

# **Chapter 18**

## **Landscape and visual**

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# 18 Landscape character and visual

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This chapter summarises the landscape character and visual assessment carried out for the upgrade of the Great Western Highway between Blackheath and Little Hartley (the project). The full landscape character and visual assessment is provided in Appendix N (Technical report – Urban design, landscape and visual). Urban design components of the project are discussed in Chapter 4 (Project description).

## 18.1 Assessment approach

The landscape character and visual impact assessment for the project was undertaken in accordance with the Environmental Impacts Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA-N04 (Transport for NSW, 2020c) and included:

- a desktop assessment including:
  - consideration of relevant legislation and policy requirements
  - review of the landscape, topography, land use and heritage context of the area around the project
  - identification of a study area
  - determination of landscape character zones, sensitive receiver locations and potential viewpoints within the study area
- a site visit to survey the area around the project to assess landscape character and confirm significant landforms and representative viewpoints
- assessment of the potential landscape character and visual impacts of the project during construction and operation
- identification of mitigation measures to mitigate the potential impacts identified.

### 18.1.1 Study area, landscape character zones and viewpoints

The study area for the assessment includes the potential visual catchment, or areas where visibility of the project is anticipated during construction and operation, including nearby lookouts from hiking trails. The study area is shown in Figure 18-1.

Landscape character zones were determined based on characteristics such as vegetation, geology, landform, land use and development density. Considering these differing natural and social elements across the landscape, four landscape character zones were identified as shown in Figure 18-1.

Considering a range of factors including receiver types (motorists, residents, visitors), view type (at-grade, elevated, or panoramic), distance from the project and any important or protected views identified in planning documents, 17 representative viewpoints were identified. The representative viewpoints have been selected to represent locations where the operational infrastructure would be most visually prominent at Blackheath and Little Hartley and are shown in Figure 18-2 and Figure 18-3 respectively.

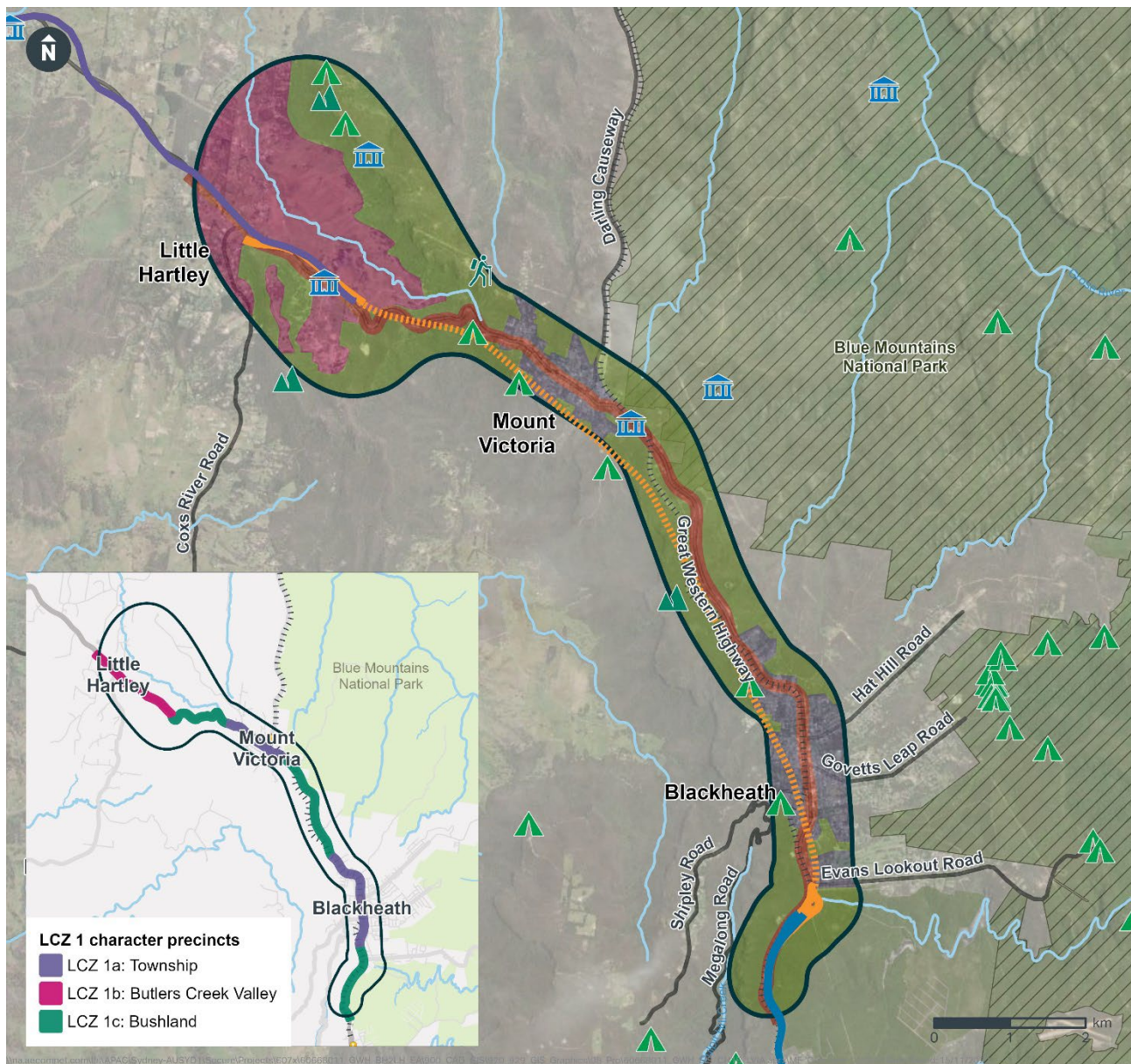
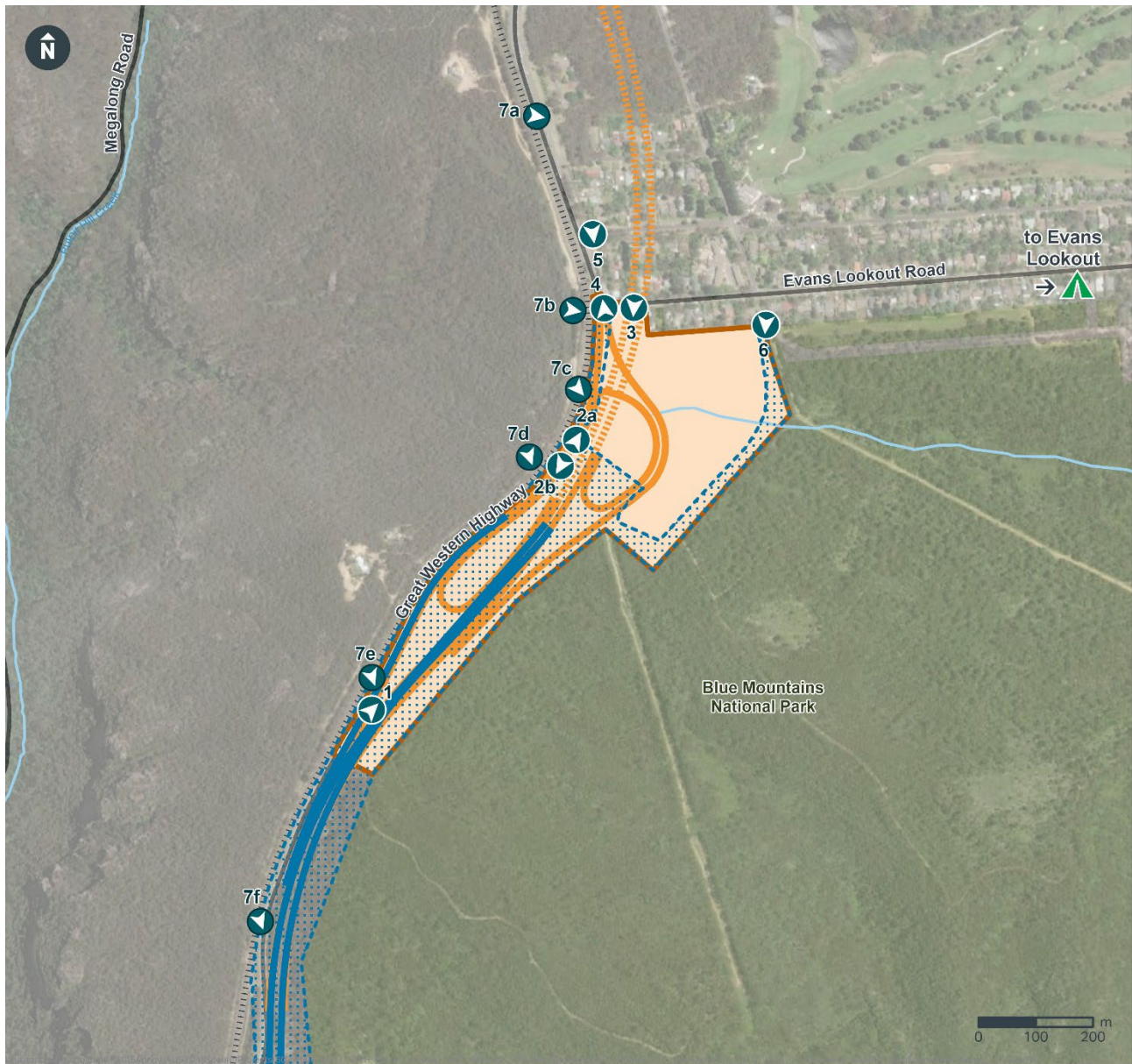


Figure 18-1 Study area and landscape character zones





Basemap Source: Department of Customer Services, 2021; Earthstar Geographics

Legend		Existing environment
Blackheath to Little Hartley Upgrade	Katoomba to Blackheath Upgrade	
Surface work	Surface road	Railway
Tunnel	Construction footprint	Main road
Construction footprint		Watercourse
Representative viewpoint		National parks and reserves

Figure 18-2 Representative viewpoints at Blackheath



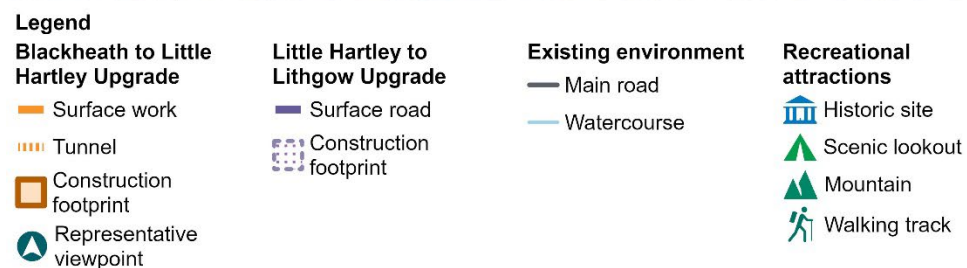
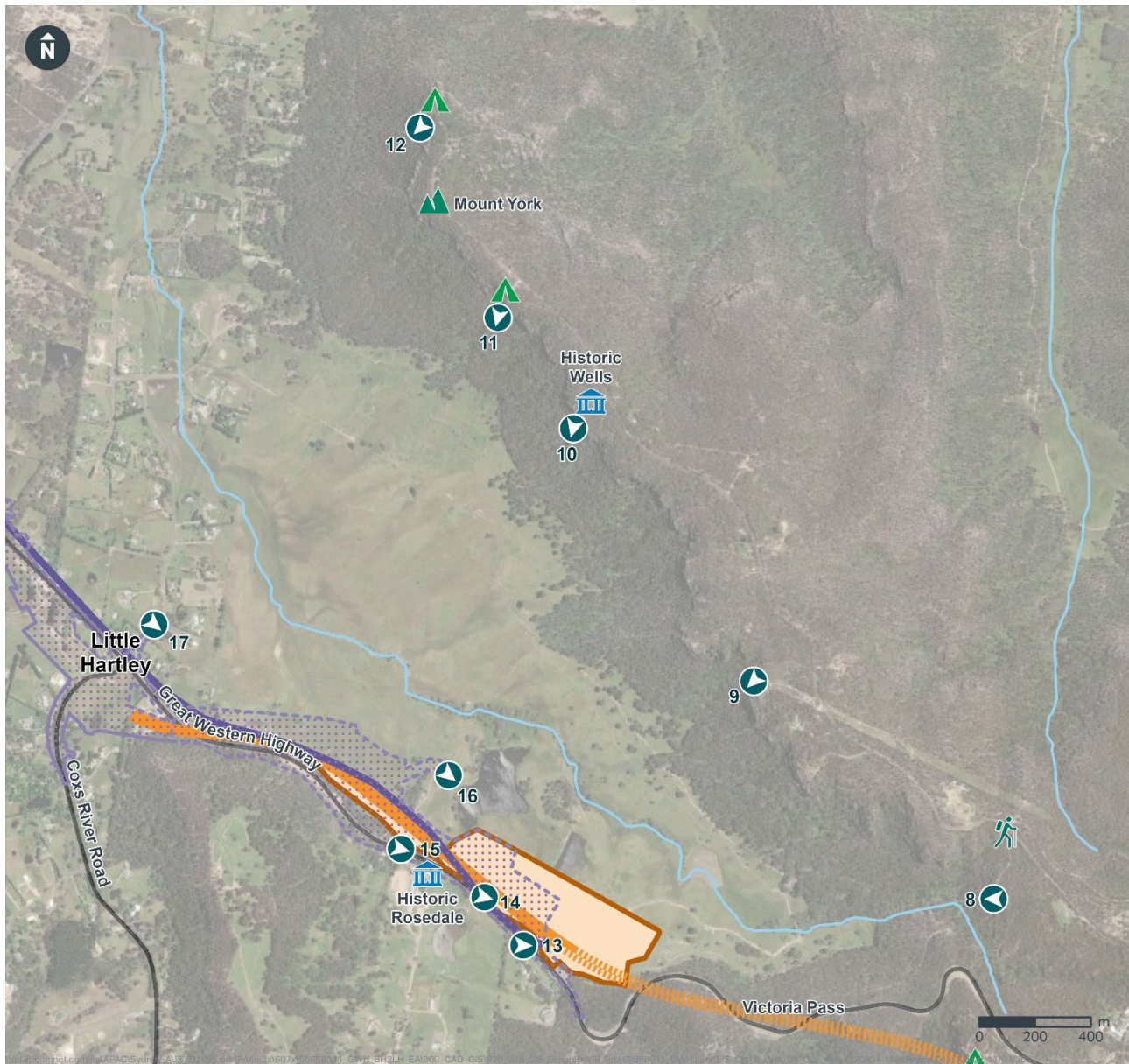


Figure 18-3 Representative viewpoints at Little Hartley

### 18.1.2 Assessment criteria

The landscape character and visual impact ratings have been determined using the sensitivity and magnitude matrix based on the Environmental Impacts Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA-N04 (Transport for NSW, 2020c) as shown in Figure 18-4.

Sensitivity is a qualitative measurement considering the capacity of the landscape character zone or visual receiver to absorb change from the project. Magnitude is a qualitative measurement of the scale, form and character of the project when compared to the existing environment. For the visual impact assessment, this includes consideration of how far the project is from the viewer.

The matrix below is used to determine the overall impact level, which represents a combination of sensitivity and magnitude ratings. The effect of the overall impact was then qualitatively assessed as 'adverse', 'neutral' or 'beneficial' when measured against the existing environment.

	MAGNITUDE OF EFFECT				
		High	Moderate	Low	Negligible
SENSITIVITY	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 18-4 Landscape character and visual impact grading matrix

### 18.1.3 Ventilation design options

The preferred ventilation design for the project has not been determined, and therefore two options have been assessed in the environmental impact assessment including emissions via ventilation outlets and emissions via portals.

Portal emissions would not require additional built structures. The ventilation outlet option would include a 10 metre tall structure (above the finished surface level) near the Blackheath and Little Hartley portals assumed to be a cylindrical form around 10 metres in diameter. Further detail regarding portal emissions and ventilation outlet emissions options is provided in Chapter 3 (Project alternatives and options), Chapter 4 (Project description) and Chapter 9 (Air quality).

Both options have been considered in Section 18.4 with qualitative ratings related to visual impacts summarised in Table 18-7 and Table 18-8.

## 18.2 Existing environment

The existing environment around the study area is characterised by dense vegetation from the Blue Mountains National Park, as well as built forms attributed to the towns of Blackheath and Mount Victoria. The project crosses areas with varied local context, differing built form elements, unique natural characteristics and various land uses.

The Greater Blue Mountains World Heritage Area is listed on the World Heritage List and is located outside but near the construction footprints at Blackheath and Soldiers Pinch (see Figure 18-1). The significance of the area is closely tied to ecological, biological and conservation importance. An additional area of the Greater Blue Mountains Area is nominated for listing on the National Heritage List (referred to as the Greater Blue Mountains Area – Additional Values) and extends across parts of the construction footprints at Blackheath and Soldiers Pinch. Further information about these items is provided in Chapter 17 (Non-Aboriginal heritage).

With regard to the study area, the Greater Blue Mountains World Heritage Area is closest to the project at the Soldiers Pinch construction site. Part of the study area encroaches on the Greater Blue Mountains World Heritage Area, however no viewpoints are contained in this area. From the Greater Blue Mountains World Heritage Area, views to the project are not available, therefore viewpoints have not been selected from this area. Further, the project is not located within or near any views which impact the Greater Blue Mountains World Heritage Area or National Park.

The presence of the Greater Blue Mountains World Heritage Area is a consideration of the value of the landscape in the area surrounding the project and has been included in the general sensitivity of the landscape character zones assessed.



### 18.2.1 Baseline environment

This assessment considers a baseline environment for the operational visual impact assessment, which for the purpose of this assessment, the other components of the Great Western Highway Upgrade Program (Upgrade Program) have been completed at the commencement of project construction including the Katoomba to Blackheath Upgrade and the Little Hartley to Lithgow Upgrade.

At Blackheath the baseline environment would be comprised of the existing environment, in addition to elements from the Katoomba to Blackheath Upgrade which include:

- a connection from Katoomba to Blackheath, using the existing Great Western Highway alignment, to provide a local road connection to the Blackheath township
- a dual lane carriageway, in addition to the existing Great Western Highway, extending east of Blackheath to Katoomba
- an active transport trail which would run along the existing Great Western Highway until Blackheath, where it would run along the eastern side of the Blackheath construction site
- sediment and water quality basins
- vegetation clearance and landscape and revegetation
- road infrastructure including a utilities corridor, fencing, safety barriers, lighting and signage.

At Little Hartley the baseline environment would be comprised of the existing environment, in addition to elements from the Little Hartley to Lithgow Upgrade which include:

- a dual lane carriageway extending west of Little Hartley
- two bridge structures adjacent to the Little Hartley portal over the carriageway connecting to the existing Great Western Highway alignment
- an active transport trail which would run along the local service road alignment adjacent to the Little Hartley portal to Berghofer's Pass
- formalisation of Berghofer's Pass car park
- sediment and water quality basins
- vegetation clearance and landscape and revegetation
- upgraded private property access, and other road infrastructure such as fencing, safety barriers, lighting and signage.

### 18.2.2 Landscape character

A description and sensitivity rating for each landscape character zone based on the baseline environment described in Section 18.2.1 is provided in Table 18-1. Landscape character zone 1 has been further categorised into character precincts based on surrounding landscapes: landscape character zone 1a (Township), landscape character zone 1b (Butlers Creek Valley), and landscape character zone 1c (Bushland).

Table 18-1 Landscape character zones and sensitivity

Landscape character zone	Description	Sensitivity
Landscape character zone 1a: Great Western Highway (Township)	The landscape of the Great Western Highway where it passes through the Blackheath and Mount Victoria townships is characterised by road infrastructure supporting connections to commercial and residential areas and includes signalised intersections and street trees.	Low
Landscape character zone 1b: Great Western Highway (Butlers Creek Valley)	The Great Western Highway at the bottom of Victoria Pass is characterised by the curving road adjacent to pockets of native and exotic vegetation associated with the pastoral landscape. The majority of this area would be subject to landscape character impacts from the Little Hartley to Lithgow Upgrade.	Moderate
Landscape character zone 1c: Great Western Highway (Bushland)	The Great Western Highway where it passes through scenic areas of bushland associated with the Blue Mountains National Park. Parts of this area would be subject to landscape character impacts from the Katoomba to Blackheath Upgrade.	High
Landscape character zone 2: Township	The more densely populated townships within the study area, located off the Great Western Highway including Blackheath and Mount Victoria, typically comprised of a central commercial area surrounded by residential development with heritage items, such as older commercial buildings, individual houses or heritage conservation areas.	Low
Landscape character zone 3: Harley Valley	The valley near Little Hartley, comprising open pastoral landscapes surrounded by densely vegetated bushland slopes, sensitive to new built forms given these are limited within the area.	High
Landscape character zone 4: Bushland	The dense, rugged bushland that surrounds the majority of the Great Western Highway unique to the Blue Mountains and Greater Blue Mountains World Heritage Area, comprising eucalypt woodland and forests, with lookouts common along steep ridge lines looking toward the valley.	High

### 18.2.3 Viewpoint locations

A total of 17 viewpoints were identified to present representative visual changes in the landscape and to assess the potential visual impacts of the project on visual receivers. Viewpoints identified at Blackheath are shown in Figure 18-2, while viewpoints identified at Little Hartley are shown in Figure 18-3. All viewpoints are described in Section 7 of Appendix N (Technical report – Urban design, landscape and visual).

Table 18-2 provides a description of the eight viewpoints assessed as having high and high to moderate impacts as a result of construction and/or operation of the project.

Table 18-2 Viewpoints assessed as having high and high to moderate impacts

Viewpoint	Description
2a	Located on the Great Western Highway at Tennyson Road in Blackheath representing the view of motorists looking north-east (travelling westbound) adjacent to the scenic nature of the Blue Mountains National Park (see Figure 18-5).
2b	Located on the Great Western Highway at Tennyson Road in Blackheath representing the view of motorists looking south-west (travelling eastbound) adjacent to the scenic nature of the Blue Mountains National Park.
3	Located on Evans Lookout Road in Blackheath, which provides access to Blue Mountains National Park and the Greater Blue Mountains World Heritage Area and associated hiking trails, representing the view of motorists and residents looking south (travelling eastbound) toward the Great Western Highway.
6	Located on Valley View Road in Blackheath, representing the view of residents looking south from the rear of residential properties.
7	Includes 6 views (7a-7f) located along the train line at Blackheath representing the view of commuters looking south (travelling eastbound) with an elevated view to the Great Western Highway, adjacent to the scenic nature of the Blue Mountains National Park (see Figure 18-9).
9	Located at an informal lookout point at an existing transmission easement (for exact location see Figure 18-3), representing an elevated view from visitors and two residential houses looking south-west over the Hartley Valley (see Figure 18-11).
10	Located near the Historic Wells lookout, representing an elevated view from visitors looking south over the Hartley Valley.
15	Located at the Hartley Valley Holiday Farm within a landscape conservation area, representing a view from motorists and visitors looking east (see Figure 18-13).

### 18.3 Potential impacts – construction

Construction activities, including night lighting at Blackheath, Soldiers Pinch and Little Hartley construction sites that involve or support tunnelling activities, are likely to result in potential landscape character and visual impacts. Receivers who would likely be impacted include but are not limited to:

- residents that adjoin and/or have views of the project and/or construction sites
- road users
- visitors to nearby recreational attractions.

The most visible construction activities would likely include:

- clearing of vegetation and earthworks
- construction of structures to support the permanent tunnel operational facilities described in Chapter 5 (Construction)
- operation of heavy and/or light vehicles for construction site access and spoil haulage movements



- presence of visually prominent plant and equipment, including cranes, roadheaders, tunnel boring machines (TBMs) and construction hoarding
- TBM assembly and launch areas, concrete batching plant and acoustic shed at the Little Hartley construction site
- lighting for night-time works.

An indicative list of construction equipment and activities required for the project is provided in Chapter 5 (Construction). In general, potential construction impacts would be localised to the area within and immediately surrounding the construction footprint. However, as the proposed construction period would be up to around eight years, measures to mitigate potential landscape character and visual impacts at the construction sites are detailed in Section 18.5.

### 18.3.1 Landscape character

Landscape character impacts during construction would be anticipated at all landscape character zones identified in Section 18.2.2 with the exception of landscape character zone 2 as no surface works are proposed at this location and therefore construction landscape character impacts are anticipated to be negligible.

A summary of the landscape character impacts during construction for each landscape character zone is provided in Table 18-3.

Table 18-3 Summary of landscape character impacts during construction

Landscape character zone	Sensitivity	Potential impact discussion	Impact rating
Landscape character zone 1a: Great Western Highway (Township) 1a	Low	The other components of the Upgrade Program would result in the increased presence of construction activities surrounding the project, reducing the magnitude of change of the project. Construction of the project would overlap with construction activities at Blackheath and Little Hartley, both spatially and temporally as a result of the Upgrade Program. This overlap of construction activities would result in an overall impact rating of high to moderate (adverse).	High to moderate (adverse)
Landscape character zone 1b: Great Western Highway (Butlers Creek Valley) 1b	Moderate		High to moderate (adverse)
Landscape character zone 1c: Great Western Highway (Bushland) 1c	High		High to moderate (adverse)
Landscape character zone 2: Township 2	Low	None.	Negligible (neutral)
Landscape character zone 3: Harley Valley 3	High	The Little Hartley construction site would substantially impact the quiet, rural valley centred around Butlers Creek, adding to the clutter of construction associated with the Little Hartley to Lithgow Upgrade, including large equipment, activities and ancillary facilities within the landscape.	High (adverse)

Landscape character zone	Sensitivity	Potential impact discussion	Impact rating
Landscape character zone 4: Bushland4	High	At Blackheath, the vegetation clearing from the Katoomba to Blackheath Upgrade would result in the spatial widening of the Great Western Highway. This would comprise a distinct shift in the local character of the area within the Great Western Highway corridor and within the local area of bushland to the east, within the Blue Mountains National Park.	High (adverse)

### 18.3.2 Visual impacts

Assessment of the potential construction impacts for all viewpoints is included in Section 7 of Appendix N (Technical report – Urban design, landscape and visual). Potential moderate and high to moderate impacts to viewpoints are summarised in this section.

#### Blackheath

Table 18-4 provides a summary of the potential moderate and high to moderate impacts to viewpoints at Blackheath during construction. Road users on the Great Western Highway, including tourists or those accessing recreational attractions, would see detailed views of the Blackheath construction site as well as a widened road corridor due to vegetation clearance.

A small number of residents at the rear of their properties on Evans Lookout Road between Valley View Road and the Great Western Highway would be able to see the Blackheath construction site fencing and hoarding. Residents on Evans Lookout Road would see a higher volume of traffic, given construction vehicles would access the Blackheath construction site at the intersection of the Great Western Highway and Evans Lookout Road. Residents on Valley View Road may experience a smaller increase in light vehicle construction traffic vehicles as this road would be used for light vehicle access to the Blackheath construction site.

Visual receivers including residents and tourists or recreational road users, who may expect to experience scenic outlooks throughout their journey, are considered highly sensitive and would be visually impacted during construction.

Measures to mitigate these potential visual impacts are detailed in Section 18.5.

Table 18-4 Summary of high and high to moderate visual impacts during construction at Blackheath

Viewpoint	Potential impact discussion	Sensitivity	Magnitude of change	Overall impact rating
2a: Great Western Highway at Tennyson Road looking north	The project would result in a large area to the north and east of the viewpoint being cleared of vegetation, followed by earthworks that would extend down the hillside to the east. If selected as the preferred ventilation design, construction of the ventilation outlet would be seen to the north east with the visual clutter of the construction site further down the hillside.	High	High	High (adverse)
3: Evans Lookout Road	The area to the south of the viewpoint would be cleared of vegetation and open up a view of fencing, hoarding and construction activities associated with the upgrade of the intersection of Evans Lookout Road and the Great Western Highway and the construction of the eastbound on-ramp and connection with the upgraded Great Western Highway in the fore to middle ground of the view.	Moderate	High	High to moderate (adverse)
4. Great Western Highway at Evans Lookout Road	The project would result in the presence of general construction activity, including roadworks, earthworks and construction equipment within this viewpoint. Construction vehicles would be seen turning between the Great Western Highway and Evans Lookout Road however this access would have been used during construction of the Katoomba to Blackheath Upgrade and therefore would not result in changes to the baseline view. The visual clutter of construction would be seen over a substantial portion of the viewpoint and would comprise an adverse change within the view.	Moderate	High	High to moderate (adverse)
6: Valley View Road	Vegetation would be cleared to open up the view of the valley to the south. The presence of hoarding and fencing around the construction site would limit views into the site, however if no fencing is provided, construction activity would be clearly viewed in the fore and middle ground, including earthworks, construction equipment and machinery and stockpiling.	Moderate	High	High to moderate (adverse)



Viewpoint	Potential impact discussion	Sensitivity	Magnitude of change	Overall impact rating
7: the train from Blackheath	<p>Vegetation would be cleared to the north of the Katoomba to Blackheath Upgrade which would open up views into the valley to the east. The elevated viewpoint would result in views over any boundary fencing, allowing views into the construction footprint.</p> <p>General construction activity would be clearly visible in the fore and middle ground of the viewpoint, including earthworks, construction equipment and machinery, stockpiling and amenities buildings.</p>	High	High	High (adverse)

## **Soldiers Pinch**

Road users on the Great Western Highway would have limited views to the Soldiers Pinch construction site given its lower elevation in the landscape. Further, the project would only be visible to the road users for a short duration as they travel along the Great Western Highway. Lighting required for night-time construction works would be visually prominent to road users passing by. The main changes that would be noticeable for road users include vegetation clearing, construction equipment such as mid-tunnel access shaft and cranes and construction plant and material laydown.

This site is considered to have moderate sensitivity and a low magnitude of change. The overall impact rating for the visual impacts at Soldiers Pinch would be moderate to low (adverse).

## **Little Hartley**

Table 18-5 provides a summary of the potential moderate and high to moderate impacts to viewpoints at Little Hartley during construction.

Road users on the Great Western Highway, including tourists or those accessing the area for recreational purposes, would see construction works associated with Little Hartley construction site. A small number of residents would be able to view the construction site and associated work from their properties on the Great Western Highway in Little Hartley. Construction activities and/or machinery that would be visible to these visual receivers include lighting required for night-time works, TBM operations, an acoustic shed and other large construction infrastructure.

Measures to mitigate these potential visual impacts are detailed in Section 18.5.

Table 18-5 Summary of moderate and high to moderate visual impacts during construction at Little Hartley

Viewpoint	Potential impact discussion	Sensitivity	Magnitude of change	Overall impact rating
8: Berghofer's Pass	The project would visually comprise an extension of the construction footprint for the Little Hartley to Lithgow Upgrade which would result in earthworks and general construction activity being visible beyond the project construction footprint. However, from this distance it is unlikely that much detail of this activity would be discernible	Moderate	Moderate	Moderate (adverse)
9: Transmission easement lookout	Activities and machinery within the construction footprint, such as earthworks, TBM transport, assembly and launch, the acoustic shed and concrete mixing facilities would be visually prominent. Night lighting would be visible within the construction footprint for the hauling of spoil within Little Hartley valley.	High	Moderate	High to moderate (adverse)
10: Historic Wells lookout	The project would comprise an extension of the construction footprint of the Little Hartley to Lithgow Upgrade. Only the larger elements within the construction site would be discernible against the visual clutter within the construction footprint, including the larger buildings and stockpile areas, earthworks and sheds. Night lighting would be visible within the construction footprint for the hauling of spoil within the valley.	Moderate	High	High to moderate (adverse)
11: Bardens lookout	Construction activities would be seen as an area of visual clutter extending to the south from the Little Hartley to Lithgow Upgrade construction footprint. It is unlikely much detail would be seen from this viewpoint due to the oblique viewing angle.	Moderate	Moderate	Moderate (adverse)
13: Great Western Highway	The project would be seen in the middle to the background of this viewpoint, beyond the Little Hartley to Lithgow Upgrade. The view would include the acoustic shed, TBM assembly area and other general construction activity. Trucks hauling spoilage would access the construction footprint during the day and night, with night lighting required to facilitate the movements and other construction activity.	Low	High	Moderate (adverse)



Viewpoint	Potential impact discussion	Sensitivity	Magnitude of change	Overall impact rating
14. Great Western Highway	Larger elements of the project construction would be visible from this viewpoint, including the concrete mixing facility, the top of the acoustics shed and earthworks equipment associated with construction of the dual carriageway. Night lighting would be visible within the construction footprint, along with construction traffic accessing the construction site during the day and night.	Low	High	Moderate (adverse)
15: Hartley Valley Holiday Farm	Earthworks and roadworks would be visible from this viewpoint. Vegetation would have already been removed, opening up views across the valley. Construction activities would be seen in the middle to background of the viewpoint. Night lighting associated with the removal of spoil would be visible within the valley, along with an increase in construction traffic on the existing Great Western Highway.	High	Moderate	High to moderate (adverse)
16: 2200 Great Western Highway	Construction activities associated with the Upgrade Program, including sediment and water quality basins and the eastbound carriageway of the Great Western Highway. The project would be visible beyond these construction activities, including stockpiling, a construction water treatment plant, and the visual clutter within the construction footprint seen from a reasonable distance away. Night lighting associated with the removal of spoil would be visible against the backdrop of Victoria Pass and Mount Sugarloaf.	Moderate	Moderate	Moderate (adverse)

## 18.4 Potential impacts – operation

Landscape character and visual impacts during operation of the project would likely impact the following receivers:

- residents that adjoin and/or have views of the project and/or operational infrastructure
- road users
- visitors to nearby recreational attractions.

The water supply pipeline between the Little Hartley construction footprint and Lithgow would be located underground or integrated within existing infrastructure (such as bridges) and would therefore have negligible visual impacts during operation.

Both ventilation design options described in Section 18.1.3 have been considered in the operational impact assessment. While the overall impact rating for each ventilation design option is similar, the qualitative rating differs (i.e. whether the impact is considered 'adverse' 'neutral' or 'beneficial' in nature).

As Soldiers Pinch would only be used to support construction of the project, this area has not been considered in the operational assessment.

### 18.4.1 Landscape character

A summary discussion of potential operational impacts to each landscape character zone is provided below with the impact ratings findings summarised in Table 18-6. The overall impact ratings do not consider the implementation of mitigation measures to reduce impacts. Landscaping and other measures, such as murals and surface decoration of ventilation outlets (if selected as the ventilation design), would be considered to reduce potential landscape character impacts. These measures, detailed in Section 18.5, may reduce the overall impact ratings detailed below.

Table 18-6 Summary of landscape character impacts during operation

Landscape character zones	Sensitivity	Magnitude of change	Overall impact rating	Qualitative rating	
				Ventilation outlets	Portal emissions
Landscape character zone 1a	Low	Low	Low	Beneficial	Beneficial
Landscape character zone 1b	Moderate	High	High to moderate	Adverse	Neutral
Landscape character zone 1c	High	Moderate	High to moderate	Adverse	Neutral
Landscape character zone 2	Low	Negligible	Negligible	Neutral	Neutral
Landscape character zone 3	High	Moderate	High to moderate	Adverse	Adverse
Landscape character zone 4	High	Moderate	High to moderate	Adverse	Adverse

#### Landscape character zone 1a: Great Western Highway: Township

The project would not result in direct changes to townships along the Great Western Highway within the study area. The project would, however, substantially reduce traffic and heavy vehicles

on the existing Great Western Highway, resulting in improved accessibility and amenity of the townships along the Great Western Highway, particularly Blackheath.

### **Landscape character zone 1b: Great Western Highway: Butlers Creek Valley**

The project would introduce a number of road infrastructure changes including the Little Hartley portal, surface road connections and operational infrastructure such as a water treatment plant and substation at this location. If selected as the preferred ventilation design, the ventilation outlet would introduce a 10 metre tall structure above the finished surface level near the Little Hartley portal. The project would tie in with infrastructure delivered by the Little Hartley to Lithgow Upgrade which would have changed the landscape character zone before the project. The project would introduce operational infrastructure comprising an uncharacteristic built form in this area.

Both ventilation design options would have an overall impact rating of high to moderate. The portal emissions option would have a qualitative rating of neutral, while the ventilation outlet option would have a qualitative rating of adverse given the visual impact of the structure within the landscape. Measures to mitigate these impacts are detailed in Section 18.5.

### **Landscape character zone 1c: Great Western Highway: Bushland**

The project would result in localised widening on the Great Western Highway and an upgraded interchange at Blackheath. If selected as the preferred ventilation design, the ventilation outlet would introduce a 10 metre tall structure above the finished surface level near the Blackheath portal. While the project would involve the widening of landscape character zone 1c into the neighbouring landscape character zone 4 (Bushland), the project has been designed to be well integrated into the landscape, including by locating the ventilation building underground. Landscape planting would help integrate the project with the surrounding landscape. The upgraded surface interchange would be similar to others nearby (i.e. at Leura). Additionally, elements of the Katoomba to Blackheath Upgrade would comprise a change to the landscape character zone that precedes the project.

Both ventilation design options would have an overall impact rating of high to moderate. The portal emissions option would have a qualitative rating of neutral, while the ventilation outlet option would have a qualitative rating of adverse given the new structure would be uncharacteristic within the existing Great Western Highway corridor. Measures to mitigate these impacts, such as landscaping between new carriageways and on- and off-ramps, are detailed in Section 18.5.

### **Landscape character zone 2: Township**

No operational infrastructure would occur within view of landscape character zone 2 and therefore the overall impact rating is negligible. The closest project elements would include landscape planting and surface road upgrades near Evans Lookout Road south of Blackheath, however these are located within landscape character zone 1a.

### **Landscape character zone 3: Butlers Creek Valley**

Operational project elements including the Little Hartley portal and new surface road upgrades would be contained within this landscape character zone. The widening of the Great Western Highway and the addition of large built structures such as the Little Hartley portal would elevate the prominence of the transport corridor which would reduce the open landscape contained within the ridgelines of the Great Western Highway within landscape character zone 3. If selected as the preferred ventilation design, the ventilation outlet would introduce a 10 metre tall structure above the finished surface level near the Little Hartley portal which would add to the large visual elements within this landscape character zone.

While the landscape character zone would already be substantially altered by the Little Hartley to Lithgow Upgrade, the built form proposed as part of the project would still comprise uncharacteristically large elements to the landscape character zone. Irrespective of the ventilation design, the overall impacting rating would be high to moderate (adverse). Measures to mitigate these potential impacts, such as landscaping and visually embedding project elements within low points in the landscape, are detailed in Section 18.5.



## **Landscape character zone 4: Bushland**

Key visual operational project elements at Blackheath would include the tunnel portal, upgraded surface roads, the tunnel operations facility, water quality basins, signage and landscape planting. These new structures would elevate the prominence of the transport corridor. While uncharacteristic of the landscape character zone, the perceived scale of the tunnel operations facility would be perceived as being reduced by the surrounding bushland enclosing the facility and landscape planting proposed.

While the landscape character zone would already be substantially altered by the Katoomba to Blackheath Upgrade, the project would require additional vegetation removal. Irrespective of the ventilation design, the overall impact rating would be high to moderate (adverse). Measures to mitigate these potential impacts are detailed in Section 18.5.

### **18.4.2 Visual impacts**

The project would be in tunnel for the majority of its length, which generally limits the potential for visual impacts to the areas around the tunnel portals where surface works and operational infrastructure are proposed.

Assessment of the potential operational impacts for all viewpoints is included in Section 7 of Appendix N (Technical report – Urban design, landscape and visual). This includes potential impacts to viewpoints 5, 12, 13, 14 and 17 that were considered to range between low (adverse), low to negligible (neutral) and negligible (neutral).

Those viewpoints subject to potential moderate and high impacts are discussed in the sections below. The overall impact ratings described in Table 18-7 and Table 18-8 do not consider the implementation of mitigation measures to reduce impacts. Landscaping and other measures, such as considering murals and surface decoration of ventilation outlets (if selected as the ventilation design), would be considered to reduce potential visual impacts. These measures, detailed in Section 18.5, may reduce the overall impact ratings detailed below.

#### **Blackheath**

Assessment of the potential operational visual impacts at all Blackheath viewpoints is included in Appendix N (Technical report – Urban design, landscape and visual). Moderate and high potential impacts to viewpoints located at Blackheath are summarised in Table 18-7.

Three viewpoints would have an overall visual impact rating of high (viewpoints 2a, 2b and 7). Existing views, as well as visual representations of the project from these viewpoints are shown in Figure 18-5 to Figure 18-10.

The existing environment presented in these viewpoints is different to the baseline environment defined in Section 18.2.1. The baseline environment at Blackheath would show reduced vegetation having been cleared for the Katoomba to Blackheath Upgrade. Some additional vegetation clearance would be required for the project which would comprise a substantial change at Blackheath from the existing environment which is located amongst dense bushland on a sloping site.

Views east across the valley that were previously screened by vegetation would become exposed to motorists, cyclists and train commuters. The increased width of the Great Western Highway corridor, the Blackheath portal, the tunnel operations facility and the ventilation outlet (if selected as the ventilation design) would result in substantial long-term changes. The scale of these elements would be uncharacteristic of the surrounding environment. Given the presence of other large operational infrastructure, the portal emissions option (if selected as the ventilation design), would only partly reduce the impact at viewpoint 7.

Overall, the visual impact of the project at Blackheath is considered to be moderate (adverse). This is based on consideration of the unique sensitivities of the Blue Mountains and the high value of the landscape and views linked to tourism, the natural environment and heritage values.

Table 18-7 Summary of moderate and high visual impacts during operation at Blackheath

Viewpoint	Potential impact discussion	Ventilation option	Sensitivity	Magnitude of change	Overall impact rating
1: Great Western Highway	Additional road corridor and transport infrastructure would include: <ul style="list-style-type: none"> <li>a two-lane Great Western Highway westbound carriageway which connects to the tunnel at the Blackheath portal</li> <li>landscape plantings around the upgraded surface roads.</li> </ul>	Ventilation outlet or portal emissions	Moderate	Moderate	Moderate (neutral)
2a: Great Western Highway at Tennyson Road looking north	Additional road corridor and transport infrastructure with cleared vegetation exposing the: <ul style="list-style-type: none"> <li>Great Western Highway westbound carriage</li> <li>tunnel on-ramp</li> <li>Blackheath portal</li> <li>ventilation outlet (if selected as the ventilation design)<sup>1</sup>.</li> </ul> See Figure 18-6.	Ventilation outlet or portal emissions	High	High	High (adverse)
2b: Great Western Highway at Tennyson Road looking south	Additional road corridor and transport infrastructure with cleared vegetation exposing the: <ul style="list-style-type: none"> <li>sloping landscape to the east</li> <li>tunnel off-ramp (seen from an elevated viewpoint).</li> </ul> See Figure 18-8.	Ventilation outlet or portal emissions	High	High	High (adverse)

<sup>1</sup> The ventilation outlet is unlikely to affect the magnitude of change at this location. The qualitative rating would remain as adverse given the level of change to the view due to the visual changes during operation of the project

Viewpoint	Potential impact discussion	Ventilation option	Sensitivity	Magnitude of change	Overall impact rating
3: Evans Lookout Road	<p>Noticeably cleared areas and minor additional infrastructure including:</p> <ul style="list-style-type: none"> <li>• vegetation clearance and landscape planting to screen the road infrastructure</li> <li>• new batters along the Great Western Highway</li> <li>• new road surface and fencing</li> <li>• ventilation outlet (if selected as the ventilation design), which would comprise a large, uncharacteristic piece of infrastructure in this view.</li> </ul>	Ventilation outlet or portal emissions	Moderate	Moderate	Moderate (adverse)
4: Great Western Highway at Evans Lookout Road	<p>No new dominant elements with small scale changes including:</p> <ul style="list-style-type: none"> <li>• upgrade of the existing intersection</li> <li>• Great Western Highway retained with new fencing, safety barriers and signage.</li> </ul>	Ventilation outlet or portal emissions	Moderate	Low	Moderate to low (neutral)
6: Valley View Road	<p>No new dominant elements with small scale changes including:</p> <ul style="list-style-type: none"> <li>• landscape planting</li> <li>• ventilation outlet (if selected as the ventilation design), which may be seen over the tops of trees until proposed landscape planting matures.</li> </ul>	Ventilation outlet or portal emissions	Moderate	Low	Moderate to low (neutral)

Viewpoint	Potential impact discussion	Ventilation option	Sensitivity	Magnitude of change	Overall impact rating
7: the train from Blackheath	<p>Moderate to expansive additional road corridor and transport infrastructure including:</p> <ul style="list-style-type: none"> <li>on- and off-ramps and local road connections</li> <li>upgrade to the Great Western Highway and Evans Lookout Road intersection</li> <li>fencing, landscaping, signage and other road infrastructure</li> <li>the tunnel operational facility</li> <li>ventilation outlet (if selected as the ventilation design), which would be seen in the horizon over longer periods of time by commuters and would be an uncharacteristic built form against the surrounding bushland.</li> </ul> <p>See Figure 18-10.</p>	Ventilation outlet	High	High	High (adverse)
		Portal emissions	High	Moderate	High to moderate (neutral)



Figure 18-5 Viewpoint 2a – existing view westbound showing the Great Western Highway at Tennyson Road



Figure 18-6 Viewpoint 2a – proposed view westbound showing the upgraded Great Western Highway on the left and the ventilation outlet (if selected as the ventilation design) on the right





Figure 18-7 Viewpoint 2b – existing view eastbound showing the Great Western Highway



Figure 18-8 Viewpoint 2b – proposed view looking eastbound showing the upgraded Great Western Highway on the right and the Blackheath off-ramp on the left





Figure 18-9 Viewpoint 7(b) and 7(c) – existing views east from the train line showing the Great Western Highway



Figure 18-10 Viewpoint 7(b) and 7(c) – proposed views east from the train line showing the vegetation to be cleared for the project in pink

## Little Hartley

Assessment of the potential operational visual impacts at all Little Hartley viewpoints is included in Appendix N (Technical report – Urban design, landscape and visual). Moderate and high potential impacts to viewpoints located at Little Hartley are summarised in Table 18-8.

Two viewpoints would have an overall impact rating of high to moderate (viewpoints 9 and 15). Existing views, as well as visual representations of the project from these viewpoints are shown in Figure 18-11 to Figure 18-14.

From the elevated viewpoints, the substantial distance from the project coupled with undulating terrain typically limits the overall impact of the project. Viewpoints located along the Great Western Highway typically look out to the Little Hartley to Lithgow Upgrade works which screen the impact of the project. At viewpoint 15, the project is seen from a partially elevated position, where the widened Great Western Highway corridor would be noticeable.

The ventilation outlet (if selected as the ventilation design), water treatment plant and the substation would comprise the most prominent elements of the project. While these elements would be uncharacteristic of the surrounding environment, they would be partially screened by landscape planting proposed as part of the project.

Overall, the visual impact of the project at Little Hartley is considered to be moderate (adverse). This is based on consideration of the picturesque character of the Little Hartley valley, the high volume of tourist traffic and activity and recreational hiking trails nearby.

Table 18-8 Summary of moderate and high visual impacts during operation at Little Hartley

Viewpoint	Operational visual impact	Ventilation option	Sensitivity	Magnitude of change	Overall visual rating
8: Berghofer's Pass	Additional infrastructure, seen in conjunction with more prominent Little Hartley to Lithgow Upgrade elements, viewed from afar including: <ul style="list-style-type: none"> <li>• water treatment plant and substation</li> <li>• limited view of the new surface road extending westbound from Little Hartley</li> <li>• landscaping</li> <li>• ventilation outlet (if selected as the ventilation design).</li> </ul>	Ventilation outlet or portal emissions	Moderate	Moderate	Moderate (adverse)
9: Transmission easement lookout	A similar view as from viewpoint 8 described above, but closer. See Figure 18-12.	Ventilation outlet or portal emissions	High	Moderate	High to moderate (adverse)
10: Historic Wells lookout	A similar view as from viewpoint 8 described above, but further away than viewpoint 8 and 9.	Ventilation outlet or portal emissions	Moderate	Moderate	Moderate (adverse)
11: Bardens lookout	Small scale changes seen from an oblique angle from afar and partially screened by vegetation.	Ventilation outlet or portal emissions	Moderate	Low	Moderate to low (neutral)

Viewpoint	Operational visual impact	Ventilation option	Sensitivity	Magnitude of change	Overall visual rating
15: Hartley Valley Holiday Farm	<p>Increased infrastructure within the valley setting, seen in conjunction with more prominent Little Hartley to Lithgow Upgrade elements at grade, with introduced project elements including:</p> <ul style="list-style-type: none"> <li>• carriageway which is elevated from the surrounding property</li> <li>• safety barriers, signage and passing traffic</li> <li>• landscaping.</li> </ul> <p>See Figure 18-14.</p>	Ventilation outlet or portal emissions	High	Moderate	High to moderate (adverse)
16: 2200 Great Western Highway	<p>Small scale changes seen from afar and partially screened by the Little Hartley to Lithgow Upgrade, the ventilation outlet (if selected as the ventilation design) and the Little Hartley portal tucked away in the hillside due to the low elevation at this viewpoint.</p>	Ventilation outlet or portal emissions	Moderate	Low	Moderate to low (adverse)





Figure 18-11 Viewpoint 9 – existing view south over the Little Hartley valley



Figure 18-12 Viewpoint 9 – proposed view south over the Little Hartley valley





Figure 18-13 Viewpoint 15 – existing view eastbound towards Victoria Pass



Figure 18-14 Viewpoint 15 – proposed view eastbound towards Victoria Pass showing the bridge structure (delivered by the Little Hartley to Lithgow Upgrade), water treatment plant and substation

## 18.5 Environmental mitigation measures

### 18.5.1 Performance outcomes

Performance outcomes for the project in relation to urban design, landscape and visual impacts are listed in Table 18-9 and identify measurable performance-based standards for environmental management.

Table 18-9 Urban design, landscape and visual performance outcomes

SEARs desired performance outcome	Project performance outcome	Timing
The project is well designed and enhances the environment where it is located, including improved accessibility and connectivity for communities and public spaces. The project helps to support the health and wellbeing of Country by valuing, respecting and being guided by Aboriginal people.	Design the project to respond to the surrounding landscape character and integrate the design of built and natural environments in an understandable, complementary, and sustainable way, establishing a robust Connection to Country. Incorporate Aboriginal heritage interpretation and Aboriginal cultural design principles into the design of the project in consultation with Aboriginal stakeholders.	Design
The project contributes to greener places through the enhancement and provision of green infrastructure.	Design and construct the project to include green infrastructure as part of surface operational infrastructure, where feasible.	Design and construction

### 18.5.2 Mitigation measures

Mitigation measures to avoid, minimise or manage potential landscape character and visual impacts as a result of the project are detailed in Table 18-10. A full list of mitigation measures for the project is provided in Appendix R (Compilation of environmental mitigation measures).

Table 18-10 Environmental mitigation measures – landscape character and visual impacts

ID	Mitigation measure	Timing
LV1	<p>A Place Design and Landscape Plan (PDLP) will be prepared to minimise landscape character and visual impacts, and detail and guide the implementation of landscape features to be installed as part of the project. This would include requirements for:</p> <ul style="list-style-type: none"> <li>• landscape and re-vegetation</li> <li>• the provision of vegetative screening to soften the appearance of structural elements of the project and provide screening of sensitive views to the project</li> <li>• requirements of the Aboriginal and non-Aboriginal cultural and heritage interpretation</li> <li>• site levels and grades for the project that integrate with the surrounding terrain to assist with the visual assimilation of the project into the surrounding landscape where practicable. The gradients of engineered slopes will seek to maximise the establishment of vegetation and allow for appropriate maintenance.</li> </ul>	Construction

ID	Mitigation measure	Timing
	The PDLP will be prepared in accordance with applicable guidelines, be consistent with the project identity in the EIS and relevant urban design objectives and principles for the project including consideration of implementation of Crime Prevention Through Environmental Design (CPTED) principles, and in consultation with the relevant councils.	
LV2	<p>As part of further design development, opportunities to visually integrate the project into the landscape, will be considered and will reflect the landscape and revegetation requirements identified in environmental mitigation measures for biodiversity and non-Aboriginal heritage. This will consider measures including:</p> <ul style="list-style-type: none"> <li>• retention and protection of existing trees where reasonable and feasible, particularly along the unaltered edges of the existing Great Western Highway</li> <li>• avoidance of formal rows of trees or blocks of shrub and grass plantings as these would be uncharacteristic within both the Blackheath and Little Hartley landscape settings</li> <li>• reinstatement of cleared native vegetation to achieve a net increase in tree numbers and canopy in proximity to the project that will not be covered by a biodiversity offset strategy</li> <li>• strategic placement and planting of vegetation in line with the surrounding landscape character zone(s)</li> <li>• sourcing locally endemic native species</li> <li>• carrying out appropriate soil analysis and identification of soil preparation requirements for landscaping treatments to inform the PDLP and vegetation management in accordance with the <i>Batter Surface Stabilisation Guideline</i> (RMS, 2015).</li> </ul>	Design
LV3	The Construction Environmental Management Plan (CEMP) will include specific measures to minimise the visual intrusion of construction areas and construction compounds.	Construction
LV4	<p>Lighting employed during construction and operation will be minimised, taking into account:</p> <ul style="list-style-type: none"> <li>• minimum lighting requirements and design standards to maintain safety during construction and safety for operational traffic</li> <li>• guidance on the management of obtrusive lighting effects in <i>AS4282-1997: Control of the Obtrusive Effects of Outdoor Lighting</i></li> <li>• guidance on good lighting principles provided in Part 4 of <i>Dark Sky Planning Guideline</i> (DPE, 2016a)</li> <li>• the biodiversity lighting requirements for the project (refer to environmental mitigation measure B8).</li> </ul>	Design, construction and operation