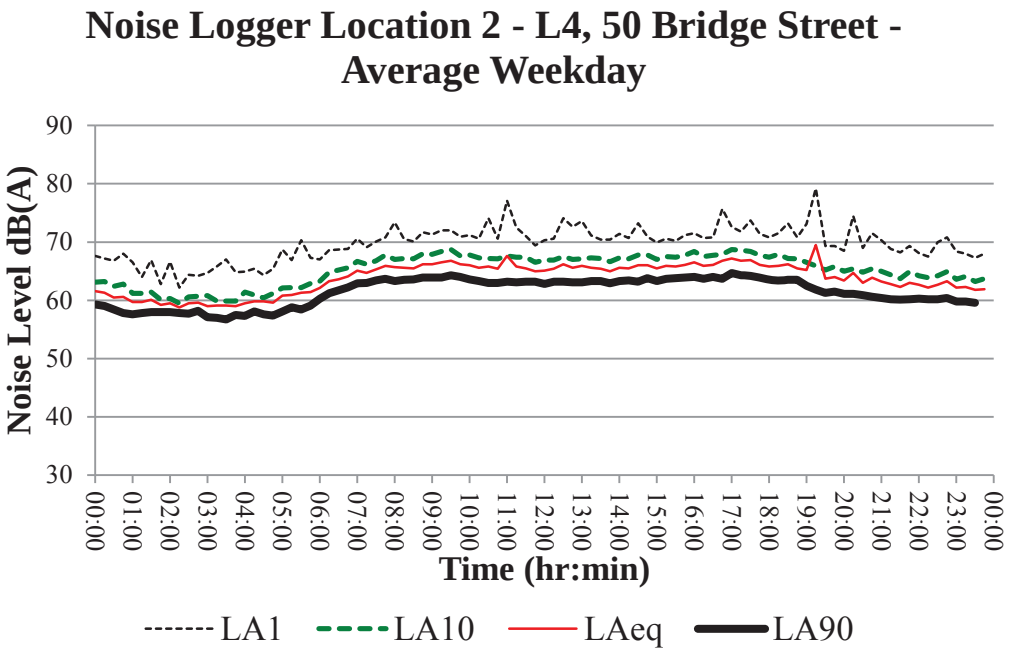


Figure 17 Average weekday for Logger Location 2, dB re 20 µPa.

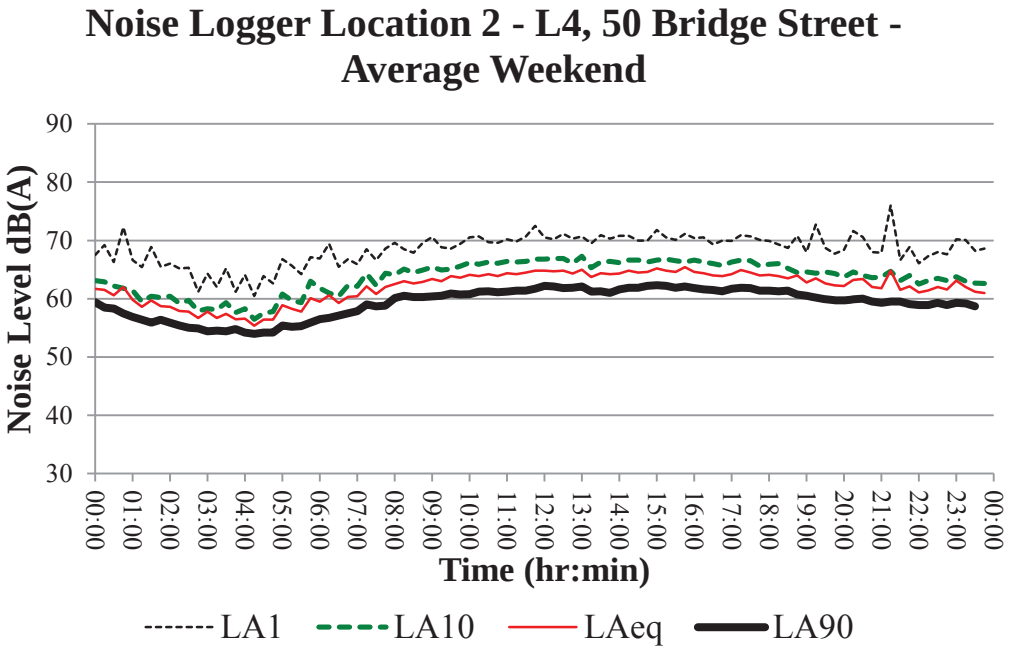


Figure 18 Average weekend for Logger Location 2, dB re 20 µPa.

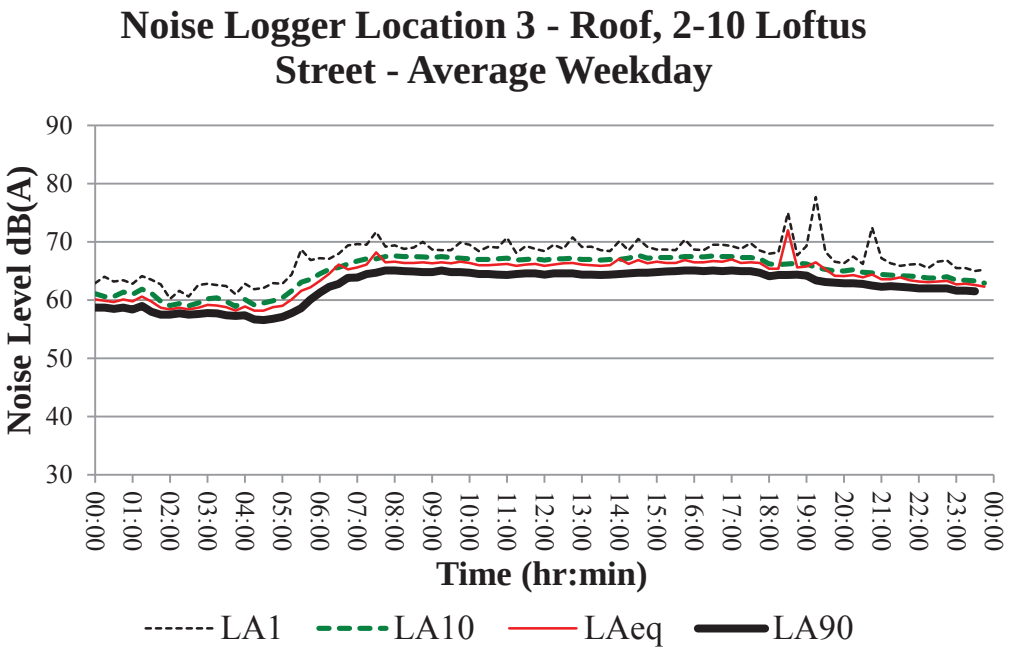


Figure 19 Average weekday for Logger Location 3, dB re 20 µPa.

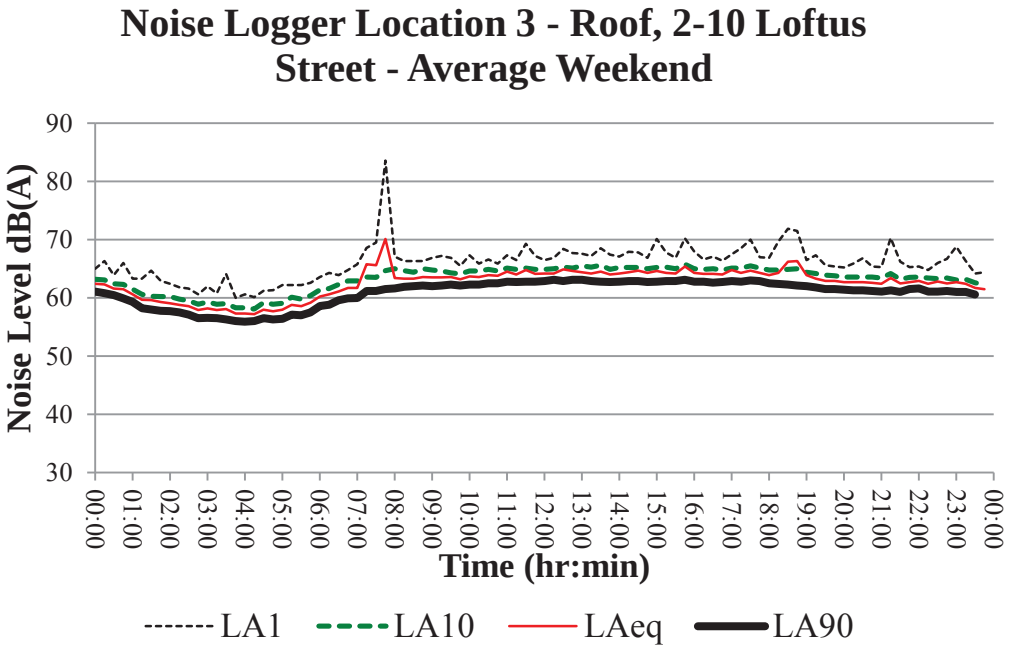


Figure 20 Average weekend for Logger Location 3, dB re 20 µPa.

Table 26 to Table 28 depict the average of weekday and weekend-day hourly L_{Aeq} for the daytime, evening and night-time periods for all three noise loggers. Along with average $L_{Aeq(15min)}$ data. the Rating Background Levels are also being presented for each logger location. The RBL is presented for the day, evening and night time periods, as defined in the NSW Industrial Noise Policy.

The RBL was calculated using the 'tenth percentile' method given in Appendix B of the INP. The average industrial L_{Aeq} noise level (Which is the noise level from all industrial noise sources, not necessarily the measured ambient L_{Aeq} noise level) was represented by the measured L_{A90} noise level.

	Daytime (0700 - 1800)	**Evening (1800 – 2200)**	**Night time (2200 – 0700)**
Average Weekdays $L_{Aeq(15min)}$ dB	73	65	61
Average Weekend-days $L_{Aeq(15min)}$ dB	64	62	60
Rating Background Level	63	61	58

Table 26 Average of the Weekdays and Weekend-days for Logger Location 1.

	Daytime (0700 - 1800)	**Evening (1800 – 2200)**	**Night time (2200 – 0700)**
Average Weekdays $L_{Aeq(15min)}$ dB	66	65	61
Average Weekend-days $L_{Aeq(15min)}$ dB	64	63	60
Rating Background Level	63	60	55

Table 27 Average of the Weekdays and Weekend-days for Logger Location 2.

	Daytime (0700 - 1800)	**Evening (1800 – 2200)**	**Night time (2200 – 0700)**
Average Weekdays $L_{Aeq(15min)}$ dB	66	66	61
Average Weekend-days $L_{Aeq(15min)}$ dB	65	64	60
Rating Background Level	64	62	56

Table 28 Average of the Weekdays and Weekend-days for Logger Location 3.

4.3 Noise Impacts to the Community

4.3.1 Building Services

We have reviewed the building services feasibility strategy, and have identified the main items of plant likely to be major noise sources. These are listed below in Table 29 and Table 30 noting that final plant distribution is subject to ongoing detailed design.

Location	Associated Plant
Level 45 Plant Room	• Tri-generation plant • Emergency Generators • Cooling towers • Various fans • Chillers • Lift motor room • Air handling unit • Pumps
Level 44 Plant Room	• Substation • Boilers & hot water plant • Air handling units • Chillers • Pumps
Level 20 Plant Room	• Various fans • Pumps • Air handling unit
Level 7/8 Plant Room	• Various fans • Pumps • Air handling unit
Finger Buildings	• Various fans • Basement vents
Basement Level 1 Plant Room	• Substation • Ventilation fans • Chillers • Air handling units
Basement Level 2 Plant Room	• Substation • Ventilation fans
Ground Level Substation Ventilation	• Ventilation fans

Table 29 Alfred/Bridge Street preliminary main building services plant

Location	Associated Plant
Level 12 Plant Room - 9-13 Young St	• Cooling towers • Exhaust Fans • Boilers • Emergency Generator
Level 11 Plant Room-9 - 13 Young St	• Chillers

Table 30 Young and Loftus preliminary main building services plant

Within the Bridge and Alfred Block, the number of plant items are expected to marginally increase, with the addition of the Level 7/8 plant room and associated plant, along with small items of plant located on the rooftops of the finger buildings. These additions are not expected to greatly influence the existing noise environment of the area and can be easily dealt with using standard noise control measures such as acoustic louvres, attenuators, enclosures, and barriers.

The Young and Loftus Block servicing strategy will change considerably as buildings are changed. However, the general strategy to centralise plant allows for noise control to be centralised and be more efficient. The main plant impacts will be to the precinct itself and the application of standard noise control measures such as acoustic louvers, attenuators, enclosures, and barriers will likely mitigate impact to the surrounding environment.

4.3.2 Traffic

The Precinct is bound by Alfred Street and the Cahill Expressway to the north, Bridge Street to the south, Phillip Street to the east and Loftus Street to the west.

In consultation with Arup traffic engineers, it is expected that an increase of no more than 16-21 cars within peak hours to the Young and Loftus precinct is to be projected. This results in a negligible increase in traffic noise from the development, and therefore an insignificant impact.

4.4 Noise Impacts to the Development

Environmental noise and vibration sources which may affect the development after the construction phase and during normal operation include:

- Mechanical plant and services noise from adjacent rooftop plant
- Vibration and ground borne noise emanating from the elevated railway across Alfred Street
- Traffic and pedestrian noise from Bridge Road, the Cahill Expressway, Phillip Street and Loftus Street
- Aircraft noise
- Deliveries and waste collection servicing the Precinct
- Low frequency ‘rumble’ noise of passenger ferries arriving and departing the nearby Circular Quay

The façade will be assessed to mitigate noise break in to the criteria outlined in Section 4.1.3.

We have performed a preliminary break-in calculation through a standard double glazing construction of 6 mm panes of glass separated by a 12 mm air gap. This analysis indicates that the background noise levels are likely to be met for residential buildings. Since the criterion for residential buildings is more stringent than for commercial buildings, this analysis shows the impact of environmental noise to the development is likely to be insignificant.

Traffic increases to the Precinct are negligible and therefore are not expected to influence the existing ambient noise environment.

5 Utilities Services

The following provides an outline of the existing services available to the site and identifies any required alterations to serve the proposed development.

Details of the existing services through the dial before you dig (DBYD) service and initial discussions with the Utility authorities indicate the existence of the following services serving or traversing the site:

Electricity Supply – Ausgrid:

- Chamber substation at 33 Alfred St
- High voltage control point at 50 Bridge St
- Two upper level substations at 50 Bridge St
- Various low voltage supplies to the Young and Loftus block

Communications Services - Optus, Primus Telecom, Nextgen Network, Uecomm, AAPT / PowerTel, Verizon, Soul:

- Various fibre, broadband and mobile services

Water Services - Sydney Water:

- Sewer, potable water supply and stormwater

Gas Supply – Jemena:

- Natural gas supply

5.1 Electricity Supply

The design team has had initial discussions with Ausgrid to inform an understanding of the existing services and determine a way forward for formal applications required at a later stage.

5.1.1 Existing Services

The existing services are described as follows. Refer to Figure 21 below for details.

Bridge and Alfred Block

The existing chamber substation at 33 Alfred St is located in the basement. It presently serves the 50 Bridge St basement main switchboard and the 33 Alfred St building.

The high voltage control point at 50 Bridge St serves the two upper level substations of the 50 Bridge St tower.

The upper level substations at 50 Bridge St are located on levels 20 and 44.

Young and Loftus Block

There are various low voltage supplies to the Young and Loftus block supplied from pits along Young St, Loftus St and Loftus Ln.

Figure 21 Existing electricity services

5.1.2 Required Alterations

Bridge and Alfred Block

A new substation may be required to serve the additional floor space at the Bridge and Alfred Block. A number of options are being developed with the preferred strategy to be taken forward for formal application at a later stage.

Upgrade to the existing substations on levels 20 and 44 to meet current Ausgrid requirements may be possible without needing to replace with completely new substations. Disconnection from the 33 Alfred St substation may be required to achieve the new network configuration.

The works may also include upgrades of the existing high voltage infrastructure serving the site to meet Ausgrid requirements.

The extent of the upgrades is subject to further discussions with Ausgrid.

Young and Loftus Block

A new substation may be required to serve the Young and Loftus Block. A number of options are being developed with the preferred strategy to be taken forward for formal application at a later stage.

Upgrades to site power infrastructure to meet Ausgrid requirements may also be needed.

The extent of the upgrades is subject to further discussions with Ausgrid.

5.2 Communications

5.2.1 Existing Services

The following communications services networks exist within or in proximity of the boundary of the development zone based on our interpretation of the DBYD information. Further discussions are required with the service providers to confirm existing arrangements. The utility communications cabling is generally installed in underground conduits on street verges with regular access points through manholes or pits. These services are:

- Optus - optic fibre network serves Bridge and Alfred block with various existing connections running through the site and also around the Young and Loftus Block on Young and Loftus streets and Customs House Lane.
- Primus Telecom – cable broadband within Telstra duct conduit running along Bridge St, no existing connections.
- Nextgen Network - high performance data within Telstra duct conduit running along Bridge St, no existing connections.
- Uecomm - business broadband at the corner of Bridge and Young streets, no existing connection.
- AAPT / PowerTel - optic fibre network existing connection to 50 Bridge St
- Verizon – optic fibre network existing connections to 50 Bridge St
- Soul – optic fibre network at the corner of Bridge and Young streets, no existing connection

Mobile coverage is currently provided to the precinct from various service providers.

5.2.2 Required Alterations

Required alterations to suit the new development are to be considered at a later stage. The project will be registered with Telstra and the relevant service providers to achieve the aspirations for this site.

5.3 Water Services

The design team has had initial discussions with Sydney Water to inform an understanding of the existing services and determine a way forward for formal applications required at a later stage. Refer to Figure 22 below.

5.3.1 Existing Services

The existing services are described as follows. Refer to the Figure below for details.

Potable Water Supplies

Existing water mains are available running along Phillip, Bridge, Young and Loftus streets which currently serve the site.

Wastewater

Existing water mains are available running along Phillip, Bridge, Young and Loftus streets which currently serve the site.

Stormwater

The Bennelong Stormwater Channel presently runs under the existing car park of the 50 Bridge St Block and through the proposed Young & Loftus Block new car park.

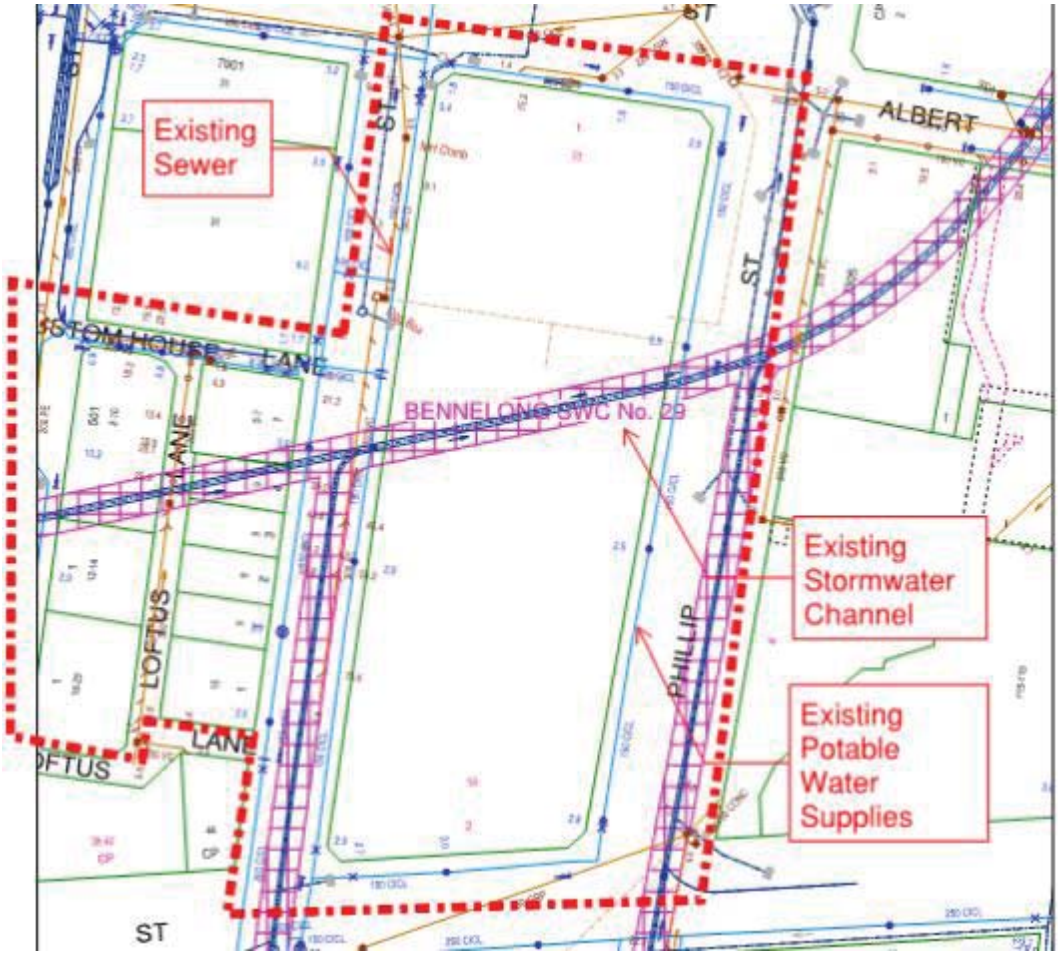


Figure 22 Existing water services

5.3.2 Required Alterations

Potable Water Supplies

At present, we anticipate water demand to not exceed the existing site supply. The supply requirements and connection point location(s) will need to be confirmed with Sydney Water. We will be undertaking further assessment and formal applications at a later stage.

Wastewater

At present, we anticipate wastewater to not exceed the existing site capacity. The supply requirements and connection point location(s) will need to be confirmed with Sydney Water. We will be undertaking further assessment at a later stage.

Stormwater

While initial dialogue has been undertaken with Sydney Water we will need to discuss the constraints of the Bennelong Stormwater Channel further with the authority to ensure this asset is not disturbed and the current level of access is retained. The aim of the current proposed development is to avoid disturbing this asset. From our experience on other projects in the area, we understand that there are specific requirements which will need to be adhered to which include:

- Adequate separation from the stormwater channel and the building structure
- Maintaining the current access strategy via the existing basement areas

These requirements will be adhered to and approved with Sydney Water at subsequent design stages to inform the Development Application.

5.4 Gas Supply

The design team has had initial discussions with Jemena to inform an understanding of the existing services and determine a way forward for formal applications required at a later stage. Refer to Figure 23 below.

5.4.1 Existing Services

The existing services are described as follows. Refer to the Figure below for details.

Existing high pressure secondary mains are available running along PhillipPhillip, Bridge, Young and Loftus streets and Loftus Lane at various connection points serving the site.

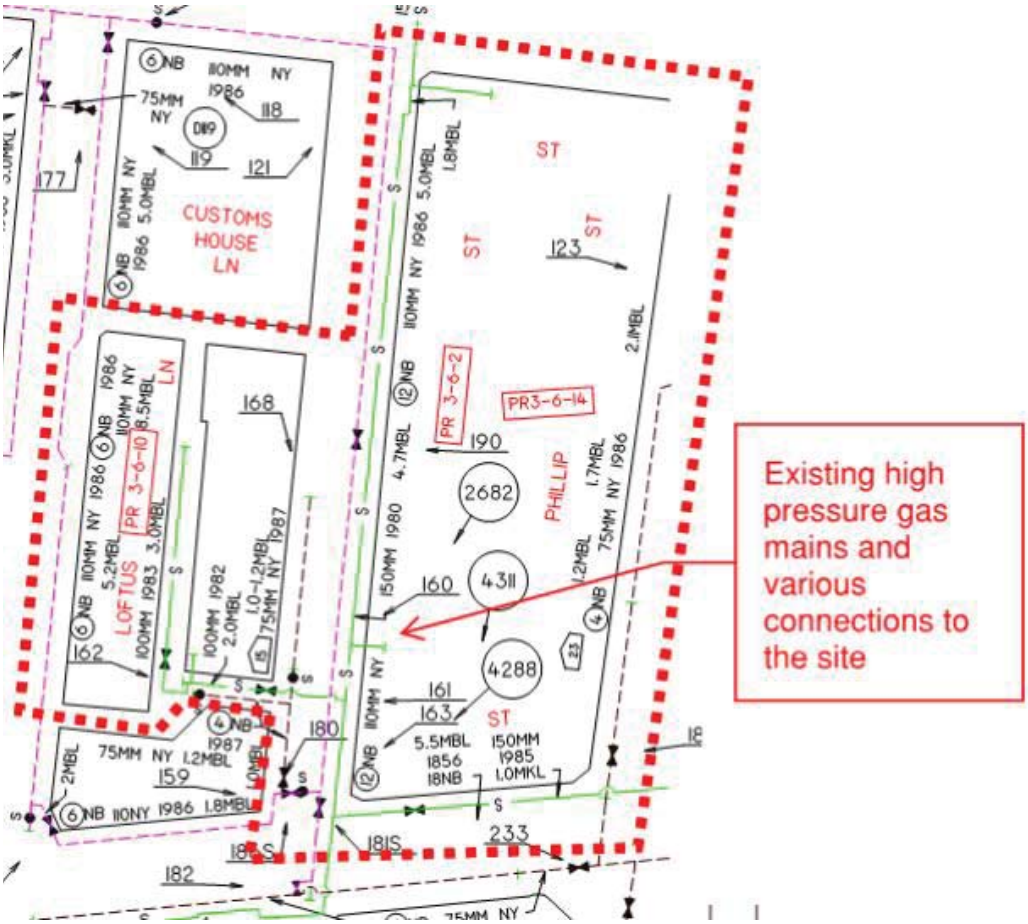


Figure 23 Existing gas services

5.4.2 Required Alterations

Based on our initial review the site appears to be provided with adequate natural gas infrastructure. To determine any required alterations, demand, metering and pressure drop arrangements will need to be confirmed with AMP Capital and Jemena to allow for a formal application at a later stage.

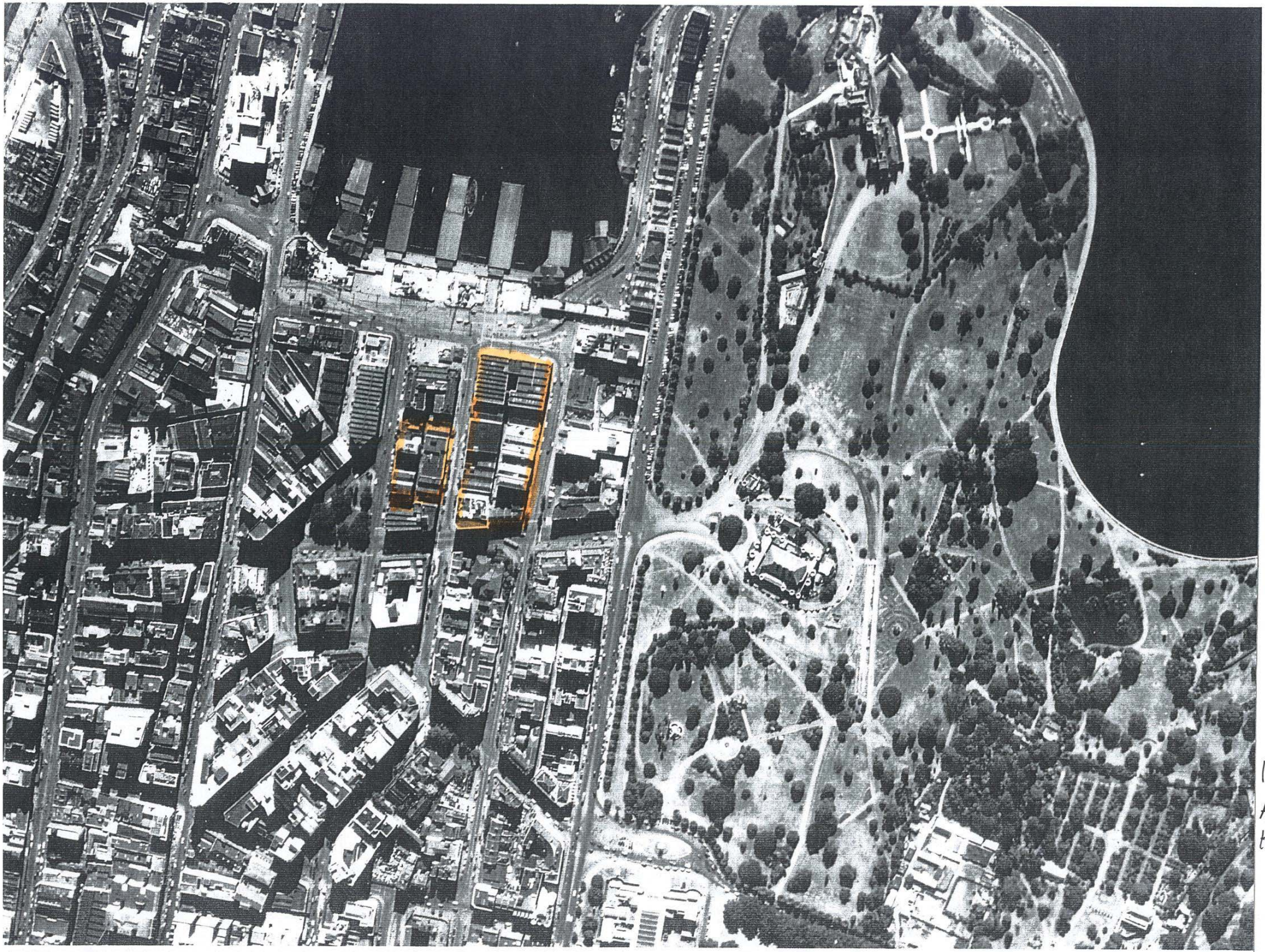
Appendix A

Phase 1 Contamination

A1 Historical aerial photography and plans

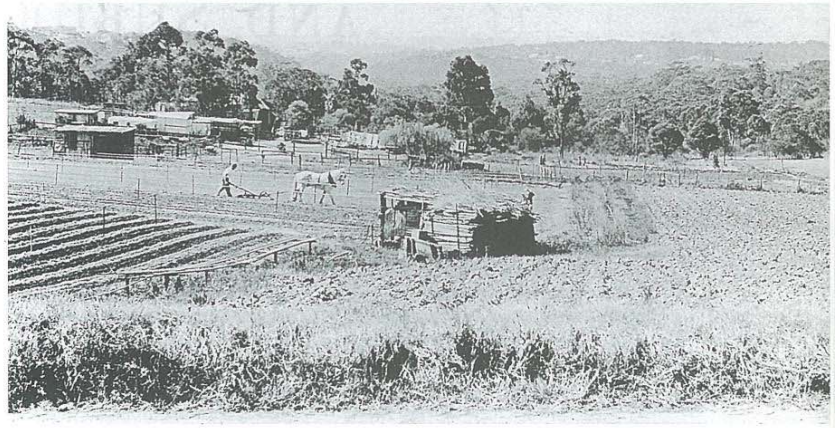
1930
AMP Precinct
Highlighted


CIRCULAR
STREET
LOTUS
YOUNG
PHILLIP
PLACE
STRE
_1948



1951
AMP Precinct
Highlighted

December 1960 although there were already ominous signs confirmed by the later reclamation of channels and mudflats along the Cook's River at Mascot that mass air travel within and without Australia was about to accelerate. This technological shift would eventually spell the doom of sea travel for all but those young or affluent enough who could afford ocean cruises. The next twenty years were to see new initiatives in road transport, containerisation and, above all in terms of the occupation of space by human beings and their tools, office construction. Suburban housing deepened and expanded as heritage sites and rural territory alike fell before the demand of capital, the concrete mixer and the pursuit of 'family values' in the omnipresent suburbs.



A market garden at North Ryde, October 1965. This was the site of a future sportsfield at Macquarie University. (Macquarie University)

The City of Sydney, August 1982. (Macquarie University)

DARLING HARBOUR
PYRMONT BAY
JONES BAY
ELIZABETH BAY
COCKLE BAY
HYDE PARK
PHILLIP PARK
COOK PARK
INNER DOMAIN
CRICKET GROUND
PRINCE ALFRED PARK
BELMORE PARK
RAILWAY TERMINUS
EXHIBITION BUILDING
OLD CEMETERIES
VICTORIA PARK
UNIVERSITY RESERVE
CAMPERDOWN
DARLINGTON
SURRY HILLS
TOWN HALL
PARLIAMENT HOUSE
WYNYARD SQUARE
CIRCULAR QUAY
PYRMONT BRIDGE
CRICKET OVAL

1854

have I seen such a retreat for filth
as the Rocks of Sydney. Few places
und more healthily and delightfully
ut nowhere are the country and the
nature so painfully contrasted with
ry and deformity which lie to the
charge of man.'

vons, 'Remarks upon the Social Map
ey', Mitchell Library manuscripts.

nd Clarke's Map of the City of Sydney
virons of Balmain and Glebe,
le, Redfern, Paddington, etc. 1854'.
brary)

ap of 1854 is a particularly fine
ple of the cartographer's craft and
utiny of its detail can hint at much of
fe in the period. Gold discoveries and
s occupied the minds and the
of both the Australians and the newly
easure hunters. But 'golden' the city
bs were certainly not. Metropolitan
the 1850s could offer very little in the
nmunity facilities to the majority
bitants.

1836

'The short space of fifty years has converted the horrid and tractless wilderness – the transient resting place of some migratory tribe of naked savages – into the busy mart of civilized and enlightened intercourse; whence there is yearly exported to the mother-country produce to the value of upwards of a million sterling and where the tastes, the pursuits, the comforts, and even elegancies of English society are valued and enjoyed to a far more substantial extent than in many of the large towns of Great Britain itself.'

James Maclehose, *Picture of Sydney and Strangers' Guide in New South Wales, for 1838,* London, 1838, p. vi.

Plan of Sydney with Pyrmont, New South Wales: The Latter the Property of Edw. Macarthur Esquire, Divided into Allotments for Building, 1836.' J. Basire, Lithographer. (Mitchell Library)

In the five years since the 1831 map, there had been continued development of the port of Sydney. This could be seen on busy Sussex Street, which ran parallel to Darling Harbour. Maclehose wrote that 'it forms the main thoroughfare between the wharfs, flour mills, shipbuilding yards, and manufacturies,' and conjectured that 'for its length, [it] has more valuable merchandise and other property conveyed through it than any other street in Sydney.' Sydney had now definitely escaped from the restrictions earlier placed on its commercial growth by Britain. The town had some merchants wealthy enough to be involved in ventures such as whaling, which required high capital investment, but brought great rewards. At the time this map was drawn, Walsh Bay, between Miller's Point and Dawes Point, was the anchorage for whalers.

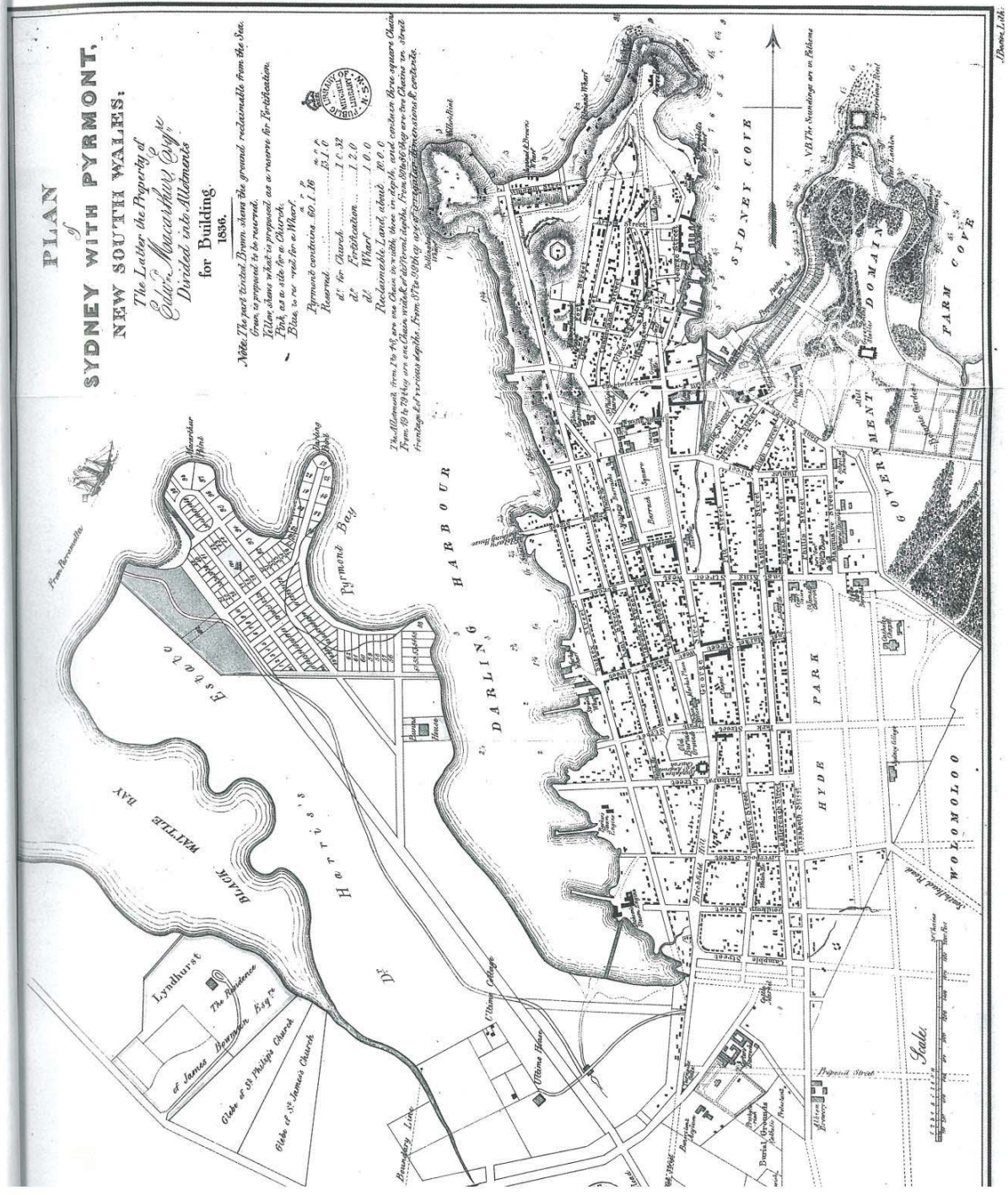
Strikingly shown in Basire's map is Sydney's first industrial waterfront suburb, Pyrmont. Its water location and deepwater anchorages made Pyrmont a port for the unloading of timber and coal and by the 1840s shipbuilding for bullock carts bringing goods into Sydney was carried on there too. Much colonial shipbuilding had been carried on outside Sydney at coastal locations where there was a good supply of timber. In the 1830s when iron-hulled ships, such as the one pictured in this map, began to be built, shipbuilding moved back into Sydney.

There was a spirit of enterprise now in Sydney and men were to be found to invest in all kinds of schemes. An illustration of this is the plan to reclaim parts of the Harbour. (The key to the map claims to show 'land reclaimed from the sea' in brown.) It was remarkable that people were willing to go to the expense and trouble of reclaiming a few acres in a certain location on the Harbour, when a whole continent lay practically unexplored at their backs.

The growing population of the city meant increased demand for all kinds of goods which had to be imported. It meant increased need for shipment of wheat and other foodstuffs from up and down the coast. This necessitated improvement of the roads serving the docks. At about this time, Brickfield Hill's steep grade was levelled off and made easier for bullock carts bringing goods into Sydney by road or carting loads up from the docks.

In 1836 steamships had only been in use in the Sydney area for five years, and they were still experimental. The one pictured steaming past Pyrmont may have been 'The Experiment', aptly named, since its paddlewheels were driven by four horses on a treadmill. Steam was still used only to supplement wind power. Steamboats, however, had the potential to revolutionise Sydney's river transport system, and its trade and contacts with the outside world.

The Sydney of Basire's map was no longer a pathetic settlement of minor criminals and rejects, watched by reluctant soldiers and officials and kept alive by a grudging home government. It had become a self-sustaining commercial centre, its prosperity determined less by decisions and payments of the distant British Colonial Office than by world commodity prices.



1822

'His Excellency the Governor further orders and directs that no person whatever shall erect any house or dwelling in the town of Sydney, whether on leasehold ground or otherwise, without previously obtaining his permission through Mr. Meehan, the acting surveyor, who has a plan of the town recently made out, and approved by His Excellency... A non-compliance with these orders will subject the proprietors to have their houses pulled down, and further incur the Governor's displeasure.'

Government Order, *Sydney Gazette,* 11 August 1810.

an of the Town and Suburbs of dney, August 1822'. (Mitchell Library)

Although Governor Lachlan Macquarie was on his way ack to England when this plan was ublished, it was probably prepared by is order. The town which it shows is lacquarie's Sydney – a more regular nd more complex settlement than it ad been before 1810.

Macquarie found Sydney a dirty, raggling settlement of crooked streets nd irregular buildings when he rrived in the colony on 28 December 1809. Because all the land in Sydney had been reserved as crown property, only to be leased to individuals for short periods, lessees had had no incentive to put up good buildings. Streets were crooked, unsanitary and narrow. Pitt Street, for example, was only half its present width. Macquarie was determined to give Sydney straight streets, good buildings and above all some civic pride. Soon after he took office, he ordered the streets destumped and widened to fifty feet. The older names of 'Rows' (see map page 17) were replaced with more dignified ones – George Street, Pitt Street and so on. Macquarie Street was a brand new thoroughfare running down the east side of the town. Even the Rocks area did not escape Macquarie's attentions. He ordered the Argyle Cut to be made and attempted to impose some order on an area that was so rugged, such a jumble of houses and crooked lands, that William Charles Wentworth described it as

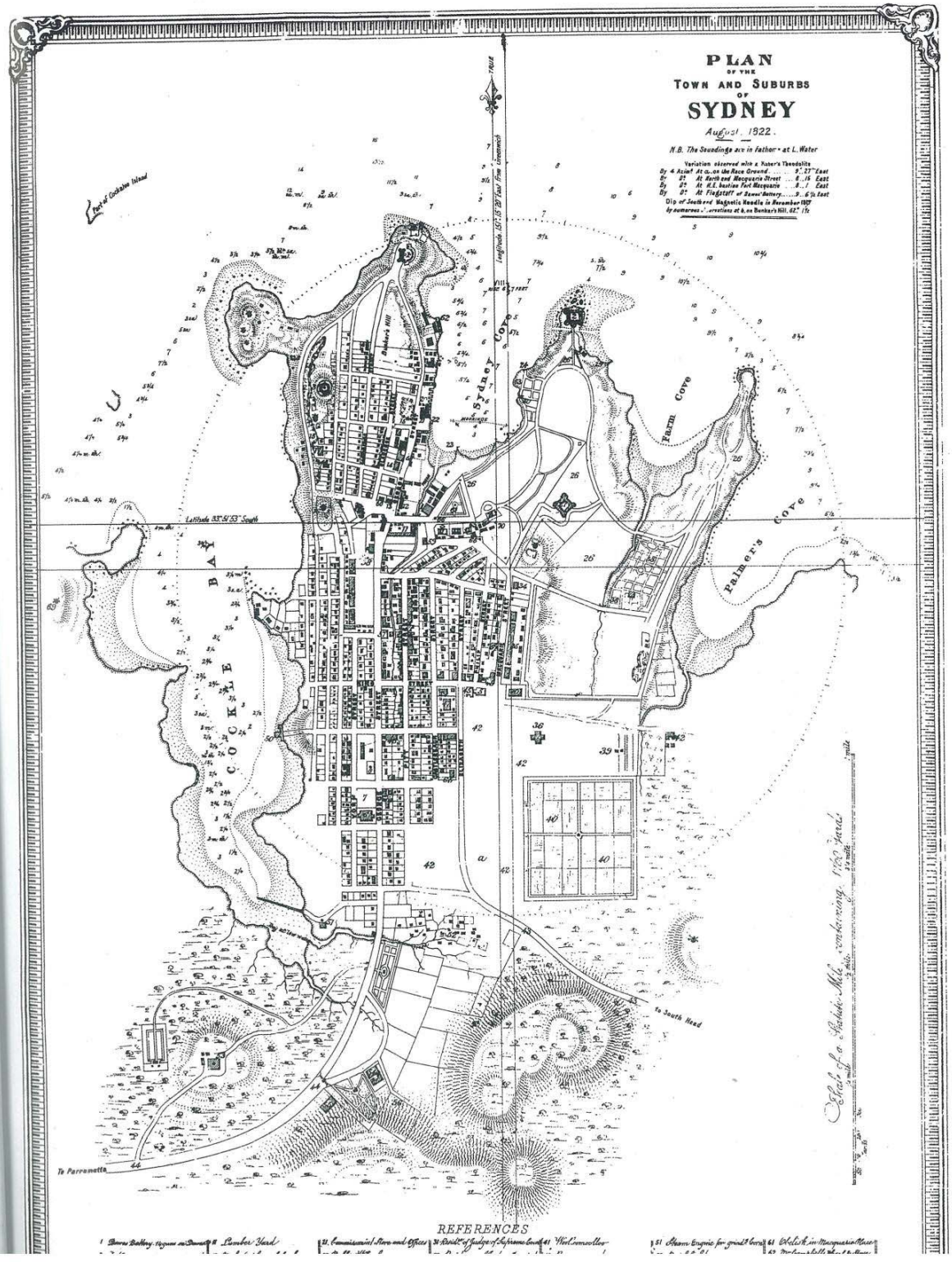
in 1821 was over 12 000. But with the talented architect Francis Greenway, Macquarie gave Sydney a number of fine public buildings, which are marked on the map. There are, for example, the hospital buildings off Macquarie Street (35), the large barracks, which Macquarie described as 'perhaps the best and most compleat of any in His Majesty's Foreign Dominions'. There is Macquarie Place with Greenway's important-looking Obelisk, from which all the colony's roads were measured (61). The Government stables are there (27). But the grand government house and the cathedral which Macquarie planned were forbidden by the Colonial Office.

The shores of Cockle Bay (later Darling Harbour) had previously been wild bush and scrub. Now in this map there are two wharves off the east side of the Harbour. Produce from Parramatta came in by ship to these wharves. From Market Wharf (50), it was carted up over the hill to the new market which in 1813 Macquarie had ordered laid out.

A historian of a generation ago said of the title of this map: 'Suburbs – truly a touch of the grandiloquent Macquarie!' True, there were no real suburbs yet but there were two fairly good new roads going out of Sydney. The road to Parramatta (44) had been graded and widened by convict labour. The South Head Road ran eastwards out of Sydney (43). (The expense was defrayed by tolls, and there was a suitably impressive toll gate. 'Pedestrians went free, a horseman paid threepence and vehicular traffic in proportion to its

buildings. Down the east side of the town a belt of land was reserved for various uses. At the northern end was the Government Domain laid out in its delightful setting (26). Government House was still the early one on Bridge Street which Macquarie found so exasperatingly inadequate. Since the Domain was for recreation Macquarie ordered a windmill removed from the area in 1814. Further south was an area now called Hyde Park which was a racecourse. Brickworkers from the Brickfields were sternly forbidden to dig for materials there. Further south still, below the South Head Road was the Common, an area of 1000 acres for public grazing. There was a continuous effort to limit and control the wandering of livestock in the town itself. A typical ordinance warned: 'All horses or other cattle in harness or draft, cows, sheep, goats or pigs which may be found in any part of Hyde Park will be taken up and impounded for trespass.'

'The town may now be pronounced to be tolerably regular', declared William Charles Wentworth in 1820. It was regular, but it was also a more complex place than twenty years before. There was a bank, for example, and a post office. There were quarries and wharves and shipbuilding yards. And on Cockle Harbour a quiet technological revolution was under way. John Dickson had begun to grind wheat with a steam-driven mill (51) grinding 260 bushels a day as compared to the twenty bushels a week which a windmill could process. The colony's acreage of wheat had quadrupled since 1800; steam power



Appendix B

Noise Impact Assessment

B1 Acoustic Glossary

Assessment Background Level (ABL)

A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening or night time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background LA90 noise levels – i.e. the measured background noise is above the ABL 90% of the time.

'A'-Weighted Sound Level dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise. A change of 2 to 3 dB is subjectively barely perceptible.

Decibel

The ratio of sound pressures which we can hear is a ratio of 106:1 (one million : one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound level' (L) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre

20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

Equivalent Continuous Sound Level (LAeq)

Another index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level, which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kilohertz (kHz), e.g. 2 kHz = 2000 Hz. Human hearing ranges from approximately 20 Hz to 20 kHz. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. For more detailed analysis, each octave band may be split into three one-third octave bands or, in some cases, narrow frequency bands.

Peak Particle Velocity (PPV)

Peak Particle Velocity is the parameter most often used for the quantification of ground borne and structure-borne vibration. It is the maximum positive or negative magnitude of vibration in a defined direction caused by the passage of a wave front during a specified interval. Particle velocity is used in most cases because this parameter has been found to correlate best with the onset of structural damage. It can also be used to provide some guidance on disturbance to people and the sensitivity of equipment and processes to vibration.

Rating Background Level (RBL)

A single-number figure used to characterise the background noise levels from a complete noise survey. The RBL for a day, evening or night time period for the overall survey is calculated from the individual Assessment Background Levels (ABL) for each day of the measurement period, and is numerically equal to the median (middle value) of the ABL values for the days in the noise survey.

Reverberation Time (RT60)

The time, in seconds, taken for a sound within a space to decay by 60 dB after the sound source has stopped is denoted at the reverberation time. The RT is an important indicator of the subjective acoustic within an auditorium. A large RT subjectively corresponds to an acoustically ‘live’ or ‘boomy’ space, while a small RT subjectively corresponds to an acoustically ‘dead’ or ‘flat’ space.

Sound Power and Sound Pressure

The sound power level (Lw) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (Lp) varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.

Statistical Noise Levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index that allows for this variation. 'A'-weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. $dBL_{A10,\ 5min}$ or $dBL_{A90,\ 8hr}$..

$L_{A90(T)}$

Refers to the sound pressure level measured in dB(A), exceeded for 90% of the time interval (T) –i.e. measured noise levels were greater than this value for 90% of the time interval. This is also often referred to the background noise level.

$L_{A10(T)}$

Refers to the sound pressure level measured in dB(A), exceeded for 10% of the time interval (T). This is often referred to as the average maximum noise level and is frequently used to describe traffic noise.

Structure-borne Noise

Structure-borne noise is the transmission of noise energy as vibration of building elements. The energy may then be re-radiated as airborne noise. Structure-borne noise is controlled by structural discontinuities, i.e. expansion joints and floating floors.

Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing structure-borne noise or human comfort issues respectively. Vibration amplitude may be quantified as a peak value, or as a root mean squared (rms) value.

Vibration amplitude can be expressed as an engineering unit value e.g. 1mm/s or as a ratio on a logarithmic scale in decibels:

Vibration velocity level, LV (dB) = 20 log (V/V_{ref}),

(where the preferred reference level, V_{ref}, for vibration velocity = 10^{-9} m/s).

The decibel approach has advantages for manipulation and comparison of data.

B2 Derivation of Industrial Noise Policy

Industrial Noise Policy

The New South Wales environmental noise policy relating to industrial noise is the New South Wales Environment Protection Authority Industrial Noise Policy (INP) dated January 2000. Noise emission from plant and equipment on the proposed training facility is required to be assessed by this policy as part of the City of Botany Bay minimum requirements for new developments document.

The objective of the INP is to protect residential areas from noise generated by commercial, industrial or trade premises. Noise limits are set based on land use in the area and existing background noise levels. Compliance is achieved if the adjusted L_{eq} noise level at any residence affected by noise from the facility is below the noise limit. The adjusted L_{eq} is determined by applying corrections for such noise characteristics as duration, intermittency, tonality, and impulsiveness.

The assessment of noise emission under INP is based on the calculation of a noise limit at a receiver position, taking into account the land-use in the surrounding area and the background noise level.

INP separates the day into three different time periods – day, evening and night. These time periods are detailed in Table 31.

Period	Day of Week	Time period
Day	Monday-Saturday Sunday, Public Holidays	0700-1800hrs 0800-1800hrs
Evening	Monday-Sunday	1800-2200hrs
Night	Monday-Saturday Sunday, Public Holidays	2200-0700hrs 2200-0800hrs

Table 31 INP Time Periods

The INP provides guidance on acceptable noise levels from the introduction of new industrial noise sources to an area. The assessment procedure for industrial noise sources has two components:

- Controlling intrusive noise impacts in the short term for residences.
- Protecting noise level amenity for particular land uses such as residences and commercial offices etc.

Both of these components suggest noise criteria that should not be exceeded in order to avoid any adverse noise impacts on the affected areas. Both criteria should be taken into account when assessing the noise impact of industrial source(s) associated with the proposed development, and where the intrusiveness and the amenity criterion differ, the lower of the noise criteria should be adopted as the project-specific noise criterion.

Selection of noise sensitive receivers

Five noise sensitive receivers were chosen for the purpose of setting criteria based on the residential and commercial premises most likely to be affected by noise from the Precinct. Due to differing criteria for residential and commercial receivers, a general selection of both criteria has been considered.

Both residential and commercial receivers have been considered for the Young and Loftus block, taking into account both classifications have been considered for design. This location will govern mechanical services noise emanating from within the Young and Loftus Block and ensure appropriate levels are achieved.

The 33 Alfred Street receiver will combine noise originating from both the Level 7/8 plant room and the exhaust vents/small plant on the roof of the finger buildings. This is for commercial façade break-in purposes and will govern general noise levels within the Bridge and Alfred Block.

117 Macquarie Street is the site of the Intercontinental Hotel, and is located across Phillip Street to the Bridge and Alfred Block. This receiver is classified as residential and will govern noise emanating from both Level 44/45 and Level 7/8 plant rooms on the 50 Bridge Street tower, along with contributions from the finger buildings.

1 Farrer Place, also known as Governor Phillip Tower is located south across Bridge Street to the 50 Bridge Street tower. This high rise commercial tower will be a direct receiver to the Level 44/45 plant, especially large cooling towers exhausting vertically to the south of the building. This receiver will govern the noise emitted from the rooftop plant.

Intrusiveness Criteria

A 15-minute sampling period is typically used when measuring the level of intrusive noise. This is taken to be a reasonable estimate of the period over which annoyance may occur. Therefore the intrusiveness criterion is summarised as follows:

L_{Aeq} (15 min) ≤ L_{A90} (15 min) Background Level + 5 dB

Because of the variable nature of background noise levels, the INP specifies single number background noise levels for use in setting the intrusiveness noise criterion. The Assessment Background Level (ABL) for each time period of a day is the level exceeded by 90 % of the $L_{A90,15min}$ measurements. The Rating Background Level (RBL) for a particular time period is the median of the ABL values for that time period for each day of the measurement period.

Location	**Time Period**	**RBL**	**Intrusiveness Criterion**
		dB(A)	RBL + 5 dB(A)
Noise Logger Location 1	Day	63	74
	Evening	61	66
	Night	58	63
Noise Logger Location 2	Day	63	67

	Evening	60	65
	Night	55	61
Noise Logger Location 3	Day	64	69
	Evening	62	67
	Night	56	62

Table 32 Derivation of intrusiveness criteria

Amenity Criteria

Criteria for the protection of amenity are given for various types of receiver and different times of the day. The amenity criterion is set so that the L_{Aeq} noise level from the industrial noise source does not increase the total industrial noise levels at the receiver above the acceptable noise level (ANL) for that receiver.

The amenity criterion is set based on how close the existing average LAeq industrial noise levels are to the ANL, using the adjustment factors given in Table 2.2 of the INP.

In cases where the existing $L_{Aeq,average}$ noise levels exceed the ANL by more than 2 dB(A), and the existing noise levels are unlikely to decrease in future, then the amenity criterion is set to be 10 dB(A) lower than the existing noise levels at the receiver. This is to prevent a creeping background noise environment. Other corrections in Table 2.2 reflect this idea of not making the noise environment worse.

A summary of the amenity criteria using data from the loggers is presented below in Table 31.

Location	Classification	Time period	Existing L_{eq}, dB(A)	ANL* L_{eq}, dB(A)	Modification to acceptable noise limit**	Amenity Criterion Existing L_{Aeq} + modification of ANL (Leq,dB(A))
Young & Loftus Precinct	Residential	Day	66	60	-10 dB from Existing Noise Level	66-10 = **56**
		Evening	65	50	-10 dB from Existing Noise Level	65-10 = **55**
		Night	61	45	-10 dB from Existing Noise Level	61-10 = **51**
Young & Loftus Precinct	Commercial	Day	66	65	-8 dB from Acceptable Noise Level	65-8 = **57**
		Evening	65	65	-8 dB from Acceptable Noise Level	65-8 = **57**
		Night	61	65	-2 dB from Acceptable Noise Level	65-2 = **63**
33 Alfred Street	Commercial	Day	65	65	-8 dB from Acceptable Noise Level	65-8 = **57**
		Evening	64	65	-6dB from Existing Noise Level	65-6 = **59**
		Night	61	65	-2dB from Acceptable Noise Level	65-2 = **63**
117 Macquarie Street (Intercontinental Hotel)	Residential	Day	65	60	-10 dB from Existing Noise Level	65-10 = **55**
		Evening	64	50	-10 dB from Existing Noise Level	64-10 = **54**
		Night	61	45	-10 dB from Existing Noise Level	61-10 = **51**
1 Farrer Place (Governor Phillip tower)	Commercial	Day	71	65	-10 dB from Existing Noise Level	71-10 = **61**
		Evening	64	65	-6 dB from Acceptable Noise Level	65-6 = **59**
		Night	60	65	-2 dB from Acceptable Noise Level	65-2 = **63**

Table 33 Derivation of Amenity Criteria for Commercial and Residential Receivers

*Acceptable Noise Level, according to Table 2.1 (NSW Industrial Noise Policy, 2000)

**According to Table 2.2 (NSW Industrial Noise Policy, 2000)

Applicable Criteria

The most stringent of the intrusiveness and the amenity criteria should be the limiting criterion and sets the project specific noise level to be met by the development of The Precinct. Table 34 compares the intrusiveness and the amenity criteria at the Noise Sensitive Receiver, and identifies the limiting criterion for each time period.

Noise Sensitive Receiver	Classification	Time Period	Intrusiveness Criterion	Amenity Criterion	Project Specific Criterion, dB $L_{Aeq,15min}$
Young & Loftus Precinct	Residential	Day	69	56	**56**
		Evening	67	55	**55**
		Night	62	51	**51**
Young & Loftus Precinct	Commercial	Day	N/A	57	**57**
		Evening	N/A	57	**57**
		Night	N/A	63	**63**
33 Alfred Street	Commercial	Day	N/A	57	**57**
		Evening	N/A	59	**59**
		Night	N/A	63	**63**
117 Macquarie Street (Intercontinental Hotel)	Residential	Day	67	55	**55**
		Evening	65	54	**54**
		Night	61	51	**51**
1 Farrer Place (Governor Phillip tower)	Commercial	Day	N/A	61	**61**
		Evening	N/A	59	**59**
		Night	N/A	53	**53**

Table 34 Project Specific Noise Levels at Noise Sensitive Receivers, dB L_{Aeq}

The most stringent noise criteria over all time periods would normally be adopted as the project-specific noise criteria, to ensure that the noise criteria are met at all times.