Project Number SJ-06087

Sydney CityGrid project

Environmental Assessment for Stage 2A(ii) of the Sydney CityGrid Project - City East Zone Substation and Integrated Commercial Tower

Volume 1 – Main Report

February 2012

Document Control and Approval

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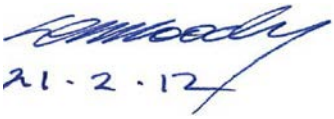
Signed: 

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Certification of the Environmental Assessment

Submission of Environmental Assessment

Prepared under Part 3A of the Environmental Planning and Assessment Act 1979

Environmental assessment prepared by:	
Name	Peter Carson
Qualifications	BSc Hons
Address	GHD Pty Ltd Level 15, 133 Castlereagh Street Sydney NSW 2000
In respect of:	Sydney CityGrid Project - City East Zone Substation Stage 2A(ii)
Project to which Part 3A applies	
Applicant name	Ausgrid
Applicant address	570 George Street Sydney NSW 2000
Land to be developed	Lot 1, DP 626651 and land below Bligh Street
Proposed development	Construction and operation of the City East Zone Substation and integrated commercial tower at 33 Bligh Street, Sydney.
Environmental assessment	An environmental assessment is attached that addresses all matters in accordance with Part 3A of the Act
Certificate	I certify that I have prepared the contents of this document and to the best of my knowledge: • It is in accordance with the requirements of Part 3A; • It contains all available information that is relevant to the environmental assessment of the development to which it relates; and • The information contained in the document is neither false nor misleading.
Signature	
Name	Peter Carson
Date	21 February 2012

Glossary and abbreviations

Term	Definition
AHIMS	Aboriginal Heritage Information Management System
Alluvium	Sediment deposited by flowing water, as in a riverbed, flood plain, or delta.
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
AS	Australian Standard
Assessment Report	The Assessment Report prepared by the Department of Planning and Infrastructure under Part 3A of the EP&A Act and submitted to the Minister for consideration.
Belmore Park Zone Substation	Belmore Park Zone Substation Project – an element of the Sydney CityGrid Project.
BS	British Standard
BSP	Bulk Supply Point
CCTV	Closed circuit television
CBD	Central Business District
CECT	City East Cable Tunnel
CEMP	Construction Environmental Management Plan
CIP	Community Information Plan
City East Zone Substation	City East Zone Substation – an element of the Sydney CityGrid Project
CO	Carbon monoxide
CoS	City of Sydney
CSDCP 1996	Central Sydney Development Control Plan 1996
CTMP	Construction Traffic Management Plan
DCP	Development Control Plan
dB(A)	Db means decibel which is a unit for measuring sound. If an "A weighting filter" is used to measure sound the sound level is given in units of dB(A).
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DIPNR	Department of Infrastructure, Planning and Natural Resources
DoPI	NSW Department of Planning and Infrastructure
Dykes	Dykes are geological features which vary in width from tens of centimetres to several metres and consist of near vertical igneous rock intrusions into the host rock. Dykes generally have a significant effect on foundation bearing pressures and, particularly in tunnels, jointed margins may be a source of groundwater inflow.

Term	Definition
EMF	Electric and magnetic fields. An electric field is a region where electric charges experience an invisible force. The strength of this force is related to the voltage, or pressure, which forces electricity along wires. Electric fields are strongest close to their source, and their strength diminishes rapidly with distance from the source. A magnetic field is a region where magnetic materials experience an invisible force produced by the flow of electricity (known as the electric current and measured in Amperes or amps). The strength of a magnetic field depends on the size of the current (measured in amps), and decreases with distance from the source.
EMR	Environmental Management Representative
Environmental Assessment	Generally, this term means the process of examining the environmental benefits and consequences of projects in advance of decision making. The term has a specific meaning under the *Environmental Planning & Assessment Act 1979* being the form of an environmental assessment required under Part 3A of this Act.
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
ESD	Ecologically sustainable development. This is broadly defined as: using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Feeder	Three individual electrical transmission cables (phases) bundled together.
FSA	Floor Space Area
FSR	Floor Space Ratio
GWTP	Ground water treatment plant
HDCP 2006	City of Sydney Heritage Development Control Plan 2006
Hz	Hertz (one hertz is defined as one cycle per second)
ICNG	Interim Construction Noise Guideline, DECCW 2009
INP	Industrial Noise Policy
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
kV	Kilovolts or one thousand volts. A volt is a measure of the potential difference across a conductor when a current of one ampere dissipates one watt of power.
L_{A90}	The sound level that is exceeded during 90% of the sampling period.
L_{Aeq}	Equivalent Continuous Sound Level: The notional sound pressure level which, if maintained constant over a given time, delivers the same amount of acoustic energy at some point as the time-varying sound pressure level would deliver at the same point and over the same period of time.
$L_{A\ (max)}$	The highest measured noise level during the period of measurement.
LEP	Local Environmental Plan
Licence conditions	Design, Reliability and Performance Licence Conditions for Distribution Network Service Providers (1 December 2007 – NSW Minister for Energy)
MCoA	Minister's Conditions of Approval
mg	milligrams
Muffler	A device to suppress noise emissions from noisy equipment or machinery.

Term	Definition
n-2 licence conditions	Design, Reliability & Performance Licensing Conditions by the Minister for Energy for the Sydney CBD signed December 2007. N is designing the network elements for no credible contingencies; n-1 is designing for a single credible contingency (normally involving an outage of one line or one item of electrical apparatus within a substation) and n-2 is designing for two credible contingencies (normally involving outages of two lines or two items of electrical apparatus within a substation).
NES	Matters of National Environmental Significance protected under the EPBC Act
NO_X	Nitrogen
OEH	NSW Office of Environmental and Heritage
OHS	Occupational health and safety
Paleovalley	An ancient rock valley that has been filled with sediments
PBC	polycyclic biphenols
PM_{10}	Particles less than 10 microns in size
$PM_{2.5}$	Particles less than 2.5 microns in size
POEO	Protection of the Environment Operations Act 1997
pphm	Parts per hundred million
PPV	Peak Particle Velocity
Project	Stage 2A(ii) of the City East Zone Substation and integrated commercial tower
Proponent	Ausgrid
Preferred Project Report	A report prepared by the Proponent following consideration of all submissions if there are any proposed changes to the project.
Reliability	An outcome based measure of the effectiveness of various network management and investment strategies in terms of their ability to provide continuous electricity supply to customers.
RBL	Rating Background Noise Level
RL	Relative Level
Roadheader	Mechanical excavating machine that has a large rotating cutting head mounted on a moveable boom. They are able to turn tight corners during tunnel construction.
Sandstone	A sedimentary rock, formed by the compression and cementing of sand and other sediments over a long period of time. The majority of the Sydney Basin is underlain by sandstone.
Security	The level of back up capability able to be provided by the network. Supply security is a measure of the ability to provide back up electricity supply during stated credible contingency events.
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy 55 – Remediation of Land
Shaft	A long, narrow, often vertical passage sunk into the earth, or a duct or conduit for the passage of air (as for ventilation or heating). Often used to access a tunnel from the ground surface.
SLEP 2005	Sydney Local Environmental Plan 2005
SMF	Synthetic mineral fibres

Term	Definition
SO_2	Sulfur dioxide
State-owned Corporation	A company or corporation specified in Schedule 1 of the *State-owned Corporations Act 1989* in which the major share holder is the NSW Government.
Strata	A horizontal layer of material, especially one of several parallel layers arranged one on top of another. Sandstone is often formed of numerous layers of sediment compressed together to form the rock mass.
Cable tunnel	A short section of tunnel which links to a main tunnel
STSS	A sub-transmission switching station (STSS) containing switchgear, generally 132kV without transformers. A STSS is generally the first stage of a BSP.
Submissions Report	A report prepared by the Proponent that provides responses to the submissions received following exhibition of the Environmental Assessments.
Substation	An electrical facility which serves as a control and transfer point on an electrical transmission and distribution system. Substations route and control electrical power flow, transform voltage levels, and serve as delivery points to individual customers.
SWL	Sound Power Level
Sydney Water	Sydney Water Corporation
SWL	Sound Pressure Level
Sydney CityGrid Project	New and/or refurbished substations in the Sydney CBD and a tunnel network for 132kV cables.
Transformer	An item of electrical equipment that generally transforms a higher voltage to a lower voltage.
TSP	Total suspended particles
ug/m^3	Micrograms per cubic metre
VDV	Vibration Dose Value
VENM	Virgin Excavated Natural Material
Zone Substation	A zone substation at 132kV/11kV or 33kV/11kV supplying the 11kV distribution network (with transformers).

Executive summary

Introduction

The Sydney CityGrid Project is an integrated program of works to upgrade critical electricity infrastructure in Sydney's central business district (CBD). It has been developed by Ausgrid to augment and replace infrastructure which is due for retirement in the Sydney CBD and the inner metropolitan area and to comply with the Design, Reliability and Performance licence conditions. The requirements specify that all city zone substations and transmission feeders must achieve a 'n-2' capacity which means that they must be able to supply the full electricity demand with any two transformers or feeders out of service.

The Sydney CityGrid Project is based on a holistic approach to network planning that takes into account relevant planning criteria, asset replacement requirements, network reliability standards and anticipated longer term network needs. It seeks to meet network needs in a cost effective manner and facilitate prudent longer term network investment decisions. The project is comprised of a number of discrete but interrelated components, one of which involves constructing and operating a new City East Zone Substation.

The Minister for Planning granted Concept Approval for the Sydney CityGrid Project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 September 2009. Ausgrid is seeking Project Approval for the City East Zone Substation under Part 3A of the EP&A Act in the following stages:

- Stage 2A(i) – involves site establishment and demolishing the existing building at the site, 33 Bligh Street (known as Kindersley House). Project Approval for Stage 2A(i) was received on 13 July 2011.
- Stage 2A(ii) – involves subsurface construction works and constructing, operating and maintaining the City East Zone Substation and the integrated 24 storey commercial tower located above the substation (subsequently referred to as the 'project'). The substation would be in the basement and lower levels and the commercial tower would be above the substation.
- This Environmental Assessment has been prepared to support an application for Project Approval for Stage 2A(ii) under Part 3A of the EP&A Act. It addresses the requirements of the Director-General of the Department of Planning and Infrastructure issued on 12th August 2011, as well as the requirements of MCoA 3.2 of the Concept Approval.

The project

The project involves the following works:

- Bulk excavation for the substation basement
- Excavating and constructing a shaft and a 150 metre section of cable tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street. The cable tunnel would interface with the City East Cable Tunnel which was subject to a separate Environmental Assessment and approved by the Minister for Planning and Infrastructure on 18th July 2011.
- Constructing and operating the City East Zone Substation and commercial tower above the substation.

The objective of the project is to obtain approval to construct, operate and maintain the City East Zone Substation and 24 storey integrated commercial tower. Construction would commence immediately following completion of Stage 2A(i).

The substation is needed as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the ability to achieve the objectives of the overall project. The commercial tower would provide additional commercial space in the CBD and achieve a high quality urban design outcome.

Stakeholder issues

Ausgrid consulted with key stakeholders when developing the Sydney CityGrid Project and also when developing the design for Stage 2A(ii) of the City East Zone Substation. The main issues raised relating to Stage 2A(ii) include:

- Noise and vibration during excavation and construction works, as well as operation of the substation
- Impacts on traffic and pedestrian access during construction
- Impacts on archaeology and built heritage adjacent to the site
- Impacts on existing and proposed underground assets
- The built form of the substation and commercial tower and associated impacts on the surrounding urban environment
- Impacts of electric and magnetic fields during operation of the substation
- Management of groundwater during excavation and tunnelling
- Management of waste and spoil generated during construction and operation
- Greenhouse gas emissions associated with operation of the substation

Design review process

The design of the built form for the substation and commercial tower was selected following a design review process in accordance with MCoA 3.2 of the Concept Approval. This included an invited competitive design alternatives process that was based on the principles of the invited design review competition in the Sydney Local Environmental Plan (2005). The objective of this process was to:

- Encourage high quality and innovative design by using a competitive design process
- Achieve development that individually and collectively contributes to the architectural and overall urban design quality of the city.

Structure of the Environmental Assessment

This Environmental Assessment is structured as follows:

- **Chapter 1** introduces the project
- **Chapter 2** provides a description of the site and its context
- **Chapter 3** provides an outline of the statutory and strategic framework
- **Chapter 4** provides information on stakeholder consultation undertaken for the project
- **Chapter 5** provides information on the need and justification of the project. It also outlines the consistency of the project with the Concept Approval and other relevant documentation
- **Chapter 6** describes the project
- **Chapter 7** outlines the results of the environmental risk analysis undertaken for the project
- **Chapters 8 - 22** assess the potential environmental impacts of the project in accordance with the Director-General's requirements
- **Chapters 23 and 24** conclude the Environmental Assessment by providing information on the management and mitigation of impacts including the draft Statement of Commitments that would be implemented

Draft Statement of Commitments

The Environmental Assessment provides Ausgrid's commitments for environmental mitigation, management and monitoring. The draft Statement of Commitments includes recommended mitigation measures to reduce and avoid identified impacts. The Statement of Commitments will be finalised following exhibition of the Environmental Assessment.

Exhibition of the Environmental Assessment

This Environmental Assessment is placed on public exhibition for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this period, the written submissions on the Environmental Assessment are able to be provided to the Department of Planning and Infrastructure. These submissions must be addressed to:

Department of Planning and Infrastructure

GPO Box 39

SYDNEY NSW 2001

The next steps

Ausgrid is seeking approval from the Minister for Planning for the construction of Stage 2A(ii) of the City East Zone Substation. The next steps in the process are:

- **Consideration of submissions** that are received by the Director-General of the Department of Planning and Infrastructure. Ausgrid is then required to prepare and submit:
  - A Submissions Report, which contains responses to issues raised in the submissions, and/or further design development
  - A Preferred Project Report, outlining any proposed changes to the project to minimise its environmental impacts (if necessary)
  - A revised Statement of Commitments
- **Determination of the Environmental Assessment**. The Director-General of the Department of Planning and Infrastructure provides an assessment report on the Environmental Assessment to the Minister for Planning and Infrastructure, who then makes a decision on the project and, if approved, can set Conditions of Approval.

Community liaison would continue throughout the construction phase and operational phase of the project.

1. Introduction

This chapter introduces this Environmental Assessment and provides an overview of the project and its objectives. It outlines the planning approval process and the approach taken to prepare the Environmental Assessment.

1.1 Background to the project

Ausgrid developed the Sydney CityGrid Project as an integrated program of works to upgrade critical electricity infrastructure in Sydney's central business district (CBD). The Sydney CityGrid Project comprises a number of discrete but interrelated components, one of which involves construction and operation of the City East Zone Substation at 33 Bligh Street, Sydney.

Concept Approval for the Sydney CityGrid Project was granted by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 September 2009. The Concept Approval requires further environmental assessment prior to commencing various stages of the Sydney CityGrid Project, including the City East Zone Substation. As a result, Project Approval is required to construct and operate the City East Zone Substation and integrated commercial tower.

The City East Zone Substation is an essential component of the overall Sydney CityGrid Project and Ausgrid is seeking Project Approval for the substation under Part 3A of the EP&A Act in the following stages:

- Stage 2A(i) – involves site establishment including demolition of the existing building at the site, 33 Bligh Street (known as Kindersley House). Project Approval for Stage 2A(i) was received on 13 July 2011. Preparatory works have commenced and site works are expected to begin in the first quarter of 2012.
- Stage 2A(ii) – involves subsurface construction works and construction and operation of the City East Zone Substation and the integrated commercial tower located above the substation (subsequently referred to as the 'project'). The substation would be in the basement and lower levels and the commercial tower would be above the substation.

This Environmental Assessment has been prepared to support an application for Project Approval under Part 3A of the EP&A Act. It addresses the assessment requirements in issued by the Director-General of the Department of Planning and Infrastructure on 12th August 2011 as well as the requirements of Minister's Condition of Approval (MCoA) 3.2 of the Concept Approval.

1.2 The Sydney CityGrid Project

1.2.1 Overview

During the next decade, Ausgrid must replace critical electrical infrastructure within the Sydney CBD that is due for retirement and to comply with Design, Reliability and Performance licence conditions relating to the operation of substations and transmission feeders. The licence requirement specifies that all city zone substations and transmission feeders must achieve a 'n-2' capacity which means that they must be able to supply the full electricity demand with any two transformers or feeders out of service.

Ausgrid developed an integrated strategy to meet the licence requirements by constructing new infrastructure or refurbishing existing electricity infrastructure, while maintaining sufficient spare capacity to ensure an ongoing and reliable electricity supply. This strategy is referred to as the Sydney CityGrid Project.

The Sydney CityGrid Project is being implemented in the following stages:

- Stage 1 – Belmore Park Substation site
  - Stage 1A – Constructing and operating the Belmore Park Zone Substation on the corner of Pitt, Campbell and Hay Streets. A cable tunnel would connect the City South Cable Tunnel (CSCT) to Belmore Park Zone Substation

  - Stage 1B – Commercial/retail development on the site of the Belmore Park Zone Substation
- Stage 2 – Remaining works
  - Stage 2A – Constructing and operating the City East Zone Substation at 33 Bligh Street, Sydney. This stage would be developed as two discrete components:
  - Stage 2A(i) – involves demolishing the existing building on the site (Kindersley House)
  - Stage 2A(ii) – involves subsurface construction works and constructing and operating the City East Zone Substation and the associated commercial tower located above the substation
  - Stage 2B – Refurbishing the existing Dalley Street Zone Substation
  - Stage 2C – Constructing and operating a sub-transmission switching station (STSS) on a site at the intersection of Riley Street and Albion Street, Surry Hills
  - Stage 2D – Constructing and operating the City East Cable Tunnel (CECT) between the Riley Street STSS and the City North Zone Substation. The CECT would connect to the proposed City East and existing Dalley Street Zone Substations, and a potential services control room located adjacent to the Riley Street STSS
  - Stage 2E – Extension of the CSCT from Wade Place to Riley Street, Surry Hills.

The indicative location of components of the Sydney CityGrid Project is shown in Figure 1.1.

1.2.2 Objectives of the Sydney CityGrid Project

Ausgrid is responsible for one of Australia's largest electricity networks which serves Sydney, the Central Coast and the Hunter region. Between 2008 and 2020, Ausgrid plans to invest about $16 billion in its network to meet increasing electricity demand and further enhance the high levels of supply and reliability. This involves maintaining and replacing existing infrastructure and building additional capacity to support new developments.

During the next decade, Ausgrid must augment and replace infrastructure which is due for retirement in the Sydney CBD and the inner metropolitan area to comply with licensing requirements. The licence specifies that all CBD substations must achieve 'n-2' capacity (Design, Reliability & Performance Licensing Conditions issued by the Minister for Energy).

The Sydney CityGrid Project has been developed to meet the licence requirements in the Sydney CBD. It is based on a holistic approach to network planning that takes into account relevant planning criteria, asset replacement requirements, network reliability standards and anticipated long term network needs. It seeks to meet network needs in a cost effective manner and facilitate prudent long term network investment decisions.

Over the next 10 years, the Sydney CityGrid Project involves constructing new zone substations, or upgrading and refurbishing existing zone substations, and replacing high voltage cables supplying the substations to:

- Meet 'n-2' licence conditions
- Cater for future demand and introduce new technologies that are likely to reduce electricity 'losses' by reducing the resistance of the electricity network
- Ensure timely replacement of infrastructure which is due for retirement to maintain a reliable electricity supply for the CBD.

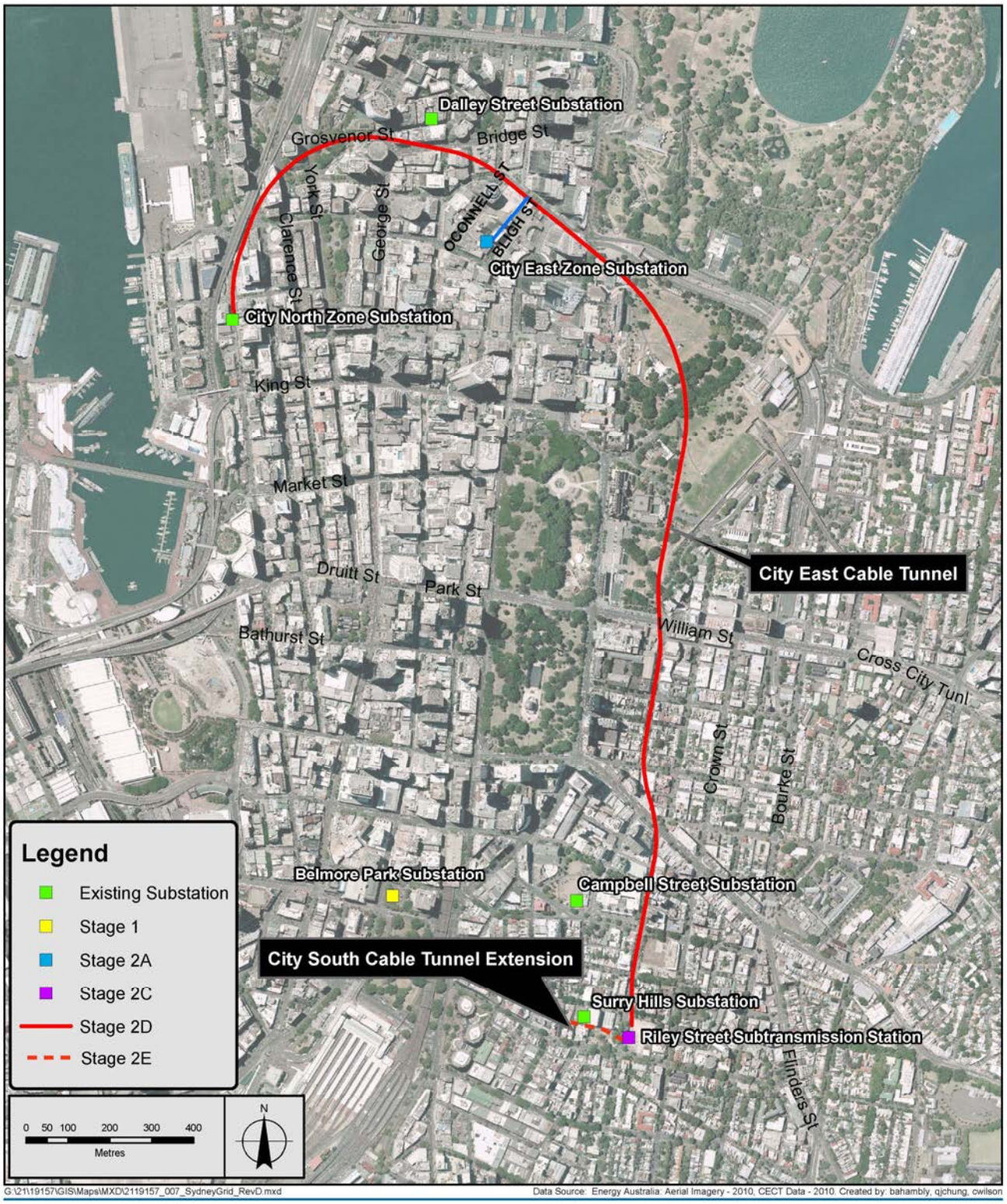


Figure 1.1 Components of the Sydney CityGrid Project

1.2.3 Environmental Assessment of the Sydney CityGrid Project

On 9 April 2008, Ausgrid submitted a Concept Application to the Department of Planning for the Sydney CityGrid Project and a Project Application for the Belmore Park Zone Substation (refer to Section 3.1.2). The Department of Planning issued environmental assessment requirements in accordance with Section 75F(2) of the EP&A Act.

Ausgrid prepared separate Environmental Assessments that addressed the assessment requirements for the Concept Plan and Belmore Park Zone Substation. The Environmental Assessments were exhibited and the Director-General required that Ausgrid respond to issues raised in the submissions. Submissions Response and Preferred Project Reports (May 2008) were prepared, after which the Minister for Planning granted the following approvals under Part 3A of the EP&A Act on 20 September 2009:

- Concept Approval for the Sydney CityGrid Project.
- Project Approval for Stage 1 which relates to works at the Belmore Park Zone Substation site.

The Concept Approval requires that additional environmental assessment is undertaken to obtain Project Approval for those components of the project that comprise Stage 2 of the Sydney CityGrid Project. Ausgrid subsequently obtained:

- Project Approval for Stage 2A(i) of the City East Zone Substation on 13 July 2011.
- Project Approval for Stage 2D and 2E of the Sydney CityGrid Project on 18 July 2011.

1.3 Purpose of this Environmental Assessment

The purpose of this Environmental Assessment is to assess the environmental impacts of Stage 2A(ii) of the Sydney CityGrid Project in accordance with the requirements of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000*. It addresses the environmental assessment requirements issued by the Director-General of the Department of Planning and Infrastructure on 12th August 2011.

1.4 The proponent

Ausgrid is a state-owned corporation owned by the NSW Government and is the proponent for this project. Ausgrid's distribution network is used to convey electricity from the transmission network operated by TransGrid to end users.

The principal objectives of Ausgrid as an energy distributor are prescribed by the NSW *Energy Services Corporations Act 1995*. The principal objectives are:

- To be a successful business.
- To protect the environment.
- To facilitate regional development and de-centralisation.
- To operate safe and reliable electricity distribution systems.
- To be an efficient and responsible supplier of electricity.
- To participate in the wholesale and retail markets for electricity and other forms of energy.

Ausgrid is a public authority under the EP&A Act.

1.5 Overview of Stage 2A of the Sydney CityGrid Project

1.5.1 Staging of the City East Zone Substation

The Concept Approval defines Stage 2A of the Sydney CityGrid Project as 'construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets'. Ausgrid purchased 33 Bligh Street, Sydney, as the site for the City East Zone Substation.

Following a number of network supply interruptions in early 2009, Ausgrid committed to completing the Sydney CityGrid Project prior to the system need dates required to meet regulatory licence conditions. The main opportunity identified to reduce the timeframe to deliver the Sydney CityGrid Project involved splitting the development approval and construction of the City East Zone Substation into the following stages:

- **Stage 2A(i)** – Site preparation and demolition of the existing building at 33 Bligh Street, Sydney. Preparatory works have commenced and site works are expected to begin in the first quarter of 2012.
- **Stage 2A(ii)** – This is described in Chapter 5 and involves bulk excavation for the substation basement, construction of a shaft and a 150 m section of tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street, and construction and operation of the City East Zone Substation and integrated commercial tower.

Staging the approvals could potentially reduce the duration to deliver the City East Zone Substation by between 9 - 12 months which is a significant consideration given the critical importance of providing a reliable electricity supply to the CBD.

1.5.2 Substation and integrated commercial tower

The existing buildings on the site are known as Kindersley House (refer to Section 2.2). As part of a previous development application, the City of Sydney Council granted consent to demolish these buildings and establish a 205 m high commercial tower. As the substation would be relatively small in stature (about 45 m high) compared to the urban form in this part of the CBD where buildings are commonly over 100 m high, Ausgrid identified an opportunity to develop the site as an integrated substation and commercial tower (refer to Section 5.2.2).

Ausgrid and Investa Property Group (Investa) subsequently entered into an agreement to develop the site as an integrated substation and commercial tower. Ausgrid is responsible for developing the substation and Investa is responsible for developing the commercial tower above the substation. The substation and commercial tower would be built in a single construction phase.

The design for the substation and commercial tower is detailed in Chapter 1 and was selected following a design review process in accordance with the Director-General's requirements and the requirements of MCoA 3.2 of the Concept Approval. This included an invited competitive design alternatives process that was based on the principles outlined in the Sydney Local Environmental Plan (2005). The objective of this process was to:

- Encourage high quality and innovative design by using a competitive design process
- Achieve development that individually and collectively contributes to the architectural and overall urban design quality of the city.

The brief for the competition was reviewed and endorsed by the City of Sydney Council prior to distribution to five architectural firms with demonstrated experience in the design of high quality commercial buildings.

A six member selection committee was established to evaluate the five designs. The committee included representatives from the City of Sydney, Government Architect's office, Investa and Ausgrid. The submission by Fitzpatrick and Partners was selected as the preferred option as it provided a unique landmark building that would add value and quality to the mix of buildings in the CBD, whilst meeting the specific requirements relating to the proposed use of the site. The committee considered that this design best achieved design excellence as it featured:

- A bold, crisp design that presented as heroic and resonated landmark quality to provide a positive architectural statement.
- An innovative design with an interesting and elegant façade that would provide an iconic and lasting legacy.

The design is described in Chapter 1 and Figure 1.2 shows a photomontage of the built form. The substation would be located in the basement and podium levels and would extend to a height of about 52.58 m above O'Connell Street and 45.68 m above Bligh Street. The commercial component would be a tower above the

substation that would have a height of about 161.73 m and would achieve 5 Star Greenstar and 5 Star NABERS ratings. The tower would be composed of three cubic volumes separated by horizontal offsets. It would have a floor space area of 28,050 m^2 with floor plates on the 20 commercial floors ranging between 1,342 m^2 and 1,474 m^2.

Figure 1.2 Photomontage of the substation and commercial tower

1.6 Objective of the project

The objective of the project is to construct and operate the City East Zone Substation and integrated commercial tower. Construction of Stage 2A(ii) would commence immediately following completion of Stage 2A(i).

The substation would support the operation of the overall Sydney CityGrid Project and assist Ausgrid to meet licence requirements in the CBD. The commercial tower would provide additional commercial space in the CBD and achieve a high quality urban design outcome.

1.7 Approvals process

Concept Approval has been obtained for the Sydney CityGrid Project and Project Approval is now required to undertake the project. This Environmental Assessment has been prepared as part of an application for Project Approval under Part 3A of the EP&A Act and will be publicly exhibited for at least 30 days, during which time submissions are invited to be submitted to the Director-General of the Department of Planning and Infrastructure.

Following the conclusion of the exhibition period, the Director-General may require that Ausgrid respond to issues raised in submissions. If required, Ausgrid would respond to issues raised and may modify the project and Statement of Commitments. This response would be documented in a Submissions Report that would be submitted to the Director-General.

If significant modifications to the project or Statement of Commitments are made at this stage, a Preferred Project Report would be prepared as part of the Submissions Report to clearly define the revised elements of the project, commitments and environmental impacts.

The Director-General would evaluate this Environmental Assessment, the Submissions Report and any Preferred Project Report, giving consideration to submissions received during the exhibition period. The Director-General would recommend to the Minister whether to grant approval or refuse the Project Application. If the Minister grants approval this may be subject to conditions.

1.8 Structure of this Environmental Assessment

The following chapters of this Environmental Assessment are structured as follows:

- **Chapter 2** provides a description of the site and its context
- **Chapter 3** provides an outline of the statutory and strategic framework
- **Chapter 4** provides information on stakeholder consultation undertaken for the project
- **Chapter 5** provides information on the need and justification of the project. It also outlines the consistency of the project with the Concept Approval and other relevant documentation
- **Chapter 6** describes the project
- **Chapter 7** outlines the results of the environmental risk analysis undertaken for the project
- **Chapters 8 - 22** assess the potential environmental impacts of the project in accordance with the Director-General's requirements
- **Chapters 23 and 24** conclude the Environmental Assessment by providing information on the management and mitigation of impacts including the draft Statement of Commitments that would be implemented

2. Site location and setting

This chapter provides a summary of the location of the site.

2.1 Sydney CBD

The objective of the Sydney CityGrid Project is to ensure that Sydney's CBD is provided with a reliable electricity supply in the long term. A reliable electricity supply is essential because Sydney, as Australia's only recognised global city, is the key link between the Australian and global economies. The Sydney CBD is a hub for commercial and financial operations and has a high concentration of business service firms, in particular those associated the financial and stock markets. A reliable electricity supply is critical to allowing the CBD to function efficiently and effectively.

Sydney's CBD is highly urbanised and the built form is characterised by high rise commercial and residential developments. Land is used for a variety of purposes including residential and commercial use as well as tourist and cultural attractions, and parks and open space, including Hyde Park and the Domain and Royal Botanic Gardens.

Sydney CBD is a popular shopping district with a range of retail centres and speciality shops as well as Pitt Street Mall, the Queen Victoria Building, David Jones, and Myer outlets.

A range of cultural attractions are located in the CBD and immediate surrounds. These include the Sydney Opera House, Harbour Bridge, Art Gallery of NSW, Australian Museum, Hyde Park Barracks, Queen Victoria Building, Sydney Town Hall and State Theatre. In addition, Sydney hosts a variety of cultural events including the Sydney Festival, Mardi Gras, and Chinese New Year celebrations.

2.2 The site and surrounds

2.2.1 The site

The project involves works at 20-22 and 24-26 O'Connell Street and 33 Bligh Street, located in the City of Sydney Local Government Area. The site is legally defined as Lot 1 Deposited Plan 626651 and is roughly rectangular in shape with an approximate site area of 2,040 m^2 (refer to Figure 2.1).

Existing development on the site consists of two commercial buildings, one 17 storey office building constructed in 1960 (20-22 O'Connell Street and 33-35 Bligh Street) and another 13 storey office building constructed in 1983 (24-26 O'Connell Street) that is merged with the lower levels of the original building. These buildings are referred to as Kindersley House and were constructed with a concrete frame and glass infill wall structure. A total of 45 car park spaces are provided in the basement level car park that is accessible via O'Connell Street.

The site has frontage to and pedestrian access from both Bligh and O'Connell Street. Approval to demolish the existing buildings on the site was granted as part of Stage 2A(i) of the City East Zone Substation on 13 July 2011. Figure 2.2 and Figure 2.3 show views to Kindersley House from Bligh Street and O'Connell Street.

Land uses surrounding the site are predominantly commercial office towers with active street frontages, retail activities, hotels, restaurants and cafes. The northern boundary of the site is adjoined by the former NSW Club House building, the Mulpha building and AFT House (refer to Figure 2.4). To the south, Cigna House abuts the site as does a 13 storey office building at 50 - 58 Hunter Street. Immediately to the east of the site is Richard Johnson Square, a paved area comprising a historic monument, seating and a small kiosk (refer to Figure 2.5). To the west of the site is O'Connell Street.

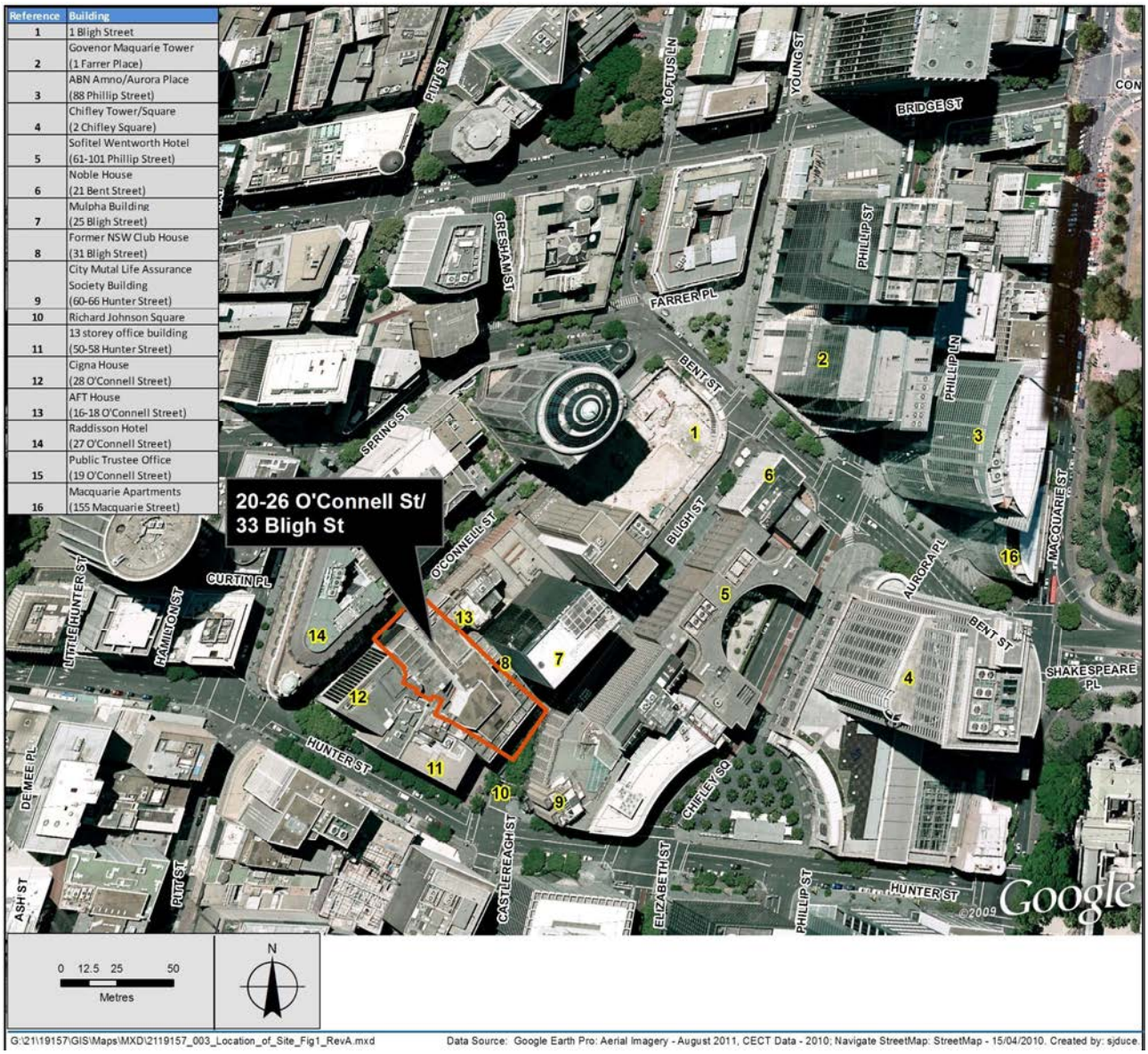


Figure 2.1 Site location map

Figure 2.2 View of Kindersley House from the corner of Hunter Street and Bligh Street

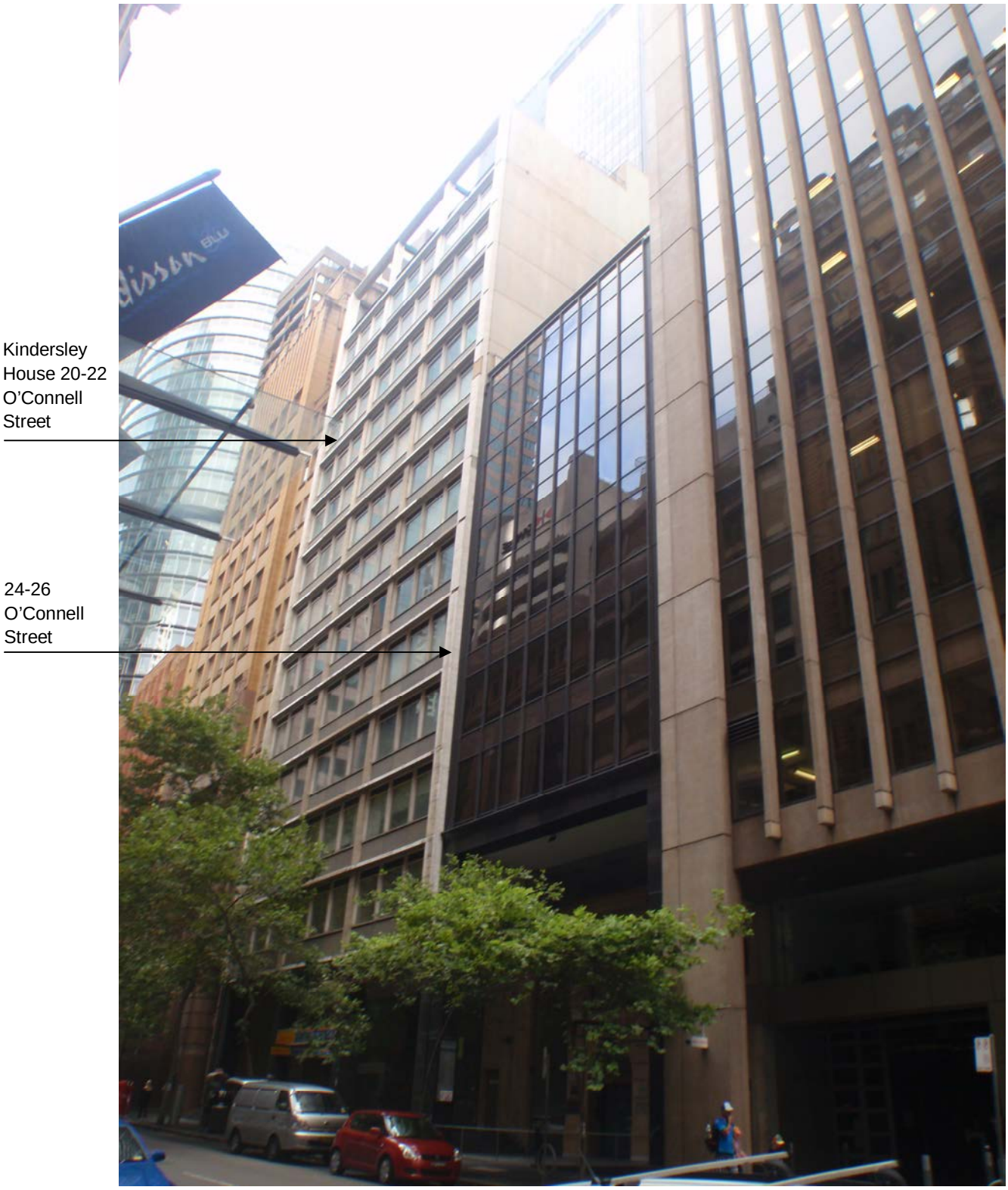


Figure 2.3 **View of the two buildings that form Kindersley House at 20-22 and 24-26 O'Connell Street**

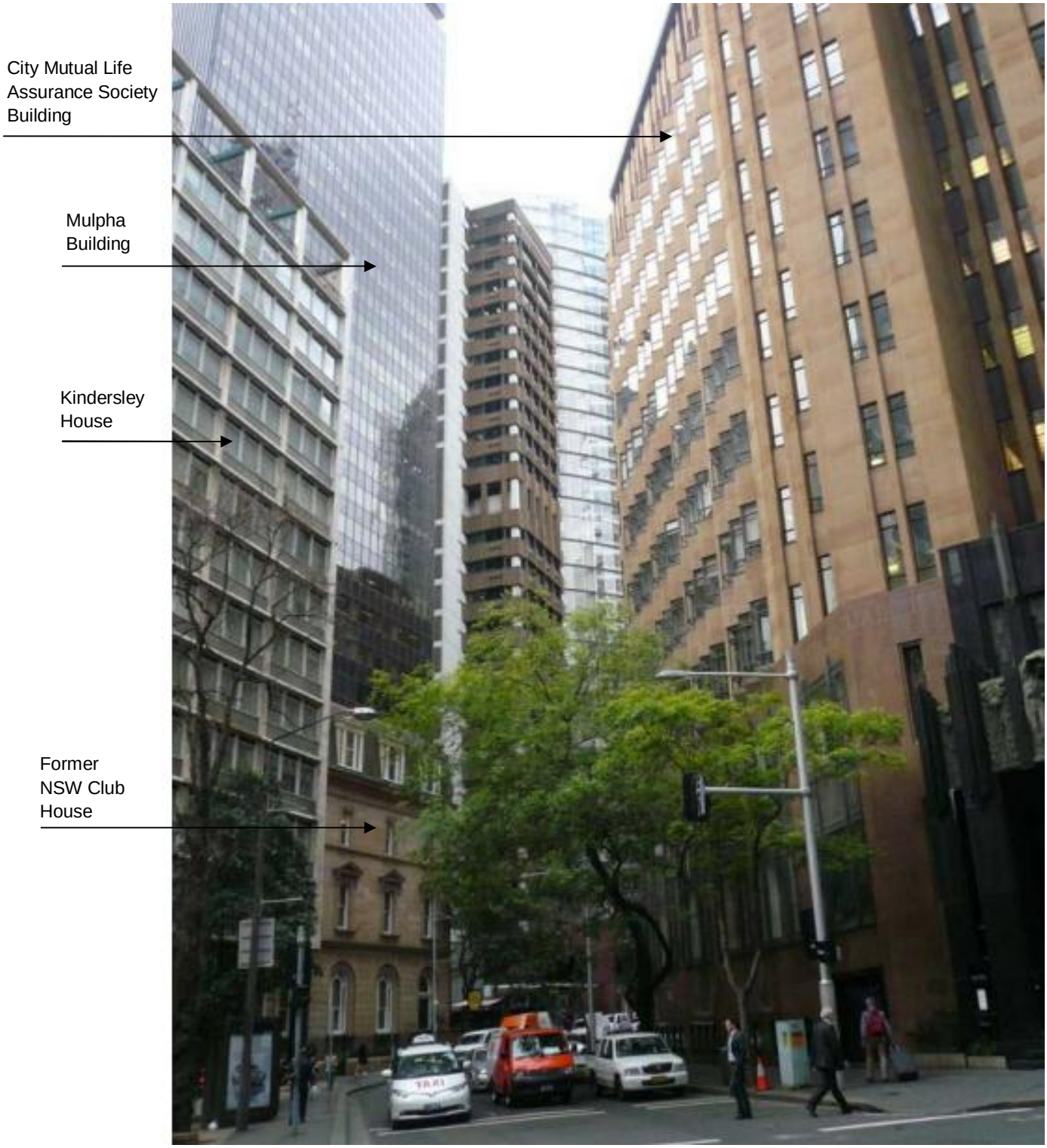


Figure 2.4 **View along Bligh Street showing the NSW Club House at 31 Bligh Street and the City Mutual Life Assurance Society Building**

Figure 2.5 Richard Johnson Square

Significant developments within the vicinity of the site include Wales House, the Public Trustee Office, Radisson Hotel Plaza, City Mutual Life Assurance Society Building, Sheraton Wentworth Hotel, Chifley Tower/Square, Macquarie Apartments, ABN Amro/Aurora Place, Noble House, Governor Macquarie Tower, and No. 1 Bligh Street.

A number of buildings in the surrounding area are heritage listed. These are identified in Chapter 14 and include the former NSW Club House and AFT House which are adjacent to the northern boundary of the site.

The site is in the northern part of the CBD and is accessible to a wide range of commercial, retail, entertainment and cultural services. It is in close proximity to bus and rail services, and is about 300 m from Wynyard train station and the George Street bus corridor. In addition to the 45 space basement car park, limited on-street metered car parking is available along Bligh, O'Connell and Hunter Streets, and public car parks are accessed from Bent and O'Connell Streets.

2.2.2 Infrastructure corridors in the vicinity of the site

Two corridors for railway infrastructure are located in the vicinity of the site. As indicated in Figure 2.6, the alignment of the tunnels for the CBD Metro Stage 1 pass beneath the site. Although the NSW Government has announced that the CBD Metro Stage 1 will not proceed at this time, Project Approval has been granted under Part 3A of the EP&A Act and the tunnel alignments form part of a rail corridor as defined by State Environmental Planning Policy Infrastructure (ISEPP) (refer to Section 3.2.1).

Figure 2.6 also reflects that a portion of the site is within an interim rail corridor as defined by the ISEPP. This interim rail corridor is referred to as the 'CBD Rail Link' in the ISEPP and is commonly known as the 'Metro Pitt' alignment to distinguish it from another interim rail corridor generally located to the west of George Street.

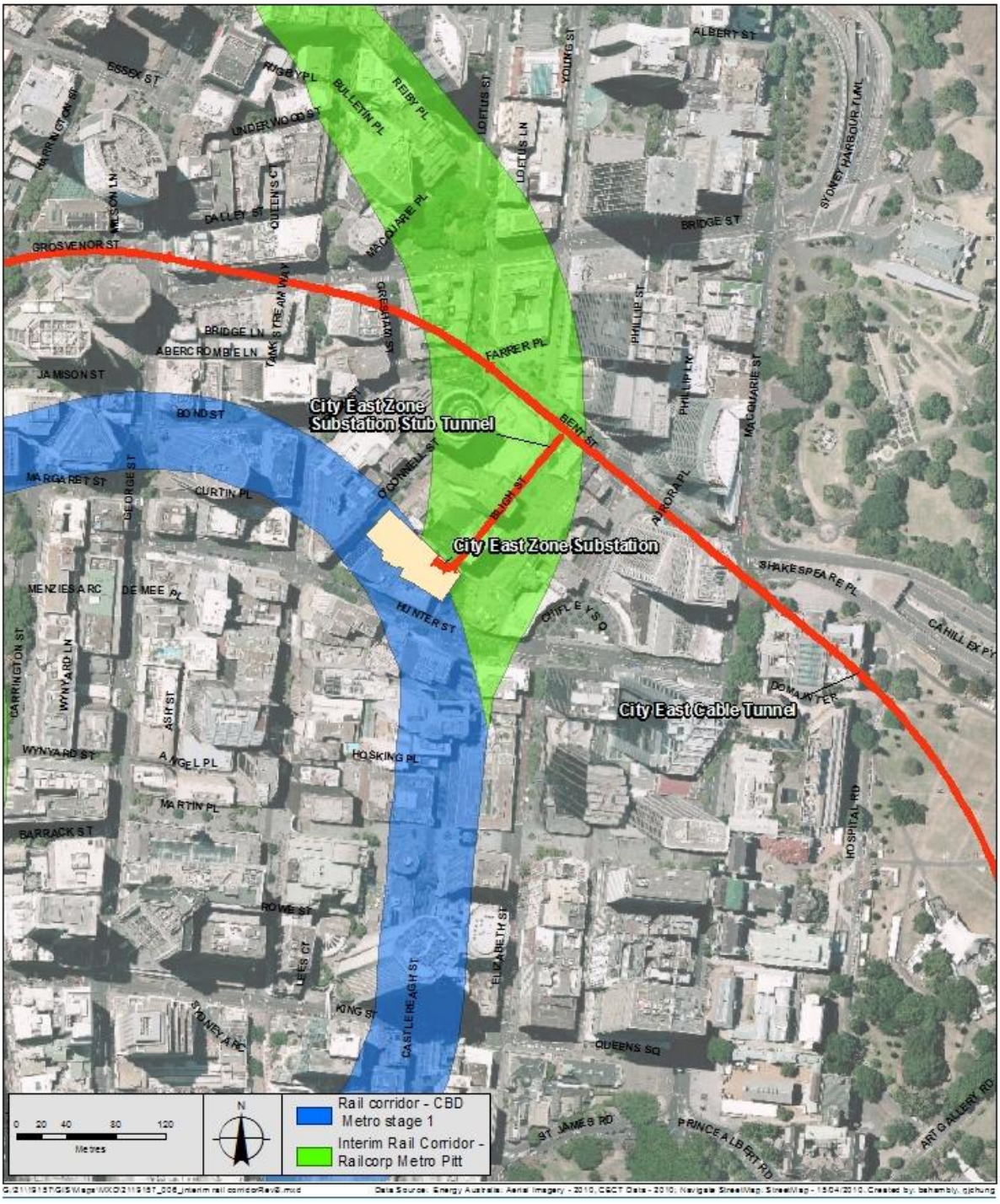


Figure 2.6 Alignment of rail corridors in the vicinity of the site

3. Statutory and strategic framework

This chapter summarises the approval process for the project under Part 3A of the NSW EP&A Act and the permissibility under relevant environmental planning instruments.

3.1 Approval process under the NSW Environmental Planning and Assessment Act, 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the statutory framework for planning approval and environmental assessment in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning and Infrastructure, statutory authorities and local councils.

The EP&A Act contains three schemes that impose requirements for planning approval:

- Part 3A provides for control of projects that require approval from the Minister for Planning and Infrastructure. Part 3A was repealed on 1 October 2011, however some projects will continue to be assessed under transitional arrangements for Part 3A projects
- Part 4 provides for control of 'local development' that requires development consent from the local Council
- Part 5 provides for control of 'activities' that do not require approval or development consent under Part 3A or Part 4.

The need or otherwise for development consent is set out in environmental planning instruments – State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs), or Local Environmental Plans (LEPs).

3.1.1 Objects of the EP&A Act

The following objects of the EP&A Act are relevant to the proposal:

(ii)The promotion and co-ordination of the orderly and economic use and development of land

(iii) The protection, provision and co-ordination of communication and utility services

(iv) The provision of land for public purposes

(vii) Ecologically sustainable development.

The project is consistent with the objects of the EP&A Act as it will:

- Promote the orderly and economic use of land by locating a commercial development within a underutilised area of a commercial precinct near regional transport infrastructure
- Provide utility services in the form of the City East Zone Substation which is an essential component of the overall Sydney CityGrid Project
- Provide a new through-site link for public purposes and public art

Achieve a high level of ESD including a minimum 5 Star Green Star office rating and 5 Star NABERS Energy rating.

3.1.2 Application of Part 3A of the EP&A Act 1979

Minister's declaration of the Sydney CityGrid Project

Section 75B(1) of the EP&A Act defines projects to which Part 3A applies and states that:

This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:

(a) by a State environmental planning policy, or

(b) by order of the Minister published in the Gazette (including by an order that amends such a policy).

The carrying out of particular or a class of development, or development for a program or plan of works or activities, may be so declared.

On 11 February 2008 the Minister for Planning declared that the Sydney CityGrid Project is a project to which Part 3A of the EP&A Act applies. This declaration includes:

'Development by EnergyAustralia for the purposes of upgrading the electricity supply network in the Sydney Central Business District (known as the 'Sydney CityGrid Project'), located within the City of Sydney local government area, and involving:

- *construction and operation of up to three new zone substations (including, as necessary, the demolition and/or refurbishment of existing zone substations, and the construction and use of commercial and/or retail developments on, adjacent to, or integrated with, the new zone substations);*
- *the refurbishment and augmentation of existing zone substations;*
- *replacement of, and upgrades to, EnergyAustralia's existing high voltage cable network;*
- *the construction and use of tunnels for the installation and operation of high voltage cables and associated cables, and other infrastructure; and*
- *the construction, operation and use of associated works, including ventilation and shafts and access structures, generally in the locations, or following the route, shown on the indicative map prepared by EnergyAustralia dated December 2007 and titled 'Sydney CityGrid Project.'*

(NSW Government Gazette No. 21, page 1168, 22 February 2008)

As the project includes construction and operation of a zone substation and the construction and use of a commercial and/or retail development that is integrated with the zone substation, it is consistent with the Minister's declaration and is subject to approval under Part 3A of the EP&A Act.

Concept Approval of the Sydney CityGrid Project

On the 20 September 2009, the Minister for Planning granted Concept Approval for the Sydney CityGrid Project (refer to Appendix A) based on information contained in:

- 08_0075 Major Project Application;
- Sydney CityGrid Project Concept Environmental Assessment Report, prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008; and
- Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009.

For the purposes of the Concept Approval and any Project Approval granted under it, Minister's Condition of Approval 1.3 of the Concept Approval defined the various components of the Sydney CityGrid Project as:

- Stage 1 – Belmore Park Substation site
  - Stage 1A – Construction and operation of the Belmore Park Zone Substation and cable tunnel connection from City South Cable Tunnel to Belmore Park Zone Substation; and
  - Stage 1B – Commercial/retail development on the corner of Pitt, Campbell and Hay Streets, to be integrated with the works comprising Stage 1A.
- Stage 2 – The balance of the works required for the concept plan, other than those defined as Stage 1 works, and comprising:
  - Stage 2A – Construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets;

- Stage 2B – Refurbishment of existing Dalley Street Zone Substation or construction of a new building adjacent to the existing site;
- Stage 2C – Construction and operation of a sub-transmission switching station (STSS) on a site at the intersection of Riley Street and Albion Street, Surry Hills;
- Stage 2D – Construction of City East Cable Tunnel between Riley Street STSS and City North Zone Substation with connections to the proposed City East and existing Dalley Street Zone Substations, and a potential services control room adjacent to the Riley Street STSS; and
- Stage 2E – Extension of the City South Cable Tunnel from Wade Place to Riley Street, Surry Hills.

Minister's Condition of Approval (MCoA) 2.2 requires that the construction and operation of Stage 2 of the Sydney CityGrid Project is subject to further assessment under Part 3A of the EP&A Act. In seeking approval for Stage 2 works, MCoA 2.3 allows Ausgrid to submit a Project Application for Stage 2 in its entirety, or submit separate applications for each sub-stage or a combination of sub-stages.

Ausgrid proposes to obtain Project Approval for Stage 2A of the Sydney CityGrid Project in two separate but interrelated stages. Approval for Stage 2A(i) was granted on 13 July 2011.

The works that are the subject of this Environmental Assessment are Stage 2A(ii) of the City East Zone Substation and integrated commercial tower (the 'project'). The Director-General of the Department of Planning and Infrastructure issued assessments requirements for Stage 2A(ii) on 12 August 2011.

Environmental Planning and Assessment Act 1979 as amended

Amendments to the EP&A Act came into force on 1 October 2011 to repeal Part 3A of the EP&A Act. Schedule 6A of the EP&A Act as amended defines transitional arrangements to enable certain types of projects to continue to be assessed under Part 3A.

Clause 2 of Schedule 6A of the EP&A Act defines transitional Part 3A projects and states that:

(1) For the purposes of this Schedule, the following are transitional Part 3A projects:

(a) an approved project (whether approved before or after the repeal of Part 3A),

(b) a project for which environmental assessment requirements were notified or adopted before the repeal of Part 3A,

(c) a project that is the subject of a Part 3A project application and that the regulations declare to be a transitional Part 3A project.

(2) However, a transitional Part 3A project does not include any of the following:

(a) a project that ceases to be a project to which Part 3A of this Act applies by the operation of State Environmental Planning Policy (Major Development) Amendment 2011,

(b) a project that ceases to be a project to which Part 3A of this Act applies by the operation of any other State environmental planning policy, of this Schedule or of a regulation under this Act.

Stage 2A(ii) is a transitional Part 3A project as environmental assessment requirements were issued on 12 August 2011, prior to the repeal of Part 3A on 1 October 2011.

3.1.3 Application of other provisions of the EP&A Act

Under Section 75R(3) of the EP&A Act, environmental planning instruments (other than State environmental planning policies) do not apply to or in respect of an approved project. Section 75J(3) states that the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved. As such, it is at the Minister's discretion whether the provisions of the Sydney Local Environmental Plan 2005 are to be taken into account.

3.1.4 Effect of Part 3A of the EP&A Act on approvals under other legislation

Part 3A of the EP&A Act removes the need for approvals under some legislation that may be required for proposals assessed under Part 4 or Part 5 of the EP&A Act. Part 3A consolidates relevant approval requirements and environmental management provisions into a single assessment process.

Section 75U(1) of the EP&A Act specifies certain authorisations which are not required for an 'approved project' under Part 3A, namely:

(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,

(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,

(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,

(d) an Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974,

(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation or State protected land,

(f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,

(g) a bush fire safety authority under section 100B of the Rural Fires Act 1997,

(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000.

Section 75A defines 'approved project' as 'a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given'. Consequently, these approvals would not be required if the Minister grants Project Approval to carry out the project under Part 3A.

Under Section 75V(1) of the EP&A Act, the following authorisations cannot be refused if necessary to carry out an 'approved project' and are to be substantially consistent with an approval to carry out the project given under Part 3A:

(a) An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997; and

(b) an aquaculture permit under section 144 of the Fisheries Management Act 1994,

(c) an approval under section 15 of the Mine Subsidence Compensation Act 1961,

(d) a mining lease under the Mining Act 1992,

(e) a production lease under the Petroleum (Onshore) Act 1991,

(f) an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act),

(g) a consent under section 138 of the Roads Act 1993,

(h) a licence under the Pipelines Act 1967.

3.1.5 Director-General's requirements

Director-General's requirements

The Director-General issued assessment requirements under Section 75F(3) of the EP&A Act on 12th August 2011 and this Environmental Assessment addresses those requirements (Appendix B). Table 3-1 summarises

the environmental assessment requirements issued on 12 August 2011 and lists the section of this document that addresses each requirement.

Table 3-1 Summary of Director-General's requirements

Director-General requirements	Document reference
General requirements	
Inclusion of an executive summary	Executive Summary
Detailed description and location of all project components	Chapter 6
A timeline identifying the proposed construction and operation of the project	Section 6.7
Maps/plans/figures identifying existing environmental features and the location of the project	Chapter 2, Chapter 6 and Chapter 8
Extent of excavation, spoil and fill volumes	Chapter 13
Consideration of any relevant statutory provisions	Chapter 3
An assessment of the key issues during construction and operation	Chapters 8 - 21
Draft Statement of Commitments	Chapter 22
A conclusion justifying the project	Chapter 24
Certification by the author of the Environmental Assessment that the information if neither false nor misleading	Certification of Environmental Assessment
Issue-specific requirements	
Demonstrate consistency with the Concept Approval and Project Approval for Stage 2A(i)	Section 5.3 and Section 5.4
A **visual impact assessment** during construction and operation of the project	Chapter 8
Provide outcomes of the **design review process**	Section 8.1
A **noise and vibration impact assessment** for the construction and operation of the project	Chapter 12
Confirmation that **Aboriginal items of significance** will be unlikely to be present within the project areas, in consultation with the Metropolitan Local Aboriginal Land Council and other relevant Aboriginal community.	Chapter 17
A **non-indigenous heritage assessment** which identifies any heritage items under or adjacent to the areas affected by the project.	Chapter 15 and Chapter 16
An **air quality assessment** for the construction and operation of the project and specific mitigation and management measures	Chapter 18
A **greenhouse gas potential assessment** in accordance with the methodology specified in the *National Greenhouse Accounts (NGA) Factors* (DECC, November 2008).	Chapter 19
Identify how the development will incorporate **ecologically sustainable development** principles in the design, construction and ongoing operation of the project	Section 6.3.16
Provision of **bicycle parking and end of trip facilities** in accordance with NSW Planning Guidelines for walking and cycling requirements	Section 6.3

Director-General requirements	Document reference
Detailed information on **water quality impacts** including surface water and groundwater during construction and operation	Chapter 20
A traffic and access assessment	Chapter 14
An electric and magnetic fields impact assessment	Chapter 21
Detail outcomes of consultation with RailCorp and NSW Transport in relation to project components near **other existing or proposed infrastructure**	Section 4.2
Environmental risk analysis	Chapter 7
Consultation program	Chapter 4

Concept Approval requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, the environmental assessment requirements Stage 2 of the Sydney CityGrid Project, or any sub-state of Stage 2 (Stage 2A, 2B, 2C,2D and 2E) are specified in MCoA 3.1, 3.2 and 3.3 of the Concept Approval, as amended (refer to Appendix A). Table 3-2 summarises the environmental assessment requirements detailed in the Concept Approval together with the section of this document that addresses each requirement.

Table 3-2 Summary of requirements in the Concept Approval

Requirements	Document reference
General requirements	
Demonstration that the project is consistent with the Concept Approval	Section 5.3
Detailed description and location of all project components and identification of environmental constraints	Chapter 6
Detailed project specific Statement of Commitments	Chapter 23
Outcome of consultation with RailCorp and Sydney Metro	Section 4.2
Issue-specific requirements	
A project level noise and vibration impact assessment for construction and operation noise prepared in accordance with the NSW Industrial Noise Policy (EPA, 2000), the interim Noise Control Guideline – Construction Site Noise (DECC 2008a), the Environment Noise Management – Assessing Vibration: a Technical Guidelines (DEC 2006a) and the Environment Criteria for Road Traffic Noise (EPA 1999). The assessment shall be prepared in consultation with the DECC.	Chapter 12
A project level **non-indigenous heritage assessment** prepared in consultation with the Heritage Council of NSW.	Chapter 15 and Chapter 16
An updated **indigenous heritage assessment** informed by the views of the Metropolitan Aboriginal Land Council and any other relevant, readily contactable Aboriginal community.	Chapter 17
An updated air quality assessment	Chapter 18
A **greenhouse gas potential assessment** in accordance with the methodology specified in the *National Greenhouse Accounts (NGA) Factors* (Department of Climate Change, November 2008).	Chapter 19
Detailed information on **water quality impacts**	Chapter 20

Requirements	Document reference
An updated traffic and access assessment	Chapter 14
A design review process for the proposed City East Zone Substation	Section 8.1
Consultation with Sydney Water Corporation	Section 4.2

3.2 Permissibility of the project under relevant environmental planning instruments

3.2.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to assist in the effective delivery of public infrastructure in the State by improving certainty and regulatory efficiency through a consistent planning assessment and approvals regime for public infrastructure and services across NSW. ISEPP defines the environmental assessment and approval process for public infrastructure and services facilities.

Clause 41 – Development permitted without consent

Clause 41 of ISEPP provides that development for the purpose of an electricity transmission or distribution network may be carried out by or on behalf of an electricity supply authority or public authority without development consent on any land.

As the project is for the purpose of an electricity distribution network and would be undertaken by a public authority, it would be able to be undertaken as development without consent if it were not otherwise a project that requires approval under Part 3A of the EP&A Act (refer to Section 3.1.2).

Clause 86 – Excavation in, above or adjacent to rail corridors

As the CBD Metro Stage 1 has been approved under Part 3A of the EP&A Act, it is a 'rail corridor' as defined by the ISEPP. Sydney Metro Authority was the rail authority for this rail corridor, however the agency was formally disbanded on 30 June 2010 following the deferment of the CBD Metro Stage 1 project. The statutory functions of Sydney Metro Authority are now undertaken by NSW Transport.

Clause 86 relates to development that involves penetrating the ground to a depth of at least 2 m below the existing ground level on land:

- Within or above a rail corridor, or
- Within 25 m (measured horizontally) of a rail corridor, or
- Within 25 m (measured horizontally) of the ground directly above an underground rail corridor.

The project is subject to Clause 86 as it would be located above the rail corridor for the CBD Metro Stage 1 and involves excavation to a depth of greater than 2 m below the existing ground surface.

Before determining the project application, the Department of Planning and Infrastructure must provide written notice to the chief executive of the rail authority for the rail corridor (NSW Transport) within seven days of receiving the application and take into consideration:

- Any response to the notice that is received within 21 days after the notice is given, and
- Any guidelines issued by the Director-General for the purposes of this clause and published in the Gazette.

Concurrence of the Chief Executive of NSW Transport is required prior to consent being granted. When deciding whether to grant concurrence, the Chief Executive is required to take into account:

a) The potential effects of the development (whether alone or cumulatively with other development or proposed development) on:

    i. The safety or structural integrity of existing or proposed rail infrastructure facilities in the rail corridor, and

ii. The safe and effective operation of existing or proposed rail infrastructure facilities in the rail corridor, and

b) What measures are proposed, or could reasonably be taken, to avoid or minimise those potential effects.

As detailed in Section 4.2.5, Ausgrid consulted extensively with the former Sydney Metro Authority when developing designs for Stages 2A(i) and 2A(ii) of the City East Zone Substation. The design has been refined to reduce the depth of excavation for the basement as this would maximise the separation distance between basement and the tunnels for the CBD Metro Project Stage 1. Transport NSW confirmed that this approach would avoid or otherwise minimise potential impacts on the safety, structural integrity, and operation of future developments within this rail corridor.

Clause 88 – Development within or adjacent to interim rail corridor

A portion of the site is located within an interim rail corridor as defined by the ISEPP. This interim rail corridor is referred to as the 'CBD Rail Link' in the ISEPP and is commonly known as the 'Metro Pitt' alignment to distinguish it from another interim rail corridor generally located to the west of George Street. RailCorp is the rail authority for the CBD Rail Link.

The project is subject to Clause 88 of ISEPP as it involves development which has a capital investment value of more than $200,000 and involves erecting a structure that is 10 or more metres high.

Before determining the project application, the Department of Planning and Infrastructure must provide written notice to the Chief Executive of RailCorp within seven days of receiving the application. Concurrence of the Chief Executive is required prior to consent being granted. In determining whether to grant concurrence, the Chief Executive is to take into account the likely effect of the development on:

(a) The practicability and cost of carrying out rail expansion projects on the land in the future, and

(b) Without limiting paragraph (a), the structural integrity or safety of, or ability to operate, such a project, and

(c) Without limiting paragraph (a), the land acquisition costs and the costs of construction, operation or maintenance of such a project.

As detailed in Section 4.2.6, Ausgrid has consulted extensively with RailCorp during development of designs for Stages 2A(i) and 2A(ii). The design has been specifically developed to incorporate reasonable measures to minimise potential impacts on both the practicality of carrying out rail expansion projects in the interim rail corridor, and the structural integrity and safety of rail expansion projects in the interim rail corridor.

3.2.2 State Environmental Planning Policy No. 55 – Remediation of Land

The aims and objectives of State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) are to provide a statewide approach to remediation of contaminated land and promote remediation of contaminated land to reduce risk of harm.

The project does not require consent under SEPP 55. Never-the-less, the principles of SEPP 55 were considered when preparing the Environmental Assessment for the project.

Under SEPP 55, a consent authority must not grant development consent unless:

(a) It has considered whether the land is contaminated, and

(b) 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, and

(c) If the land requires remediation to be made suitable for the 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.

The definition of remediation in Clause 4 of SEPP 55 includes 'removing, dispersing, destroying, reducing, mitigating or containing the contamination of any land; or eliminating or reducing any hazard arising from the contamination of any land (including by preventing the entry of persons or animals on the land)'.

The site has been used as a commercial building since the 1930s. A stage 1 preliminary contamination assessment undertaken at the site by Urban Environmental for Bovis Lend Lease in 2008 identified the presence of asbestos in fill encountered in one borehole. This investigation related to a previous development at the site.

The site is considered to be suitable for the proposed use. Any contaminated material would be managed in accordance with relevant legislation and guidelines which are outlined in Chapter 13, including the Department of Environment and Climate Change (DECC) Waste Classification Guideline (2009).

3.3 Compliance with local planning instruments

The following local planning instruments and plans are relevant to the project:

- Sydney Local Environmental Plan 2005 (LEP 2005)
- Draft Sydney Local Environmental Plan 2011 (Draft LEP 2011)
- Central Sydney Development Control Plan 2006 (DCP 2006)
- City of Sydney Access Development Control Plan 2004 (Access DCP)
- City of Sydney Draft Development Control Plan 2011 (Draft DCP 2011).

The project's consistency with LEP 2005, Draft LEP 2011, DCP 1996 and Draft DCP 2011 are considered in the tables of compliance at Appendix C.

A summary of the project's consistency with the key local development standards and controls is discussed in Table 3-3. Variations to, and non-compliance with, the key standards and guidelines highlighted in the table are discussed in detail in Chapter 8 of this Environmental Assessment.

Table 3-3 Summary of consistency with local planning instruments

Clause	Comments
Sydney Local Environmental Plan 2005	
Part 2 – Zoning	The site is located in the City Centre zone. The proposed public utility and commercial development is consistent with the zone objectives as: • It would provide essential infrastructure as well accommodate additional commercial and retail floor space on a currently under-utilised site. • The proposed design responds to the scale and design of surrounding built form, particularly heritage items; and • It would activate the street frontage. The proposed uses are permissible with development consent in the City Centre zone.
Part 3 – Height of Buildings	A maximum building height of 235 metres applies to the site. The project would have a maximum building height of 161.73 m which is well below the maximum permitted on the site. Taking the average of the RL of the entrances (Bligh Street Foyer RL.19.2 and O'Connell Street Entry RL 12.3), the average is RL. 15.75. Based on this, the maximum building height RL is 177.48
Part 4 – Floor Space Ratios	A maximum floor space ratio (FSR) of 12.5:1 applies to commercial developments on the site. Under clause 10 of the LEP the FSR control can be varied up to 13.75:1 (i.e. by 10%) if it meets certain criteria. The project would have a FSR of 13.75:1, a justification for the variation under clause 10 is located at Section 8.2.4.

Clause	Comments
Part 5 – Car Parking	LEP 2005 sets a maximum parking provision of 40 spaces on the site. The project would have up to 40 parking spaces for the commercial tenants, one for a courier, and five service vehicle spaces for the substation, and two for truck parking. The final number of car parking spaces would be finalised during detailed design. A traffic impact assessment is located at Appendix N and summarised in Chapter 14.
Part 6 – Heritage Provisions	A Heritage Impact Statement which addresses Part 6 of the LEP is located at Appendix P and summarised in Chapter 14.
Draft Sydney Local Environmental Plan 2011	
Zoning	The site is located in Zone B8 Metropolitan under Draft LEP 2011. The objectives for this zone are generally consistent with the objectives for the City Centre zone under LEP 2005. The proposed uses are permissible with development consent in the draft B8 zone.
Height	Under the Draft LEP the maximum building height for the site will remain at 235 m. The project would have a maximum building height of 161.73 m which is below the maximum permitted on the site.
FSR	A maximum base FSR of 8:1 applies to the site with an additional 4.5:1 permitted for commercial development. The LEP allows for a further 10% variation to the FSR development standard for sites which have been subject to a design competition. The project would have a maximum FSR of 13:75:1 and therefore complies with the maximum FSR development standard on the site. Further discussion relating to the FSR control is located in Section 8.2.4.
Development Control Plan 1996	
An assessment against all the relevant provisions in DCP 1996 is located in the table of compliance at Appendix C. An assessment against the key built form controls including building alignment, street frontage heights, setbacks, building bulk and building exteriors is located at Chapter 8. The project generally complies with the objectives and controls in DCP 1996, and where non-compliances occur, variations to the controls are strongly supported by the merits of the project, substantial public benefit, and the absence of any adverse amenity impacts.	
Access DCP	
The Access DCP sets minimum access requirements for new and existing development within the City of Sydney local government area (LGA). The proposed access arrangements for the project are addressed in the Access Report and included at Appendix O. The report demonstrates that the commercial component and publicly accessible areas of the project would comply with the relevant Australian Standards for access and therefore complies with the Access DCP.	

3.4 Other relevant NSW legislation

As indicated in Section 3.1.2, Sections 75U and 75V of the EP&A Act limit approvals that are required under other NSW legislation. The following section outlines additional approvals that may be required.

3.4.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates noise, air, land and water pollution. Environment protection licences are granted by the NSW Office of Environmental and Heritage (OEH) under the POEO Act for 'scheduled activities', 'scheduled development work' and regulating water pollution.

As the project is not a 'scheduled activity' or 'scheduled development work', an environment protection licence is not required.

As discussed in Chapter 19, groundwater may seep into the basement and cable tunnel and this would be collected and treated prior to discharge offsite to the stormwater system. Under Section 120 of the POEO Act,

it is an offence to pollute waters. If required, Ausgrid would obtain an environment protection licence for this activity. Section 122 states that it is a defence against proceedings under Part 5.3 of the POEO Act if the pollution was regulated by an environmental protection licence and the conditions of that licence were not contravened.

Under Section 75V(1) of the EP&A Act, an environment protection licence under Chapter 3 of the POEO Act cannot be refused if it is required to carry out an approved project.

3.4.2 Water Management Act 2000

The project would involve dewatering the basement excavation and cable tunnel. Under Section 91(3) of the *Water Management Act 2000*, an aquifer interference approval is required for projects that penetrate an aquifer. As indicated in Section 3.1.4, activity approvals under Section 91 of the *Water Management Act 2000* are not required for Part 3A projects.

Ausgrid consulted with NSW Office of Water (NOW) and additional information, including pumping volumes, flow rates and water was requested. Ausgrid has committed to preparing a Water Quality Sub-Plan as part of the CEMP. The Sub-Plan would be prepared in consultation with NOW and include details regarding estimated pumping volumes, flow rates and water quality.

3.4.3 Roads Act 1993

Works for the substation and cable tunnel would be required within the Bligh and O'Connell Street road corridors. These streets are non-classified roads and the City of Sydney Council is the relevant road authority. As a public utility, Ausgrid is exempt from the requirement under Section 138 of the *Roads Act 1993* to obtain consent from the local council to work within non-classified roads exercising its functions under the *Electricity Supply Act 1995*.

As indicated in Section 3.1.4, any approval granted under Section 138 of the *Roads Act 1993* must be applied consistently with the Part 3A Project Approval.

3.4.4 Electricity Supply Act 1995

The project requires works within the road reserves for Bligh and O'Connell Streets to construct the substation, cable tunnel and shafts for cable risers. Part 5 of the NSW *Electricity Supply Act 1995* sets out Ausgrid's powers relating to acquisition of land, construction of electricity works and powers of entry. These powers allow Ausgrid to construct electricity works within public roads with exemption from approval under the NSW *Local Government Act 1993*.

Under Part 5 of the *Electricity Supply Act 1995*, Ausgrid is required to notify the City of Sydney of the works and take into consideration any associated submission.

3.5 Commonwealth legislation

3.5.1 Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and management of protected areas and species, populations and communities and heritage items.

Approval from the Commonwealth Minister of Sustainability, Environment, Water, Population and Communities is required for:

- An action which has, will have or is likely to have a significant impact on "matters of National Environmental Significance" (NES matters). NES matters include:
  - World heritage values of a declared World Heritage property;
  - National Heritage values of a listed National Heritage place;

  - Ecological character of a declared Ramsar wetland;
  - Listed threatened species and ecological communities;
  - Listed migratory species;
  - Commonwealth marine environment; and
  - Nuclear actions.
- An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment;
- An action on Commonwealth land which has, will have or is likely to have a significant impact on the environment; or
- An action which has, will have, or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

A search of the EPBC Act protected matters database was undertaken as part of the Environmental Assessment Report for the Concept Plan prepared by PlanCom Consulting Pty Ltd (December 2008). It was considered unlikely that there would be any significant impacts on the protected matters. As such, the Sydney CityGrid Project was not referred to the Commonwealth Minister for the Environment.

As the 2008 search of the protected matters database was undertaken prior to confirmation of the site for the City East Zone Substation, GHD repeated this process in February 2010 and in March 2011. The results indicated that there are unlikely to be any protected matters that would be significantly impacted by the project. As a result, the project has not been referred to the Commonwealth under the EPBC Act.

4. Stakeholder consultation

This chapter outlines community consultation and stakeholder engagement that has been undertaken for the project. It summarises issues that have been raised during this consultation and how they have been addressed. It also provides details on future community consultation for the project.

4.1 Consultation approach

4.1.1 Community Information Plan

Ausgrid is committed to working closely with the community during both the planning and construction phases of the Sydney CityGrid Project and has developed a Community Information Plan (CIP) to address the requirements of MCoA 4 of the Concept Approval. This plan outlines the community and stakeholder communications and consultation processes that are to be undertaken throughout all stages of the Sydney CityGrid Project. The plan is a dynamic document that is regularly updated to ensure it addresses issues specific to the stages that together form the Sydney CityGrid Project.

The objectives of the CIP are to:

- Provide a framework that allows the community to be well informed and a process to address concerns
- Clarify areas of responsibility between Ausgrid and its contractors
- Meet the MCoA for the Sydney CityGrid Project.

A sub-plan has been developed that specifically relates to consultation associated with Stage 2A of the CityGrid Project and should be read in conjunction with the Sydney CityGrid CIP dated September 2009. Although approval of the City East Zone Substation and integrated commercial tower is being sought in two stages (refer to Section 1.3), a single CIP has been prepared to cover both Stage 2A(i) and Stage 2A(ii). A single CIP has been prepared to cover both stages due to many of the issues and communication methods being common across both stages of the project.

The CIP for Stage 2A will be periodically updated during the project to ensure its relevance to the pre-construction, construction and operational stages.

4.1.2 Consultation techniques

A range of engagement techniques were used to inform the affected community and stakeholders and to identify issues and concerns when preparing the Environmental Assessment. These activities included meetings with affected landowners and building managers, ongoing liaison with government agencies, and distributing community newsletters to properties in the vicinity of the site. A free call project 1800 number (1800 006 549) and dedicated email address (majorprojects@ausgrid.com.au) have also been available since the start of the CityGrid Project and have remained a central contact point for stakeholders to raise issues.

The objectives of the community and stakeholder engagement activities have been to:

- Identify interested stakeholders and appropriate communication methods
- Provide the community with up to date and timely information
- Provide a direct avenue for feedback to the project team
- Find a balance between social and environmental needs to ensure there is equity in the way that the project is delivered.

Ausgrid has been consulting with the community and relevant government agencies regarding Sydney CityGrid Project since early 2008. Given the interdependencies between all components of the Sydney CityGrid Project, consultation during preparation of the Environmental Assessment for Stage 2A(ii) expanded

upon that undertaken when preparing previous environmental assessments for the Concept Plan, Stage 1, Stage 2A(i) and Stage 2D and 2E of the Sydney CityGrid Project.

Consultation specifically relating to the City East Zone Substation was undertaken in 2010 when preparing the Environmental Assessment (July 2010) and subsequent Submissions Report and Preferred Project Report (March 2011) for Stage 2A(i) of the City East Zone Substation. At the time the Environmental Assessment (July 2010) was prepared, Stage 2A(i) included subsurface construction activities that now form part of Stage 2A(ii).

The following sections outline issues that were raised during consultation with relevant government agencies and the community most likely to be impacted by the project. These sections list issues relevant to Stage 2A(ii) that were identified during consultation for Stage 2A(i) or in submissions provided in response to the Environmental Assessment for Stage 2A(i). These include matters relating to subsurface construction activities and the design of the substation and integrated commercial tower.

4.2 Consultation with government agencies

4.2.1 City of Sydney Council

Ausgrid met with representatives of the City of Sydney on 5 February 2010 to specifically discuss the staged approval process for the City East Zone Substation. It was explained that this staged approach is required to minimise the timeframe required to deliver the overall Sydney CityGrid Project.

Ausgrid confirmed that the site at 33 Bligh Street, Sydney, had been purchased and that it would be developed as an integrated substation and commercial tower. Ausgrid would be responsible for development of the substation and an agreement would be entered into with Investa to develop the commercial tower.

As required by MCoA 3.2 of the Concept Approval, the design review process for the City East Zone Substation was based on the principles of the design review competition of the Sydney Local Environmental Plan 2005 and included consultation with Council. Council reviewed and endorsed the brief for the design competition prior to it being issued to the invited competitors. A Council representative was also included on the committee that selected the preferred design that is outlined in Chapter 1. As such, Council's views were considered when selecting the preferred design.

The Department of Planning and Infrastructure also consulted the City of Sydney when preparing the environmental assessment requirements (refer to Section 3.1.5). Council requested that the design principles be amended to require that the design:

Enhance the context of surrounding heritage items and in particular should give special consideration to the following:

- *the use of high quality materials commensurate with those represented in surrounding items including yellowblock sandstone, trachyte, and true bronze, and to a lesser extent, red Tarana granite;*
- *the massing, heights and proportions of surrounding items; and*
- *the fine level of architectural detailing and robust articulation of surrounding items.*

Council also requested that the following additional design principle be included:

The design, in the vicinity of the adjacent heritage listed property to the north at 33 Bligh Street, should incorporate a street setback that aligns with the former NSW Club, and maintains views of this item, looking north along Bligh Street.

These issues relate to the built form of the project and are addressed in Chapter 8.

4.2.2 NSW Office of Environment and Heritage

Consultation with the NSW Office of Environment and Heritage was focused on the noise and vibration assessment, and the heritage and archaeology assessments.

Noise and vibration

OEH was consulted in September 2011 to discuss the approach to the noise and vibration assessment. This expanded upon consultation undertaken during preparation of the Environmental Assessment (June 2010) and Submissions Report and Preferred Project Report (March 2011) for Stage 2A(i). OEH confirmed that the investigation should be undertaken in accordance with the guidelines listed in the Director-General's requirements. As indicated in Chapter 11, the noise and vibration assessment has been prepared in accordance with these guidelines.

During this consultation, OEH confirmed that:

- It is appropriate that the noise and vibration assessment update the previous report that assessed subsurface construction activities that were originally in Stage 2A(i) and are now included in Stage 2A(ii).
- As plant and equipment has not been selected, at this stage it is not possible to model the operational noise impacts in accordance with the INP. An acceptable approach is for the noise assessment to set performance goals that have been calculated in accordance with the INP, and for Ausgrid to commit to selecting plant and equipment to achieve these goals.

Heritage and archaeology

OEH (formerly the Heritage Branch of the Department of Planning) was consulted during Stage 2A(i) and 2A(ii) of the City East Zone Substation. This involved discussing the scope and results of the archaeological and built heritage assessments that have been undertaken.

The site has been substantially modified by excavation of the basements for Kindersley House in the 1960s and 1980s. During consultation for the Stage 2A(i) Environmental Assessment, the Heritage Branch of the Department of Planning indicated that the main issues associated with the project would be related to the following aspects of built heritage:

- Impact of vibration on heritage listed buildings in the vicinity of the works;
- Impact on view lines to and from the heritage listed buildings in the vicinity of the works;
- The massing of the building envelope should be developed such that it is of an appropriate design and scale and does not overawe the adjacent heritage listed buildings.

The Heritage Branch of the Department of Planning provided a submission on the Environmental Assessment for Stage 2A(i) of the City East Zone Substation and supported the findings of the heritage and archaeology studies, including those aspects relating to subsurface construction that are now included in Stage 2A(ii).

In September 2011, OEH was contacted to discuss the assessments being undertaken for the Environmental Assessment for Stage 2A(ii). In addition to the issues raised in consultation for Stage 2A(i), OEH advised that the Environmental Assessment should consider potential impacts on subsurface structures such as the Bennelong Drain.

Potential impacts on built heritage are assessed in the Statement of Heritage Impact prepared by NBRS + Partners (Appendix P) which is summarised in Chapter 1. Impacts on archaeology are assessed in Chapter 1. Potential impacts associated with vibration are assessed in Chapter 1. The results of these assessments conclude that the project is unlikely to result in significant adverse impacts on built heritage.

4.2.3 NSW Office of Water

The NOW provided a submission on the Environmental Assessment for Stage 2A(i) and advised that information, including pumping volumes, flow rates and water quality is required to determine whether a licence is required under the *Water Act 1912*. The issues raised for Stage 2A(i) also relate to Stage 2A(ii).

NOW requested that it be provided with a copy of the Water Quality Management Sub-plan that would be prepared before construction starts and the results of geotechnical and groundwater investigations regardless of whether a licence under Part 5 of the *Water Act 1912* is considered necessary.

Chapter 1 assesses potential impacts of the project on groundwater and addresses the issues raised by NOW. In addition, the Statement of Commitments require that further consultation be undertaken with NOW during construction planning to determine whether a licence under the *Water Act 1912* is required. This will involve:

- Ausgrid providing NOW with a copy of the Water Quality Management Sub-Plan and results.
- Ausgrid providing NOW with a copy of the results of geotechnical investigations and analysis relating to groundwater.

4.2.4 Sydney Water Corporation

Ausgrid consulted with Sydney Water Corporation (Sydney Water) during development of the concept design for Stage 2A(i) of the City East Zone Substation. Sydney Water's main concerns related to the potential for construction to impact on water and wastewater mains and the heritage listed Bennelong Stormwater Channel within Bligh Street adjacent to the site for the City East Zone Substation. These issues relate directly to the subsurface construction works that now form part of Stage 2A(ii).

Sydney Water indicated that there is the potential for construction to alter the existing rock stress regime around pipelines. The integrity of the ground/rock support in the vicinity of these drainage lines would need to be maintained at all times during construction of the project and any rock bolting must avoid interference with the drainage lines and their trench or tunnel installation. The detailed design would be developed to ensure that ground support such as rock anchors would not impact on these drainage lines.

Sydney Water requested that condition surveys be undertaken prior to and at the completion of construction as well as possible condition monitoring during construction. As detailed in the Statement of Commitments in Table 23-1, condition surveys would be conducted as part of the project.

Sydney Water requested that its assets be accurately shown on the final drawings for detailed assessment and that geotechnical information be provided. It also requested that construction be carried out in a manner that does not compromise the ability to maintain, renew, replace or appropriately enlarge the drainage lines. Works are not permitted within 3 m curtilage around each drainage line, without the appropriate level of heritage approval.

Ongoing consultation would be undertaken with Sydney Water during construction planning and this would involve providing drawings to Sydney Water showing the location of known services and utilities relative to the excavations to be undertaken for the project.

4.2.5 NSW Transport

As indicated in Section 2.2.2, the alignment of the tunnels for the CBD Metro Stage 1 is beneath the site. Although the NSW Government has announced that the CBD Metro Stage 1 will not proceed at this time, the project has been designed to accommodate the future presence of the CBD Metro Stage 1. This minimises the potential for any interface issues between the project and Stage 1 of the CBD Metro Project, should it proceed in the future.

Ausgrid liaised closely with NSW Transport (formerly Sydney Metro) from the outset of the CBD Metro Stage 1 project until the NSW Government announced that it had been deferred. Opportunities to avoid or otherwise minimise impacts on the CBD Metro Stage 1 were explored and this involved reducing the depth of excavations required for the basement that form part of the City East Zone Substation. NSW Transport confirmed that the design provides sufficient separation distance between the tunnels for the CBD Metro Stage 1 and the City East Zone Substation. On this basis, NSW Transport advised that the project is unlikely to impact on the future viability of the tunnels for the CBD Metro Stage 1.

Ausgrid and NSW Transport have commenced negotiating an agreement that would detail the measures to be implemented to protect the tunnel corridor.

4.2.6 RailCorp

Consultation with RailCorp has been undertaken during development of the concept design. This involved consultation during preparation of the Concept Environmental Assessment (December 2008) as well as the Environmental Assessments for Stage 2A(i) of the Sydney East Zone Substation, and Stages 2B, 2D and 2E of the Sydney CityGrid Project. RailCorp raised a number of issues that need to be considered during development of the concept design to ensure that the Sydney CityGrid Project does not adversely impact on any existing or proposed assets that include the City Circle and Eastern Suburbs Rail Lines, and the proposed MetroWest and MetroPitt Rail Lines.

RailCorp was provided the opportunity to comment on drawings that define the horizontal and vertical alignment of the Sydney CityGrid Project relative to existing and proposed rail assets. The base of the interim rail corridor for the proposed MetroPitt tunnels is located between about RL - 17.8 and RL - 18.2 where it intersects with the cable tunnel under Bligh Street. The crown of the cable tunnel would be between about RL - 23 and RL - 26 at this location to provide a separation distance of at least 5.5 m. Issues raised by RailCorp have been addressed during development of the concept design and RailCorp advised that this separation distance is appropriate and is unlikely to constrain future development of the MetroPitt corridor.

RailCorp requested the following information be provided during development of the detailed design:

- Tunnel design criteria
- An electrolysis report for those areas of the project within 60 m of the existing electrified rail network (or other distance as agreed with RailCorp)
- A services search to identify the presence of any rail services in the immediate vicinity of the project
- Geotechnical and structural reports for components of the project within 25 m of existing rail infrastructure
- Construction methodologies, risk assessments, Safe Work Method Statements and any monitoring regimes applicable to rail infrastructure
- Methods to prevent contaminants entering into the rail corridor, including possible stormwater ingress must be taken into account
- A condition survey identifying the condition of existing infrastructure prior to and after construction of the project.

These items of information are more relevant to Stage 2D of the Sydney CityGrid Project and the only item that is potentially relevant to the project is the tunnel design criteria. This would be provided to RailCorp during development of the design.

RailCorp also advised that the following noise and vibration issues should be considered:

- Impacts of vibration on existing infrastructure e.g. road/ rail tunnels
- Impacts of vibration from rail operations on the project.

Ausgrid would continue to consult with RailCorp to address potential issues during development of the detailed design. This would include the opportunity to comment on relevant design information.

4.2.7 Roads and Traffic Authority

The Roads and Traffic Authority (RTA) submitted a response to the Environmental Assessment (July 2010) for Stage 2A(i) and raised issues that are relevant to Stage 2A(ii), including:

- The need for a Construction Traffic Management Plan to be prepared and submitted to the RTA for review prior to commencement of works
- A Road Occupancy Licence should be obtained from the Transport Management Centre for any works which may impact on the traffic flows along Bligh and O'Connell Streets as a result of the project.

- Approval may be required if works which require the use of cranes or other construction vehicles which occupy the road reserve.
- The layout of the car parking areas should be in accordance with AS 2890.1 – 2004 and AS 2890.2 – 2002.
- Ausgrid should be responsible for all public utility adjustments/relocation works necessitated by the project and as required by the various utility authorities and/or their agents.
- All works/regulatory signposting associated with the project should be at Ausgrid's expense.

These issues are addressed in Chapter 14.

4.2.8 Department of Trade and Investment, Regional Infrastructure and Services

NSW Industry & Investment submitted a response to the Environmental Assessment (July 2010) for Stage 2A(i) and confirmed that it did not wish to raise any issues on the content of the Environmental Assessment. As Stage 2A(ii) does not raise any issues relevant to the Department of Trade and Investment, Regional Infrastructure and Services, additional consultation has not been undertaken.

4.2.9 Metropolitan Local Aboriginal Land Council

A site inspection was undertaken by a representative from the Metropolitan Local Aboriginal Land Council on 19 April 2010. As construction of Kindersley House involved excavation into bedrock, it was considered highly unlikely that the site contains any items of significance to the indigenous community. On this basis, the Metropolitan Local Aboriginal Land Council confirmed that there are no specific issues requiring consideration (refer to Chapter 17).

4.3 Consultation with community stakeholders

Ausgrid recognises the importance of effective communication with the community during the planning, construction and operational phases of a project. Extensive consultation has been undertaken with key community stakeholders during development of the Sydney CityGrid Project.

Community consultation during preparation of this Environmental Assessment expanded upon that undertaken for Stage 2A(i) which included a site visit to identify any buildings, businesses or organisations adjacent to or in the immediate vicinity of the site that are likely to have specific consultation requirements. The owners of adjacent and nearby buildings were contacted to arrange face to face meetings with members of the Ausgrid project team. These meetings aimed to outline the program of works and enabled stakeholders to ask questions and raise any issues or concerns they may have with the project. Meetings were held with:

- Radisson Hotel
- Soffitel Wentworth Hotel
- Adjacent landholders including
  - Bryant Strata Management
  - BCS Strata Management
  - CB Richards Ellis
  - Coombes Property
  - Strata Plus
  - Kingsmede
  - The Lowy Institute for International Policy.

During these meetings, stakeholders raised a number of issues relating to Stage 2A(ii) and these are outlined in Table 4-1.

4.3.1 Newsletters distributed to the community

Newsletters were distributed to the area surrounding the site in May 2010, July 2010 and August 2011 outlining the project and providing updates on key milestones. Copies of the newsletters are in Appendix D.

The August 2011 newsletter provided an update on the status of the overall project to develop a substation and integrated commercial tower at the site and indicated that Stage 2A(i) had been approved and an environmental assessment was being prepared for Stage 2A(ii). It also invited neighbours to contact Ausgrid to raise issues or obtain further information.

4.3.2 Meetings with landowners surrounding the site

The approach to community consultation for both stages of the City East Zone Substation has been specifically designed to actively engage landowners in the immediate vicinity of the site as they have the greatest potential to be affected by construction and operation of the project. Once the design review process had been completed, Ausgrid met with landowners surrounding the site to outline the steps taken to select the preferred design for which approval would be sought in Stage 2A(ii). This included discussing the design constraints associated with infrastructure such as substations.

As the Lowy Institute for International Policy raised a number of issues relating to the design of the building during consultation undertaken between May 2010 and April 2011, a meeting was convened in May 2011 to present the design. This meeting was attended by the Department of Planning and Infrastructure and involved outlining the findings of the selection panel that concluded the selected design would deliver an iconic building that demonstrates design excellence. The selection panel included a NSW Government architect and representatives from the City of Sydney and the proponent (refer to Section 8.1).

As part of construction planning for Stage 2A(i), Ausgrid met with landowners adjoining the site to negotiate property agreements. This involved a series of one-on-one meetings with:

- The Lowy Institute for International Policy
- Radisson Hotel
- Bryant Strata Management
- BCS Strata Management
- CB Richards Ellis
- Coombes Property
- Strata Plus
- Kingsmede

The first meetings relating to the property agreements occurred in July 2011 and meetings will continue until the agreements have been finalised. Given the interrelationship between Stage 2A(i) and 2A(ii), the meetings provided an effective opportunity for Ausgrid to brief these stakeholders on issues related to Stage 2A(ii) This involved providing information relating to the building design selected as an outcome of the competitive design process.

Multiple meetings have been held with each adjoining landholder and this demonstrates that the level of consultation has been commensurate with the degree of interest and likely impact on the stakeholder.

These meetings have been effective as they have ensured that those in the immediate vicinity of the site have a high level of awareness of the project. The meetings provided stakeholders with multiple opportunities to raise issues directly with the Ausgrid and for Ausgrid to outline how these issues would be addressed.

Consultation with the broader community would be conducted during exhibition of the Environmental Assessment (refer to Section 4.4) and throughout construction of Stage 2A(i) and for 2A(ii), subject to the approval process.

4.3.3 Summary of issues raised by the community

Table 4-1 summarises issues relating to the project that were raised during consultation with the community.

Table 4-1 Summary of issues raised by the community

Issue	Comments	Where addressed
Noise and vibration	• Impacts of construction and operation on sensitive receivers, including businesses, and guests staying at the Radisson Plaza Hotel. • Impacts of noise on the operation of surrounding businesses during normal working hours. • Works creating excessive noise and vibration should be limited to outside standard working hours. • Concern over the noise impacts associated with trucks being loaded and unloaded, particularly during spoil management activities.	Chapter 12
Groundwater management	• Potential for groundwater to seep into the excavations and for water to accumulate following demolition activities. • Water Quality Management Sub-Plan should be prepared as part of the CEMP.	Chapter 20
Traffic and access	• Deliveries to the site should be timed to avoid periods of congestion. • The two vehicle access points on O'Connell Street proposed as part of the design would disrupt pedestrian and vehicular movements and only one entrance point should be permitted. • Information is lacking on how and where trucks transporting demolition material would be loaded. • Concern over the impact of the works on the short term parking restrictions and taxi stand along O'Connell Street which provides space for hotel guests to unload baggage from vehicles.	Chapter 14
Air quality	• Potential for dust to enter into the foyer and settle on guests of the Radisson Plaza Hotel, particularly when spoil is loaded into trucks. • Concern over the impact of fine dust particles on the air intake system for the Radisson Plaza Hotel.	Chapter 18
Electric and magnetic fields	• Concerns related to public health.	Chapter 21
Heritage	• Impacts on the surrounding precinct, particularly views to and from the State Heritage Listed NSW Club Building (the Lowy Institute), AFT House and public open space. • The design of the substation and integrated commercial tower building should provide a sympathetic response in terms of the scale, massing, setbacks, façade articulation, proportioning and detailing to complement and reinforce the heritage qualities of the surrounding heritage items.	Chapter 14 – 16
Construction work hours	• Noise and vibration intensive construction work should be outside standard construction hours.	Section 6.7
Hoardings and site access	• Potential impacts of the location of hoardings on site lines and access to adjoining properties and car park entrances.	Section 8.3
Internal substation design	• Alternative internal layouts should be investigated to enable appropriate setbacks from Bligh and O'Connell Street frontages.	Section 8.2

Issue	Comments	Where addressed
Streetscape and public domain	• Concern over the lack of activation of Bligh and O'Connell Street frontages. • Concern that the 8-storey substation would have long term adverse impacts on Richard Johnson Square.	Section 8.3 and Section 15.2 Section 6.3 and Section 8.3
Structural integrity and support of surrounding buildings	• Impact of demolition and construction works on the structural integrity of adjacent buildings.	Table 23-1
Crane movements	• Potential for crane oversail on adjoining properties.	Section 6.6

4.4 Exhibition of the Environmental Assessment

The Environmental Assessment will be publicly exhibited by the Department of Planning and Infrastructure for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this time, a copy of the report will be available for viewing at selected locations and on websites maintained by the Department of Planning and Infrastructure and Ausgrid.

During the exhibition period, government agencies, interested groups and organisations, and the community would be invited to make written submissions to the Department of Planning and Infrastructure in response to the Environmental Assessment.

Ausgrid would also undertake community consultation during the exhibition period that is separate to the Department of Planning and Infrastructure's formal exhibition process. This would provide the community with additional information and consultation activities would include:

- Distributing a community newsletter outlining the Department of Planning and Infrastructure's public exhibition process and identifying opportunities to make submissions
- Letter box drops
- Further meetings with government agencies and surrounding landowners, if required
- Providing information on Ausgrid's website
- Maintaining the project information hotline and email

4.5 Consultation during construction of the project

As outlined in the Community Information Plan for Stage 2A, Ausgrid would continue to liaise closely with affected properties and the wider community in Bligh, O'Connell and Hunter Streets to keep them informed of all aspects of construction. Ongoing consultation activities would include:

- Ausgrid's website would be updated to include the latest information and contact details for the project, including copies of published community information and links to other Sydney CityGrid projects.
- A branded project sign would be erected at the site at the earliest possible stage to inform people of the project and provide contact details. A sign would also be installed to provide relevant contacts for emergencies during construction.
- Advertising and community newsletters would be used to notify the wider community about the development.

- Information would be disseminated by Ausgrid's community relations team to local and metropolitan media to further promote the project and key information to the wider community.

5. Strategic justification

This section outlines the strategic justification for the project as an essential component of the Sydney CityGrid Project. It also discusses the project's consistency with the Concept Approval for the Sydney CityGrid Project and the Project Approval for Stage 2A(i) of the City East Zone Substation.

5.1 Overview of the need for the Sydney CityGrid Project

The need and justification for the Sydney CityGrid Project is described in detail in the Concept Environmental Assessment Report (PlanCom, 2008). In summary, the existing electricity supply infrastructure in the Sydney CBD requires refurbishment, replacement, and augmentation to provide a secure electricity supply to the Sydney CBD that complies with new licensing requirements. The requirements specify that all city zone substations and transmission feeders must achieve a 'n-2' capacity, which means that they must be able to supply the full electricity demand with any two transformers or feeders out of service.

Ausgrid developed the Sydney CityGrid Project as an integrated strategy that is the most effective means of rebuilding or refurbishing the existing infrastructure while maintaining sufficient spare capacity to ensure an ongoing and reliable electricity supply. The overall objectives of the Sydney CityGrid Project are to:

- Meet and comply with the 'n-2' licence requirements
- Replace critical infrastructure that is scheduled for retirement
- Meet the forecast electricity network needs and demands in a cost effective manner
- Facilitate prudent longer term investment decisions
- Provide the flexibility to accommodate future network upgrades.

The potential environmental impacts of the Sydney CityGrid Project were assessed in the 2008 Concept Environmental Assessment Report and Concept Approval was subsequently granted by the Minister for Planning on 20 September 2009. Project Approval was also granted for Stage 1 of the Sydney CityGrid Project relating to the Belmore Park Substation development. As such, it is considered that the need for and justification of the Sydney CityGrid Project has been demonstrated.

The following section outlines the need and justification for Stage 2A(ii) within the context of the Sydney CityGrid Project.

5.2 Need and justification for the City East Zone Substation and integrated commercial tower

5.2.1 Need for the City East Zone Substation

The existing City East 33kV/11kV zone substation located at Woolloomooloo was commissioned in the 1960s and is approaching the end of its technical life. As it is not feasible to replace the substation at the existing site, a replacement substation is planned for completion by 2016 to cater for the projected growth in load in the CBD and improve reliability standards to comply with the 'n-2' licence conditions.

The new City East Zone Substation is required to allow 132kV feeders from the Riley Street STSS to be connected to the City North Zone Substation. A number of 11kV feeders would also link the City East Zone Substation to various parts of the northern-eastern Sydney CBD. Concept Approval and MCoA 1.3 specifically permits construction and operation of the new City East Zone Substation in the vicinity of Phillip, Bligh, Bent and O'Connell Streets, Sydney. Ausgrid purchased the site at 33 Bligh Street to establish the City East Zone Substation.

The City East Zone Substation is both needed and justified as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the ability to achieve the objectives of the overall project.

5.2.2 Need for the substation and commercial development to be integrated

Ausgrid was required to purchase sites for the Sydney CityGrid Project to construct essential above ground infrastructure such as the Belmore Park and City East zone substations. Land in the CBD is expensive and the purchase of 33 Bligh Street represents a significant proportion of the capital investment cost of the City East Zone Substation.

In terms of building height, the substation would be relatively small in stature (about 46 m above Bligh Street) compared to existing buildings in this part of the CBD where building heights are commonly in excess of 100 m. As the site currently features two commercial buildings and the City of Sydney had previously granted development consent to construct a 205 m commercial tower, an opportunity was identified to develop the site as an integrated substation and commercial tower.

Ausgrid is the proponent for the overall project and would be responsible for development of the substation. Ausgrid has entered into an agreement with Investa to deliver the commercial tower above the substation. This approach would allow the airspace above the substation to be developed for commercial purposes to reduce the capital cost of the substation and provide a built form that complements the surrounding urban environment. The substation and commercial tower would be built in a single construction phase.

The design for the City East Zone Substation and integrated commercial tower has been developed following a design review process that complied with the City of Sydney guidelines. As indicated in Section 8.1.1, the selection committee considered that the preferred design best addressed the design brief and demonstrated design excellence.

The integrated development is therefore needed as it would have the dual benefit of:

- Realising a commercial return on the purchase of the site by developing a commercial tower in the airspace above the substation.
- Providing a built form that exhibits design excellence and complements the surrounding urban environment which is characterised by high rise commercial towers.

5.3 Consistency with the Concept Approval for the Sydney CityGrid Project

On 20 September 2009, the Minister for Planning approved the Concept Plan for the Sydney CityGrid Project subject to compliance with a number of conditions. MCoA 3.1a of the Concept Approval requires a demonstration that the project is consistent with the requirements of the Concept Approval and generally consistent with the scope and intent of the concept outlined in documents listed in Condition 1.1 of the Approval. There are a number of MCoA that are not relevant to the approval of the project, including MCoA 4-6 inclusive which relate to actions that must be completed prior to commencing construction. The following sections demonstrate how the project is consistent with MCoA 3.1a.

5.3.1 MCoA 1.1 - General consistency with the documents specified in the Concept Approval for the Sydney CityGrid Project

The project is required to be generally consistent with documents listed in MCoA 1.1, including:

- 08_0075 Major Project Application;
- Sydney CityGrid Project Concept Environmental Assessment Report, prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008;
- Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009.

Consistency with these documents is discussed below.

08_0075 Major Project Application

The Major Project Application provided an overview of the Sydney CityGrid Project. It identified the key components of the Sydney CityGrid Project and the main issues associated with construction and operation.

Substation location and commercial development

The key aspects of the Sydney CityGrid Project are described in Section 2.5 of the report submitted as part of the Major Project Application and Section 2.5.4 relates to the City East Zone Substation and states:

A new City East Zone Substation is also required to be constructed which may include an integrated commercial/retail development. The specific site is still to be confirmed. A detailed environmental assessment in support of a separate project application will be submitted to the Department of Planning at a later date.

The CECT would be designed to allow for the connection of five 132kV feeders at new City East, emanating from the Riley Street STSS. Similarly, the City East connection must also allow for the installation of the four 132kV feeders that would run between the new City East and Dalley Street zone substations.

Section 2.6 of the report submitted as part of the Major Project Application states that:

Planning and feasibility studies in regard to the construction of a new City East Zone Substation are underway and an area in the northern CBD, in the general vicinity of Bent Street is considered to be a favourable location.

The project is consistent with the Major Project Application as the site for the City East Zone Substation is 33 Bligh Street which is in the vicinity of Bent Street, and the substation would be integrated with a commercial/retail development. Separate Project Applications were submitted to the Department of Planning on 15 May 2010 for Stage 2A(i) and Stage 2A(ii).

Feeder connections and design options including cable tunnels

The report submitted as part of the Major Project Application states that the City East Cable Tunnel would be designed to allow for the connection of five 132 kV feeders at the new City East Zone Substation, emanating from Riley Street STSS. Similarly, the City East connection must also allow four 132 kV feeders to be installed that would run between the new City East and Dalley Street zone substations. The following three potential options were identified to provide the connections:

- Option A: A shaft, and associated headworks within, or nearby to the substation building, and connection to the tunnel either directly or by cable tunnel between the main CECT alignment and the shaft
- Option B: Construction of a cable vault near to the substation building and then connection to the CECT alignment via directional drilling or microtunnelling
- Option C: Direct connection between the CECT alignment and the substation basement via directional drilling or microtunnelling.

The project is consistent with the Major Project Application as the tunnel connecting the City East Zone Substation and the City East Cable Tunnel involves a shaft and associated headworks within the substation building, and a cable tunnel connection between the substation and the City East Cable Tunnel. This is equivalent to Option A outlined in the Major Project Application and would enable feeders to be installed to connect to the City East Zone Substation.

Sydney CityGrid Project Concept Environmental Assessment Report, prepared by PlanCom Consulting Pty Ltd and dated 8 December 2008

A new City East Zone Substation

Section 4.2.6 of the Concept Environmental Assessment states that:

A new City East Zone Substation is also required to be constructed which may include an integrated commercial/retail development. The specific site is still to be confirmed. A detailed Environmental Assessment in support of a separate project approval would be submitted to the Department of Planning at a later date.

The CECT would be designed to allow for the connection of five 132 kV feeders at new City East Zone Substation, emanating from the Riley Street STSS. Similarly, the City East connection must also allow for the installation of the four 132 kV feeders that would run between the new City East Zone Substation and Dalley Street Zone Substation.

The project is consistent with Section 4.2.6 of the Concept Environmental Assessment as it involves constructing and operating a substation integrated with a commercial/retail development. The substation would connect to the City East Cable Tunnel to allow 132 kV feeders to be installed. . A total of five feeders would connect the City East Zone Substation to the Riley Street STSS.

As indicated in the Preferred Project Report for Stage 2D of the Sydney CityGrid Project, it is no longer proposed to refurbish the Dalley Street Zone Substation and install feeders to connect the Dalley Street Zone Substation to the City East Zone Substation. The Dalley Street Zone Substation would continue to be maintained until it is retired. Four feeders would connect the City East Zone Substation to the City North Zone Substation.

Substation location and commercial development

Section 3.5 of the Concept Environmental Assessment Report states that:

At present, a preferred location for the new City East Zone Substation has not been identified, however, EnergyAustralia is considering a site in the vicinity of Phillip, Bent Street, Bligh and O'Connell Streets. Sites under consideration are being discussed with potential developers and the final choice is subject to detailed negotiations. Given the high value of land in this part of the CBD an integrated substation/commercial development is being considered. It is expected that within an integrated development most of the substation would be accommodated in the lower and basement floors.

The project is consistent with Section 3.5 of the Concept Environmental Assessment Report as the site for the substation is at 33 Bligh Street which is in the vicinity of Phillip, Bent, Bligh and O'Connell Streets. In addition, the substation would be integrated with a commercial development. The substation would be in the basement and lower levels and the commercial development would be above the substation.

Cable tunnels

Section 4.2.4 of the Concept Environmental Assessment Report states that the City East Cable Tunnel would include smaller cable tunnels to facilitate connection to substations. This would include cable tunnel connections between the City East Cable Tunnel and the new City East Zone Substation.

The project is consistent with Section 4.2.4 of the Concept Environmental Assessment Report as it includes a cable tunnel to connect the City East Zone Substation to the City East Cable Tunnel.

Sydney CityGrid Project Submissions Response & Preferred Project Report, prepared by PlanCom Consulting Pty Ltd and dated May 2009

Section 4.1 of the Submissions Response & Preferred Project Report states that:

Apart from design changes to the Belmore Park Zone Substation and amendments to the proposed staging of the commercial development aspect of that project, there are no other proposed changes to the Sydney CityGrid Project, as detailed in the Project EAR submitted on 17 December 2008.

The Submissions Response & Preferred Project Report did not amend the aspects of the Sydney CityGrid Project described in the Concept Environmental Assessment that are relevant to Stage 2A(ii). As the project is consistent with the Concept Environmental Assessment, it is therefore consistent with the Submissions Response & Preferred Project Report.

5.3.2 MCoA 1.3 – Staging/scheduling of Concept Plan Components

MCoA 1.3 defines the various components of the Concept Plan and MCoA 1.3b(i) includes 'Stage 2A being the construction and operation of the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets'.

The project is consistent with MCoA 1.3b(i) as it involves construction and operation of the City East Zone Substation at a site between Bligh Street and O'Connell Street.

5.3.3 MCoA 2.2 – Stage 2 Development

MCoA 2.2 requires that construction and operation of Stage 2 (including Stages 2A, 2B, 2C, 2D and 2E) is subject to further assessment under Part 3A of the EP&A Act.

As discussed in Section 1.1, Ausgrid is seeking approval for the City East Zone Substation in two separate but interrelated stages that are referred to as Stage 2A(i) and Stage 2A(ii). Ausgrid consulted with the Department of Planning prior to seeking approval for the City East Zone Substation in two stages. Section 75E(4) of the EP&A Act enables a project application to be submitted for part of a project. The Department confirmed that separate project applications can be submitted for Stage 2A(i) and Stage 2A(ii).

The City East Zone Substation Project is consistent with MCoA 2.2 because approval for both of these stages would be sought under Part 3A of the EP&A Act.

An Environmental Assessment for Stage 2A(i) was submitted to the Department of Planning in July 2010 and approval was granted on 13 July 2011.

5.3.4 MCoA 2.3 – Stage 2 Development

MCoA 2.3 allows Ausgrid to submit an application for Stage 2 in its entirety or to submit separate applications for each sub-stage (stages 2A, 2B, 2C, 2D and 2E) or any combination of these stages.

The project is consistent with MCoA 2.3 as a separate application has been submitted for Stage 2A(ii).

5.3.5 MCoA 3.1 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.1 provides the environmental assessment requirements for project applications for Stage 2, of any sub-stage of Stage 2, or any combination of sub-stages submitted as a single project. These requirements are detailed in Table 3-2 which includes a cross reference to the section of this Environmental Assessment in which they are addressed. As such, the Environmental Assessment is consistent with MCoA 3.1.

5.3.6 MCoA 3.2 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.2 provides environmental assessment requirements for any project application for Stage 2A and/or 2B that are additional to those detailed in MCoA 3.1. MCoA 3.2a requires that a design review process for the proposed City East Zone Substation or Dalley Street Zone Substation form part of the Environmental Assessment. The outcome of this design review process would form part of the Environmental Assessment. The design review process would be based on the principles of the design review competition of the Sydney Local Environmental Plan 2005 and include consultation with Council.

MCoA 3.2b details design principles that are to be adopted for the design review process and MCoA 3.2c requires that the design review process take into consideration measures to reduce magnetic fields (refer to Table 3-2).

The project is consistent with MCoA 3.2 as the design review process has been undertaken based on the principles of the design review competition of the Sydney Local Environmental Plan 2005. Council was consulted during this process and this involved reviewing and endorsing the design brief. A Council representative was also included on the selection committee that evaluated the designs and chose the preferred option.

5.3.7 MCoA 3.3 – Project Applications and Specific Requirements

Pursuant to Section 75P(1)(a) of the EP&A Act, MCoA 3.3 provides environmental assessment requirements for any project application that are additional to those detailed in MCoA 3.1. MCoA 3.3 requires that Ausgrid consult with Sydney Water Corporation when confirming the preferred route for the City East Cable Tunnel to ensure its major sewer assets, stormwater and associated infrastructure (existing or planned) are not located within the selected route. This consultation with Sydney Water Corporation must continue during the detailed design and construction stage to avoid impacts.

The City East Cable Tunnel as defined by MCoA 1.3b(iv) of the Concept Approval includes the connection to the City East Zone Substation. Ausgrid consulted with Sydney Water Corporation regarding the potential impact on their assets associated with a 150 m section of cable tunnel below Bligh Street that forms part of the City East Cable Tunnel. Sydney Water Corporation confirmed that its major sewer assets, stormwater and associated infrastructure (existing or planned) are not located within the alignment for the cable tunnel beneath Bligh Street. Ausgrid would continue consultation with Sydney Water Corporation during construction planning for the project (refer to Section 4.2.4). The project is therefore consistent with MCoA 3.3.

5.4 Consistency with the Project Approval for Stage 2A(i) of the City East Zone Substation

Project Approval for Stage 2A(i) was granted on 13 July 2011. The scope of Stage 2A(i) of the City East Zone Substation is described in the Submissions Report and Preferred Project Report (March 2011) and involves demolishing the existing buildings on the site. The Project Approval for Stage 2A(i) specifically relates to demolition and does not contain any conditions relevant to the approval process for Stage 2A(ii).

6. Project description

This section describes the components of the project, the indicative construction method and timing.

6.1 Overview of the project

As detailed in Section 1.5, Stage 2A of the Sydney CityGrid project has been divided into two stages to reduce the duration required to deliver the City East Zone Substation. Stage 2A(ii) is the subject of this Environmental Assessment and involves the following main construction stages:

- Bulk excavation for the substation basement.
- Excavating and constructing a shaft and a 150 m section of tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street where it will interface with the City East Cable Tunnel Project. The City East Cable Tunnel is known as Stage 2D of the Sydney CityGrid Project and was approved on 18 July 2011.
- Constructing and operating the City East Zone Substation and integrated commercial tower.

Construction of Stage 2A(ii) would commence immediately following completion of Stage 2A(i).

The following sections describe the:

- Overall built form of the substation and integrated tower
- Components of the substation
- Cable tunnel
- Indicative construction method

6.2 Stratum subdivision

The project seeks approval for stratum subdivision of the future development. The commercial and substation components of the project would be placed into separate stratums. The subdivision is proposed to facilitate the independent operation and management of the two components of the project once it is completed. Easements would be placed on the stratum lots to provide access through those lots where appropriate, such as the common fire stairs within the substation component of the podium. Draft subdivision plans are located at Appendix F.

6.3 Description of the building

6.3.1 Building height

The project would have a maximum height of 161.73 m (RL 177.48 AHD). It would have a podium 45.68 m high on the Bligh Street frontage and 52.58 m high on the O'Connell Street frontage. Photomontages of the building during day time and night time periods are shown in Figure 6.1 and Figure 6.2 and plans are provided in Appendix G .

6.3.2 Building setbacks

Podium setbacks

On the Bligh Street frontage, the podium would be setback and aligned to respond to the adjoining buildings facing Richard Johnson Square (refer to Appendix G). As a result, the podium setback ranges between 2.7 m and 4.5 m to the property alignment.

On the O'Connell Street frontage, the building podium would be generally built to the boundary. The façade of the building would overhang the property boundary with O'Connell Street, which is owned by the City of

Sydney Council. Ausgrid consulted with the City of Sydney regarding the matter and will undertake the necessary steps to obtain land owner's consent and a lease for the facade to overhang the site boundary.

The building podium would be built to the site's northern and southern boundaries. Drawing No. PA-07 in Appendix G outlines the ground-level setbacks of the building to the property boundaries.

Tower setbacks

To provide a visually interesting building envelope, the tower's setbacks vary throughout the envelope. Table 6-1 provides a summary of the tower setbacks at various heights. The setbacks of the built form from the property boundaries (marked as red dashed lines) are shown on the architectural plans provided in Appendix G.

Table 6-1 Summary of tower setbacks

Frontage	Low rise (m)	Mid rise (m)	High rise (m)
North	0	0	0
East (Bligh Street)	2.6 – 5.65	2.6 - 5.65	2.6 – 5.65
West (O'Connell Street)	0.2 - 1	0.2 - 1	0.2 - 1
South	2 - 8.5	0.5 - 7	3 – 9.5

Figure 6.1 Photomontage of the building when viewed from Bligh Street during the day

Figure 6.2 Photomontage of the building when viewed from Bligh Street at night

6.3.3 Floor space area schedule

The project seeks approval for a total floor space area (FSA) of 28,050 m^2 and a floor space ratio (FSR) of 13.75:1. Table 6-2 provides a summary of the land uses and FSA on a floor by floor basis.

The FSA has been calculated in accordance with the LEP 2005 definition of FSA. Drawings illustrating the areas within the building that have been included in the FSA calculation are provided at Appendix I. In accordance with the relevant definition, the following areas are excluded from the calculation of FSA:

- All areas in and associated with the substation, as these areas are required to accommodate electrical plant.
- The Level 6 (O'Connell Street) and Level 7 (Bligh Street) unenclosed lobby / through-site link area which is open to both street frontages.
- The unenclosed areas of the Sky Lobby (Level 14) and Sky Garden (Level 32), which are naturally ventilated open spaces with operable louvres on three sides.

Excluding the above areas from the FSA calculation is consistent with other similar precedent development applications in the City of Sydney.

Table 6-2 Land use and floor space area

Level	Land use(s)	FSA (m^2)
Basement levels		
Level 1	Substation	-
Level 2	Substation	-
Level 3	28 tenant parking spaces 1 motorcycle bay Plant Substation	-
Level 4	10 tenant parking spaces 5 Ausgrid service vehicle spaces 1 courier bay 2 truck bays 1 motorcycle bay 184 bicycle spaces Plant Substation	11
Level 5	Plant Substation	-
Above ground levels		
Level 6 (O'Connell Street)	Lobby Building management Plant Substation	22
Level 7 (Bligh	Lobby Café	7 36

Level	Land use(s)	FSA (m^2)
Street)	Plant Substation	
Levels 8-11	Plant Substation	-
Level 12	Plant	-
Level 13	Plant Change rooms and amenities	236
Level 14	Sky Lobby	9
Levels 15-25 (Low Rise)	Commercial premises	1,362 (each level)
Level 26	Plant	-
Levels 27-31 (Mid Rise)	Commercial premises	1,474 (each level)
Level 32	Sky Garden	9
Level 33-36 (High Rise)	Commercial premises	1,342 (each level)
Level 37	Plant	-
Total		28,050

Under the draft LEP definition for gross floor area (GFA), the area allocated to change rooms and amenities would be considered 'End of Journey' floor space and is able to be excluded from the GFA calculation. Therefore under the draft LEP, the project has a GFA of 27,814 m^2 and an FSR of 13.49:1.

6.3.4 Materials and finishes

The proposed tower would utilise a mix of materials and finishes to provide the optimum environmental and aesthetic outcome.

The three main volumes of the tower would consist of glazed white frit curtain wall façades. The glazing panels would be framed by timber encased aluminium. The facades would also feature fixed aluminium shadow boxes that express the horizontal scale of each floor level.

The precast concrete core would be broken into four components separated by vertical glazed slots. The two end components incorporate the open fire stairs and the primary hydraulic risers. Full height glazing would be provided along the lift cores to activate the exposed part of the facade.

Detail of the proposed materials and finishes is provided on FSA drawings in Appendix I and on the materials board submitted separately to the Department of Planning and Infrastructure.

6.3.5 Internal components and circulation

An Access Report has been prepared by Morris Goding Accessibility Consulting (see Appendix O). The report demonstrates that the commercial component and publicly accessible areas of the project would comply with the relevant Australian Standards for access.

6.3.6 Pedestrian circulation

Pedestrian access to the tower would be available from both Bligh Street and O'Connell Street. A transfer lobby located at the Bligh Street level would provide pedestrian access via transparent vertical transporters up to the main commercial building lobby located at Level 14 (Sky Lobby), above the substation component of the building.

Through site access would be provided between Bligh Street and O'Connell Street during business hours via escalators and an accessible lift. Outside of office hours, low scale unenclosed gates would be used to prevent unauthorised access through the building.

Figure 6.3 shows the ground level floor plan indicating and egress to the site and the red dashed line denotes the property boundary. Further details are provided in the architectural plans located in Appendix G.

6.3.7 Vehicle access and car parking

The project would have:

- A maximum of 40 car parking spaces (including two accessible spaces) across two basement levels which would be allocated to the commercial tenants. The number of car parking spaces would be finalised during detailed design.
- A loading dock, including two truck parking spaces within the basement.
- Two motorcycle parking spaces.
- One courier parking space.
- Five service vehicle spaces would be provided for vehicles servicing the substation.

All vehicular access to the site, including service vehicles, would be via the basement entrance on O'Connell Street.

Access between the parking levels would be provided by two-way ramps. Ramp grades, transitions, and height clearance would comply with AS 2890.1:2004.

A turntable would provide access to the loading dock. The access, circulation and manoeuvring areas for service vehicles would comply with AS 2890.2 – 2002.

6.3.8 Bicycle parking spaces

A total of 184 bicycle parking spaces would be provided in the basement of the building. Associated change rooms and amenities would be provided on Level 13 within the podium.

6.3.9 Public domain and landscaping

A Public Domain Concept Plan has been prepared by Aspect (see Appendix V). The Plan shows the proposed design and finishes within the site boundary and provides an indicative scheme for public domain improvements to Richard Johnson Square. Richard Johnson Square is owned by the City of Sydney Council and further design and consultation with Council is required to finalise the public domain and landscaping plan that would be undertaken separate to this project. Cabling associated with the substation would run underneath Richard Johnson Square and the final design of this area would need to maintain access and clearance to the cabling for operational and maintenance purposes.

Landscape plans have also been prepared for the Sky Lobby and Sky Garden levels of the building (Appendix W).

A ground level setback would be provided on Bligh Street to align with the former NSW House and to provide a cafe with table seating. The cafe and seating would activate the Richard Johnson Square public domain.

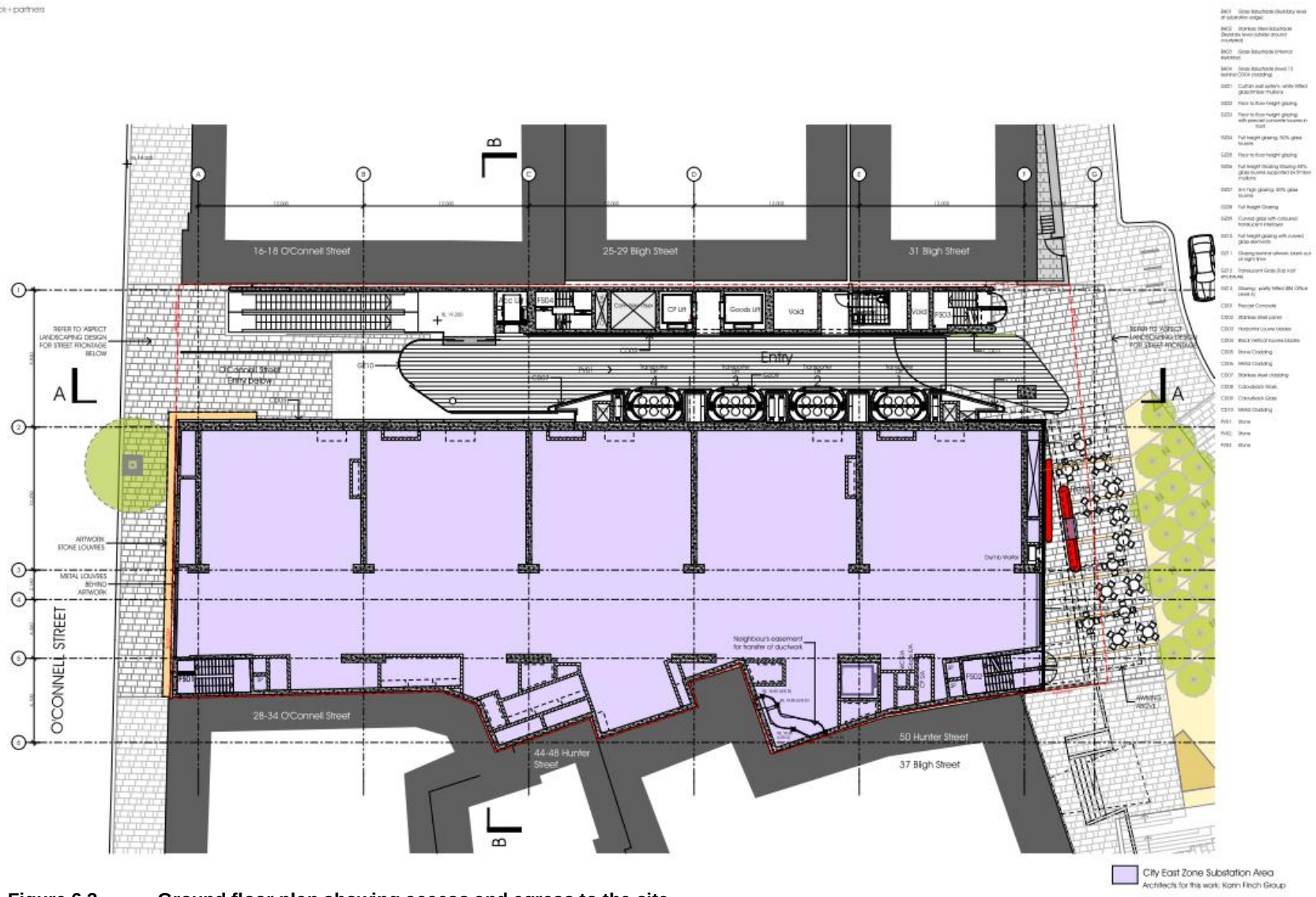


Figure 6.3 **Ground floor plan showing access and egress to the site**

6.3.10 Lighting

External and internal lighting would be provided around and throughout the building in accordance with AS 1680. Lighting is also proposed through-out the public domain for security and access requirements.

Internal light fittings within the commercial and retail areas would comply with AS 1680 and Green Star targets. In addition, specialist lighting within the building's entrance lobby would enhance the visual environment at ground level. All lighting would be time clock and light level controlled.

6.3.11 Signage

Signage zones have been designated on the plans on the eastern, southern and western sides of the building. These are located on the podium levels and the upper level of the building for identification purposes.

6.3.12 Building services

The following section provides an overview of building services that would be required for the project. Further investigations and consultation with relevant service providers would be undertaken as part of the detailed design phase to confirm connection requirements.

Electricity

Due to the nature of the building there would be significant changes to the electrical infrastructure. A new electricity connection would be provided to the building.

Telecommunications

The project would connect to existing telecommunications infrastructure in O'Connell Street and Bligh Street. It is not anticipated that trunk infrastructure would need to be upgraded. Telecommunications connection requirements would be confirmed during detailed design.

Water and sewer

The project would connect to water mains in O'Connell Street and Bligh Street to provide fire and hydraulic services. It is not anticipated that any upgrades to trunk infrastructure would be required.

A single sewer connection to the main within O'Connell Street would be made and if possible this would use an existing connection. The connection point is proposed to be at the Sydney Water manhole. It is not anticipated that any upgrades to Sydney Water's assets would be required.

The design team would liaise with Sydney Water to finalise the connections to water and sewer assets during the detailed design phase. Sydney Water would further assess the impact of the project when an application for a Section 73 Certificate is made.

Gas

A new gas connection would be made on O'Connell Street. This metered connection would serve mechanical boiler plant and other gas uses.

6.3.13 Operational waste management

An Operational Waste Management Plan has been prepared for the commercial tower and is located at Appendix Y. The plan outlines measures to achieve the following:

- Avoid the generation of unnecessary waste
- Minimise the quantities of wastes generated ending up as landfill
- Recovering, reusing and recycling waste generated onsite where possible.

All waste facilities and equipment would be designed and constructed to be in compliance with Sydney City Council Codes, Building Code of Australia, Australian Standards and statutory requirements and would include:

- A dedicated central commercial garbage room located adjacent to the loading dock within the basement (Level 4). The waste room would provide space for waste sorting and hold separate bins for glass, metal, plastic, electronic equipment and green waste. It would accommodate waste compactors and balers for general waste and recyclable paper products to minimise the volume of waste transported from the site.
- Each commercial tenancy or cleaners would be responsible for separating their waste and transferring the different types of waste and recycling to the designated garbage room on Level 4.
- Waste would be collected directly from the garbage room. Service vehicles would enter via O'Connell Street and park in the loading bay adjacent to the waste room.
- The building management or cleaner would be responsible for collecting waste from public areas such as the Sky Lobby. They would also be responsible for cleaning of the garbage areas and recycled waste holding areas, educating and updating tenants on sorting methods for their waste, organising both garbage and recycled waste pick-ups as required and assisting with emptying the bins during collection.

The volume of waste that would be generated by the project has been estimated and the following waste storage would be provided for the commercial and retail uses:

- General waste – Two 1500L bins, plus a compactor. Three collections would be required per week.
- Recyclables – One baler would be provided for cardboard and plastic products. 25 wheeled plastic bins with a capacity of 240L would be provided. Two collections are likely to be required per week.

6.3.14 Safety and Security

Closed circuit television (CCTV) monitoring would be provided to foyers and entry lobbies, main public areas, car park and loading dock, building entry and exit points. The CCTV coverage would be viewed and controlled by 24 hour security staff from a centralised security room.

A reception area located in the Sky Lobby would be staffed during business hours. Natural surveillance would also occur as a result of the operation of retail uses.

6.3.15 Compliance with the Building Code of Australia

A Building Code of Australia (BCA) compliance report has been prepared for the commercial tower component of the project by Blackett Maguire + Goldsmith (Appendix J). The report confirms that the building has been designed with regard to the requirements of the BCA and the commercial tower is capable of complying with the relevant provisions of the BCA.

ARUP has provided advice regarding the fire engineering for the commercial tower component of the project (Appendix K). This confirms that the commercial tower is capable of complying with the prescriptive provisions of the BCA and where necessary the fire-safety-related ‘deemed to satisfy’ provisions of the BCA. A Fire Safety Engineering and Evacuation Strategy would be prepared prior to the occupation of the tower.

6.3.16 Ecologically sustainable development

The commercial tower is targeting a 5 Star Green Star Office Design (v3) rating and a 5 Star NABERS Office Energy Rating. An Ecologically Sustainable Development report prepared by ARUP is located at Appendix L. The report details environmental strategies and targets for the commercial tower along with specific initiatives which would or could be incorporated into the design of the building. These include:

- Passive design solutions including façade optimisation, with good day lighting, glare control, thermal comfort and night flush to reduce energy consumption.
- Use of energy efficient lighting systems and sensor controls.
- Providing cycling storage facilities to occupants and visitors as well as change facilities to reduce travel demand and car dependency.
- During construction of the commercial tower, the project would aim to reduce demolition and construction waste by at least 84%, achieved through recycling and other means of diversion from landfill. Materials with ozone-depleting substances during its manufacturing process would also not be used.

An Integrated Water Management Plan prepared by ARUP (Appendix X) which indicates that the commercial tower would incorporate measures aimed at reducing potable water consumption by:

- Using efficient water fittings.
- Collecting rainwater from the building roof, treated where necessary, and reticulated back through the building for non-potable water uses.
- Minimising the landscape irrigation requirements, by selecting drought tolerant species.

Further options to reducing potable water use would be considered during detailed design.

6.4 Description of the substation

As indicated in Figure 6.1, the substation would be constructed over eight levels. These levels would be split by the two level car park, lobby and retail floor. Each level would cater for a specific component of the substation as outlined in Table 6-3.

The final dimensions of all plant and equipment within the substation would be confirmed during the detailed design and procurement phase. The transformers would be designed to fit within bays that are approximately 5 m long and 5.8 m wide as outlined in the indicative floor plans in Appendix G. The EMF assessment (Appendix AA) was based on the indicative floor plans showing the layout of the main elements of plant and equipment that would generate EMF.

Table 6-3 Components of the substation

Level	Substation component
1	Cable marshalling
2	Switch room/distribution centre
5	Transformer Bay
6	Amenities/plant room
8	132kV switch rooms
9	Cable joining
10	Control room/capacitor
11	Transformer radiator cooling

The substation would be in operation 24 hours a day, 7 days a week and would be maintained in accordance with the same systems applied to the remainder of Ausgrid's network. Typical maintenance of the substation would include cleaning mechanical and electrical equipment, air conditioners, hot/cold water systems, greasing the gas blower, checking the SF6 gas pressure, checking flow relays and wiring, inspecting bushings and on-load tap changing transformers and monitoring gas density, temperature and oxygen detectors.

The substation would ultimately be connected to Ausgrid's 11kV network, however this would be undertaken separately and is not within the scope of this project.

6.4.1 Security

The substation would be a secure site and would not be permanently staffed. Access would be restricted at all times to authorised personnel only. Separate vehicle accesses for the substation and commercial tower would be provided to ensure that access to the substation is restricted. Security control for the substation driveway may involve swipe card access.

6.5 Description of the cable tunnel

A cable tunnel is required beneath Bligh Street to connect to the City East Zone Substation with the City East Cable Tunnel which would pass beneath Bent Street. The cable tunnel would be approximately 150 m long with cross sectional dimensions of approximately 4 m wide by 4 m high (refer to Figure 6.5).

The cable tunnel would commence from a shaft extending from the basement of the City East Zone Substation to a depth of about RL – 23.6 and decline to about RL – 32.7 beneath the intersection of Bent Street and Bligh Street (refer to Figure 6.4).

Midway along Bligh Street, the cable tunnel would pass beneath the Metro Pitt corridor that has been reserved for future expansion of the rail network by RailCorp. At this location the cable tunnel would be at a depth of about RL – 23, which is at least 5.5 m below the Metro Pitt tunnels (RL - 17.76 and RL - 18.16). As discussed in Section 4.2.6, RailCorp has confirmed that this separation distance is adequate and would not compromise the future viability of expansion of the rail network within the Metro Pitt corridor.

The cable tunnel is designed and would be constructed to minimise the risk of ground settlement and potential settlement induced damage to existing buildings and other above ground and underground infrastructure by:

- Considering the results of geotechnical investigations and interpretation of ground conditions along the tunnel alignment when detailing the structural design.
- Designing the tunnel as a fully lined "tanked" tunnel to limit the amount of groundwater seepage to 300 litres/100 m/day and to minimise the risk of drawdown of the groundwater table that would be associated with long term seepage into a "drained tunnel". Reducing the risk of drawdown of the groundwater table also minimises the risk of settlement along the alignment and the associated risk of damage to buildings.
- Confirming that the vertical alignments maintain adequate clearance to existing aboveground and underground infrastructure and provide adequate rock cover to limit tunnel induced ground surface settlement.
- Designing the tunnel lining to withstand expected permanent loads associated with the full range of ground conditions and groundwater level (e.g. rock and water) pressures.
- Modelling expected ground settlements due to tunnelling works to prove design inputs and assumptions and confirm that expected ground movements and ground settlement are within acceptable limits.

The design includes a fully lined cable tunnel to limit the volume of groundwater that seeps into the tunnel. Groundwater from the substation and cable tunnel is likely to be pumped to the existing CSCT water treatment plant (via the CSCT), which is located at the Campbell Street Zone Substation. Groundwater would be treated to the relevant ANZECC 2000 standards prior to discharge to the stormwater system.

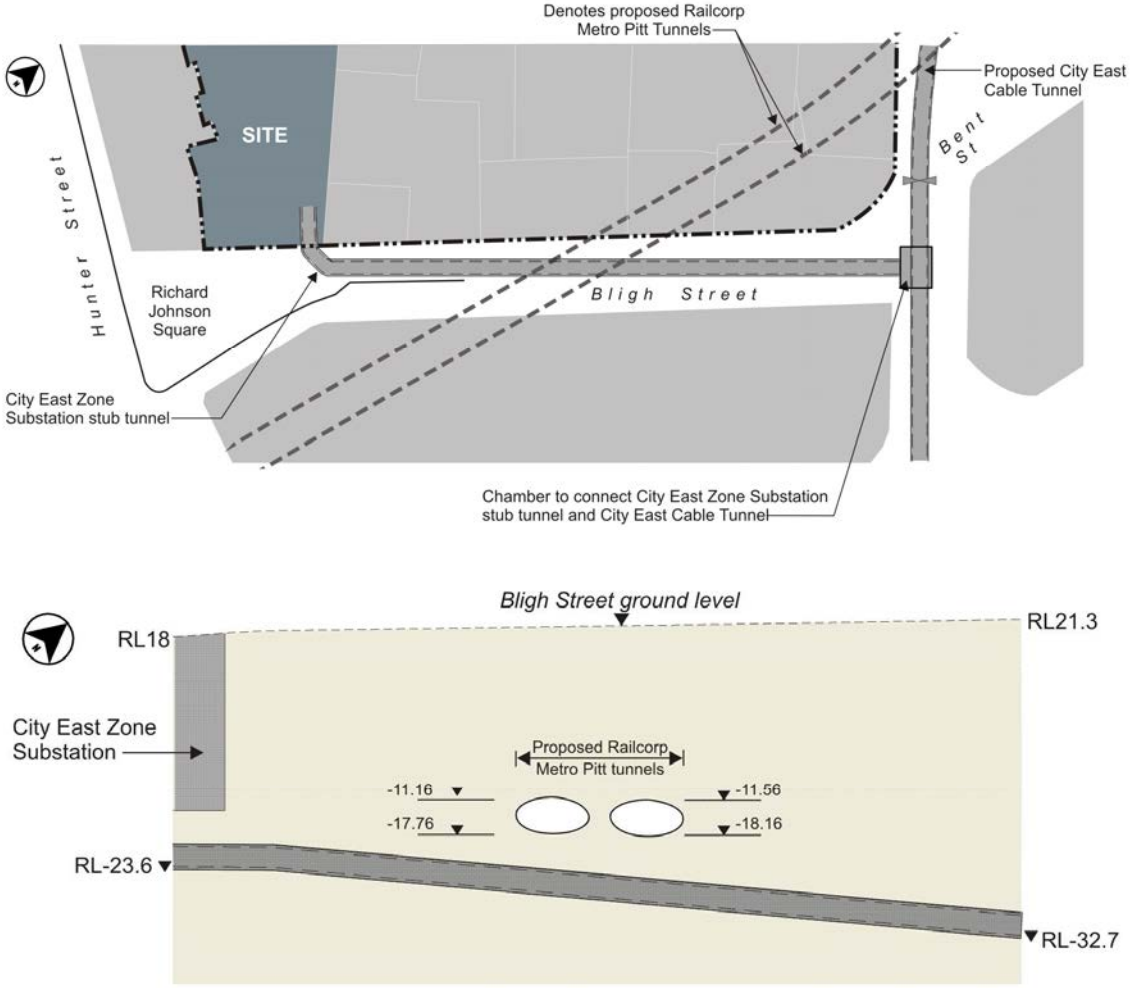


Figure 6.4 Indicative long section of the cable tunnel

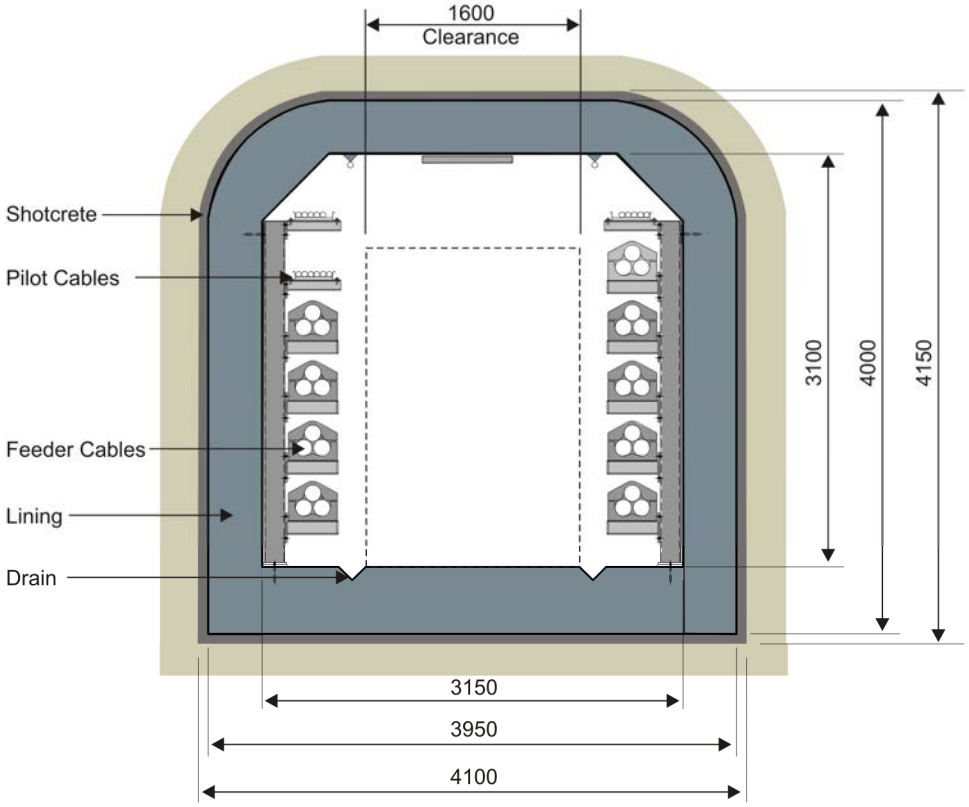


Figure 6.5 Indicative cross section of the cable tunnel

6.6 Indicative construction method

6.6.1 Hoardings and site amenities

Hoardings or other protective structures would be installed along several site boundaries to provide a safe working environment for construction workers and separation from the general public. As construction would commence immediately following completion of Stage 2A(i), it is anticipated that the hoardings and site sheds used for Stage 2A(i) would be available for use by the contractor undertaking Stage 2A(ii). This would be confirmed during construction planning and the CEMP would include plans detailing site access arrangements and facilities such as hoardings that would be installed to maintain vehicle and pedestrian access to the site and adjacent properties.

As indicated in Figure 6.6, hoardings would be required:

- Along the Bligh Street frontage. This would provide overhead protection for pedestrians as well as potentially facilitating site amenities on the first level on top of the hoarding. This hoarding would extend from the site boundary to the edge of Bligh Street and would enclose part of Richard Johnson Square.
- Along the O'Connell Street frontage. This would provide overhead protection for pedestrians as well as potentially facilitating site amenities on the first level on top of the hoarding.
- Adjacent to the rear fire exit for the Mulpha building. The stair well between the Mulpha building and Ashington House serves as a fire exit from the Mulpha Building. Overhead hoarding would be installed to provide safe egress from this fire exit at all times.
- Adjacent to the access ramp to 37 Bligh Street. This would provide overhead protection to those accessing 37 Bligh Street.
- Adjacent to the entrance to Ashington House (44 - 48 Hunter Street) car park; and

- Adjacent to the former NSW Club (Lowy Institute).

All hoardings would be erected in accordance with the City of Sydney Guidelines for Temporary Protective Structures. The overhead hoardings would be designed to accommodate loads from scaffolding that may be required during demolition of the building.

Installation of the hoardings and associated overhead protection for pedestrians as part of Stage 2A(i) would require the removal of street trees along O'Connell Street. As Stage 2A(ii) is likely to use hoardings and overhead protection installed during Stage 2A(i), it is unlikely that additional street trees would need to be removed. However if construction planning indicates that additional street trees are required to be removed, the contractor would implement reasonable and feasible measures to refine the construction method to minimise the number of trees that wuold be impacted. Any trees removed would be replaced with advanced stock and the species would be selected in consultation with the City of Sydney Council.

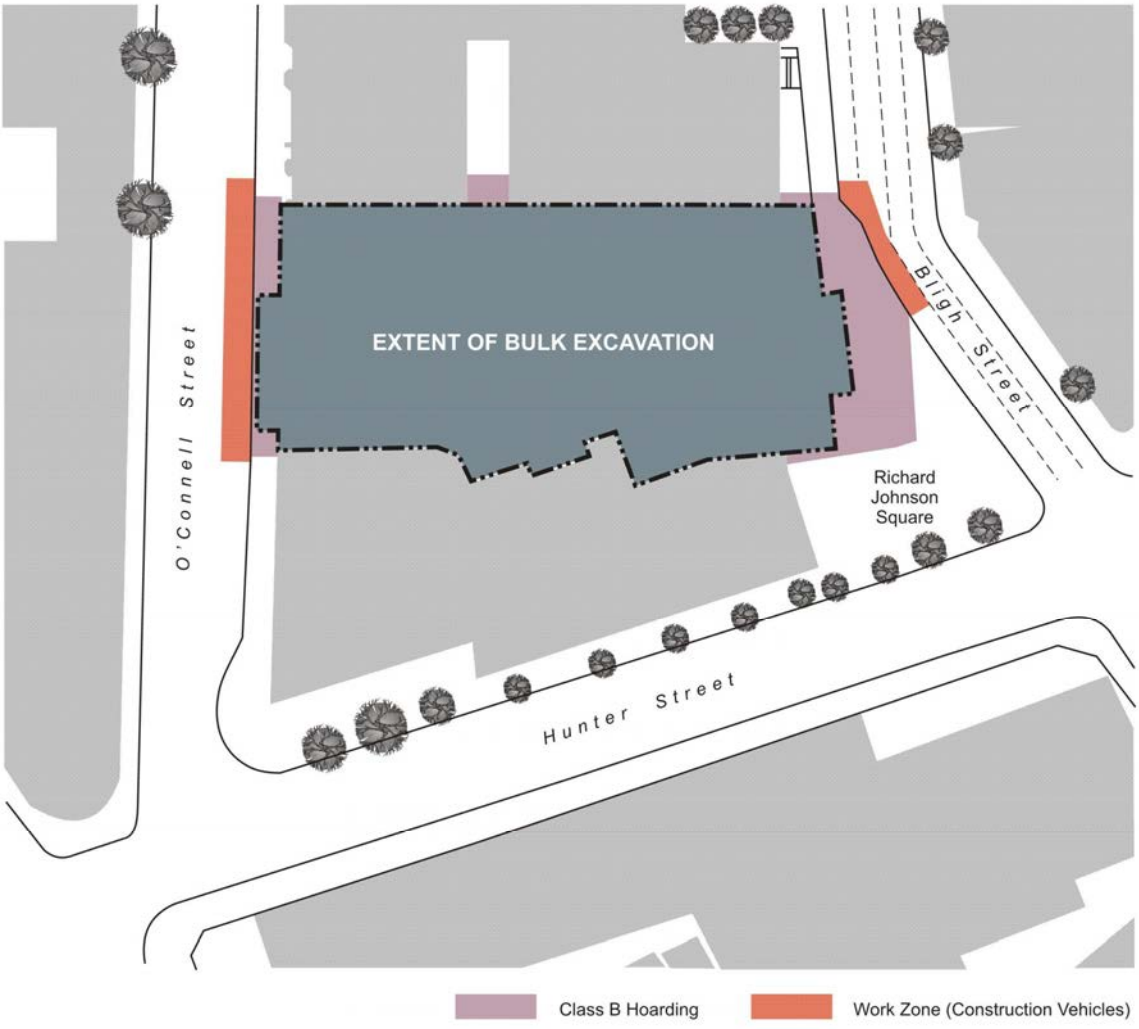


Figure 6.6 Indicative location of hoardings

6.6.2 Bulk excavation

Once demolition has been completed under Stage 2A(i), bulk excavation would likely commence at the O'Connell Street elevation and would progress in an easterly direction. During excavation, access to the site would be predominantly via O'Connell Street and occasionally via Bligh Street, if required.

Further work would be undertaken during the detailed design phase to ensure that bulk excavation works are designed and performed to minimise the risk of ground movements / settlement. This would involve:

- Consider the results of geotechnical investigations, interpretation, and modelling, to assess and predict likely horizontal ground movements associated with rock stress relief as bulk excavation proceeds.
- Designing a shoring / retention system around the perimeter of the bulk excavation (as required) to ensure that horizontal ground movements are kept within acceptable limits.
- Designing a foundation system (e.g. pad footings) that minimises the risk of ground settlement.

Underpinning and shoring works on the perimeter of the site would commence during initial stages of bulk excavation. These works may require a number of different techniques including but not limited to, underpinning, rock anchors and temporary shoring. These works are generally programmed to occur concurrently with the bulk earthworks and may encroach on the footpaths of Bligh and O'Connell Streets. Temporary footpath closures or pedestrian diversions may be required for works that encroach on footpaths.

Equipment used in the bulk excavation would include rippers, rock saws, rock hammers and excavators. Rock saws would be used at the perimeter of the excavation. The size of rock hammer and excavator used would be dependent on the task, with larger machinery likely to be used during bulk excavation and smaller machinery during detail excavation or when necessary to reduce noise and vibration impacts on neighbouring properties.

The bulk excavation for the basement would extend from the current basement at approximately RL 9 to a depth of approximately RL -7, which is approximately 19 m below the level of O'Connell Street and 26 m below the level of Bligh Street (refer to Figure 6.7 and Figure 6.8).

As discussed in Section 4.2.5, extensive consultation has been undertaken with NSW Transport and it has been agreed that this excavation depth for the substation basement would not adversely impact on the viability of the tunnels for the CBD Metro Stage 1.

Bulk excavation would involve excavating cable riser shafts within the Bligh and O'Connell Street road reserves adjacent to the site boundary. This is likely to require temporary partial closure of the footpaths in the immediate vicinity of the works. Once the cable riser shafts have been excavated, a temporary surface would be constructed to provide pedestrian access across the excavations.

Groundwater that seeps into the excavation for the basement would be collected, treated and pumped to the stormwater system. The connection point to the stormwater system would be determined during detailed construction planning would identified in the CEMP. The treatment system would be designed such that discharged water complies with the requirement of Section 120 of the POEO Act (refer to Section 20.2.2).

Spoil generation

It is estimated that approximately 34,866 m^3 of in-situ material would be excavated for the basement. This equates to a bulked volume of 58,226 m^3 based on a bulking factor of 1.67. The spoil would be loaded onto trucks and removed from site for reuse and/or disposal at a licensed landfill. The reuse and/or disposal location would be determined by the contractor undertaking the works.

Materials handling

Due to restricted space on the site and the depth of the excavation, vehicles carrying excavated materials would require a temporary access point. A temporary vehicular crossing would be constructed in O'Connell Street, near the southern site boundary. Trucks would reverse into the site under traffic control and drive out in forward direction. As the vehicles would be required to cross footpaths on O'Connell Street, a pedestrian management plan would be prepared as part of the CEMP to ensure that potential impacts on pedestrian access and safety are minimised. Further details on the materials handling system and vehicle access arrangements during bulk excavation would be developed by the contractor during the detailed design phase and would be described in the CEMP.

As the depth of the excavation increases, it would reach a stage where it is no longer practical to construct ramps to allow trucks to be loaded with spoil within the site boundaries. Once this stage is reached, alternative vehicle access arrangements would need to be implemented and may involve vehicles being loaded and unloaded while parked on Bligh or O'Connell Streets using cranes situated within the site.

Class B reinforced gantry hoarding would be erected to provide a secure corridor for pedestrian movement along the footpaths between the site hoarding and the vehicles being loaded or unloaded. A frame to secure the spoil while unloading into trucks and surrounding hoarding would be positioned in the traffic lane adjacent to the site. This land would be occupied using Ausgrid's powers under the *Electricity Supply Act 1995*. Parking on the eastern side of Bligh Street may need to be removed and converted to a live traffic lane allowing two lanes to continue to operate. Parking on O'Connell Street adjacent to the site may need to be removed and converted to a works zone or similar if O'Connell Street is used as an access point.

A variation on this system would involve trucks parking adjacent to the site to be loaded / unloaded. A pedestrian path would be established in the street lane adjacent to the site with full protective measures to separate cars from pedestrians and possibly an overhead gantry for additional protection. A pedestrian safety procedure would be implemented as part of the CEMP, which may involve traffic controllers and retractable barriers to separate pedestrians from vehicle movements. This variation would be contingent on loading allowances on the ground next to the basement excavation.

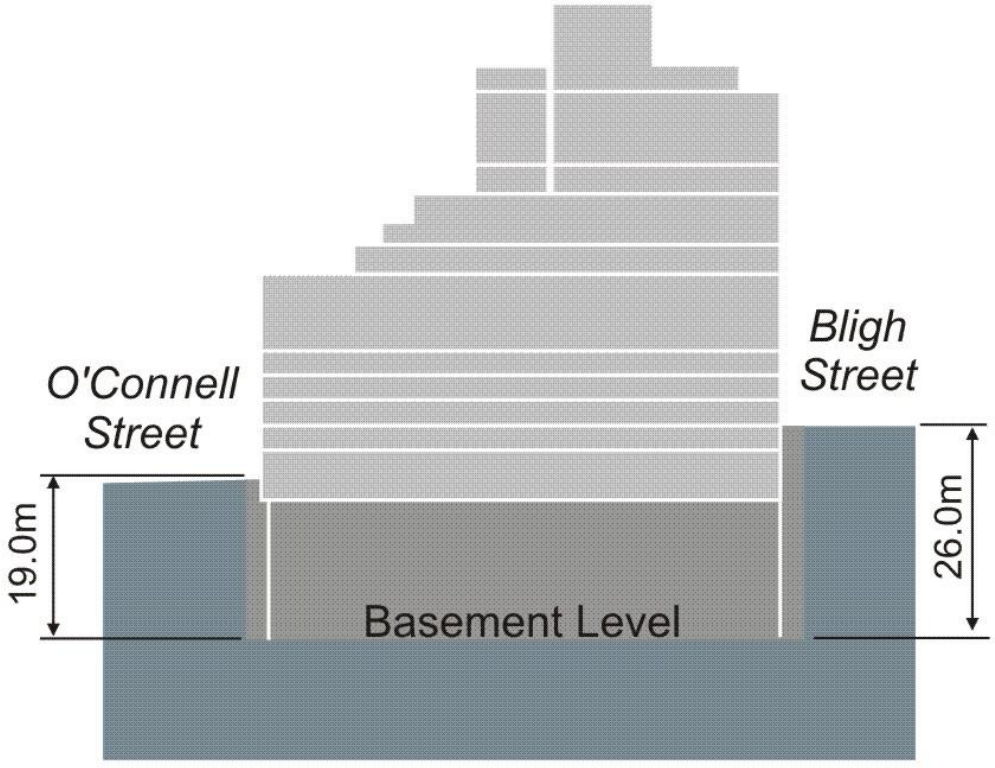


Figure 6.7 Indicative cross section of bulk excavation

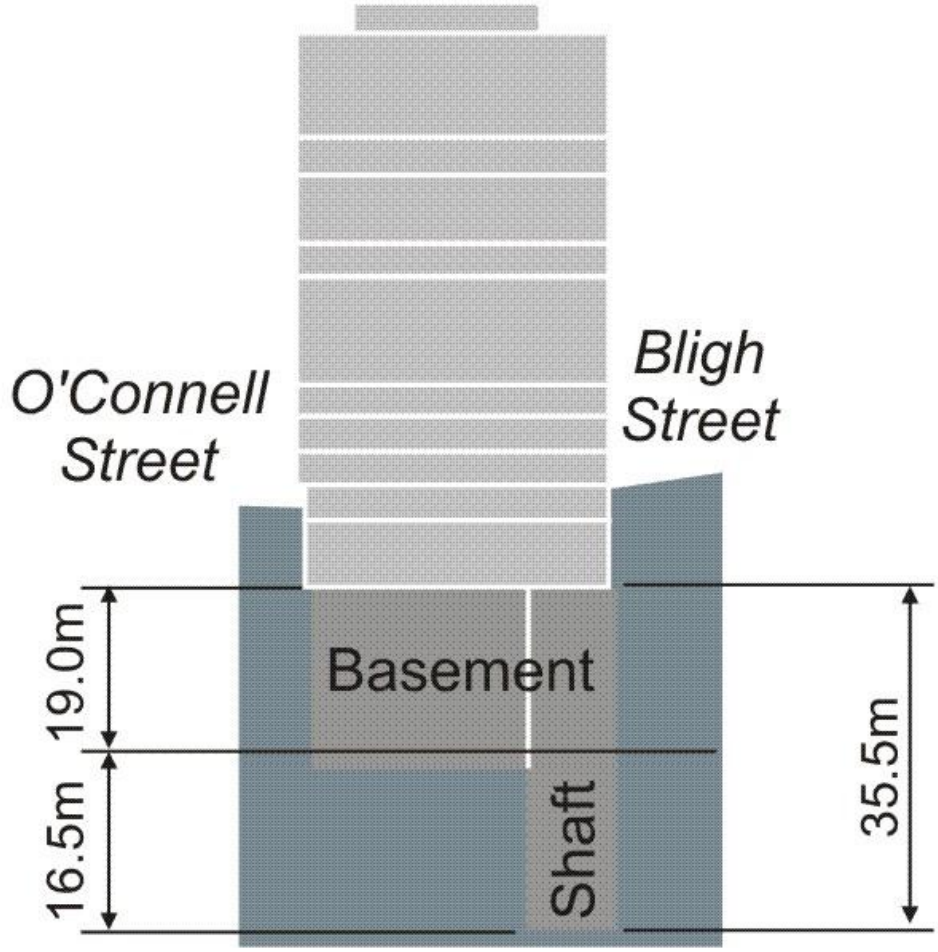


Figure 6.8 Indicative cross section of the excavation looking from Bligh Street

6.6.3 Cable tunnel

Construction of the shaft and tunnel would generally involve:

- Excavating the shaft using a rock breaker
- Excavating the tunnel using the road header such as a Mitsui 200 or similar equipment
- Installing mesh and rock bolts
- Installing shotcrete on the walls.

It is estimated that approximately 5644 m^3 of in-situ material would be excavated from the shaft and tunnel. This equates to a bulked volume of 9425 m^3 based on a bulking factor of 1.67. This material would be transferred along the tunnel and removed by crane from a shaft within the site. The spoil would be loaded onto trucks and disposed offsite.

Groundwater that seeps into the tunnel during construction would be collected, treated and pumped to the stormwater system. The treatment system would be designed such that discharged water complies with the requirements of Section 120 of the POEO Act. The cable tunnel would also be fully lined to limit the volume of groundwater that seeps into the tunnel.

6.6.4 Construction of the substation and commercial tower

Once the excavation works are complete, the tower cranes would be established and construction of the basement would commence. The cranes would be used to handle materials to install the structure, services, façade, roofs.

The crane locations would be determined by the contractor during construction planning.

Constructing the substation and commercial tower would require various items of machinery including cranes, scaffolding, concrete pumps, concrete vibrators, concrete delivery trucks, builders lift, builders hoist, air compressor, jack hammers and concrete saws.

6.6.5 Fitout and commissioning

Once the structure is complete, the internal components of the substation, cable tunnel and commercial tower would be installed and commissioned.

6.7 Timeframe

6.7.1 Construction hours

Construction would generally be carried out during the following hours:

- Monday to Friday 7 am to 7 pm;
- Saturdays 7 am to 5 pm; and
- No work on Sundays or Public Holidays.

The proposed construction hours would involve works outside the standard construction hours identified in the Interim Construction Noise Guideline and would include works between 6 pm and 7 pm Monday to Friday and 1pm and 5pm on Saturdays. These extended hours are consistent with the City of Sydney's standard construction hours in the CBD. The extended working hours are considered to be justified as assessments indicate that during general construction works, the predicted noise levels would comply with the evening and extended Saturday construction noise criterion (refer to Appendix M).

Noise intensive activities such as rock breaking would be undertaken during the following hours:

- Monday to Saturday 9 am to 12 pm;
- Monday to Friday 2 pm to 5 pm; and
- At no time on Sundays or public holidays.

The below ground elements of the cable tunnel would be constructed 24 hours per day, however surface works, such as loading spoil into trucks, would be limited to the standard construction hours.

Ancillary activities that may occur outside the standard construction hours include, but may not be limited to, oversize truck movements and deliveries of certain plant and equipment on an occasional basis. Works may also be undertaken outside these hours in the event of a direction from police or other relevant authority for safety reasons, or emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

6.7.2 Duration of construction

Table 6-4 outlines the estimated construction duration. The overall duration of construction is estimated to be 41 months and some tasks listed in Table 6-4 would be undertaken concurrently.

Table 6-4 Estimate duration of construction

Task	Duration*
Bulk excavation	8 months
Cable tunnel and shaft excavation	8 months
Constructing the City East Zone Substation	20 months
Constructing the commercial tower	18 months
Fitout and commission the substation	12 months
Fitout the tower	13 months
Overall construction duration	41 months

* To provide a conservative estimate of vehicle movements associated with waste and spoil disposal, these durations are based on works being limited to five days per week.

7. Environmental risk assessment

7.1 Purpose of the environmental risk analysis

An environmental risk analysis was undertaken to identify key issues for the project and ensure that they are addressed in this Environmental Assessment. This was based on the same process that was implemented for all other Environmental Assessments prepared for the Concept Plan and stages of the Sydney CityGrid Project. This risk analysis involved reviewing the likely construction and operational issues to identify:

- Potential risks and/ or issues
- Potential impacts and consequences associated with the risk and/ or issues
- Indicative management measures that could be implemented to mitigate potential impacts.

The environmental risk analysis was limited to those elements relating to construction and operating the substation and integrated commercial tower.

7.2 Results of the environmental risk analysis

A summary of results from the environmental risk analysis is presented in Appendix E. Risks have been separated into 'key' risks to the project and 'other' environmental risks.

The key potential impacts were identified based on the:

- Characteristics and sensitivity of the receiving environment
- Potential impacts likely to occur, including their duration, intensity and degree to which they can be mitigated
- Level of uncertainty of the anticipated residual impacts.

The key issues are those that are considered to have medium or high adverse environmental impacts, if not effectively mitigated. They include issues that require investigation to ensure a high degree of certainty that potential risks can be effectively managed. Key issues are assessed in Chapters 8-22.

Other environmental risks are those that are considered to have low risks associated with adverse impacts and would be managed by implementing the Statement of Commitments.

Based on the results of the environmental risk analysis, the following issues were identified as those that require consideration in this Environmental Assessment:

- Noise and vibration associated with the construction and operation of the substation and commercial tower, and the potential for associated offsite impacts on the amenity of the surrounding area and structural integrity of buildings
- The design and urban form of the project and its potential impact on the aesthetics of the surrounding environment
- Impacts on the heritage significance to adjacent buildings
- Management of spoil generated during construction
- Traffic impacts, particularly those associated with delivery of construction material and transport of construction waste
- EMF impacts during operation of the substation
- Management of groundwater during construction and operation
- Air quality impacts associated with dust generated during excavation.

8. Built form and urban design

The built form of the proposed building has been assessed in terms of LEP 2005 and DCP 1996 which set out the parameters for an appropriate built form on the site. Where appropriate the assessment also considers the Draft LEP 2011 and Draft DCP 2011.

8.1 Overview of the design review process

8.1.1 Competitive design alternatives process

Design of the project involved a design review process that included an invited competitive design alternatives process in consultation with City of Sydney Council. This approach addressed the requirements of MCoA 3.2 of the Concept Approval.

The objective of the invited competitive design alternatives process was to:

- Encourage high quality and innovative design through the use of a competitive design process
- Achieve development that individually and collectively contributes to the architectural and overall urban design quality of the city.

Five competitors were invited to participate in the competitive design alternatives process in late 2010 which ran until May 2011. The competition timetable is outlined in Table 8-1.

Table 8-1 Competition timetable

Task	Date
Competition launch	November 26, 2010
Competition close	February 7, 2011
Round 1 presentations	February 9 and 11, 2011
Round 2 presentations	March 9, 2011
Assessment by selection committee	February 14 – May 9, 2011
Recommendation by selection committee	May 10, 2011

The brief for the competitive process was reviewed and endorsed by the City of Sydney Council prior to its distribution to competition entrants, and included the design principles in MCoA 3.2 of the Concept Approval. The design alternatives were prepared by architectural firms with demonstrated experience designing high quality buildings. Each alternative provided at a minimum, an indicative design solution for the site, with sufficient detail to demonstrate that it is a feasible development option and achieves design excellence. The designs were required to detail how the minimum performance requirements for the City East Zone Substation and integrated commercial tower building have been addressed.

The brief for the invited competitive design alternatives process included the following design objectives:

1. Stimulate imaginative architectural and urban design proposals that achieve design excellence in the resolution of:
   - Urban form
   - Spatial relationships to other towers
   - Response to context
   - Activation of street frontages

- Architectural design
- Use of materials
- Provide a distinctive architectural contribution to the area and the City skyline.

2. Improve the quality and significance of the public domain of the site and Richard Johnson Square.
3. Conserve and respect existing heritage items and archaeological items and streetscapes within and adjacent to the site.
4. Provide a high level of pedestrian amenity, with street level activation through public artwork in both O'Connell and Bligh Streets or other appropriate activity and connection to Richard Johnson Square.
5. Ensure that the design proposals are compatible with other approved developments and the city's planning framework.
6. Have regard to construction methodology (i.e. buildability and staging).
7. Have regard to the budget.

A six member Selection Committee was established to assess the submissions. This Committee included representatives from the City of Sydney, Government Architect, Investa and Ausgrid.

Following the initial submissions and presentations, the Selection Committee developed a shortlist of designs for further clarification and investigation. The Committee issued a set of clarification questions and asked the firms to re-submit and present their responses on 9 March 2011.

Outcomes and selection of the preferred design

The Selection Committee evaluated the shortlisted designs and selected the submission by Fitzpatrick and Partners as the preferred option. The design complied with the competition brief and received the following comments from the Selection Committee:

- The proposal was a bold, crisp design that presented as heroic and resonates landmark quality, providing a positive architectural statement
- Was an innovative design with an interesting and elegant tower façade that would provide an iconic and lasting legacy
- The interstitial spaces and detail treatment of the soffit to each cubic volume would be particularly important when viewed by the public at ground level
- The proposed substation artwork façade presents a risk of appearing too heavy if not handled properly, however the panel felt that the further development of the submitted proposal had artistic possibilities
- The proposed substation façade concept celebrated rather than hid the substation component, whilst incorporating art for public benefit
- The artwork solution does not need to be replicated on both Bligh and O'Connell Street frontages, with the O'Connell Street frontage offering an opportunity to be more consistent with adjoining building facades
- Alternatives to detailing the substation façade should be investigated. This could include reconstituted stone if the 'sandstone' elements become too fine, as it would allow different fixing and customised profiles, and could be colour matched to a sandstone finish
- The interiors challenge normal commercial office practice by providing the amenities as a floating block. This concept can be commercially tested and resolved during detail design
- The floor plate efficiency is high with typical NLA of 1,245 sqm – 1,416 sqm
- Developed a public domain which had been dealt with in a well thought out manner with the celebration of the substation artworks, outbound building café and landscaping of Richard Johnson Square in a complementary manner

- Internal timber floor panelling has the ability to provide tenant flexibility for internal stair location
- Fitzpatrick and Partners indicated that there does not appear to be a historical argument for a setback to the former NSW Club (Lowy Institute) building, as all early plans and photos indicate a building built to the street edge
- The proposal would provide a great contribution to the variety of CBD buildings.

Overall, it was considered that the submission put forward by Fitzpatrick and Partners provided a unique landmark building which would add value and quality to the mix of buildings in the CBD, whilst meeting the specific requirements and proposed usage of the site. The scheme successfully addressed the challenges of the site and brief and delivered a proposition that would achieve design excellence including an iconic legacy.

The selection process was both comprehensive and robust and complied with the process requirements set down by the City of Sydney.

8.1.2 Design development and consultation

Fitzpatrick and Partners have commenced detailed design, encompassing the overall design of the substation and commercial tower, taking into account comments and suggested direction from the Selection Committee. In furthering the design development, the Selection Committee recommended:

- Alternatives to detailing the substation façade should be investigated
- Alternative solutions for the O'Connell Street substation façade should be investigated.

Ausgrid has provided information to the community and neighbouring stakeholders about the preferred design. This involved explaining the design review process and the design's compliance with the controls set down by the City of Sydney. Design controls required by the specialist infrastructure of the City East Zone Substation were also outlined.

8.2 Built form

Photomontages of the buildings are provided in Figure 8.1, Figure 8.2 and Figure 8.3. Architectural plans for the project are provided in Appendix G.

Figure 8.1 **Photomontage of the proposed building when viewed from Bligh Street – looking from north east**

Figure 8.2 **Photomontage of the proposed building when viewed from Pitt Street - O'Connell Street frontage looking from south west**

Figure 8.3 Photomontage of the proposed building in the context of the city skyline

8.2.1 Street alignment

Consistent with Design Principle 6 in the DGRs, and the request from the City of Sydney Council which accompanied the DGRs, the proposed building podium incorporates a street setback to align with the heritage listed former NSW Club.

By setting back the building alignment, the project would enhance views to the NSW Club looking north along Bligh Street. These views are currently obstructed by the existing Kindersley House building, which aligns with the site boundary.

In addition to the general building alignment, a void area has been provided along the northern boundary at the entry to the commercial tower lobby. The void area would expose the southern part of the NSW Club facade, providing a vertical curtilage around the façade and restoring the contextual street pattern in which this building was originally viewed.

The proposed void area would enhance views to the item and conserve its significance, and also integrate the heritage values of the item within the project.

Consistent with the adjacent buildings that front O'Connell Street, the project would be built to the street alignment on O'Connell Street.

8.2.2 Building height

Building height

The project has a maximum building height 161.73 m and therefore complies with the maximum building height development standard of 235 m in LEP 2005 and draft LEP 2011.

An assessment of the project's shadowing is located at Chapter 8.

Street frontage height

The project would have a street frontage height of 52.6 m on the O'Connell Street frontage and 45.7 m at the Bligh Street frontage. The street frontage heights would therefore vary the street frontage height control in DCP 1996, which sets a range to be between 20 m and 45 m above street ground level.

However, consistent with the DCP and the outcomes of the design competition for the site, the design of the podium has regard to and would generally match the parapet height the street frontage heights of four of the five adjacent buildings, namely 37 Bligh Street to the east, 48 Hunter Street, 28-24 O'Connell Street, and 16 O'Connell Street.

The proposed podium heights would also achieve a comfortable street environment for pedestrians in terms of daylight, scale, sense of enclosure and wind mitigation. In light of the above, the proposed street frontage heights are considered appropriate and would result in a better design and heritage outcome than compliance with the numeric DCP control.

8.2.3 Tower setbacks

Front setback

The project would vary the 8 m weighted average front setback control in DCP 1996 on both the Bligh Street and O'Connell Street frontages. A 2.6-5.65 m setback is provided to Bligh Street and a 0.2-1 m setback is provided to O'Connell Street.

Despite varying the numeric control, the setbacks would achieve the objective of the DCP control as:

- The protrusion into the DCP front setback area would not have any adverse impacts on the amenity of the future building occupants or the adjoining commercial buildings. There are no residential buildings adjoining the site.
- The narrow width of the tower and selection of light materials and finishes would ensure that reasonable levels of daylight would be achieved at street level. The 7-12 m high atrium space and through-site link would also provide a visual connection to the adjoining streets and increase daylight at street level.

- The Wind Tunnel Tests (see Appendix U) demonstrate that the project would not result in adverse wind impacts at street level. This found that Richard Johnson Square would be generally protected from the prevailing winds by the surrounding buildings and shows a relatively calm wind environment suited for pedestrians to sit.

Furthermore, the DCP notes that smaller setbacks may be acceptable:

- On street blocks less than 30 metres deep from the street frontage
- To accommodate protrusions for architectural modulation and visual interest.

The building has two street frontages and a total depth of 39 m. If the weighted average setback was applied to the project it would not be capable of providing a commercially appropriate floorplate on the site.

The Architectural Design Statement at Appendix H, demonstrates that the proposed front setbacks are the outcome of a long design evolution process, which included a competitive design competition.

The proposed variation to the front setback control is considered appropriate as it would provide a building with a high-level of architectural modulation and visual interest, whilst still deliver commercially attractive floorplates and achieve the objectives of the DCP setback control, specifically those related to amenity.

Side setback

Consistent with the winning design competition scheme, the proposed tower would be built to the eastern boundary and would not provide a 3 m side setback above 45 m, as required in DCP 1996. The proposed design would result in the core of the building being located next to the western face of the Mulpha Building.

The proposed variation to the eastern side setback control is considered appropriate as:

- The proposed setback would not have any significant additional adverse daylight access or view impacts as compared to that of a development which complies with the 3 m side setback control.
- The affected Mulpha Building would still have excellent daylight access from its other frontages and would retain its primary views to the north and east.
- The Mulpha Building is built to the site boundary and does not provide a side setback to the subject site.
- The DCP notes that separation between commercial buildings is less important, and that walls without windows do not need to be set back.
- The proposed setback is unlikely to have adverse impacts in terms of ventilation, privacy or wind effects.

The side setback on the western boundary varies between 0.2 m-1 m and therefore partially complies with the side setback control in the DCP. However, as there are no towers located on the sites adjoining this boundary, and limited to no potential for towers to be built on these small sites in the future, there is unlikely to be adverse daylight access, view, ventilation, privacy or wind effects as a result of the variation.

8.2.4 Building bulk

The bulk and scale of the proposed building has been assessed in terms of the FSR development standards set out in LEP 2001 and Draft LEP 2009 and building bulk controls set out in DCP 1996 and Draft DCP 2011.

Whilst the following assessment has considered the project's consistency with the FSR development standards contained within LEP 2005 and draft LEP 2009, in order to demonstrate that a suitable built form is proposed on the site, it should be noted that under clause 75R(3) of the EP&A Act, environmental planning instruments, such as LEP 2005, do not apply to Project Applications. In deciding whether or not to give approval for the Project Application, the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project.

As calculated under LEP 2005, the FSA of the proposed building is 28,050 m^2 or a FSR of 13.75:1.

Clause 54 of LEP 2005, establishes the maximum permissible FSR. The site is located in the A1 Area where the maximum permissible FSR for development is 8:1. Clause 54(2) allows a floor space ratio (additional to the 8:1 maximum permissible FSR) of up to 4.5:1 for commercial uses. Additional floor space, up to a maximum FSR of 12.5:1, is subject to compliance with Clause 54(3) which states:

(3) The achievement of a maximum floor space ratio set by subclause (1) and (2) is subject to compliance with:

(a) The height, development plan, design excellence, heritage, ecologically sustainable development and other provisions of this plan, and

(b) If applicable, the allocation of heritage floor space to the site in accordance with Clause 62 (allocation of heritage floor space).

The project is eligible to achieve the additional 4.5:1 for a total FSR of 12.5:1 under the LEP as:

- The provisions for height, development plans, design excellence, heritage, ESD and other provisions of the LEP have been demonstrated to comply in the table of compliance at Appendix C; and
- The approval requires the purchase of heritage floor space of an equivalent amount.

Clause 10 of LEP 2005 contains provisions that enable the consent authority to exercise discretion in certain circumstances to vary the maximum permissible FSR by up to 10%, which in this case equates to a total maximum permissible FSR for the site of 13.75:1.

The relevant provisions of Clause 10 state:

(1) Consent may be granted to development of land in Central Sydney, … even though the proposed development contravenes a maximum height or maximum floor space ratio for a building …, imposed by a development standard, but only if the consent authority is satisfied that:

(a) All the objectives of the development standard will be fulfilled, and

(b)The contravention will not:

(i) Create an undesirable precedent for other development, or

(ii) Diminish the overall effect of the development standard for development in the vicinity of the site, and

(c) The particular physical attributes of:

(i) The site, in terms of location, context, slope, site configuration and the like, and

(ii) The proposed development, in terms of urban form, bulk, height, floor space ratio, car parking, and the like, will render the strict application of the development standard unreasonable or unnecessary in the circumstances, and

(d) The proposed development will improve or contribute positively to the public domain and would achieve design excellence.

The project's consistency with the qualitative criteria under which a variation to the maximum permissible FSR can be granted is demonstrated in the following discussion.

10(a) Objectives of development standard

The project's consistency with the objectives for the FSR development standard is demonstrated in Table 8-2.

Table 8-2 Consistency with the FSR development standard objectives

Objective	Proposal's consistency
(a) to ensure a degree of equity in relation to development potential for sites of different sizes and for sites located in different parts of Central Sydney, and	The additional FSA proposed is within the 10% variation contemplated under Clause 10 of the LEP.
(b) to ensure that proposals for new buildings are assessed with due regard to the development plan, design excellence, urban design and built form provisions of this plan, and	The proposed building has been subject to a design competition and design development process that has resulted in a built form and urban design outcome that demonstrates design excellence. In addition, the building has been substantially designed to best practice standards of ESD and is proposing to achieve a 5 star building rating.
(c) to provide a framework for the award and allocation of heritage floor space, and	The approval may require the purchase of heritage floor space of an equivalent amount.
(d) to provide sufficient floor space for high quality development for the foreseeable future, and	The building would be a high quality development providing A-Grade commercial floor plates.
(e) to encourage the provision of residential and visitor accommodation, and	Not applicable.
(f) to encourage the provision of certain uses and facilities that provide a public benefit, and	The project would result in a use encouraged by the FSR objectives and result in a building that demonstrates best practice in relation to ESD. It would significantly improve the existing quality of the public domain in the locality, augment a through site link, and integrate public art in a highly visible manner. The City East Zone Substation would also provide a substantial public benefit through the provision of regional infrastructure to service the eastern part of Central Sydney.
(g) to regulate the density of development and generation of vehicular and pedestrian traffic.	The project complies with the maximum allowable provision for onsite parking in accordance with clause 65 of LEP 2005 which is based on site area not FSA. The project encourages pedestrian movement by improving the permeability and visibility of the through site link.

10(b) Precedent that will diminish effect of Development Standard in the vicinity of development

The proposed building height is 73 m lower than the maximum permissible height of 235 m. The existing height of buildings in the vicinity of the site range from 3-4 storey buildings up to 225 m. As the existing (and approved) buildings in the immediate surrounds are of a similar height, massing and form, the proposed variation to the FSR development standard would not set an unacceptable built form within the area.

The City of Sydney Council also approved an earlier scheme with a 10% variation for an FSR of 13.75:1 on this site. This demonstrates that a variation up to 13.75:1 in this location is considered appropriate in terms of built form outcomes.

10(c) Physical attributes of the site and development render strict adherence unnecessary

The design of the project has responded to its location within its setting. The strict application of the FSR control would constrain the viability integrating the substation and commercial tower which would result in a substation being development without active uses or a through-site link.

10(d) Development will improve or contribute positively to the public domain and would achieve design excellence

The competitive design process and subsequent design development of the preferred building has resulted in a building of high architectural quality and significant improvement to the quality of the public domain in an area that is in need of rejuvenation. Specifically:

- The commercial floor plates provide prime grade office space, and flexibility for larger floors, by allowing paired or quadruple floors linked by internal stairs within courts atria
- The building opens up the streetscape, highlighting a number of the heritage items surrounding the site
- The building provides a safe, clearly visible and equitable access through site pedestrian link
- Public art is provided at ground level, including the proposed building facades. (Note: the public art are the substation façade sculptures itself)

In light of the above, the proposed FSR of 13.75:1 is appropriate on the site.

Under clause 4.4 of Draft LEP 2009, the maximum permissible FSR for development is 8:1. Clause 6.4 allows a floor space ratio (additional to the 8:1 maximum permissible FSR) of up to 4.5:1 for commercial uses, therefore resulting in the same maximum permissible FSR of 12.5:1. Under clause 6.21 of the draft LEP, if the design of a new building is the result of a competitive design process, the consent authority may grant consent to the erection of the new building that has a maximum amount of floor space that exceeds by 10% the amount permitted by clause 4.4 plus the sum of any accommodation floor space.

Therefore notwithstanding the satisfaction of the tests under clause 10 outlined above, under the Draft LEP the proposed FSR of 13.63:1 would comply as a design competition has been held.

The building has a maximum commercial floor plate of 1362 m^2 and therefore complies with DCP 1996 and Draft DCP 2011's maximum area for commercial floor plates (1,400 m^2) above a height of 120 m. The maximum horizontal dimension of the building facade is 64 m and therefore does not exceed the draft DCP maximum of 65 m.

8.2.5 Building exteriors

The proposed podium façade retains and reinforces the predominant masonry character and articulation of Central Sydney. The design, which incorporates public art into the building's facade, would provide a visually interesting and contemporary façade that respects the existing heritage character of the adjoining buildings.

On O'Connell Street, part of the façade projects into the public space. This projection is only minor and would not detract from significant views and vistas. The projection is necessary to provide the internal area within the site to meet the spatial requirements of the substation, and would allow for a visually interesting and contemporary façade.

The tower materials are predominantly light in colour, which would result in reflected light into the streets and complement the characteristic light colours of Central Sydney. The three distinct volumes in the tower form and solar shading would break up the glazed areas of the tower and provide a distinct façade that contributes to the central Sydney skyline.

8.3 Visual and urban design assessment

The following section provides a summary of the Visual and Urban Design Assessment prepared by Graham Brooks and Associates (refer to Appendix Z).

8.3.1 Existing environment

The site is in the northern section of the Sydney Central Business District. This area has been subjected to periodic waves of development since the 1790s. These phases of development have generated a unique urban cultural landscape where tall and very tall buildings sit in close proximity to relatively small older buildings.

As a result, the northern section of the Sydney CBD presents a distinctive urban vitality that defies traditional notions of "sympathetic" scale and architectural compatibility between adjoining buildings or those within clearly defined streetscapes.

Development history

The late 19th century development is largely defined by several significant public buildings, most of which line Bridge Street. Of particular relevance is the four storey former NSW Club. This relatively small but robustly designed sandstone building is set at an angle to the street alignment and is set back behind a small front garden.

By the 1930s the NSW Club was sandwiched between slightly larger commercial buildings that had been demolished and redeveloped by the late 20th century, resulting in the former NSW Club now being surrounded by high and very high rise buildings. In addition the post war preference for setbacks from the street to form small forecourt plazas to high rise buildings (since reversed), created a series of small café/retail plazas to the north of the former Club, exposing its northern wall in a manner created by a very different urban context.

Post war architecture and development saw a change in building height and design. Building materials changed and radically different façade expressions were generated, with an increasing proportion of windows. Architectural detailing became more simplified and buildings such as the City Mutual Life began to address the wider city context, making strong statements on prominent corners. By the late 1960s the scale of buildings in the precinct increased towards 15-20 storeys and their footprints became larger as sites were amalgamated. This trend extended into the 1970s and 1980s when the prevailing heights of new commercial buildings in the immediate vicinity, including those at the rear of and side of the former NSW Club altered the scale of this section of the CBD. Other buildings at the northern ends of Bligh and O'Connell Streets and the Governor Macquarie complex further north continue the theme of very tall buildings, creating the dynamic complexity that distinguishes this part of the Sydney CBD. The changes in the streetscape between the 1930s and 2011 are illustrated in Figure 8.4 and Figure 8.5.

Figure 8.4 Bligh Street in the 1930s looking towards the NSW Club House building

Figure 8.5 Current view into Bligh Street from Hunter Street, with Richard Johnson Square on the left

8.3.2 Impact assessment

Construction

Visual impacts of the project during construction would be similar to other high-rise developments constructed within the CBD and would be associated with the presence of plant and machinery related to an active construction site. The site would be surrounded by hoardings erected in accordance with the City of Sydney's guidelines that would screen street level views to the site.

As construction proceeds, the superstructure would be visible from surrounding public space and buildings.

Potential visual impacts would be temporary and would be managed by ensuring that the worksite and surrounding areas would be maintained in a tidy state.

Operation

The building design was selected based on the outcome of a competitive design process in accordance with MCoA 3.2 of the Concept Approval. The following sections outline how the building design responds to each of the design principles listed in the Director-General's requirements dated August 12th 2011.

Design principle 1

Generate a high quality for the site and introduce a building form that respects and integrates well with its immediate context, including the heritage significance of the surrounding buildings and space, and provides a distinctive contribution to the area and the city skyline.

The project has responded to this design principle through incorporating the following design aspects:

- The location of the multi-storey mass of the substation to the south of the overall site enables a narrow vertical slot to be provided against the adjoining small scale NSW Club building. This creates an opportunity to introduce relatively small scale, albeit long vertical elements, close to the NSW Club building, responding to its scale with a complex combination of smaller scale spaces and richly architectural components.
- Locating the through site link and service core against the northern boundary creates significant opportunities to model the scale and composition of the building against the adjoining form NSW Club, while locating the mass of the substation against the southern boundary, as far from the NSW Club building as possible.
- The setbacks of the new vertical stair tower and structural column from the façade alignment of the adjoining NSW Club building provide visual relief to the immediate backdrop of the historic building when viewed from the north down Bligh Street.
- The distinctly different treatment of the multi-storey substation enclosure, which forms the base of the new development, compared to the high rise tower section, including the separation between the two components created by the high level sky lobby. This enables the overall building to create an urban dialogue with both the medium rise and the high rise buildings in its locality. This aspect is reinforced by the return of the substation screen into the setback of the stair tower, emphasising the mass of the lower element and its relatively sympathetic scale against the lower historic building when compared with the uninterrupted sheer façade massing of the high rise building behind it.
- The decorative composition and artistic expression of the screen on the substation massing to both Bligh and O'Connell Street facades. The robust scale and sandstone materiality of the louvres create a strong reference to the heavily detailed sandstone facades of the surrounding 19th and early 20th centry buildings. They also successfully screen the visually random pattern and scale of the ventilation louvres required by the substation.
- The successful integration of the Bligh Street café into the façade composition of the main building, in contrast to the poor quality and unresolved nature of the later additions at street level for the adjoining plaza setbacks of the two high rise towers towards the northern end of Bligh Street.

Design principle 2

Improve the quality and significance of the public domain of the site and the precinct (specifically Richard Johnson Square)

The project has responded to this design principle by incorporating a Public Domain Concept Plan that provides an indicative scheme for public domain improvements to Richard Johnson Square. Richard Johnson Square is owned by the City of Sydney Council and further design and consultation with Council is required to finalise the public domain and landscaping plan

Design principle 3

Conserve and respect existing heritage items and archeological items and streetscapes within and adjacent to the site. The design should enhance the context of surrounding heritage items and in particular should give special consideration to the use of materials, massing, heights and proportions of surrounding items.

The project has responded to this design principle by incorporating the following design aspects:

- The project respects the significance and streetscape identity of the various heritage items in the vicinity by means of architectural massing with its vertical proportions. Separation created by the sky lobby between the massing of the base (substation) to reflect the variety of surrounding early and mid 20th century medium rise heritage items and other buildings, and the separate massing of the high rise commercial tower, as it rises into the skyline context of the existing high rise buildings.

- It respects the scale and identity of the adjoining former NSW Club by standing the main visual mass back from its common boundary, by setting the Bligh Street façade back to open vistas to the historic building, and by the visually refined lightness of the texture of modern elements, albeit of a high rise nature, which form the backdrop to the Club building when viewed from the north.
- The proposed presentation of a portion of the southern side wall of the former NSW Club is a positive outcome as it reinforces the three dimensionality of the building and strengthens its presence in the streetscape. It is apparent from the 1884 map that this portion of the southern side façade was originally open to a laneway or court on the site.
- The selection of sandstone for the deep external louvres and their artistic composition on both the Bligh and O'Connell Street facades successfully masks the multi-storey bulk of the substation with its more functional louvres behind.

Design principle 4

Provide a high level of pedestrian amenity, with street level activation through public art or other appropriate activity and connection to the precinct (specifically Richard Johnson Square).

The design would provide a high level of pedestrian amenity, by providing street level activation on both street frontages as well a new through site connection between Bligh Street and O'Connell Street. Public art would be provided at ground level and include the substation façade sculptures.

Design principle 5

Ensure that the design proposals are compatible with other approved development and the city's planning framework.

The design would not be incompatible with other approved development in the vicinity of the site or Council's planning framework. An assessment of the project against Council's planning framework has been undertaken in Section 3.3.

Design principle 6

The design in the vicinity of the adjacent heritage listed property to the north at 31 Bligh Street should aim to incorporate a street setback that aligns with the former NSW Club, and maintains views to this item, looking north along Bligh Street.

The project has responded to this design principle through incorporating the following design aspects:

- A ground floor plan is provided in
- Figure 6.3, showing the indicative design of the building and its interface with surrounding buildings and public spaces including Richard Johnson Square. The lobby and stair tower would be recessed back from the Bligh Street frontage to open up views to the corner and southern façade of the Club building in a manner that reflects the narrow adjoining laneway evident on the 1880s map. With the removal of Kindersley House which projects against its southern corner, the visual mass of the Former NSW Club building would be recaptured and considerably strengthened, enabling it to better define its own identity in the Bligh Street streetscape.
- The mass of the substation at street level is pulled back from the Bligh Street frontage and aligned directly with the splayed façade of the adjoining Club building. This creates enhanced view lines to the historic building when approaching through Richard Johnson Square from Hunter Street.
- The future proposal to raise the general level of Richard Johnson Square in the vicinity of Hunter Street would create a larger viewing catchment in this location for the appreciation of the Former NSW Club building. Figure 6.1, Figure 6.2 and Figure 8.1 reflect that the setbacks have been incorporated to maintain views to the former NSW Club.

8.4 Mitigation measures

8.4.1 Construction

During construction the following mitigation measures/safeguards would be adopted:

- Where practicable existing street trees on footpaths would be retained and protected
- New tree planting would be in accordance with City of Sydney requirements/standards
- Pavement and lighting upgrade would be to the City of Sydney's public domain standards
- Maintenance of built works, and public domain fixtures and fittings
- Planting establishment.

8.4.2 Operation

During development of the detailed design, the following issues would be considered:

- The visual presentation of the façade louvre composition masking the mass of the substation on both Bligh and O'Connell Street frontages may appear too monolithic and unified when viewed from a distance. This issue can be resolved through close collaboration with the artist during design development
- The relatively low height of the underside of the decorative façade screen to the Bligh and O'Connell Street frontages, when compared with the higher ground floor recesses of adjoining buildings, particularly on O'Connell Street. This is apparently unavoidable given the required locations and layouts of the louvres on the substation elevations
- The potential for the vertical edge of Richard Johnson Square against the Hunter Street frontage to be too visually high and spatially disruptive when viewed from Hunter Street, as it may restrict views into Richard Johnson Square from pedestrians walking up the Hunter Street footpath as they cross into the Bligh Street intersection. This can be mitigated through careful design for the upgraded Square to create an appropriate setting for the monument and improve public amenity.

9. Solar access

9.1 Impact assessment

Shadow diagrams illustrating the additional shadow cast by the project are located at Appendix R. The shadow diagrams identify that overshadowing would occur along parts of the neighbouring buildings, streets and footpaths. This overshadowing is additional to that currently associated with the buildings on the site, known as Kindersley House.

Limited additional overshadowing would occur on a small part of Martin Place at noon on 21 June. The area of additional overshadowing on Martin Place would be located along part of the eastern side of the footpath area off Castlereagh Street. The proposed shadow impact on Martin Place is consistent with the additional shadow approved by the City of Sydney as part of the 2008 Rice Daubney scheme for the site.

The additional overshadowing does not occur within that area of Martin Place between Pitt Street and George Street, where overshadowing is further restricted under clause 49 of the LEP 2005.

The site is not affected by any sun access plane as identified in Schedule 2 of the LEP and therefore Clause 48 of the LEP does not apply. The site is not a Category A or B site and clause 52 of the LEP does not apply.

9.2 Mitigation measures

The additional overshadowing created by the project is minor, complies with the relevant overshadowing controls, and is considered to be acceptable. No mitigation measures are proposed.

10. Reflectivity

This chapter provides a summary of the Solar Light Reflectivity Analysis for the proposed Stage 2A City East Zone Substation and Integrated Commercial Development at 33 Bligh Street, Sydney prepared by Windtech (Appendix S).

10.1 Impact assessment

The solar reflectivity study addresses the requirement of the October 2003 City of Sydney DCP, which states that:

- 4.5.1 New buildings and facades should not result in glare that causes discomfort or threatens safety of pedestrians or drivers
- 4.5.2 Visible light reflectivity from building materials used on the facades of new buildings should not exceed 20%
- 4.5.3 A Reflectivity Report that analyses the potential solar glare from the proposed new development on pedestrians or motorists may be required.
- The reflectivity analysis was carried out using the technique published by Mr David N. H. Hassall (1991). The limiting veiling luminance of 500 candelas per square meter for the comfort of vehicle drivers was adopted as a basis for assessing the glare impact from the subject development.

10.1.1 Impact on drivers and pedestrians

Eight street level study point locations within the site were identified for the driver and pedestrian reflectivity analysis. A glare protractor was used to assess the amount of glare likely to be caused as well as provide a direct comparison with the 500 candelas per square metre criterion.

Results from the analysis of the eight street level study points indicated that due to the view of the substation and commercial tower being obscured by the existing buildings surrounding the site, there would be no adverse glare from these points.

10.1.2 Impact on occupants of neighbouring buildings

During detailed design, further investigations would be undertaken to ensure the building provides acceptable level of veiling luminance to occupants of surrounding buildings. This would involve designing the building to have normal specular reflectivity of visible light of less than 20%. The impact of glare is affected by a number of factors including:

- The intensity of glare
- The duration of glare impact
- The type of use of the building
- The type of glazing on the neighbouring buildings (e.g. clear or tinted)
- The shading elements on the façade of the neighbouring building
- The level of tolerance by the occupant of the neighbouring building

10.2 Mitigation measures

To minimise adverse glare on the surrounding streets and associated outdoor areas of the project, as well as to comply with the 2003 City of Sydney DCP, the façade would be designed to have a maximum normal specular reflectivity of visible light of 20% or less.

11. Wind impact

This chapter provides a summary of the Pedestrian Wind Environmental Statement for the proposed Stage 2A City East Zone Substation and Integrated Commercial Development at 33 Blight Street, Sydney prepared by Windtech (Appendix T) and Wind Tunnel Tests for City East Zone Substation and Integrated Commercial Development – 33 Bligh Street, Sydney Australia prepared by Cermak Peterka Petersen (Appendix U).

11.1 Existing environment

Three principle wind directions affect the site. These prevail from the north-east, south and west and occur during different periods of the year.

11.1.1 North east

Currently, the pedestrian pathway along O'Connell Street and Bligh Street are aligned directly to the north-easterly winds. The upstream neighbouring buildings along the north-eastern side of Bligh Street are effective in shielding the ground level areas along O'Connell and Bligh Streets from these prevailing winds.

11.1.2 South

The pedestrian footpath along O'Connell Street is shielded from the southerly winds by the surrounding buildings. The pedestrian pathway along Bligh Street is aligned directly to the southerly winds coming along Castlereagh Street however these winds are expected to be mitigated by the time they reach the site due to the effect of neighbouring buildings.

11.1.3 West

The pedestrian pathways along O'Connell Street and Bligh Street, and the adjacent Richard Johnson Square are well shielded from westerly winds by the neighbouring buildings.

11.2 Impact assessment

Two impact assessments were undertaken to determine the potential impacts of the development on the local wind environment. Windtech's Pedestrian Wind Environment Statement assessed the general wind effects that are identifiable by visual inspection while Cermak Peterka Petersen undertook a wind tunnel test to assess potential wind impacts on amenity. A model of the project was fabricated to a 1:400 scale and placed into a wind tunnel.

Consideration was given to the interaction between the wind and the building morphology, including the distances between proposed building forms, their overall heights and bulk, as well as the landform and street pattern. Impacts were considered at various points within the project including the ground level within and around the pedestrian footpaths, the proposed outdoor café, the open through site link, the Sky Lobby area and its outdoor terrace areas, and the internal Sky Garden.

The results indicated wind conditions for all outdoor trafficable areas within and around the site would be suitable for their intended uses provided the measures outlined in Section 11.3 are adopted. The results of the wind tunnel tests determined that the wind environment at ground level around the site would be suitable for pedestrian sitting or standing. The area to the east of the site at Richard Johnson Square would generally be protected from the prevailing winds by the surrounding buildings and would have a relatively calm wind environment suited for pedestrian sitting. Conditions on the upper levels of the buildings would be windier, but still acceptable for sitting or standing.

11.3 Mitigation measures

Wind conditions for all outdoor trafficable areas within and around the project would be suitable for their intended uses, provided that:

- The proposed canopy above the ground level outdoor café and seating area is retained in the final design and wind tunnel testing be undertaken at a later design stage to verify the adequacy of this treatment scheme.
- 1.5m high impermeable portable screens are provided within and around the ground level outdoor café and seating area.
- An internal wall will be provided within the ground level lobby at the top of the escalators between Bligh Street and O'Connell Street (Note: We are showing a full height wall in our DA drawings).
- The proposed impermeable balustrades along the perimeter of the outdoor terrace area on the Sky Lobby Level be retained in the final design.
- A strategic planting scheme similar that presented in Figure 11.1 below is provided for the outdoor terrace area on the Sky Lobby Level.

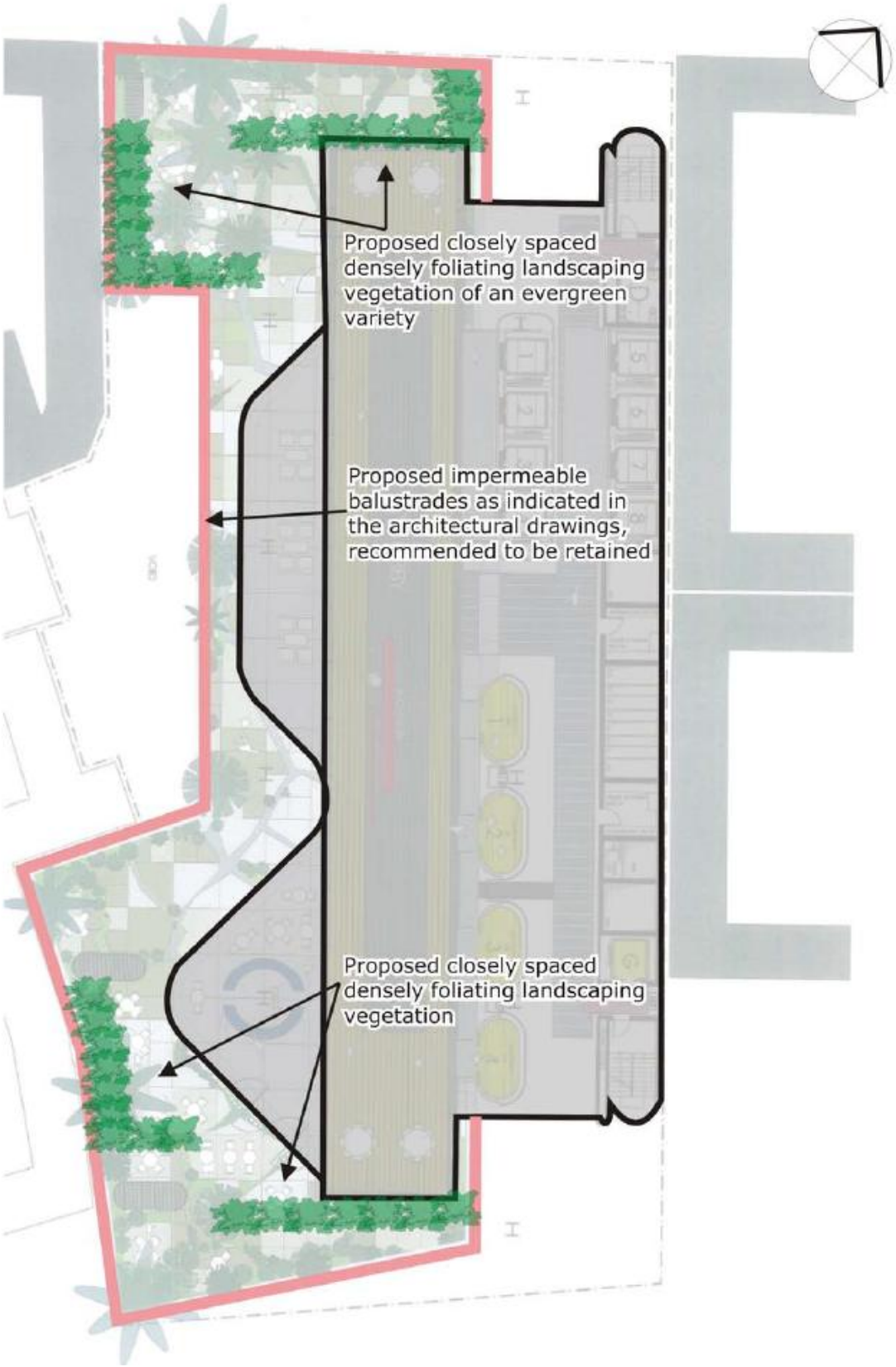


Figure 11.1 Treatments to be implemented to mitigate wind impacts at the sky lobby

12. Noise and vibration

This chapter provides a summary of the Sydney CityGrid Project City East Zone Substation Stage 2A(ii) Construction Noise and Vibration Impact Assessment prepared by Wilkinson Murray (Appendix M) and City East Zone Substation and Integrated Commercial Development – 33 Bligh Street Operational Acoustic Project Application Report prepared by ARUP (Appendix M).

12.1 Existing environment

The site is located within Sydney's CBD, a highly urbanised area with built form characterised by high rise residential and commercial developments. Land is used for a variety of purposes including residential and commercial use as well as tourist and cultural attractions, and parks and open space, including Hyde Park and the Domain and Royal Botanic Gardens.

Land uses directly surrounding the site are predominantly commercial office towers with active street frontages, retail activities, hotels, restaurants and cafes. Noise sources in the area are typical of a city environment and associated with traffic, people and construction activities.

12.1.1 Ambient noise levels and surrounding receivers

Long-term ambient noise levels were monitored at two locations surrounding the site, selected to cover the range of environments in the potentially affected areas. The locations are presented in Table 12-1 and shown in Figure 12.1.

Table 12-1 Long term noise monitoring locations

Monitoring site	Address	Relevant noises noted during site visits
A	Bligh Street Sydney	Local traffic and general city noise
B	O'Connell Street	Local traffic and general city noise

Noise monitoring was conducted between Monday, 15 February and Tuesday, 23 February 2010.

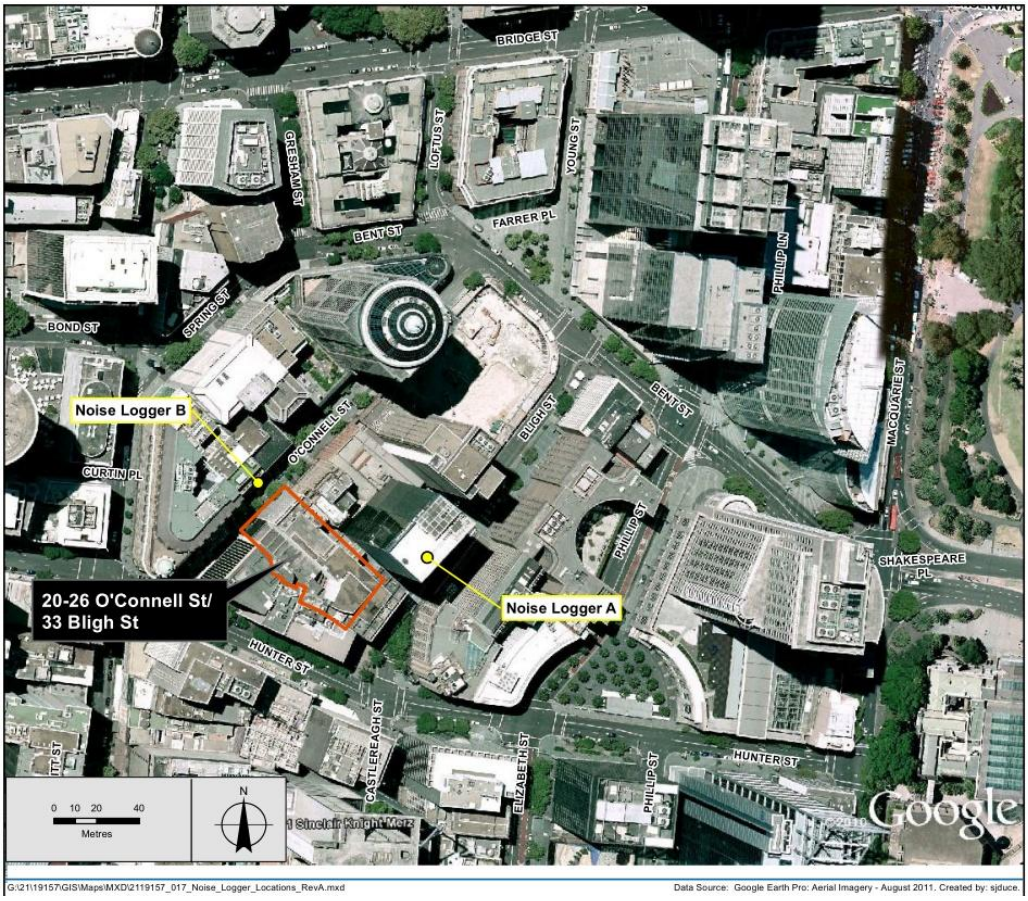


Figure 12.1 Noise monitoring locations

Surrounding potentially affected receivers areas are presented in Table 12-2.

Table 12-2 Surrounding receiver areas

Description	Location
Radisson Hotel - O'Connell Street	Immediately to the west of the site at a distance of 20 m
Sofitel Wentworth Hotel – backing on to Bligh Street	To the north east of the site at a distance of 65 m
Commercial properties	Immediately to the north and south of the site
Heritage listed building – former NSW Club (Lowy Institute)	Immediately to the north of the site

Table 12-3 summarises the monitoring results, for daytime, evening and night time periods as defined in DECCW *Interim Construction Noise Guideline* (CNG). The summary values are:

- L_{Aeq} (period) – the equivalent continuous L_{Aeq} noise level measured over the assessment period; and
- RBL – Rating Background Level is a measure of typical background noise levels which are used in determining noise criteria.

Weather conditions were suitable for noise measurements during the monitoring period.

Table 12-3 Summary of measured noise levels

Noise logging site	RBL (dBA)				$L_{Aeq,period}$ (dBA)			
	Daytime 7am-6pm	**Evening 6-10pm**	**Night Time 10pm-7am**	**Saturday 7am-5pm**	**Daytime 7am-6pm**	**Evening 6-10pm**	**Night Time 10pm-7am**	**Saturday 7am-5pm**
A	58	59	56	58	63	64	66	63
B	65	61	59	65	70	67	65	70

12.1.2 Construction performance criteria

The following sections detail the applicable site specific construction noise and vibration criteria based on the:

- Interim Construction Noise Guideline (DECCW, July 2009), and;
- Assessing vibration: a technical guideline (DEC, February 2006).

Construction Noise Criteria

DECCW released the "*Interim Construction Noise Guideline*" (CNG) in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the noise should not exceed the L_{A90} background noise by more than 10 dBA. This is for standard hours: Monday to Friday 7 am to 6 pm, and Saturday 8 am to 1 pm. Outside the standard hours the criterion would be background plus 5 dBA. A more complete description of the guidelines is in Table 12-4.

Table 12-4 Construction noise goals at residences using quantitative assessment

Time of day	Management level LAeq,(15 min)	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq,(15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

In addition, the following construction noise management levels $L_{Aeq\ (15\ min)}$ are recommended for other receivers and areas as follows:

- Active recreation areas (such as parks) external $L_{Aeq\ (15\ min)}$ 65 dBA
- Industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dBA
- Offices, retail outlets external $L_{Aeq\ (15\ min)}$ 70 dBA

Based on the above, presents the applicable noise management levels for construction activities.

Table 12-5 Site specific construction noise management levels

Location	Construction noise management level, L_{Aeq} - dBA				Maximum construction noise level, L_{Aeq} - dBA
	Day	Evening	Night	Saturday (extended)	
Bligh Street	68	64	61	63	75
O'Connell Street	75	66	64	70	75
Commercial Properties	70				75

Vibration criteria

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that standard are used to set "preferred" and "maximum" vibration levels in the document "Assessing Vibration: A technical guideline" (February 2006) produced by the NSW DEC.

Acceptable values of human exposure to continuous vibration, such as that associated with underground tunnelling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 12-6.

Table 12-6 Criteria for exposure to continuous and impulsive vibration

Place	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night-time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night-time	0.20	0.40
Offices	Day or night-time	0.56	1.1
Workshops	Day or night-time	1.1	2.2

In the case of intermittent vibration which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) which is presented in Table 12-7.

Table 12-7 Acceptable vibration dose values for intermittent vibration (m/s $^{1.75}$)

Location	Daytime		Night-time	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events in the relevant time period.

Building damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 "Explosives - Storage and Use - Part 2: Use of Explosives" recommends the frequency dependent guideline values and assessment methods given in British Standard 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they "are applicable to Australian conditions".

The British Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) from BS 7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented in Table 12-8.

Table 12-8 Transient vibration guide values - minimal risk of cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The standard states that the guide values in Table 12-7 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration results in dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

In addition to the British Standard, in the case of heritage listed buildings at 16-18 O'Connell Street and 31 Bligh Street, guidance for structural damage was derived from the German Standard DIN 4150 -3 "Structural Vibration Part 3 – Effects of Vibration on Structures. Table 12-9 details the guideline values for vibration levels for heritage buildings.

Table 12-9 DIN 4150 recommended PPV vibration levels for heritage listed buildings

Frequency (Hz)	Guideline values for velocity (mm/s)
1 – 10	3
10 – 15	3 - 8
40 – 50	8 - 10

The British Standard notes that a building of historical value should not, unless it is structurally unsound, be assumed to be more sensitive to vibration impacts. Surrounding heritage listed buildings should be inspected by a structural engineer. If these buildings are found to be structurally sound there may be scope for increasing vibration criteria to that of residential buildings.

Ground-borne noise

Ground-borne noise refers to noise produced by vibration of floor slabs and other building elements, which radiates noise into the interior of a building. The ICNG addresses ground-borne noise as follows;

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure. Ground-borne noise caused, for example by underground works such as tunnelling, can be more noticeable than airborne noise. The following ground-borne noise levels for residences indicate when management actions should be implemented. These levels recognise the temporary nature of construction and are only applicable when ground-borne noise levels are higher than airborne noise levels. The ground-borne noise levels are for evening and night-time periods only, as the objectives are to protect the amenity and sleep of people when they are at home.

- Evening (6 pm to 10 pm) Internal: $L_{Aeq\ (15\ min)}$ 40 dBA
- Night-time (10 pm to 7 am) Internal: $L_{Aeq\ (15\ min)}$ 35 dBA

The internal noise levels are to be assessed at the centre of the most-affected habitable room. For a limited number of discrete, ongoing ground-borne noise events, such as drilling or rock-hammering, $L_{A\ (max)}$ using a slow response on the sound level meter may be better than $L_{Aeq\ (15\ min)}$ in describing the noise impacts

Traffic noise criteria

The DECC's *Environmental Criteria for Road Traffic Noise* (ECRTN) presents the NSW Government's guidelines for road traffic noise criteria. The policy provides road traffic noise criteria for proposed roads or residential land use developments as well as criteria for other sensitive land uses.

Table 12-10 presents the relevant noise criteria for this project, extracted from the ECRTN.

Table 12-10 Traffic noise criteria extracted from the NSW ECRTN

	Criteria		
Type of development	**Day time 7am-10pm**	**Night time 10pm-7am**	**Where criteria are already exceeded**
Land use development with the potential to create additional traffic on existing freeways and arterial roads	$L_{Aeq(15hour)}$ 60dBA	$L_{Aeq(9hour)}$ 55dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction o the development. Locations, internal layouts, building materials and construction

	Criteria		
Land use development with the potential to create additional traffic on collector road	$L_{Aeq(1hour)}$ 60dBA	$L_{Aeq(1hour)}$ 55dBA	should be chosen so as to minimise noise impacts. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dB
Land use development with the potential to create additional traffic on local roads	$L_{Aeq(1hour)}$ 55dBA	$L_{Aeq(1hour)}$ 50dBA	

Residences in the vicinity of the site that may be potentially affected by traffic noise, such as the Radisson and Wentworth Hotels, have been assessed with respect to the above criteria.

As the existing traffic noise exceeds the traffic noise criteria and there is no expectation of traffic noise in the area decreasing, the 2dBA allowance goal applies for all roads.

12.1.3 Operational performance criteria

Internal noise criteria

AS 2107 provides guidance for design background noise levels for various types of occupancy. Target noise limits for noise generated by building services and noise break-in from external sources have been determined by a combination of guidance from AS 2107 and experience from similar projects.

In addition to the overall dB(A) limits, the project would be designed to a Noise Rating (NR) curve. This would assist in providing a balanced background noise spectrum to avoid annoying characteristics such as low-frequency “rumble” or high-frequency “hiss”, while still achieving the overall AS 2107 dB(A) noise levels.

For a typical building services spectrum, the noise rating of the spectrum is approximately 5 units below the dB(A) rating – e.g. an overall level of 45 dB(A) typically would be rated at approximately NR 40.

These limits generally correspond to the maximum limits given in AS 2107, rather than the satisfactory limits (which are ~5 dB lower). The maximum limits have been chosen as they promote a higher level of speech privacy and have proved to be acceptable based on extensive experience.

Table 12-11 outlines noise level targets for the various spaces to be achieved by all services running normally and together plus quasi-steady external noise break-in. The project would use the ‘maximum’ levels for design to provide a degree of noise masking and speech privacy in internal areas.

Table 12-11 Design internal sound levels, dB re 20uPa

Type of occupancy	Recommended design sound level (from Table 1, AS2107)
Car parking	NR 60/ ~65dB(A)
Transformer bays	NR 75/ ~80dB(A)
Radiator space	NR 75/ ~80dB(A)
Control room	NR 55/ ~60dB(A)
Switch room	N/A
Substation amenities	NR 55/ ~60dB(A)
Cabling joining	NR 70/ ~75dB(A)

Type of occupancy	Recommended design sound level (from Table 1, AS2107)
Commercial lobby	NR 45/ ~50dB(A)
Open plan offices	NR 40/ ~45dB(A)
Plant room	N/A
Toilets	NR 50/ ~55dB(A)
Sky lobby/reception	NR 40/ ~45dB(A)
Sky garden	NR 45/ ~50dB(A)

Note: The recommended design control levels given in this table are used 'traditionally' for sealed, air-conditioned buildings, and apply only to 'quasi steady-state' noise – typically building services noise.

Green Star IEQ-12

To comply with the Green Star (Office Design v3) Interior Environment Quality category, up to two points are awarded where 95% of the project's net lettable area (NLA) does not exceed the 'satisfactory' ambient internal noise levels in accordance with AS/NZS 2107:2000, as follows:

- Building services design: One point is awarded where, within the entire base building general office space, noise from the building services does not exceed 40 dBL_{Aeq}
- Overall building: One point is awarded where within the base building office space, the sound level does not exceed 40 dBL_{Aeq} (assuming open plan offices).

Reverberation times

AS 2107 provides recommended mid-frequency design reverberation times for building interiors. The recommended reverberation times represent appropriate acoustic conditions for different building areas.

Table 12-12 Design reverberation time targets

Type of occupancy	Recommended reverberation times (from Table 1, AS2107)
Car parking	N/A
Transformer bays	(*)
Radiator space	N/A
Control room	0.4-0.7
Switch room	N/A
Substation amenities	(*)
Cabling joining	N/A
Commercial lobby	0.5-1.0
Open plan offices	0.4-0.6
Plant room	N/A
Toilets	N/A
Sky lobby/reception	(*)
Sky garden	(*)

(*) Reverberation time should be minimised as far as practicable for noise control

Industrial noise policy

The Environment Protection Authority Industrial Noise Policy (INP) dated January 2000, provides guidelines on operational noise criteria. 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.

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.

These components result in noise criteria that should not be exceeded in order to minimise 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 project, and where the intrusiveness and the amenity criterion differ, the most stringent of the noise criteria should be adopted as the project-specific noise criterion.

The intrusiveness criterion only applies at residential receivers and the amenity criterion applies at both residential and commercial receivers.

Intrusive criteria

The intrusive noise criteria is calculated based on the RBL plus 5 dB at the boundary of any noise sensitive receiver. Along O'Connell Street, the closest noise sensitive receiver is the Radisson Plaza Hotel. This receiver is comparable with a residential receiver and the intrusiveness criteria has been assessed. Along Bligh Street, the closest noise sensitive receiver is the Lowy Institute, which is a commercial receiver. The Sofitel Wentworth Hotel is 65m from the site.

The intrusiveness criteria have been calculated for the Sofitel Wentworth Hotel (using the noise logger data installed at 33 Bligh Street) and the Radisson Plaza Hotel as these are the comparable to residential receivers.

The intrusiveness criteria for the Radisson Plaza Hotel are summarised in Table 12-13.

Table 12-13 Intrusiveness criteria for the Radisson Plaza Hotel, along O'Connell Street

Time period	Rating background level RBL L_{A90}	Intrusiveness criterion RBL + 5dB(A)
Day (7am-6pm)	65	70
Evening (6pm-10pm)	61	66
(10pm-7am)	59	64

The intrusiveness criteria for the Sofitel Wentworth Hotel are summarised in Table 12-14. Monitoring at this site was undertaken between 6 – 13 September 2011.

Table 12-14 Intrusiveness criteria for the Sofitel Wentworth Hotel, along Bligh Street

Time period	Rating background level RBL L_{A90}	Intrusiveness criterion RBL + 5dB(A)
Day (7am-6pm)	61	66
Evening (6pm-10pm)	57	62
(10pm-7am)	54	59

Amenity criteria

Criteria for the protection of amenity are given for various types of receivers and different times of the day. The amenity criterion is set so that the noise levels from the industrial noise source do not increase the total industrial noise levels at the receiver above the acceptable noise level for that receiver. The amenity criterion applies to the L_{Aeq} noise level from all industrial noise sources over the time period.

A summary of the amenity criteria is outlined in Table 12-15. In cases where the existing $L_{Aeq,}$ average noise levels exceed the acceptable noise level (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 consistent with the approach set out in Table 2.2 of the INP and is to reduce the potential for continual increases in industrial noise levels.

Table 12-15 Summary of amenity criteria for the receivers in the vicinity of the site

Noise sensitive receiver	Time period	Existing L_{Aeq}, dB(A)	ANL LAeq, dB(A) (as per Table 2.1 of the INP)	Modification to acceptable limit (as per Table 2.2 of the INP)	Amenity criterion existing L_{Aeq},T + modification of ANL (L_{aq},dB(A))
Radisson Plaza Hotel	Day	69	60	ANL-10dB	59
	Evening	68	50	L_{Aeq}-10dB	58
	Night	64	45	L_{Aeq}-10dB	54
Sofitel Wentworth Hotel	Day	69	60	L_{Aeq}-10dB	59
	Evening	65	50	L_{Aeq}-10dB	55
	Night	65	45	L_{Aeq}-10dB	55
Lowy Institute	Day	69	65	L_{Aeq}-10dB	59
	Evening	65	N/A	N/A	N/A
	Night	65	N/A	N/A	N/A

Industrial noise policy limiting criteria

The most stringent of the intrusiveness and the amenity criteria is the limiting criterion according to the INP, and sets the project specific noise level to be met by the project. Table 12-16 compares the intrusiveness and the amenity criteria at the noise sensitive receivers and identifies the limiting criterion for each time period for each area.

Table 12-16 Industrial noise policy limiting criteria for the noise sensitive receivers along Bligh and O'Connell Streets

Noise sensitive receiver	Time period	Intrusiveness criterion	Amenity criterion	Limiting criterion
Radisson Plaza Hotel	Day	70	59	59
	Evening	66	58	58
	Night	64	54	54
Sofitel Wentworth Hotel	Day	66	59	59
	Evening	62	55	55
	Night	59	55	55
Lowy Institute	Day	N/A	59	59
	Evening	N/A	N/A	N/A
	Night	N/A	N/A	N/A

12.1.4 Noise source levels

Construction of the building

Noise sources that are likely to be associated with the excavation and construction of the project are identified in the following sections.

To assess the potential noise and vibration impacts during construction, a number of scenarios and typical equipment were developed and are summarised in Table 12-17.

Table 12-17 Construction scenarios

Reference	Scenario	Equipment
1	Excavation	• 1x front end loader • 2x dump truck • 2x rock breakers • 1x excavator • 1x mobile crane
2	General construction on site	• 1x jack hammer • 1x generator • 1x concrete pump • 2x concrete truck • Hand tools • Crane

Typical sound power levels (SWL) of the plant likely to be used during demolition, excavation and construction are identified in Table 12-18. These SWLs have recently been measured at other similar construction sites.

Table 12-18 Typical construction plant sound power levels (SWL)

Plant	SWL, dBA	Sound pressure level at 7 m
Excavator	107	82
Dump trucks	112	87
Rock breaker	122	97
Concrete trucks	112	87
Saws	116	91
Saw cutter	115	90
Small excavators	90	65
Concrete trucks	109	84
Small generators	95	71
Front-end low-loader	112	87
Compressor	100	75
Bobcat	103	78
Hand tools	90	65
Jackhammer	105	80

Predicted noise levels at receivers are based on 15-minute periods. This equipment has been distributed across the site for the noise predictions.

The major noise source would be the hydraulic rock breaker and Figure 12.2 provides an example of this type of machine.

Figure 12.2 Photograph of a hydraulic rock breaker

Tunnelling construction

Noise from the roadheader is unlikely to be acoustically significant as noise associated with this equipment would be contained by the tunnel walls. Ancillary equipment, including the exhaust fan and dust collector, would generate noise associated with this construction activity.

Typical sound levels of the construction plant likely to be used during construction of the cable tunnel are identified in Table 12-19. These levels have recently been measured at other similar construction sites.

Table 12-19 Typical tunnelling equipment plant sound power levels

Plant	SWL	Sound pressure level at 7m
Excavator with header	112	87
Bogie (dump) truck	112	87
Crane	110	85
Power tools	115	90
Concrete trucks	109	84
Small generators	95	70
Ventilation fan* and dust collector	105	80

* Assumes a silencer on the fan.

Figure 12.3 provides a photograph of a roadheader that is similar to that which would be used to construct the cable tunnel. This removes rock using a grinding action that provides close control over the excavated profile of the tunnel roof and upper walls.

This type of machine can safely perform detailed excavations quite close to sensitive structures such as historic buildings, and generates relatively low levels of vibration and regenerated noise. Experience has shown that they can be used on a 24 hour basis to construct tunnels near residences with minimal disturbance to the occupants.

Figure 12.3 Photograph of a roadheader

Operation

Table 12-20 and Table 12-21 summarise the indicative type and location of plant and related louvres that would be included in the west and east facades of the project and would generate operational noise. The location of louvers are shown in the architectural plans in Appendix G. The plant and equipment specifications would be refined during detailed design.

Table 12-20 Bligh Street (east) elevations plants and louvres

Plant type	Plant location	Working hours
Substation		
Transformer corridor natural ventilation	Level 7	Transformers working 24/7
2x general exhaust 1x garbage exhaust 1x toilet exhaust	Level 7	During office hours
Transformer corridor natural ventilation	Level 8	Transformers working 24/7, at different % loads depending on energy demand
Street press intake	Level 8	In the event of fire only
Office tower		
AHU plant	Level 12	During office hours
AHU plant	Level 26	During office hours

Plant type	Plant location	Working hours
3x cooling towers	Level 37	Working 24/7
Chillers	Level 37	During office hours

Table 12-21 O'Connell Street (west) elevation plants and louvres

Plant type	Plant location	Working hours
Substation		
Intake for ground lobby vent	Level 5	During office hours
Transformer corridor natural ventilation	Level 5 to Level 7	Transformers working 24/7, at different % loads depending on energy demand
Stair press intake	Level 7	In the event of a fire
Carpark exhaust discharge	Level 9	During office hours
Stair press intake	Level 12	In the event of a fire
Office tower		
AHU plant	Level 12	During office hours
AHU plant	Level 26	During office hours
3x cooling towers	Level 37	Working 24/7
Chillers	Level 37	During office hours

12.2 Impact assessment

12.2.1 Construction noise assessment

Construction noise

Assessment of likely noise at surrounding commercial and residential receivers has been considered during excavation and general construction (refer to Table 12-23 and Table 12-24). Daytime, evening, night time and Saturday construction noise management criteria are also presented in Table 12-23 and Table 12-24 to gauge compliance when compared to the predicted noise levels. The predicted noise levels are based on equipment noise levels, distance attenuation and shielding from existing buildings and structures etc, where applicable.

Exceedance of noise criteria of up to 10 dBA is predicted when large rock breakers are used during excavation. These items of plants are significantly louder than other site equipment and compliance with criteria is expected when the large rock breakers are not operating. To minimise the impact of works which exceed the noise criteria, activities such as rock breaking would be undertaken during the following hours:

- Monday to Saturday 9 am to 12 pm;
- Monday to Friday 2 pm to 5 pm; and
- At no time on Sundays or public holidays.

Mitigation measures outlined in Section 12.3 would be implemented, including using rock saws around the perimeter of the excavation to reduce potential impacts associated with heavy rock breakers.

During general construction works, the predicted noise levels comply with the evening and extended Saturday construction noise criterion. Based on this, extending the construction hours beyond those recommended in

the ICNG to allow works between 6 pm – 7 pm Monday to Friday and 1 pm – 5 pm on Saturday is considered appropriate.

Construction noise and vibration impacts would be minimised by implementing the mitigation measures.

Tunnelling noise

Construction airborne noise at surrounding residential receivers was assessed for tunnelling along Bligh Street based on the typical sound power levels presented in Section 12.1.3.

Table 12-22 presents maximum predicted construction noise levels at nearby residences during tunnelling at night. This indicates that acceptable noise levels would occur at these locations. In addition, these hotels have fixed windows and therefore internal noise levels would be further attenuated by this feature.

Table 12-22 Predicted noise levels at residences from tunnelling works

Location	Predicted noise level dBA	Night criteria dBA	Exceedence dBA	Compliance
Sofitel Wentworth	44	61	-	Yes
Radisson Hotel	64	64	0	Yes

12.2.2 Construction vibration assessment

The main item of equipment that has potential to generate substantial levels of vibration are rock breakers involved in site excavation and a road header to conduct tunnelling activities under Bligh Street.

Whilst tunnelling equipment (used underground) can generate relatively high airborne noise levels within the tunnels, noise transmission to locations outside the tunnels would be satisfactorily attenuated by the intervening soil or rock.

Operation of roadheaders and rock breakers also generates ground vibration that has the potential to transmit to nearby buildings as audible (regenerated) noise. Regenerated roadheader noise usually has a low frequency "rumbling" character, whereas rock breaker noise can be described as having repetitive impulsive character. Regenerated noise is of potentially greater significance than the accompanying tactile vibration, as it is normally perceptible at a greater distance from the source.

Table 12-23 Predicted noise levels at receivers during excavation and building construction

	Predicted	Day			Evening			Night			Saturday (extended)		
Location	**Noise dBA**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**
Excavation													
Sofitel Wentworth	55 (day) / 43 (evening)	68	-	Yes	64	-	Yes	61	-	NA	63	-	Yes
Radisson Hotel	76 (day) / 74 (evening)	75	1	**No – marginal**	66	8	**No**	64	-	NA	70	6	**No**
Lowy Institute	77 (day) / 67 (evening)	70	7	**No**	70	-	Yes	70	-	NA	70	7	**No**
Southern Commercial	80 (day) / 73 (evening)	70	10	**No**	70	3	**No**	70	-	NA	70	10	**No**
Commercial across Bligh Street	78 (day) / 75 (evening)	70	8	**No**	70	5	**No**	70	-	NA	70	8	**No**
Building construction													
Sofitel Wentworth	46	68	-	Yes	64	-	Yes	61	-	NA	63	-	Yes
Radisson Hotel	67	75	-	Yes	66	1	Yes	64	-	NA	70	-	Yes
Lowy Institute	65	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes
Southern Commercial	66	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes
Commercial across Bligh Street	65	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes

Table 12-24 Predicted noise levels at receivers during façade works

	Predicted	Day			Evening			Night			Saturday (extended)		
Location	**Noise dBA**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**	**Criteria dBA**	**Exceedance dBA**	**Compliance**
Facade													
Sofitel Wentworth	53	68	-	Yes	64	-	Yes	61	-	NA	63	-	Yes
Radisson Hotel	64	75		Yes	66	-	Yes	64	-	NA	70	6	Yes
Lowy Institute	60	70	-	Yes	70	-	Yes	70	-	NA	70	7	Yes
Southern Commercial	59	70	-	Yes	70	-	Yes	70	-	NA	70	10	Yes
Commercial across Bligh Street	62	70	-	Yes	70	-	Yes	70	-	NA	70	8	Yes
Construction and facade													
Sofitel Wentworth	54	68	-	Yes	64	-	Yes	61	-	NA	63	-	Yes
Radisson Hotel	67	75	-	Yes	66	1	Marginal	64	-	NA	70	-	Yes
Lowy Institute	66	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes
Southern Commercial	66	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes
Commercial across Bligh Street	65	70	-	Yes	70	-	Yes	70	-	NA	70	-	Yes

Vibration from rock breakers

The impulsive vibration from large rock breakers can cause audible regenerated noise in buildings up to distances of 50 m to 100 m from an excavation site, depending on ground conditions, type of structure and ambient noise conditions. Levels in the order of 45 dBA to 50 dBA have been measured in the basement of properties 70 m from a large rock breaker operating to remove the lower bench in a tunnel.

Table 12-25 sets out the typical ground vibration levels at various distances from rock breakers operating in hard sandstone such as that found at the site.

Table 12-25 Rock breaker PPV vibration levels (mm/s) at various distances

Operation	PPV vibration level (mm/s) at given distance					
	5 m	10 m	20 m	30 m	40 m	50 m
Heavy rock breaker (eg 1500 kg)	4.5	1.3	0.4	0.2	0.15	0.02
Medium rock breaker (eg 600 kg)	0.2	0.06	0.02	0.01	-	-

Excavation would be conducted using a combination of rippers, rocksaws and rock breakers. The perimeter of the site would be sawn with rocksaws and the remainder of the site would be excavated by rock breakers and rippers.

Vibration from rock breaker operations has the potential to generate perceptible vibration at surrounding properties. Previous measurements indicate that PPV vibration levels from heavy (1500 kg) and medium sized (600 kg) rock breakers would be in the order 4.5 mm/s and 0.2 mm/s at a distance of 5 m from the boundary.

At these levels of vibration, the preferred vibration dose (VDV) of 0.4 $mm/s^{1.75}$ would be exceeded for heavy rock breakers after less than two hours, whilst lighter rock hammers could operate all day without exceeding the VDV. As operation of a large rock breaker over the entire day would exceed the nominated human comfort criteria, they may be used on a rotational basis to provide respite to surrounding receivers. Section 6.7.1 reflects that noise intensive activities such as the use of rock breakers would occur during restricted hours to provide respite.

Structural damage vibration criteria is much higher than human comfort criteria, therefore compliance with the latter ensures that structural damage criteria would be satisfied.

Operation of heavy rock breakers in the vicinity of heritage listed buildings is likely to exceed the criteria for structural damage presented in Table 12-8 and Table 12-9. As indicated in Section 12.1.2, surrounding heritage listed buildings would be inspected by a structural engineer to determine whether they are structurally sound. If the buildings are structurally sound, there may be scope for increasing the vibration criteria for the heritage listed buildings to that of residential buildings.

Regenerated noise during rock breaking

Regenerated noise from rockbreakers would vary depending on the size of the rockbreaker and the distance from the rockbreaker and the receiver. Predicted internal noise levels in surrounding properties are summarised in Table 12-26 and indicate that the criteria are likely to be exceeded.

During construction planning, alternative construction methods would be investigated to minimise regenerated noise from rockbreakers. Where practicable:

- Rock saws and rippers would be used
- Smaller rockbeakers would be used
- Respite periods would be provided to receivers particularly during shoulder periods of the day.

Table 12-26 Estimated regenerated noise levels during rockbreaking

Location	Heavy rockbreaker (dBA)	Medium rockbreaker (dBA)	Criteria (dBA)
Sofitel Wentworth	30 - 50	30 - 45	40
Adjacent commercial receivers	45 - 80	40 - 65	45

Vibration from roadheaders

For tunnelling operations, regenerated noise is usually transitory in nature and increases in level as the tunnelling works approach a particular building, reaches a maximum when the works are immediately nearby, and then decreases as tunnelling moves on. The rise and fall of the noise level is controlled by the rate of tunnel advance, which typically ranges from 5 m to 10 m per day, depending on ground conditions and excavation methods.

Wilkinson Murray has measured groundborne noise levels from a roadheader similar in size to that likely to be used for the project and the results are summarised in Figure 12.4. These results were used to predict noise in basements of buildings near cable tunnel to be excavated by road header.

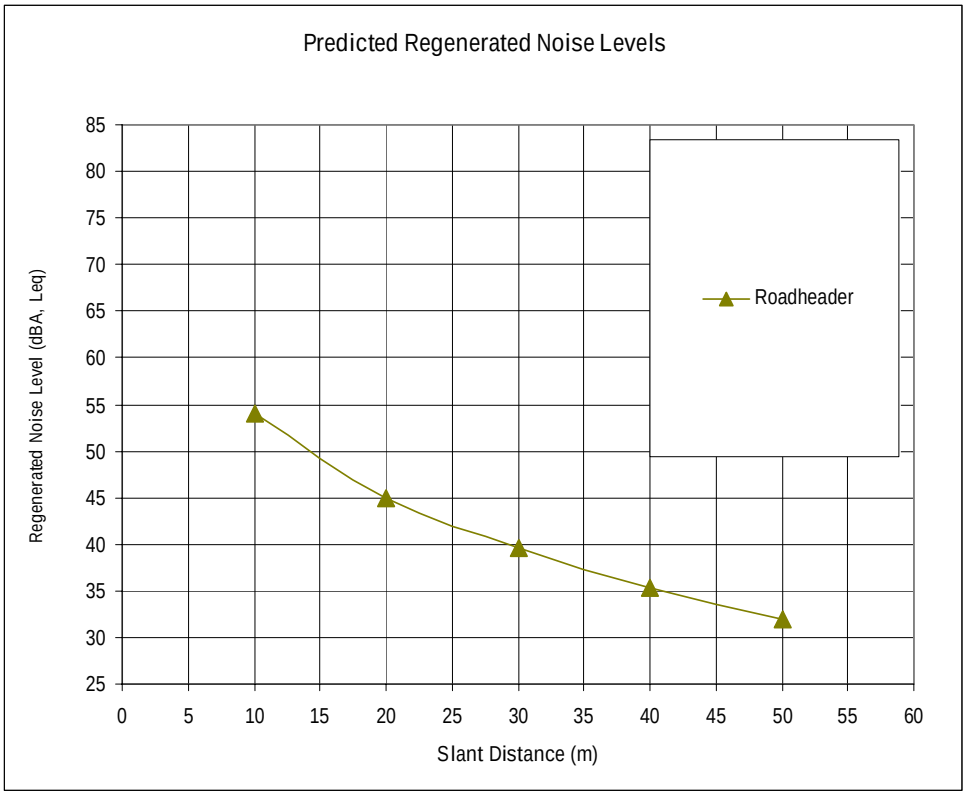


Figure 12.4 Predicted regenerated noise from road header

Slant distances from the cable tunnel to buildings in Bligh Street indicate the minimum distance from the head of the tunnel to the basements of commercial properties and the Sofitel Wentworth Hotel is in the order of 30 m.

At distances of 30 m, a regenerated noise level of 39 dBA is expected and this would comply with the daytime regenerated noise criterion. In the case of noise levels in the Sofitel Wentworth, the basements of the building are 15 m below ground level and this represents about four levels. Allowing for an attenuation of 2 dBA per level, the noise levels at ground floor of the hotel are predicted to be in the order of 31 dBA which is well below the night time regenerated noise criterion of 35 dBA. Based on this, 24 hour operation of the roadheader would comply with regenerated noise criteria.

Vibration levels associated with ground-borne noise are well below human comfort or structural damage criteria. No adverse impact with respect to perceptible vibration or structural damage at any residences is predicted.

12.2.3 Construction traffic

Construction of the project would generate traffic movements and the peak in heavy vehicle movements would be associated with spoil haulage. Transport of equipment to the site would occur during the initial stage involving site preparation works and intermittently in between stages. Approximately 1-2 deliveries per day are estimated. Table 12-27 summarises heavy vehicle movements during the various stages of excavation.

Table 12-27 Heavy vehicle movement attributed to spoil removal

Construction activity/source	Duration (days)[1]	Truck trips per day[2]	Maximum truck movements per hour[3]
Bulk excavation of basement	150	192	20
Cable tunnel and shaft excavation	150	13	2

[1] At 5 days per week.

[2] Number of truck trips per day estimated on the basis of 5 m^3 per single unit dump truck and each trip generating one inbound movement and one outbound movement.

[3] Maximum truck trips per hour is based on a 10-hr work day or maximum throughput of one truck movement every 5 minutes.

As discussed in Section 14.2 the average daily traffic through the various road sections in the northern CBD in the vicinity of the site range from 7000 vehicles per day (Castlereagh Street) up to 30,000 vehicles per day (Macquarie Street) and with the Eastern Distributor/South Dowling Street around 60,000 vehicles per day. The peak hour volumes are estimated to range from 500-1,500 vehicles per hour for the local roads and up to 7000 vehicles per hour for Eastern Distributor/South Dowling Street.

In the case of Eastern Distributor, Southern Cross Drive, Anzac Parade, Moore Park Road, M5 East Motorway, Western Distributor, Victoria Road and City West Link the roads can be classified as arterial roads. In the case of Macquarie Street, Hunter Street, Elizabeth Street, Market Street the roads can be classified as a collector road. Bent Street, O'Connell Street, Bligh Street, Phillip Street, King Street and Bridge Street are classified as local roads.

Analysing the traffic data and the estimated vehicle movements during the construction phase indicates that the 2dB limit on the increase in road traffic noise levels applies. Calculations indicate there would be minor increases in road noise during the peak construction activities of less than 0.4dB.

12.2.4 Operational noise and vibration assessment

As detailed plant selections are not available at this stage, it is not possible to carry out a detailed assessment of the operational noise impacts. During detailed design, plant and equipment would be selected such that the project complies with criteria established in accordance with the INP and design levels identified in AS2107. This may involve acoustically treating some noise sources to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant practicable, or treating the plant with enclosures, barriers, duct lining and silencers, etc as required to comply with regulatory sound level requirements.

Experience with similar projects indicates that it would be possible to achieve regulatory requirements with appropriate treatment of the plant.

Noise from transformers

A preliminary assessment was undertaken to confirm that noise and vibration emissions from the substation would be likely to comply with criteria established in accordance with the INP. Noise levels were measured at Ausgrid's City South Substation, in Cunningham Street, Sydney. These measurements were obtained as the

main source of operational noise and vibration at the City East Zone Substation is likely to be the gas insulated transformer, and a gas transformer operates at the City South Substation.

Noise levels were measured at 1 m from the gas transformer in the City South Substation on 12 December 2010. This level was used to undertake a preliminary assessment of the reverberant noise in the transformer bays breaking out through the transformer roadway to the nearest noise sensitive receivers. To carry out the calculations, the level was normalised to the overall Mitsubishi transformer noise data provided by Ausgrid.

The assessment assumed that a hollow concrete block such as Boral Acousticell is used in the transformer bays back wall, together with an absorptive ceiling, to reduce the reverberant noise level inside the transformer bays. Hollow concrete block has been used on other Ausgrid substations and has proved to be a suitable solution to reduce noise in transformer enclosures.

The assessment concluded that using material such as Boral Acousticell on the rear wall of each transformer bay and absorptive ceilings in the transformer bays would enable the limiting noise criteria for the day, evening and night time to be met at the noise sensitive receivers along O'Connell Street. The limiting noise criteria for the day, evening and night time would be met at the Sofitel Wentworth Hotel and for the daytime at the Lowy Institute.

Traffic noise impact

The project would include a car park split over two levels including a maximum of 40 car spaces and eight service vehicles. The existing building utilised 43 car parking spaces in the basement with access from O'Connell Street and contained a loading dock which would have generated very similar traffic movements to the proposed development.

Considering the maximum number of parking spaces provided and the level of loading and service vehicle activity anticipated as part of the project the additional effect of these vehicles is minimal on the nearest intersections to the site after which vehicles disperse.

A detailed traffic impact assessment has also been undertaken for the project and is discussed in Chapter 14.

The traffic noise break-in from Bligh and O'Connell Street can be resolved with adequate façade glazing and building envelope construction. Traffic vibration impact on the project is unlikely to be any issues since road traffic generally produce low vibration levels. It should also be controlled by appropriate design of the building structure.

12.3 Mitigation measures

Construction

Without mitigation, noise levels from some construction activities are predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures have been recommended to ensure that noise is reduced where feasible.

A range of possible approaches to reducing the impact of construction noise is described below and would be applied to areas of potential exceedances.

12.3.1 Community liaison and general approaches to mitigation

A community relations program would be implemented to keep the potentially affected community informed of progress of the works, and to advise of any anticipated changes in noise and vibration emissions prior to critical stages of the works. This would involve explaining complaint procedures and response mechanisms. This program would be included in Ausgrid's Community Information Plan that has been specifically developed for the City East Zone Substation Project.

Close liaison would be maintained between the communities surrounding the site and the contractor undertaking the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

12.3.2 Noise and vibration management plan

A noise and vibration management plan would be included in the CEMP for the project. The plan would detail the mitigation, monitoring and community liaison measures to be implemented and would be updated to incorporate any additional measures that emerge as the project design evolves and work methodologies become better defined.

Areas that would be addressed in the plan include:

- Noise and vibration monitoring
- Response to complaints
- Responsibilities
- Monitoring of noise emissions from plant items
- Reporting and record keeping
- Non compliance and corrective action

Specific actions to be included in the plan would relate to:

- Plant noise audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing would be undertaken by the contractor
- Operator instruction – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission
- Equipment selection – All fixed plant at the work site would be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with DECCW guidelines
- Site noise planning – Where practical, the layout and positioning of noise-producing plant and activities on the work site should be optimised to minimise noise emission levels
- Use rocksaws in conjunction with rock breakers, where feasible
- Install a noise barrier between the site and the street frontages with minimum 17 mm thick structural plywood; (the site would be surrounded by hoardings erected in accordance with the City of Sydney Guidelines)
- Consideration to be given to the use smaller rock breakers where practicable. This would involve evaluation of the relative increase in the duration of works that may result from use of smaller machinery
- Noise intensive activities such as rock breaking would be undertaken during the following hours: Monday to Saturday 9 am to 12 pm and Monday to Friday 2 pm to 5 pm providing a respite period between 12 pm and 2 pm
- Install vibration monitors in adjacent commercial buildings, in particular the Lowy Institute, to ensure that vibration in these buildings do not exceed acceptable levels.

Operation

At this stage the selection of mechanical plant has not been finalised. This would be undertaken during the detailed design stage of the project and would be done to meet the performance criteria established for the project and detailed in this chapter. A more detailed assessment of the noise and vibration from the transformers within the substation would also be considered further in the detailed design of the project.

Typical noise mitigation strategies which could be adopted include the selection of low noise plant, the use of plant enclosures, acoustic louvres on air intake/exhaust paths and acoustic attenuators.

13. Spoil and waste management

13.1 Impact assessment

13.1.1 Construction

Basement, cable tunnel and shaft excavation

Spoil volume and classification

Spoil is material removed from ground excavation and would be generated during bulk excavation for the basement and excavation of the shaft and cable tunnel. The total expected spoil generated from the project would be approximately 40,510 m^3 (in situ).

Geotechnical investigations at the site (PSM May 2008) indicate the subsurface comprises a thin layer of fill overlying weathered sandstone. The backfill behind the walls comprises bricks, sand or sandstone. Backfill material at one location contains asbestos sheeting (fibro). Investigations indicate that the site does not contact acid sulphate soils.

Table 13-1 summarises the inferred subsurface profile from the PSM (May 2008) geotechnical and environmental investigations. Based on this, it is likely that the majority of spoil generated from the project would be virgin excavated natural material (VENM) comprising Class IV, III and II sandstone. VENM is clean, natural material that is uncontaminated with other waste materials or manufactured chemicals. Fill would also be excavated that would not be VENM and would require disposal to an appropriately classified and licensed landfill, though it may be able to be reused at the landfill for remediation or general operational purposes.

Table 13-1 Inferred subsurface profile

Unit	Approximate thickness	Typical description
Fill	0.1 to 1.7 m	Sandy gravels with some clay
Class IV Sandstone	1.0 m	Moderately to highly weathered sandstone
Class III Sandstone	2.0 to 2.7 m	Moderately weathered sandstone
Class II Sandstone	Not known	Slightly weathered sandstone

Potential for contamination

The preliminary contamination assessment report for the site by Urban Environmental Consultants Pty Ltd (May 2008) concludes that the site shows no indication of gross contamination other than asbestos containing materials used as backfill at one location (as mentioned above). On this basis, the asbestos containing materials would be segregated when the basement is excavated. It would be disposed to landfill by an excavation contractor that is a certified ASI licensed NSW Work Cover contractor in accordance with NSW Work Cover Guidelines and appropriate health and safety controls.

Spoil material would be classified in accordance with the DECC (April 2008) *Waste Classification Guidelines* prior to offsite disposal or reuse/recycling.

Excavation volumes

Table 13-2 shows the expected quantities of spoil associated with each construction activity/source. The majority of spoil would be generated during bulk excavation of the basement.

Table 13-2 Estimated spoil generation

Construction activity/ source	Expected volume (in situ)
Bulk excavation of basement	34,866 m^3
Cable tunnel and shaft excavation	5,644 m^3
TOTAL	40,510 m^3

Management approach

The overarching approach to spoil management for the project is based on the principles of the waste hierarchy and includes the objective of maximising reuse and recycling of spoil generated and managing contaminated spoil appropriately to minimise impacts to the environment.

There is limited opportunity to reuse excavated spoil as part of the project, however there are good opportunities for beneficial reuse off-site. For example, spoil can be reused as engineering fill or other construction materials. Spoil can also be beneficially reused for land reclamation or remediation works or for operational purposes at landfills. The least preferred option for off-site management is disposal at landfill. The spoil management options are summarised in Figure 13.1.

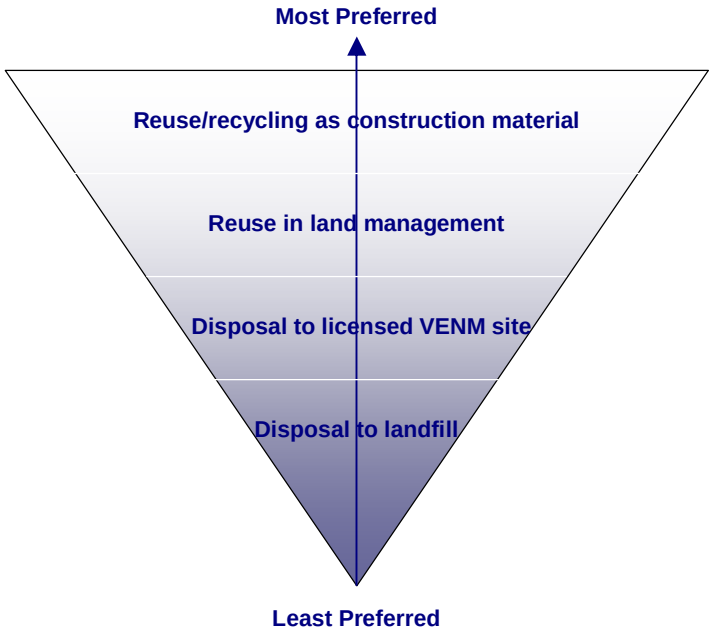


Figure 13.1 Spoil management hierarchy

A spoil and waste management sub-plan would be prepared as part of the CEMP that would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation.

Reuse and disposal options

When considering spoil reuse and disposal, the volume of material and timing of spoil generating activities are key to determining feasible options. Small quantities can be utilised on a large number of construction projects or accepted at disposal sites (such as landfills or mining voids), but larger quantities often require special arrangements to be negotiated. The possibility of such arrangements also depends on the timing of other major construction projects requiring fill coinciding with the period when spoil is being generated.

VENM can be accepted and re-used on other construction sites with minimum effort and cost. There are a number of applications for shale and sandstones found in the Sydney region. The technique used to extract the material or the degree of processing largely determines the material's likely reuse application. Hawkesbury sandstone can be used to produce coarse concrete sand or as select earth fill material. Other potential applications are as a lower level pavement material or low grade road base. Some shale types can be used as fill for building sub-base road pavements, others are suited to crushing, grinding and processing to produce clay for vitrified products such as tile, pipes and bricks.

VENM can also be used in beneficial land management. For example, shale materials can be used as cover for contaminated land reclamation projects. Opportunities to reuse spoil materials in beneficial land management can sometimes be limited as appropriate land management projects may not be underway in the vicinity of the VENM generating activities.

At some 'VENM only' sites in Sydney such as extractive industry voids (disused quarries), VENM can be accepted free of the Section 88 Waste and Environment Levy, so disposal costs are low. While there are a number of extractive industry voids in the Sydney region, not all are potential VENM filling sites and only a few are currently operating as VENM only receival sites.

VENM can be accepted at landfill sites without incurring the s88 Levy provided it is used for operational purposes such as daily cover. However, landfills are restricted to the amount of VENM that they are able to claim a rebate on the s88 Waste and Environment Levy - 20 percent of the total quantity of waste received and landfilled at the site. Often, sufficient material is delivered to these landfills by small operators (such as landscapers and builders), and so there may be limited opportunities to accommodate material from the project.

Typical landfill sites that receive VENM for use as daily cover or onsite engineering works include the WSN landfills at Belrose, Eastern Creek and Lucas Heights, the Glenfield Waste Depot and Enviroguard, Brandown and Penrith Waste landfills.

'Contaminated' spoil management

Spoil material that is contaminated could be disposed of at the SITA landfill at Kemps Creek or at Penrith Waste at Mulgoa. Both these sites are licensed to receive contaminated soils. The SITA landfill is also licensed to receive 'Special Waste' and 'Restricted Waste', which requires special landfilling techniques.

Minimal contaminated spoil material is expected to be generated by the project.

Substation and commercial tower

Waste concrete from tunnel lining and other construction work may be suitable for crushing and reuse if significant quantities are generated. If this is the case, the waste concrete would be transferred off site to a construction and demolition recycler. Otherwise, it would be collected and disposed of to an appropriately licensed landfill.

Cable off cuts produced during cable tunnel fit out would contain useful and valuable metals (the conductor) and would be suitable for recycling. Any off cuts would be collected and recycled.

Any other surplus recyclable construction material such as steel off cuts or scrap would be recycled. Timber and plywood (from formwork) would be reused or recycled where possible, for example for firewood/wood chips. Other construction materials that are non-recyclable would be disposed of at an appropriately licensed landfill in accordance with NSW legislative requirements.

Recycling and general waste bins would be provided at site offices and amenities. Recyclable materials such as glass, aluminium, plastic and paper would then be taken off site for recycling.

Site amenities (general waste)

Small quantities of general waste and recyclables would be generated from first aid rooms, induction rooms, lunch sheds, change rooms and amenities. Both recycling bins and general garbage bins would be provided for site personnel to source separate recyclables. Recyclables would then be transported offsite for recycling.

13.1.2 Operation

A preliminary assessment of waste likely to be generated during operation of the project has been undertaken and this would be refined during detailed design. As detailed in Section 6.3.13, an Operational Waste Management Plan has been prepared for the project and is located in Appendix Y. Project waste would be managed in accordance with the City of Sydney's Waste Storage Design requirements.

The project would generate waste associated with operation of the commercial and retail areas. Within the commercial areas, each week it is estimated that approximately 14,000 litres of non-recyclable and 28,000 litres of recyclable waste would be generated. Within the retail areas, each week it is estimated that approximately 375 litres of non-recyclable and 250 litres of recyclable waste would be generated.

There would be a dedicated garbage / recycling room located on Level 4 adjacent to the loading dock for the storage of all waste. A nominated private waste and recycling contractor would collect all waste as per recommended collection cycle.

Collection would occur using the level 5 O'Connell Street loading dock entry access to the garbage room. The 3.6 m height shown is sufficient for all collector vehicles to access the loading dock, however front load collection would not be possible as this would require 6 m height access.

Waste management

Each tenant would be responsible for their own in house storage of general waste and recycling. During the course of the day or at the end of it, staff or cleaners would transport the materials to the designated garbage room located on Level 04 and place them in the allocated compactors.

All waste would be collected by the private waste contractor. The waste would be collected from the garbage room utilising the loading dock accessed off Level 5 Street level (O'Connell Street).

Recyclable Waste

Tenants are likely to sort waste at source (on each level), and this can be achieved with the supply of recycling bins at each level. At the end of the day or during operating hours tenants or cleaners would transport the recyclables to the waste room on Level 4 and place each type into the correct bin or compactor. All bins and machinery would be labelled with every product grade. It is expected that the majority of recyclable waste generated by these tenants would most likely be paper recyclable products such as cardboard boxes and paper products. To reduce the volumes and minimize area required, a baler may be provided.

Recyclable waste is likely to collected by a recycling company twice weekly.

Waste collection

General waste would be collected and compacted. It is likely that general waste would be collected three times a week.

A detailed in Section 6.3.13, an Operational Waste Management Plan has been prepared for the project. Project waste would be managed in accordance with the City of Sydney's Waste Storage Design requirements.

13.2 Mitigation measures

Construction

As part of the CEMP, a spoil and waste management sub plan would be prepared that would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation and would include measures such as:

- Arrangements to reduce the volume of materials brought onto site such as packaging. In addition, required construction materials would be ordered in the correct quantities to minimise waste.

- Reuse or recycling of spoil would be undertaken wherever practicable. Stockpile areas would be allocated for construction waste to allow separate stockpiling of recyclable and non-recyclable materials. In addition, colour coded and clearly marked containers for different recyclable materials would be provided.
- Records would be kept of all waste volumes and destinations.
- Sites for disposal of surplus spoil would be selected according to the rate of development activity and the volumes of material generated elsewhere.
- Ongoing training would be provided for construction personnel to ensure correct sorting of waste and recyclable materials and promote the principles of the waste hierarchy. Waste minimisation and management would be included in tool box sessions and site management planning.

Operation

An Operational Waste Management Plan would be implemented.

14. Traffic and access

14.1 Existing environment

Existing road network

Bligh Street

Bligh Street is a one-way single carriageway road with on-street parking on both sides. It intersects with Bent Street on its northern end and Hunter Street on its southern end. Both ends are signal-controlled. South of the Hunter Street intersection the road becomes Castlereagh Street. In its northern side, there is a "No Stopping" restriction at all times, while on its southern side, there is a 'No Parking' restriction during business hours.

Bent Street

Bent is a two-way, undivided road with generally one to two lanes per direction depending on the adjacent on-street parking restrictions. The posted speed limit is 50 km/h. Bent Street intersects with Bligh Street at a signal-controlled intersection. Bent Street provides direct access to the Eastern Distributor.

O'Connell Street

O'Connell Street is a one-way single carriageway with on-street parking on both sides. It intersects with Bent Street on its northern end and Hunter Street on its southern end. The intersection with Hunter Street is signal-controlled.

Phillip Street

Phillip Street is a two-way road with generally one to two lanes per direction depending on the adjacent on-street parking restrictions. The posted speed limit is 50 km/h. Phillip Street connects to Elizabeth Street at the south and provides a north-south connection, together with Bridge Street, to the Cahill Expressway. Phillip Street has limited parking with taxi zones along both sides of the streets as well as a bus zone near Bent Street.

Site accessibility

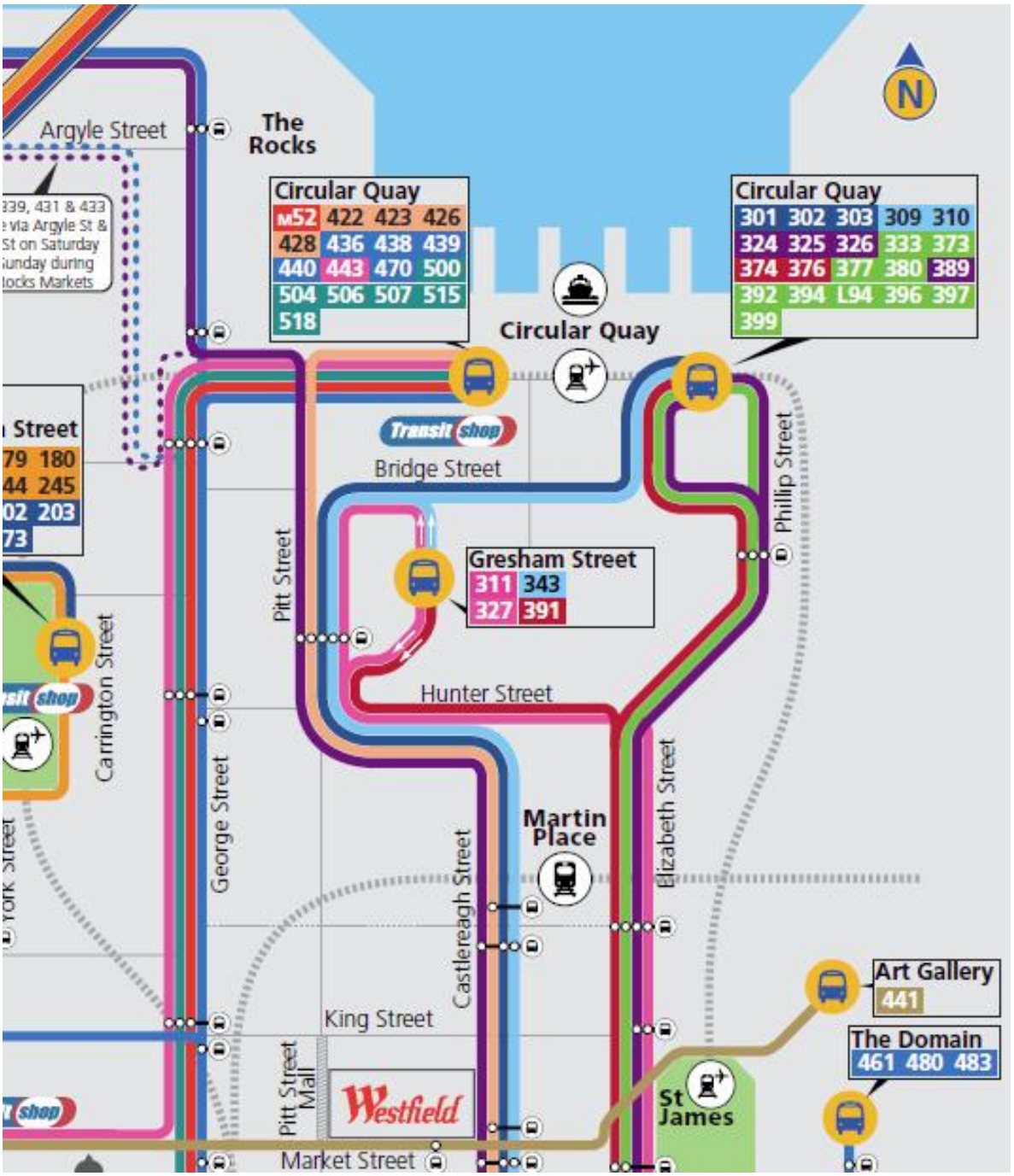
The site has frontages to both O'Connell Street and Bligh Street which provide pedestrian access.

Bus routes

Public transport in the vicinity of the site is restricted to bus routes. Numerous local bus routes service Phillip Street, an important north-south bus corridor through the Sydney CBD. Bent Street is an important east-west bus corridor linking the Eastern Distributor and the CBD. There are no bus routes or bus stops along Bligh or O'Connell Streets.

The Philip Street – Elizabeth Street corridor, one street block east of Bligh Street is a major bus route for outbound buses from Circular Quay. Bus routes using this corridor include Routes 324, 325, 326, 333 373, 374, 376, 377, 380, 389, 392, 394, L94, 396, 397, 399. Three additional outbound bus routes originate from Gresham Street and pass near the Site. These are bus routes 311, 327 and 391, passing through Pitt Street, then Hunter Street then to Elizabeth Street.

Figure 14.1 shows these bus routes in the vicinity of the site.



Source: **http://www.sydneybuses.info/network-interchange-maps/A4P_DeparturesGuide_LR.pdf**

Figure 14.1 Bus routes

CityRail stations

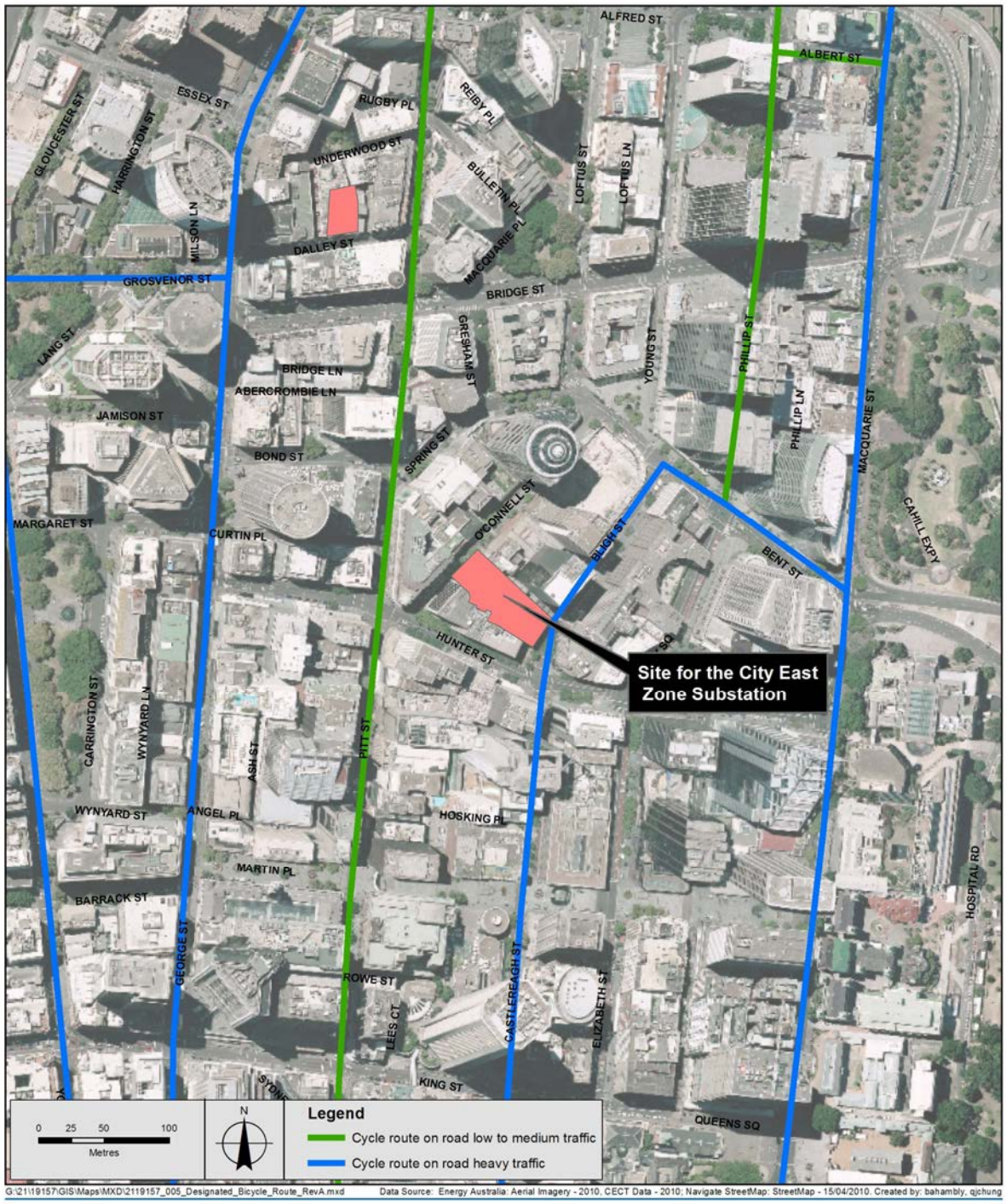
The site is in close proximity to two railway stations. Martin Place railway station is located 300 m south of Hunter Street while Circular Quay railway station is located 400 m north Hunter Street.

Bicycle network

Bligh Street is a designated on-road cycle route in the City of Sydney Council's designated bicycle network. This links the on-road routes along Bent Street towards Castlereagh Street.

Other designated on-road cycle routes in the vicinity of the site include Pitt Street and Macquarie Street, running in a general north-south orientation.

Designated bicycle routes are shown in Figure 14.2.



rce:http://www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAndTransport/Cycling/CoSCycleMap.pdf

Figure 14.2 Designated bicycle routes

Traffic conditions

Traffic surveys were conducted on O'Connell Street during both the AM and PM commuter peaks on a typical weekday. As O'Connell Street is one way in the southbound direction, surveys were conducted at the Bent Street intersection in the AM peak, and at the Hunter Street/Pitt Street intersection in the PM peak. The existing basement car park at the site is currently vacant and is not contributing to the existing traffic flows.

Results of the surveys for the peak hour AM and PM traffic is presented in Table 14-3.

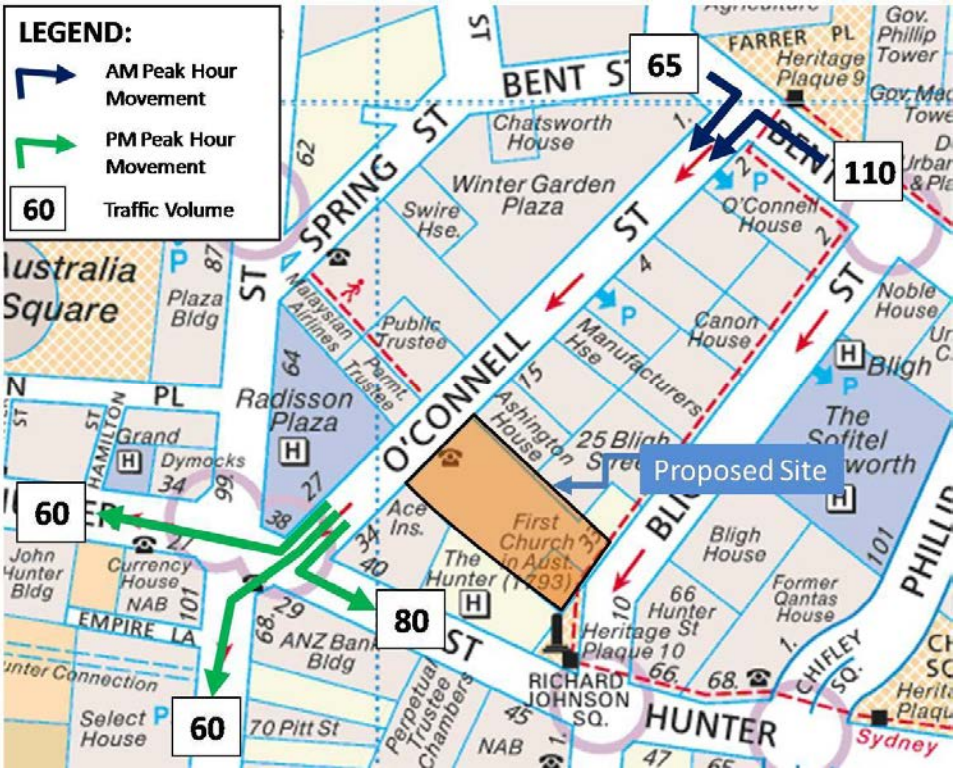


Figure 14.3 Existing traffic volumes

On-site observations in August 2011 indicated that traffic flowed acceptably during both the morning and evening peak periods. Queues at the Hunter Street/Pitt Street intersection in the PM peak were 6 to 7 cars long, with all vehicles passing through the intersection in one signal cycle.

The intersection at Bent Street allows for controlled left and right turns into O'Connell Street, with passing vehicles utilising the adjacent traffic lane to manoeuvre around the turning vehicle. Westbound through vehicles on Bent Street leave sufficient room for eastbound vehicles to turn right onto O'Connell Street.

14.2 Impact assessment

14.2.1 Construction

Construction staging and duration

It is anticipated that the construction activities would occur over a period of approximately 41 months. Traffic volumes generated by the construction employees and by materials delivery would vary depending on the construction phasing.

The construction stages are generally as follows:

- Site preparation
- Bulk excavation for the basement. The spoil would be loaded onto trucks and removed from site for reuse and/or disposal at a licensed landfill. The reuse and/or disposal location would be determined by the contractor undertaking the works
- Construction of a shaft and a cable tunnel beneath Bligh Street to the intersection of Bent Street and Bligh Street. The spoil would be transferred along the tunnel and removed by crane from a shaft within the site
- Construction of the City East Zone Substation and commercial tower.

Standard construction hours are anticipated to be between 7:00 am and 7:00 pm, Monday to Friday and between 7:00 am to 5:00 pm on Saturday. No work would be generally undertaken on Sundays or Public Holidays. However, for specific activities such as delivery of oversized plant or structures or emergency work, activities may be undertaken outside the standard construction hours. It is also proposed that underground activities associated with construction of the cable tunnel be undertaken 24 hours per day. Spoil removal from tunnelling activities would occur during normal construction hours.

Table 14-1 shows the estimated duration of construction.

Table 14-1 Duration of construction

Task	Duration*
Bulk excavation	8 months
Cable tunnel and shaft excavation	8 months
Construction of the City East Zone Substation	20 months
Constructing the commercial tower	18 months
Fitout and commission the substation	12 months
Fitout the tower	13 months
Overall duration (noting that some tasks would be undertaken concurrently)	41 months

* To provide a conservative estimate of vehicle movements associated with waste and spoil disposal, these durations are based on works being limited to five days per week during the construction hours

Construction access

Access to the site would be provided via O'Connell Street and Bligh Street and would include gates that feature pedestrian safety devices. Temporary use of traffic lanes and/or road occupancy may be required along Bligh Street and O'Connell Street. Should this be required, traffic control measures specified in "AS1742.3: 2002 Traffic Control Devices for Works on Roads" and the RTA's "Traffic Control at Work Sites" would be provided to ensure impacts on road safety are minimised and to warn road users in advance of the change in traffic conditions.

Traffic generation

The main traffic generated during the construction phase would be associated with:

- Delivering construction materials
- Removing spoil
- Delivering and removing construction equipment and machinery
- Moving construction personnel, including contractors, site labour force and specialist supervisory personnel.

Light vehicle traffic

Light vehicle traffic generation would be associated with staff movements as well as visitors to the site. Staff would comprise project management, various trades, and general construction staff. Over the full construction period, the peak construction workforce is estimated to be approximately 100 staff. It is assumed that the traffic generation would be influenced by the availability of on-site parking spaces, as the site has limited on-site parking. It is estimated that approximately only 5 to 10 on-site parking spaces would be provided to accommodate construction staff, works vehicles and visitor parking with the site area. Moreover, long-term on-street parking in the vicinity of the site is also very limited while demand is also high. Hence, construction staff may be discouraged from utilising on-street parking to minimise impact on the existing usage. Considering the proximity of the site to various public transport services, staff would be encouraged to use public transport to reduce vehicle traffic generation to the site. It is estimated that approximately 10 cars (or 20 trips per day) would be generated. Assuming all light vehicles arrive during the peak hour, this translates to 10 vehicles per hour (inbound in the AM and outbound in the PM)

Heavy vehicle traffic

Heavy vehicle movements would be required throughout the construction period, however the peak would be during bulk excavation when spoil would need to be removed from the site. There are estimated to be 192 truck trips per day during bulk excavation, compared to approximately 30 per day in later stages of the project when materials and concrete are delivered to construct the structures on the site.

Table 14-2 shows the expected quantities of spoil associated with each construction activity/source. The majority of spoil would be generated during bulk excavation of the basement.

Table 14-2 Estimated spoil generation

Construction activity/source	Expected spoil generation (insitu)	Duration
Bulk excavation of basement	34,866 m^3	32 weeks
Cable tunnel and shaft excavation	5,644 m^3	32 weeks
TOTAL	40,510 m^3	64 weeks (5 days per week)

The number of vehicles per day attributed to the spoil removal can be summarised as follows:

Table 14-3 Heavy vehicle movements attributed to spoil removal

Construction activity/source	Expected spoil generation(Bulked volume)	Duration (days)[1]	Maximum truck trips per day [2]	Maximum truck movements per hour [3]
Bulk excavation for the basement	58,226 m^3	160	192	20
Cable tunnel and shaft excavation	9,425 m^3	160	13	2

[1] At 5 days per week.
[2] Number of truck trips per day estimated on the basis of 5 m^3 per single unit dump truck and each trip generating one inbound movement and one outbound movement.
[3] Maximum truck trips per hour is based on a 10-hr work day or maximum throughput of one truck movement every 5 minutes.

In addition, equipment that would need to be brought to the site would entail heavy vehicle movements. Equipment would include:

- Earthmoving equipment such as excavators, dozers, backhoes and bobcats
- Mobile crane
- Rock saws
- Rock hammer
- Road header
- Concrete, reinforcement, formwork and other deliveries for construction of the cable tunnel and building structure
- Progressive removal of equipment and construction equipment.

Majority of the heavy vehicle movements associated with the transport of equipment to the site would occur during the initial stage involving site preparation works and intermittently in between stages. Approximately 1-2 deliveries per day are estimated. The worst case scenario would have four heavy vehicle movements occurring during the peak hour.

Oversize vehicle movements

In some instances, plant and equipment required for the project would be oversized and subject to relevant RTA road restrictions. Special arrangements would be made to minimise disruption to traffic and this would involve ensuring the appropriate signs and warning devices are in place prior to and during works outside standard construction hours.

Estimated total vehicle movements

In summary, it is estimated that approximately 10 light vehicle movements per hour during the peak hour. The heavy vehicle movements are expected to be at a maximum during the excavation works. There would be 20 heavy vehicles per hour occurring during the peak hour during the excavation works. With equipment delivery, an additional four heavy vehicle movements are expected.

Proposed heavy vehicle routes

A Traffic Management Plan would be prepared as part of the Construction Environmental Management Plan to manage materials delivery and spoil disposal. Potential spoil disposal sites have been identified and the final disposal site would be selected by the contractor. Haulage routes to and from the site and the major road network would generally utilize designated heavy vehicles routes where possible.

The proposed routes for the site are outlined below and in Figure 14.4.

Departure routes:

- To the South: Hunter Street – Macquarie Street – Eastern Distributor – Southern Cross Drive;
- To the East: Hunter Street – Macquarie Street – Eastern Distributor – Moore Park Road/Anzac Parade;
- To/from the West: Hunter Street – Macquarie Street - Eastern Distributor – Southern Cross Drive – M5 East Motorway;
- To the Inner West: Hunter Street - Phillip Street – Elizabeth Street – Market Street – Western Distributor – Anzac Bridge – Victoria Road/City West Link;
- To the North: Hunter Street – Macquarie Street – Conservatorium Road – Cahill Expressway.

Arrival routes:

- From the South: Southern Cross Drive – Eastern Distributor – Bent Street;
- From the East: Anzac Parade / Moore Park Road – Eastern Distributor – Bent Street;
- From the West: M5 East Motorway – Southern Cross Drive – Easter Distributor – Bent Street;
- From the Inner West: Victoria Road / City West Link – Anzac Bridge – Western Distributor – King Street – Elizabeth Street – Phillip Street – Bent Street; and
- From the north: Cahill Expressway – Conservatorium Road – Bridge Street – Phillip Street – Bent Street.

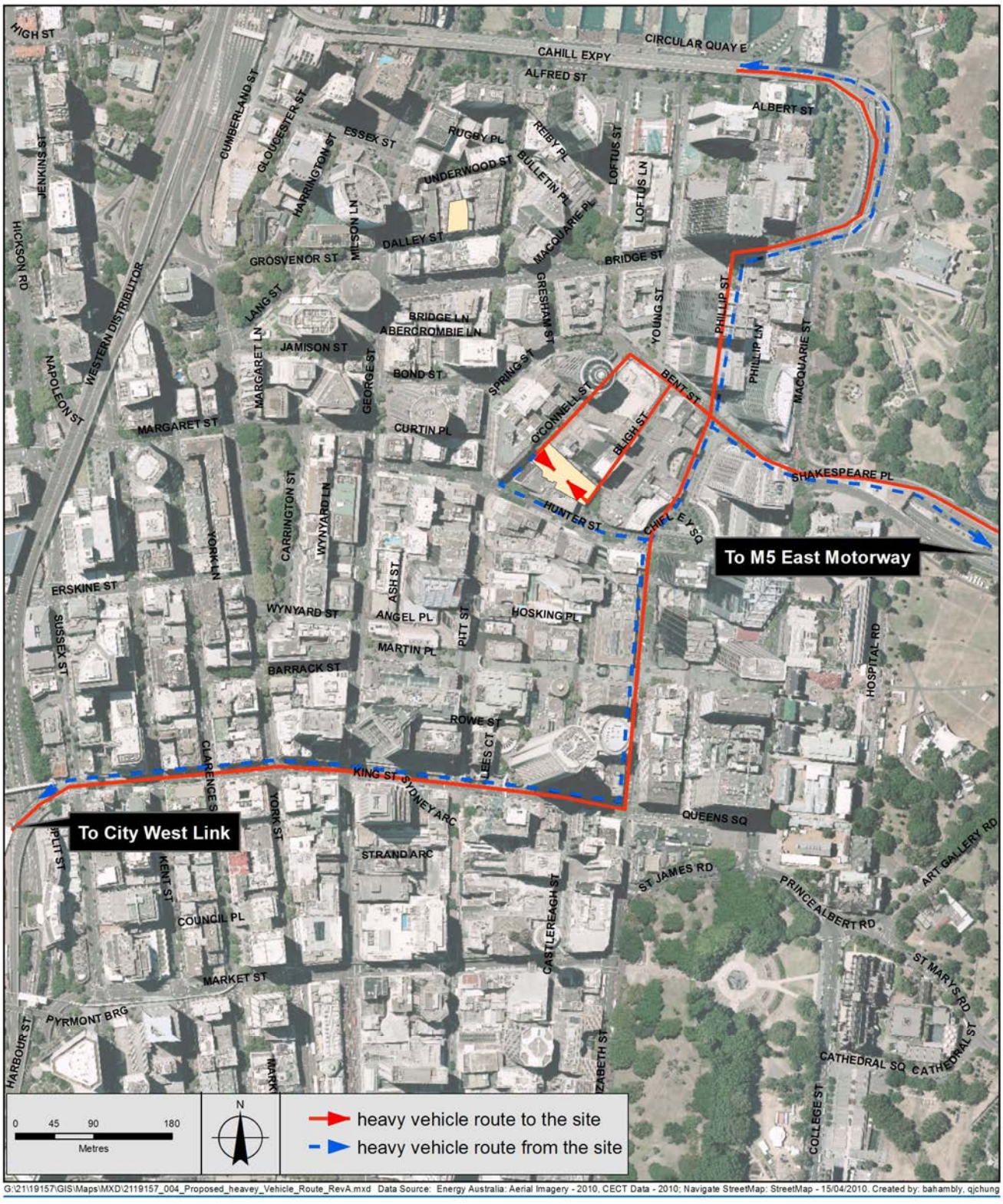


Figure 14.4 Proposed heavy vehicle routes

Distribution of traffic

For the purpose of this assessment, the following distribution is assumed:

- 60% - South, east and west via the Eastern Distributor
- 20% - North via the Cahill Expressway; and
- 20% - Inner west via Western Distribution.

Site access

Access to the construction site would require controlled and managed vehicle access. The maximum estimated vehicle movements per day would comprise of 20 light vehicle movements (10 In and 10 Out) for staff and visitors, four heavy vehicle movements for general deliveries (two In and two Out) and 192 heavy vehicle movements (96 In and 96 Out) for spoil disposal. It is further estimated that the likely hourly generation would be a maximum of 24 heavy vehicle movements and 14 light vehicle movements, as shown in Table 14-4.

Table 14-4 Inbound and outbound traffic at key intersections adjacent to the site

	AM Peak			PM Peak		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Light vehicle	10	4	14	4	10	14
Heavy vehicles for deliveries	2	2	4	2	2	4
Heavy vehicles for spoil disposal	10	10	20	10	10	20
Total vehicles	22	16	38	16	22	38

The average daily traffic through the various road sections in the northern CBD range from 7,000 vehicles per day (Castlereagh Street) up to 30,000 vehicles per day (Macquarie Street). The peak hour volumes are estimated to range from 500-1,500 vehicles per hour.

The existing road network generally operates close to capacity during the midday business peak hour and the morning and afternoon peak hours. Previous assessments of the traffic conditions in the CBD have noted little spare capacity and congestion during peak periods.

In comparison, the additional traffic brought about by the construction represents a minor increase in existing traffic. The likely generation of construction of the project would be approximately 2.5% of the existing peak hour traffic on Macquarie Street. This increase is expected to have an insignificant impact on the road sections and intersections in the surrounding areas of the site. Noting that the existing conditions are already close to capacity, it is unlikely that the project would result in a substantial additional adverse traffic impact.

Impact of temporary road closures

Partial and/or temporary road closures along Bligh Street or O'Connell Street may be required during some stages of construction to enable heavy vehicle manoeuvres and to accommodate construction procedures. Such closures would impact on the existing travel routes. Detour routes would be identified and appropriate advance notices, and warning signs would be provided to notify motorists of changes to the traffic conditions. An activity specific traffic management plan would be prepared to ensure appropriate measures are implemented.

Impact on parking

It is anticipated that temporary possession of kerbside parking may be necessary to provide suitable access to the construction site. It is estimated that approximately three parking spaces at each access location on Bligh Street and O'Connell Street would be required. The short term loss of a total of six parking spaces is considered to be a minor impact.

Impact on bus stops and bus routes

It is unlikely that the temporary changes to traffic conditions associated with the project would directly impact on operation of the nearest bus routes and bus stops which are located along Bent Street and Hunter Street. Where necessary, consultation with the bus service provider and City of Sydney Council at an early stage would assist in identifying appropriate measures to minimise potential disruptions or temporary changes to the bus service.

Impact on pedestrians and cyclists

The northern portion of the Sydney CBD is a high pedestrian activity zone and there is the potential for short term delays to pedestrian access along Bligh and O'Connell Streets during vehicle access and/or egress to the site. The project would use part of the footpath and Richard Johnson Square adjacent to the Bligh Street frontage as a construction zone. While this would alter pedestrian paths, measures would be implemented to ensure that pedestrian access is maintained along Bligh Street and to adjacent buildings.

As indicated in Section 6.6.1, hoardings or other protective structures would be installed along several site boundaries to provide a safe working environment for construction workers, and ensure that pedestrian safety along the footpaths is maintained. All hoardings would be erected in accordance with the City of Sydney Guidelines for Temporary Protective Structures. Where overhead gantries are required, lighting would be installed to ensure a safe pedestrian environment is provided.

Installation of shoring and underpinning around the perimeter of the site is likely to require equipment to operate on the footpaths of Bligh and O'Connell Streets. There would also be temporary changes to pedestrian access during excavation of the cable risers within the footpaths adjacent to the frontages with Bligh and O'Connell Streets. Temporary footpath closures or diversions would be implemented to minimise potential impacts on pedestrian safety during these works.

A pedestrian management plan would be developed as part of the Construction Environmental Management Plan to minimise potential impacts on pedestrian and cyclists movements. This would detail specific measures to be implemented to minimise impacts on pedestrian safety during activities such as vehicle access and egress to the site. Bligh Street is a designated on-road cycling route. Suitable detours would need to be investigated in detail and mitigation measures implemented to manage pedestrian and cycle movements near and around the site.

Impact on businesses

Although construction activities would alter pedestrian movements along Bligh and O'Connell Streets adjacent to the site, hoardings and overhead protection measures would be installed to ensure that access is maintained to adjacent businesses. Section 6.6.1 reflects that the hoardings would be installed such that access to fire stairs in adjacent buildings is not impeded (refer to Figure 6.6). Adjacent properties would continue to be accessed using the existing vehicle and pedestrian entry points during the construction period and the use of protective measures such as hoardings would ensure that safe access to adjacent buildings is maintained.

The project has the potential to cause short term delays to vehicles accessing basement car parking in adjacent buildings. This impact would be minor and limited to periods when construction vehicles are accessing the site.

Consultation would be undertaken with surrounding businesses and management measures would be developed and included in the CEMP to ensure access to these properties are maintained.

14.2.2 Operation

The project would provide car parking in two basement levels. Two vehicle access points would be provided from O'Connell Street. One entrance would provide access to the basement car parking levels, and the second would provide street level access to the substation. The architectural plans in Appendix G show vehicle access points and car parking arrangements.

Substation

Driveway configuration

A separate driveway crossing and entrance is required for the substation and access would be limited to Ausgrid's authorised personnel only. This would be used infrequently for maintenance purposes and is located towards the southern end of the site on O'Connell Street.

This entrance has been designed to enable access by a special delivery platform that would be used to deliver transformers, both for their initial installation and for upgrade and replacement. Due to the large turning circle of the vehicle that would be used during this activity, O'Connell Street would be temporarily closed and parking removed during this period. This would require a special event traffic management plan (refer to Section 14.3).

Car park arrangements

The car park includes five service vehicle spaces for exclusive use of Ausgrid on Basement Level 4.

Access control

A door would provide security access control at the property boundary for access to the Ausgrid Substation. This would be closed 24 hours and security access would be available via swipe card or similar device.

Commercial tower

Driveway configuration

There would be an access driveway ramping down to Basement Level 4 to provide access to the loading dock and first level of car parking. The entrance would be located towards the northern end of the site on O'Connell Street. Signals would be provided to control traffic on the ramp and manage two way traffic. Vehicles entering the car park would have priority to minimise the potential for queuing on O'Connell Street.

Car park arrangements

The car park has been designed to comply with the Class 1 or 2 car park classification in accordance with AS/NZS 2890.1:2004. As detailed in Section 6.3.3 provision has been made for the following parking spaces which would distributed between the two basement car parking levels:

- 38 car parking spaces
- 184 bicycle spaces
- Two motorcycle bays
- One courier bay

The two parking levels would be connected by two-way ramps. The number of car parking spaces would be refined during detailed design and there would be a maximum of 40.

Loading dock

A loading dock including two truck parking spaces would be provided within the basement. A turntable would be installed to allow the MRV to reverse into the dock.

Access control

A barrier would provide security access control at the property boundary for access to the car park and loading dock out of hours. During normal business access hours (6.30 am – 6.30 pm) the barrier will remain open.

Pedestrian configuration and safety

Primary pedestrian access to the commercial building would be from Bligh Street. In addition, there would be access via escalators to the commercial lobby from O'Connell Street via the through site link.

Figure 6.3 shows the proposed access and egress arrangements and the relationship between the main entrance on Bligh Street and Richards Johnson Square.

During the morning and afternoon peak periods when pedestrian traffic is at its busiest, up to 28 vehicles per hour are expected. This is equivalent to a vehicle movement every two minutes. There are many similar driveway arrangements at other locations along O'Connell Street and pedestrians expect to interact with vehicles at each of these locations.

Traffic generation

Based on surveys of similar commercial sites in the Sydney CBD, vehicle movements from the commercial tenant parking spaces in the building have been estimated for the morning peak hour, midday hour and evening peak hour. Table 14-5 summarises the traffic generation during these periods.

Table 14-5: Peak hour traffic generation for the car park

Time \ Direction	Inbound	Outbound	2-Way Total
Morning peak hour	15	1	16
Midday hour	2	2	4
Evening peak hour	2	15	17

Table 14-6 provides the peak period service vehicle flows for the loading dock, excluding bicycles and motorbikes.

Table 14-6: Peak hour traffic generation for the loading dock

Time \ Direction	Inbound	Outbound	2-Way Total
Morning peak hour	6	6	12
Midday hour	7	6	13
Evening peak hour	2	2	4

Distribution of traffic and traffic flows

The following distribution for approach routes is assumed:

- 40% - Western suburbs on the Western Distributor via King Street then Elizabeth Street and Bent Street
- 35% - Northern suburbs on the Harbour Bridge and use either Grosvenor Street or the Cahill Expressway to access Bridge Street and then Loftus Street to Bent Street
- 15% from eastern Suburbs on William Street then Elizabeth Street
- 10% from southern suburbs on Elizabeth Street or the Eastern Distributor

Forecast traffic flows have been identified for the AM and PM peak. These are presented in Figure 14.5.

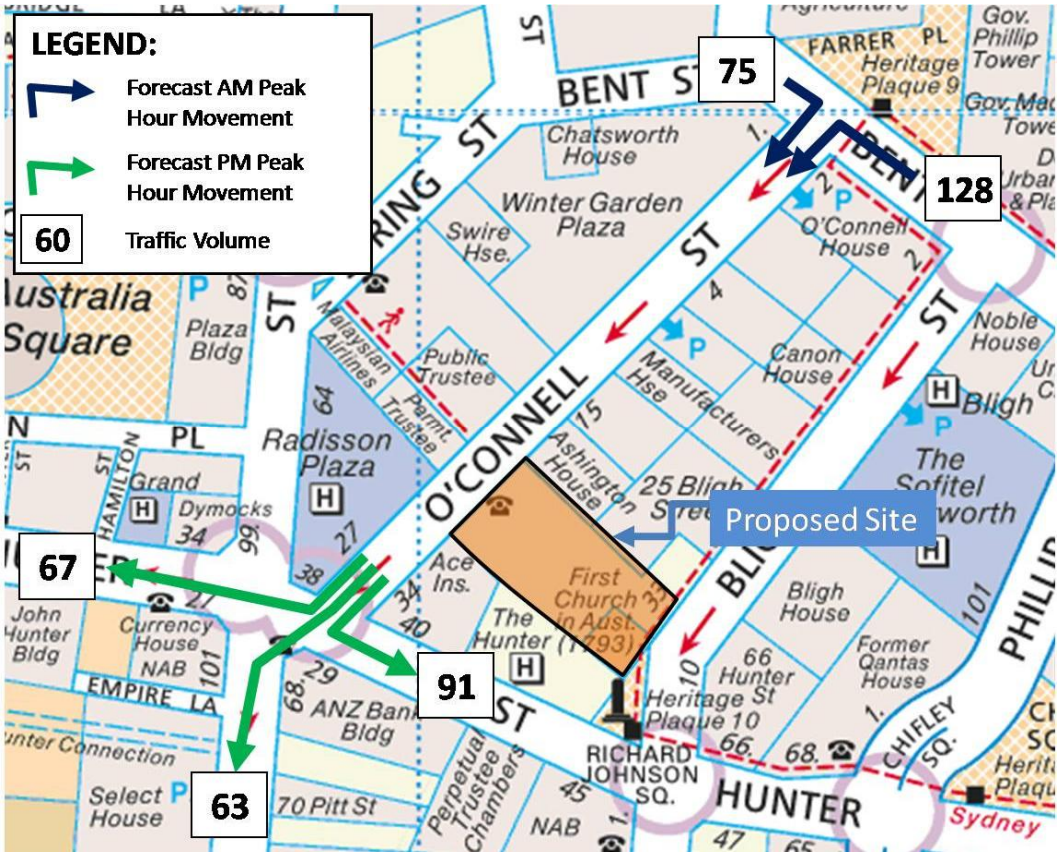


Figure 14.5 Forecast Traffic Flows

A comparison of the existing and forecast vehicle movements at both intersections is shown in Table 14-7.

Table 14-7 Comparison of existing and forecast traffic volumes

Intersection	Vehicle movement	Existing peak hour traffic movements	Forecast peak hour traffic movements	Increase
Bent Street	Left onto O'Connell	110	128	16%
	Right onto O'Connell	65	75	15%
Hunter/Pitt Street	Left onto Hunter	80	91	14%
	Through to Pitt	60	63	5%
	Right onto Hunter	60	67	12%

The analysis indicates that the project is forecast to have a minor impact on the surrounding road network in the morning and evening peak periods. Movements at both intersections are forecast to experience at most an additional vehicle every four minutes (on average) in the peak hour. On site observations indicate that both intersections operate with significant spare capacity, with minimal vehicle delays. Queues at the Hunter Street/Pitt Street intersection are a manageable 6 to 7 cars long, with this figure not expected to increase dramatically as a result of the project.

The previous building at the site (Kindersley House) had 43 car parking spaces and contained a loading dock which would have generated very similar traffic movements to the project. It is concluded that there would be no additional impact as a result of this project compared to traffic conditions when the building was previously fully tenanted.

14.3 Mitigation measures

Traffic management plans would be prepared in consultation with RTA and the City of Sydney Council and would include the following measures to manage potential impacts on the traffic and transport network:

Additional measures that would be part of the Traffic Management Plan include:

Construction

- In consultation with RTA and Council, general signposting of Bligh Street and O'Connell Street in the immediate vicinity of the site with appropriate heavy vehicle and construction warning signs
- Development of a suitable vehicle detour route, if required during specific construction activities
- Installation of specific warning signs at entrances to the construction site to warn existing road users of entering and exiting construction traffic
- Distribution of day warning notices to advice local road users of scheduled construction activities, road closures, detours, etc.
- Installation of appropriate traffic control and warning signs for areas identified where potential safety risk issues exist
- Preparation of a pedestrian management plan
- Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements
- Inducting truck and vehicle operators on the requirements of the Traffic Management Plan.

Implementing a community information and awareness program would be an important measure to ensure the surrounding stakeholders are informed of changes to traffic conditions. This awareness program would be initiated prior to construction commencing and during the construction period to ensure that the local business establishments in the area are fully aware of the construction activities with particular regard to construction traffic accessing the site. The awareness program shall identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction related matters.

Operation

The following measures would be implemented during operation of the project:

- Flashing warning lights for pedestrians as vehicles depart the site
- CCTV surveillance of the access with connection to the security office. An audible device may also be appropriate
- Mirrors to assist exiting drivers to view pedestrians on the footpath
- Warning signage on each side of the crossover for pedestrians and signage for drivers leaving the driveway.

An event specific Traffic Management Plan would also be prepared during construction or operation if there are any special events in the CBD that would potentially be impacted by traffic movements associated with the project. The time and duration of these events would be clearly noted and construction delivery processes would be rearranged to cater to the affected days.

15. Heritage

This chapter provides a summary of the *Statement of Heritage Impact City East Substation and Integrated Commercial Development 33 Bligh Street Sydney* prepared by NBRS+Partners (Appendix P).

15.1 Existing environment

The site is occupied by Kindersley House, a 1960s high-rise development erected to house the Sydney Stock Exchange. The existing building has no identified architectural merit and with the adjoining development to its south, detracts from the overall heritage and streetscape significance of the surrounding precinct.

The surrounding precinct is of heritage significance for historic, aesthetic and social values related to the early Colonial period of development of Sydney and its subsequent development in the late Victorian era and early 20th Century. Whilst not listed as a heritage item, the site it located in close proximity to a number of heritage listed items (either adjoining the site or within the visual catchment). The location of these heritage items is shown in Figure 15.1 and details regarding these items are summarised in Table 15-1.

Source: Sydney LEP 2005

Figure 15.1 Location of heritage items in the vicinity of the site

Table 15-1 Heritage items surrounding the site

Heritage item	Address	Listing
Former NSW Club building (now known as the Lowy Institute)	31 Bligh Street	• City of Sydney Heritage Inventory No. 2028 • NSW State Heritage Register • The Register of the National Estate • The National Trust of Australia (NSW)
AFT House (former Delfin House)	16 - 18 O'Connell Street	• City of Sydney Heritage Inventory No. 2026 • The Register of the National Estate • Royal Institute of Architects (NSW Chapter) • The National Trust of Australia (NSW) • The Art Deco Society
CML building (City Mutual Life Assurance Society Building)	60 - 66 Hunter Street	• City of Sydney Heritage Inventory No. 2013 • The Register of the National Estate • NSW State Heritage Register • Royal Institute of Architects (NSW Chapter) • The National Trust of Australia (NSW) • The Art Deco Society
Public Trust Office	19 - 21 O'Connell Street	• City of Sydney Heritage Inventory No. 2027 • The Art Deco Society
Radisson Plaza Hotel (former Bank NSW)	64 - 66 Pitt Street/ 27 O'Connell Street	• City of Sydney Heritage Inventory No. 2017 • The Register of the National Estate • NSW State Heritage Register • The National Trust of Australia (NSW) • The Art Deco Society
Richard Johnson Square	Bligh Street	• City of Sydney Heritage Inventory No. 8079 • The Register of the National Estate • The National Trust of Australia (NSW)

The former NSW Club building and the AFT house are situated directly adjacent to the site, as indicated in Figure 15.1. Further detail of the historical and architectural significance of these two buildings is provided below.

Richard Johnson Square

Richard Johnson Square is located at the intersection of Bligh and Hunter Streets and was created by a street closure. It commemorates the first Christian Worship Service held in the Colony of NSW and the erection of the first Church in 1793 by the colony's first Chaplain, Reverend Richard Johnson.

The square includes an elaborate Gothic Revival style monument that was erected in 1925 and a late Victorian light fitting, originally from Martin Place. The square and its monument are listed as items on the Register of the National Estate and are listed by the National Trust of Australia (NSW).

The design of the square is simple and allows pedestrians to use a former street intersection and provides a sympathetic scale and setting for the surrounding heritage items.

The former NSW Club building

The former NSW Club building was designed in the Victorian Academic Classical style by architect William Wardell and built by John Fry between 1884 and 1887. The Mansard roof form is a later addition to the original but executed in the same style. The building is listed on the NSW State Heritage Register under the provisions of the NSW *Heritage Act 1977* because of an earlier Permanent Conservation Order under the *Heritage Act 1977* on the site. It is identified as an item on the Register of the National Estate and is listed by the National Trust of Australia (NSW). The NSW Heritage Inventory description for the item states in part:

The NSW Club House is a fine sandstone city building which now stands in isolation as a remnant of Victorian Sydney amid intense office and hotel development. Barclays House Tower is physically connected to the building to the west. The NSW Club House is symmetrically designed, with the exception of the front door which is located to the north. The building features restrained classical decoration, featuring an ashlar sandstone plinth and slate mansard roof with classically detailed gable windows. The roof gable is a later Edwardian addition made in 1916. The building is divided by string courses at each floor and is topped by a classical cornice with dental detail. The ground floor stonework has recessed joints and the upper stonework is plain ashlar. The windows are in three groups with, curved head with quoins and keystones on the ground floor, pedimented on the first floor, and with smaller curved headed windows on the second floor. The building retains its iron palisade fence and stone base along Bligh Street.

The statement of significance identifies the exceptional 'Italian Palazzo' facade treatment as being highly significant for its streetscape character in Bligh Street.

The heritage and urban design constraints presented by the proximity of this building to the site are:

- The necessity for recognition of the established scale of the former NSW Club building in the design of any new structure on the adjoining site in context in the street
- A recognition of the dominant existing horizontal divisions of the Club façade
- Consideration of the proportions of openings and vertical elements in the new work to harmonise with the existing building without imitating or detracting from it
- The necessary use of compatible recessive materials and façade detailing to compliment the surrounding established architectural character and to limit any impact on perception of the heritage qualities of the item.

AFT house

The AFT house building was designed in the Inter-War Art Deco style by architect C.Bruce Delit and built by Stuart Brothers between 1939 and 1940. The building is an item on the Register of the National Estate and is listed as a significant 20th century design by the Royal Australian Institute of Architects (NSW Chapter), the National Trust of Australia (NSW) and the Art Deco Society. The NSW Heritage inventory description states in part:

AFT House, originally a banking chamber with offices above, exemplifies the Art Deco style. The facade comprises two zones. The first consists of a decorative archway clad in granite, rising four floors in height, which dominates the streetscape. Above rises an expanse of sandstone. The building features stylised and geometric semiabstract decoration. On bronze doors and carved panels beneath the arch, the architect has allegorized the spirit of the machine age and NSW, 'The Age of Plenty'.

The entrance foyer has travertine clad walls and a marble floor, and retains original metal and glass light fittings and decorative lift doors. The former Egyptian Art Deco banking chamber is monumental. Two stories in height, the chamber retains a vaulted ceiling and rich detailing.

The building is visually linked by design and materials to the adjacent Manufacturers House and fits well into the streetscape. The statement of significance identifies the facades style and detail to be of exceptional significance representing a departure from traditional forms and expressing contemporary modern design

concepts and building technologies by integrating materials with function and structure. The streetscape contribution of the building to O'Connell Street is considerable.

The heritage and urban design constraints presented by the proximity of this building to the site are:

- A need for recognition of the scale of the base section of the building in the design of any attached section of the project in relation to the lower portion of AFT House
- Consideration of the potential for new suitably scaled elements on the south of AFT House to 'book-end' with Manufacturers House to the north
- The necessity for the use of sympathetic materials on the project to reduce impact on the heritage item and its visual dominance in the streetscape
- Recognition of the balance of vertical and horizontal elements predominating in the adjoining streetscape
- Treatment of the exposed southern façade of the hiertage item following demolition of Kindersley House.

15.2 Impact assessment

The heritage impact statement was undertaken by NBRS+Partners (Appendix P) based on the guidelines set out by the NSW Heritage Office publication 'Statements of Heritage Impact', 2002. The assessment considered the significance of the impact of the project on the built heritage of the surrounding area. It concludes that the project minimises potential negative heritage impacts and enhances the heritage significance of the adjacent heritage items. It also considers that the bulk and scale of the project has been minimised at the O'Connell Street elevation through the use of a variety of materials to provide modulation to the façade. Reconstituted stone louvres, fixed as a sculptured screen over the podium level substation would provide articulation and modulation to the podium.

The project has been designed to minimise potential impacts on the following aspects of heritage significance:

- The southeastern corner of Bligh Street has been set back for the building alignment to minimise negative heritage impact on Richard Johnson Square and Hunter Street. Care should be taken in the articulation of this corner of the substation
- Visual and physical access through the site at Ground Level by connecting Bligh and O'Connell Streets is a sympathetic solution that provides human scale and decreases the bulk of the building.
- Sympathetic solutions were considered, however discounted for the following reason:
- Reducing the height of the podium was considered desirable to provide a reduced height scale difference between the former NSW Club and the project. This was discounted due to substation plant requirements.
- A summary of the assessment of the project against the NSW Heritage Office publication 'Statements of Heritage Impact', 2002 guidelines is provided below.

New development adjacent to a heritage item (including additional buildings and dual occupancies)

How is the impact of the new development on the heritage significance of the item or area to be minimised?

There are a variety of street alignments and building heights along the existing streetscapes of Bligh and O'Connell Streets and buildings from a variety of periods and styles. The site is adjacent to the four-storey former NSW Club building, located at 31 Bligh Street, and those heritage buildings on O'Connell Street have an overall scale ranging from 10 to 17 levels. It is necessary to address sensitively the heritage significance, scale and proportions of these buildings, while constricting a relatively bulky substation. The adverse impacts of the bulk have been minimised by using a sculptural screen, comprising reconstituted stone louvres fixed to a steel frame clear of the substation structure. This palette would provide careful modulation and articulation of the large façade planes and contribute to the streetscape and heritage significance of the adjoining buildings.

The Bank of NSW building and Manufacturing House are heritage listed buildings with façades that are highly articulated. The sculptural reconstituted stone screen proposed for the O'Connell Street façade podium level would provide quality, fine grained articulation to minimise the appearance of bulk. This treatment would help to minimise the negative impacts of bulk and scale on the surrounding heritage items.

On the Bligh Street elevation, the project would be set back from the former NSW Club building eastern alignment. In doing so, the Bligh Street entry to the commercial tower would expose the southern façade of the former NSW Club building. Historically, the southern wall of the former NSW Club building has adjoined a building. To respect the cultural significance of the heritage item, the wall would be clad using a new material that matches the original stone on the east elevation of the former NSW Club building. Different surface treatment would be used to interpret the proposed wall as new material. Care should be taken to minimise waterproofing issues. The same principle applies to the exposed southern façade of the AFT building. The southern wall would incorporate a granite finish (for four walls) and sandstone to the upper floors to match the stone cladding used on the west elevation. A different finish would respect the heritage and interpret new material from old.

The junction between the proposed building and the two adjoining heritage buildings is sensitive. To minimise the negative heritage impact on the former NSW Club building and the AFT House, an entry void would be created at Bligh and O'Connell Streets. This would enable the articulation and visibility of the southern façade of the Former NSW Club building and AFT House. This minimises negative heritage impact on views and vistas to the heritage listed buildings and frames the southern facades by providing a scale that is sympathetic to the heritage listed buildings.

To minimise the visual appearance of height of the building, a 11 m high landscape 'Sky Lobby', located on Level 14 above the substation podium would be constructed. This 'void' would delineate and address the scale and heights of the heritage listed buildings on both Bligh and O'Connell Streets.

Why is the new development required to be adjacent to a heritage item?

Ausgrid undertook a process to select a site for the City East Zone Substation in the vicinity of Phillip, Bent, Bligh and O'Connell Streets. The substation is required to be located close to the alignment of the City East Cable Tunnel to minimise the extent of infrastructure required to connect these elements. This process identified 33 Bligh Street as the preferred site because it is of a suitable size and the connection to the City East Cable Tunnel could be provided by constructing a short 150 m long cable tunnel. Importantly, there is also development consent to demolish the existing buildings on the site and construct a commercial tower however this development did not proceed for commercial reasons.

How does the curtilage allowed around the heritage item contribute to the retention of its heritage significance?

The building mass would be set back from the former NSW Club Building by approximately 9 m to expose its southern wall and to enable appreciation of its east elevation. This provides the opportunity for the public to appreciate the heritage significance of the fabric and the building's setback from the street alignment.

The building mass would be pulled back from the AFT building by approximately 4 m to expose its southern wall. This is a positive heritage impact as it enables public appreciate of the western façade of the AFT building.

How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?

The project would not interrupt views and vistas to and from the heritage items on O'Connell Street as it maintains the existing street alignment.

The project is setback from the southern façade of No 31 Bligh Street to ensure there is minimal interruption of views and vistas to and from the heritage item and addresses Richard Johnson Square, also a heritage item.

Is the development sited on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?

As indicated in Chapter 15, 33 Bligh Street is unlikely to contain any significant archaeological deposits. The site is adjacent to Richard Johnson Square which is considered to have archaeological potential.

A cable riser shaft would be excavated within the Bligh Street road reserve, adjacent to the site boundary and would impact on areas disturbed during construction of the footpath and installation of underground services such as electricity cables, water mains, stormwater mains and fibre optic cables. Excavation in this area would be monitored by an archaeologist to indicate the characteristics of the strata above the bedrock as this would provide guidance on the possible nature of remains in the adjacent Richard Johnson Square.

Excavation within Richard Johnson Square would be required to install 11kV cables to connect to the City East Zone Substation and also as part of the public domain landscaping that would be undertaken separate to the project. Section 16.2.2 reflects that potential impacts on items of archaeological significance within Richard Johnson Square would be considered as part of environmental impact assessments for these separate projects.

Is the new development sympathetic to the heritage item? In what way (e.g. form, siting, proportions, design)?

The O'Connell Street facade would be sited on the existing street alignment with setbacks at ground level for entry, following the adjacent heritage listed buildings. This siting is sympathetic with the significance of the heritage items.

The massing, in particular the height of the podium, sympathetically addresses the heights and proportions of the heritage items in close proximity on Bligh and O'Connell Streets. The proportions and detailing of the building would articulate and modulate the podium to reduce the bulk of the substation. This would be achieved by using fine-grained reconstituted stone louvres on the sculptured screen which would cover the substation.

Construction of the open air stair using precast concrete would provide a texture and scale that articulates the junction between heritage items and the project.

Will the additions visually dominate the heritage item? How has this been minimised?

The proposed tower structure would be considerably higher than the heritage items in close proximity. The impact of the contrast in scale has been minimised by articulating the scale of the podium structure to include a sky lobby and sky garden.

Will the public and users of the item still be able to view and appreciate its significance?

The project would enhance views to the existing heritage items and allow the continued public appreciation of the heritage items located in close proximity.

Landscaping of Richard Johnson Square, using level changes, planting and street furniture would encourage public use of the space. Activation of the space for public passive recreation would enable enhanced opportunities for appreciation of the heritage items located in close proximity to the site.

15.3 Mitigation measures

The Statement of Heritage Impact concludes that the project would not adversely affect the identified heritage significance of the heritage items in close proximity to the site. No mitigation measures are proposed.

16. Archaeology

This chapter provides a summary of a non-indigenous archaeology study undertaken by Casey and Lowe. A full copy of the study is located in Appendix Q.

16.1 Existing environment

The property is zoned in the City of Sydney's Archaeological Zoning Plan (1992) as having no archaeological potential. The site is unlikely to contain archaeological remains as excavation of the basements for Kindersley House extended into bedrock to a depth of 3 - 9 m below the existing ground level. This finding usually reflects the presence of basements of sufficient depth to have removed most if not all of the site's archaeological remains.

The site is adjacent to Richard Johnson Square which marks the approximate location of Sydney's first church (and later used as the first school), built by Rev. Richard Johnson in 1793. Although the available historical record is unlikely to able to determine the exact location of the timber church building (pers. com. Dr Rosemary Annable, historian), the square may contain remains that could belong to the church.

16.2 Impact assessment

Construction of the existing buildings and their basements involved excavation to about 3 m below the level of O'Connell Street and 9 m below Bligh Street. This excavation is considered likely to have removed all items of potential archaeological interest with the possible exception of the bases of wells if they were deeper than 3 m in this area. All other structural remains and features relating to the nineteenth century land use of the property would have been removed. Based on this assessment, excavation of the basement and construction of the cable tunnel is unlikely to impact on any items of archaeological significance.

The excavation of the cable tunnel from 33 Bligh Street to the intersection with Bent Street would be carried out by road header at depth. It would not involve any surface excavation along Bligh Street and therefore would not have any impact on archaeological remains.

16.2.1 Bennelong Drain

There are branches of the 1857 brick oviform Bennelong Stormwater Channel (known as the Bennelong Drain and Fort Macquarie Sewer) listed on Sydney Water's S170 register) under the adjacent roadways, including one under O'Connell Street and the Castlereagh Street branch crosses Bligh Street and continues under the buildings immediately north of the Kindersley House site (refer to Figure 16.1). While excavation for the cable tunnel would pass below the drain, the tunnel would be within competent bedrock and the separation distance is such that there are unlikely to be impacts on the structural integrity of the Bennelong Drain. The depth and location of the Bennelong Drain would be confirmed prior to works commencing.

As indicated in Section 4.2 Ausgrid has consulted with Sydney Water and condition surveys of the Bennelong Drain would be undertaken pre and post construction to determine if construction has impacted on the asset, and if so, measures would be implemented to address the impact.

Figure 16.1 Location of Bennelong Drain in the vicinity of the site

16.2.2 Richard Johnson Square

The construction of the City East Zone Substation may require the adjacent section of Richard Johnson Square up to Bligh Street to be enclosed within a work zone for the duration of the construction phase, after which extensive cabling associated with the substation would run beneath the Square. The Square marks the approximate location of Sydney's first church (and later as the first school) built by Rev. Richard Johnson in 1793. Although available historical records are unable to determine the exact location of the timber church building, remains of the church could be beneath Richard Johnson Square.

As indicated in drawing PA-02 in Appendix G, the project would require excavation of a shaft for cable risers within the Bligh Street road reserve. The majority of the cable riser shaft would be excavated within bedrock. The surface soils in this area would have been disturbed previously by construction of the footpath and installation of underground services including low voltage electricity cables, water pipelines, optic fibre cables, and a stormwater main. While the footpath area is likely to have been disturbed previously, there is the potential for the work to disturb archaeological remains belonging to structures previously present in the square.

Excavation within Richard Johnson Square may be required as part of works that would not be undertaken as part of Stage 2A(ii) and relate to public domain improvements and installation of cables to connect to the City East Zone Substation.

An indicative Public Domain Concept Plan has been prepared to redevelop Richard Johnson Square and further design and consultation with Council is required to finalise the plan (refer to Section 6.3.9). The public

domain landscaping would be undertaken separate to the project in conjunction with Council and would take into account the need to install cables beneath the surface of Richard Johnson Square to connect to the substation. The final design of the landscaping plan would need to provide access and clearance to the cabling for operational and maintenance purposes. Potential impacts on items of archaeological significance within Richard Johnson Square would be considered as part of environmental impact assessments for these separate projects.

16.3 Mitigation measures

The initial bulk excavation of the City East Zone Substation may impact on deeper archaeological remains, namely the bases of any wells sunk in the early decades of the use of the site. The initial bulk excavation would be monitored by an experienced historical archaeologist.

Branches of the Bennelong Drain in the vicinity of the site would be marked on all key engineering drawings, especially where the drain is adjacent to excavation shoring where rock anchors may be used. The CEMP would also include drawings showing the location of the branches of the Bennelong Drain relative to construction works.

The excavation of the cable riser shaft on the Bligh Street frontage would be monitored by an archaeologist to indicate the nature of the strata above bedrock in the area. This may serve as guidance for the possible nature of remains in the adjacent Richard Johnson Square.

Installing cabling and landscaping within Richard Johnson Square has the potential to impact on archaeological remains connected with Australia's first church building. Once the plan has been developed, an archaeological impact statement would be prepared to assess potential impacts on items of archaeological significance.

17. Aboriginal cultural heritage

17.1 Existing environment

The site has been substantially modified by previous development, including construction of the existing commercial buildings. The basement level of the building has been excavated into sandstone bedrock and is approximately 3 m below the O'Connell Street frontage and up to 9 m below the Bligh Street frontage.

An Aboriginal Cultural Heritage Assessment was undertaken by Navin Officer Heritage Consultants as part of the Concept Environmental Assessment (EnergyAustralia 2008). This involved a search of the Aboriginal Heritage Information Management System (AHIMS) that is maintained by OEH which identified 16 known Aboriginal sites in the vicinity of the Sydney CityGrid Project. Navin Officer concluded that these results demonstrate that remnants of Aboriginal archaeological material may survive in limited contexts in the now highly modified environment of the CBD. However, the likelihood that Aboriginal site remnants survive in an undisturbed context is remote.

Given the high degree of landform modification within the intensely urbanised area of Sydney's CBD, the remaining Aboriginal archaeological resource is likely to consist of isolated remnants that are hard to predict at a local level. Areas with the greatest potential for subsurface archaeological deposits were predicted to be:

- The pre-European foreshore zone, up to 200 m from the former shoreline, especially where the former land surface was lower than the current (artificially elevated) one
- Formerly lower lying areas which have been subsequently filled to provide an elevated building or road platform
- Where excavation for building foundations or below-ground levels has not removed the pre-European soil profile

Deposits underlying road carriageways and their adjacent pavements are likely to be highly disturbed due to the construction of the road foundation, former road surfaces and grades, and the intrusion of below ground service trenches for sewer and water pipelines and telecommunication cables. High-rise structures and buildings with basements are also unlikely to overlie sediments with any archaeological potential, due to the high level of disturbance and soil extraction required during construction.

The Aboriginal Heritage Information Management System search was repeated in 2011 during preparation of this Environmental Assessment and did not identify any additional items in the study area, nor the presence of any known Aboriginal sites at 33 Bligh Street.

17.2 Impact assessment

17.2.1 Indigenous heritage

Construction of Kindersley House involved excavation into bedrock and removed the pre-European soil profile and it is highly unlikely that any items of potential significance to Aboriginal communities remain within the site. As such, construction of the project is unlikely to impact on items of potential significance to Aboriginal communities.

A site inspection by a representative from the Metropolitan Land Council was conducted on 19 April 2010. This confirmed that there are unlikely to be any indigenous heritage issues associated with the City East Zone Substation.

The assessment undertaken for the project complies with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010).

17.3 Mitigation measures

17.3.1 Indigenous heritage

The following mitigation measure would be included in the CEMP to manage potential impacts on items of Aboriginal heritage significance:

- If unexpected Aboriginal object(s) are encountered during construction, all work likely to affect the object(s) would cease immediately and the OEH informed in accordance with the *National Parks and Wildlife Act 1974*. OEH and the Metropolitan Local Aboriginal Land Council would be consulted to confirm an appropriate course of action. This may involve the object being collected, recorded and deposited at the Australian Museum in accordance with standard archaeological practice.

18. Air quality

18.1 Existing environment

Air quality in the CBD is considered to be typical of a highly developed residential and commercial area and the main emissions that affect quality are related to traffic along major arterial roads, dust, and smoke from bushfires elsewhere in the region on occasion. There are no industrial point sources of air emissions in the vicinity of the site. Pollutants that are potentially harmful to humans include carbon monoxide, ozone, nitrous oxides, sulphur dioxide, and total suspended particles (including PM_{10} – particles less than 10 microns in size). Road traffic is the main source of these pollutants in the vicinity of the site.

The OEH (formerly DECCW) operates a network of air quality monitoring stations and the two closest to the site are located at Randwick and Rozelle. Monitoring results from these two locations between the year 2000 – 2009 are summarised in Table 18-1 and indicate that air quality generally complied with DECCW's air quality goals. The one hour average ozone goal of 10 parts per hundred million (pphm) was exceeded during three of the years at Randwick and in one year at Rozelle. The PM_{10} 24 hour average goal of 50 micrograms per cubic metre (ug/m^3) was exceeded in five years at Randwick and four years at Rozelle.

The area surrounding the site is typical of a highly urbanised locality. Sensitive receivers in the immediate vicinity of the site include community stakeholders listed in Section 4.3, such as:

- Radisson Hotel
- Soffitel Wentworth Hotel
- Adjacent landholders including
  - Bryant Strata Management
  - BCS Strata Management
  - CB Richards Ellis
  - Coombes Property
  - Strata Plus
  - Kingsmede
  - The Lowy Institute for International Policy.

Table 18-1 Summary of air quality data for Randwick and Rozelle monitoring stations

	Sulphur dioxide (pphm)		Nitrous oxides (pphm)		Ozone (pphm)		PM_{10} (ug/m^3)		Carbon dioxide (ppm)	
	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle	Randwick	Rozelle
DECCW goal	20 (Maximum 1 hour average)		12 (Maximum 1 hour average)		10 (Maximum 1 hour average)		50 (24 hour average)		9 (Maximum 8 hour average)	
2000	2.7	NA	6.6	7.0	8.7	8.0	46.5	NA	NA	4.5
2001	3.6	NA	6.5	6.6	11.4	11.5	36.5	NA	NA	3.2
2002	2.4	NA	5.4	8.6	13.9	10.0	147.2	NA	NA	2.8
2003	3.5	NA	5.5	5.2	7.9	8.3	71.3	NA	NA	2.2
2004	2.4	NA	5.7	6.4	11.0	9.4	49.0	54.1	NA	2.2
2005	2.5	NA	6.3	5.2	9.6	8.1	46.3	46.8	NA	2.1
2006	4.3	NA	6.0	5.7	8.3	9.3	55.7	50.3	NA	2.0
2007	3.6	NA	4.5	5.0	9.0	8.8	71.2	54.4	NA	1.8
2008	2.9	NA	4.1	4.0	6.1	5.6	36.3	43.1	NA	1.5
2009	1.7	NA	3.6	4.9	7.8	8.3	1735.6	1562.8	NA	2.3

Source: DECCW data from air quality index for Randwick and Rozelle

18.2 Impact assessment

18.2.1 Construction

Potential impacts on air quality during construction are related to dust in general and PM_{10} in particular. OEH's assessment criteria are a maximum annual increase in deposited dust of 2 g/m^2 per month above background levels. The maximum total dust (total suspended particulates) deposited from any source during a 24 hour period should not exceed 4 g/m^2 over a 12 month period. The PM_{10} 24 hour limit is 50 ug/m^3.

Dust

Dust would be generated during a range of activities associated with excavation, tunnelling, materials handling and construction activities.

Environmental effects of airborne particulate matter (dust) are generally related to the particle size range of the dust. Health effects are associated with fine particles less than 10 micrometres in equivalent aerodynamic diameter (PM_{10}), whereas coarser particles (10 - 100 micrometres) are associated with effects on amenity such as visible dust plumes or deposition on surfaces. As a dust plume is transported downwind from a source, the coarser particulates progressively drop-out of the air column to deposit on surfaces (land, buildings, cars etc), while the finer particulate fractions are retained in the air column longer by turbulent mixing. Wind erosion or dust lift-off can become significant under strong winds (greater than 5 m/s).

The amount of dust generated would be dependent on the type of construction activity undertaken and the prevailing weather conditions. There is a risk that dust may impact on the amenity of the surrounding areas if appropriate controls are not implemented.

Excavating the basement would generate dust at the working face and during materials handling. As the depth of the excavation would progressively increase during the course of the works, this would help protect the site from prevailing winds and result in a higher proportion of dust being deposited within the site than if the site was exposed.

To minimise dust impacts associated with operation of the road header, the tunnel would be fitted with a mechanical ventilation system to filter the air and remove dust particles prior to the air being discharged from the tunnel. The filtration system would be designed to limit dust emissions to acceptable levels and meet the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended). This

would ensure clean air is available to workers within the tunnel and minimise the potential for offsite impacts associated with dust.

Dust generated when constructing the substation and tower would be typical of that experienced with handling building materials and using construction equipment. The potential for dust to impact on the surrounding environment would be minimised by installing site hoardings.

Spoil would be stockpiled prior to being loaded onto trucks and transported offsite. Potential for offsite impacts associated with dust (total suspended particles as well as PM_{10}) are considered to be minor as the site hoardings would be installed around the perimeter and management measures would be implemented to ensure that dust from stockpiles is minimised.

Provided that the mitigation measures are implemented, it is considered that potential dust emissions would be negligible and have localised impacts that are likely to comply with OEH's assessment criteria.

Combustible emissions

There is potential for emissions of combustion gases to be generated during construction works. Combustible emissions would be expected to contain substances such as oxides of nitrogen (NO_X), fine particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO) and sulfur dioxide (SO_2). Combustion emissions are considered to have insignificant impact on air quality when compared to emissions from existing sources in the area such as motor vehicles or nearby roads.

18.2.2 Operation

There is potential for air quality impacts to arise from the operation of the equipment within the substation. This could include sulphur hexafluoride (SF6) leaks from the gas insulated equipment. The switchgear is very reliable equipment and there is low likelihood of SF6 leaks occurring,

SF6 is a comparatively heavy gas and it would settle into the basement and shaft in the substation if there are any leaks. As indicated in Section 19.1, monitoring equipment and alarms would be installed within the substation to detect SF6 leaks and alert Ausgrid. If there is a major leak, the ventilation system would be activated and air from the substation, including the SF6 would be discharged via the vents on the Bligh Street and O'Connell Street frontages. The SF6 would constitute a relatively low percentage of the air purged from the substation and would disperse. As SF6 is non-toxic, there is no exposure limit.

All the ventilation systems including natural and mechanical air relief, air intakes and air discharges have been designed to comply with AS1668.2. In particular all exhaust air and spill air would be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.

Air from the substation would be discharged via vents along the eastern, western and northern elevations. The location of vents and exhausts would be confirmed during detailed design and indicative locations are show on drawings 219015, 219017 and 219028 in Appendix G. The vents would be oriented such that airflows would not be directed towards windows or air intake points of surrounding buildings and this would minimise the potential for adverse impacts on the amenity of the surrounding area. It is unlikely that operation of the vents would result in unacceptable impacts on pedestrians or users of Richard Johnson Square.

The substation would be maintained and monitored in accordance with Ausgrid's existing procedures to ensure it is operating effectively. This would ensure that the potential air quality impacts arising from the operation of the equipment is minimised and that all equipment is adequately monitored to detect SF6 leaks early. Operation of the project would have negligible impact ton air quality in the locality.

18.3 Mitigation measures

18.3.1 Construction

A construction air quality management plan would be prepared as part of the CEMP and would include the following measures to manage potential impacts on air quality:

- Manage and dispose of any hazardous materials such as asbestos in accordance with relevant guidelines, including Code of Practice for the Safe Removal of Asbestos (National Occupational Health and Safety Committee 2002) and Australian Standard AS-2601 1991 – Demolition of Structures
- During tunnel construction, all air would be ventilated through a filter unit such that discharged air meets the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* (as amended)
- Exposed surface areas would be managed via dust mitigation measures
- Wheels of all site plant and vehicles would be cleaned so that material with potential to generate dust is not spread on surrounding roads
- Roads around the construction site would be swept to remove deposited material with the potential to generate dust, if necessary
- Water would be used to suppress particles potentially generated during the erection barriers, screens and other ancillary structures
- Water may be used to suppress dust emissions during dry windy periods (as required)
- The height from which dust generating material is dropped would be minimised
- Loaded trucks carrying spoil would be covered at all times
- Cutting/grinding of materials on site would be kept to a minimum, but if necessary equipment and techniques to minimise dust would be used
- Earthworks would be kept damp, as required, especially during dry weather;
- Spoil stockpiles would be damped as necessary
- Potentially dusty materials would be handled as little as possible
- Construction plant and vehicles would be well maintained and regularly serviced. Visible smoke from plant would be avoided. Defective plant would not be used
- Engines would be switched off when vehicles are not in use and refuelling areas would be away from areas of public access
- Where practicable and feasible, loading and unloading would take place within the site.

18.3.2 Operation

All the ventilation systems including natural and mechanical air relief, air intakes and air discharges have been designed to comply with AS1668.2. In particular all exhaust air and spill air shall be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.

Gas density meters would be installed on gas insulated equipment to detect any drop in pressure which would signify that a leak has occurred.

19. Greenhouse gas assessment

19.1 Impact assessment

Operation of the substation

Sulfur hexafluoride (SF_6)

The City East Zone Substation would use sulfur hexafluoride (SF_6) gas as an insulating medium in the five gas insulated transformers and other high voltage (132 kV) switchgear. Research into practices in a number of other countries where substations are integrated with commercial developments indicated that SF_6 is the preferred insulating medium.

As the gas is non-toxic, there is no exposure limit. Due to its high global warming potential and its long atmospheric lifetime, SF6 gas is included in the greenhouse gases of the Kyoto protocol.

The greenhouse gas emissions associated with the leakage of sulphur hexafluoride (SF_6) during operation of the substation was estimated in accordance with:

- National Greenhouse and Energy Reporting Act 2007
- National Greenhouse Accounts Factors July 2011 (Department of Climate Change and Energy Efficiency, 2011)
- ENA Industry Guideline for SF_6 Management (Energy Networks Association, 2008).

The annual leakage of SF_6 was estimated by multiplying the stock of SF_6 in equipment by the leakage rate for each equipment type. The total quantity of SF_6 was multiplied by its global warming potential to convert the quantity to units of carbon dioxide equivalent.

Annual emissions (t CO_2-e) = Stock (t SF_6) x annual leakage rate (%/a) x global warming potential

The SF_6 stock was estimated by Ausgrid based on similar equipment to that proposed for the substation and the equipment manufacturer provided maximum leakage rates for each equipment type. These are outlined in Table 19-1 below and are indicative as the final equipment specifications would be determined as part of the procurement process. The global warming potential used for SF_6 was 23,900 in accordance with National Greenhouse Accounts Factors July 2011.

Table 19-1 Greenhouse gas emissions from SF_6 leakage

Equipment type	SF_6 stock (t)	Leakage rate (%/annum)	Fugitive emissions (t CO_2-e/a)
Transformers	3.75	0.2	179
132 kV switchgear	1.53	0.5	183
11 kV switchgear	0	NA	0
Total			362

The annual emissions from SF_6 leakage was estimated as 362 t CO_2-e. The total emissions from SF_6 in electrical equipment in Australia in 2009 were estimated as 42,000 t CO_2-e (Department of Climate Change and Energy Efficiency 2011). Therefore the emissions from SF_6 leakage for the project were estimated to be less than 0.1% of Australia's SF_6 emissions.

19.2 Mitigation measures

The following mitigation measures would be implemented to minimise potential impacts on greenhouse gas emissions.

- To minimise SF_6 emissions Ausgrid would adhere to the responsible use principles outlined in ENA Industry Guideline for SF_6 Management (Energy Network Association, 2008). The guideline provides principles for:
  - Equipment selection and design
  - Procurement and contract specifications
  - Operation and maintenance of SF_6 insulated equipment
  - Equipment and SF_6 gas replacement and disposal
- Ausgrid would follow best practice guidelines to reduce or eliminate any leakage of SF6 gas during installation, operation, maintenance and decommissioning of the transformer and switchgear equipment. The equipment would be procured from a leading manufacturer which would ensure it is designed and manufactured to minimise leakage during operation. Should a major leak occur, gas leakage alarms and an appropriately designed ventilation system would ensure the safety of personnel
- Capturing SF_6 gas in the very small quantities expected to be leaked is not considered to be practicable and introduces various OH&S issues due to the displacement of air by the gas. Ausgrid would provide a well ventilated environment for the transformers to allow any losses that may occur to be dispersed to atmosphere.

20. Water quality

20.1 Existing environment

20.1.1 Surface water

There are no surface water courses near the site and runoff is directed to the existing stormwater system. The site is located within the Bennelong drain catchment which has an area of approximately 72 hectares and is bounded by Clarence Street to the west, Bathurst Street to the south, Macquarie Street to the east, and Sydney Harbour to the north. Sydney's CBD stormwater drainage system consists of a series of drains aligned in a north-south direction. Stormwater runoff generally flows in a northerly direction until it reaches Alfred Street at Circular Quay. At Alfred Street, the drainage system branches into three outlets, two of which discharge to Circular Quay and the third and largest discharges at Bennelong Point.

The drainage characteristics of these catchment areas have been heavily modified by urban development and there are no natural drainage lines remaining. Water quality in Sydney Harbour is typical of an urbanised catchment. It is likely that a number of port and non-port related activities including accidental spills and polluted stormwater run-off from land combine to affect water quality. This includes sediment in runoff from construction and maintenance activities and litter and other contaminants such as oil from the catchment.

Water quality within Sydney Harbour is heavily influenced by runoff following large rain events. Runoff from urban areas is generally contaminated with sediment, nutrients, hydrocarbons, heavy metals, pathogens, and other toxic, and occasionally persistent chemicals (DEC 2006b). This contamination originates from roads, sewer overflows, spills, industrial activities, building sites and other sources. Water quality is comparatively better during drier periods with reduced volumes of runoff.

20.1.2 Groundwater

Groundwater monitoring has been undertaken for a number of tunnelling projects in the CBD, including Ausgrid's City West Cable Tunnel and City South Cable Tunnel. Groundwater chemical testing was undertaken as part of geotechnical investigations for the City East Cable Tunnel project and is considered to be indicative of groundwater that would be encountered at the site. These investigations conclude that the groundwater chemistry is likely to be similar to that recorded during construction of the Cross City Tunnel, City South Cable Tunnel, City West Cable Tunnel, and the City North Zone Substation (PSM, 2009). Acid Sulphate Soils are not expected to be encountered during the project.

Groundwater from the City South Cable Tunnel is treated at the Campbell Street Substation site and groundwater from the City West Cable Tunnel is pumped to and treated at the Campbell Street site. Water from this groundwater treatment plant (GWTP) is then discharged to the stormwater system which ultimately enters Cockle Bay.

A comparison of groundwater quality at these locations was undertaken during development of the treatment system for the City North Zone Substation (KBR, 2007). These results indicate that groundwater quality is very similar being acidic, having relatively high turbidity and TSS values, and having very similar metal concentrations (KBR, 2007).

Water quality objectives were developed by SKM (2005) for the Campbell Street GWTP in accordance with guidelines prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ). This indicated that raw groundwater at the City North Zone Substation did not meet the water quality objectives for pH, TSS, colour, turbidity, manganese (total and dissolved), iron (total and dissolved), aluminium and zinc.

Groundwater at the City East Zone Substation is considered to be similar to that at the City North Zone and other tunnelling projects in the CBD. Geotechnical investigations for the City East Cable Tunnel indicate that the groundwater table at the site is expected to be encountered at about RL-7 m (PSM, 2009) which is at or below the bulk excavation level for the basement.

Table 20-1 summarises the characteristics of the raw and treated groundwater at the Campbell Street GWTP and compares it to the water quality objectives. The monitoring is undertaken in accordance with the Operational Environmental Management Plan for the City South Cable Tunnel.

The water quality goals in Table 20-1 are ideal performance parameters against which operation of the plant is evaluated over the long term. There are times when the concentration of parameters of the treated water is higher or lower than the goals. This variability is a function of changes in raw water chemistry, as well as events such as malfunction of the GWTP. To account for this variability, the Operational Environmental Management Plan also includes:

- Chronic water quality criteria – this criteria has been developed to provide operational staff with guidance on what pollutant concentrations may have an impact on Cockle Bay. If the long term average discharge levels from the GWTP are below these chronic levels, the impact is considered to be negligible. If the long term chronic levels are exceeded, management responses may include additional sampling, review of pollutant sources, and investigation of potential modifications to the GWTP; and
- Acute water quality criteria – exceedance of the acute water quality criteria is considered to be a potential pollution event that is required to be reported to OEH in accordance with EnergyAustralia's incident investigation and reporting procedures. This may also trigger management responses such as visual inspections of the discharge point at Cockle Bay, additional sampling, review of potential pollutant sources, and potential modification to the operation of the GWTP.

Table 20-1 reflects that the average treated water quality meets the water quality goal for the majority of parameters. These results are long term averages that are influenced by a small number of spikes when there are elevated concentrations of water quality parameters. As a result, average water quality for total suspended solids, turbidity, total iron, total manganese, arsenic, chromium, zinc, and mercury exceed the water quality goal but are below the chronic water quality criteria defined in the Operational Environmental Management Plan and are therefore considered to have negligible impact. Copper is the only average water quality parameter that exceeds the chronic water quality criteria, however it does not exceed the acute criteria. The monitoring results indicates that groundwater is able to be treated to a level that complies with water quality objectives developed in accordance with guidelines developed by ANZECC and the ARMCANZ.

Table 20-1 Summary of groundwater quality monitoring at Campbell Street WTP

Parameter	Unit	Water quality goal [1]	Chronic water quality criteria [1]	Acute water quality criteria [1]	Average raw water quality [2]	Average treated water quality [2]	Cockle Bay water quality [3]
Total suspended solids (TSS)	mg/L	10	29	71	62	17	4
Turbidity	NTU	10	40	82	989	12	0.5
Dissolved Oxygen	mg/L	8-11	8-11	<6	8	9	-
Oil and grease	mg/L	10 (no visible)	10	40	6	6	-
pH	pH	7.0 – 8.5	7.0 – 8.5	<6.0 and >9.0	6	8	8
Soluble Iron (Fe)	µg/L	300	1250	49817	18953	85	3
Total Iron (Fe)	µg/L	2000	8150	49817	118741	2224	57.7

Parameter	Unit	Water quality goal [1]	Chronic water quality criteria [1]	Acute water quality criteria [1]	Average raw water quality [2]	Average treated water quality [2]	Cockle Bay water quality [3]
Soluble Manganese (Mn)	µg/L	1250	5150	66639	3608	1183	6.4
Total Manganese (Mn)	µg/L	1250	5150	66639	3977	1397	8.7
Aluminium (Al)	µg/L	41.3	41.3	240	140	22	41.3
Arsenic (As)	µg/L	4.5	13.5	1603	8	6	1.7
Cadmium (Cd)	µg/L	5.5	22.5	121	2	1	0.1
Chromium (Cr)	µg/L	4.4	17.5	4799	7	5	0.25
Copper (Cu)	µg/L	8	8	73	11	11	3.3
Lead (Pb)	µg/L	4.4	10.5	3567	5	3	2.4
Nickel (Ni)	µg/L	70	290	1443	63	23	0.9
Zinc (Zn)	µg/L	25	123	450	729	73	12
Mercury (Hg)	µg/L	0.4	1.5	45	10	1	0.05

1 – SKM, 2005

2 – Sampling, September 2006 – October 2010

3 – Source, KBR,2007

20.2 Impact assessment

20.2.1 Surface water

Construction

Potential surface water impacts would be limited to runoff that may transport sediment off-site and enter the stormwater system that ultimately discharges to Sydney Harbour at Circular Quay and Bennelong Point. There is also the potential for vehicles associated with construction of the project to result in sediment being deposited on adjacent roadways and for this sediment to be transported to the stormwater system. Chemical spills on the construction site may be transported to the surface water and groundwater systems.

Surface water impacts are considered to be minor and would be mitigated by implementing the recommended management measures.

Operation

During operation, rainwater from the roof would be collected and stored in a tank at the plant level of the tower via rainwater outlets and downpipes. Rainwater will be filtered using a first flush system. Rainwater surcharged from the tank will be discharged to the stormwater main at O'Connell Street or Bligh Street.

The project would not increase the volume of stormwater discharged from the site because the existing site is impervious and runoff is directed to the stormwater system.

20.2.2 Groundwater

Construction

Groundwater seepage

Groundwater is likely to flow in to excavations that extend below RL-7, including those for the basement, cable tunnel and shaft. There is also the potential for rain and runoff to accumulate in the excavations for the basement. This water would be collected, treated, and pumped to the stormwater system.

A number of near vertical fault zones or closely spaced joints have been identified in east Sydney and the CBD. In the vicinity of the site, these include the GPO Fault Zone and Martin Place Joint Swarm which typically contain subparallel, isolated faults and/or joints within the zones themselves. The rock mass either side of these features can also contain some more closely spaced jointing near vertical zones of faulting. These features are typically more conducive to groundwater movement and are likely to be associated with higher groundwater flow rates.

The groundwater table is within slightly weathered to fresh Hawkesbury Sandstone bedrock and would be drawn down to the depth of the basement excavation. As detailed in Section 4.2.3, a licence from the NSW Office of Water will be obtained under the *Water Act 1912* for the dewatering. The results of geotechnical investigations indicate that permeability is estimated to be about 0.02 Lugeon, however test values were in the range of 0.01 to 50 Lugeon (PSM, 2009). Based on the results of tunnelling works undertaken in similar geotechnical conditions within the CBD, it is estimated that total seepage of groundwater into the final excavation would be less than 1 L/second.

Settlement of buildings due to groundwater drawdown typically only occurs if the water table is within the soil horizon and the buildings are founded within this soil horizon prior to the water table being drawn down. Geotechnical investigations in the vicinity of the site indicate that there is only a shallow depth of soil or fill and the water table is located below this horizon, within the bedrock. Further, buildings in the vicinity of the site are likely to be founded on sandstone. Based on this, it is considered unlikely that groundwater drawdown would cause settlement of buildings. The cable tunnel would also be fully lined to exclude groundwater seepage as far as practicable and once complete would not affect groundwater levels.

Groundwater treatment

Groundwater quality is expected to be similar to inflows to the City South Cable Tunnel and City West Cable Tunnel that are collected and treated at Ausgrid's Campbell Street GWTP and City North Zone substation sites respectively. Treated water is discharged to stormwater mains that ultimately enter Cockle Bay. The monitoring results of treatment systems operated at these locations indicates that groundwater is able to be treated to a level that complies with water quality objectives developed in accordance with guidelines developed by ANZECC and the ARMCANZ.

The water quality objectives for the Campbell Street GWTP were developed to be consistent with the 'high level of protection' trigger values. These were selected because although Cockle Bay is highly disturbed and receives significant pollutant loads from stormwater, sewer, hardstand and roadway runoff, it is an important tourist venue and is connected to Sydney Harbour (SKM 2005). Given this, similar water quality objectives are considered to be applicable to the City East Zone Substation as treated water is likely to be discharged to Sydney Harbour at Bennelong Point.

A temporary groundwater treatment system would be installed at the site to manage groundwater that seeps into the basement and cable tunnel excavations during construction. Any groundwater intercepted would be treated to comply with the requirement of Section 120 of the POEO Act and this would focus on removing of iron and manganese which are generally in relatively high concentrations in groundwater in the Sydney CBD. This system would also treat surface water that accumulates in the basement excavation prior to being discharged to the stormwater system. The specifications and capacity of the treatment system would be confirmed by the construction contractor and detailed in the CEMP.

Operation

Groundwater seepage and treatment

The basement, cable tunnel and associated shaft constructed as part of Stage 2A(ii) would be fully lined to exclude groundwater seepage as far as practicable and once complete would not affect groundwater levels. Any groundwater intercepted would be collected and treated to an acceptable level prior to discharge to the stormwater system.

A drainage system would be installed during fit-out of the cable tunnel and, once it has been commissioned, the temporary system used during the construction phase would be decommissioned. The permanent groundwater treatment system would be part of the integrated system that has been designed to accommodate all components of the CECT, CSCT extension, and associated cable tunnel connections to substations. This groundwater treatment system has been approved as part of Stage 2D of the Sydney CityGrid Project. Groundwater from the City East Zone Substation and associated cable tunnel would be collected in sump at the junction of the cable tunnel and the CECT. It would then be pumped to the Campbell Street Substation WTP via the CECT.

The Campbell Street Substation WTP is designed to treat 3.5 litres per second under normal conditions and it currently treats about 2 litres per second. The basement and cable tunnel have been designed to minimise ingress of groundwater. Calculations for the City East Cable Tunnel included seepage from the cable tunnel and estimated that less than 0.1 L/s that would need to be treated. Based on this, the inflow treated at the Campbell Street Substation would increase from approximately 2 L/s to 2.1 L/s and this increase is well within the design capacity of the treatment plant.

This GWTP is considered to be operating effectively and has substantial spare capacity. Treatment would focus on removal of iron and manganese which are generally in relatively high concentrations in groundwater in the Sydney CBD.

Water from the treatment plant would continue to be discharged to stormwater mains that ultimately enter Cockle Bay. The treatment system is likely to continue to comply with the requirement of Section 120 of the POEO Act.

Based on the above, given the small increase in the volume of groundwater to be treated due to operation of Stage 2A(ii), potential impacts associated with groundwater treated at the Campbell Street WTP and discharged to Cockle Bay are considered to be minor.

The performance of the Campbell Street WTP and its potential impact on the ecosystem of Cockle Bay would continue to be monitored in accordance with the requirements of the Operational Environmental Management Plan. The monitoring requirements of this strategy are summarised in Section 20.3.2.

Settlement of buildings due to groundwater drawdown typically only occurs if the water table is within the soil horizon and the buildings are founded within this soil horizon prior to the water table being drawn down. Geotechnical investigations in the vicinity of the site indicate that there is only a shallow depth of soil or fill and the water table is located below this horizon, within the bedrock. Further, buildings in the vicinity of the site are likely to be founded on sandstone. Based on this, it is considered unlikely that groundwater drawdown would cause settlement of buildings. The cable tunnel would also be fully lined to exclude groundwater seepage as far as practicable and once complete would not affect groundwater levels. Potential impacts associated with discharge of treated groundwater are considered to be minor because:

- Groundwater quality is expected to be similar to that encountered in the Cross City Tunnel, City South Cable Tunnel and City West Cable Tunnel
- Similar treatment systems to those operating at the Campbell Street and City North substation sites would be implemented
- These existing treatment systems have proven to comply with relevant water quality objectives.

20.3 Mitigation measures

20.3.1 Construction

A Water Quality Management Sub-Plan would be prepared as part of the CEMP for the project. The sub-plan would be prepared in accordance with 'Managing Urban Stormwater: Soils and Construction' (Volume 1, 4th Edition, the 'Blue Book', Landcom, 2004) and would detail specific measures to be implemented to manage soil, surface and groundwater impacts during construction including:

- Establishment of sediment control devices around construction sites to manage stormwater entering and leaving the sites. Control devices would also be installed on inlets to the stormwater system downstream of the sites
- Daily check of machinery to ensure there are no oil, fuel or other liquids leaking
- Development of contingency plans to deal with spills which might occur during construction
- On-site storage of chemicals or fuels in accordance with relevant Australian Standards and Material Safety Data sheets. Spill kits would be provided on site and bunded areas would contain 110% of the liquid material as required by DECC's Environmental Protection Manual *Technical Bulletin Bunding and Spill Management*
- If any areas of suspected contamination are identified prior to or during works, the area would not be disturbed and the area would then be cordoned off as if it were a safety risk. Ausgrid's Environmental Services Unit representative would then be contacted immediately
- Final cleanup after the works are complete would include removal of any erosion control devices, removal of any sediment in drainage lines which has been trapped by erosion control devices, and restoration of disturbed areas.

The Sub-Plan would be developed in consultation with OEH to ensure the output from the treatment system is suitable for discharge to the stormwater system and the measures implemented would allow construction to comply with Section 120 of the POEO Act. It would detail the treatment process to be implemented and the associated monitoring program to verify that the treated water meets water quality objectives prepared in accordance with guidelines developed by ANZECC and ARMCANZ.

Additional geotechnical and groundwater investigations would be undertaken and the results would be considered as part of the detailed design process and development of the treatment system.

20.3.2 Operation

Consultation with Sydney Water Corporation and/or the City of Sydney would be undertaken to determine whether there are any capacity limitations within the stormwater system that would influence the location of the connection for the water discharged from the treatment system.

Consultation with Sydney Water and/or the City of Sydney would be undertaken to determine whether there are any capacity limitations within the stormwater system associated with the increase in the volume of water discharged from the Campbell Street WTP.

Treated water from the Campbell Street WTP would be monitored in accordance with the Operational Environmental Management Plan for the Sydney CBD 132kV Cable Project.

21. Electric and magnetic fields

This chapter provides a summary of the electric and magnetic field assessment undertaken for the project by Aurecon. The full report is included in Appendix AA.

21.1 Existing environment

21.1.1 Overview of electric and magnetic fields

Electric and magnetic fields (EMF) are part of the natural environment and are present in the earth's core and the atmosphere. EMF is also produced wherever electricity or electrical equipment is in use. Power lines, electrical wiring, household appliances and electrical equipment all produce EMF. EMF is sometimes incorrectly referred to as electromagnetic radiation.

The electric field is proportional to the voltage (which can be considered as the pressure with which electricity is pushed through the wires). The magnetic field is proportional to the current; that is, to the amount of electricity flowing through the wires. Both electric and magnetic fields are also dependent on the source geometry (i.e. conductor heights, cable depths, phase separations and so on).

Electric and magnetic fields decrease rapidly as you move away from the source. Generally, the smaller the object or closer the conductors producing the field, the more rapidly the field decreases as you move away from the source.

Electric fields are shielded by most objects, including trees, buildings and skin and their strength reduces rapidly as you move away from the source. In contrast, magnetic fields pass through most materials. Although electric fields were the primary focus of scientific attention more than 20 years ago, today most interest and research centres on magnetic fields.

EMF is typically measured in milliGauss (mG). Table 21-1 provides an indication of the relative levels of EMF generated by appliances commonly used in homes.

Ausgrid designs its infrastructure according to the principle of prudent avoidance, which means taking reasonable steps to limit field exposures from new facilities by locating and operating the equipment prudently within Australian health guidelines.

Table 21-1 Typical magnetic field measurements from home appliances

Appliance	Typical measurement (mG)	Range of measurement (mG)
Stove	6	2 – 30
Computer	5	2 – 20
Television	1	0.2 – 2
Electric blanket	20	5 – 30
Hair dryer	25	10 – 70
Refrigerator	2	2 – 5
Toaster	3	2 – 10
Kettle	3	2 – 10
Fan	1	0.2 - 2

21.1.2 Existing electric and magnetic fields at the site

Existing magnetic fields at the site were measured by Aurecon on 23rd February 2011. At the time of the measurements, both buildings on the site were empty and, accordingly the normal magnetic field sources one would expect in a commercial building were absent and this was reflected in the generally low fields measured.

Magnetic fields along the Bligh Street frontage were generally between 2 and 3 mG, with levels increasing to about 6 mG above 11kV cables that are laid below the footpath. On the O'Connell Street frontage, levels were generally between 4 and 7 mG, increasing to about 14 mG due to the possible presence of underground services.

Magnetic fields within the building were generally less than 6 mG, with localised peaks of up to 18 mG along the northern wall. The elevated field source appeared to be either inside the boundary wall or outside the building. The most notable point sources were near the bathroom on the southern wall of Level 4 and about 7 m east of the north-western corner of Levels 5 and 6. These sources were very localised and the fields decreased rapidly with increasing distance from the source.

21.1.3 Health standards

The issue of EMF and health effects has been extensively reviewed over the past 30 years by Australian and international inquiries and expert panels have been established to try to determine whether or not human exposure to EMF is related to adverse health effects. To date, adverse health effects due to EMF have not been established.

While EMFs involve both electric and magnetic components, electric fields are relatively constant over time, are readily shielded and, in the health context, are generally no longer associated with the same level of interest as magnetic fields. Accordingly, magnetic fields are the main focus of the EMF assessment for the project.

There is not currently an Australian Standard for EMF exposure limits. Until a few years ago, the relevant Australian health standard was the 'Interim Guidelines on Exposure to 50/60 Hz Electric and Magnetic Fields' (1989), issued by the National Health and Medical Research Council (NHMRC) and based on international guidelines. The relevant international guidelines are those issued by the International Commission on Non-ionising radiation Protection (ICNIRP) which were first issued in 1988, have been regularly updated since, and were most recently re-issued in 2010.

As the NHMRC has not updated its guidelines since they were originally issued, they have lapsed and the relevant Australian regulator (now ARPANSA) has been developing a new standard for several years. In December, 2006, ARPANSA issued a Draft Standard on "Exposure Limits for Electric and Magnetic Fields (0Hz to 3kHz)" for public comment. The Draft Standard proposed a magnetic field exposure limit (reference level) for the general public of 1000 milligauss (mG), which is numerically identical to the previous (Australian) NHMRC Guidelines but only 50% of the current (2010) version of the international (ICNIRP) guidelines upon which they were based. It is understood that, as a result of submissions received in response to the 2006 Draft, the Australian Government Radiation Health Committee, at its meeting of 18th July, 2007, resolved, inter alia, to revise the magnetic field limit for the general public upwards to 3000mG.

In the absence of a current Australian standard, while noting the possible adoption of a 3000mG limit in the new ARPANSA Standard, the EMF assessment for the project has referred to the current international (ICNIRP) guideline level of 2000mG.

In applying the ICNIRP Guideline, it is important to recognise that the numerical limits, (e.g. 2000mG), are based on established health effects. ICNIRP's fact sheet on the guidelines notes that:

"It is the view of ICNIRP that the currently existing scientific evidence that prolonged exposure to low frequency magnetic fields is causally related with an increased risk of childhood leukaemia is too weak to form the basis for exposure guidelines. Thus, the perception of surface electric charge, the direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes are the only well established adverse effects and serve as the basis for guidance."

Being based on established biological effects which occur at field levels much higher than those normally encountered in the vicinity of electrical equipment, the (numerical) exposure limits in the guidelines and standards cannot be said to define safe limits for possible health effects, should these exist, from fields at levels normally encountered in the vicinity of electrical equipment. Nevertheless, the foreword to the ARPANSA Draft Standard, notes that "the incorporation of arbitrary additional safety factors beyond the limits of the Standard is not supported". It is in this context that precautionary measures such as 'prudent avoidance have arisen.

21.1.4 Principle of prudent avoidance

The principle of prudent avoidance involves doing whatever can be done without undue inconvenience and at modest expense to avert the possible risk. The practice of prudent avoidance has been adopted by the (Australian) Energy Networks Association (ENA) and most Australian power utilities, including Ausgrid.

The Draft ARPANSA Standard addresses prudent avoidance in an Annex entitled "A Public Health Precautionary Approach to ELF Fields". The Annex states:

[Prudent avoidance] *"does not imply setting exposure limits at an arbitrarily low level, and requiring that they be achieved regardless of cost, but rather adopting measures to reduce public exposure to ELF fields at modest cost."*

Internationally, the World Health Organisation has also addressed the notion of prudence or precaution on several occasions, including in its 2007 publication Extremely low frequency fields Environmental Health Criteria, Vol 238, which states:

"…..the use of precautionary approaches is warranted. However, it is not recommended that the limit values in exposure guidelines be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection."

It also states:

"Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted."

Given the inconclusive nature of the science regarding potential impacts on health, it is considered that a prudent approach continues to be the most appropriate response in the circumstances. Under this approach, subject to modest cost and reasonable convenience, power utilities should design their facilities to reduce the intensity of the fields they generate, and locate them to minimise the fields that people, especially children, encounter over prolonged periods. While these measures are prudent, it cannot be said that they are essential or that they would result in any benefit.

21.2 Impact assessment

21.2.1 Magnetic field is dependent on load

The magnetic fields from substation equipment depend on the loadings at that particular time. As such, it is necessary to make practical assumptions regarding the substation and feeder loadings to characterise the magnetic fields from the substation.

During a typical day, the amount of load current passing through a substation varies substantially between a daily minimum which is generally in the early hours of the morning, and a daily maximum at times of peak demand. Loadings also vary seasonally and generally reach a peak in either summer or winter.

In the EMF/health context, consideration is generally given to the following two loading conditions:

- As the epidemiological associations which underpin community interest regarding magnetic fields tend to relate to elevated 'average' magnetic fields, it is necessary to characterise an 'average' condition. This is achieved by making a conservative estimate of the long term

average load and linking it to reasonable assumptions regarding other factors. The magnetic fields derived under these conditions are the most appropriate for consideration in the context of the magnetic field/health literature, rather than the maximum capacity of the substation, which may only be required for very short periods, on relatively few occasions, over the service life of the substation.

- As the 'reference levels in the relevant health guidelines are independent of time, it is also necessary to check the magnetic fields under peak load conditions to confirm that the 'reference levels' have not been exceeded.

This approach has been followed to model magnetic fields from the substation. The substation loading is assumed to be at the 85th percentile level (i.e. that level which is exceeded for only 15% of the year. This approach is in accordance with the Standard Basis for Quoting Transmission Line Magnetic Fields. Energy Networks Association, 2006, provided that the 'reference levels' are not exceeded under peak load conditions.

For the purpose of the EMF assessment, it was assumed that the total 85th percentile loadings of the proposed zone substation would be shared equally between all 72 outgoing 11kV feeders.

21.2.2 Modelling EMF

The magnetic field contribution expected from the substation and associated underground feeder entries was modelled using the CDEGS software package. CDEGS is an internationally recognised software package pioneered by Safe Engineering Services & Technologies to provide grounding and electromagnetic and conductive interference analysis involving electrical networks. Plan and 3D view screenshots of the CDEGS model of the proposed works are shown in Appendix AA.

The magnetic field levels were calculated for the 85th percentile of the forecast initial and ultimate load levels. Following completion of the project, the magnetic fields would be dependent on the actual loading rather than that used for calculation purposes.

Magnetic fields were calculated at a height of 1 metre above the various street and floor levels in accordance with international practice. The model calculated magnetic field levels at the following parts of the site:

- Carpark Level 3 – contour map produced
- Carpark Level 4 – contour map produced
- O'Connell St Level – contour map produced
- Building Management Office Level 6 – contour map produced
- Bligh St Level – contour map produced
- Capacitor bank level – contour map produced
- First commercial floor (RL65) Level – contour map produced
- Northern wall (Notional internal wall of adjoining building) - Vertical contour map produced
- Three vertical contours along various sections of the southern wall
- Back wall of lifts from Bligh Street level to office foyer: - Vertical contour map produced
- Front wall of lifts from Bligh Street level to office foyer. - Vertical contour map produced

As with any high rise building, the project would have electrical plant, cabling and internal wiring. Magnetic fields from these sources have not been modelled as the design details are yet to be confirmed.

The total magnetic field level at any point would be the vector sum of all of the magnetic field contributions of the various underground and above ground sources, including external ones. The model only considered the contribution of the substation and its associated feeders and does not consider external sources.

The model results are shown in Figures 3.5 to 3.18 of Appendix AA and present horizontal and vertical contour plots, with profiles along the street frontages. The model results indicate that:

- Within the substation, the highest magnetic fields appear to be strongly influenced by the capacitors and the transformer connections (refer to Figures 3.3 – 3.6a of Appendix AA). Levels are expected to be in excess of public exposure limits but well within occupational exposure limits. Levels would be expected to reduce to less than 100 mG within 5 metres of the connections.
- The fields across the bulk of the remainder of the substation itself would be less than 50mG, except for the areas in proximity to the transformer connections and capacitors and those areas directly above or beside underground cables or cable risers connections (refer to Figures 3.3 – 3.6a of Appendix AA).
- The fields in areas within the car park that would be accessible to the general public are predicted to be generally in the range of 2 to 20 mG. Localised peaks, may occur near the 11kV risers on levels 3 and 4 (car park levels) and mitigation measures would be implemented as required connections (refer to Figures 3.3 – 3.6a of Appendix AA).
- In the ultimate condition, the substation's contribution to the magnetic fields in adjoining buildings on the northern side (adjacent to the former NSW Club Building at 31 Bligh Street) would be less than 2 mG above Level 12, the contribution on Levels 9 and 10 is predicted to be in the range 10 to 20 mG in the vicinity of the capacitors but less than 10 mG elsewhere (refer to Figure 3.13 in Appendix AA). The contribution between Levels 1 and 8 is predicted to be in the range 5 to 20 mG, with the lowest fields towards the eastern boundary (Bligh Street).
- The highest magnetic field contribution from the substation to the adjoining building at No. 31 Bligh Street is predicted to be generally less than 10 mG but may be slightly higher in the vicinity of the capacitors near the top of the adjoining building.
- The substation's contribution to the magnetic fields in adjoining buildings on the southern side would be less than 5mG above level 12 and generally between 5 and 20 mG between levels 1 and 12 (refer to Figures 3.14 – 3.16 of Appendix AA). There would be localised peaks up to 50 mG between levels 1 and 9 in the vicinity of the capacitor bank risers midway along the southern side.
- The magnetic field levels along the street frontages are expected to be dominated by the outgoing underground feeders. Modelling predicts magnetic fields directly above the cables of up to 20 mG, however the precise location and loading of the cables is yet to be determined (refer to Figures 3.7 and 3.10 in Appendix AA).

The model results indicate that there would be localised areas of elevated magnetic field levels in some areas accessible to the public in vicinity of the substation and associated electrical infrastructure. In considering these localised higher fields, it is important to recognise that fields would be experienced for short periods of time as people pass through the car park, and the levels are similar to those experienced in everyday life. To put this into perspective, the Energy Networks Association has published a series of typical magnetic field levels associated with particular appliances at normal user distance (refer to Table 21-1).

From the above range of fields in Table 21-1, it can be seen that the fields in most of the publically accessible areas of the project would be within the range normally encountered in everyday life. In a few places, including the level 3 car park and level 4 car park near the 11kV and 132kV risers, the commercial lifts as they pass the capacitor banks and the southern side in the vicinity of the capacitor bank cable risers, the highest calculated fields are predicted to be higher than the range in Table 21-1. As public access is restricted to no closer than 1.5 m to the 11kV riser cables and 0.5 m to the 132kV riser cables, these levels are likely to be within the relevant public or occupational health limit.

In the absence of other equipment or infrastructure that generates EMF, EMF associated with the substation equipment is approximately inversely proportional to the square of the distance from the source. This means that the value of EMF at a distance of 5 m from the source would be 25 times less than the value of EMF at the source. As EMF at the site boundary is generally predicted to be less than 20 mG, at a distance of 5 m the EMF contribution from the substation is likely to be less than 1mG.

21.2.3 Compliance with Health Standards

Occupational standards

When assessing compliance with health standards, the EMF report considered exposure to the general public rather than to occupational exposures. Occupational exposures are subject to different (higher) limits than general public exposure and are influenced by work practices, as well as the design and operation of equipment. It is assumed that Ausgrid would comply with occupational limits when operating the substation.

85th percentile loads

The predicted magnetic field contribution of the substation to areas in its vicinity that are accessible to the general public is expected to be generally less than 40mG under ultimate loading conditions. Its contribution to the magnetic fields in occupied spaces in adjacent buildings is expected to be generally less than 20mG under ultimate loading conditions. This contribution would be confined to levels 1 to 10 and would decrease with increasing distance from the substation wall. The highest of these fields is 5% of the relevant health guideline (reference level) for the general public.

The substation's contribution to the magnetic fields at its Bligh Street frontage would be up to 20mG and would be dominated by the outgoing feeders. At the O'Connell Street frontage the magnetic fields would be up to 50mG with the main contributor being the nearby transformer connections.

Long term (ultimate) peak load condition

As discussed in Section 21.2.1, the magnetic field generated by the substation would be dependent on load that this varies daily and seasonally according to demand. The loadings on substations also tend to grow over time until the substation's 'ultimate capacity' is reached. For this reason, if they occur at all, the loadings corresponding to the maximum capacity of a substation are only likely to occur infrequently and for relatively short periods.

The modelling examined a scenario with the substation loaded to its capacity. A small area that would be accessible to the public in the vicinity of the 11kV risers in the level 3 car park and level 4 car park may experience magnetic fields may exceed 2000mG. In accordance with the principles of prudent avoidance, during details design further consideration would be given options to reduce the magnetic fields in the public car parking areas on Levels 3 and 4. This may involve considering measures to reduce magnetic fields, or installing barriers such as fencing to maximise separation from high field sources without impinging on their requirements for access and egress.

Electric fields

As most electrical equipment associated with the substation would be indoor, it would produce little or no electric field external to the equipment enclosure. It is understood that the only unenclosed high voltage connections within the substation would be short sections within the transformer enclosures. These enclosures would only be accessible to authorised persons. On this basis, the electric fields in these areas, directly under the connections, based on typical equipment characteristics, have been estimated to be within the relevant occupational limits.

No major source of electric field is expected beyond the live areas of the substation.

21.2.4 Compliance with the principles of prudent avoidance

The principle of prudent avoidance involves "doing whatever can be done at modest cost and without undue inconvenience to avoid the possible risk (to health)" (Gibbs, 1991). Ausgrid operates its assets in accordance with the principles of prudent avoidance and this involves:

- Providing balanced, accurate information to employees and customers, including electric and magnetic field measurements and advice.
- Taking reasonable steps to limit field exposures from new facilities by locating and operating electrical installations prudently within the latest health guidelines.

- Closely monitoring engineering and scientific research, overseas policy development and major reviews of scientific, medical and engineering research regarding electric and magnetic fields and health.
- Cooperating fully with any bodies established by governments in Australia to investigate and report about power frequency electric and magnetic fields.

The principles of prudent avoidance have been applied when developing the concept design for the City East Zone Substation and this included investigating technically feasible measures to reduce EMF. The following measures have been incorporated:

- Using compact indoor switchgear which results in reduced magnetic fields compared to larger outdoor facilities
- The main sources of EMF are the transformers and associated vertical risers. The design places the transformers and associated vertical risers in the central part of the site to maximise the distance between these components and the property boundary. This minimises the influence of the transformer connections on the EMF levels at the boundary.
- Locating the 11kV switchgear below street level to minimise the influence of EMF from the 11kV transformer tails on areas that are accessible to the general public.
- Re-designing and relocating the 11kV and 132kV risers associated with the transformers and the 11kV capacitor cabling.

As indicated in Section 21.3, further investigations will be undertaken during detailed design to identify measures to further reduce EMF in accordance with the principles of prudent avoidance.

21.2.5 Australian Standard AS2067-2008

Australian Standard AS2067-2008 provides common rules for the design and the erection of high voltage electrical installations. This standard provides brief informative guidance on EMF in Appendix D: EMF and Safety Issues. Appendix D provides the following guidance:

The designer must ensure that the installation design is, so far as is reasonable and practicable, carried out in such a way as to:

a) *provide for the safety of persons, including employees of and contractors to the operator;*

b) *reduce the exposure of persons, including employees of and contractors to the operator and the public, to electric and magnetic field effects; and*

c) *reduce any damage, inconvenience or other detriment as a result of the activity.*

There are five basic techniques that should be used in the design and installation processes to reduce EMF:

i. *Reduce electrical current by using more energy efficient equipment for large electrical loads such as lift motors, air conditioning equipment, industrial motors and manufacturing equipment.*

ii. *Balance circuits to minimize net magnetic fields.*

iii. *Reduce magnetic fields by circuit installation arrangements that reduce distance between, or coordinate the relative placement of, all conductors in the same circuit.*

iv. *Maximize distance between EMF sources and sensitive areas where the level, duration, affected persons or other consequences of exposure may warrant attention.*

v. *Shield sources by containment or dispersal behind specialized barriers.*

In considering the practical application of Appendix D, it should be recognised that AS 2067 is a technical standard that is provided for information. AS2067 refers designers to both ARPANSA and ENA for further information. Accordingly, it is to be interpreted as providing practical guidance to the adoption of precautionary measures as recommended by both WHO and ARPANSA rather than as proposing actions which go beyond such precaution.

Section 4.3 of Appendix AA discusses strategies that have been implemented, and would continue to be implemented during detailed design to address the techniques outlined in Appendix D of AS 2067.

21.3 Mitigation measures

The following measure would be implemented to minimise potential impacts associated with EMF:

- Consistent with the principles of prudent avoidance, and to the extent feasible, during detailed design consideration would be given to the configuration and phasing of the 11kV and 132kV transformer connections and the 11kV capacitor cabling to examine the feasibility of configuring the 11kV air cored reactors to achieve a degree of field cancellation.
- Further work would be undertaken during detailed design to minimise EMF impacts in accordance with the principles of prudent avoidance, which includes those outlined in Appendix D of AS2067.

22. Infrastructure and utilities

22.1 Existing environment

As detailed in 6.3.12, a services search for the site was undertaken to determine the presence of existing infrastructure or utilities. Results showed that the site is connected to services which are typical of inner city areas. These include electricity, gas, water, telecommunications, and sewer.

22.2 Impact assessment

There is potential for construction activities to impact on existing infrastructure and utilities on the site. As outlined in Section 6.3.12, due to the nature of the project, significant changes would need to be made to the existing electricity infrastructure. The project would connect to gas, water, telecommunications, stormwater, and sewer services that are present in Bligh and O'Connell Streets. It is unlikely that any upgrades to trunk infrastructure would be required to cater for the project.

22.3 Mitigation measures

To minimise impact on existing infrastructure and utilities at the site the following mitigation measures would be implemented:

- Dial-before-you-dig searches would be undertaken prior to the commencement of construction works
- A qualified services locator would be engaged to visit the site and undertake potholing to determine the presence and location of existing services
- Ausgrid would consult with service providers and develop procedures to be implemented during connection to services and/or temporary relocation of services, if required.

23. Statement of commitments

23.1 Introduction

This Environmental Assessment has identified a range of measures to avoid, manage, mitigate offset and/or monitor the environmental impacts of the project. These measures are detailed in Chapters 8 - 1 and would be implemented during pre-construction and construction.

This chapter provides Ausgrid's draft Statement of Commitments. This may be revised to respond to issues raised in submissions received by the Department of Planning and Infrastructure during exhibition of the Environmental Assessment, or to address potential impacts associated with any changes to the project made following exhibition of the Environmental Assessment. Following approval of the project, the final Statement of Commitments would guide the subsequent phases of the project to reduce environmental impacts. Organisations involved in the design and construction phases would be required to undertake the works in accordance with these commitments.

23.2 Environmental management framework

The environmental management framework during construction of the project would be based on development and implementation of a CEMP by the contractor. This plan would be prepared in accordance with the *Guideline for the Preparation of Environmental Management Plans* (DIPNR, 2004). It would address the compliance obligations set out in the Minister's Conditions of Approval and Statement of Commitments and would be implemented by the contractor and any subcontractors undertaking construction activities.

Implementation of the CEMP would ensure that construction of Stage 2A(i) of the City East Zone Substation complies with relevant environmental legislation; conditions of applicable licences, approvals and permits; and the Environmental Management Systems Guidelines (NSW Government 1998). The CEMP would be endorsed by the appointed project Environmental Management Representative (EMR) prior to approval by the Director-General of the Department of Planning and Infrastructure.

The CEMP would include:

- Emergency contact information for key personnel
- An overview of the project and its objectives
- Relevant legislative requirements that apply to the project
- Project scope
- An outline of the existing environment and conditions
- Project environmental impacts
- Licences and permits obtained to meet statutory requirements
- Roles and responsibilities for all personnel, including responsibilities for planning, approving, implementing, maintaining, assessing and monitoring environmental controls
- Implementation requirements and environmental procedures. This would detail the actions to be implemented to address the compliance obligations set out in the Minister's Conditions of Approval and Statement of Commitments, including any requirements for monitoring and/or auditing.

The CEMP would include a number of sub-plans that would detail measures to be implemented to manage specific issues, including but not limited to:

- Noise and vibration
- Traffic and access
- Spoil and waste management
- Surface and groundwater management
- Consultation and community engagement.

Compliance with the CEMP would be monitored by implementing a Compliance Tracking Program prepared in accordance with MCoA 5 of the Concept Approval.

23.3 Amendments to the statement of commitments prepared for the Concept Plan

As required by MCoA 3.1c of the Concept Approval, this section provides the project specific commitments for environmental mitigation, management and monitoring. The draft Statement of Commitments are additional to Ausgrid's obligations under the Concept Approval.

Table 23-1 Draft Statement of Commitments

Key issue	Commitment
Noise and vibration	Construction would generally be carried out during the following hours: • Monday to Friday 7 am to 7 pm • Saturdays 7 am to 5 pm • No work on Sundays or Public Holidays Noise intensive activities such as rock breaking would be undertaken during the following hours: • Monday to Saturday 9 am to 12 pm • Monday to Friday 2 pm to 5 pm • At no time on Sundays or Public Holidays Construction of the cable tunnel is proposed to occur 24 hours per day, however surface works associated with the tunnelling (such as truck movements) would be limited to the standard construction hours. Other activities that may occur outside the standard construction hours include, but may not be limited to, oversize truck movements and deliveries of certain plant and equipment on an occasional basis. Works may also be undertaken outside these hours in the event of a direction from police or other relevant authority for safety reasons, or emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

Key issue	Commitment
	A noise and vibration management sub-plan would be prepared as part of the CEMP and would: • Identify potentially affected receivers, activities to be carried out, ancillary facilities, and associated sources of noise at each premises; • Quantify the background noise level for the nearest sensitive receivers; • Identify the construction noise, ground-borne noise and vibration objectives; • Provide an assessment of potential noise levels during construction against the objectives; • Identify reasonable and feasible mitigation measures to reduce noise and vibration levels where the objectives would be exceeded; • Describe noise and vibration management methods and procedures that would be implemented; • Detail procedures for notifying sensitive receivers of construction activities that are likely to affect their noise and vibration amenity; • Measures to monitor compliance with noise and vibration objectives and respond to complaints.
	The following general management measures would be included in the noise and vibration management sub-plan: • Where feasible and practicable, dampened and/or smaller rock hammers would be used; • Where reasonable and feasible, plant and equipment such as excavators, cranes and trucks would be fitted with silencers and low noise mufflers (residential standard), • Where possible, plant would be located and orientated to direct noise away from sensitive receivers; • Where possible, deliveries would be carried out within standard construction hours; • Plant and equipment would be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. All plant and equipment would be maintained in good order; • Mobile plant and trucks operating on site for a significant portion of the project would have reversing alarm noise emissions minimised in-so-far-as possible, recognising the need to maintain occupational safety; and • Solid hoardings and/or site sheds would be erected on work site boundaries to function as noise barriers.
	A condition survey would be undertaken of surrounding buildings, services and structures prior to commencement of construction. This would include inspecting surrounding heritage listed buildings and considering whether the predicted ground movements from the geotechnical model would be likely to affect the structural integrity of the buildings. This would assist to determine whether the vibration criteria for residential buildings should be applied to the heritage listed buildings. If adverse impacts on the structural integrity of a heritage building is considered likely, measures would be developed to minimise the potential for damage and this may involve strategies such as refining the construction method or providing temporary structural support. A post construction condition survey would also be undertaken. Any damage attributable to the project would be repaired at Ausgrid's expense. If contact cannot be made or agreement reached despite reasonable effort, Ausgrid would not prepare a condition survey for that property.
	During detailed design and procurement, plant and equipment would be selected to ensure that the operational noise emissions would comply with criteria calculated in accordance with the Industrial Noise Policy.
Non-indigenous heritage	During excavation of the existing basement floor slab, the residual ground surface would be inspected by an archaeologist to identify the potential for the site to contain any items of non-indigenous heritage archaeological significance. Any items non-indigenous heritage significance would be recorded by the archaeologist and managed in consultation with the OEH.
	Following completion of demolition, a Schedule of Conservation Works to be undertaken in conjunction with the approved works would be prepared by a heritage architect in consultation with the OEH. The schedule would detail conservation works designed to minimise further damage to fabric as well as to reinstate an appropriate level of finish, and would include specification notes.

Key issue	Commitment
	Branches of the Bennelong Drain in the vicinity of the site would be marked on all key engineering drawings, especially where the drain is adjacent to excavation shoring where rock anchors may be used. The CEMP would also include drawings showing the location of the branches of the Bennelong Drain relative to construction works.
	Once details regarding the public domain plan for Richard Johnson Square have been finalised in consultation with the City of Sydney, an archaeological impact statement would be prepared to assess potential impacts on items of archaeological significance. The archaeological statement would be undertaken by an appropriately qualified heritage consultant in consultation with the OEH. This would involve development of additional management measures to be implemented.
	If any unexpected historical relic(s) are encountered during the course of construction, all work likely to affect the relic(s) would cease immediately and the OEH would be notified in accordance with the *Heritage Act 1977*.
Indigenous heritage	If any unexpected Aboriginal object(s) are encountered during the course of construction, all work likely to affect the object(s) would cease immediately and the OEH would be informed in accordance with Section 91 of the *National Parks and Wildlife Act 1974*. Consultation would also occur with the Metropolitan Local Aboriginal Land Council regarding an appropriate course of action.
Air quality	A construction air quality management plan would be prepared as part of the CEMP and would include the following measures to manage potential impacts on air quality: • Manage and dispose of any hazardous materials such as asbestos in accordance with relevant guidelines, including Code of Practice for the Safe Removal of Asbestos (National Occupational Health and Safety Committee 2002) and Australian Standard AS-2601 1991 – Demolition of Structures; • During tunnel construction, all air would be ventilated through a filter unit such that discharged air meets the requirements of the Protection of the Environment Operations (Clean Air) Regulation 2002 (as amended); • Exposed surface areas would be managed via dust mitigation measures; • Wheels of all site plant and vehicles would be cleaned so that material with potential to generate dust is not spread on surrounding roads; • Sealed roads around construction sites would be swept to remove deposited material with potential to generate dust, if necessary; • Water would be used to suppress particles potentially generated during the erection of barriers, screens and other ancillary structures; • Water may be used to suppress dust emissions during dry windy periods (as required); • The height from which dust generating material is dropped would be minimised; • Loaded trucks carrying spoil would be covered at all times; • Cutting/grinding of materials on site would be kept to a minimum, but if necessary equipment and techniques to minimise dust would be used; • Earthworks would be kept damp, as required, especially during dry weather; • Spoil stockpiles would be damped as necessary; • Potentially dusty materials would be handled as little as possible; • Construction plant and vehicles would be well maintained and regularly serviced. Visible smoke from plant would be avoided. Defective plant would not be used; • Engines would be switched off when vehicles are not in use and refuelling areas would be away from areas of public access; and • Where practicable and feasible, loading and unloading would take place within the site.

Key issue	Commitment
	The air quality management plan would also: Establish a protocol to handle dust complaints that includes recording, reporting and appropriate actions for expected types of complaints; Include a reactive management program detailing how and when operations are to be modified to minimise the potential for dust emissions, should emissions exceed the relevant criteria; and Address the monitoring, management and control of air pollutants including gaseous substances generated during construction.
	All the ventilation systems for the substation and tower, including natural and mechanical air relief, air intakes and air discharges would be designed to comply with AS1668.2. In particular all exhaust air and spill air shall be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.
Soil and water	A Water Quality Management Sub-Plan would be prepared as part of the CEMP for the project. The sub-plan would be prepared in accordance with 'Managing Urban Stormwater: Soils and Construction' (Volume 1, 4th Edition, the 'Blue Book', Landcom, 2004) and would detail specific measures to be implemented to manage soil, surface and groundwater impacts during construction. It would identify opportunities for on-site reuse of groundwater and surface water, and include a program for monitoring the effectiveness of the sediment control system.
	The Water Quality Management Sub-Plan would be developed in consultation with OEH to ensure the output from the treatment system is suitable for discharge to the stormwater system and the measures implemented would allow construction to comply with Section 120 of the POEO Act. It would detail the treatment process to be implemented and the associated monitoring program to verify that the treated water meets water quality objectives developed in accordance with guidelines developed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ).
	Consultation with Sydney Water Corporation and/or the City of Sydney would be undertaken to determine whether there are any capacity limitations within the stormwater system that would influence the location of the connection for the water discharged from the treatment system.

Key issue	Commitment
Traffic and access	A construction traffic management plan would be prepared in consultation with RTA and City of Sydney Council as part of the CEMP and would include the following measures to manage potential impacts on the traffic and transport network: • General signposting of Bligh Street and O'Connell Street in the immediate vicinity of the site with appropriate heavy vehicle and construction warning signs; • If temporary road closures are required, traffic control measures specified in "AS1742.3: 2002 Traffic Control Devices for Works on Roads" and the RTA's "Traffic Control at Work Sites" would be detailed in a traffic control plan and subsequently implemented; • Development of a suitable vehicle detour route, if required during specific construction activities; • Installation of specific warning signs and safety devices at entrances to the construction site to warn existing road users of entering and exiting construction traffic; • Preparation of a pedestrian management plan that details measures to be implemented to minimise impacts on pedestrian movement and maintain pedestrian safety. Specific consideration would be given to activities undertaken within Richard Johnson Square, footpaths, emergency access points to adjacent buildings, vehicle access and egress to the site, and the need for protective gantries above footpaths; • In addition to relevant Australian Standards and RTA guidelines, all traffic management would also conform to Workcover NSW "Code of Practice for Working Near Traffic and Mobile Plant"; • Barriers approved by the RTA and/or City of Sydney Council would be provided between the construction sites and trafficable areas. Pedestrian and cycle diversions would be required during the works; • Consult with Council regarding management measures to be implemented during works that would impact on Council controlled roads; • Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements; • Inducting truck and vehicle operators on the requirements of the traffic management plan; and • An event specific traffic management plan would also be prepared if there are any special events in the CBD that would potentially be impacted by traffic movements associated with the project. The time and duration of these events would be clearly noted and construction delivery processes would be rearranged to cater to the affected days.
	Prior to the commencement of construction, condition surveys would be prepared for sections of Bligh, O'Connell and Hunter Streets in the vicinity of the site that are likely to be used by construction traffic. Any road/ footpath damage, aside from that resulting from normal wear and tear, would be repaired to the pre-existing standard at Ausgrid's cost.
	A community information plan would be continued following the demolition phase and during the construction period to ensure that the local community is aware of the construction activities including construction traffic accessing the site. The awareness program would identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and other construction related matters.
Storage of dangerous goods	All dangerous goods (as defined by the Australian Dangerous Goods Code) and combustible liquids, would be stored and handled strictly in accordance with: • All relevant Australian Standards; • A minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and • The DECC's Environment Protection Manual Technical Bulletin Bunding and Spill Management (EPA 1997).

Key issue	Commitment
Spoil and waste management	A spoil and waste management sub-plan would be prepared as part of the CEMP and would identify how spoil and other waste material would be handled, stockpiled, reused and disposed. It would address the principles of the waste hierarchy and relevant health and safety as well as environmental legislation and would include measures such as: • All waste would be managed in accordance with DECC's Waste Classification Guideline (2008); • Arrangements to reduce the volume of materials being brought onto site such as packaging. In addition, required construction materials would be ordered in the correct quantities to minimise waste; • Reuse or recycling of demolition and excavation materials would be undertaken wherever practicable. Stockpile areas would be allocated for construction and demolition waste to allow separate stockpiling of recyclable and non-recyclable materials. In addition, colour coded and clearly marked containers for different recyclable materials would be provided; • Records would be kept of all waste volumes and destinations; • Sites for disposal of surplus spoil would be selected according to the rate of development activity and the volumes of material generated elsewhere; • Ongoing training would be provided for construction personnel to ensure correct sorting of waste and recyclable materials and promote the principles of the waste hierarchy. Waste minimisation and management would be included in tool box sessions and site management planning; and • Any synthetic mineral fibres would be bagged or wrapped in plastic and handled per Worksafe Australia's Synthetic Mineral Fibres – National Standard and National Code of Practice.
EMF	Further work would be undertaken during detailed design to minimise EMF impacts in accordance with the principles of prudent avoidance, which includes those outlined in Appendix D of AS2067.
Greenhouse gas emissions	To minimise SF_6 emissions Ausgrid would adhere to the responsible use principles outlined in ENA Industry Guideline for SF_6 Management (Energy Network Association, 2008). Ausgrid would follow best practice guidelines to reduce or eliminate any leakage of SF6 gas during installation, operation, maintenance and decommissioning of the transformer and switchgear equipment.
Infrastructure and utilities	To minimise impact on existing infrastructure and utilities at the site the following mitigation measures would be implemented: • Dial-before-you-dig searches would be undertaken prior to the commencement of construction works • A qualified services locator would be engaged to visit the site and undertake potholing to determine the presence and location of existing services • Service providers would be consulted and develop procedures to be implemented during connection to services and/or temporary relocation of services, if required.
Urban design	During development of the detailed design, the following issues would be considered: • Features to be included to ensure the commercial tower would be designed to achieve a minimum 5 Star Green Star rating; • Impact of reflectivity due to the external glazing. As a minimum, the external glazing would have a normal specular reflectivity of visible light of 20% or less to minimise adverse glare impacts; • The visual presentation of the façade louvre composition masking the mass of the substation on both Bligh and O'Connell Street frontages may appear too monolithic and unified when viewed from a distance. This issue would be resolved through close collaboration with the artist during design development • The underside of the decorative façade screen to the Bligh and O'Connell Street frontages is of relatively low height when compared with the higher ground floor recesses of adjoining buildings, particularly on O'Connell Street. Opportunities to reduce this impact would be considered. • There is potential for the vertical edge of Richard Johnson Square against the Hunter Street frontage to be visually and spatially disruptive when viewed from Hunter Street. This would be mitigated through careful design for the upgraded Richard Johnson Square to create an appropriate setting for the monument and improve public amenity, subject to approval by Council.

Key issue	Commitment
Wind impacts	The detailed design would be prepared to include the following: • A canopy above the ground level outdoor café and seating area would be provided. • 1.5m high impermeable portable screens would be provided within and around the ground level outdoor café and seating area. • An internal wall would be provided within the ground level lobby at the top of the escalators between Bligh Street and O'Connell Street. • Impermeable balustrades would be provided along the perimeter of the outdoor terrace area on the Sky Lobby Level. • A strategic planting scheme similar to that presented in the Wind Environment Statement would be provided for the outdoor terrace area on the Sky Lobby Level.
Detailed design investigations	Detailed design of the basement excavation and cable tunnel structure would be undertaken based on the results of geotechnical investigations to minimise potential impacts associated with ground settlement and stability.
	RailCorp and NSW Transport would continue to be consulted during development of the detailed designs for the basement excavation and cable tunnel to ensure that potential impacts associated with their rail corridors are mitigated to an acceptable level. This would include consideration of the location and impact of associated items such as rock bolts and rock anchors.
Fire safety	A Fire Safety Engineering and Evacuation Strategy would be prepared prior to the occupation of the tower.
Hazards and risks	Services potentially affected by construction activities would be identified to determine requirements for diversion, protection and/or support.
	Construction safety sub plans would be prepared to manage hazardous incidents and public safety during the construction of the project.
Consultation	A Community Information Plan would be prepared in accordance with the requirements of MCoA 4.3 of the Concept Approval. This would set out the community communications and consultation processes to be undertaken during Stage 2A(ii) and would include specific consultation regarding issues such as: • Noise and vibration • Traffic and access • Dust.
Cumulative impacts	Ausgrid would minimise cumulative impacts through precise management of projects and communication with other authorities. This would involve consultation with organizations constructing other projects in the immediate vicinity of the City East Zone Substation, to identify potential cumulative impacts and opportunities to minimize these impacts.

24. Conclusion

This Environmental Assessment has been prepared in accordance with the requirements of Part 3A of the EP&A Act and addresses the Director-General's requirements issued on 12 August 2011 and also the requirements of MCoA 3 of the Concept Approval.

The existing electricity supply infrastructure in the Sydney CBD requires refurbishment, replacement and augmentation to provide a secure supply of electricity to the Sydney CBD that complies with the 'n-2' licence conditions. Ausgrid developed the Sydney CityGrid Project as an integrated strategy that is the most effective means of rebuilding or refurbishing the existing infrastructure while maintaining sufficient space and capacity to ensure an ongoing and reliable electricity supply.

The existing City East 33 kV/11 kV zone substation located at Woolloomooloo was commissioned in the 1960s and is approaching the end of its technical life. A new City East Zone Substation is required to replace the Woolloomooloo substation to cater for the projected growth in load in the CBD and improve reliability standards to comply with the 'n-2' licence conditions.

The City East Zone Substation is both needed and justified as all stages of the Sydney CityGrid Project are integrated and interdependent. Failure to construct the City East Zone Substation would compromise the ability to achieve the objectives of the overall project.

The site was purchased specifically for the purpose of constructing the City East Zone Substation. Land in the CBD is expensive and the purchase of 33 Bligh Street represents a significant proportion of the capital investment cost of the City East Zone Substation. As the site currently features two commercial buildings and the City of Sydney had previously granted development consent to construct a 205 m commercial tower, an opportunity was identified to develop the site as an integrated substation and commercial tower.

Ausgrid and Investa Property Group have entered into an agreement to develop the site as an integrated substation and commercial tower. This approach would allow the airspace above the substation to be developed for commercial purposes to reduce the capital cost of the substation and provide a built form that complements the surrounding urban environment.

Key social and environmental issues have been progressively evaluated and assessed during development of the design and preparation of the Environmental Assessment. This has involved extensive consultation with government agencies and stakeholders that would have a role in constructing and operating the project. The outcomes of consultation have also informed development of the Statement of Commitments that would be implemented to manage potential adverse impacts and enhance benefits during the construction and operational phases. The Statement of Commitments would reduce the duration, extent and severity of potential impacts.

While the project has the potential to result in some short term adverse impacts, these need to be balanced against the substantial positive impacts that would result from the overall Sydney CityGrid Project. The substation is considered to be in the public interest as a reliable electricity supply as this is critical to allowing the CBD to function efficiently and effectively, particularly given Sydney's function as Australia's only recognised global city, and hub for commercial and financial operations. The benefits of the project substantially outweigh adverse impacts.

25. References

Department of Climate Change 2008, *National Greenhouse Accounts (NGA) Factors*, Department of Climate Change, Barton, Australian Capital Territory.

Department of Climate Change and Energy Efficiency 2011, *Australian National Greenhouse Accounts – National Inventory Report 2009, Volume 1*, Department of Climate Change and Energy Efficiency, Barton, Australian Capital Territory.

Department of Environment and Conservation (DEC) 2006a, *Assessing Vibration: A Technical Guideline,* Department of Environment and Conservation, Sydney.

Department of Environment and Conservation (DEC) 2006b, *NSW State of the Environment 2006*, Department of Environment and Conservation, Sydney.

Department of Environment and Climate Change (DECC) 2008a, *Interim Noise Control Guideline: Construction Site Noise*, Department of Environment and Climate Change, Sydney.

Department of Environment and Climate Change (DECC) 2008b, *Waste Classification Guideline*, Department of Environment and Climate Change, Sydney.

Department of Environment, Climate Change and Water (DECCW) 2010, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, Department of Environment, Climate and Water, Sydney.

Department of Environment, Climate Change and Water (DECCW) 2009, *Interim Construction Noise Guidelines,* Department of Environment and Climate Change, Sydney.

Department of Infrastructure Planning and Natural Resources (DIPNR) 2004, *Guideline for the Preparation of Environmental Management Plans*, Department of Infrastructure and Natural Resources, Sydney.

EnergyAustralia 2010, Environmental Assessment for Stage 2A(i) of the City East Zone Substation, July 2010.

EnergyAustralia 2010, Submissions Response and Preferred Project Report, March 2011.

EnergyAustralia 2009, *Preferred Project Report*, May 2009.

EnergyAustralia 2009, Submissions Response and Preferred Project Report, May 2009.

Environmental Protection Authority 2000, *NSW Industrial Noise Policy,* Environmental Protection Authority, Sydney.

Environmental Protection Authority 1999, *Environment Criteria for Road Traffic Noise*, Environmental Protection Authority, Chatswood, Sydney.

Environmental Protection Authority 1997, *Environment protection manual for authorised officers: bunding and spill management*, technical bulletin, Environmental Protection Authority, Sydney.

Hassall, D 1991, Reflectivity, Dealing with Rogue Solar Reflections, Hassall, D, Sydney.

KBR 2007, City North Zone Substation, Assessment of operational discharge of treated groundwater to Cockle Bay, September 2007.

National Occupational Health and Safety Commission 2005, *Code of practice for the safe removal of asbestos*, 2nd Edition, April 2005, Commonwealth Government of Australia, Canberra.

National Occupational Health and Safety Commission 1990, *Synthetic Mineral Fibres – National Standard* and *National Code of Practice*, May 1990, Commonwealth Government of Australia, Canberra.

NSW Government 1998, *Environmental Management Systems Guidelines*, November 1998, Sydney.

Pells Sullivan Meynink Pty Limited (PSM) 2008, Geotechnical investigations, May 2008, Sydney.

Pells Sullivan Meynink Pty Limited (PSM) 2009, City East Cable Tunnel – Interpretation of geotechnical and Hydrological Conditions, 14 January 2009, Sydney.

SKM, 2005, EnergyAustralia Sydney CBD Tunnel – Assessment of operational discharge of tunnel water into Cockle Bay, report prepared by Sinclair Knight Merz dated 30 May 2005.

Urban Environmental Consultants Pty Ltd 2008, *Preliminary contamination assessment report*, May 2008, Sydney.