14 Visual impacts and urban design

This chapter provides an assessment of the urban design, landscape character and visual amenity implications associated with the project. The Technical working paper: Landscape character and visual impact and the Urban design report have been prepared, and are provided in **Appendix K** and **Appendix L**. This chapter provides a summary of those documents and an assessment of the potential impacts of the project.

Table 14-1 sets out the Secretary's Environmental Assessment Requirements (SEARs) as they relate to urban design, landscape character and visual amenity, and notes where these have been addressed in the environmental impact statement (EIS).

Table 14-1 SEARs – urban design, landscape character and visual amenity

SEARs	Where addressed
A consideration of the urban design and visual amenity implications of the proposal, including supporting infrastructure, during construction and operation. The assessment must identify urban design and landscaping objectives to enhance the ventilation stacks, interchanges, tunnels, 'cut and cover' arrangements, consider resulting residual land and treatments, and demonstrate how the proposed hard and soft urban design elements of the proposal would be consistent with the existing and desired future character of the area traversed affected by the proposal.	Potential impacts to visual amenity during the construction and operation phase are provided in **Sections 14.3.1** and **14.3.2**. Urban design and landscaping objectives are provided in **Section 14.1.3** and Sections 3.1 and 3.3 of **Appendix L**. Consideration of the existing and desired future character of the area is provided in **Sections 14.1.1** and **14.3.2**.
Identification of opportunities to utilise surplus or residual land, and utilise key structures (such as stacks) for multiple uses ie integration with other structures.	Refer to **Sections 14.3.1**, **14.3.2**, **13.2.1** and **13.2.2**.
Evaluation of the visual impacts and urban design aspects of the proposal (and its components) on surrounding areas, and consistency with the urban and landscape design of the M5 East Motorway and WestConnex Urban Design Corridor Framework.	Refer to **Section 14.1.3**.
A consideration of impacts on views and vistas, streetscapes, key sites and building, and direct amenity impacts (such as proximity and overshadowing).	Refer to **Sections 14.3.1** and **14.3.2**.
Details of urban design and landscape mitigation measures, having regard to the urban design and landscape objectives for the proposal.	Refer to **Section 14.4**.
Measures to manage lighting impacts both during construction and operation, in particular lighting of the St Peters interchange and impacts on the operation of Sydney Airport.	Refer to **Section 14.4**.
Artists' impressions and perspective visualisations of the proposal from a variety of locations along and adjacent to the route.	Refer to **Section 14.3.2**, and Section 5.2 to 5.6 of **Appendix L** and Section 6 of **Appendix K**.

14.1 Assessment methodology

The urban design, landscape character and visual amenity impact assessment within this chapter has been undertaken in accordance with the *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime, 2013b), the *WestConnex Urban Design Corridor Framework*, and *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014c). Further guidelines used to inform this impact assessment include:

- Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (Roads and Maritime, 2012)
- Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Roads and Traffic Authority, 2011)
- Noise Wall Design Guideline: Design guidelines to improve the appearance of noise walls in NSW (Roads and Traffic Authority, 2006)
- Shotcrete Design Guidelines – Design guidelines to avoid, minimise and improve the appearance of Shotcrete (Roads and Traffic Authority, 2005b)
- *Designing to Minimise Vandalism* (Final Draft) (Roads and Traffic Authority, 2008a)
- Landscape Guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding (Roads and Traffic Authority, 2008)

The assessment comprised three components: an urban design assessment, a visual assessment and a landscape character assessment.

Key steps in the urban design, landscape character and visual amenity impact assessment included:

- Analysis of the landscape and visual context, including:
  - Assessment of the existing landscape character and visual environment
  - Definition of landscape character zones
  - Identification of potential views to the project during construction and operation
- Summary of the policy and planning setting
- Identification of urban design and landscape objectives
- Assessment of potential impacts and benefits during construction and operation
- Identification of reasonable and feasible mitigation measures.

Aboriginal and non-Aboriginal heritage items were also considered as although they may not be directly affected by the project, they may be indirectly impacted through physical and visual encroachment into curtilage areas, and changes to the heritage context of the landscape. Visual impacts to Aboriginal heritage have been assessed in **Sections 23.3.1** and **23.3.2**. Visual impacts to non-Aboriginal heritage items have been assessed in Section 8.7 and Table 60 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**), and are summarised in **Sections 20.3.1** to **20.3.3**.

14.1.1 Analysis of the landscape and visual context

Assessment of the existing environment

The existing landscape and visual environment along the project has been assessed through a desktop review of aerial photography, geographic information system (GIS) mapping of topography and vegetation, land use mapping and site inspections. A description of the existing landscape and visual environment is provided in **Sections 14.2.1** to **14.2.4**.

An assessment of the visibility of key project elements from surrounding areas has been facilitated through the use of a visual envelope model. The visual envelope model uses GIS mapping to plot areas which would be able to see the highest point of the major portion of each project element. The GIS map contains landform, generally without consideration of land cover such as trees or houses, which may provide screening.

Definition of landscape character zones

In order to assess potential landscape character impacts, the project corridor has been divided into separate areas, with each assigned one of five landscape character zones as follows:

- Residential
- Industrial
- Recreational
- Transport corridor
- Urban centre
- Commercial corridor.

These landscape character zones relate to the existing environment prior to constructing the project and are summarised in **Table 14-6**. The landscape character zones have been identified based on areas of landscape with similar characteristics or strongly defined spatial qualities, visually distinct from adjoining areas. As the majority of the project comprises underground infrastructure, the landscape character zones have focused on surface areas.

Operational components of the project are described in detail in **Section 14.3.2**. The potential impacts on landscape character as a result of the operation of the project are assessed in **Table 14-14**. Works undertaken as part of the construction stage have also been assessed for landscape character impacts.

Identification of potential views to the project

The assessment of visual impacts is based on viewpoints or the viewshed within which project components may be seen. Key project components which may be visible during construction and operation include:

- Construction:
  - Construction activities and construction disturbance areas
  - Construction ancillary facilities, such as temporary construction compounds
- Operation:
  - The Kingsgrove motorway operations complex (MOC1) and western surface works
  - Bexley Road South motorway operations complex (MOC2)
  - Arncliffe motorway operations complex (MOC3)
  - The St Peters interchange and local road upgrades, and the St Peters and Burrows Road motorway operations complexes (MOC4 and MOC5).

The visual impact assessment and night lighting assessment in **Sections 14.3.1** and **14.3.2** have considered potential views of these key project components during construction and operation.

14.1.2 Policy and planning setting

The policy and planning setting for the project and its potential landscape and visual impacts has been established based on the following regional planning documents and relevant Local Environment Plans (LEPs):

- Sydney Regional Environmental Plan No. 33 – Cooks Cove, a deemed State Environmental Planning Policy
- Princes Highway Corridor Strategy 2013 (Rockdale City Council, 2013)
- Hurstville Local Environment Plan 2012 (Hurstville LEP 2012)
- Canterbury Local Environment Plan (Canterbury LEP 2012)
- Rockdale Local Environment Plan (Rockdale LEP 2011)
- Sydney Local Environment Plan (Sydney LEP 2012)
- Marrickville Local Environment Plan (Marrickville LEP 2011).

The Cooks Cove Growth Centre is a 100 hectare precinct, which is bounded by the Cooks River and Muddy Creek, Marsh Street, West Botany Street and Bestic Street. It is subject to *Sydney Regional Environmental Plan No. 33 – Cooks Cove*. Preliminary strategies identified an area for employment uses near Marsh Street with the remainder of the site to be set aside for conservation, open space and recreational purposes. Planning for the site is now being handled by the Urban Growth Development Corporation. However, it is understood that the Department of Planning and Environment (DP&E) is investigating the site as a potential priority precinct, which may result in changes to the current land use zonings. Future development of land (including re-zoning) in the vicinity of the ventilation facility that involves multi-storey buildings would need to consider the air dispersion performance of the facility.

The Princes Highway Corridor Strategy, an initiative of Rockdale City Council, was adopted by the Council in late 2013. The strategy focuses on revitalising the corridor within the Rockdale local government area for employment uses and growing the Arncliffe town centre. This strategy recommends changes to the distribution of residential, mixed use and business zones, as well as increased densities.

The desired future character of the area has been informed by the strategic direction provided in these documents. Existing land use zonings and the desired character of these zonings are summarised in **Table 14-2**. Details of potential land use and property impacts are provided in **Sections 13.2.1** to **13.2.2** (Land use and property) of the EIS.

Table 14-2 Land use zonings within areas of the project

Area of project	Description of land use zoning
Western surface works	The M5 East Motorway corridor is zoned as SP2 Infrastructure under both the Hurstville LEP 2012 and the Canterbury LEP 2012. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. The land to the north of the M5 East Motorway and western surface works area is zoned as RE1 Public Recreation, R3 Medium Density Residential, IN2 Light Industrial under the Canterbury LEP 2012. The land to the south of the M5 East Motorway and western surface works area is zoned as R2 Low Density Residential and IN2 Light Industrial, with some pockets of RE1 Public Recreation under the Hurstville LEP 2012. This zoning reflects the desire to maintain the existing low-medium density residential character and suburban setting of the area, with pockets of bushland.

Area of project	Description of land use zoning
Bexley Road surface works	The M5 East Motorway and Bexley Road are zoned as SP2 Infrastructure under the Canterbury LEP 2012. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. North of the M5 East Motorway and west of Bexley Road is zoned as R3 Medium Density Residential and some pockets of RE1 Public Recreation under the Canterbury LEP 2012. East of Bexley Road is zoned as R2 Low Density Residential, E1 National Parks and Nature Reserves and some pockets of RE1 Public Recreation under the Canterbury LEP 2012. This zoning reflects the desire to maintain the existing low-medium density residential character and bushland setting of the area. South of the M5 East Motorway and west of Bexley Road is zoned as R2 Low Density Residential, RE1 Public Recreation, and SP2 Infrastructure (along the East Hills railway line) under the Canterbury LEP 2012. This zoning reflects the desire to maintain the existing low density residential character and bushland setting of the area, while maintaining accessibility.
Arncliffe surface works	East of the Kogarah Golf Course is Sydney Airport which is zoned as SP2 Infrastructure under the Rockdale LEP 2011. This zoning reflects a desire to maintain accessibility, supporting economic activity, tourism and efficient freight movement.Marsh Street and West Botany Street, to the north and west of the Kogarah Golf Course, are zoned as SP2 Infrastructure under the Rockdale LEP 2011. This zoning reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The north of the Kogarah Golf Course, along Marsh Street, is zoned as R2 Low Density Residential, B4 Mixed Use, R4 High Density Residential and RE1 Public Recreation under the Rockdale LEP 2011. This zoning reflects the desire to maintain the residential character of the area along with integrated business development and recreational areas, in keeping with the *Sydney Regional Environmental Plan No. 33 – Cooks Cove* and the *Princes Highway Corridor Strategy.* The west of the Kogarah Golf Course, along West Botany Street, is zoned as R2 Low Density Residential. This zoning reflects the desire to maintain the existing low density residential character of the area.
St Peters interchange and local road upgrades	The Princes Highway is zoned as SP2 Infrastructure under the Rockdale LEP 2011 and Campbell Road is zoned as SP2 Infrastructure under Sydney LEP 2012. Canal Road is also zoned as SP2 Infrastructure under the Sydney LEP 2012 and the Marrickville LEP 2011 This zoning reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The Alexandria Landfill (the future site of the St Peters interchange) is zoned as SP2 Infrastructure (Sydney LEP 2012) and IN1 General Industrial (Rockdale LEP 2011). To the north of the Alexandria Landfill along the Princes Highway are areas zoned as B6 Enterprise Corridor and B4 Mixed Use, to the east along Campbell Street and Campbell Road are areas zoned as IN2 Light Industrial and R1 General Residential under the Rockdale LEP 2011, and RE1 Public Recreation under the Sydney LEP 2012. To the east and south along Burrows Road and the Alexandra Canal the land is zoned as IN1 General Industrial under the Sydney LEP 2012. To the west of the landfill and Canal Road is land zoned as IN1 General Industrial under the Marrickville LEP 2011. The zoning of the areas surrounding the St Peters interchange identify that the desired future character of the broader area is to retain the existing low to medium density development, whilst also continuing to encourage business development within the enterprise corridor and mixed use areas and industrial development contained within the existing industrial areas.

14.1.3 Urban and landscape design

The WestConnex Urban Design Framework provides specific urban design direction for the development and delivery of WestConnex in the form of design objectives. Each of the WestConnex Motorway Urban Design Framework objectives is supported by design principles that guide the urban design and provide a benchmark against which to assess outcomes. The relevant urban design objectives of the project are outlined in **Table 14-3**.

An Urban Design Review Panel has been formed to oversee development of urban and landscape design for the project. The role of the Panel is to provide advice regarding the urban design concept and its development. The Panel makes recommendations in relation to architecture, urban and landscape design and artistic aspects of the project.

A landscape and urban design plan would be prepared in consultation with the local community and the Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay local councils. It would include input from the New M5 Urban Design Review Panel to ensure the requisite design quality is achieved. Refer to **Section 14-44** for more detail.

Table 14-3 Specific urban design objectives and their application to the project

Objective	Application to project
Environmental Responsiveness: Planning, design construction and long term management shall be based upon a natural systems approach which is responsive to the environment and promotes the highest levels of sustainability.	• Protect and retain as much existing vegetation as possible to minimise the footprint, maximise vegetated screening and reduce loss of green space and green links • Use only containerised planting stock to facilitate rapid establishment of new landscape installations • Include plant species that reinforce local indigenous plant communities • Key elements such as retaining walls and noise barriers would have textured surfaces where needed to discourage vandalism and contain anti-graffiti coatings allowing easy graffiti removal • Balance the composition of built form and landscape by maximising planting opportunities including large trees as a foil for the proposed infrastructure elements and to help in cooling, masking noise and improving air quality • Use of dimmable light emitting diode strip lighting and other energy saving products for lighting.
Connectivity and Legibility: Build connectivity across the city, beyond the boundaries of the M5 East Motorway corridor and promote increased legibility of places, buildings, streets and landmarks.	The design would create a simple, legible and inviting design solution that: • Provides self-explanatory roads with geometry and design to match posted speeds and ease of way-finding • Enhances and creates active transport infrastructure to provide safe and seamless journeys for pedestrians and cyclists • Enhances and creates connections to and from public open space • Provides visual stimuli within the tunnel to create a progressive sequence of events for the motorist.
Placemaking: Create beautiful places, streets, structures and landscapes that draw their form, character and materiality from local context, the intrinsic natural and cultural qualities of each locale.	The design would add to local places, streets, structures and landscape and minimise impacts on the local community through the following design treatments: • Use of high quality, robust and functional materials and products in the public domain • Activating the edges of public spaces through design by considering pedestrians and cyclists and adjacent land uses • Offering opportunities for the future redevelopment and renewal of land along the corridor.

Objective	Application to project
Urban renewal and liveability: Enable opportunities for urban renewal and provide high levels of urban amenity and livability.	The design would consider and integrate with local movement networks, places and land uses to support existing urban renewal and enable future opportunities for urban renewal by: • Improving access to public and active transport • Enhancing local street, pedestrian and bus connectivity (through a regular street edge) • Removing surface traffic creating long term improvements in air quality and noise on surface roads and streets that support pedestrian activity • Creation of new dedicated cycle paths, shared paths, footpaths and crossings to improve active transport connections • Providing extensive tree planting of endemic species to achieve canopy cover for shade, shelter and habitat.
Memorable identity and a safe, enjoyable experience: Provide a memorable project identity and experiences for road users and adjacent stakeholders that are safe, convenient and enjoyable.	A memorable identity would be created with a high quality user experience for motorists and adjacent communities by: • Keeping a simple and consistent language of built elements and components to minimise visual clutter • Providing a secure environment including aspects such as passive surveillance, clear sight lines and lighting • Creating distinctive portal access points that reinforce the character of the local area and are respectful of the individual setting • Differentiating character zones and breaking up tunnel lengths to vary the driver experience and heighten awareness of geographical location through lighting, signage and art • Maximising opportunities to provide a well vegetated green corridor by maintaining or improving links to open space at the western surface works and providing public open space at the St Peters interchange.
A new quality benchmark: Provide design and construction quality of world class standard. WestConnex shall establish a new benchmark for integrated sustainability, engineering, art, architecture and urban design.	A world-class solution for the M5 East Motorway would be delivered that sets a benchmark in the travel experience. The design would establish an identity for the existing M5 East Motorway and future stages by: • Integrating the various existing and proposed built form elements such as portals, noise barriers and retaining walls to reinforce an integrated design that enhances visual unity and clarity • Utilising durable and high quality materials and providing good access to ensure the motorway maintains its identity for years to come.

14.1.4 Assessment of potential impacts during construction and operation

The impact assessment for the construction and operational phases of the project was undertaken as follows:

- A visual impact assessment for construction works, which evaluated the impact of the construction of the project on the surrounding landscape and receiver views from residential areas and those of passing road users. The following project components were included:
  - Construction compounds and tie-in works
  - Changes to pedestrian, cyclist and vehicular traffic movements to surrounding areas
  - Night lighting impacts
- An operational landscape character assessment evaluating the potential impacts of the project's operation on the combined quality of the built, natural and cultural aspects that make up the project area and provide its unique sense of place (see below for further detail)

- An operational visual impact assessment evaluating the impact of the project's operation on the surrounding landscape and receiver views from residential areas and those of passing road users. Project components considered included:
  - Operational facilities
  - Night lighting impacts (see below for further detail)
- Urban design assessment, which considered:
  - In-tunnel urban design
  - Integration of the project with surrounding areas
  - Benefits for local communities through provision of access and open space
  - Landscape and built form of permanent facilities.

Assessment of landscape character and visual impacts

The sensitivity of changes in landscape character and other visual impacts were compared to the magnitude of those changes. For the purposes of the visual assessment, the sensitivity of the landscape is based on the extent to which it can accept a particular type and scale of change without adverse character impacts. The magnitude of change affecting a landscape or visual receptor depends on factors such as the nature, scale and duration of the particular change. These concepts are explained further in Section 2.3.1 of Technical working paper: Landscape character and visual impact (**Appendix K**).

Potentially most affected visual receivers have been identified through a GIS mapping system taking into account topography and potential screening by vegetation and existing development. Artists' impressions of the project are included in the Technical working paper: Landscape character and visual impact. Select artists' impressions demonstrating the visual implications of 10 years post project are included in **Section 14.3.2**.

A visual envelope was defined by considering the extent to which elements of the project would be visible from surrounding areas. The visual envelope was broadly mapped to provide an indication of which parts of the project would be likely to be viewed from surrounding areas. The mapping typically shows 'worst case,' scenarios (eg some receivers may only see a small extent of a project surface facility, where as other closer receivers may view a substantial part of the infrastructure element).

With respect to ventilation facilities at Kingsgrove, Arncliffe and St Peters motorway operation complexes, a detailed review and finalisation of architectural treatment of the ventilation facilities would be undertaken during detailed design. This would be guided by the ventilation performance requirements and the following design principles, as well as outcomes of community consultation:

- Reflective of site and context
- Integration with landscape
- Sculptural urban scale objects – urban landmarks
- Forms informed by function
- Identifiable by their materiality
- Appropriate use of materials.

Further detail in these principles can be found in the Urban design report (**Appendix L**). For the purposes of this assessment, an envelope design has been considered with a preliminary architectural treatment concept.

Assessment of night lighting

The assessment of night lighting impacts considers the change from the existing situation using the visual impact grading matrix in Section 2.3.1 of Technical working paper: Landscape character and visual impact (**Appendix K**). An assessment has been carried out for each site, for both construction and operation phases. Residents and road users are the key receiver locations and are separately assessed. For both construction and operational phases of the project, the visual impact assessment assumed that light levels would be sufficient to meet work health and safety requirements, site security levels, whilst also meeting the operational requirements of Sydney Airport.

14.2 Existing environment

The project would traverse the suburbs of Narwee, Beverly Hills, Kingsgrove, Bexley North, Earlwood, Bardwell Park, Bardwell Valley, Arncliffe, Wolli Creek, Tempe, Sydenham, St Peters, Alexandria and Mascot. It comprises a series of contained surface works areas connected by two (east and west bound) tunnels. For the purposes of the Technical working paper: Landscape character and visual impact and the Urban design report (which are provided in **Appendix K** and **Appendix L**), the project has been divided into the following areas for analysis and assessment:

- Western surface works area
- Bexley Road surface works area
- Arncliffe surface works area
- St Peters interchange and local road upgrades surface works area.

A study area boundary for the visual assessment of each surface works area was defined as 500 metres from the boundary of the construction footprint associated with each surface works area (refer **Figure 14-1**). Due to the landform, tree cover, built form and street layout, the study areas provide reasonable boundary within which the project could visually influence the landscape through which the corridor runs. Further, the boundary of each surface works area has been assumed to be the boundary of the construction footprint of the project. As this would be greater in area than the operational footprint in most instances, this approach would represent the worst case scenario for disturbance.

The existing environment of the project area contains a mixed level of visual amenity. This is due to a variety of factors, most significantly the fact that road and rail transport corridors already exist through much of the project area. Furthermore, there are few iconic views available within the project area, and some sections of the project area (such as the existing Alexandria landfill) do not currently provide a high level of visual amenity.

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Figure 14-1 Project area and study area boundary

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14.2.1 Western surface works area

Topography and visibility

The western surface works area gently rises in elevation from east to west. Around half of the western surface works area (west of the Kindilan underpass) lies on a valley floor. Elevated land visually buffers the M5 East Motorway from the surrounding landscape. Despite its elevation in places, views to and from the western surface works area are limited due to the prevalence of mature tree cover in the surrounding landscape, the gentle, even rise of the landform between valley and ridgeline, and industrial development in the valley floor to the south of the M5 East Motorway.

Context

The western surface works area ties in with the existing M5 East Motorway and is surrounded by a mix of residential and light industrial development. The central portion of the area is bounded by Canterbury Golf Course to the north, which is buffered from the M5 East Motorway by a patch of Cooks River / Castlereagh Ironbark Forest (ie the Beverly Grove bushland).

The M5 East Motorway is flanked on both sides by the M5 Linear Park, which provides a pedestrian and cycle path linking pockets of recreational open space of varying sizes, including a road reserve area. Wolli Creek runs roughly parallel to the M5 Linear Park, comprising a fenced concrete channel with occasional pockets of in-channel vegetation (either reed beds or weedy tree species).

Housing in the area is zoned medium density residential to the north and low density residential to the south of the M5 East Motorway corridor. Surrounding suburbs contain well established landscapes (gardens and parks) and mature street trees.

The Airport, Inner West and South railway corridor runs south of the M5 East Motorway with a local mixed use urban centre located at Kingsgrove Railway Station. Views between this area and the western surface works area are screened by vegetation and buildings.

Key non-Aboriginal heritage items and conservation areas in and around the western surface works area include:

- Welfare Avenue Urban Conservation Area, listed on the Register for the National Estate (a non-statutory register)
- Pallamana Parade Urban Conservation Area, listed on the Register for the National Estate, a non-statutory register, located in Beverly Hills
- Kingsgrove Railway Station Group (local heritage significance) located at corner of Kingsgrove Road and Commercial Road, Kingsgrove
- Kingsgrove East urban conservation area, listed on the Register of the National Estate (a non-statutory register), located in Kingsgrove
- The Kingsgrove West Urban Conservation Area, listed on the Register of the National Estate (a non-statutory register), which lies just west of the Kingsgrove East urban conservation area.

Further information on visual impacts to these and other non-Aboriginal heritage items can be found in Section 7.4 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). These impacts are summarised in **Sections 20.3.1** and **20.3.3**. None of the above listed non-Aboriginal heritage items would experience significant visual impacts as a result of the project.

Landscape character zones

The existing landscape character of the landscape zones around the western surface works area are identified in **Table 14-4** and shown in **Figure 14-2** to **Figure 14-5**.

Table 14-4 Description of landscape character zones – Western surface works

Landscape character zone	Description
Residential	This zone flanks the western surface works area along its north-western, south-western and central-northern boundaries. It consists of low and medium density residences, predominantly single and double storey houses on individual lots with mature landscaping and street trees. Residential housing is generally buffered along the M5 East Motorway by a strip of recreational land, ranging in width from a pedestrian / cycle path pavement to a wider tract of recreational land.
Industrial	There are two pockets of industrial development near the western surface works area, one to the north and one to the south of the M5 East Motorway. The northern pocket comprises an older mix of light industrial buildings, each addressing streets lined with mature street trees. This industrial zone abuts residential neighbours to the west and east, Clemton Park to the north and the M5 East Motorway to the south. The southern pocket contains a mix of older style, low rise light industrial buildings with mature street trees, in addition to more recent, larger scale industrial complexes. It lies between the M5 Linear Park and the Airport, Inner West and South railway corridor on the valley floor. It is buffered from residential development by the railway corridor to the south, Kingsgrove Road to the east, the M5 Linear Park to the north, and by the continuation of Beverly Grove Park South towards the west.
Recreational	Several pockets of recreational land lie within the western surface works area: • Recreational land within or in the vicinity of the M5 Linear Park including: – Four small pocket parks and one pocket park with a large stormwater basin to the north and south of the M5 East Motorway along the pedestrian / cyclist pathway between Cooloongatta Road and Kooemba Road – Tallawalla Reserve on Tallawalla Street – Beverly Grove Park South, south of the M5 East Motorway and north of Wolli Creek at the eastern end of the western surface works area – Beverly Grove Park North, north of the M5 East Motorway and abutting back fences of residences on Rosebank Avenue, Armitree Street and Glamis Street • Recreational land outside the M5 Linear Park such as Beverly Hills Park • Canterbury Golf Course • Beverly Grove bushland, a patch of Cooks River / Castlereagh Ironbark Forest, a critically Endangered Ecological Community.
Transport corridor	The transport corridor comprises: • The M5 East Motorway • The Airport, Inner West and South railway corridor • Major road corridors such as King Georges Road and Kingsgrove Road. While these are large scale transport corridors, the urban design and land use on either side of the roadways help to integrate these elements into the surrounding landscape.
Urban centre	An urban centre lies south-east of Kingsgrove Railway Station, along Kingsgrove Road around 200 metres from the south-eastern corner of the western surface works area. It comprises a small cluster of commercial development with a few scattered community facilities.

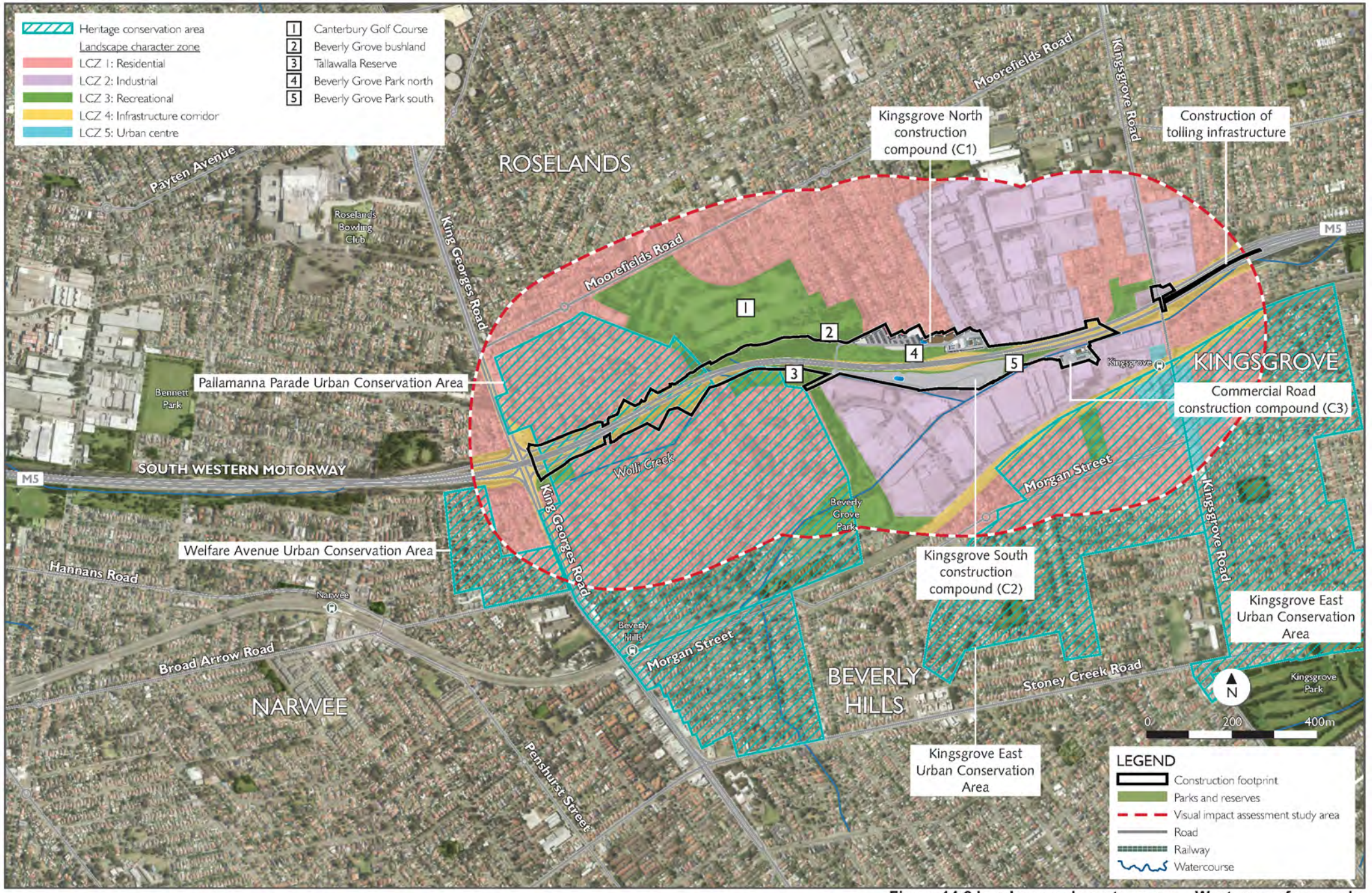

Figure 14-2 Landscape character zones - Western surface works

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14.2.2 Bexley Road surface works area

Topography and visibility

The Bexley Road surface works area lies north of Wolli Creek, broadly on the valley floor. The landform rises to the north almost immediately from Wolli Creek to a ridgeline around 400 metres north of the northern boundary of the site. The M5 East Motorway, adjacent to Wolli Creek to the north, has been built up above the valley floor, before entering a dive structure under Bexley Road.

Local screening elements at this location include:

- Barrier structures, such as noise barriers and screening walls, particularly associated with the M5 East Motorway corridor which limit views along Bexley Road
- Mature vegetation, including street trees, park trees, and riparian vegetation along Wolli Creek which particularly limit views from areas south of Wolli Creek northwards to the site and from areas to the east, where there is further riparian vegetation associated with Wolli Creek (east of Bexley Road)
- Landform, such as noise mounds and other mounds mitigating level changes between roadways and Wolli Creek.

Context

The Bexley Road surface works area is zoned SP2 infrastructure and is transected by the M5 East Motorway and Bexley Road into the three distinct areas – the Bexley Road North construction compound, the Bexley Road East construction compound and the Bexley Road South construction compound.

The Bexley Road North construction compound and Bexley Road East construction compound remain fenced off from public access. The Bexley Road South construction compound has been landscaped and is currently utilised as a public recreational area, part of the M5 Linear Park.

Wolli Creek flanks the Bexley Road South construction compound and the Bexley Road East construction compound to the south, comprising a fenced concrete channel with occasional pockets of in-channel vegetation, and a fringe of mature riparian vegetation. The land immediately south of Wolli Creek is zoned Public Recreation (RE1), and comprises a steep, densely vegetated embankment.

The western boundary of the Bexley Road North construction compound backs onto the backyards of residential properties, which front onto Flatrock Road and Jones Avenue. These dwellings lie within medium density residential land.

Along its north-eastern boundary, the Bexley Road North construction compound site is flanked by Bexley Road and low density residential development on land zoned for low density residential.

The Bexley Road East construction compound is bounded on the east by low density housing, and to the west by Bexley Road. To the south, the site adjoins a bushland area associated with the western extent of Bardwell Valley Park, which is zoned National Parks and Nature Reserves. At the boundary, the park is well vegetated with a mix of mature indigenous tree and shrub vegetation and woody weeds such as Large Leaf Privet. This vegetation effectively screens the Bexley Road East construction compound from the south.

Key non-Aboriginal heritage items and heritage conservation areas in and around the Bexley Road surface works area include:

- Bexley North Railway Station Group, listed on the Sydney Trains Section 170 Heritage and Conservation Register located in Bexley Road, Bexley North
- Wolli Creek culvert, listed on the Roads and Maritime Section 170 Heritage and Conservation Register, located in Bexley Road, Earlwood
- Clemton Park heritage conservation area, listed on the Register of the National Estate (a non-statutory register), located within and adjacent to the Bexley Road East construction compound

- Wolli Creek Valley, listed on the Rockdale LEP 2011 as an item of local significance and located to the east of the Bexley Road surface works.

Further information on visual impacts to these and other non-Aboriginal heritage items can be found in Section 7.4 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). These impacts are summarised in **Sections 20.3.1** to **20.3.3**. None of the above listed non-Aboriginal heritage items would experience significant visual impacts as a result of the project.

Landscape character zones

The existing landscape character of the landscape zones around the Bexley Road surface works area are identified in **Table 14-5** and shown in **Figure 14-3**.

Table 14-5 Description of landscape character zones – Bexley Road surface works area

Landscape character zone	Description
Residential	Land surrounding the Bexley Road surface works area is predominantly residential, zoned medium density to the west of Bexley Road, north of the M5 East Motorway, and low density in all other areas. This zone adjoins or lies adjacent to: • The western boundary of the Bexley Road North construction compound site (C4) • The northern and north eastern boundaries of the Bexley Road East compound site (C6).
Recreational	This zone can be broadly divided into three groups: • Parks with organised sporting facilities (Beaumont Park and Kingsgrove Avenue Reserve) • Parks typically characterised by flat topography and central playing fields surrounded by mature shade and street trees • Bushland reserves / National Parks (Bardwell Valley Park and Wolli Creek corridor).
Transport corridor	This zone comprises: • The M5 East Motorway • The railway corridor • Bexley Road corridor. The urban design and land use on either side of the roadway allows integration of these elements into the surrounding landscape.
Urban centre	An urban centre is situated on the southern side of the railway line adjacent to the Bexley Railway Station, around 150 metres from the south-eastern corner of the Bexley Road surface works area boundary. It comprises a small commercial area with shops, cafes and restaurants, community facilities (eg a public library), and a number of small pocket parks with limited facilities.

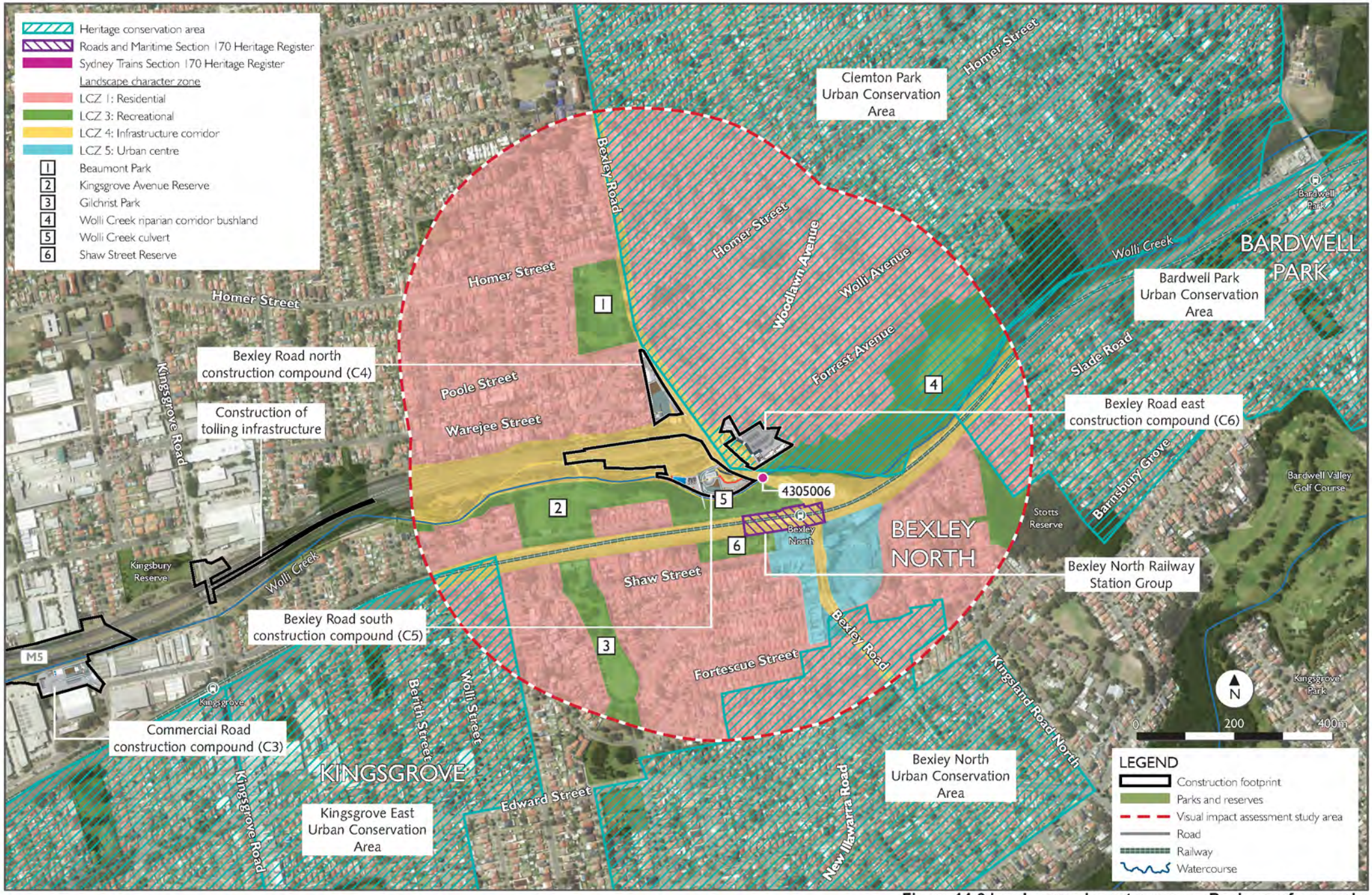

Figure 14-3 Landscape character zones - Bexley surface works

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14.2.3 Arncliffe surface works area

Topography and visibility

The Arncliffe surface works area is generally low-lying and flat due to its proximity to Cooks River and Botany Bay. The topography begins to rise from the north-western corner westwards, but there are no significant views to or across the area from ridgelines due to the gradual rise and distance from elevated ground. A view eastwards across the Arncliffe surface works area is available from the north western corner of the site on Marsh Street where the street rises to a bridge over the M5 East Motorway.

The Cooks River catchment is highly urbanised and is dominated by low density residential development and pockets of industrial areas concentrated in Botany along the Alexandra Canal. Views to the Arncliffe surface works area from much of the low density residential development are limited by the flat landform and low (single and double storey) housing, although some views are available from taller buildings in surrounding areas, namely from the high density and mixed use zoned land to the north of the site.

Views from the M5 East Motorway (along the western boundary of the Golf Course) are screened by landform, vegetation and noise barriers associated with the road corridor. No views are available from beyond the M5 East Motorway corridor (ie from Cahill Park and Riverine Park, which lie on the western side of the M5 East Motorway).

Context

The Arncliffe surface works area is located in the eastern corner of the Kogarah Golf Course. The Golf Course is a roughly triangular site, bounded by:

- Marsh Street, which forms the northern boundary of the site and crosses the Cooks River at the north-eastern boundary
- The M5 East Motorway / Eve Street cycle path along the south western boundary
- The Cooks River along the eastern boundary.

Arncliffe Railway Station is located around 600 metres east of the site at the corner of Burrows Road and Arncliffe Street.

The land to the east of the Arncliffe surface works area (on the eastern bank of the Cooks River) is Sydney Airport, which is zoned SP2 infrastructure. The majority of the land to the west of the site is zoned low density residential, with pockets of mixed use, high density residential and public recreation, particularly to the north of Marsh Street.

The Kogarah Golf Course is well connected to other recreational open space along the Cooks River, including Cahill Park to the north and Riverine Park to the south.

The Eve Street Cycle Path is part of the greater Cook Park Trail which runs along the north western and south western boundary of the Kogarah Golf Course. It is an off-road pedestrian and cycling route that follows the western foreshore of Botany Bay and connects with the Cooks River Cycleway at Tempe to the north, which leads to Olympic Park at Homebush.

In terms of non-Aboriginal heritage items in and around the Arncliffe surface works, the Western Outfall Main Sewer - Rockdale to Homebush (State Heritage Significance) is located at the corner of Marsh Street and M5 East Motorway Tempe. Further information on visual impacts to non-Aboriginal heritage items can be found in Table 60, Section 8.7 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). These impacts are summarised in **Sections 20.3.1** to **20.3.3**. The above listed non-Aboriginal heritage item would not experience significant visual impacts as a result of the project.

Landscape character zones

The existing landscape character of the landscape zones around the Arncliffe surface works area are identified in **Table 14-6** and shown in **Figure 14-4**.

Table 14-6 Description of landscape character zones – Arncliffe surface works area

Landscape character zone	Description
Residential	Residential land is located to the north, west and south of Kogarah Golf Course. This zone can be divided into two groups: • High Density Residential: – This zone comprises a small portion to the north of the site and borders Innesdale Road and Marsh Street – A combination of residential apartments and airport transit hotels overlook the Kogarah Golf Course and beyond. This area is characterised by closely spaced high rise buildings with limited green open space at ground level – Opportunities for district and regional views from these buildings would be available • The Low Density Residential: – This zone forms a large area to the west of Marsh Street, West Botany Street and south of the M5 East Motorway – This zone comprises predominantly single and double storey houses on individual lots with mature landscaping and street trees – Characterised by generally wide, quiet streets periodically traversed by transport corridors (eg Marsh Street, West Botany Street and the M5 East Motorway).
Recreational	A large expanse of recreational land lies within and to the north, south and east of Kogarah Golf Course. This zone can be broadly divided into two groups: • Recreation – open space: – This zone is characterised by green space used for passive and active recreational pursuits – This zone is zoned as Public Recreation and is well connected to other recreational open spaces along the Cooks River to the north and south – Kogarah Golf Course is contained within this zone • Recreation – waterways: – This zone is characterised by recreational land directly adjacent to waterways – They are often narrow (sometimes limited to pedestrian / cycle access only) with occasional breakout spaces, areas of mature ‘bushland’ pockets, and turfed recreation spaces – These areas are predominantly used for active recreation (walking / cycling) as well as the Cooks River waterway itself, which is used for active aquatic-based recreation activities such as rowing, kayaking and fishing to the north of the Marsh Street bridge. Refer to **Sections 16.3.1** and **16.3.2** for potential impacts of the project on this waterway – This zone is located north of the Marsh Street Bridge, along the Cooks River.
Infrastructure	This zone is utilitarian in nature, characterised by the individual spatial necessities of their transport uses. This zone is divided into two groups: • Infrastructure – transport corridor, comprising the M5 East Motorway, Marsh Street, West Botany Street and Wickham Street • Infrastructure – airport, comprising the land east of the Cooks River that forms Sydney Airport.

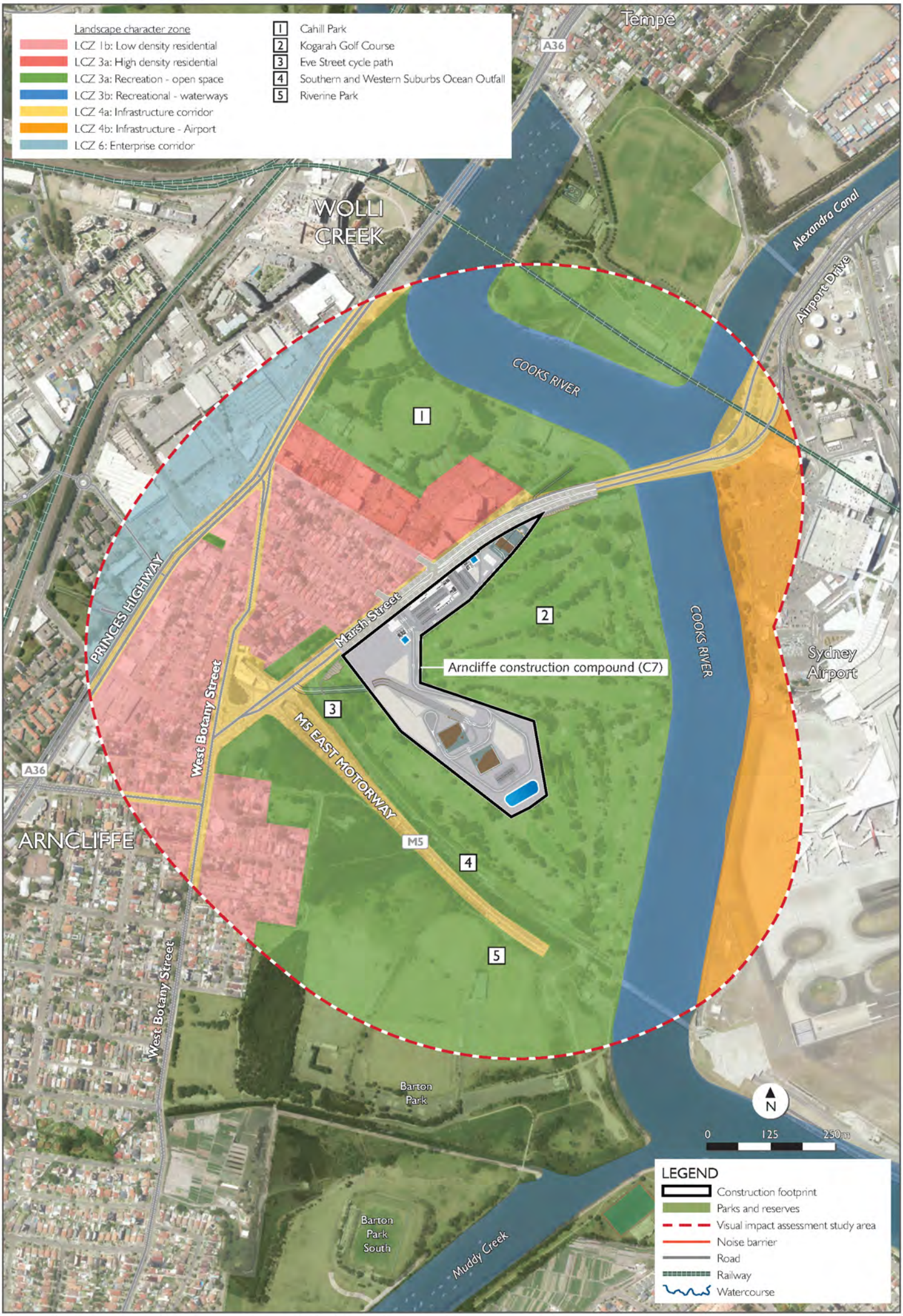

Figure 14-4 Landscape character zones - Arncliffe surface works

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14.2.4 St Peters interchange area

Topography and visibility

The St Peters interchange lies within a flat, low lying area adjacent to the Alexandra Canal. West of the Alexandra Canal, the landform gently rises to the Princes Highway corridor, which follows a low ridgeline. Views from the Princes Highway towards the Canal are generally screened by hoarding and opaque fencing surrounding existing industrial complexes along the Princes Highway. Some localised mounding on the northern side of the highway (such as from the St Peters Anglican Church) provides glimpses over the fencing and to the Alexandria Landfill, but views to the Canal itself are not available due to viewing distance and obstruction by buildings and vegetation.

The Alexandra Canal is bounded on both banks by large industrial complexes. Therefore no views from the Canal itself would be available to the project.

Sydney Park, located to the north of the St Peters interchange, comprises a series of constructed landforms, the tallest reaching around 30 metres in height. These landforms form the highest viewing positions within the surrounds of the St Peters interchange, providing views to Sydney Airport and the Sydney central business district. However no views are obtained to the Alexandria Landfill site due to mature fringing vegetation surrounding the park, residential housing and localised landform.

Context

The St Peters interchange site lies on land zoned as:

- IN1 General Industrial (majority of the site)
- SP2 Infrastructure
- IN2 Light Industrial (the north western corner at the Princes Highway, Canal Road intersection).

To the north of the St Peters interchange, the Princes Highway is an active business corridor with commercial and industrial development on both sides. This land is zoned B6 Enterprise Corridor, SP1 Special Activities, SP2 Infrastructure, RE2 Private Recreation and B4 Mixed Use. North of the development fronting the Princes Highway, the land is predominantly low density residential housing, with pockets of recreation spaces.

North of the St Peters interchange, Campbell Street is bounded by land zoned as R2 Low Density Residential to the south-west, and a mixture of B4 Mixed Use, B6 Enterprise Corridor, RE1 Public Recreation and R1 General Residential zoned land to the north. It is a narrow, two lane street bounded by terrace housing, vacant land, Simpson Park and industrial buildings.

Sydney Park, which is zoned RE1 Public Recreation, is located to the north of the proposed St Peters interchange and is the largest park in the City of Sydney at approximately 40 hectares in size. It is a regionally significant open space and a valuable community asset that would provide an important cycle and pedestrian connection to the St Peters interchange.

Main roads surrounding the proposed St Peters interchange include:

- Canal Road, which forms the south western boundary of the site and is a key arterial route serving the Sydney CBD as well as Sydney Airport and Port Botany
- Gardeners Road, which lies south east of the Alexandra Canal forms an important transport connection including as a heavy vehicle route.

The St Peters Railway Station, which forms part of the Bankstown to City line, is located around 700 metres north of the site at the corner of King Street and Lord Street.

Key non-Aboriginal heritage items and heritage conservation areas in and around the proposed St Peters interchange include:

- Southern Cross Hotel (Local Heritage Significance) located at 340 Princes Highway, St Peters
- Service Garage (Local Heritage Significance) located at corner of Canal Street and Princes Highway, St Peters
- Terrace Group (Local Heritage Significance) located at 2-34 Campbell Road, Alexandria
- Warehouse 'Rudders Bond Store' (Local Heritage Significance) located at 53-57 Campbell Road, Alexandria
- Alexandra Canal (State Heritage Significance) located at the confluence of the Cooks River
- Town and Country Hotel (Local Heritage Significance) located at 2 Unwins Bridge Road, St Peters
- Group of Victorian Filigree and Victorian Italianate terrace houses – 'Narara' (Local Heritage Significance) located at 4-18 Unwins Bridge Road, St Peters
- Waugh and Josephson industrial buildings (Local Heritage Significance) located at 1-7 Unwins Bridge Road, St Peters
- Goodsell Estate Conservation Area (Local Heritage Significance) located between Bedwin Road, May Street, Caroline and May Lane and the railway line, St Peters
- St Peters Anglican Church (State Heritage Significance) located at 187-209 Princes Highway, St Peters
- St Peters Brickpit Geological Site (Local Heritage Significance) located between Bedwin Road, May Street, Caroline and the Princes Highway, St Peters
- Cooks River Container Terminal (Local Heritage Significance) located at 20 Canal Road, St Peters
- Houses (Local Heritage Significance) located at 28-44 Campbell Street, St Peters
- House (Local Heritage Significance) located at 82 Campbell Street, St Peters
- Former site of 'Petersleigh', demolished in 1910 (Local Heritage Significance) located at 310 Princes Highway, St Peters
- Former site of 'Nun-Cotnook', demolished, c1920s (Local Heritage Significance) located at Corner of Berne Street and Princes Highway, St Peters
- Ricketty Street bridge crossing Alexandra Canal (Local Heritage Significance) at St Peters.

Further information on visual impacts to non-Aboriginal heritage items can be found in Section 8.7 and Table 60 of the Technical working paper: Non-Aboriginal heritage (**Appendix R**). These impacts are summarised in **Sections 20.3.1** to **20.3.3**. Of the above listed non-Aboriginal heritage items, only the Alexandra Canal would experience significant visual impacts as a result of the project.

Landscape character zones

The existing landscape character of the landscape zones around the proposed St Peters interchange area are identified in **Table 14-7** and shown in **Figure 14-5**.

Table 14-7 Description of landscape character zones – St Peters surface works area

Landscape character zone	Description
Residential	This zone lies to the north and north-west of the proposed St Peters interchange, lying over a gently undulating landform. The zone comprises: • Predominantly R2 Low Density zoned land, which is characterised by a mix of single and double storey brick and rendered terrace homes on small lots, punctuated by special use buildings such as schools and churches. Some newer townhouses and detached dwellings also exist within the terrace housing • Pockets of R1 General zoned land are dotted throughout the area (mainly along more major roads) and comprise low rise apartment blocks • A number of heritage listed items are located within this zone, including two groups of double storey 'Victorian' terrace houses located in Campbell Road and Unwins Bridge Road. The Campbell Road terraces, which are zoned R1 General Residential, comprise a row of double story terrace houses with rear lane access that backs onto Sydney Park. This zone is generally characterised by suburban streets that are periodically traversed by transport corridors, such as Campbell Road.
Industrial	Three distinct groups of industrial zoned land lie within the proposed St Peters interchange, including: • The former Alexandria Landfill site: – Much of the landfill site is not visible from the existing road network, due to the existing urban form, topography and screening provided by existing vegetation and mature street tree planting. Where the site does lie directly adjacent to a road, it is bound by tall solid fencing, hoardings or visually impenetrable sheds • The active industrial corridor which backs onto the Alexandra Canal: – Characterised by large, low lying industrial buildings and sheds with open, fenced lots between them for private car parking and truck loading facilities – While the buildings themselves address the main roads on either side of the Canal (namely Burrows Road and Bourke Road), glimpses can be seen between these large, long buildings to the Alexandra Canal – The streets are lined with large, mature trees – Some blocks act as storage areas for large shipping containers, which visually tie these industrial developments to the Canal and its history as an active shipping corridor • Large blocks of industrial land with large industrial complexes on them, many of which have internal courtyard car parking areas. These complexes visually address the streets in a similar manner to those backing onto the Alexandra Canal, with blank building fronts softened by mature street trees and occasional entries to car parks and courtyards at the rear of the buildings.

Landscape character zone	Description
Recreation	Due to the density of the surrounding residential area, recreational green space is highly used and valued by the local community. It typically comprises formalised, turfed parks with mature fringing vegetation (street trees). Recreational parks within the area fall within two categories: • Large scale parks: – Sydney Park is a regionally significant park located north of Campbell Road – The park topographically comprises a series of manmade landforms and wetlands – The park is characterised by large, open turfed areas and mounds, fringed with mature trees and screening vegetation, as well as pockets of dense vegetation – Facilities within the park include walking paths, BBQs, picnic facilities, seating, public toilets, a playground, and educational elements such as the water sensitive urban design initiatives (eg the bio retention systems) • Smaller sized pocket parks – Simpson Park: a small, flat, rectangular, local park located north of Campbell Street, fenced on all sides and consisting of a playground, cricket nets, and mature fig trees that line Campbell Street – Camdenville Park: a small park located on the corner of Unwins Bridge Road and Bedwin Road, comprising a playing field and detention basin.
Transport corridor	This zone comprises a number of major roads: • Princes Highway: – Strong linear transport corridor broadly following a low ridgeline and characterised by active retail, light industrial, and commercial development – Views are visually confined within the road corridor, predominantly due to built forms on either side of the road. Glimpses can be seen to the landscape beyond the fringing development along perpendicular roads and through gaps between buildings and commercial complexes – Utilitarian character with limited scenic amenity • Canal Road: – Visually characterised by industrial development on either side of the road – The road crosses over the Alexandra Canal, which provides views along the Canal to adjacent industrial development – The road corridor is intermittently flanked by substantial tree cover – The landform slopes away from the Princes Highway to the west.
Commercial corridor	This zone is an active business and commercial corridor which runs north - south adjacent to the Princes Highway. Although this zone broadly follows the ridgeline along the Princes Highway, views to the landscape beyond are limited by built form. The heritage listed St Peters Anglican Church sits on a natural high point and is the only area that contains substantial tree cover along the corridor within the area. The character of the zone is primarily influenced by the utilitarian nature of the road setting, with business and commercial development prominent on either side of the Princes Highway.

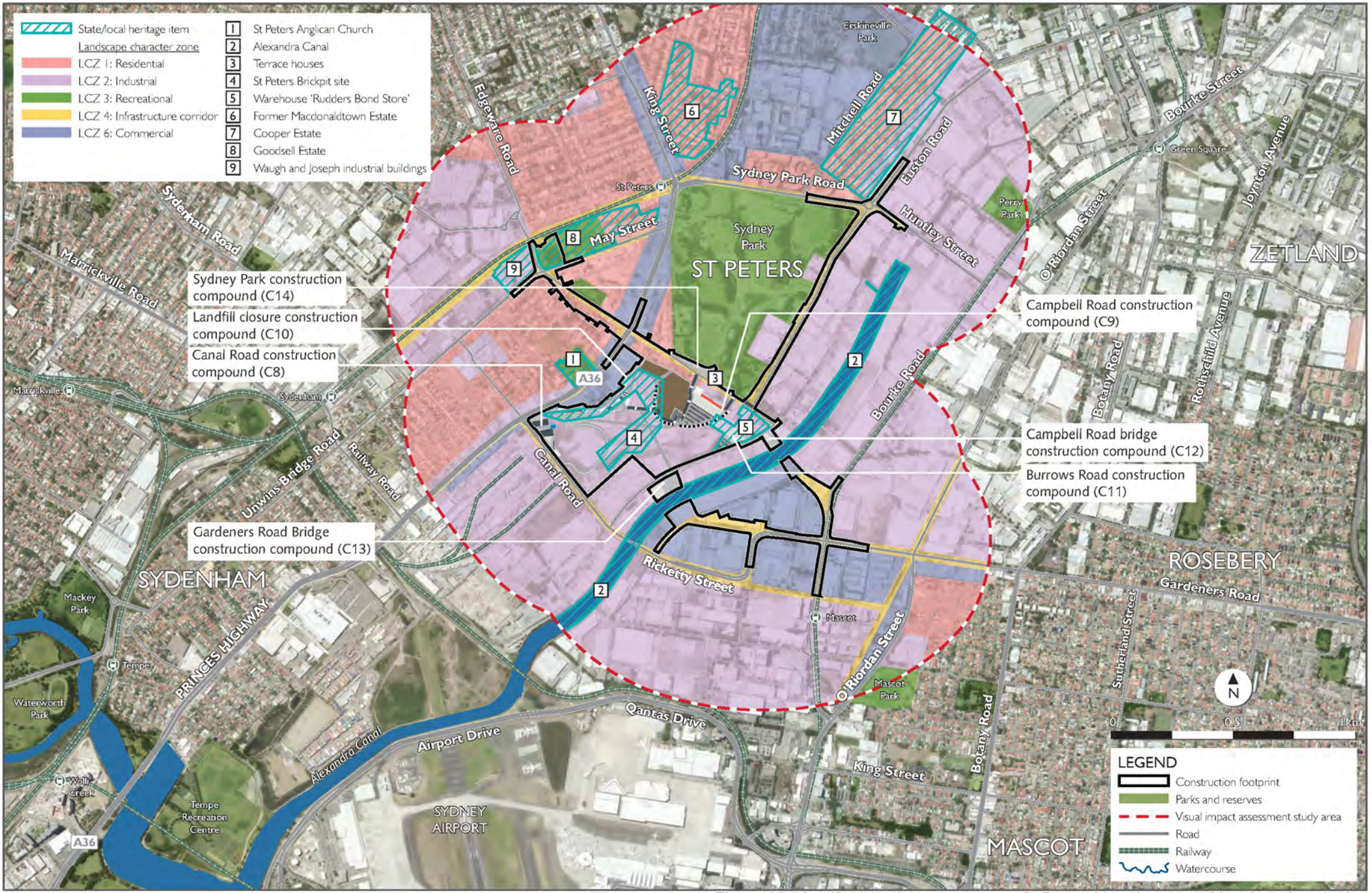

Figure 14-5 Landscape character zones - St Peters interchange and local road upgrades

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14.3 Assessment of potential impacts

14.3.1 Construction

The following sections provide an assessment of the potential construction visual impacts and the construction night lighting impacts of the project. Potential visual and lighting impacts associated with construction would be temporary for the duration of the works at each site and works would be undertaken to revegetate and rehabilitate each site on completion of construction.

Construction visual impacts

Visual impacts during the construction of the project would result from the introduction of construction activities and construction ancillary facilities into the existing urban landscape. For the purpose of assessing these impacts, temporary construction compounds and construction disturbance areas have been grouped depending on landscape and receiver contexts:

- Western surface works within the existing motorway corridor
- Pedestrian and Cyclist Routes – Beverly Hills, Kingsgrove, Bexley
- Kingsgrove North construction compound (C1)
- Kingsgrove South construction compound (C2)
- Commercial Road construction compound (C3)
- Bexley Road North construction compound (C4)
- Bexley Road South construction compound (C5)
- Bexley Road East construction compound (C6)
- Arncliffe construction compound (C7)
- Canal Road construction compound (C8)
- Campbell Road construction compound (C9)
- Landfill closure construction compound (C10)
- Burrows Road construction compound (C11)
- Alexandra Canal bridge construction compound (C12)
- Gardeners Road bridge construction compound (C13)
- Sydney Park construction compound (C14)
- Pedestrian and cyclist routes through the M5 Linear Park at Beverly Hills, Kingsgrove and Bexley and along the M5 East Motorway.

The location of each of the construction compounds is shown in **Figure 6-7** in **Section 6.6.4** (Construction work). **Section 14.3.1** provides a description of the duration and scope of works to be carried out at each site. The locations of representative receivers are identified in **Table 14-11**, and in Sections 6.1.1 to 6.1.14 of the Technical working paper: Landscape character and visual impact (**Appendix K**).

The potential visual impacts at each of these sites are assessed further in this section.

M5 East Motorway in-road construction activity

To ensure the capacity on the existing M5 East Motorway is maintained whilst construction work is in progress, the western surface works would be constructed over the traffic stages outlined below:

- Stage 1: road alignment maintains two 3.5 metre wide lanes in both directions
- Stage 2: alignment switches eastbound traffic onto the new eastbound carriageway constructed in previous stage and retains westbound traffic on the existing westbound carriageway

- Stage 3: this is the permanent alignment that has east and westbound traffic using the final carriageways.

Road users would be subject to road construction works over a period of up to around three years. During this time, the following structures, equipment and construction activities are likely to be visible for road users travelling along the M5 East Motorway:

- Earthworks including cuttings, fill embankments and construction of cut and cover dive structures / portals
- Temporary noise barriers and concrete barriers along the M5 East Motorway
- Fencing around the site
- Vehicle access and egress directly to and from the M5 East Motorway.

The receivers would be road users, and the potential impacts to these receivers are outlined in **Table 14-8**, and in more detail in Section 6.1.15 of the Technical working paper: Landscape character and visual impact (**Appendix K**).

Table 14-8 Western surface works – construction activity within the motorway

Receiver location	Construction stage	Visual impact
M5 East Motorway - Adjacent to Coolongatta Road	1	Low sensitivity with high magnitude for stages 1 and 2, and moderate magnitude for stage 3, with a moderate overall impact rating for stages 1 and 2, and a moderate to low overall impact for stage 3.
	2	
	3	
East of Kindilan Underpass	1	Low sensitivity with high magnitude for stages 1 and 2, and moderate magnitude for stage 3, with a moderate overall impact rating for stages 1 and 2, and a moderate to low overall impact for stage 3.
	2	
	3	

Pedestrian and Cyclist Routes – Beverly Hills, Kingsgrove, Bexley

The landscape character changes to and visual impacts of changes to pedestrian and cyclist routes during construction and operation are outlined in Table 14-9.

Table 14-9 Proposed landscape character changes to and visual implications of pedestrian and cyclist routes

Pedestrian and cyclists route	Proposed changes
M5 East Motorway cycleway: • Eastbound – King Georges Road to Bexley Road • Westbound – Bexley Road to King Georges Road.	As part of King Georges Road interchange upgrade, cyclists are now unable to use M5 East Motorway and have been detoured to an alternative route.
Shared path on southern side of M5 East Motorway between Karingal Street and Kindilan Underpass	Existing path closed and cyclists detoured to northern side cycleway via Karingal Street and Kindilan Underpass.
Shared path on northern side of M5 East Motorway between Garema Circuit and Kindilan Underpass	Existing path closed and cyclists detoured to a new alignment that runs along the rear of the site.
Kindilan Underpass	Pedestrian and cyclist access maintained. Width of underpass reduced to allow construction vehicle access between Kingsgrove North construction compound and Kingsgrove South construction compound.
Shared path on southern side of M5 East Motorway, western side of Bexley Road	Path realigned to allow for site establishment and works associated construction compound C5.

Alternative pedestrian and cycle way routes outlined above are to be provided where existing routes cannot be maintained during construction. These routes would be clearly defined and sign posted to safely manage pedestrian and cyclist activity. Pedestrian and cycleway routes would be protected by hoarding and / or other barriers, be constructed of an all-weather surface and well maintained.

Each of the receiver locations assessed in **Table 14-10** have been assessed as part of the changes seen due to the nearest construction compound. Below, these locations have been reassessed as points within the greater journey of the user. No ratings have changed at these locations due to this assessment.

Overall, the journey along the existing pathway through the M5 Linear Park would be visually disrupted in a number of places due to construction activity. The changes to views near the Kindilan Underpass, Kingsgrove North construction compound (C1), Kingsgrove South construction compound (C2) and Bexley Road North and South construction compounds (C4 and C5) constitute high visual impacts, although these must be viewed within the context of being points within the greater journey that the pedestrian / cyclist would pass, and that the changes are temporary.

Table 14-10 Pedestrian and cyclist routes – Beverly Hills, Kingsgrove, Bexley construction visual impact assessment

Location	Receiver position	Visual impact assessment
M5 Linear Park: North of the M5 East Motorway	Beverly Grove Park North, adjacent to Glamis Street	The sensitivity of pedestrians and cyclists is high due to the importance of the quality of the view to recreational users, the slow speed at which they would move through the site, and the proximity with which they would view certain construction activities. The magnitude of changes to views during construction at these locations is high, as the character of the view would change significantly from the existing parkland to constricted views between noise barriers and fences adjoining the construction compound, and pedestrians and cyclists would also be diverted.
	Beverly Grove Park, adjacent to Kindilan Underpass	
	Bexley Road, entry to park	
M5 East Motorway		While recreational cyclists may use the M5 East Motorway most cyclists using the M5 East Motorway are assessed as commuters. The sensitivity of cyclists using the M5 East Motorway is therefore low. The magnitude of these changes for cyclists is unable to be assessed, as cyclists would be diverted via another route during construction.

Kingsgrove North construction compound (C1)

Kingsgrove North construction compound would be located north of the M5 East Motorway and accessed via Garema Circuit. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Hoarding (around four metres high)
- Temporary noise barriers (around 2.5 metres high along of northern boundary of the compound, and around 4.5 metres along the eastern boundary of the compound)
- Car parking for up to around 170 personnel
- Tunnel shaft within an acoustic spoil shed and associated haulage
- Site offices and crib area
- Storage laydown areas
- Access between the northern and southern side for light construction vehicles via the existing Kindilan Underpass
- Sedimentation pond.

Kingsgrove North construction compound would be highly visible to adjoining residential development due to the acoustic shed area and associated infrastructure. The site works would be visually screened with hoarding, fencing, and would also incorporate a temporary noise barrier adjoining residential development. As such, much of the compound infrastructure would be visible only above the perimeter hoarding, fencing and noise barriers.

The existing shared pedestrian and bicycle path that currently passes through the site would be permanently realigned to generally follow the temporary noise barrier along the boundary of the compound before connecting back to the existing shared path on the northern side of the Kindilan underpass.

Five receiver locations have been identified, including views from a mixture of residential and industrial premises, recreation areas (golf course), roadways and pedestrian / cycleways as identified in **Table 14-11**.

Kingsgrove South construction compound (C2) and Commercial Road construction compound (C3)

The Kingsgrove South construction compound would be located south of the M5 East Motorway and accessed via the Kindilan Underpass (connecting this compound to the Kingsgrove North construction compound). The site currently comprises a road reserve known as Beverly Grove Park. The following project structures, equipment and construction activities are likely to be visible from surrounding receiver locations:

- Civil site compound
- Stockpiling of fill and pavement materials as well as materials generated from excavation activities prior to off-site removal
- Laydown and storage of materials to be incorporated into permanent works
- Access between the northern and southern side for construction traffic via the existing Kindilan Underpass
- Construction of the Kingsgrove motorway operations complex (MOC1)
- A chain link fence surrounding the site
- Removal of noise mounds / barriers.

The Commercial Road construction (C3) compound would be located on the southern side of the existing M5 East Motorway, within a private property between Tallawalla Street and Commercial Road, Kingsgrove. The Commercial Road construction compound would be mainly used as a tunnelling support site. The site currently comprises of an industrial property. The following structures, equipment and construction activities are likely to be visible from surrounding receiver locations

- Hoarding (around four metres high) and chain link fence surrounding the site
- An acoustic shed and associated haulage
- Two site offices and crib area
- Substation.

Both compounds would be highly visible to the adjoining industrial development due to the proximity of the construction site and activities such as the civil works, acoustic shed area and associated infrastructure. Site works would be visually screened with hoarding and fencing adjoining the industrial development. As such, much of the compound infrastructure that would be visible would be restricted to activities or infrastructure that extends above the perimeter hoarding and fencing.

It is anticipated that once the tunnelling activities have been completed at the Commercial Road construction compound, the construction facilities would be removed and the tunnel shaft backfilled. The land would be returned for future industrial uses consistent with the land use zoning for the site.

Once supporting works for the western surface works are complete at the Kingsgrove South construction compound, activities would commence for the construction of the permanent Kingsgrove motorway operations complex (MOC1). Three representative receiver locations have been identified for views from industrial neighbours and roadways as detailed in **Table 14-11**.

Bexley Road North construction compound (C4)

The Bexley Road North construction compound would be located on the western side of Bexley Road and north of the existing M5 East Motorway. It would be located within an area of vacant land bounded by the intersection of Bexley Road and Poole Street in the north, Bexley Road in the east, the M5 East motorway in the south and residential properties along Flatrock Road and Jones Avenue in the west. The Bexley Road North construction compound would be mainly used as a tunnelling support site.

The following project structures, equipment and construction activities are likely to be visible from surrounding receiver locations:

- Noise barrier (around 4.5 metres high) surrounding the site
- Tunnel shaft
- Acoustic shed
- Self bunded fuel storage
- Electrical substation and electricity supply point
- Spoil stockpile and associated haulage.

The Bexley Road North construction compound would be highly visible to adjoining residential development due to the tunnelling shaft, acoustic shed area and associated infrastructure. The construction compound would provide complete excavation for the westbound tunnel. Site works would be visually screened and would include a temporary noise barrier around 4.5 metres high along the boundaries of the construction compound. As such, much of the compound infrastructure that would be visible would be restricted to activities or infrastructure that extends above the perimeter hoarding and fencing, or could be viewed from elevated locations.

Once tunnelling activities have been completed, the temporary infrastructure would be removed and the tunnel shaft would be backfilled in order to prepare the land for other use consistent with the land use zoning. An air quality monitoring station for the project has been constructed at the site.

Six representative receiver locations have been identified for views from motorways, residential areas and pedestrian / cycleways as detailed in **Table 14-11**.

Bexley Road South construction compound (C5)

The Bexley Road South construction compound would be located on the western side of Bexley Road to the south of the existing M5 East Motorway tunnel portals. The site would be used for tunnelling support during construction, and for the Bexley Road South motorway operations complex (MOC2), including emergency smoke extraction facility, during operation.

The construction compound is surrounded by Bexley Road to the east, M5 East Motorway to the north and Wolli Creek to the south and west. The following structures, equipment and construction activities are likely to be visible from surrounding Receiver Locations:

- Hoarding (around four metres high) and noise barrier (around 4.5 metres high) around the site
- Tunnel shaft
- Acoustic shed
- Electrical substation on mezzanine within acoustic shed
- Water treatment plant
- Sedimentation pond
- Spoil stockpile.

The Bexley Road South construction compound would include a noise barrier around 4.5 metres high erected around the site and spoil activities to occur within an acoustic shed. Heavy vehicles would enter the site via Bexley Road and once would exit back onto Bexley Road heading west via the M5 East Motorway.

Once construction works are completed, the tunnelling shaft would become part of the permanent Bexley Road South motorway operations complex (MOC2).

Four representative receiver locations have been identified for views from motorways, residential areas and pedestrian / cycleways as detailed in **Table 14-11**.

Bexley Road East construction compound (C6)

The Bexley Road East construction compound would be located on the eastern side of Bexley Road, south of the intersection with Wolli Avenue. This site would be used mainly for car parking and administrative support activities for the Bexley Road North construction compound (C4) and the Bexley Road South compound (C5).

The construction compound is located on the eastern side of Bexley Road, with site access from Wolli Avenue. The following structures, equipment and construction activities are likely to be visible from surrounding Receiver Locations:

- Hoarding (around four metres high) or noise barrier (around 4.5 metres high) surrounding the compound
- Two site offices and crib areas
- Ablutions block
- Parking for around 105 light vehicles.

Three representative receiver locations have been identified for views from motorways, residential areas and pedestrian / cycleways.

Arncliffe construction compound (C7)

The Arncliffe construction compound would be located on the southern side of Marsh Street, encompassing part of the Kogarah Golf Course. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Hoarding (around four metres high) and temporary noise barrier (around three metres high) surrounding the site
- Car parking for around 193 light vehicles
- Tunnel shaft (around 12 metre diameter)
- Acoustic spoil shed and associated haulage
- Electrical substations and electricity supply points
- Water treatment plants
- Three site offices, crib rooms
- Two ablutions blocks
- Storage laydown areas
- Concrete testing station
- Sedimentation ponds.

The Arncliffe construction compound would be highly visible to adjoining residential development due to the construction and excavation of two tunnel shafts (one temporary tunnel access and one for the Arncliffe ventilation facility) within one of two acoustic spoil sheds adjoining Marsh Street. Further, the entry / exit point to the site on Marsh Street would be in operation 24 hours a day, seven days a week, therefore night lighting adequate to support safe construction activity is assumed.

The site works would be visually screened with hoarding and also incorporate a temporary noise barrier adjoining residential development. As such, much of the compound infrastructure would be visible only above the perimeter hoarding, fencing and noise barriers.

Four representative receiver locations have been identified for views from motorways, roadways, recreational areas and pedestrian / cycleways as detailed in **Table 14-11**.

Canal Road construction compound (C8)

The Canal Road construction compound would be located on the north-eastern side of Canal Road and the southern side of the Princes Highway, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Chain-link fence and temporary noise barrier (around 2.5 metres high) surrounding the site
- Site carpark
- Spoil stockpile
- Electrical substations and electricity supply point
- Water treatment plant
- Site offices (including one double stacked office), workshop area and ablutions block
- Storage laydown areas
- Sedimentation pond.

The entry / exit point to the site on Canal Road would be in operation 24 hours a day, seven days a week, therefore night lighting adequate to support safe construction activity is assumed.

Four receiver locations have been identified, including views from a mixture of road users, industrial and commercial premises as detailed in **Table 14-11**.

Campbell Road construction compound (C9)

The Campbell Road construction compound would be located on the southern side of Campbell Road between Woodley Street and Harber Street, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Chain-link fence and temporary noise barrier (around 2.5 metres high) to the north eastern boundary of the compound
- Stockpile of materials generated from the St Peters interchange and local road upgrades
- Site offices
- Site carpark
- Storage laydown areas
- Sedimentation pond.

One receiver location has been identified, which included views from a mixture of residential recreation areas and roadways as detailed in **Table 14-11**.

Landfill closure construction compound (C10)

The landfill closure construction compound would be located on the southern side of Campbell Road, west of the Campbell Road Compound, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Hardstand areas for site offices, amenities, laydown and material storage
- Site fencing, barriers and demolition of existing buildings
- Land closure works consisting of earthworks, foundation treatment and capping.

One receiver location has been identified, which included views from industrial premises as detailed in **Table 14-11**.

Burrows Road construction compound (C11)

The Burrows Road construction compound would be located on the northern side of Burrows Road, west of the intersection with Campbell Road, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Demolition of existing buildings
- Hardstand areas for overflow car parking
- Laydown and storage areas for materials.

One receiver location has been identified, which included views from and industrial premises and road users as detailed in **Table 14-11**.

Alexandra Canal bridge construction compound (C12)

The Alexandra Canal bridge construction compound would be located on the southern side of Burrows Road, opposite the intersection with Campbell Road, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Crib room and ablutions block
- Car parking
- Minor stockpiles of materials
- Laydown and storage of permanent materials for bridge works.

One receiver location has been identified, which included views from a mixture of industrial premises and road users as detailed in **Table 14-11**.

Gardeners Road bridge construction compound (C13)

The Gardeners Road bridge construction compound would be located on the southern side of Burrows Road in St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Minor stockpiles of materials
- Laydown and storage of permanent materials for bridge works.

One receiver location has been identified, which included views from a mixture of industrial premises and road users as detailed in **Table 14-11**.

Sydney Park construction compound (C14)

The Sydney Park construction compound would be located on the northern side of Campbell Road in Sydney Park, St Peters. The following project structures, equipment and construction activities would be visible from surrounding receiver locations:

- Establishment works associated with construction of shared path, bridge and ramps
- Laydown and storage of permanent materials for bridge works
- Construction of bridge across Campbell Road
- Construction of shared path in Sydney Park.

Three receiver locations have been identified, including views from a mixture of residential and recreation areas, and road users as detailed in **Table 14-11**.

Summary of construction visual impacts

A summary of assessed visual impacts based on evaluation of landscape / view sensitivity and magnitude of change (refer to **Table 14-4**) is provided for residential receivers and road users surrounding construction sites in **Table 14-11**.

Table 14-11 Construction visual impacts summary

Receiver identity	Receiver type / construction area	Sensitivity of receivers	Magnitude of change	Overall rating
Western surface works - construction activity within the motorway				
M5 East Motorway adjacent to Coolongatta Road	Stage 1 – road users	Low	High	Moderate
	Stage 2 – road users	Low	High	Moderate to low
	Stage 3 – road users	Low	Moderate	Moderate to low
East of Kindilan Underpass	Stage 1 – road users	Low	High	Moderate
	Stage 2 – road users	Low	High	Moderate
	Stage 3 – road users	Low	Moderate	Moderate to low
Pedestrian and cyclist routes along and around the M5 Linear Park at Beverly Hills, Kingsgrove, Bexley				
Beverly Grove Park North, adjacent to Glamis Street	Pedestrians and cyclists	High	High	High
Beverly Grove Park, adjacent to Kindilan Underpass	Pedestrians and cyclists	High	High	High
Bexley Road, entry to park	Pedestrians and cyclists	High	High	High
Cyclists along the M5 East Motorway	Cyclists	Low	Unable to be assessed, as cyclists would not use the M5 East Motorway during these construction works	NA
Kingsgrove North construction compound (C1)				
1 - Garema Circuit	Industrial neighbours	Low	Low	Low
2 - Glamis Street	Residents and Pedestrians / cyclists	High	High	High
3 - 101 Armitree Street	Residents	Moderate	Moderate	Moderate
4- Kindilan underpass	Pedestrians and cyclists - M5 Linear Park	High	High	High
5- Canterbury Golf Course	Golf players	Moderate	Low	Moderate to low
6 - M5 East Motorway	Road users	Low	Low	Low
Kingsgrove South (C2) and Commercial Road (C3) construction compounds				
6 - M5 East Motorway	Road users	Low	Low	Low
7 - Commercial Road C3 entry	Industrial neighbours	Low	Low	Low

Receiver identity	Receiver type / construction area	Sensitivity of receivers	Magnitude of change	Overall rating
8 - Vanessa Street industrial compounds	Industrial neighbours	Low	High	Moderate
Bexley Road North construction compound (C4)				
6 - M5 East Motorway	Road users	Low	Low	Low
9 – Bexley Road, north of Poole Street	Residents and road users	Moderate to low	High to moderate	High to moderate for residences, moderate to low for road users
10 - M5 Linear Park, Bexley, north of M5 entry	Pedestrians / cyclists	High	High	High
11 - Intersection of Bexley Road and Wolli Avenue	Residences and road users	Moderate to low	Moderate	Moderate for residences, moderate to low for road users
12 - Flatrock Road / Jones Avenue	Residences	High	High	High
Bexley Road South construction compound (C5)				
6s - M5 East Motorway	Road user	Low	Low	Low
11 - Intersection of Bexley Road and Wolli Avenue	Residences and road users	Moderate to low	Moderate to low	Moderate for residences, moderate to low for road users
13 - M5 Linear Park, Bexley, south of M5 entry	Pedestrians / cyclists	High	High	High
15 - Bexley Road, south of the pedestrian underpass	Road users	Low	Moderate	Moderate to low
Bexley Road East construction compound (C6)				
11 - Intersection of Bexley Road and Wolli Avenue	Residences and road users	Moderate to low	Low	Moderate to low for residents, low for road users
13 - M5 Linear Park, Bexley, south of M5 entry	Pedestrians/cyclists	High	Low	Moderate
14 - Reserve adjacent to 9 Johnston Street, Bexley	Residences	High	Moderate	High to moderate

Receiver identity	Receiver type / construction area	Sensitivity of receivers	Magnitude of change	Overall rating
Arncliffe construction compound (C7)				
6 - M5 East Motorway	Road users	Low	Negligible	Negligible
15 - Intersection of Flora and Marsh Street	Residences	Moderate	High	High to moderate
	Residential neighbours (high density housing)	High	High	High
	Road users	Low	High	Moderate
	Pedestrians / cyclists	Moderate to High	High	High to moderate
16– Eve Street cycle path	Pedestrians / cyclists	High	Moderate	High - moderate
17 – Kogarah Golf Course	Active recreation	High	High	High
Canal Road construction compound (C8)				
18 – intersection of Princes Highway and Canal Road	Commercial neighbours	Low	Low	Low
	Road users	Low	Low	Low
19 – complexes backing onto the St Peters interchange	Commercial neighbours	Low	Low	Low
20 – on the Princes Highway	Industrial neighbours	Low	Low	Low
	Road users	Low	Low	Low
21 – St Peters Anglican Church	Commercial neighbours	Moderate	Negligible	Negligible
Campbell Road construction compound (C9)				
22	Residential neighbours	High	High	High
22	Road users	Moderate	High	High to moderate
22	Recreational users within Sydney Park	Moderate	Moderate	Moderate
Landfill closure construction compound (C10)				
20 – on the Princes Highway	Industrial neighbours	Low	Low	Low
Burrows Road construction compound (C11)				
23 – Burrows Road	Industrial neighbours	Low	Low	Low
	Road users	Low	Low	Low
Alexandra Canal bridge construction compound (C12)				
23 – Burrows Road	Industrial neighbours	Low	Low	Low
	Road users	Low	Low	Low
Gardeners Road bridge construction compound (C13)				
24 – Burrows Road	Industrial neighbours	Low	Low	Low
	Road users	Low	Low	Low
Sydney Park construction compound (C14)				
22 – Campbell Road	Residential neighbours	High	Moderate	High to moderate

Receiver identity	Receiver type / construction area	Sensitivity of receivers	Magnitude of change	Overall rating
	Road users	Moderate	High	High to moderate
25 - Sydney Park	Active and passive recreation	Moderate	High	High - moderate
26 – Barwon Park Road	Residential neighbours	High	High	High

Construction night lighting impacts

The potential night lighting impacts and receivers at each construction site are summarised in **Table 14-12**.

Table 14-12 Construction night lighting impacts assessment summary

Construction area	Receiver	Sensitivity to change	Magnitude of change	Overall rating
Western surface works - construction activity within the roadway	Receivers located near the M5 East Motorway, adjacent to Coolongatta Road	Low	Moderate	Moderate to low
	Receivers located near the east of Kindilan Underpass works	Low	Moderate	Moderate to low
Kingsgrove North compound (C1)	Industrial neighbours	Low	Moderate	Moderate to low
	Residents	High to moderate	High to low	High to moderate
	Pedestrians / cyclists	High	Low	Moderate
	Golf course users	High	Negligible	Negligible
	Road users	Low	Negligible	Negligible
Kingsgrove South and Commercial Road compounds (C2 and C3)	Road users	Low	Negligible	Negligible
	Industrial neighbours	Low	Moderate	Moderate to low
Bexley Road North compound (C4)	Road users	Low	Negligible	Negligible
	Residents	High to Moderate	Moderate	High to Moderate
	Pedestrians / cyclists	High	Low	Moderate
Bexley Road South compound (C5)	Road users	Low	Negligible	Negligible
	Residents	Moderate	Low	Moderate to low
	Pedestrians / cyclists	High	Low	Moderate
Bexley Road East compound (C6)	Residents	High to moderate	Moderate to low	High to moderate
	Road users	Low	Negligible	Negligible
	Pedestrians / cyclists	High	Low	Moderate
Arncliffe construction compound (C7)	Road users	Low	Negligible	Negligible
	Residential (low density)	Moderate	Moderate	Moderate
	Residential (high density)	High	High	High
	Road users	Low	Low	Low
	Pedestrians / cyclists	Moderate	Moderate	Moderate
	Pedestrians / cyclists	High	N/A	N/A
	Active recreation	High	N/A	N/A
Canal Road construction compound (C8)	Commercial neighbours	Low	Low	Low
	Road users	Low	Negligible	Negligible
	Commercial neighbours	Low	Low	Low
	Industrial neighbours	Low	Low	Low

Construction area	Receiver	Sensitivity to change	Magnitude of change	Overall rating
	Road users	Low	Negligible	Negligible
	Commercial neighbours	Moderate	N/A	N/A
Campbell Road construction compound (C9)	Residential neighbours	High	Moderate	High to moderate
	Road users	Moderate	N/A	Negligible
	Recreational users	High	N/A	N/A
Landfill closure construction compound (C10)	Industrial neighbours	Low	Low	Low
Burrows Road construction compound (C11)	Industrial neighbours – Burrows Road	Low	Low	Low
	Road users	Low	Negligible	Negligible
Alexandra Canal bridge construction compound (C12)	Industrial neighbours – Burrows Road	Low	Low	Low
	Road users	Low	Negligible	Negligible
Gardeners Road bridge construction compound (C13)	Industrial neighbours – Burrows Road	Low	Low	Low
	Road users	Low	Negligible	Negligible
Sydney Park construction compound (C14)	Residential neighbours – Campbell Road	High	Low	Moderate
	Road users – Campbell Road	Moderate	N/A	Negligible
	Active and passive recreational users – Sydney Park	High	N/A	N/A
	Residential neighbours – Barwon Park Road	High	High	High

14.3.2 Operation

This section provides an assessment of the potential operational urban design and landscape implications of the project including:

- Western surface works, including the Kingsgrove motorway operations complex (MOC1)
- Bexley Road surface works, including the Bexley Road South motorway operations complex (MOC2)
- Arncliffe surface works, including the Arncliffe motorway operations complex (MOC3)
- The St Peters interchange and local road upgrades, including the St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5).

A series of artists' impressions of key project elements has also been produced, and are available in full within Section 6 of the Technical working paper: Landscape character and visual impact (**Appendix K**). Artist's impressions presented in this chapter provide a typical view of project elements at a variety of locations along and adjacent to the route at a period of around 12 to 18 months after opening, and at around 10 years post-project (refer **Figure 14-6** to **Figure 14-10** below).

Artists' impressions have been based on the current project design and the appearance of project components and features may differ slightly as a result of design development, finalisation of materials and colours and the surrounding landscape, as well as local weather conditions on any particular day and any additional future developments in the area.

The project would be designed and operated in accordance with the WestConnex Urban Design Framework, as outlined in **Table 14-3**. An assessment of the project against these design principles is provided in Section 8 of the Urban design report (**Appendix L**) and outlined in **Table 14-13**. The project design would integrate high quality architecture with engineering solutions to sensitively integrate the project with its surrounds.

Table 14-13 Assessment against WestConnex urban design framework

Kingsgrove motorway operations complex (MOC1)	Bexley Road South motorway operations complex (MOC2)	Arncliffe motorway operations complex (MOC3)	St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)	Tunnel design
Objective: Leading edge environmental responsiveness				
• Landscaping would be used to soften views and create habitat within and along the M5 East Motorway corridor. • Upgrade of shaded path within the M5 Linear Park would increase access to active recreation opportunities. • Location of Kingsgrove motorway operations complex (MOC1) would allow for the preservation of Wolli Creek bushland.	• Landscaping would create a green gateway to the M5 Linear Park. • Addition of tree canopies would improve streetscape amenity	• Landscaping would be used to ensure facilities recess into the existing Golf Course landscaping, as well as improving biodiversity (eg Green and Golden Bell Frog habitat).	• Landscaping would create an 'urban forest.' • New open spaces would be created for community enjoyment. • New pedestrian and cycling links would increase active transport connectivity.	• Potential use of light emitting diode lighting to reduce energy consumption.

Kingsgrove motorway operations complex (MOC1)	Bexley Road South motorway operations complex (MOC2)	Arncliffe motorway operations complex (MOC3)	St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)	Tunnel design
Objective: Connectivity and legibility				
• Portal treatment (analogous to Stage 1B) would begin and end the overall WestConnex identity at the southern extent. • Transparent noise barriers would allow views to surrounds orientating motorists. • Shared path upgrades would provide active transport connectivity for local communities. • Built form would utilise the project-wide material palette, commencing the overall WestConnex identity in the southern extent of the M5 East Motorway corridor.	• Completion of the M5 Linear Park (western side) with a green gateway would reinforce landscape setting for the M5 East Motorway and the shared path of the M5 Linear Park.	• Location of facilities would maintain pedestrian and cyclist accessibility.	• St Peters interchange site would form the main connector between stages and within the southern reaches of the CBD – denoted by its green appearance and unique portal design marking it as a major decision point within the M5 East Motorway journey. • Local street upgrades would improve pedestrian and cyclist connectivity and access to open space.	• The M5 East Motorway would increase connectivity regionally within Sydney. • Locational identifier markers and other tunnel linings (break-down bays and emergency access points) would be the same as Stage 1B, providing visual stimuli, and a recognisable identity within the journey.

Kingsgrove motorway operations complex (MOC1)	Bexley Road South motorway operations complex (MOC2)	Arncliffe motorway operations complex (MOC3)	St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)	Tunnel design
Objective: Place making				
• Kindilan underpass would provide opportunities to engage with the community to increase street art concepts. • Upgrades to the M5 Linear Park and shared paths would create opportunities to reinforce the green corridor, and provide an improved landscape setting. • Location of built form would recess into the existing landscape, and would also be designed to limit the overshadowing of public open space.	• Built form would recess into its surrounds with a residential style appearance complemented by landscaping at the perimeter.	• Landscape setting would be retained and enhanced allowing facilities to recede.	• Creation of open space would provide essential active and passive recreational facilities for the community. • Transformation to an urban forest would create a new chapter in the history of the St Peters interchange. • Definition of local streets through planting and paths would support active transport for local communities.	• NA.

Kingsgrove motorway operations complex (MOC1)	Bexley Road South motorway operations complex (MOC2)	Arncliffe motorway operations complex (MOC3)	St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)	Tunnel design
Objective: Urban renewal and liveability				
• Upgraded shared path with lighting would improve amenity for existing and future residents along the M5 Linear Park.	• Location of facilities on isolated site would reduce impacts to surrounding residential lands.	• Location of facilities within Golf Course site reduces impacts on surrounding residential lands.	• Utilisation of land fill site for the St Peters interchange repurposes a site unsuitable for many other uses. • Creation of open space and active transport connections would support existing urban renewal occurring in Mascot and Erskineville and provide opportunities for further renewal in the future.	• NA.
Objective: Memorable identity and a safe enjoyable experience				
• Portal design would match that of the M4 East portals-creating identity. • Landscaping would significantly green the corridor in this location. • Inclusion of public art concept would have the potential to reinforce the street art that characterises underpasses.	• Landscaping would support the green corridor concept location within this location.	• Landscaping would ensure facilities recess into the existing Golf Course landscaping.	• Distinct portal design would create an identity for the St Peters interchange. • Heavily treed landscape would reinforce the urban forest identify of the St Peters interchange. • Open space proposal for mounds would create a memorable landscape and continue the 'language' of Sydney Park. • Public art inclusion would have the ability to activate parklands and provide a distinct talking point along the M5 East Motorway journey.	• Tunnel lining design would match the proposed M4 East tunnel, reinforcing the overall WestConnex identity.

Kingsgrove motorway operations complex (MOC1)	Bexley Road South motorway operations complex (MOC2)	Arncliffe motorway operations complex (MOC3)	St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)	Tunnel design
Objective: A new quality benchmark				
• Material selection would be durable and easy to maintain. Composition of materials would be restrained to ensure facilities wit within their surrounds.	• Material selection would be durable and easy to maintain. Composition of materials would be restrained to ensure facilities wit within their surrounds.	• Material selection would be durable and easy to maintain. Composition of materials would be restrained to ensure facilities wit within their surrounds.	• Material selection would be durable and easy to maintain. Composition of materials would be restrained to ensure facilities wit within their surrounds.	• Outcomes would be reviewed throughout design development by the Urban Design Review Panel. • Material selection would be durable and easy to maintain. • Composition of materials would be restrained to ensure facilities wit within their surrounds.

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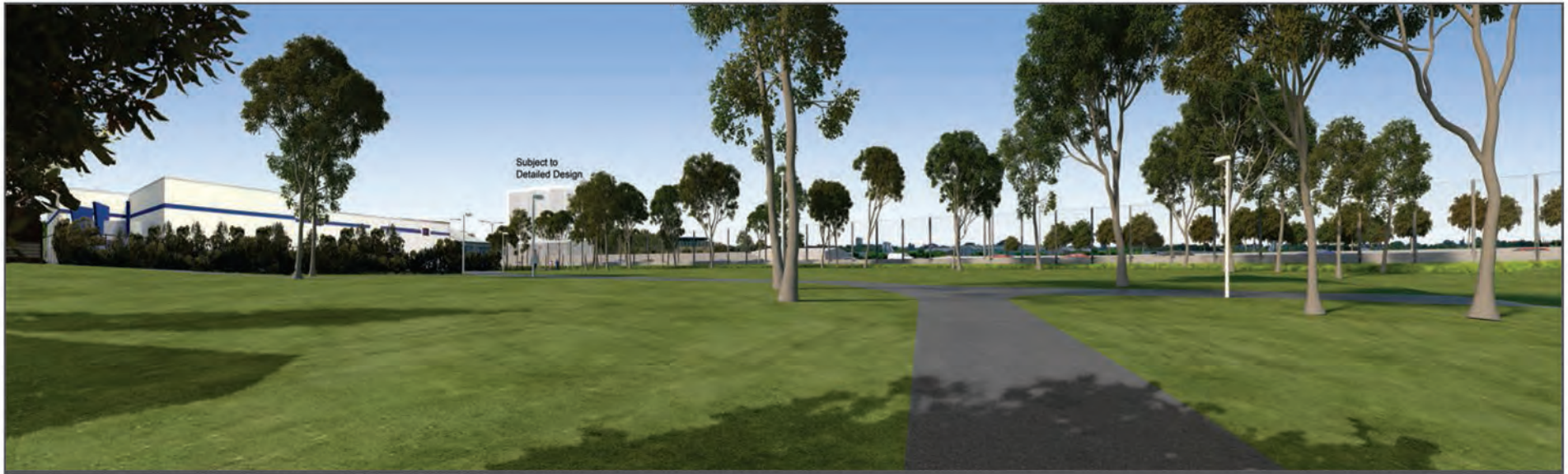
View to south - across Beverly Grove Park to New M5 motorway - project completion



View to south - across Beverly Grove Park to New M5 motorway - 10 years post project

The architectural treatment of the ventilation facilities would be confirmed during detailed design as discussed in Section 5.11

Figure 14-6 Beverly Grove Park - artists impression

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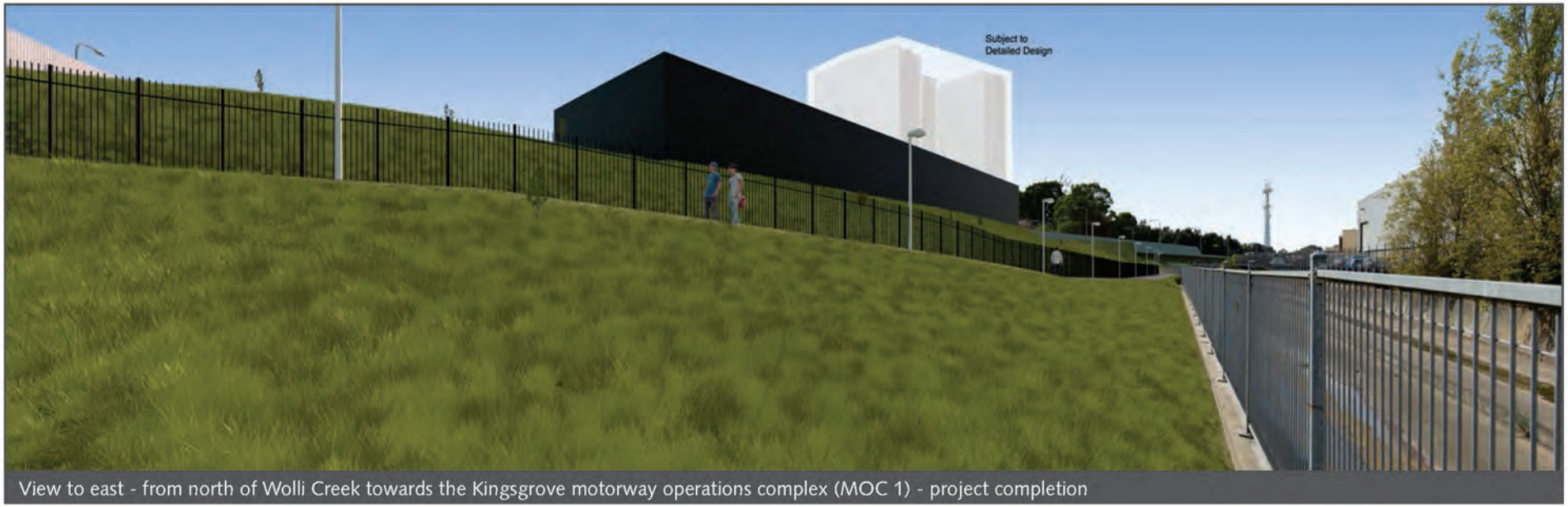

View to east - from north of Wolli Creek towards the Kingsgrove motorway operations complex (MOC 1) - project completion

View to east - from north of Wolli Creek towards the Kingsgrove motorway operations complex (MOC 1) - 10 years post project

The architectural treatment of the ventilation facilities would be confirmed during detailed design as discussed in Section 5.11

Figure 14-7 Kingsgrove motorway operations complex (MOC 1)

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View to southeast - from entry to M5 Linear Park towards Bexley Road South motorway operations complex (MOC 2)

View to southeast - from entry to M5 Linear Park towards Bexley Road South motorway operations complex (MOC 2) - 10 years post project

Figure 14-8 Bexley Road South motorway operations complex (MOC 2) - artists impression

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View to south - from Flora Street towards Arncliffe motorway operations complex (MOC 3)

View to south - from Flora Street towards Arncliffe motorway operations complex (MOC 3) - 10 years post project

The architectural treatment of the ventilation facilities would be confirmed during detailed design as discussed in Section 5.11

Figure 14-9 Arncliffe motorway operations complex (MOC 3) - artists impression

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View to west - from Burrows Road and Campbell Road intersection

View to west - From Burrows Road and Campbell Road intersection - 10 years post project

Figure 14-10 St Peters interchange - artists impression

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Western surface works

At operation, the built structures and infrastructure on site would comprise the following:

- The Kingsgrove motorway operations complex (MOC1) to support maintenance of the project during operation, accommodating around 10 workers. It would be located to the south of the western project portals and the existing M5 South West Motorway, on land previously occupied by the Kingsgrove South construction compound, and would include the following:
  - Bulky equipment storage area
  - Local maintenance facility, workshop and offices (including kitchen facilities and amenities)
  - Car parking area for up to 15 vehicles
  - Substation (including disaster recovery system)
  - Deluge tanks
  - The Kingsgrove ventilation facility
  - Access road to the facility and hardstand area
  - Reinstated shared path for pedestrians and cyclists running adjacent to the southern boundary of the park along to Wolli Creek
  - A noise barrier around five metres high adjacent to the M5 East Motorway between Kooemba Road and Beverly Grove Park, of which the top three metres would be transparent
- Beverly Grove North:
  - A transparent noise barrier around four metres high and adjacent to the M5 East Motorway between Garema Circuit and the eastern corner of Canterbury Golf Course
  - Reinstated shared path for pedestrians and cyclists, which would generally run along the northern boundary of Beverly Grove Park North
- The M5 Motorway corridor, which would include the realigned M5 East Motorway and the project:
  - Western tunnel portals
  - Two new through lanes from the M5 South West Motorway to the M5 East Motorway
  - Two new through lanes from the M5 South West and M5 East Motorway to the project
  - One new lane connecting King Georges Road interchange to the M5 East Motorway, which bypasses the project
  - Tolling gantries.

The tallest of the structures at the western surface works would be the Kingsgrove ventilation facility located at the Kingsgrove motorway operations complex (MOC1), which would be around 30 metres high. For further details on these proposed operational built structures, including artists' impressions and proposed site plans, refer to Section 5.2 of **Appendix L**.

Five landscape character zones have been identified for the western surface works site area. For an indication of landscape character zones within this area, refer **Table 14-6** and **Figure 14-2**.

The permanent changes due to the project would mainly contained within the M5 East Motorway corridor (transport corridor landscape character zone), with some encroachment into the neighbouring recreational landscape character zone at Beverly Grove Park South (due to the maintenance operations centre) and Beverly Grove Park North (with loss of the vegetated noise mound and Cooks River / Castlereagh Ironbark Forest at Beverly Grove bushland due to the M5 East Motorway tie-in works). The visibility of the infrastructure at these locations within the recreational landscape character zone would create a high to moderate visual impact for this landscape character zone.

Visual envelope mapping was undertaken from the top of the ventilation facility at the Kingsgrove motorway operations complex (MOC1) at a height of around 33 metres above existing ground level. The mapping is provided in Figure 6-51 in **Appendix K**, and illustrates the potential visibility of the project from the surrounding areas.

Views from the north-west are effectively screened by trees located along the Canterbury Golf Course perimeter. Additional vegetation planting and noise walls at Beverley Grove Park, existing and proposed as part of the project, would provide screening for residential properties bordering the park. These receivers are unlikely to experience significant visual impacts as a result of the project as only the top of the ventilation facility would be visible.

From the north-east, industrial complexes adjoining the M5 East Motorway may have views to the top of the ventilation facility. These views are likely to be generally restricted to areas within the Garema Circuit road corridor.

Similarly, views from the south and south-west are generally buffered by the large industrial complexes fronting The Crescent and Vanessa Street. The ventilation facility would be likely to be visible from a distance from the south-east, east and north-east. This is largely due to the smaller built form of industrial complexes along Commercial Road. A gentle rise in topography towards Kingsgrove Road provides an elevated position with likely views of the top of the ventilation facility from these locations.

Bexley Road surface works

The Bexley Road South motorway operations complex (MOC2) would be located to the south of the M5 East Motorway western portals, adjacent to Bexley Road, on land previously occupied by the Bexley Road South construction compound.

As with the Western surface works area, the greatest affected landscape character zone would be the road reserve which would experience a high to moderate impact. In addition, the M5 Linear Park at this location comprises a gateway to the rest of the M5 Linear Park, which places emphasis on the landscape value of this area within the greater landscape character zone.

Built structures at the Bexley Road South motorway operations complex (MOC2) would include:

- Fresh air intake and emergency smoke extraction facility
- Distribution substation.

These would be no more than five meters in height. For further details on these proposed operational built structures, including artists' impressions and proposed site plans, refer to Section 5.3 of the Urban design report in **Appendix L**.

Visual envelope mapping was untaken from the top of the MOC2 at a height of around four metres above existing ground level and demonstrates the locations from which views of the site would potentially be obtained. Figure 6-60 in **Appendix K** illustrates the potential visibility of the project from the surrounding areas.

Views from the north are restricted to the front of residential properties along the eastern side of Bexley Road (south of Poole Street) and a small section of Wolli Avenue. Views from the east are screened by the existing infrastructure and vegetation associated with the M5 East Motorway filtration plant and motorway operations support and pedestrian overpass.

It is unlikely that receivers from the south or south-west of Kingsgrove Avenue would have significant views of the Bexley Road motorway operations complex due to the density of the existing vegetation within the M5 Linear Park.

Arncliffe surface works

At operation, the built structures and infrastructure on site would comprise the following:

- The Arncliffe motorway operations complex (MOC3), which would include:
  - Ventilation facility (35 metres tall)
  - Air intake facility (10 metres tall)
  - Distribution substation (around five metres tall)
  - Water treatment plant
  - Water treatment wetland
  - Car parking.

Vehicle access is provided from Marsh Street at the intersection with Flora Street and pedestrian access is maintained adjoining the site.

Three landscape character zones have been identified for the Arncliffe surface works area. For a description of landscape character zones within this area, refer **Table 14-6** and **Figure 14-4**.

The tallest of the structures at the Arncliffe motorway operations complex (MOC3) would be the ventilation facility, which would be around 35 metres high. For further details on these proposed operational built structures, including artists' impressions and proposed site plans, refer to Section 5.4 of **Appendix L**.

The Arncliffe motorway operation complex (MOC3) would have a limited impact on the surrounding landscape character zones due to the relatively small size of the site, the potential screening and softening effect of landscaping surrounding the built elements of the project, and the limited visual integration of adjacent landscape character zones due to road corridors and boundary conditions.

Visual envelope mapping taken from the top of the ventilation facility (MOC3) at a height of around 35 metres above existing ground level demonstrates the key locations from which views of the site would be obtained. Figure 6-66 of **Appendix K** illustrates the potential visibility of the project from the surrounding areas.

The most affected receivers are likely to include motorists travelling along Marsh Street and nearby residences north-west of the site in Valda Avenue, Flora Street and Innesdale Road. In conjunction with the residential buildings and substantial mature street and garden cover, residential areas greater than 200 metres from the site are unlikely to have substantial visibility of the project elements except for the top of the ventilation facility.

Views to the motorway operations complex from the north would be available from residences in high-rise apartment buildings that line Gertrude Street, Innesdale Road and Marsh Street. Views from the south would be effectively blocked by the combination of existing screening vegetation and noise barriers along the M5 East Motorway.

Views of the MOC3 from the east within Kogarah Golf Course would be prominent, but only when users are playing on the fairways that are adjacent to the project. Areas greater than 300 metres from the site are unlikely to have substantial visibility of the project elements due to the existing mature vegetation within the golf course, except for the top of the ventilation facility.

St Peters interchange and local road upgrades

At operation, the St Peters interchange would include the following built structures and infrastructure:

- The St Peters motorway operations complex (MOC4), located on the corner of Princes Highway and Canal Road, consisting of:
  - Ventilation facility including exhaust fan room and exhaust stacks (20.5 metres tall)
  - Supply air intake building
  - Distribution substation building

  - Plenum building
  - Fire pump room (below ground)
  - Car parking and vehicle access via Canal Road
  - Deluge tanks
- The Burrows Road motorway operations complex (MOC5), located on the corner of Campbell Road and Burrows Road, consisting of:
  - The motorway control centre building (8.5 metres tall)
  - Distribution substation
  - Car parking at ground level below motorway control centre
  - Incident response parking and vehicle access via Burrows Road
- Car parking
- Leachate treatment plant
- Seven interchange bridges
- Pedestrian and cycleway bridge over Campbell Road
- Pedestrian and cycleway bridge over northern ramps
- Campbell Road bridge over Alexandra Canal
- Gardeners Road bridge over Alexandra Canal
- Two bioretention basins
- One park area, pedestrian and cycle paths, with the remaining park to be delivered as part of the M4-M5 Link.

The 'Dynamo' heritage building would be retained at the corner of the Princes Highway and Canal Road.

Five landscape character zones have been identified for the St Peters interchange and local road upgrades area. For a description of landscape character zones within this area, refer **Table 14-6** and **Figure 14-10**. For further details on these proposed operational built structures, including artists' impressions and proposed site plans, refer to Sections 5.6.4 and 5.6.5 of **Appendix L**.

The St Peters interchange lies within the industrial landscape character zone. The proposed changes would comprise a significant change to the character of the site, and therefore a high change to the landscape character zone. Areas of parkland, as well as new built forms and associated landscaping would be new elements with positive implications for the existing industrial landscape.

These changes to the site would impact the surrounding landscape character zones to varying degrees. Although the impact rating for the surrounding zones lies between moderate to moderate - low, these ratings have a lot to do with the sensitivity of the individual landscape character zones. The greatest magnitude of change would be experienced by the industrial landscape character zone, and the transport corridor landscape character zone, both of which lie partly within or adjacent to the St Peters interchange.

In terms of visual envelope mapping, Figure 6-75 of **Appendix K** illustrates the potential visibility of the project from the surrounding areas at St Peters. Visual envelope mapping taken from the top of the ventilation facility (MOC4) at a height of around 20.5 metres and the top of the motorway operations complex (MOC5) at a height of around 8.5 metres above existing ground level demonstrates the locations from which views of the site would potentially be obtained.

Views to the St Peters interchange from the west would be seen across a busy intersection, with the most prominent elements of the Dynamo building and the street trees to be retained. However, a number of new elements would be seen within the view, including the ventilation facility, new motorway operations buildings and landscaping to the Canal Road edge.

Views from the north-west would be limited by the adjacent commercial buildings that front the Princes Highway. The most visible elements would be the canopy of trees within the St Peters interchange parkland as the vegetation matures.

Views from the north-east would be a significant change in terms of the character and scale of the development, particularly with regard to the widening of Campbell Road. Elements that would be seen from the road include the pedestrian bridge joining Sydney Park, the St Peters interchange and open parklands.

Views from the south at the corner of Canal Road and Burrows Road would be limited by the adjacent industrial development and Gardeners Road bridge crossing. Views from the road to the MOC5 would be of short duration and limited by landscaping and street tree plantings.

Operational landscape character impacts

A summary of the potential operational landscape character impacts of the project is presented in **Table 14-14**. The assessment has been based on the landscape character zones identified in **Table 14-6** and **Figure 14-2** to **Figure 14-5**.

Table 14-14 Landscape character impact assessment summary

Landscape character zone	Sensitivity of landscape	Magnitude of change	Overall rating
Western surface works, including the Kingsgrove motorway operations complex (MOC1)			
Residential	Moderate	Low	Moderate to low
Industrial	Low	Low	Low
Recreational	Moderate	High	High to moderate
Transport corridor	Low	Moderate	Moderate to low
Urban centre	High	Negligible	Negligible
Bexley Road surface works, including the Bexley Road South motorway operations complex (MOC2)			
Residential	Moderate	Low	Moderate to low
Recreational	Moderate	High	High to moderate
Transport corridor	Low	Low	Low
Urban centre	High	Negligible	Negligible
Arncliffe surface works, including the Arncliffe motorway operations complex (MOC3)			
High density residential	Low	Low	Low
Low density residential	Moderate	Moderate	Moderate
Recreational – open spaces	High	Moderate	High to moderate
Recreational – waterways	Moderate	Negligible	Negligible
Infrastructure - corridor	Low	Low	Low
Infrastructure - Airport	Low	Negligible	Negligible
St Peters interchange and local road upgrades, including the St Peters motorway operations complex (MOC4) and Burrows Road motorway operations complex (MOC5)			
Residential	High	Low	Moderate
Industrial	Low	High	Moderate
Recreation	High	Low	Moderate
Transport corridor	Low	Moderate	Moderate to low
Commercial corridor	Moderate	Low	Moderate to low

Desired future character assessment

The hard and soft urban design elements of the project would assist in ensuring the project is consistent with the existing and desired future character of the project area. Hard elements refer to built infrastructure, while soft elements refer to proposed landscaping features. This desired future character assessment considers both the hard and soft urban design elements of the project.

A material palette has been developed for utilisation in built-form structures throughout the project. Materials were selected for appearance, durability and maintainability, with the main focus on materials and finishes that would visually unify buildings across the project. Examples of these materials proposed to be incorporated throughout the project are included in Section 5.1 of the Urban design report (**Appendix L**).

Maintenance facilities and motorway control centres would be designed to be used and inhabited by people on a daily basis. These structures would provide spaces and volumes appropriate to human scale, contain materials with a tactile quality, and create environments that are both comfortable and sustainable for their occupying personnel and surrounding environments.

Buildings and facilities supporting the operation of the tunnels and portals would be refined and elegant sculptural objects designed to integrate into their adjacent environments.

Western surface works

The majority of the area within which permanent changes due to the western surface works area lies is zoned SP2 Infrastructure under both the Hurstville LEP 2012 and the Canterbury LEP 2012, which reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. However, some changes would spill over into land zoned RE1 Public Recreation and a strip of unzoned land.

The road reserve to the south of the M5 East Motorway comprises Beverly Grove Park South, which is a road reserve within the M5 Linear Park. The land surrounding the western surface works area is zoned as R3 Medium Density Residential, IN2 Light Industrial, R2 Low Density Residential, with some pockets of RE1 Public Recreation under the Hurstville LEP 2012 and the Canterbury LEP 2012. This zoning reflects the desire to maintain the existing low-medium density residential character and suburban setting of the area, with pockets of bushland.

The changes within the western surface works area would visually comprise a general widening of the M5 East Motorway and associated new noise barriers, as well as the western tunnel portals, a collection of built elements associated with the Kingsgrove ventilation facility, ancillary infrastructure and operational facilities for electronic tolling, and a widened Kindilan Underpass.

The widening of the M5 East Motorway and the associated ancillary elements (noise barriers, tolling gantry, signage and landscaping) would be visually consistent with the existing and future desired character of the area within the SP2 Infrastructure zoned land. The western surface works area is predominantly flanked by RE1 Public Recreation zoned land, which visually buffers the residential (and to some extent the industrial) land beyond. As such, the project would have a minimal visual impact on these areas, and therefore the overall character of ‘a suburban setting with pockets of bushland’ would not be significantly affected.

Kingsgrove motorway operations complex (MOC1)

The Kingsgrove motorway operations complex (MOC1) would be located on land zoned as SP2 Classified Road as per the Hurstville LEP 2012. Land uses permitted with consent in this zone include development for the purposes of roads, including any development ordinarily incidental or ancillary to road development. This would include the construction and operation of the Kingsgrove motorway operations complex (MOC1), as ancillary to the operation of the project.

The change within Beverly Grove Park South (from a road reserve to the maintenance facility and the Kingsgrove ventilation facility) would constitute a character change from the existing condition. Using other areas within the M5 Linear Park as a bench mark, the narrowed pedestrian and cycle access around the edge of the widened portion of M5 East Motorway would not be out of character for this park.

The Kingsgrove motorway operations complex (MOC1) would comprise a workshop with staff offices to the east, and a large covered store to the west. The overall design intent is to blend these structures with surrounding warehouse buildings so as to appear as another industrial building. A combined access road and shared path from Tallawalla Street would be located to the south-west of the Kingsgrove motorway operations complex (MOC1), with access to the secure maintenance area between the two built structures, and staff and visitor parking to the east of the workshop and office building. The Kingsgrove ventilation facility, deluge tanks and distribution substations would also form part of the Kingsgrove motorway operations complex (MOC1).

The Kingsgrove ventilation facility, deluge tanks and distribution substation would be located to the north of the maintenance facility. At around 30 metres tall, it would be impractical to screen. The form of the three vents would be articulated to add variety to the massing and robust material palette that has been chosen. The location of the Kingsgrove ventilation facility above the west bound exit tramp would provide the most practical location to serve this function. A fire pump and water deluge tank would be located adjacent to the M5 East Motorway, with the distribution substation behind. Those buildings would be largely screened from view due to the noise barrier planned to the north and landscaping proposed to the south.

The Kingsgrove motorway operations complex (MOC1) would be constructed of precast concrete panelling to the dado with zincalume profiled cladding above, wrapping over the roof to denote the building's industrial nature. On the eastern face of the workshop, staff offices would be denoted through full length curtain wall glazing between horizontal concrete bands. Those bands as well as the northern and southern facades would be further embellished with perforated corten cladding. The distinction in materials together with a reduction in roof height for the staff offices would denote their use for human-scaled activities as opposed to the more industrial nature of the workshop.

Sitting slightly lower than the westbound bypass lane, the covered store to the west of the workshop facility would feature a zincalume clad roof and concrete blockwork walls. This roof would be visible to passing motorists in keeping with the large span metal roofs surrounding warehouses. The concrete blockwork would be largely hidden from view.

The horizontal portion of the substation building would be clad in dark face brick. Openings providing service access to the plan rooms would be grouped in common recesses to expose the structure, which would be a smooth-faced concrete block. Access doors within the blockwork would be painted light grey to match.

Patterned precast concrete panels form the eastern and western facades of the Kingsgrove ventilation facility. The vertical and horizontal joints would be integrated into the cast-in pattern. Horizontal louvres would be incorporated on the northern and southern facades that are cut with varying depths to provide opportunities for interpretive patterns to be applied. The corten of the north and south facades would evoke the ochre colours of surrounding residences, whilst the patterned pre-cast concrete would be representative of surrounding industrial buildings.

The composition of materials chosen would also indicate, through design, the commencement of the new M5 East Motorway, which would be continued east along the corridor to St Peters.

Western portals

The western portals would provide eastbound ingress to and westbound egress from the M5 East Motorway. The portals would be located within an expansive transport corridor spanning 10 lanes of traffic. To ameliorate the expanse of road space, a series of 'green canopies' would assist in blending the proposed infrastructure elements within the local built and natural fabric. Urban design outcomes at these locations would be guided by a number of existing motorway infrastructure elements including the original M5 East Motorway, the original M4 Motorway and the recent M4 Motorway widening works, and the soon to be constructed King Georges Road interchange upgrade. These combine to create a varied and cluttered driver experience.

The overall design intent for tunnel portals would be to create a refined design aesthetic that avoids clutter. Portals would be designed as architectural elements which are both attractive and welcoming. The portals would be designed to fit within the existing M5 East Motorway corridor, connect with the King Georges Road interchange upgrade and present a new, sleek and refined element.

Tunnel portals would be designed using robust, durable materials with the integration of lighting and signage. Tunnel portals would feature the following:

- Portal walls with select paint finish and anti-graffiti coating
- Portal facades with black composite metal cladding on structural steel frames
- Tunnel entry portals would feature black variable message signage above tunnel entry ramps, blending with the black composite metal cladding portal facades
- Tunnel dive approach structures which feature wall cladding with a composite metal cladding coloured silver grey with feature lighting rebates staggered at regular centres with light emitting diode strip lighting.

Bexley Road South motorway operations complex (MOC2)

The Bexley Road South motorway operations complex (MOC2) would be located within land zoned SP2 Classified Road under the Canterbury LEP 2012, which reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. Land uses permitted with consent in this zone include development ordinarily incidental to or ancillary to road development. This would include the construction and operation of the Bexley Road South motorway operations complex (MOC2), as ancillary to the operation of the project.

The Bexley Road South motorway operations complex (MOC2) would be bound by the M5 East Motorway to the north and Bexley Road to the east, both of which are zoned SP2 Infrastructure. These two road corridors to the north and east of the site visually buffer the site from the residential zoned land to the north and east. As such, the project would have a minimal visual impact on these areas, and therefore the overall character of 'low-medium density residential character and bushland setting of the area' would not be significantly affected.

The Bexley Road South motorway operations complex (MOC2) shares a boundary with the M5 Linear Park. Although this narrow parkland is used for public recreation, the land is zoned SP2 Infrastructure and is closely associated with the M5 East Motorway. The change within the Bexley Road South motorway operations complex (MOC2) site (from a road reserve to the motorway operations complex) would constitute a character change from the existing condition, but as the site is zoned SP2 Infrastructure, this change is acceptable within the desired future character of the site. In addition, the narrowed pedestrian and cycle access around the edge of the motorway operations complex would not be out of character for this linear park.

The land on the southern side of Wolli Creek to the south of the Bexley Road South motorway operations complex (MOC2) is zoned RE1 Public Recreation. The Bexley Road South motorway operations complex (MOC2) would not encroach on this land and would be visually buffered by the mature vegetation associated with the Wolli Creek corridor and recreational land adjoining it. Therefore the character of this recreational land would not be affected by the Bexley Road South motorway operations complex (MOC2).

Arncliffe motorway operations complex (MOC3)

The Arncliffe motorway operations complex (MOC3) would lie within the Kogarah Golf Course, which is unzoned. The change in land use (from private recreational open space to the Arncliffe motorway operations complex (MOC3)) does constitute a significant character change from the existing condition. The land is currently zoned as Trade and Technology, Open Space and Special Uses under the *Sydney Regional Environmental Plan No. 33 – Cooks Cove*. However no action has been taken so far to action these future uses, and the DP&E has commenced investigations of the Cooks Cove area as a potential priority precinct for rezoning.

In terms of current land use zonings, the Arncliffe motorway operations complex (MOC3) would primarily lie within the Trade and Technology zone, with minor encroachments into the Open Space and Special Uses Zones. The Arncliffe motorway operations complex (MOC3) would be compatible with these land use zones as follows:

- Within the Trade and Technology zone, roads are permitted with development consent, as are ancillary facilities supporting the functions of the zone

- Within the Open Space zone, roads are permitted with development consent, as are inland uses incidental or ancillary to the land uses lawfully carried out within the zone
- Within the Special Uses zone, land uses for the purposes of roads may be carried out with development consent, and the objectives of the zone include accommodating the M5 corridor and to provide for the development of a transport corridor by Roads and Maritime.

Given these land use zonings, it is considered that development for the purposes of the Arncliffe motorway operations complex (MOC3) would ordinarily be permissible on this land, given its proper classification as development for ancillary road infrastructure on behalf of Roads and Maritime.

It is however understood that DP&E is investigating the site as a potential priority precinct, which may result in changes to current land use zonings. MOC3 will impact future development at the site However, the magnitude of this impact will be dependent on the land use. Nevertheless a number of design responses could be implemented for any future development on the Cooks Cove site that would ensure these impacts are mitigated. Ongoing liaison with DP&E during detailed design would assist in determining the magnitude of visual impacts.

The Arncliffe motorway operations complex (MOC3) would be bounded on two sides by major road corridors: to the north by Marsh Street, which is zoned SP2 Infrastructure, and to the west by the M5 East Motorway, which also lies within unzoned land. The Arncliffe motorway operations complex (MOC3) site would be visually buffered by the M5 East Motorway, which would provide a visually impenetrable barrier between the Arncliffe motorway operations complex (MOC3) and areas to the west. The Arncliffe motorway operations complex (MOC3) would therefore have no impact on the desired character of these areas.

North of Marsh Street, the land is zoned R2 Low Density Residential, B4 Mixed Use, R4 High Density Residential and a small pocket of RE1 Public Recreation under the Rockdale LEP 2011. The Arncliffe motorway operations complex (MOC3) would be visually exposed to the R2 Low Density Residential zoned and B4 Mixed Use land, but would be buffered somewhat by Marsh Street, which is a busy four lane road. During operation, and particularly when the landscaping associated with the Arncliffe motorway operations complex (MOC3) has matured, the project would have a minimal impact on the overall character of these areas to the north, particularly considering the limited visual accessibility that these areas share. The desired 'residential character with integrated business development and recreational areas' would not be affected by the project.

The facility would include the following:

- Supply vent station
- Exhaust vent station
- Distribution substation
- Water treatment pant
- Water treatment wetland.

Landscape areas would be restored with new areas of turf and tree planting to screen this infrastructure and match the area's existing parkland character. The buildings would be of relatively low height, largely screened with vegetation, and appear as part of the overall project. The distribution substation and water treatment plant would be clad in dark face brick on structural concrete blockwork. Openings providing service access to plant rooms would be grouped similarly to the other distribution substations with common recesses exposing bands of the structure – a smooth-faced concrete block. Access doors within the blockwork would be painted light grey to match. A ventilation facility would be located adjacent to Marsh Street, including four ventilation shafts. The design of the ventilation facility and associated buildings would be reminiscent of ventilation facilities along the M5 East Motorway, albeit of a lower scale. The Arncliffe ventilation facility would be around 35 metres in height, and clad in precast concrete panels on the east and west facades and corten material cladding on the northern and southern facades.

Tunnels

A large portion of the M5 East Motorway would be in tunnel, ultimately becoming Australia's longest road tunnel. Tunnel components include lining, roof, lighting, on / off ramps and safety breakdown bays. The new M5 East Motorway tunnel would set the benchmark in improving tunnel travel experiences.

A unique identity for the M5 East Motorway tunnel would be consistent with the WestConnex M4 East Stage 1B Tunnel through the inclusion of the following:

- Portal drive structures with integrated feature lighting
- Short sections providing architectural variation with 'black' panel inserts at approximate one kilometre intervals
- Location suburb identifiers with custom image panels
- A 'mid tunnel event'
- Coloured feature lighting at selected locations and coloured lining panels within breakdown bays
- All safety and emergency exit signage requirements.

Tunnel materials, colours and finishes would be as follows:

- Left side treatments:
  - Standard 'white' compressed fibre cement epoxy coated lining panels
  - Short sections with variable width panel inserts (coloured black, white and silver grey) at approximate 500 metre intervals (mainline only) that would introduce a textural effect as a contrast to the standard white panel, providing a subtle variation in visual rhythm to reduce monotony
  - Custom image panels as location identifiers at approximate two kilometre intervals
  - Custom coloured panels as location identifiers at approximate two kilometre intervals
  - Custom coloured panels at breakdown bays
- Right side treatments:
  - Standard white compressed fibre cement epoxy coated lining panels
  - Cross passages for emergency use occur at approximate 120 metre intervals, and would be marked by the use of jade green running man symbols.

Tunnels would include elements to interest travellers and provide orientation and enjoyment. These can assist in reducing driver fatigue and increasing awareness. On the left side, location identifiers that inform motorists' orientation to above ground features would be provided (eg for Bexley North, Arncliffe, Tempe and St Peters). These identifiers would also include a section of linear feature lighting in the roof providing an additional layer of interest, occurring at approximately two kilometre intervals in both westbound and eastbound tunnels (around every one minute, thirty seconds along the journey at 80 kilometres per hour.

Lighting strategies would also be developed to reduce impacts of monotony within tunnels. The design would provide the following key lighting elements:

- Western tunnel dive structures would feature walls with composite metal cladding coloured silver grey with staggered lighting rebates. Featured light emitting diode strip lighting would create a refined glow from within the rebates and a subtle wash of light across cladding panels
- Approximate 100 metre tunnel sections with variable width white, black and silver grey panel inserts with light emitting diode strip lighting between panels. These sections would occur at approximately 500 metre intervals throughout the tunnel. Light emitting diode lighting, when combined with the variable width coloured panels, would create a contrast to the standard white panel and provide a subtle variation in visual rhythm

- Custom image panels would be used to highlight suburb locations at approximate two kilometre intervals to assist driver orientation. Approximate 100 metre sections of white translucent polycarbonate illuminated panels with variable light emitting diode lighting effects would be used, adding visual interest and variety for the motorist
- Feature custom coloured yellow lining panels at breakdown bays would be complemented with feature lighting, making the location of the breakdown bay in contrast with main tunnel lining panels
- The mid tunnel event would feature select graphic panels with light emitting diode strip lighting to panel joints, and concealed light emitting diode floodlighting to ceiling panels. It would become a memorable marker in this section of tunnel, providing drivers with an understanding of where they are in the total tunnel journey. It would feature select graphic lining panels laid parallel to the road alignment, and extending to the full height of the tunnel and partially wrapping across the tunnel ceiling over lane shoulders. Light emitting diode strip lighting would be included in the panel joints providing a range of programmable lighting effects utilising a full range of colours.

St Peters interchange

The St Peters interchange, roughly bounded by the Princes Highway, Canal Road, Burrows Road and Campbell Road, would be predominantly zoned IN1 General Industrial and SP2 Infrastructure, with pockets of IN2 Light Industrial as zoned under the Marrickville LEP. Within this context, the St Peters motorway operations complex (MOC4), Burrows Road motorway operations complex (MOC5), Eastern Portals, associated interchange roads and St Peters ventilation facility would fulfil the desired character of the site to 'maintain access and connectivity between local centres of employment and economic activity.'

Under the Marrickville LEP 2011, development for the purposes of roads is permitted on land zoned as General industrial IN1 and Light industrial IN2 with consent. Also, all other development not specified as prohibited is permissible with development consent. As such, the development of the St Peters motorway operations complex (MOC4) would ordinarily be permissible with development consent, and is therefore not inconsistent with the land use objectives of the Marrickville LEP 2011.

Under the Sydney LEP 2012, development for the purposes of roads is permitted on land zoned IN1 General Industrial with consent. Also, all other development not specified as prohibited is permissible with development consent. As such, the development of the Burrows Road motorway operations complex (MOC5) would ordinarily be permissible with development consent, and is therefore not inconsistent with the land use objectives of the Sydney LEP 2012.

The St Peters interchange would be located to the east of a band of land zoned B6 Enterprise Corridor, B4 Mixed Use and IN2 Light Industrial. The St Peters interchange would be visually detached from these areas, as they either front onto the Princes Highway, or open out onto internal courtyards and parking areas. The St Peters interchange would not impact on the existing or desired character of these areas.

To the north-east, the St Peters interchange would be bounded by Sydney Park, a regional park zoned RE1 Public Recreation. The proposed recreational spaces and landscaping within the St Peters interchange would help to integrate the project with the land use of this site, and would provide additional open space for adjoining neighbourhoods (which include land zoned R1 General Residential, R2 Low Density Residential and R3 Medium Density Residential).

Road upgrades to the land surrounding the St Peters interchange include widening of Campbell Road, Campbell Street and Euston Road, as well as new bridges spanning the Alexandra Canal and adjoining Campbell Road and Gardeners Road. The widening of Campbell Road and Campbell Street would contribute to visually significant character changes within these road corridors. Where the widened road passes through land zoned SP2 Infrastructure, B4 Mixed Use and IN2 Light industrial, the change in character would be in keeping with the desire to 'maintain access and connectivity between local centres of employment and economic activity'. Where the road widening passes through land zoned RE2 Low Density Residential and adjacent to RE1 Public Recreation (ie Campbell Street), the character of the new road is consistent with the nature of this area as a road reserve in a residential area.

The three bridges proposed to span the Alexandra Canal pass through land zoned IN1 General Industrial and SP2 Infrastructure. They would constitute a different element within the existing visual setting, but the character of these bridges and road extensions would not significantly change the character of the surrounding land uses at either location.

To achieve a lasting and cohesive urban design strategy for the overall Interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4-M5 connection. The following objectives would allow design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria Landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange, creating an urban forest
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

Such a design would allow for future stages of the Interchange to adopt similar approaches to materials and detailing to achieve overall project cohesion and an integrated 'whole of project outcome'. The landscape approach in this area is essentially to create green volume and remediate the former Alexandria landfill by creating urban forest capable of competing with the scale of the proposed St Peters interchange.

Large areas of new tree planting would be incorporated on both sides of the northern ramps and above the portals to present a continuous green canopy and create a sense of green immersion for motorists upon entry to or exit from the tunnel.

St Peters ventilation facility and distribution substation

The St Peters ventilation facility would be designed to enhance the existing street character whilst treated as a cohesive set of architectural buildings. It would be nestled into the sloping site to reduce its apparent height and respond to its context. The lowest section of the building, which fronts Canal Road and wraps around the southern end, houses the distribution substation. Immediately adjacent and slightly higher the exhaust ventilation equipment would be placed in a two level section, the lower level being entirely below ground.

Horizontally oriented fans would allow for a lower building and, through the use of a plenum system, only require a single ventilation stack. Horizontally oriented terracotta façade panels would emphasise the low nature of the building, with the ventilation stack rising up from the southern end. Patterned exposed precast concrete structural walls to the north and south of the stack would flank the eastern and western facades which would be clad in a lightweight patterned louvered veil. This vertical structure would be visually separated from the horizontal building. The joints between panels and their surface pattern would be considered so as to accentuate the height of the St Peters ventilation facility while reducing its apparent width. To the north, the supply vent building houses vertical fans which would also be lowered below ground to reduce height. The building would be capped in architectural louvres working to lighten the building near its top and allow fresh air to be drawn in.

The horizontal portions of the building would be clad in horizontally oriented dark and light grey terracotta façade panels, responding to the predominantly masonry construction of nearby residential houses. Openings providing service access to the plan rooms would be grouped into common recesses, exposing the structure – a smooth-faced concrete block. Access doors within the blockwork would be painted to match. The lower scale supply building would be clad in vertically oriented terracotta panels reflecting its function and shape whilst acknowledging its moderate scale. Patterned precast concrete panels would form the northern and southern facades of the St Peters ventilation facility. The vertical and horizontal joints would be integrated into the cast-in pattern. Horizontal louvres would be incorporated on the eastern and western facades that are cut with varying depths to provide opportunities for interpretation, visually reducing the overall width of the building.

Landscape treatments surrounding the St Peters ventilation facility would focus on creating a defined street edge with street tree planting, and features Fig tree plantings to offer increased green volume and help define a sense of landscape character for the interchange. These Figs would also provide valuable shade for park users.

St Peters Interchange portal

At St Peters interchange the design approach to tunnel portals differs from that adopted for the western portals at Kingsgrove, as the new infrastructure elements at the St Peters interchange need to sit within and be integrated with the parklands, rather than being imposed upon them. The design would provide a simple and elegant solution unifying a range of geological issues by wrapping the portal and approaches in a giant sculptural veil form.

The sculptural veil would be a series of coloured rectangular aluminium sections laid in a curvilinear series at varying angles to establish a seemingly continuous, but transparent, sinuous form.

Local road upgrades

The overall design intent is to create a series of tree lined local streets offering amenity for local residents, creating a high quality environment for pedestrians and cyclists, and integrate the local streetscape with adjacent open space and parkland, particularly in the vicinity of Sydney Park.

The design would incorporate a series of feature pedestrian and cycleway bridges to increase connectivity for and allow integration of the open space proposed for the St Peters interchange. Tree and landscape plantings would be designed to match City of Sydney, Botany Bay and Marrickville Council guidelines, whilst vegetation and tree plantings would be used to create a sense of visual separation for pedestrians and cyclists from the road edge.

The design of wall structures would be refined and elegant, without unnecessary fussiness or embellishment, with landscape treatments used to soften the appearance of retaining walls and other structures.

Proposed pedestrian and cycleway bridges over Campbell Road and northern ramps and Alexandra Canal would become integral elements, creating new connections for the regional cycle network.

The design of the pedestrian and cycle bridges would feature simple and elegant solutions, with a focus on creating horizontal alignments responding to the adjacent landscape environment of Sydney Park and the proposed landscape earth treatments for St Peters interchange.

Burrows Road motorway operations complex (MOC5)

The Burrows Road motorway operations complex (MOC5) would be located on the corner of Campbell and Burrows Roads, accommodating an open carpark, bike storage and waste facilities at ground level. The carpark would be softened by a large landscaped buffer between the kerb and building. Slender concrete columns would support the upper level allowing views out from beneath the building and raise it above flood event levels. The upper level would house reception, open plan offices, enclosed offices, breakout spaces, as well as a lunch room and associated staff amenities.

Secure areas including the motorway control room, incident coordination room and operations manager office would all be located to the western end of the building. An accessible toilet and staff breakout would all be accessed from the rear of the motorway control room.

The Burrows Road motorway operations complex (MOC5) would blend in with the surrounding light industrial land use while maintaining the identity of the project. It would be a two level building with an open carpark below the main functional spaces. The main address, vehicle and pedestrian access would be from Burrows Road. A substation building would be situated to the rear of the main structure. A long span roof supported from the northern and southern walls would provide near limitless flexibility for the interiors. Uninterrupted power supple and electrical equipment rooms would be located in a consolidated block to the north of the floor plate. The horizontal nature of the building would be accentuated by the expression of the floor and roof lines on the south elevation to Burrows Road. The floor and roof lines return around the eastern and western ends and fold vertically down the south elevation to meet and form a continuous 'C' shaped loop. A series of vertical louvres would punctuate the Burrows Road façade and return to the east to form a screen to the double height entry space.

Clad in composite aluminium panels, the southern elevation of the Burrows Road motorway operations complex would wrap up and over the building to form a casing into which the building would be inserted. The motorway control rooms would be clad in corten steel panels, emphasising their secure nature. The office and breakout spaces would be enclosed with clear glass to provide natural light to the working environments. The long linear nature of the building would be articulated with vertical louvres spaced at different intervals along the Burrows Road façade. The spacing would respond to the private or public nature of the spaces within, providing a shifting rhythm. Egress stairs and plant spaces at the ground level would be exposed, smooth faced concrete block, expressing their function. The substation to the rear would be clad in brick, referencing the site's history and acknowledging the building's more utilitarian purpose.

Open space quantum

The inclusion of publically accessible open space is a key benefit of the project's design. The project would be constructed largely within existing road reserves and efforts have been made to minimise the footprint with every surface intervention.

In the western reaches of the project, connectivity between existing areas of open space would be improved through upgraded shared paths of the M5 Linear Park. The shared paths would be enhanced by new landscaping which would assist in screening the motorway and associated noise barriers. The upgraded shared paths and landscaping would integrate with similar upgrades being undertaken for the King Georges Road interchange upgrade.

In eastern parts of the project, significant new areas of open space would be created around the St Peters interchange. A master plan solution has been developed, encompassing the entire interchange site and ensuring its integration with surrounding areas. The majority of the open space to be provided by the master plan would be completed as part of the project. The project would extend the parklands of Sydney Park further south, providing much needed open space for a growing population. Featuring landscape mounds, the design of the interchange parklands would continue the features of Sydney Park. This space would be accessed from shared paths in the east connecting to Sydney Park or via a dedicated entrance at the corner of Canal Road and Princes Highway. New open space would feature a mixture of open turf interspaced with garden beds and large trees. Landscape mounds would have sufficient height to enable park users to take advantage of views to the Sydney central business district, Sydney Airport and surrounding neighbourhoods. This restrained design would allow future interventions to meet the needs of the community in a similar manner to the ongoing evolution of Sydney Park.

Cycle and pedestrian connectivity

The project would provide improved and upgraded connectivity for cyclists and pedestrians. In the western reaches of the project, the existing M5 Linear Park shared path would be updated to provide a three metre wide surface for the majority of its length. This would be complemented by new landscaping along the length of the Linear Park.

In the east of the project a number of local street amendments would provide the opportunity to improve pedestrian and cyclist connectivity around the St Peters interchange. Bridges over the Alexandra Canal would also provide new connections between Mascot, Alexandria and St Peters. These connections would increase access for a growing residential population to Sydney Park and the additional parklands to be created as part of the project. Dedicated cycleway upgrades as part of the project would provide:

- A new east-west route connecting the existing Bourke Road and proposed Alexandra Canal cycleways in the east to the corner of Campbell and May Streets in the west
- Separated cycleway access to Sydney Park and its network of off-road cycleways
- Together with the potential King Street Gateway upgrade, connection to the existing cycleway network on either side of Sydney Park Road.

A number of shared paths would also be provided to ensure maximum connectivity and ease of navigation around the interchange site and Sydney Park. New shared paths would be provided:

- On the northern side of Campbell Road between Barwon Park Road and Bourke Road
- On the western side of Euston Road adjacent to Sydney Park, between Campbell Road and Sydney Park Road
- Within the interchange parklands connecting the new Campbell Road dedicated cycleway with Canal Road in the south.

For intersections that include dedicated cycleways, cycle signs would be provided to ensure cyclist safety and promote ease of access.

Pedestrian permeability to Sydney Park and the open space created by the project would also be improved. All dedicated footpaths would line streets terminating in either signalised or zebra crossings. The provision of street trees and landscaping would further improve pedestrian amenity along these new paths.

Operational visual impacts

The operational visual impacts of the project have been assessed at the following areas of ongoing built form operational infrastructure:

- Western surface works, including the Kingsgrove motorway operations complex (MOC1)
- Bexley Road surface works, including the Bexley Road South motorway operations complex (MOC2)
- Arncliffe surface works, including the Arncliffe motorway operations complex (MOC3)
- The St Peters interchange and local road upgrades, including the St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5).

Potential operational visual impacts have been assessed in the following sections, with a summary of the outcomes of the assessment provided in **Table 14-15** and the locations of representative receivers provided in Sections 6.1.1 to 6.1.14 of the Technical working paper: Landscape character and visual impact (**Appendix K**).

Table 14-15 Operational visual impact assessment summary

Receiver location	Receiver type	Sensitivity of receivers	Magnitude of change	Overall rating
Western surface works, including the Kingsgrove motorway operations complex (MOC1)				
Glamis Street, southern end	Residents	Moderate	Moderate	Moderate
	Pedestrians / cyclists	Moderate	Moderate	Moderate
	Passive recreational users	Moderate	Low	Moderate to low
M5 Linear Park - Kindilan underpass	Pedestrians / cyclists	Moderate	Moderate	Moderate
M5 East Motorway	Road users	Low	Low	Low
Vanessa Street Industrial Compounds	Industrial neighbours	Low	High	Moderate
Beverly Grove Park South	Pedestrians / cyclists	High	High	High
Tallawalla Street	Residential neighbours	Low	Moderate	Moderate
Bexley Road surface works, including the Bexley Road South motorway operations complex (MOC2)				
M5 East Motorway	Road users	Low	Negligible	Negligible
Intersection of Bexley Road and Wolli Avenue	Residents	Low	Moderate	Moderate to low
	Road users	Low	Moderate	Moderate to low
M5 Linear Park, Bexley, south of M5 entry	Pedestrians / cyclists	High	Moderate	High
Bexley Road, south of the pedestrian underpass	Road users	Low	Moderate	Moderate to low
Arncliffe surface works, including the Arncliffe motorway operations complex (MOC3)				
M5 East Motorway	Road users	Low	Low	Low
Intersection of Flora Street and Marsh Street	Residents (low density)	Moderate	High	High to moderate
	Residents (high density)	High	Moderate	High to moderate
	Road users	Moderate	Moderate	Moderate to low
	Pedestrians / cyclists	Moderate	Moderate	Moderate
Eve Street cycle path	Pedestrian / cyclists	Moderate	Moderate	High to moderate
Kogarah golf course	Active recreation	Moderate	Moderate	Moderate
St Peters motorway operations complex (MOC4)				
Intersection of Princes Highway and Canal Road	Commercial neighbours	Low	Moderate	Moderate to low
	Road users	Low	Moderate	Moderate to low
Commercial complexes backing onto the St Peters interchange	Commercial neighbours	Low	Low	Low
Industrial	Industrial neighbours	Low	Moderate	Moderate to low

Receiver location	Receiver type	Sensitivity of receivers	Magnitude of change	Overall rating
buildings on the Princes Highway	Road users	Low	Moderate	Moderate to low
Burrows Road motorway operations complex (MOC5)				
Burrows Road	Industrial neighbours	Low	Moderate	Moderate to low
	Road users	Low	Moderate	Moderate to low
St Peters interchange				
Burrows Road near the Gardeners Road Bridge	Industrial neighbours	Low	Moderate	Moderate to low
	Road users	Low	Moderate	Moderate to low
Industrial complex on Canal Road	Industrial neighbours	Low	Low	Low
Campbell Road	Residential neighbours	High	High	High
	Road users	Moderate	High	High to moderate
Sydney Park	Active and passive recreation	Moderate	Moderate	Moderate
Barwon Park Road	Residential neighbours	High	High	High
Local road upgrades				
Campbell Street between Unwins Bridge Road and Princes Highway	Residential neighbours with adjoining boundaries	High	Moderate	High to moderate
	Industrial neighbours	Moderate	Low	Moderate to low
	Recreational users	Moderate	High	High
	Road users	Moderate	Moderate	Moderate
	Commercial neighbours	Low	Low	Low
Campbell Street between Princes Highway and Barwon Park Road	Industrial neighbours	Low	Moderate	Moderate to low
	Road users	Low	Moderate	Moderate to low
Campbell Road between Barwon Park Road and Burrows Road	Residential neighbours with adjoining boundaries	High	High	High
	Recreational users	Moderate	Moderate	Moderate
	Road users	Moderate	Moderate	Moderate
Euston Road between Campbell Road and Sydney Park Road	Recreational users	High	High	High
	Industrial neighbours	High	High	High
	Road users	Moderate	Moderate	Moderate
Bourke Street / Bourke Road	Industrial neighbours	Low	Low	Low
	Road users	Low	Moderate	Moderate to low
Gardeners Road	Industrial neighbours	Low	Low	Low
	Road users	Low	Moderate	Moderate to low

Western surface works, including the Kingsgrove motorway operations complex (MOC1)

Few receiver groups would see the changes to Beverly Grove Park South, as the site is visually contained to the north by the M5 East Motorway and is bounded to the south by industrial development. Users of the M5 Linear Park would be the most affected, as they pass in close proximity to the proposed maintenance operations centre. The visual impacts of the changes are rated as high for this receiver group at this location.

The workers in the industrial compound to the south of the Kingsgrove motorway operations complex (MOC1) would see the changes to the site, but they are anticipated to have a lower sensitivity to changes within the landscape than recreational users of public open space.

Bexley Road South motorway operations complex (MOC2)

This site is reasonably isolated from surrounding development. It has no industrial, commercial or residential neighbours adjoining the boundaries. The most affected receivers are users of the M5 Linear Park, which would receive a high to moderate rate of visitation from people using the path for active recreation (pedestrians and cyclists), and a low rate of visitation for people choosing to use the site for passive recreation. At operation, the site would no longer be available for passive recreation, but there would be a high level of change to the view for receivers viewing the site from the path. These receivers would also be the most affected by changes to night lighting, although it is expected that at night the number of receivers using the path would drop to a low level.

Arncliffe motorway operations complex (MOC3)

The Arncliffe motorway operations complex (MOC3) would be a relatively contained built element within the north western corner of the Kogarah Golf Course. Although the change in the character of the view to the site would be substantial and is broadly assessed as moderate on average, these changes may be substantially mitigated from external receiver locations with adequate landscaping to the boundary of the site, once it has matured.

St Peters motorway operations complex (MOC4)

The visual impact within the vicinity of the St Peters motorway operations complex (MOC4) would be limited by the utilitarian character of the surrounding area, coupled with the busy nature of the nearby roads and the limited sensitivity of the surrounding receivers. Some of the visual changes would be positive, especially due to the proposed parkland style landscaping surround the St Peters motorway operations complex (MOC4), complete with pedestrian access to other parts of the site.

Burrows Road motorway operations complex (MOC5)

The visual impact within the vicinity of the Burrows Road motorway operations complex (MOC5) would also limited by the utilitarian character of the area, although on Burrows Road, the character is predominantly industrial, with a less busy road. The scale and materiality of the Burrows Road motorway operations complex (MOC5) would not be out of character within the area, although the parkland landscaping associated with the building would be a new, positive element within views to the site from the surrounding industrial developments and the road corridor. The new bridges over the Alexandra Canal would constitute new elements within the area, but their visual impact would be limited by the less sensitive receivers within the area due to its utilitarian character.

St Peters Interchange and local road upgrades

Changes to Campbell Road along the St Peters interchange boundary (between Burrows Road and the Princes Highway) constitute significant differences, especially in regards to residential neighbours and users of public open space. These two receiver groups are highly sensitive and would have clear views to changes, which would include road widening, the development of the St Peters interchange site, pedestrian pathways and bridges, and landscaping.

Campbell Street between Unwins Bridge Road and Princes Highway would change from a quiet, two lane road to a busier four lane road, with the removal of some residential properties. However these visual changes would be softened by proposed landscape features such as street trees and vegetated verges.

Campbell Street between Princes Highway and Barwon Park Road would also be widened, with higher volumes of traffic passing along it and the removal of some residential properties. However the road would be flanked to the south by a vegetated island between Campbell Street and Albert Street.

Campbell Road between Baron Park Road and Burrows Road would change from a wide but only two lane road with parallel parking, to a busy four lane road with a bus lane. Industrial and residential housing would be removed and replace with the St Peters interchange. However much of the St Peters interchange would be visible as a green, vegetated space. The pedestrian bridge over the road would also be visible as a new built element at this location.

At Euston Road between Campbell Road and Sydney Park Road, the length of the park edge wold change as the road is widened and industrial parkland is demolished and replaced with more parkland. Bourke Street and Gardeners Road would also be widened to cater for increased traffic flows.

Mitigation measures to reduce the impact of the development on residents living on Campbell Road are detailed in Sections 6.4.5.1 and 7.2 of the Technical working paper: Landscape character and visual impact (**Appendix K**) and summarised in **Table 14-17**.

Operational night lighting impacts

The potential operational night lighting impacts of the project are summarised in **Table 14-16**.

Table 14-16 Operational night lighting impacts summary

Receiver location	Receiver	Sensitivity to change	Magnitude of change	Overall rating
Western surface works	Residents - Glamis Street, southern end	Moderate	Moderate	Moderate
	Pedestrians / cyclists - Glamis Street, southern end	Moderate	Negligible	Negligible
	Passive recreational users - Glamis Street, southern end	Moderate	Negligible	Negligible
	Pedestrians / cyclists - M5 Linear Park - Kindilan underpass	Moderate	Moderate	Moderate
	Road users - M5 East Motorway	Low	Low	Low
	Industrial neighbours - Vanessa Street	Low	Moderate	Moderate to low
	Pedestrians / cyclists - Beverly Grove Park South	High	Moderate	High to moderate
	Residents - Tallawalla Street	Low	Negligible	Negligible
Bexley Road South motorway operations complex (MOC2)	Road users - M5 East Motorway	Low	Negligible	Negligible
	Residents - Intersection of Bexley Road and Wolli Avenue	Low	Low	Low
	Road users - Intersection of Bexley Road and Wolli Avenue	Low	Low	Low
	Pedestrians / cyclists - M5 Linear Park, Bexley, south of M5 entry	High	Moderate	High to moderate
	Road users - Bexley Road, south of the pedestrian underpass	Low	Low	Low
Arncliffe motorway operations complex (MOC3)	Road users – M5 East Motorway	Low	Negligible	Negligible
	Residents (low density) – intersection of Flora Street and Marsh Street	Moderate	Low	Moderate to low
	Residents (high density) – intersection of Flora Street and Marsh Street	High	Low	Moderate
	Road users – intersection of Flora Street and Marsh Street	Low	Low	Low
	Pedestrians / cyclists – intersection of Flora Street and Marsh Street	Moderate	Low	Moderate to low
	Pedestrians / cyclists - Eve Street cycle path	High	N/A	N/A
	Active recreation – Kogarah Golf Course	High	N/A	N/A

Receiver location	Receiver	Sensitivity to change	Magnitude of change	Overall rating
St Peters motorway operations complex (MOC4)	Commercial neighbours - Intersection of Princes Highway and Canal Road	Low	Low	Low
	Road users - Intersection of Princes Highway and Canal Road	Low	Negligible	Negligible
	Commercial neighbours - Commercial complexes backing onto the St Peters interchange	Low	Low	Low
	Industrial neighbours - Industrial buildings on the Princes Highway	Low	Low	Low
	Road users - Industrial buildings on the Princes Highway	Low	Negligible	Negligible
Burrows Road motorway operations complex (MOC5)	Industrial neighbours - Burrows Road	Low	Low	Low
	Road users - Burrows Road	Low	Negligible	Negligible
St Peters interchange	Industrial neighbours – Burrows Road near the Gardeners Road Bridge	Low	Moderate	Moderate to low
	Road users – Burrows Road near the Gardeners Road Bridge	Low	Negligible	Negligible
	Industrial neighbours – Industrial complex on Canal Road	Low	Negligible	Negligible
	Residential neighbours - Campbell Road	High	High	High
	Road users - Campbell Road	Moderate	Low	Moderate to low
	Active and passive recreation - Sydney Park	High	N/A	N/A
	Residents – Barwon Park Road	High	Moderate	High to moderate

Operational overshadowing impacts

Overshadowing impacts of the operational project are provided in more detail in Section 6.4 of Technical working paper: Landscape character and visual impact (**Appendix K**). These impacts are summarised as follows:

- During the summer months at the Kingsgrove motorway operations complex (MOC1), no overshadowing would occur to properties outside the MOC1 site due to the built structures. During winter, some midday to late afternoon shadowing would be experienced at the industrial complexes on Vanessa Street from the ventilation tacks of the MOC1. However this would be limited to a narrow band due to the tall, narrow form of the ventilation stacks. Furthermore, these shadows would fall on industrial properties with no public open space associated with them
- At the Bexley Road South motorway operations complex (MOC2), no residential, commercial or industrial neighbours would be affected by overshadowing. Some limited shadowing would fall onto the Wolli Creek corridor during the winter months, but this land is not used for recreation purposes
- At the Arncliffe motorway operations complex (MOC3), no residential, commercial or industrial neighbours would be overshadowed. A small portion of the Eve Street cycleway would be in shadow during winter mornings for a short period of time
- Buildings at the St Peters motorway operations complex (MOC4) would not significantly overshadow surrounding areas external to the St Peters interchange. However there would be some overshadowing at 9:00am on the winter solstice, generated by the ventilation facility onto one industrial neighbour on Canal Road

- Some overshadowing from the Burrows Road motorway operations complex (MOC5) would be experienced by a residential receiver at Campbell Road (refer Figure 6-89 of **Appendix K**). The western-most terraces at this location would be overshadowed by the pedestrian bridge spanning Campbell Road between the St Peters interchange and Sydney Park. However this shadowing would only occur from about 3:00pm until sunset during the winter months.

Operational tolling gantries

A series of tolling gantries would operate within the M5 East Motorway. The final locations of tolling gantries would be confirmed during detailed design. However, indicative locations are as follows:

- King Georges Road (entry and exit)
- M5 East Motorway (east and westbound)
- Kingsgrove Road (entry and exit)
- Bexley Road (entry and exit).

Tolling gantries would be located in areas where they are unlikely to be visually prominent from adjacent sensitive receivers, given:

- The extent of proposed revegetation and screening to the corridor edges
- The relative height of noise barriers and the lower M5 East Motorway
- The fact that road users would view the toll gantries as single structures which are visually typical within the context of the M5 East Motorway.

Residual and surplus land

Construction of the project would result in some land being affected by construction activities, which would not be required during the operation of the project (ie both surplus and residual lots – refer **Section 13.2.2**). Residual lands (mostly as a result of construction) would be returned as open space for most sites where there are no ongoing operational requirements. As detailed in this section, open space areas would be created as the preferred method for dealing with surplus lands. A number of existing urban renewal areas already surround the corridor. It is considered that provision of open space as part of the New M5 project would support such current and future urban renewal opportunities. Where reasonable and practicable to do so, some land may be rehabilitated and made available for potential sale and / or redevelopment for a permissible use

In the case of some surplus and residual land, such as land surrounding the St Peters interchange, Euston Road and the Alexandria Landfill, current land use zonings may be able to be reviewed by the relevant local council (refer **Sections 13.2.1** and **13.2.2**)

Specific opportunities which would be considered in the reuse of surplus and residual land include:

- Rehabilitation and subsequent sale and / or redevelopment of surplus lots following construction of the project
- Possible combination of adjacent lots to create a combined area suitable for redevelopment
- Incorporation of non-adjacent lots into the road reserve or project landscaping (refer **Section 13.2.2**).

Where buildings such as ventilation and workshop facilities are located at the Kingsgrove, Bexley and Arncliffe motorway operations complexes (MOC1, MOC2, and MOC3), landscaping on residual land would be used to screen as much of the built form as possible (refer Section 6.3 of **Appendix L**).

Residual land at the St Peters interchange would be landscaped and incorporated into the operation of the project under a master plan, including the following operational elements (refer Section 5.6.1 of **Appendix L**):

- Bench seating
- Terraced retaining wall
- Footpath
- Shared pathways and bridges
- Interpretive signage
- Viewing platform
- Ampitheatre
- Detention basin.

For local streets, tree and landscaped plantings would make use of residual land in the vicinity of feature pedestrian and cycleway bridges, and would assist in integrating these project elements (refer Section 5.6.2 of **Appendix L**).

14.4 Environmental management measures

The project has aimed to limits its visual impact by situating project elements within or adjacent to major transport corridors. Project elements have been designed with consideration of the surrounding areas and landscape treatments have been proposed in order to reduce the visual impacts of new infrastructure. Despite this, visual impacts would occur, particularly during the construction phase due to the introduction of construction sites and large structures such as acoustic sheds.

Environmental management measures relating to urban design, landscape character and visual amenity have been identified and are provided in **Table 14-17**.

Table 14-17 Environmental management measures – urban design, landscape character and visual amenity

Impact	No.	Environmental management measure	Timing
Construction			
Landscaping	V01	Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable, particularly: • Vegetation surrounding the Bexley Road East construction compound, particularly along the boundary between residential properties and the compound along the northern and eastern boundaries • Mature trees along the north-west (Marsh Street) and south-west boundaries of the Arncliffe construction compound site • Mature trees and vegetation along the boundary of Sydney Park along Campbell Road and Barwon Park Road.	Pre-construction
	V02	Landscape planting would use fast growing species where reasonable and feasible. This would soften views of construction sites, particularly for compounds located within public recreational spaces.	Construction
	V03	Revegetation and landscaping would be undertaken progressively.	Construction
Visual amenity	V04	Temporary noise barriers would be erected early within the site establishment phase where required to minimise noise impacts and provide visual screening.	Pre-construction / construction

Impact	No.	Environmental management measure	Timing
	V05	Temporary noise barriers would be designed to include painted surface and project information / logo to deter graffiti and reduce the scale of noise barriers, particularly adjacent to residential areas or public open space.	Detailed design
	V06	Site hoardings and fencing would be regularly maintained, including the prompt removal of graffiti.	Construction
	V07	Acoustic sheds would be designed to minimise noise impacts and provide visual screening to be visually recessive, such as the use of mid toned colours and materials to minimise the intrusiveness and potential glare of the sheds.	Detailed design
Sydney Airport lighting	V08	During detailed design, the Roads and Maritime would liaise with the Civil Aviation Safety Authority to assess the potential for impacts of night lighting from the construction of the project on Sydney Airport operations. Mitigation measures would then be developed as required.	Detailed design
Lighting	V09	Cut-off or and directed lighting would be used within and outside of construction compounds with lighting location and direction considered to ensure glare and light spill are minimised.	Detailed design
Lighting	V10	The lighting design for shared paths located within the M5 Linear Park impacted by the project or located adjacent to compounds would be designed to minimise light spill to adjoining residential properties while maintaining a safe night time environment for path users (eg lighting position below the height of the fence line).	Detailed design
Signage	V11	A signage strategy would be developed during detailed design for temporary wayfinding and safety. Potentially affected receivers would be consulted on the final signage in relation to the location and associated impacts.	Detailed design
Visual amenity	V12	Elements within construction sites would be located to minimise visual impacts as far as feasible and reasonable, for example, locating equipment back from site boundaries.	Detailed design / construction
Visual amenity	V13	Opportunities would be investigated to maximise the separation distances as far as reasonable and feasible: • Between the Kingsgrove North construction compound to the adjoining residential areas to reduce shading and visual impacts • Between the Bexley Road North and Bexley Road East construction compounds and adjoining residential areas to reduce sharing and visual impacts.	Detailed design
Visual amenity	V14	Opportunities would be investigated to provide an alternative southern cycle route for the length of the existing shared path impacted by the western surface works.	Detailed design

Impact	No.	Environmental management measure	Timing
Operation			
Visual amenity	OpV01	Vegetated batters would be limited to 1:3 and 1:4 where possible in order to maximise the impact of vegetation on these batters and minimise maintenance.	Detailed design
Visual amenity	OpV02	Chain link fencing for sites would only be used where these would not be viewed by sensitive receivers, such as residents and users of recreational space. At these locations, high quality fencing suitable for parks and public spaces would be considered.	Detailed design
Visual amenity	OpV03	Where large areas of hardstand are or structures are designed, such as carparks, consideration of shade trees within these spaces would be considered where reasonable and feasible to soften views and provide shade and visual amenity.	Detailed design / post construction
Visual amenity	OpV04	Pedestrian and shared paths would be aligned away from residential property boundaries where public open space adjoins residential boundaries.	Detailed design
Landscaping	OpV05	Planting areas would be maximised, where feasible, between public open space and infrastructure, and would include taller screening vegetation (at the Bexley Road South motorway operations complex (MOC2) between the built form and the M5 Linear Park shared path for example).	Detailed design
Landscape and urban design (general)	OpV06	A final urban design and landscape plan would be prepared in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community. The Plan shall include (but not limited to): • The architectural treatment of the ventilation facilities, which would be informed by the functional requirements and the design principles detailed in the New M5 Urban Design Report. • Landscape plans and final plant species for the western surface works, Bexley Road motorway operations complex, Arncliffe motorway operations complex, the St Peters interchange and local road upgrades • The artwork strategy for the Kindilan underpass • Consideration of the outcomes of the Safety in Design review of the project.	Detailed design
Landscape and urban design at Kingsgrove	OpV07	The design of the noise attenuation at the western surface works would be confirmed during detailed design and in consultation with the local community. This may consist of noise mounds and barriers (or a combination of both) and with consideration to the provision of accessible open space at Beverly Grove Park and a landscaped outlook.	Detailed design
Landscape and urban design at Bexley	OpV08	Landscaping at the Bexley Road motorway operations complex would consider opportunities to complement the existing topography of the built site as well as the adjacent Wolli Creek bushland.	Detailed design
Landscape and urban design at Arncliffe	OpV09	Reasonable and feasible measures to use landscaping to screen or filter views of the Arncliffe motorway operations complex from residential areas to the west would be implemented.	Detailed design
Landscape and urban design at St Peters	OpV10	Opportunities to maximise the green canopy throughout the local road upgrades at Peters with tree planting in medians where safety barriers and / or speed limits permit would be explored during detailed design, and implemented where reasonable and feasible.	Detailed design

Impact	No.	Environmental management measure	Timing
Sydney Airport lighting	OpV11	During detailed design, the Roads and Maritime would liaise with the Civil Aviation Safety Authority to assess the potential for impacts of night lighting from the operation of the project on Sydney Airport operations. Mitigation measures would then be developed as required.	Detailed design
Lighting	OpV12	Lighting design within motorway operations complexes, roadways, and on elevated pedestrian bridges would minimise the impacts of lighting to surrounding areas (particularly residential areas), for example through the use of cut-off, directed lighting and landscaping to minimise light spill and glare. This includes consideration of residences along Campbell Road.	Detailed design

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