



SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT  
DARLING HARBOUR LIVE – DARLING SQUARE - WESTERN PLOT - BUILDING W1

# LIGHT RAIL ASSESSMENT

FOR SSDA12





# DARLING HARBOUR LIVE

## SICEEP – DARLING SQUARE - WESTERN PLOT BUILDING W1

### LIGHT RAIL ASSESSMENT FOR SSDA12

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# REVISIONS

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# EXECUTIVE SUMMARY

Hyder Consulting has been engaged by Urbanest to provide advice relating to the existing light rail infrastructure adjacent to the Student Accommodation site within Darling Square development at Darling Harbour. This report will support the Stage 2 Development Application for the Student Accommodation and respond to the Secretary's environmental assessment requirements (SEARs).

The SEARs that have been issued for this project request Urbanest to address any impacts on the Light Rail corridor.

To respond to the SEARs, this report outlines the impact that the construction of the proposed student accommodation building will have on the light rail corridor including but not limited to:

- Building collision protection
- Consideration of interfaces associated with façade maintenance
- Windows openings and balconies
- Noise and vibration
- Use of cranes adjacent the light rail corridor

# 1 INTRODUCTION

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Application (referred to as SSDA 12) follows the approval of a staged SSD DA (SSDA 2) in December 2013. SSDA 2 sets out a Concept Proposal for a new mixed use residential neighbourhood at Haymarket referred to as “Darling Square”, previously known as “The Haymarket”. Darling Square forms part of the Sydney International Convention, Exhibition and Entertainment precinct (SICEEP) Project, which will deliver Australia’s global city with new world class convention, exhibition and entertainment facilities and support the NSW Government’s goal to “make NSW number one again”.

More specifically this subsequent DA seeks approval for a residential building (student accommodation) within the Western development plot (Darling Drive) of Darling Square and associated public domain works. The DA has been prepared and structured to be consistent with the Concept Proposal DA.

## 2 OVERVIEW OF PROPOSED DEVELOPMENT

The proposal relates to a detailed (‘Stage 2’) DA for a residential building (student accommodation) in the Darling Drive Plot of Darling Square together with associated public domain works. The Darling Square Site is to be developed for a mix of residential and non-residential uses, including but not limited to residential buildings, commercial, retail, community and open space. The Darling Drive Plot is one of six development plots identified within the approved Concept Proposal.

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

- Demolition of existing site improvements;
- Associated tree removal and planting;
- Construction and use of one residential building within the Darling Drive Plot, to be used for student accommodation purposes;
- Public domain improvements, including provision of a new urban courtyard space between student accommodation buildings W1 and W2; and
- Extension and augmentation of physical infrastructure / utilities as required.



### 3 BACKGROUND

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

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

Key features of the Preferred Master Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
  - Up to 40,000m<sup>2</sup> exhibition space;
  - Over 8,000m<sup>2</sup> of meeting rooms space, across 40 rooms;
  - Overall convention space capacity for more than 12,000 people;
  - A ballroom capable of accommodating 2,000 people; and
  - A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing a hotel complex at the northern end of the precinct.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, now called 'Darling Square', including apartments, student accommodation, shops, cafes and restaurants.
- Renewed and upgraded public domain that has been increased by a hectare, including an outdoor event space for up to 27,000 people at an expanded Tumbalong Park; and
- Improved pedestrian connections linking to the proposed Ultimo Pedestrian Network drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

On 21 March 2013 a critical step in realising the NSW Government's vision for the SICEEP Project was made, with the lodgement of the first two SSD DAs with the (now) Department of Planning and Environment. The key components of these proposals are outlined below.

#### Public Private Partnership SSD DA (SSD 12\_5752)

The Public-Private Partnership (PPP) SSD DA (SSDA 1) includes the core facilities of the SICEEP Project, comprising the new, integrated and world-class convention, exhibition and entertainment facilities along with ancillary commercial premises and public domain upgrades. SSDA1 was approved on 22 August 2013.

#### The Haymarket Concept Proposal (SSD 13\_5878)

The Concept Proposal SSD DA (SSDA 2) establishes the vision and planning and development framework which will be the basis for the consent authority to assess detailed development proposals within the Darling Square Site. SSDA2 was approved on 5 December 2013. The Stage 1 Concept Proposal approved the following key components and development parameters:

- Indicative staging of demolition and development of future development plots;

- Land uses across the site including residential and non-residential uses;
- Street and laneway layouts and pedestrian routes;
- Open spaces and through-site links;
- Six separate development plots, development plot sizes and separation, building envelopes, building separation, building depths, building alignments, and benchmarks for natural ventilation and solar access provisions;
- A maximum total gross floor area (non-residential and residential GFA);
- Above ground car parking including public car parking;
- Residential car parking rates;
- Design Guidelines to guide future development and the public domain; and
- A remediation strategy.

In addition to the approval of SSDA2, the following approvals have been granted for various stages of the Darling Square site:

- Darling Drive (part) development plot (SSDA3) for the construction and use of a residential building/W2 (student accommodation) and the provision of associated public domain works approved on 7 May 2014;
- North-West development plot (SSDA4) for the construction and use of a mixed use commercial development and public car park building and associated public domain works approved on 7 May 2014; and
- South-West development plot (SSDA5) – construction and use of a mixed use residential development and associated public domain works approved on 21 May 2014.
- North-East development plot (SSDA7) – construction and use of a mixed use residential development and associated public domain works approved on 16 April 2014.

Approval was also granted on 15 June 2014 for SSDA6 which includes the construction and use of the International Convention Centre (ICC) Hotel and provision of public domain works.

This report has been prepared to support a detailed Stage 2 SSD DA for a residential building/W1 (student accommodation) and associated public domain works within Darling Square (SSDA 12), consistent with the Concept Proposal (SSDA 2).

## 4 SITE DESCRIPTION

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

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the Light Rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south (refer to Figure 1).

The Darling Square Site is:

- Located in the south of the SICEEP Site, within the northern portion of the suburb of Haymarket;
- Bounded by the Powerhouse Museum to the west, the Pier Street overpass and Little Pier Street to the north, Harbour Street to the east, and Hay Street to the south; and
- Irregular in shape and occupies an area of approximately 43,807m<sup>2</sup>.



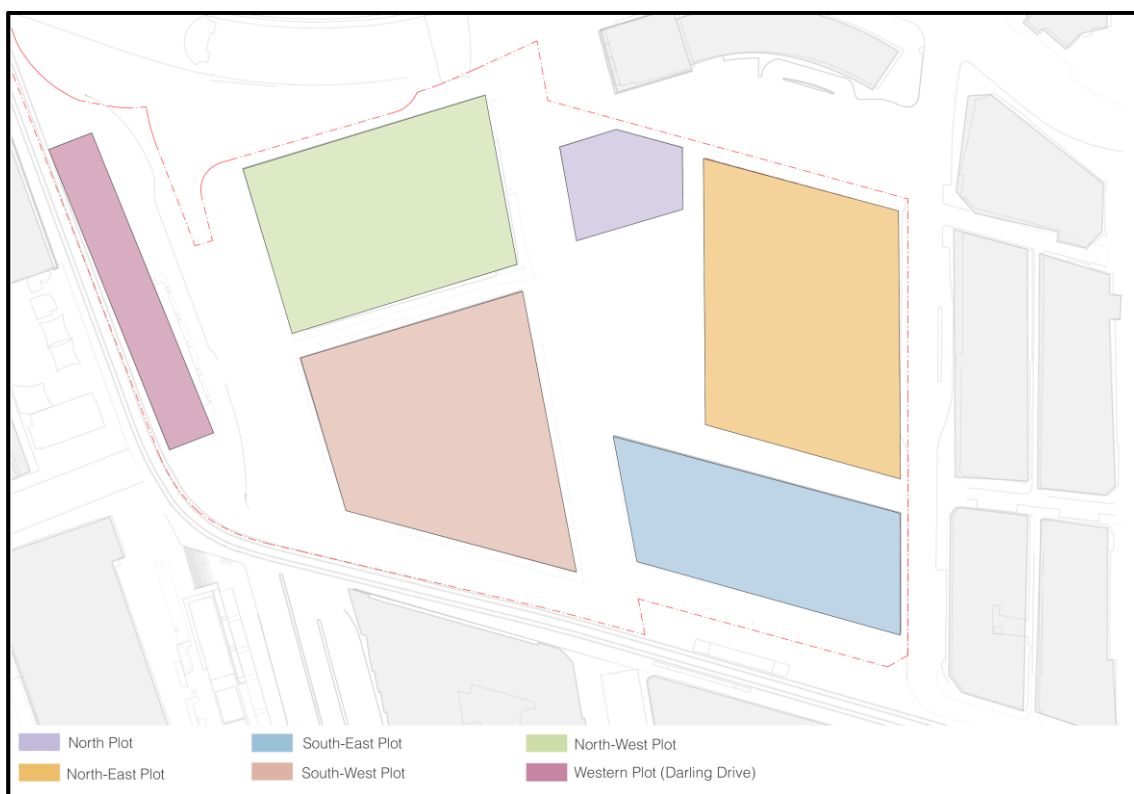
**Figure 1:** Aerial photograph of the SICEEP site



The Concept Proposal DA provides for six (6) separate development plots across the Darling Square Site (refer to Figure 2):

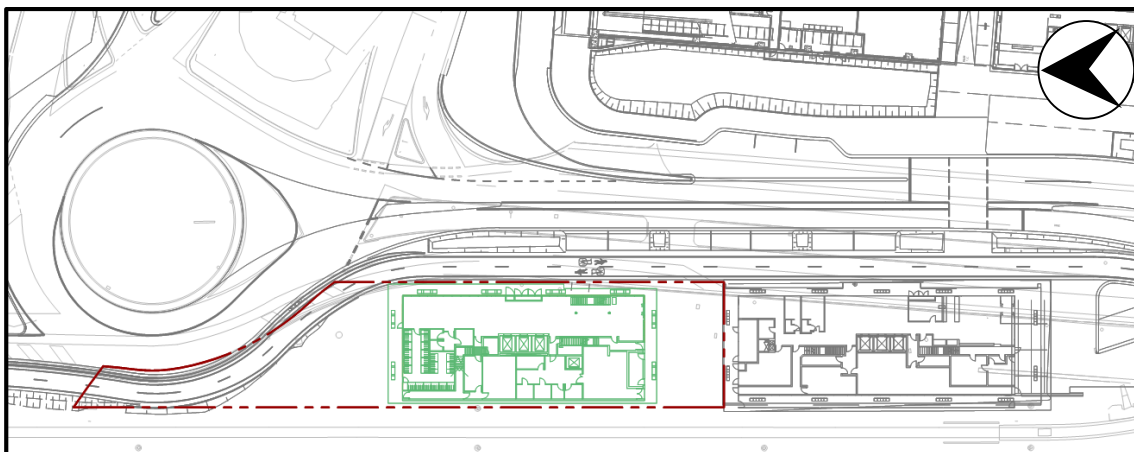
1. North Plot;
2. North East Plot;
3. South East Plot;
4. South West Plot;
5. North West Plot; and
6. Western Plot (Darling Drive).

The Application Site area relates to the northern portion of the Western Plot and surrounds as detailed within the architectural and landscape plans submitted in support of the DA.



**Figure 2 – Concept Proposal Development Plots**

The Site area for this Stage 2 DA relates to the West Plot and surrounds as detailed within the architectural and landscape plans submitted in support of the DA (refer to Figure 3).



**Figure 3: - Works boundary for subject DA**

## 5 PURPOSE OF THE REPORT

This report has been prepared to accompany the SSDA12 for the Western Plot – Building W1 of Darling Square. It addresses the relevant requirements of the Secretary's environmental assessment requirements (SEARs) as per the letter dated 20<sup>th</sup> July 2015 in relation to SSD 7133.

### 5.1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Table 2 summarises for SEARs for SSDA12 in relation to the light rail.

**Table 2** SEARs

SEARs Reference	Key Assessment Requirement
6	Address any impacts of the development on the capacity and operation of Sydney Light Rail.
6	Undertake a transport and road safety assessment for any proposed advertising signage and lighting displays visible on roads or impacting on the operation of the light rail.
7	Identify potential noise and vibration generating sources and receptors at all stages of the development and operation, including noise and vibration from communal student areas, during construction and noise and vibration from Darling Drive, the Pier Street overpass and the Sydney Light Rail.

## 6 ASSESSMENT OF LIGHT RAIL IMPACT

Building W1, located within the Western Plot is situated on land currently owned by Sydney Harbour Foreshore Authority (SHFA) and Railcorp. The Railcorp owned corridor is used for the Metro Light Rail System (formerly known as Sydney Light Rail) which is operated by Transdev. The development proposal seeks to identify all key issues relevant to the development of the student accommodation, identify any impact on the existing Light Rail corridor and all compliance required during and post construction of the buildings.

### 6.1 REFERENCE DOCUMENTS

Hyder have reviewed the following documents to identify key issues and compliance requirements.

- Transdev Network Safeworking Rules Manual, Rev 2 August, 2015 (Draft);
- Australian Standard 5100-2004 "Bridge Design" part 1 and part 2;
- Railcorp Engineering Standard ESC 370 'Air Space Developments'; and
- ASA standard 'External Developments' reference number T HR CI 12080 ST (formerly Railcorp Engineering Standard ESC 380,
- A guide to working in and around the rail corridor, November 2005, Railcorp
- Interfleet Derailment Consequences Assessment at the Darling Square Development Site October 2014 Report Number ITPLR/TA3139/01 issue C.
- Safety Interface Agreement (SIA) for W2 Plot.
- Works Deed for Building W2.
- Veolia "Light Rail Contractors Document" March 2011 Doc. Number 10737 Rev 0;
- Veolia "Light Rail Envelope Brief" March 2011 Doc. Number 10738 Rev 0;

The Transdev and Veolia documents described above set out the operator's requirements for staff and contractors working on or about the light rail corridor, these requirements will have implications for the construction and ongoing maintenance of the building works proposed and is discussed further in this report. We have included both companies standards / manuals due to the operational change mid-way through this report / project and that both are relevant to the light rail.

The Australian Standard 5100-2004 relates to collision of rail vehicles with bridges/ structures, this standard, in absence of a standard for building structures protection from light rail vehicles, is considered to be relevant but onerous and too conservative for the protection of the student accommodation buildings.

### 6.2 EXISTING CONDITIONS

#### 6.2.1 TRACK CONFIGURATION

Generally the light rail tracks are standard gauge (1435mm) parallel at approximately 4.0 to 5.0m with OHWs between the tracks which carry the catenary and contact wire(refer to photo below).





The current Metro Light Rail System traverses 7.15km from Central Station to Catherine Street at Lilyfield with the latest extension under construction to Dulwich Hill.

A section of approximately 1.5 kilometres from the intersection of Darling Drive and Hay Street to Central Station runs within the road pavement areas, which means that the light rail and road vehicles are sharing the route along with pedestrians in a pedestrianised portion of Hay Street closest to the Student Accommodation. In this section, the track is recessed into the road pavement and then set into a resilient rubber component, in some cases a floating slab arrangement is utilised. The design speed in this area is limited to 20 kph. For the remaining 5.7km of the route, the light rail has a right of way (ROW) dedicated corridor in which the allowable maximum speed is 70 kph, with further speed restrictions in other areas of tracks due to sharp bends.

The alignment of the light rail in the vicinity of the proposed student accommodation building is on a straight, running parallel to the alignment of Darling Drive. Approximately 50m to the south of the site, the track follows a tight curve of approximately 40m radius and crosses, at grade, the signalised intersection of Hay Street and Darling Drive. It is at this intersection (heading west) that the light rail ROW commences. East of this intersection, the light rail runs within Hay Street and shares the route with pedestrians and road vehicles at a maximum speed of 20km/h.

To the north of the site, the track continues along the straight for a further 250m to the Exhibition Stop where the light rail vehicle stops before continuing outbound. This limited length of track between the Exhibition Stop and the on-street running zone (20km/h), together with the sharp bend of approximately 40m radius at the commencement of the ROW, effectively limits the operation speed of the Light Rail vehicle in the vicinity of the development.

## 6.2.2 STAKEHOLDER ENGAGEMENT

Ongoing discussions have occurred throughout the production of this Development Application and the Concept Proposal Application (SSDA2) with the asset owner, operator and regulator to understand the interface matters requiring consideration during the design, construction and operational phases of the building.

In satisfaction of the conditions of consent for SSD6010 for Building W2, Urbanest has negotiated/executed

- Safety Impact Assessment (SIA) to manage all construction and operation based risks.
- Works Deed to ensure the preservation of Railcorp's interests as adjoining land owner as the operator.
- Concluded a risk analysis with respect to derailment.

It is proposed that the same measures are incorporated into the Building W1 design, assessment, construction and operational matters.

## 6.3 DESIGN APPROACH

### 6.3.1 LIGHT RAIL ENGINEERING STANDARDS

Enquiries have revealed that there are no Australian impact protection standards written specifically for light rail. TfNSW advised that it is in the process of developing light rail standards however no material has been made publicly available. In the absence of relevant standards support was given to a 'first principles' risk based approach using heavy rail standards as a baseline.

Australian Standard 5100-2004 has been written specifically for bridges with heavy rail freight and passenger vehicles in mind and the engineering standards are therefore considered not directly relevant to light rail applications. It does however refer to approval and or agreement by the 'Relevant Rail Authority', in the past RailCorp, or its predecessors have been the 'Relevant Rail Authority' in all passenger rail applications of AS5100-2004 in NSW. However, with the restructuring of the transport authorities in NSW, the responsibility for light rail does rest with Transport for New South Wales (TfNSW).

### 6.3.2 FIRST PRINCIPLES RISK BASED APPROACH

In the absence of appropriate light rail engineering standards, a 'first principles' risk based approach will be applied to the design interface points scoped in this report.

This will be supported by precedent examples from the existing Metro light rail alignment and its extension (including CBD and inner west) as well as where appropriate:

- Other Australian jurisdictions with light rail in use, particularly Melbourne; and
- Heavy rail corridor examples where appropriate, although it is acknowledged that heavy rail has an elevated risk profile to that of light rail.

It is anticipated that points of interest will include window openings on the building in close proximity to the light rail corridor and use of cranes adjacent the light rail corridor.

With reference to window openings, the example of train operation in close proximity to existing buildings is Yarra trams in Melbourne. The operator does not mandate the type or style of window, nor prevent opening windows on buildings along the tram routes. This principle is expected to be adopted for the extension of the Metro Light Rail System network through existing built up areas in Sydney. Despite this, window restrictions of 125mm are proposed to the western elevation, consistent with Building W2.

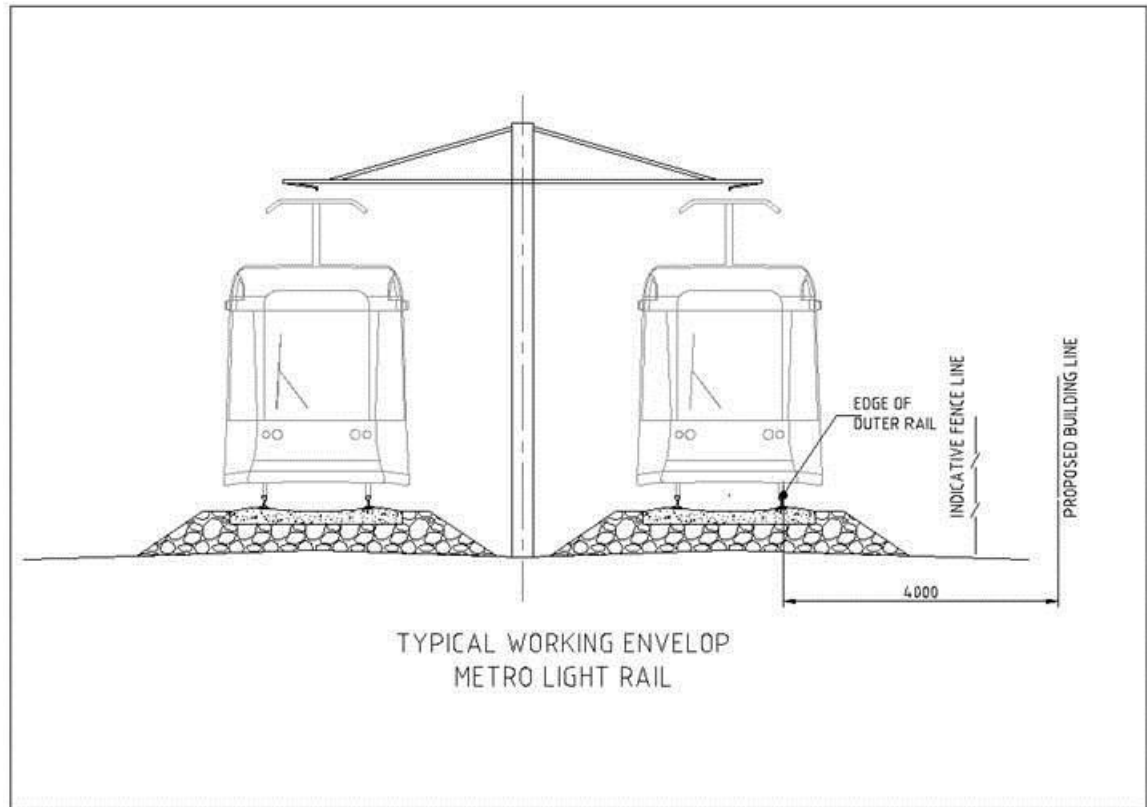
Urbanest has agreed the terms of erection and operation of a tower crane on the W2 site with TfNSW. Key requirements of these terms include 'out of service' radius not to encroach into rail corridor and use of radius restricting software when in operation. TfNSW have been made aware and acknowledge the same crane will be in use for the construction of Building W1 as referenced in the W2 Building Works Deed.

## 6.4 BUILDING LOCATION

### 6.4.1 BUILDING FOOTPRINT AND PROPOSED BOUNDARY

Proposed as part of the Stage 1 Concept Proposal (SSDA2), transfer of land and fencing of the common boundary has been completed. All Railcorp services and infrastructure including electrical and communications cables and light rail stanchions have been relocated into the rail corridor and recommissioned by TfNSW.

To accommodate the proposed building, the existing rail corridor boundary has been realigned to an agreed distance from the nearest track with the ground floor building line setback 4.0m from the nearest rail. The building footprint is proposed to be as close as the Operator's works standards allow, in this case the property boundary is proposed to be outside the kinematic clearance envelope plus 200mm safety margin (refer typical cross section below). A property boundary fence will be constructed between the building and the track which will then return into the building with gated access restricted to building cleaning and maintenance staff only.



## 6.5 BUILDING DESIGN

### 6.5.1 WINDOW OPENINGS & BALCONIES

The DA currently proposes window openings to the western façade of the Student Accommodation building facing the light rail corridor. These 125mm window openings will provide appropriate levels of natural ventilation and amenity to residents and have been designed in consultation and agreement with TfNSW.

Further to this consultative design process, it is noted that;

- No balconies have been incorporated within the building design
- Windows do not open beyond the depth of the window reveal.

This approach has been developed in response to the feedback received through the various stakeholder meetings conducted through the design process to date.

It is considered that this would be appropriate as it would eliminate the risk of any large items being dropped and the windows' reveal ledges would catch the smaller items. The small opening eliminates the ability of persons to throw items out the window.

This approach to limit the extent to which windows can be opened is consistent with other Light Rail precedents in Sydney and to a lesser extent Heavy Rail, such as the Era by Mirvac project in Chatswood.

In the context of light rail, the Melbourne light rail operator Yarra Trams does not limit, in any way, windows overlooking tram corridors. Furthermore, at the time of writing, there was no

evidence of any proposals to retrofit window opening limiters to new or extended light rail routes within Sydney by Metro Transport Sydney or by TfNSW.

Accordingly, standards which have been applied to recent heavy rail examples have informed this development, although it is our belief that they are onerous and conservative and are not consistent with the urban environment in which light rail is designed to operate.

## 6.5.2 NOISE AND VIBRATION

Refer to the Noise and Vibration Impact Assessment prepared by Acoustic Logic submitted in support of this DA.

## 6.5.3 IMPACT PROTECTION

In the absence of Light Rail standards for impact protection, this report refers to the Australian Standard AS 5100.1-2004, Bridge Design, including structures other than bridges, that are required to support or resist road or railway traffic loads e.g. retaining structures, deflection walls, or structures built over or adjacent to railways, or both (refer Australian Standard AS 5100.2- 2004 clause 1(f) and 1(g)). A number of clauses of the Standard nominate that some of the requirements of those clauses shall be confirmed as accepted by the relevant authority or the owner of the structure before the design process is commenced.

The issue of collision protection requires consideration as part of the Student Accommodation Building design due to the close proximity of the buildings to the light rail tracks (4m at ground). Australian Standard AS 5100.2- 2004 Clause 11.3.2 refers to the design of deflection walls protecting structures and AS5100.2-2004 Clause 10.4.4 which refers to the structure clearances required from the track centreline (10m horizontally and 5m vertically) where the structure protection is not required. It is noted that these clearances are based on a heavy rail environment and there may be an appropriate design solution to reduce the level of collision protection if the relevant light rail authority is in agreement.

As part of the detailed design process for the building, a risk assessment workshop with the stakeholders and the designers will be held to identify the likelihood and risks of possible light rail vehicle derailment and to discuss the options and opportunities for mitigating the impact of a derailed vehicle. The key to this analysis will be an assessment of the consequences and likelihood of a derailment. It is possible that a derailed light rail vehicle would stop within the ballast area due to the slow speeds in the vicinity of the building.

One of the possible options to mitigate a derailment is to provide derailment containment throughout the light rail track. This approach is to contain a derailed train generally parallel to the running rails and within the immediate track environment to minimise other infrastructure damage. Another possible option is to construct a guide rail on the existing up track along the length of the buildings if deemed necessary. These options will be further considered and refined in consultations with the relevant stakeholders during the design development of the project.

## 6.5.4 ELECTRO- MAGNETIC FIELDS (EFM)

Transdev has indicated the light rail systems and rolling stock are unlikely to be affected by the building. However, the building systems may be affected by the light rail harmonics. Any electronic equipment installed in the Student Accommodation Building will need to consider the light rail environment and if affected by EMF may require filters to be installed to the building's electrical circuit.

## 6.6 BUILDING CONSTRUCTION

### 6.6.1 HOARDING LINE

It is proposed that the Student Accommodation building is constructed 4 metres from the nearest rail. Construction at this distance will necessitate installation of temporary non-conductive or earthed hoarding for the full length of the construction site to a height agreed by the operator Veolia. Similar hoarding has been put in place on RailCorp construction projects in close proximity to live overhead lines and operating trains.

It is proposed that the hoarding line is set up at a 2.0m distance from the near rail. The hoarding line encroaches the light rail operator's clearance envelope which is defined as 3.0m from the near rail. It is anticipated that approval would be sought from the operator to occupy the zone for the duration of construction works. The distance of 2.0m from the rail is acceptable if no parallel access with the track is required. The kinematic envelope of the light rail vehicles plus 200mm safety margin will fit within the provided space to the hoarding line. It is preferable if the hoarding line is clear from the ballast edge, in this case the proposed hoarding line is outside the ballast edge. During the construction period while the hoarding is in place there may be maintenance implications, such as access, which will need to be addressed and agreed with the Light Rail Authority.

### 6.6.2 USE OF CRANES

Urbanest has agreed the terms of erection and operation of a tower crane on the W2 site with TfNSW. Key requirements of these terms include 'out of service' radius not to encroach into rail corridor and use of radius restricting software when in operation. TfNSW have been made aware and acknowledge the same crane will be in use for the construction of Building W1.

### 6.6.3 POTENTIAL SERVICES CROSSINGS

The requirements for site wide infrastructure may necessitate new service crossings to the light rail. Any crossing would be subject to a separate Development Application.



## 6.7 BUILDING OPERATION AND MAINTENANCE

Maintenance of the completed structure will be considered during design development and is anticipated to cover regular/ program cleaning and maintenance as well out of sequence maintenance requirements.

Building Maintenance Unit (BMU) has been negotiated and agreed with TfNSW for the W2 Plot building as documented in the Works Deed. This same approach has already been discussed with TfNSW and will be adopted for Building W1.

### 6.7.1 MAINTENANCE AND CLEANING OF LOWER LEVELS

Maintenance and cleaning of the lower levels of the student accommodation buildings could be performed from the ground within the property boundary. The proposed building façade at ground and first level will be approximately 1.0m from the boundary fence which would be a secure area with restricted access for cleaning and maintenance personnel.

## 7 RECOMMENDATIONS

Hyder Consulting recommendations are set out below:

1. A risk assessment workshop should be undertaken to identify and mitigate the risks regarding the impact protection of the buildings from the light rail vehicles in the event of derailment.
2. Urbanest should consult with Transdev in regard to construction requirements including:-
  - Static and climbing screen (as per Building W2).
  - Operation of tower cranes adjacent the live light rail corridor in accordance with established procedures (as per Building W2).
  - Window cleaning procedures and maintenance requirements based on the window opening design principle set out in this report (as per Building W2).
  - Routine and unscheduled building facade maintenance procedures (as per Building W2).
3. The works within the light rail corridor should comply with the approach set out in this report and the procedures set out in the Veolia "Light Rail Contractors Document" March 2011 Doc. Number 10737 Rev 0 and Veolia "Light Rail Envelope Brief" March 2011 Doc. Number 10738 Rev 0. It is our understanding that these two reports (or the content of) will be adopted by the new light rail operator - Transdev.

These documents set out the system access requirements, working procedures, permits required and costs associated with undertaking work which impacts on the operations and assets of the light rail operator. The documents cover basic clearance restrictions, notice for planned works, permits required, costs and responsibilities. The 'Light Rail Contractors Document' described above covers construction requirements in more detail and should be read in conjunction with the 'Light Rail Envelope Brief'.





## APPENDIX A

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# LIGHT RAIL PLAN