3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions and the design parameters including major design features, the construction method and associated infrastructure and activities.

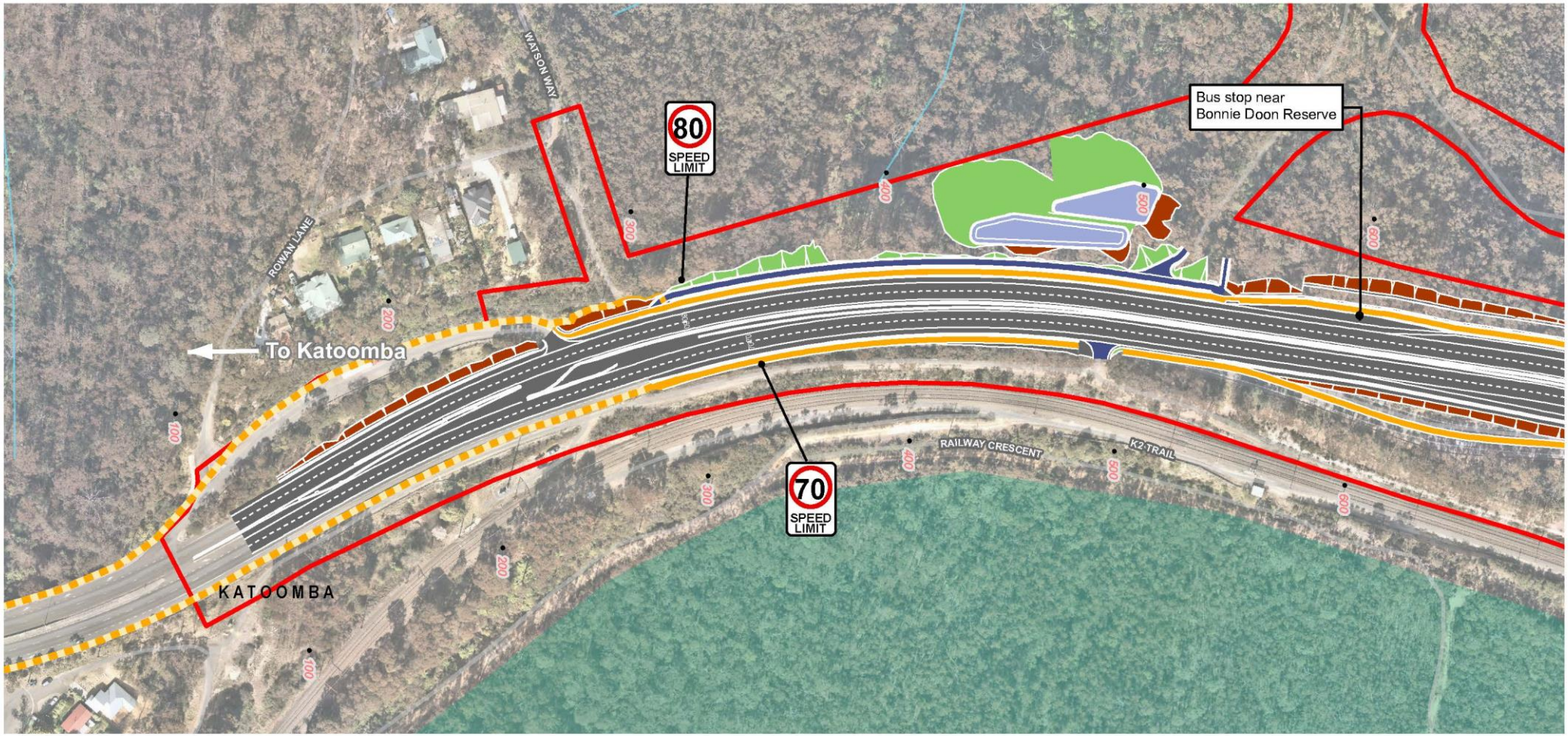
3.1 The proposal

The key features of the proposal include:

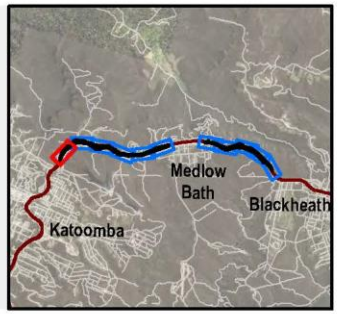
- widening of the Great Western Highway to provide a four-lane divided carriageway in two sections:
  - between Rowan Lane, Katoomba and Bellevue Crescent, Medlow Bath (about 3.5 kilometres)
  - between Station Street, Medlow Bath and Tennyson Road, Blackheath (about 1.8 kilometres)
- new concrete twin bridges (about 400 metres long) over the valley from Pulpit Hill near Explorers Road
- upgrades to intersections at Nellies Glen Road, Explorers Road and Foy Avenue
- re-use of redundant sections of the existing highway pavement for new truck stopping areas, local service roads and maintenance areas
- consolidation and improvement of the Pulpit Hill heritage interpretation area on Nellies Glen Road, including improved visitor parking
- adjustment of bus stops on the highway at Bonnie Doon Reserve, Explorers Road and Foy Avenue to provide set down and pick up locations for buses
- installation of 11 water quality basins including biofiltration and on-site detention
- upgrade and enhancement of existing sections and providing new active transport connections along the Great Western Highway, which would form part of the broader Great Blue Mountains Trail to improve active transport connectivity between Katoomba and Blackheath
- common construction activities and ancillary work, including:
  - relocation of rail infrastructure, maintenance areas, access roads and utilities (including electrical, gas, water and telecommunications)
  - work on associated rail infrastructure including adjustments to power connections and rail corridor fencing
  - civil earthworks, retaining walls, drainage work, water quality controls and tie in work to adjoining sections of the highway
  - new national park, railway, fire trail and utility authority maintenance access tracks to connect with other corridors
  - final roadworks including pavement, kerb and gutters, signs, landscaping lighting and line marking
  - new intelligent transport systems including, but not limited to, closed-circuit television, variable-message signs and variable speed limit signs
  - establishment of temporary ancillary facilities to support construction, including compound sites, site offices, stockpile and laydown locations, temporary access tracks, water quality devices and concrete batching plants.

The key features of the Katoomba to Medlow Bath section are shown in Figure 3-1a-f. The key features of the Medlow Bath to Blackheath section are shown in Figure 3-2a-e. These are described in greater detail in the remainder of the chapter.

The concept design would be further refined during detailed design to minimise environmental and social impacts and to consider community feedback to the exhibition of the REF.



Proposal area
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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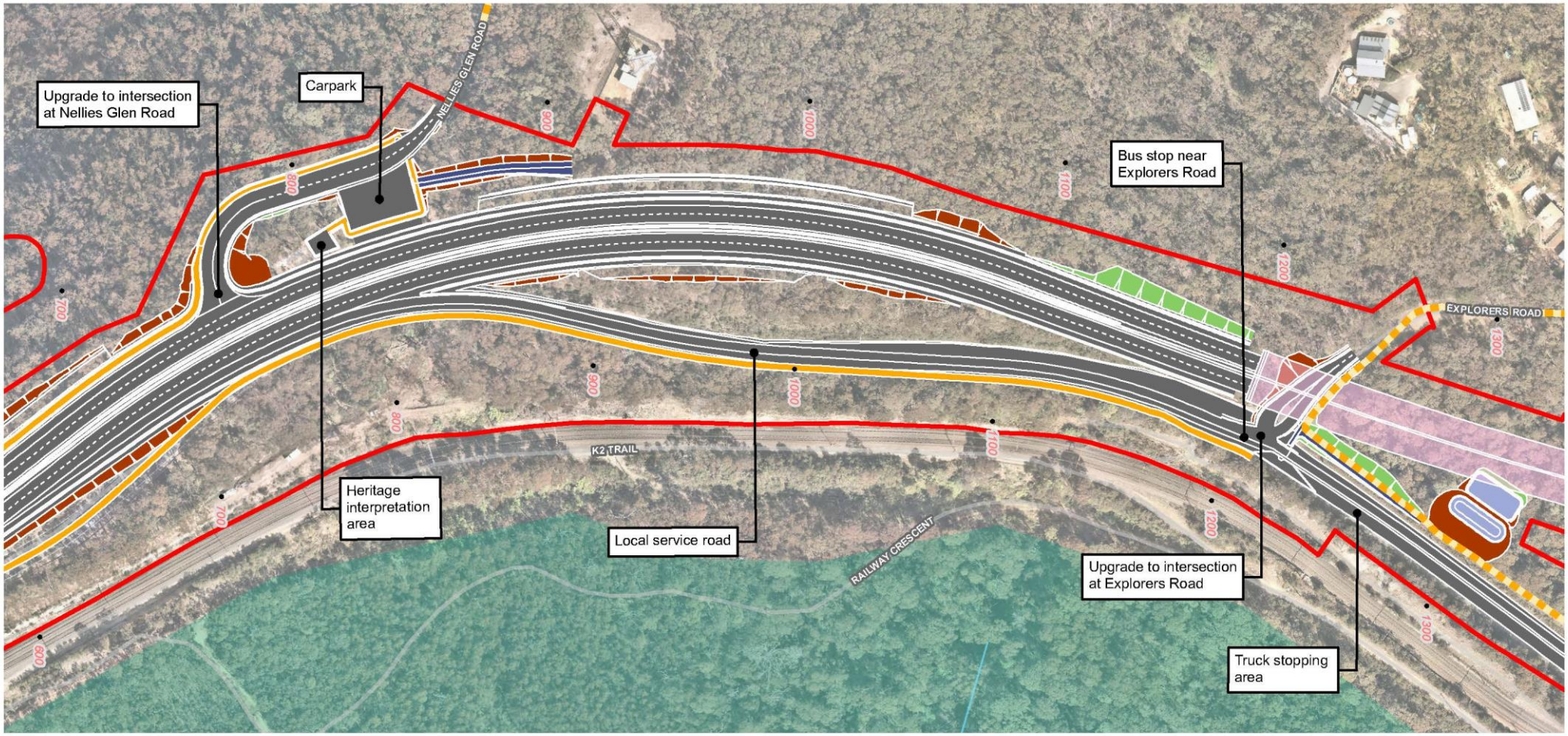
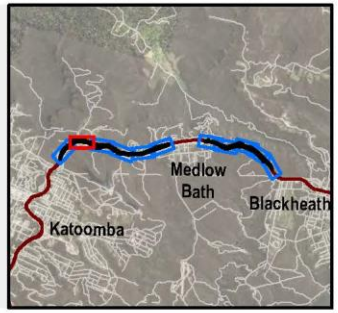
Projection: GDA2020 MGA Zone 56

FIGURE 3-1a: Key features of the proposal - Katoomba to Medlow Bath section



Proposal area
Bridge
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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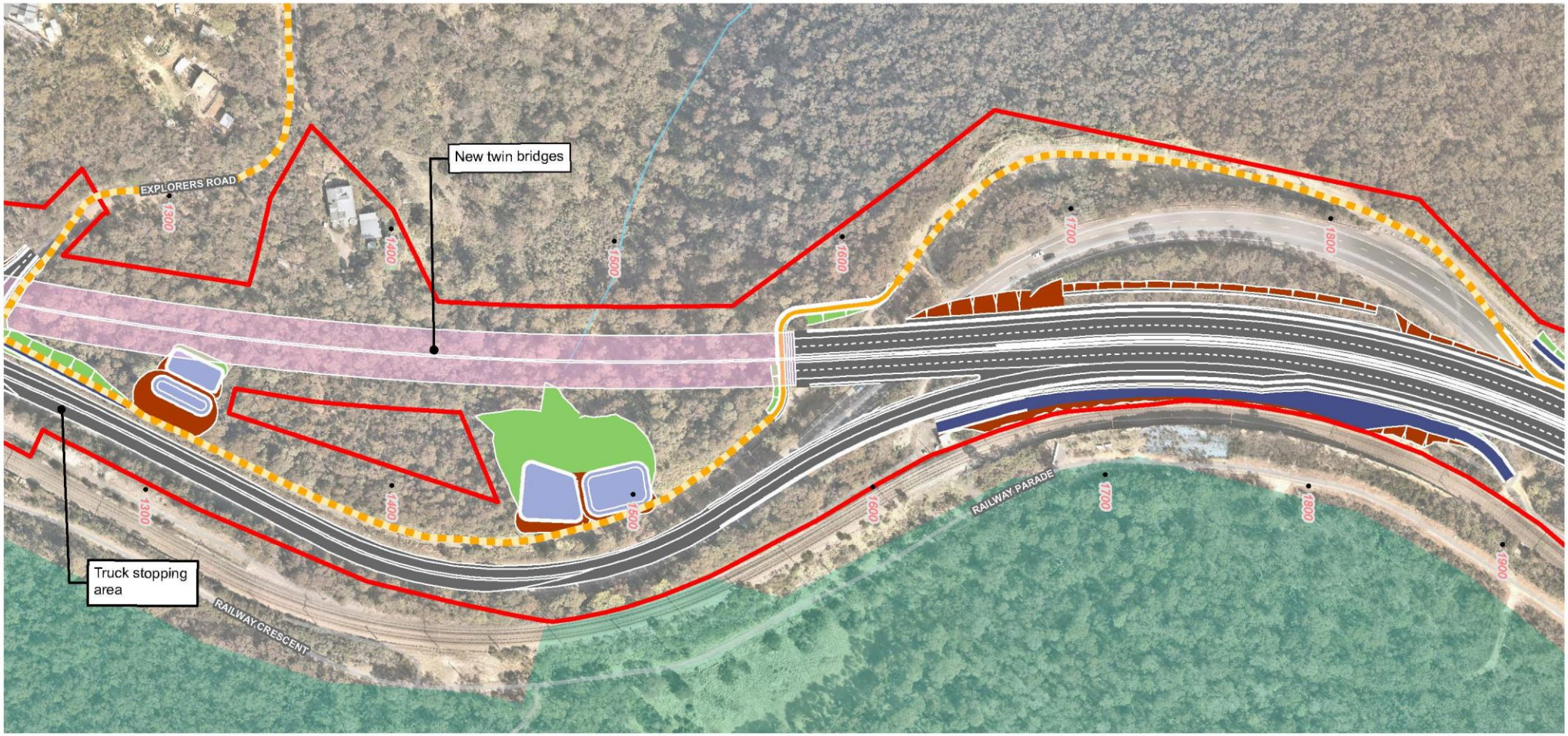
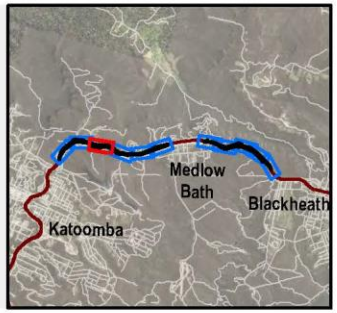
Projection: GDA2020 MGA Zone 56

FIGURE 3-1b: Key features of the proposal - Katoomba to Medlow Bath section



Proposal area
Bridge
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



Source: Aurecon, Mott MacDonald, LPI, Nearmap

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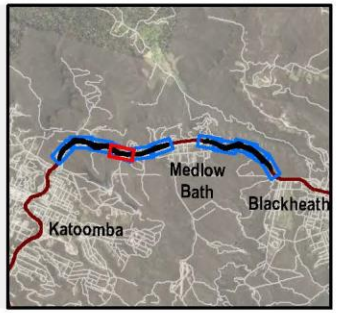
0 25 50m

Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-1c: Key features of the proposal - Katoomba to Medlow Bath section

Proposal area
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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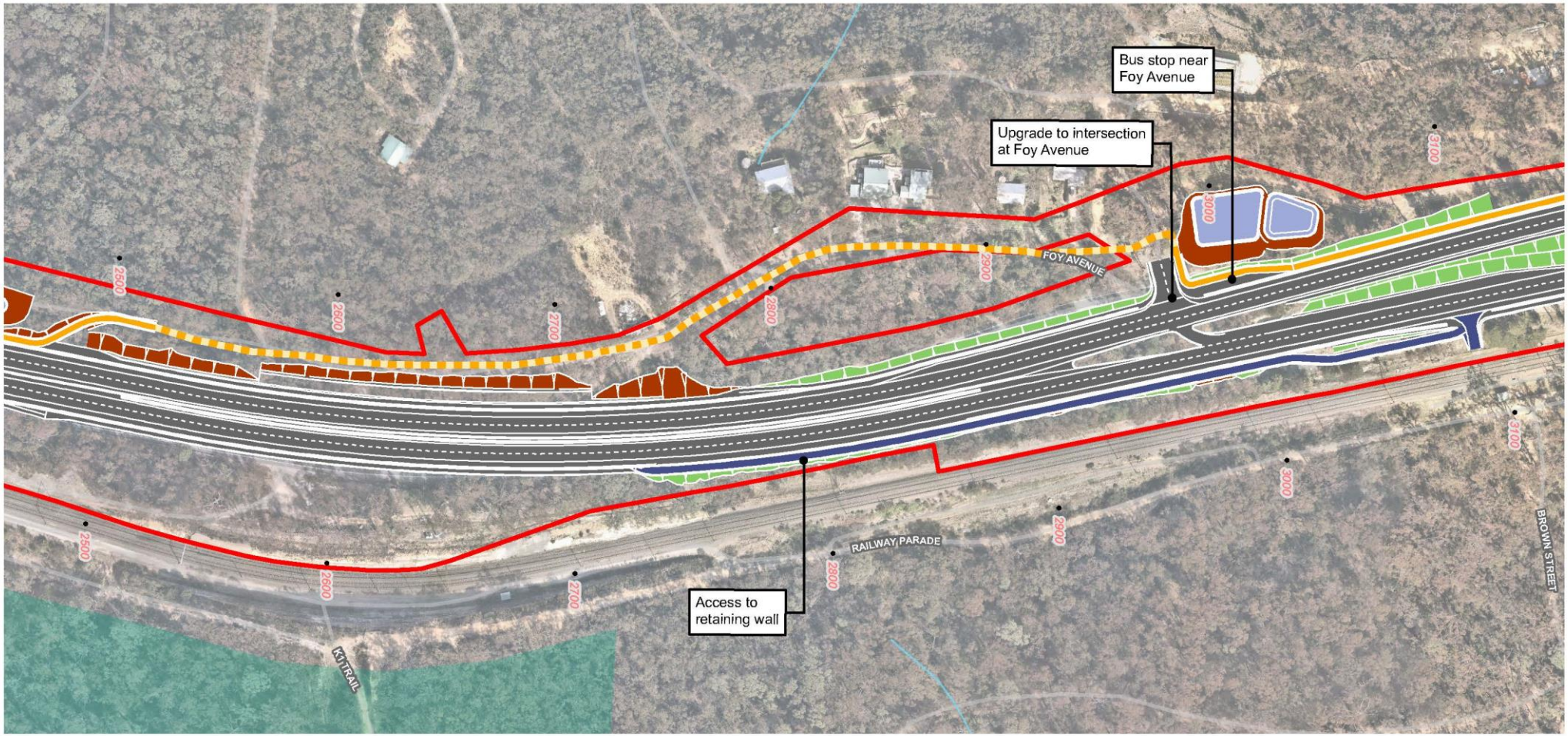
Source: Aurecon, Mott MacDonald, LPI, Nearmap

1:2,500@A4
0 25 50m

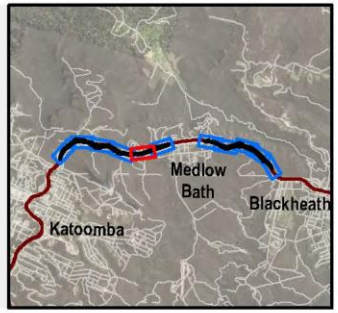
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-1d: Key features of the proposal - Katoomba to Medlow Bath section



Proposal area
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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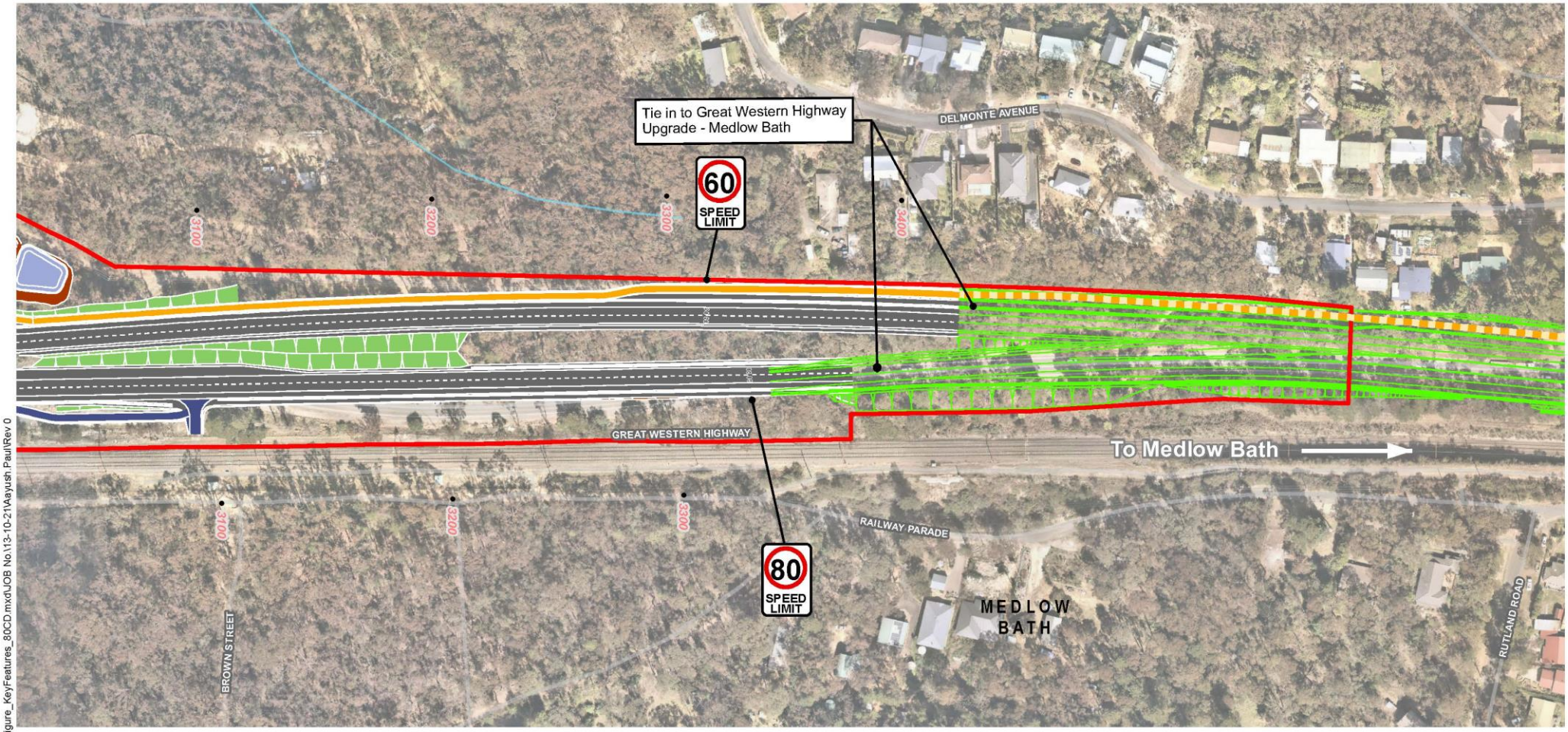
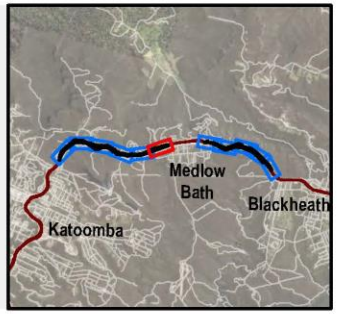
0 25 50m

Projection: GDA2020 MGA Zone 56

FIGURE 3-1e: Key features of the proposal - Katoomba to Medlow Bath section



Proposal area
Great Western Highway Upgrade - Medlow Bath proposed design
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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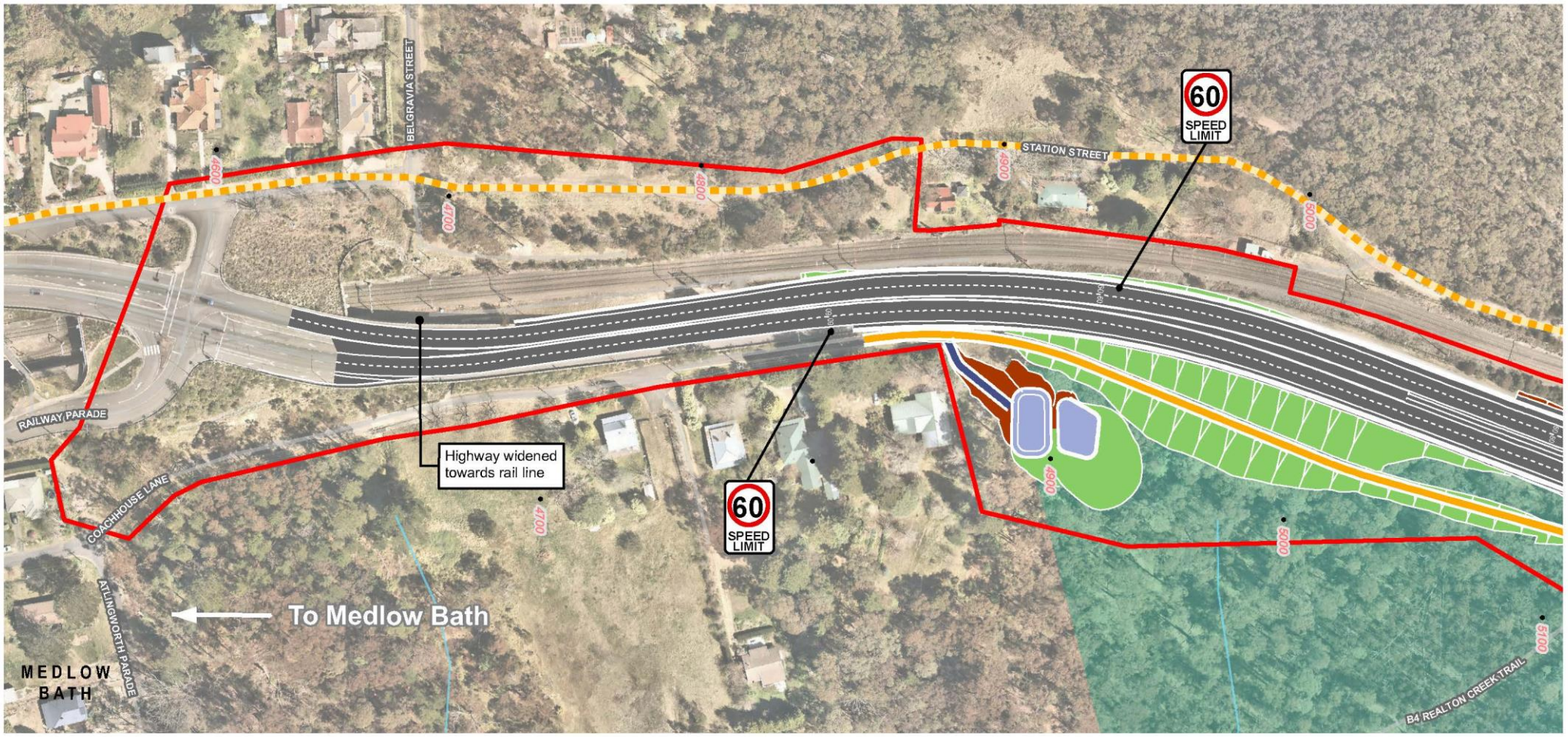
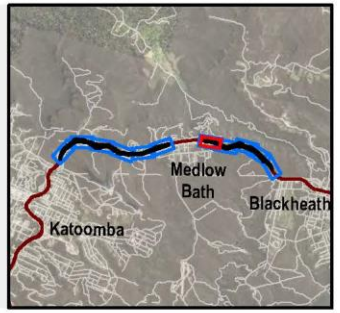
Projection: GDA2020 MGA Zone 56

FIGURE 3-1f: Key features of the proposal - Katoomba to Medlow Bath section



Proposal area
Active transport trail - existing
Active transport trail - proposed
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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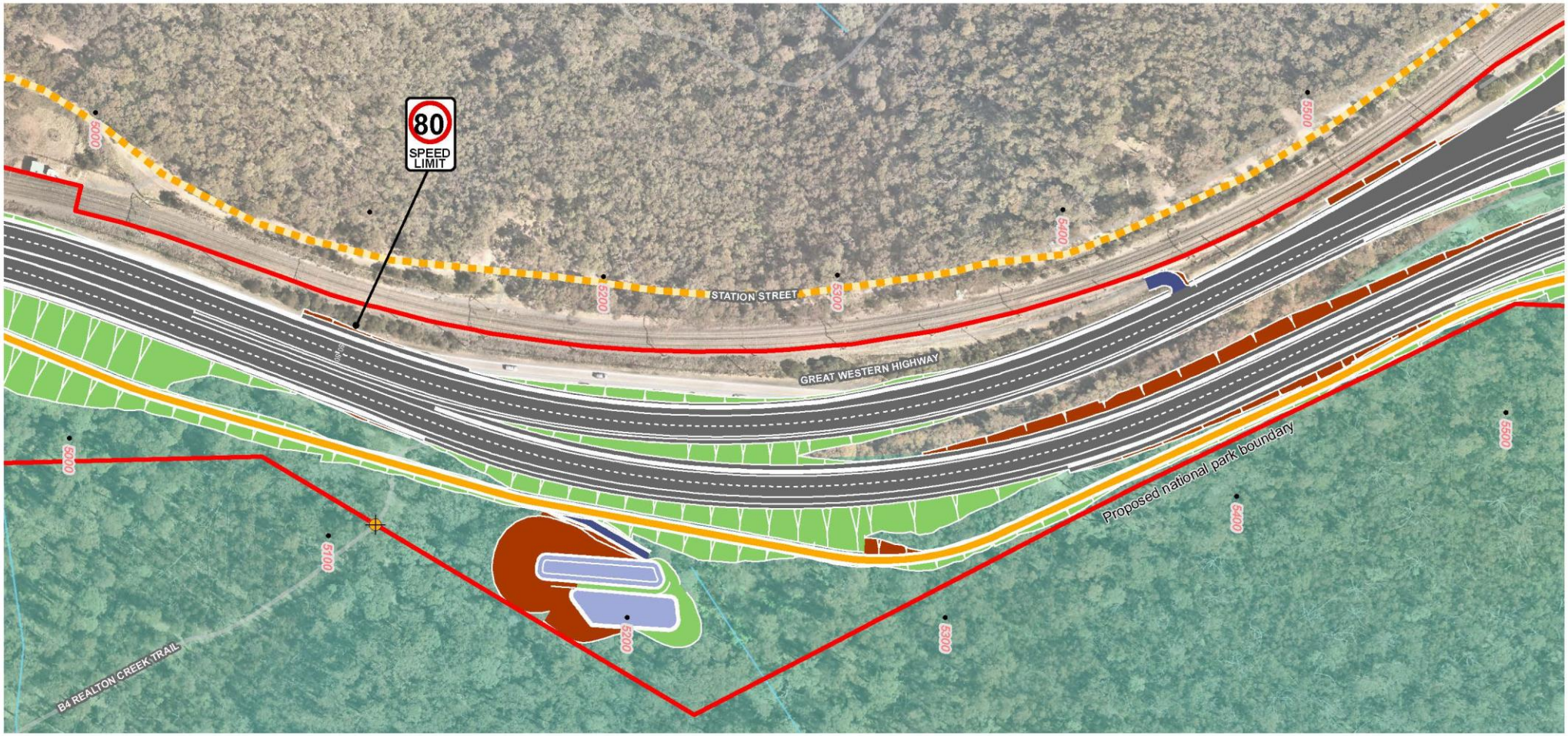
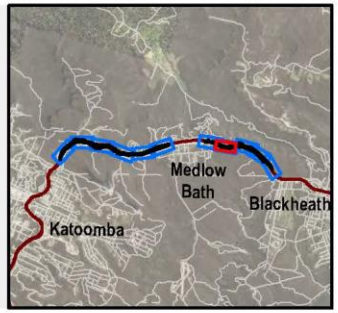
Projection: GDA2020 MGA Zone 56

FIGURE 3-2a: Key features of the proposal - Medlow Bath to Blackheath section



Proposal area
Active transport trail - existing
Active transport trail - proposed
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Existing access track connection
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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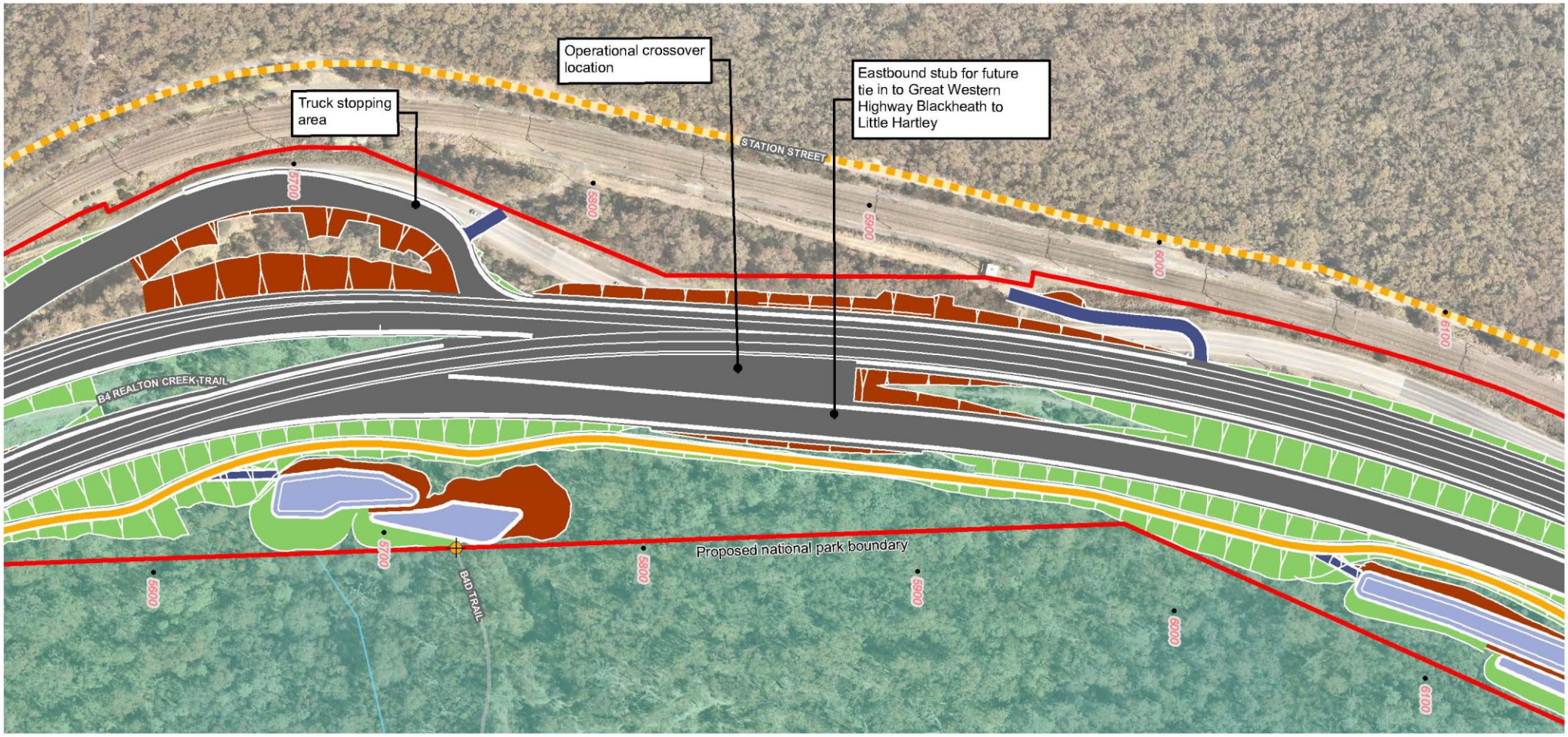
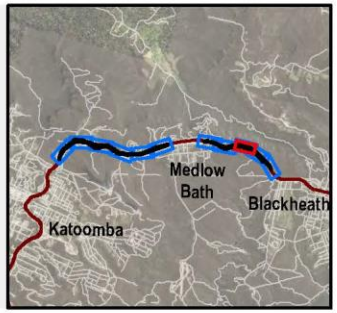
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-2b: Key features of the proposal - Medlow Bath to Blackheath section



Proposal area
Active transport trail - existing
Active transport trail - proposed
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Existing access track connection
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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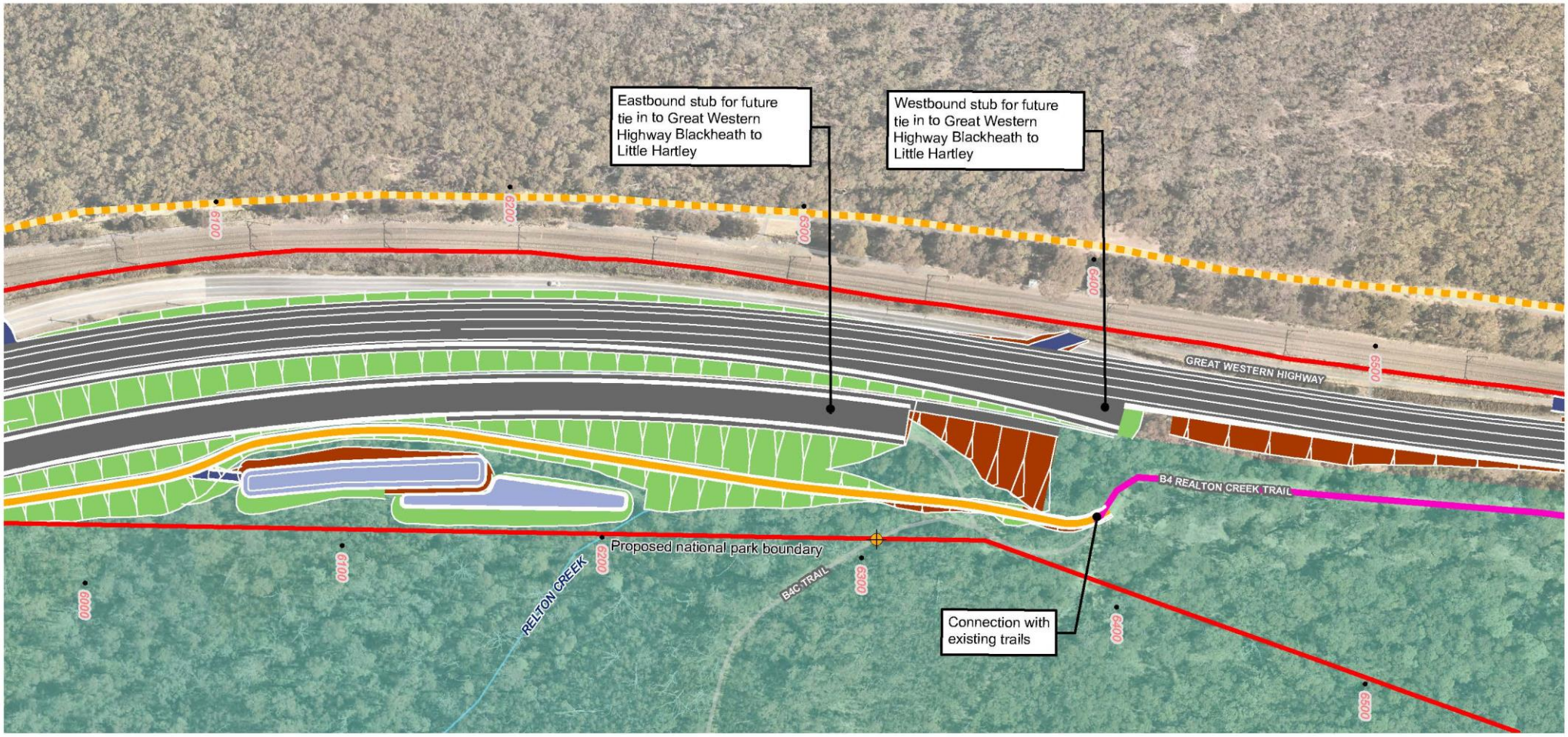
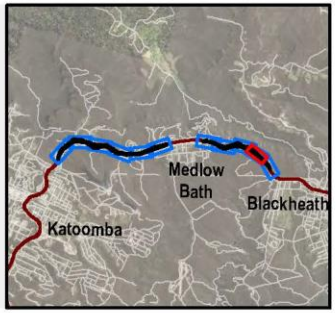
Projection: GDA2020 MGA Zone 56

FIGURE 3-2c: Key features of the proposal - Medlow Bath to Blackheath section



Proposal area
Track and path - existing
Active transport trail - existing
Active transport trail - proposed
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Existing access track connection
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

1:2,100@A4
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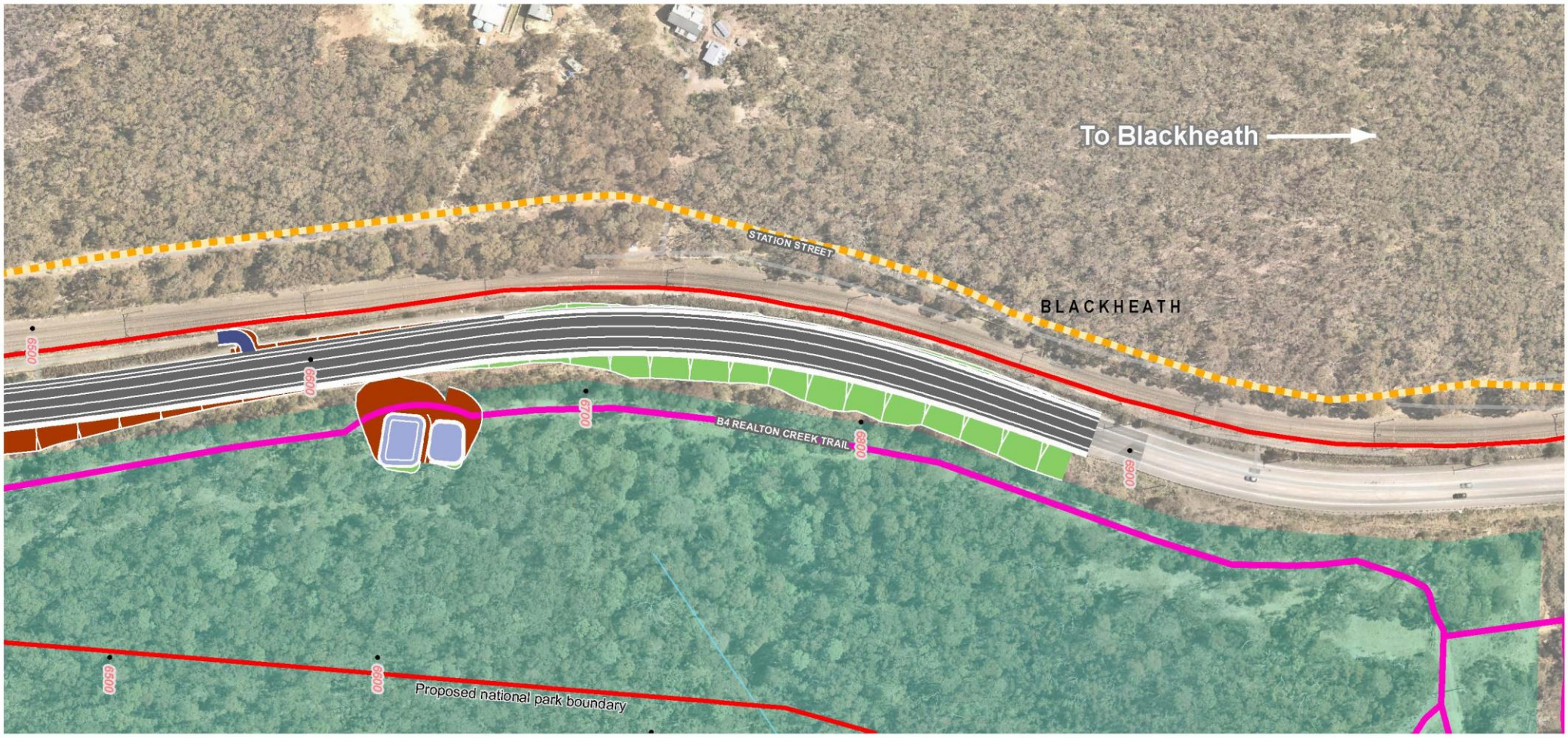
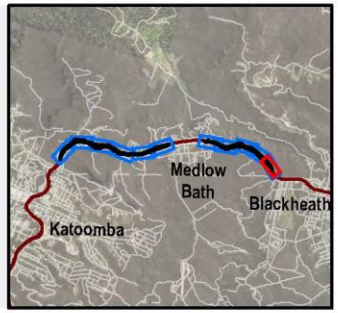
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-2d: Key features of the proposal - Medlow Bath to Blackheath section



Proposal area
Track and path - existing
Active transport trail - existing
Maintenance access
Cut
Fill
Pavement
Drainage basin
Blue Mountains National Park
Chainage



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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0 25 50m

Projection: GDA2020 MGA Zone 56

FIGURE 3-2e: Key features of the proposal - Medlow Bath to Blackheath section

3.2 Design

A description of the Katoomba to Blackheath concept design is provided in the following sections.

3.2.1 Design criteria

The Katoomba to Blackheath concept design was prepared in accordance with the guidelines and standards in Table 3-1.

Table 3-1 Design guidelines and standards

Feature	Standards
Road design	• QA Specification PS251 • Roads and Maritime Technical Directions and Quality Alerts TD2003/RS01 • Roads and Maritime Design Guides 03.286 • Roads and Maritime Standard Drawings • Roads and Maritime Specifications R151 & QA3851 • Austroads Guides AP-G34/13 • Australian Standards
Bridge design	• QA Specification PS261 • Roads and Maritime Bridgeworks Specifications • Roads and Maritime Bridge Technical Directions (BTD's) • Roads and Maritime Standard Bridge Drawings • AS5100-2017 Bridge set • T HR EL 08012 ST - Overhead Wiring Standards for Design and Construction • AS/(NZS) 5100:2017 Series Bridge Design. • Austroads Guide to Bridge Technology: Part 8 Waterway Design - A Guide to the Hydraulic Design of Bridge – February 2018. • RMS Structural Drafting and Detailing Manual (SDDM). • Austroads Guides • The Design and Construction of Incrementally Launched Bridges – DMR – 1986. • Classification of Sandstone and Shale in Sydney Region – A Forty year Review – Pells PJN et al 2019.
Signage and road marking	• AS1742 and AS1743 • RTA Delineation Guidelines • RTA Technical Direction for Road Safety Practitioners (2003) • Roads and Maritime Guide Signposting Manual (2007) • Roads and Maritime Supplement to AS1742 Manual of uniform traffic control devices (2013)
Urban design	• QA Specification PS281 • Transport for NSW *Beyond the Pavement* (2020) • Transport for NSW Bridge Aesthetics Design Guideline (2019) • Transport for NSW Practice Note EIA-N04: Guideline for Landscape Character and Visual impact Assessment (2020) • Transport for NSW Noise Wall Design Guideline (2021) • Transport for NSW Shotcrete Design Guideline (2016) • Transport for NSW Landscape Design Guideline (2018) • Transport for NSW Water Sensitive Urban Design Guideline (2017) • Roads and Maritime Guideline for Batter Surface Stabilisation Using Vegetation (2015)

Feature	Standards
	• Transport for NSW Preliminary Environmental Investigation • Transport for NSW Great Western Highway Urban Design Framework - Katoomba to Mt Victoria (2016)

Specific design criteria have been identified for the proposal length, on approach to Medlow Bath and local roads (refer to Table 3-2).

Table 3-2: Design criteria

Design element	Great Western Highway – Katoomba to Blackheath length	Great Western Highway – Medlow Bath northern and southern approaches	Local roads
Carriageway	Dual carriageway, two lanes either direction	Dual carriageway, two lanes either direction	Two lanes, two way
Design speed (kilometres per hour)	90	70	50
Posted speed (kilometres per hour)	80	60	50
Design vehicle (check vehicle)	26 metre B-double (30 metre B-double)	26 metre B-double (30 metre B-double)	12.5 metre Single Unit Truck
Through and turning traffic lane width (metres)	3.5	3.3	Explorers Road Ramp – 3.5 All other local roads – 5
Nearside shoulder width (metres)	2.5	1.5	Explorers Road Ramp – 2.5
Offside shoulder width (metres)	1	1	Explorers Road Ramp – 0.5
Minimum verge width (metres)	2	2	N/A
Active transport trail width (metres)	3	3	N/A
Maximum vertical grade (per cent)	6	6	7.5
Batter slopes	Between 2V:3H and 1V:2H	Between 2V:3H and 1V:2H	N/A
Flood immunity	Pavement drainage pit and pipe network – 10 per cent annual exceedance probability (AEP) storm event Transverse drainage network – one per cent AEP storm event		

3.2.2 Engineering constraints

The engineering constraints considered in the design of both the Katoomba to Medlow Bath and Medlow Bath to Blackheath sections are summarised in Table 3-3.

Table 3-3: Engineering constraints

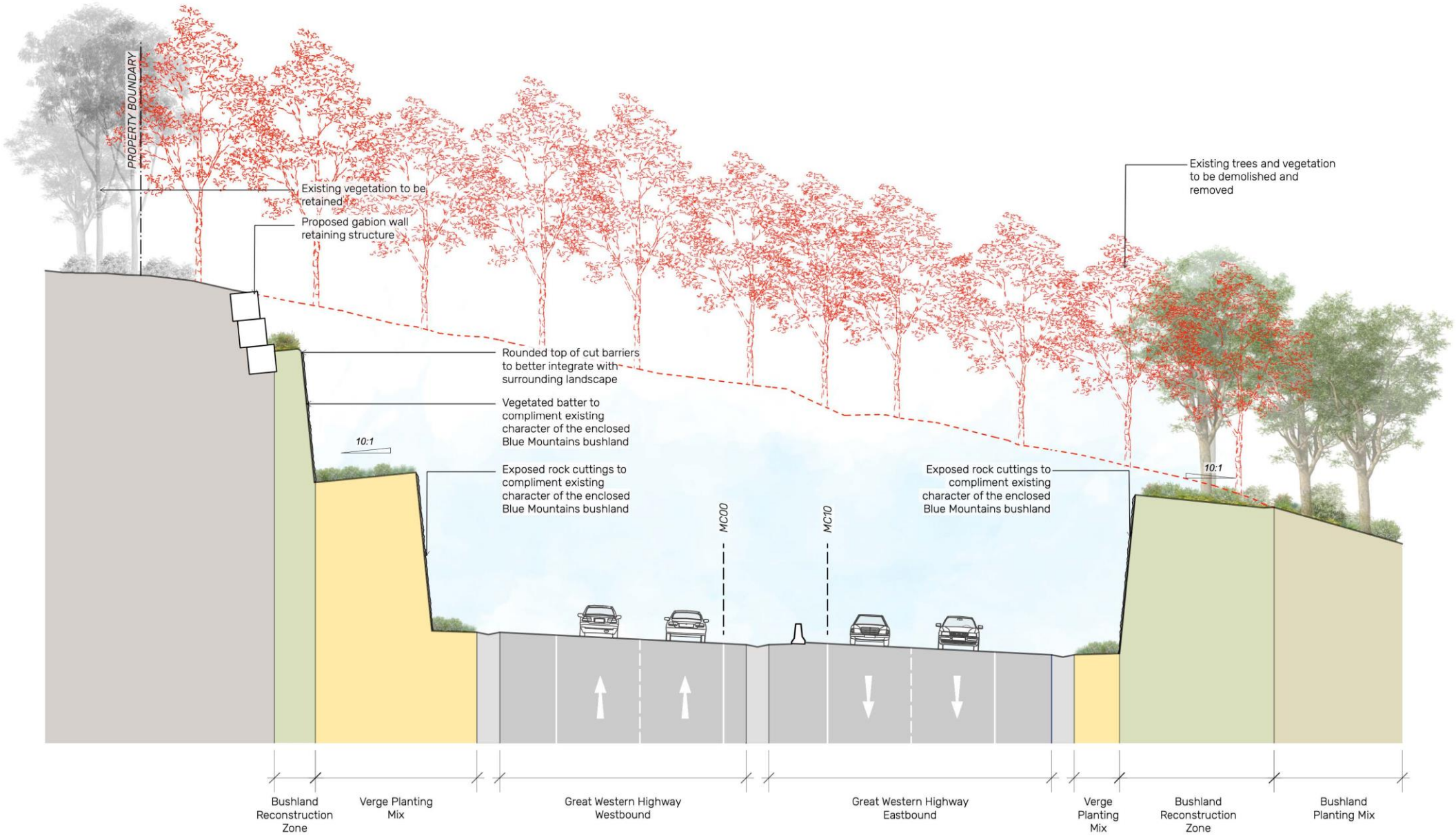
Constraint	How it has been addressed in the proposal design
Great Western Highway to remain open during construction (Katoomba to Medlow Bath, Medlow Bath to Blackheath)	As the upgraded highway would be built across or on top of the existing highway, needing to maintain trafficability of the highway during construction is important. The proposed staging of construction is outlined in Section 3.3.2. Off-line carriageways would be constructed first, while traffic remains on the existing highway. When offline carriageways are complete, traffic would be switched across so that the second carriageway can be constructed. When both carriageways are completed, traffic would be switched back to their permanent directions.
Proximity of Coachhouse Lane and the rail corridor at Medlow Bath (Medlow Bath to Blackheath)	At the eastern extent of the Medlow Bath to Blackheath section, the Great Western Highway is located in a narrow corridor between Coachhouse Lane and the rail corridor. Widening of the highway would result in impacting the rail corridor or Coachhouse Lane. To maintain local property access through Coachhouse Lane, the highway would be widened to the west, impinging on the rail corridor.
Proximity of the Main Western Railway line (Katoomba to Medlow Bath, Medlow Bath to Blackheath)	The proposal design has minimised impacts to the rail corridor and to rail assets. Immediately north of Medlow Bath, new rail corridor fencing would be installed. Access to the rail corridor would be maintained with existing gates either retained or relocated.
Steep terrain (Katoomba to Medlow Bath, Medlow Bath to Blackheath)	In several locations, the proposal design extends across valleys and cuts through existing ridges. There are several retaining walls as part of the design. The Katoomba to Medlow Bath section includes a bridge near Explorers Road, to span across the valley.

3.2.3 Major design features

Cross sections

The typical sealed carriageway for the Katoomba to Medlow Bath section in each direction would be between 10.5 and 10.9 metres wide. The verge and median areas would vary in width and include a concrete median with appropriate barriers in place. On the approach to Medlow Bath, median trees would be planted to denote the change in environment. Refer to Figure 3-3a-b for two indicative cross sections of this section.

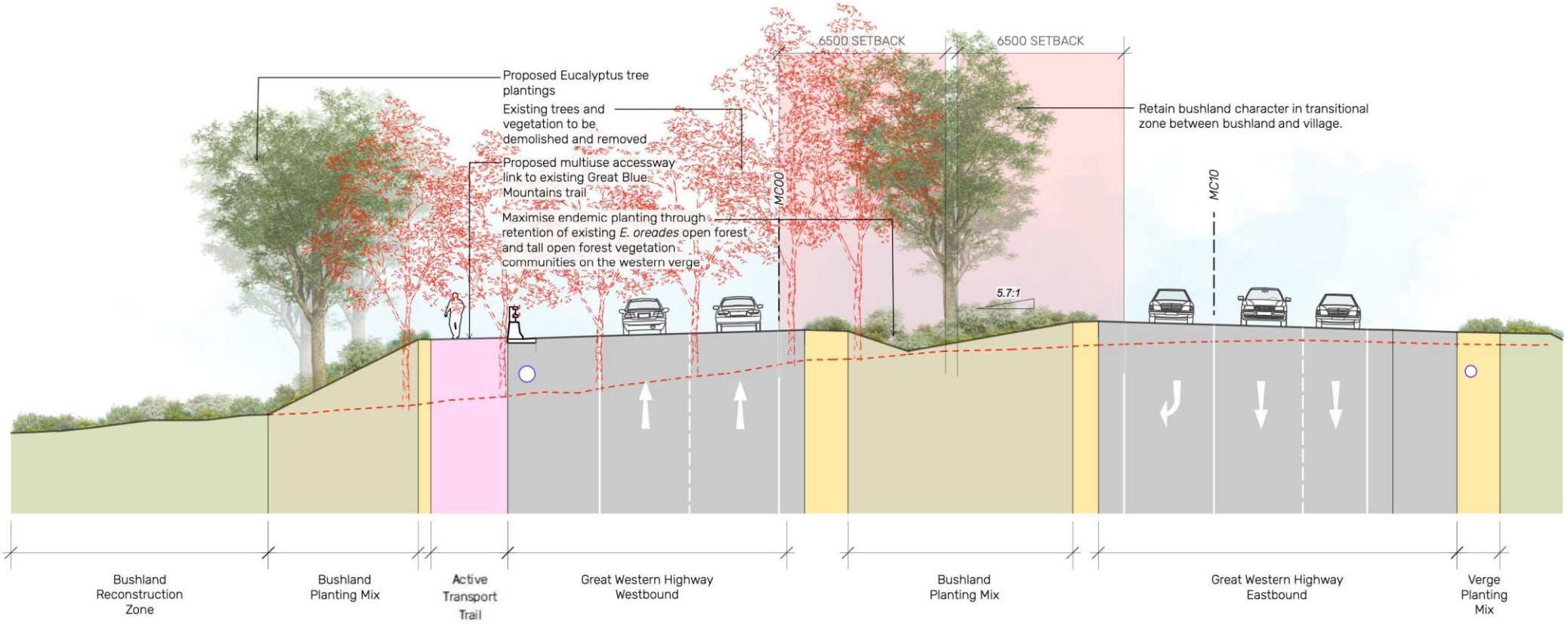
For the Medlow Bath to Blackheath section, the typical carriageway width would be between about 8.1 and 10.5 metres. The verge and median areas would vary in width, with a raised concrete median near Medlow Bath and widened medians in other areas, with appropriate barriers installed. Refer to Figure 3-4a-b for indicative cross sections of this section.



Source: SMM, 2022

NO SCALE – CH920

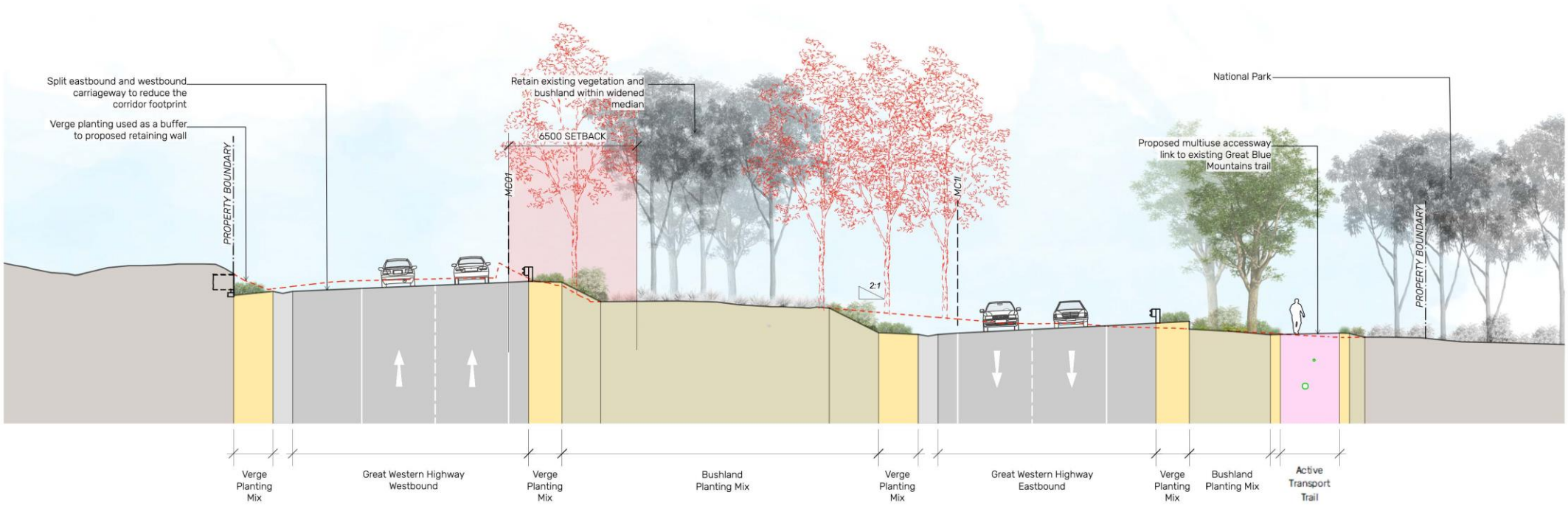
FIGURE 3-3a: Katoomba to Medlow Bath section – cut – Ch920



Source: SMM, 2022

NO SCALE – CH3100

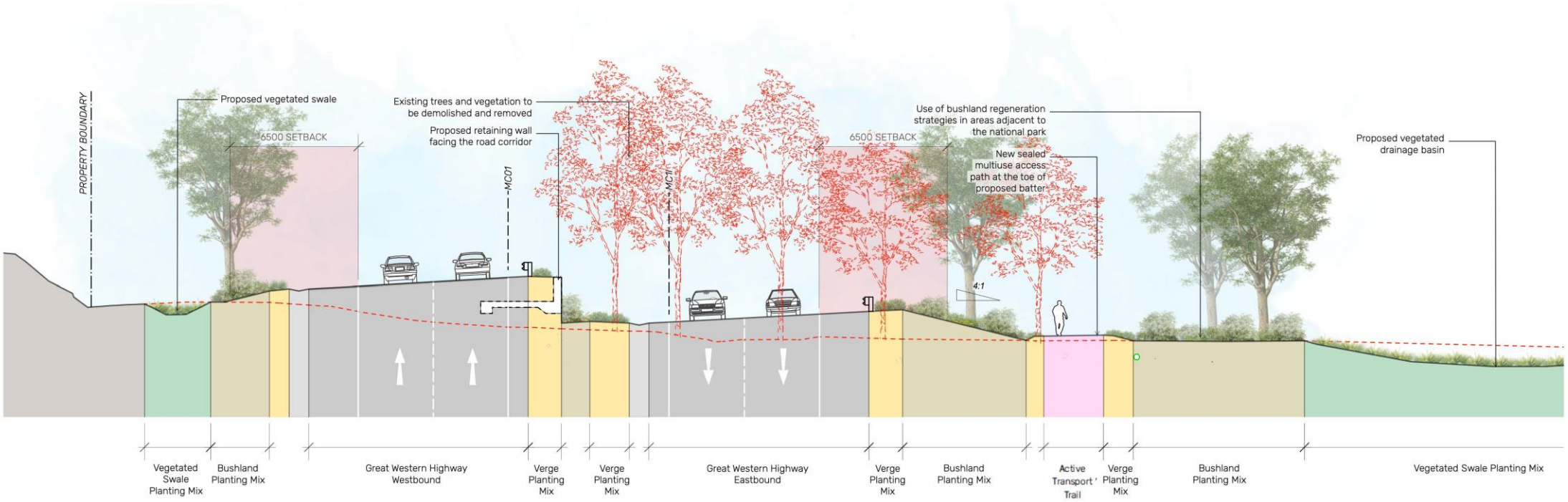
FIGURE 3-3b: Katoomba to Medlow Bath section – fill – Ch3100



Source: SMM, 2022

NO SCALE – CH5400

FIGURE 3-4a: Medlow Bath to Blackheath section – cut – Ch5400



Source: SMM, 2022

NO SCALE – CH5180

FIGURE 3-4b: Medlow Bath to Blackheath section – fill – Ch5180

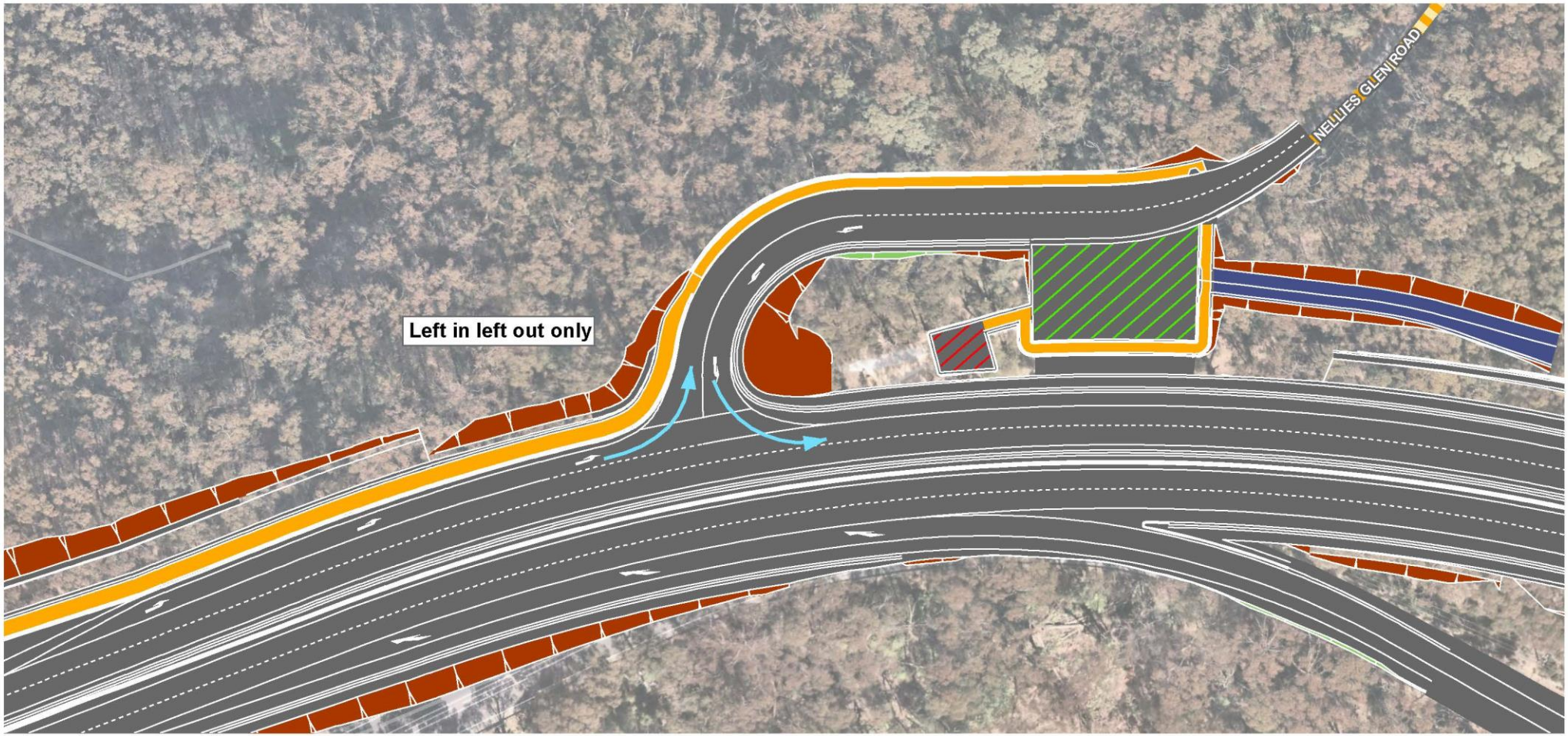
Intersection upgrades

As part of the Katoomba to Medlow Bath section, there are three local roads that connect to the Great Western Highway. These intersections would be upgraded at Nellies Glen Road, Explorers Road and Foy Avenue. These intersection upgrades are detailed in Table 3-4 and shown in Figure 3-5 to Figure 3-7.

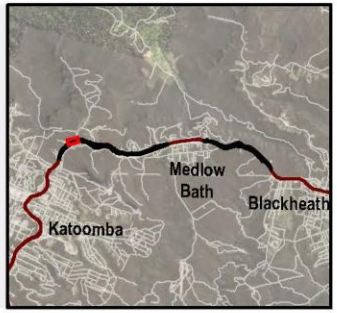
Table 3-4: Description of intersection upgrades

Intersection	Description of upgrade
Nellies Glen Road	• The intersection would be realigned further east to improve driver sight lines of traffic on the highway. • The left-out movement at Nellies Glen Road removed in 2021 due to safety concerns would be reinstated, making the intersection left-in left-out only for westbound traffic. • Access to / from the eastbound carriageway, Nellies Glen Road traffic would travel via the Explorers Road intersection.
Explorers Road	• Explorers Road would no longer connect to the Great Western Highway, as at this point, the highway would be located above on new twin bridges that would extend over Explorers Road. • Explorers Road would connect to the existing highway, which would become a service road in this location • The Explorers Road intersection would be a right in right out only intersection, with priority given to vehicles turning right out of Explorers Road. • Access to / from the westbound carriageway, Explorers Road traffic would travel via the Nellies Glen Road intersection.
Foy Avenue	• The Foy Avenue intersection with the Great Western Highway would be upgraded to provide channelised right in turn and left in left out traffic movements. • A left turn bay would be provided for highway westbound vehicles to access Foy Avenue and a channelised right turn bay for highway eastbound vehicles • Vehicles exiting the intersection would only be able to turn left, with eastbound traffic redirected to the Bellevue Crescent intersection to perform U-turns.

There are no intersections along the length of the Medlow Bath to Blackheath section.



Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Carpark
Heritage interpretation area



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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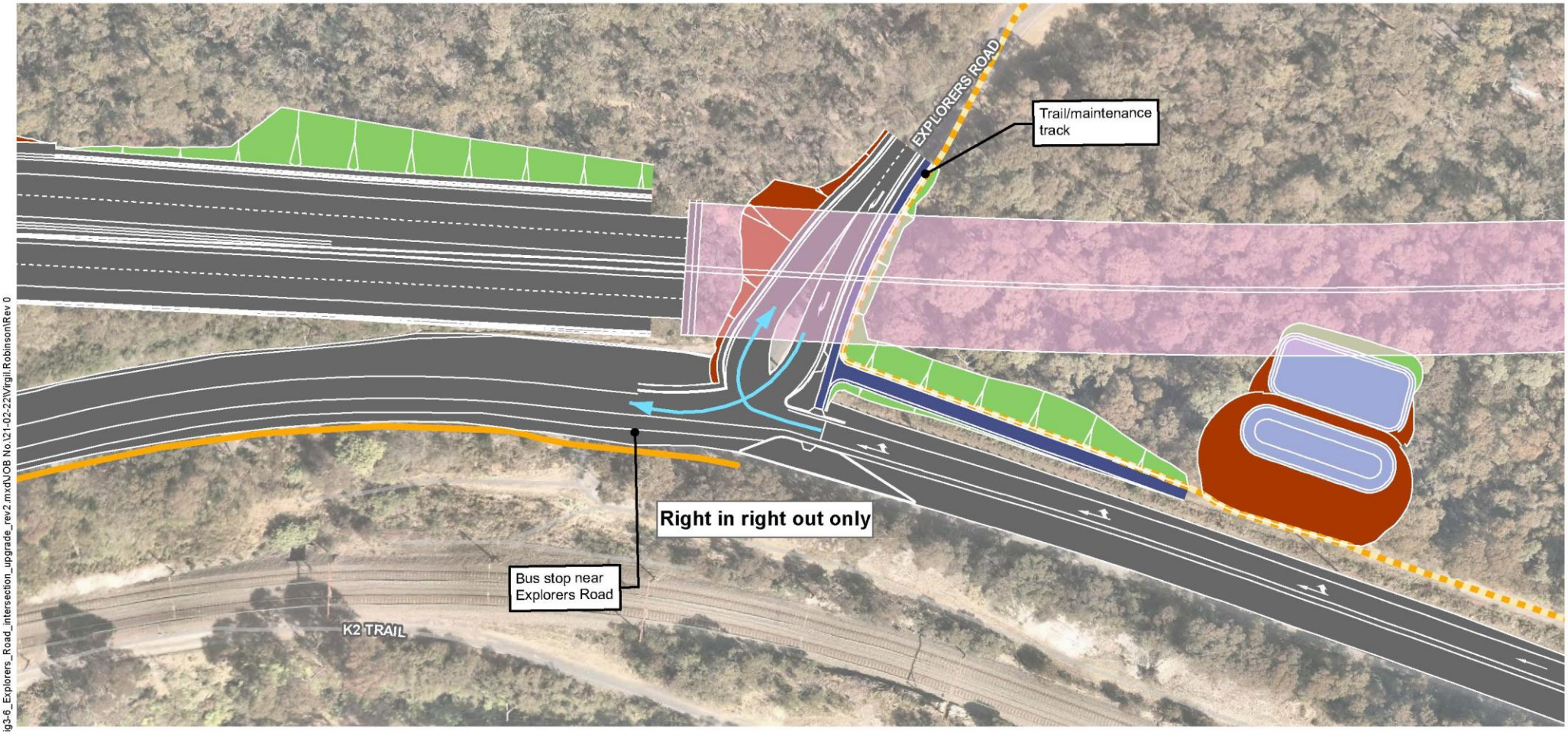
0 20 40 m

Projection: GDA2020 MGA Zone 56

FIGURE 3-5: Nellies Glen Road intersection upgrade



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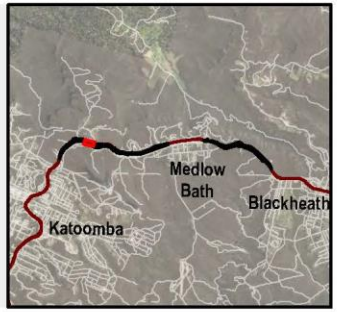
Bridge
Active transport trail - existing
Active transport trail - upgraded
Maintenance access
Cut
Fill
Pavement
Drainage basin



Source: Aurecon, Mott MacDonald, LPI, Nearmap

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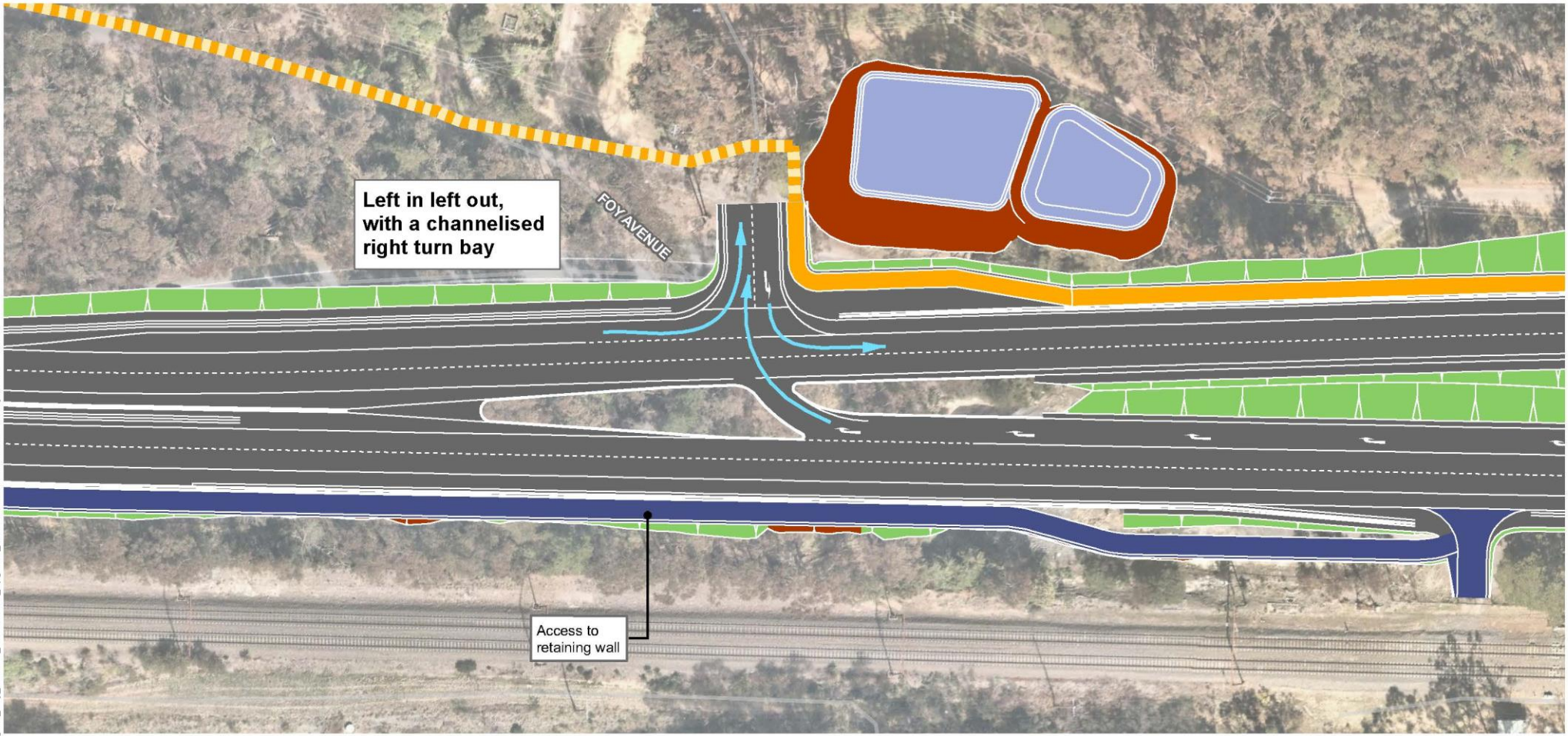
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-6: Explorers Road intersection upgrade



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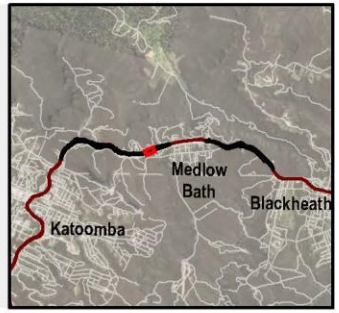
- Active transport trail - existing
- Active transport trail - upgraded
- Maintenance access
- Cut
- Fill
- Pavement
- Drainage basin



Source: Aurecon, Mott MacDonald, LPI, Nearmap

1:1,000@A4

0 15 30m

Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-7: Foy Avenue intersection upgrade

Tie-ins

The Katoomba to Medlow Bath section would connect into the existing highway west of Katoomba, near Rowan Lane where the existing highway is two lanes in each direction. The western end of this section would tie-in to the Great Western Highway south of Bellevue Crescent and connect to a section of the highway that would be upgraded as part of the Medlow Bath Upgrade.

The eastern extent of Medlow Bath to Blackheath would tie into the Great Western Highway at the Station Street intersection. This section of the highway is two lanes in each direction. To the west, the section would tie-in to the existing highway near Tennyson Road. This section of the highway is two lanes eastbound and one lane westbound. As such, the separated carriageways of the section would converge together near the truck stopping bay to match the existing highway alignment and number of traffic lanes. Pavement stubs would be constructed for each of the carriageways as part of this section for a future tie-in to the Great Western Highway Blackheath to Little Hartley (Blackheath to Little Hartley Upgrade).

The crossover pavement would be maintained as an emergency crossover point for the final arrangement.

Twin bridges over Explorers Road

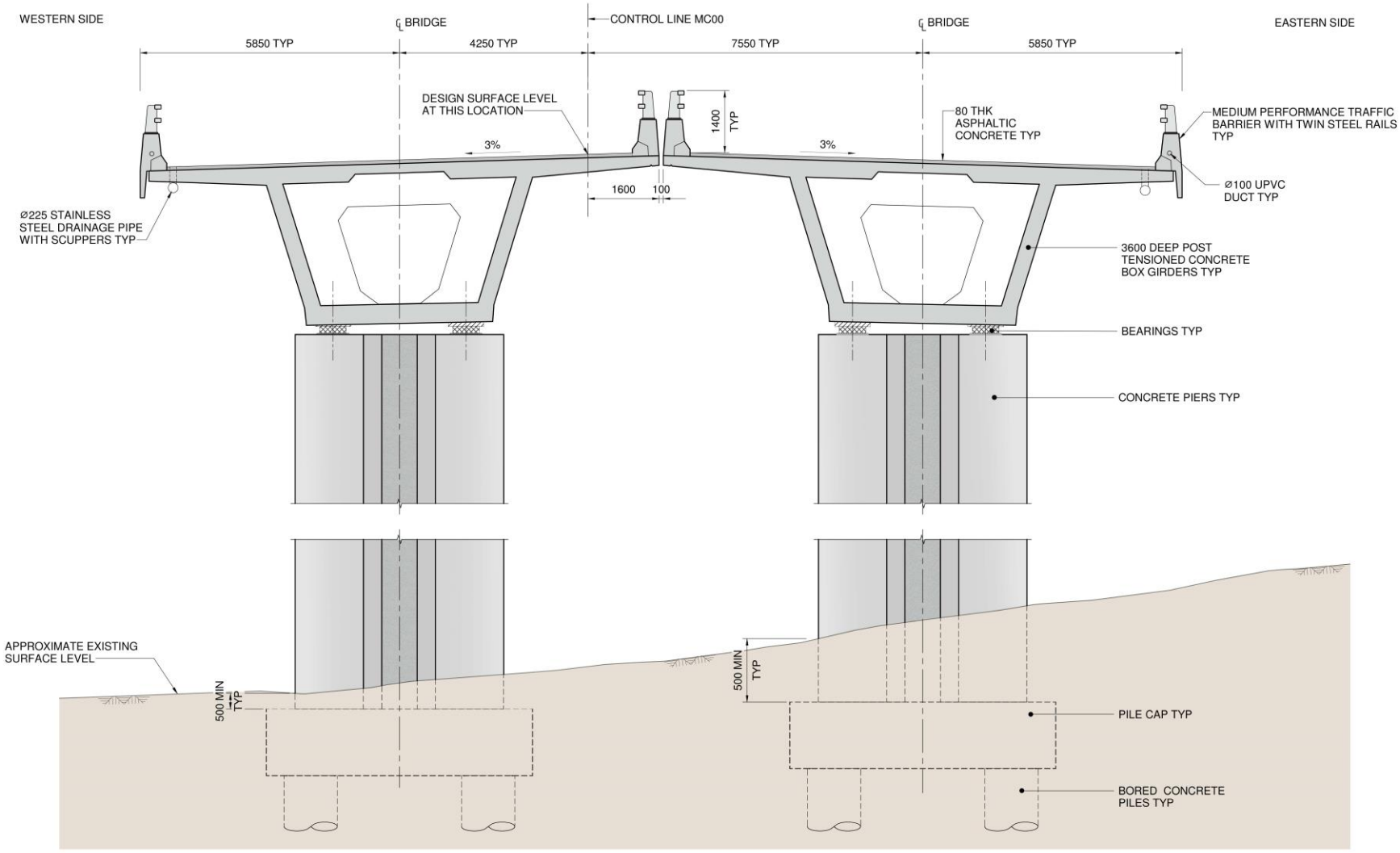
The new twin concrete bridges would span about 400 metres over the valley from Pulpit Hill near Explorers Road, Katoomba to the existing Great Western Highway. One bridge would carry eastbound traffic, while the other bridge would carry westbound traffic. Each bridge would consist of two traffic lanes and a shoulder. The road carriageway on each bridge would be about 10.5 metres wide, comprising two 3.5-metre-wide traffic lanes, a one-metre-wide inner shoulder and 2.5-metre-wide outer shoulder. A cross-section of the twin bridges is shown in Figure 3-8.

The bridge structures comprise twin 3.6 metres deep post tensioned concrete box girders constructed side by side, with a maximum spacing of 100 millimetres between each bridge for safety reasons. The maximum height of the bridge deck over ground would be about 32 metres.

The bridges would consist of nine spans with eight piers, with the maximum span length of about 55 metres. There would be four piles for each pier. The piers have been placed to avoid direct impact to an area of Blue Mountains Swamp threatened ecological community (TEC) that passes under the twin bridges. The piers have also been designed to reduce the visual bulk of the bridges in line with the urban design objectives of the proposal (refer to section 2.3.3).

Appropriate safety barriers would be constructed along both bridge structures and there would be no pedestrian access along the bridges.

Construction of the twin bridges is proposed to be via an incrementally launched method. This would involve bridge segments being pushed out from the eastern abutment near Explorers Road to the western abutment near the existing Great Western Highway. This construction technique would minimise the construction footprint required under the bridges and limit the need for extensive crane lifts. However, the construction technique may vary during detailed design or construction once a detailed construction methodology has been developed.



Source: SMM, 2022

NO SCALE

FIGURE 3-8: Typical cross section of the twin bridges

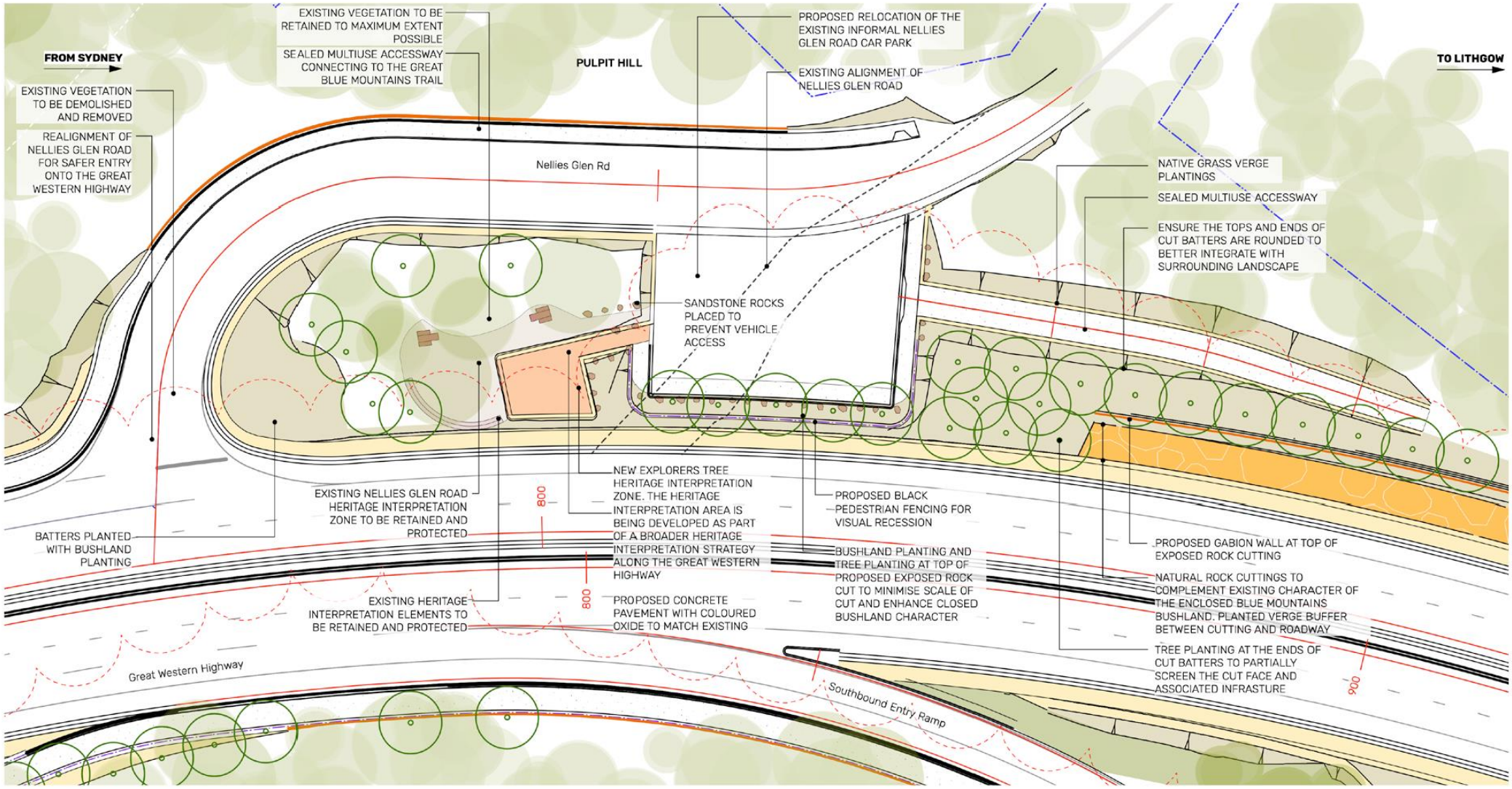
Heritage interpretation

Transport is currently engaging with specialist heritage consultants GML Heritage and Balarinji Indigenous Design and Strategy to engage stakeholders in developing a cultural interpretation strategy across the Great Western Highway Upgrade Program – Katoomba to Lithgow. This cultural interpretation strategy would look to interpret both Aboriginal and non-Aboriginal heritage along the highway alignment.

As part of the Katoomba to Medlow Bath section, an expanded and cohesive heritage interpretation area would be developed on Nellies Glen Road to display the Aboriginal and non-Aboriginal heritage of the area. The Nellies Glen Road intersection with the Great Western Highway has been shifted further east than the existing intersection. This has allowed the retention of the existing Blue Mountains City Council heritage interpretation area. The proposal would allow better connection between the disparate heritage items such as the nearby Stone arrangements (including an unmarked convict grave site). The new interpretation area would enhance and supplement the Council's existing site. It would support a broader story of the cultural significance of Pulpit Hill, not just focusing on the former Explorers Tree.

This area will incorporate improved visitor car parking and active transport trails that form part of the Great Blue Mountains Trail around Nellies Glen Road to better connect users with the interpretation area. It would not impact on the 'heritage fabric' of the site. An indicative image showing the enhanced heritage interpretation area is shown in Figure 3-9. How the enhanced heritage interpretation area would connect to the heritage items across Pulpit Hill is shown in Figure 3-10.

The heritage interpretation area would be further developed as part of the Great Western Highway Upgrade Program cultural interpretation strategy, in consultation with the Blue Mountains City Council, Heritage NSW, Aboriginal knowledge holders and the local community.



Source: SMM, 2022

NO SCALE

FIGURE 3-9: Heritage interpretation area

Existing heritage interpretation area

Bonnie Doon Reserve

Pulpit Hill and Environs

NELLIES GLEN ROAD

Possible grave

K039: Stone Arrangements

Pulpit Hill and Environs

Proposed carpark

Existing Nellies Glen Road heritage interpretation area (pictured) to be retained and enhanced

Proposed upgrade to intersection at Nellies Glen Road (to allow retention of the existing heritage interpretation area)

GREAT WESTERN HIGHWAY

K031: Explorers Tree and Environs

K2 TRAIL

The design

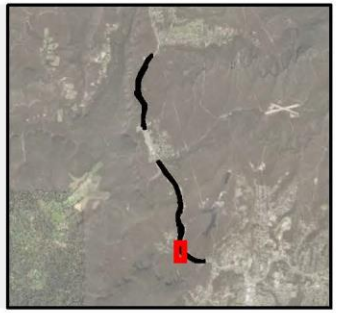
Photo location and direction indicator

Blue Mountains LEP 2015

Heritage items

Bonnie Doon Reserve

Pulpit Hill and Environs



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Source: Aurecon, Mott MacDonald, LPI, Nearmap, Niche

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0 25 50m

Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-10: Pulpit Hill heritage

Pavement

Different pavements that would be used for the proposal include:

- a full depth asphalt pavement for the main carriageway and new truck stopping bays
- bridge deck asphalt pavement for the twin bridges within the Katoomba to Medlow Bath section
- sealed granular pavements for tying into local roads, car parks and access roads, suitable for the proposed traffic loading
- concrete medians and a mix of concrete and asphalt pavement surfaces for paths.

As part of the noise assessment undertaken for the REF, one potential noise mitigation measure being considered is a low noise asphalt pavement for sections near sensitive receivers in the Katoomba to Medlow Bath section. The need for and feasibility of using low noise asphalt pavement would be confirmed during detailed design.

There are sections of pavement on the existing highway that would no longer be required for the highway alignment. These sections of pavements would either be retained for use as access trails or transport maintenance areas. If they are no longer required, the pavements would be removed and the area re-landscaped.

Truck stopping areas

The proposal would establish two new formal truck stopping areas for heavy vehicle load checking. These areas would provide areas where trucks can move off the highway to check loads and vehicles. This would address an issue that is currently experienced on the highway, where trucks pull over on the side of the highway at Foys Avenue and outside the Hydro Majestic in Medlow Bath to check their loads.

The truck stopping bays are intended as short term stop areas and would not be ‘rest areas’. There would be no ablutions or other facilities.

The truck stopping areas would be:

- one eastbound on the existing highway pavement near Explorers Road in the Katoomba to Medlow Bath section
- one westbound about one kilometre north of Medlow Bath on a section of existing highway pavement in the Medlow Bath to Blackheath section.

The truck stopping areas are shown in Figure 3-1b-c and Figure 3-2c.

Drainage and water quality

The proposal would include the following road drainage infrastructure:

- Longitudinal drains, which would run along length of the road and are designed to remove water from the road surface as quickly as possible. This would include a system of pits and pipes within the median and kerb of the road.
- Cross drainage pipes, which transfer water under the road and are generally installed along natural low points on a road to allow natural stormwater runoff from the surrounding land to drain across a road to minimise disturbance to the existing flow patterns. There would be eight cross drainage pipes within the Katoomba to Medlow Bath section but no cross drainage pipes within the Medlow Bath to Blackheath section.
- Bridge drainage system that would direct run-off from the bridge surface to pits on the northern abutment of the twin bridges that would then drain to water quality treatment basin.

- Water quality management and stormwater treatment measures that could include:
  - water quality basins
  - bio filtration systems
  - grass swales
  - scour protection at transverse culverts, longitudinal pipes and channels to prevent erosion and scour from the flow of water.

The pavement drainage pit and pipe network would be designed to achieve flood immunity for a ten per cent annual exceedance probability (AEP) flood event and the transverse drainage network would be designed to achieve flood immunity for a one per cent AEP flood event. The pavement drainage network would also incorporate overland flow routes through the proposed road pavement and landscaped areas to provide capacity in storm events.

Due to the location of the proposal within the Katoomba and Blackheath Special Catchment Areas and adjacent to the Blue Mountains National Park, it is important that the water quality treatment provides a beneficial effect on water quality. Through the concept design, Transport have held ongoing meetings with the Blue Mountains City Council and Water NSW to develop the water quality strategy for the proposal. MUSIC modelling undertaken for the proposal (refer to Section 6.1.3) show that this strategy would have a beneficial effect on water quality in the catchments.

The water quality management process is outlined in Figure 3-11. Water quality for the proposal is considered on a water runoff catchment area and each catchment would have water quality treatments such as:

- Baramy Single Vane Gross Pollutant Traps (GPTs) or approved equivalents. These are pollution control devices specifically designed to remove gross pollutants and coarse sediments from stormwater runoff.
- Bioretention systems incorporated within the onsite detention basin (OSDs). These facilitate additional nutrient removal. Sediments and attached pollutants (including nutrients, metals, and other soluble pollutants) are removed via filtration through the vegetated surface layer and filter layer below.
- Grassed line swales with check dams at the discharge point from the basins, where possible. These slow down the runoff velocity and promote infiltration to the existing low point or overland flow path.

Figure 3-12 is an example of basin outlet treatment to reduce scour, which is indicative of the treatment proposed to be implemented for the proposal. A typical cross-section of a basin is shown in Figure 3-13.

There are twelve discharge locations proposed. The locations of the proposed basins are shown in Figure 3-1a-f and Figure 3-2a-e. There would be:

- seven discharge locations within the Katoomba to Medlow Bath section. Six of these locations would have bioretention basins, and at five locations, there would be bioretention basin and OSD systems.
- five bioretention basins with OSD installed along the eastern side of the road corridor within the Medlow Bath to Blackheath section.

Transport will continue to work with Blue Mountains City Council and Water NSW on the design of the water quality devices through the detailed design. The extent of scour protection would be confirmed during detailed design.

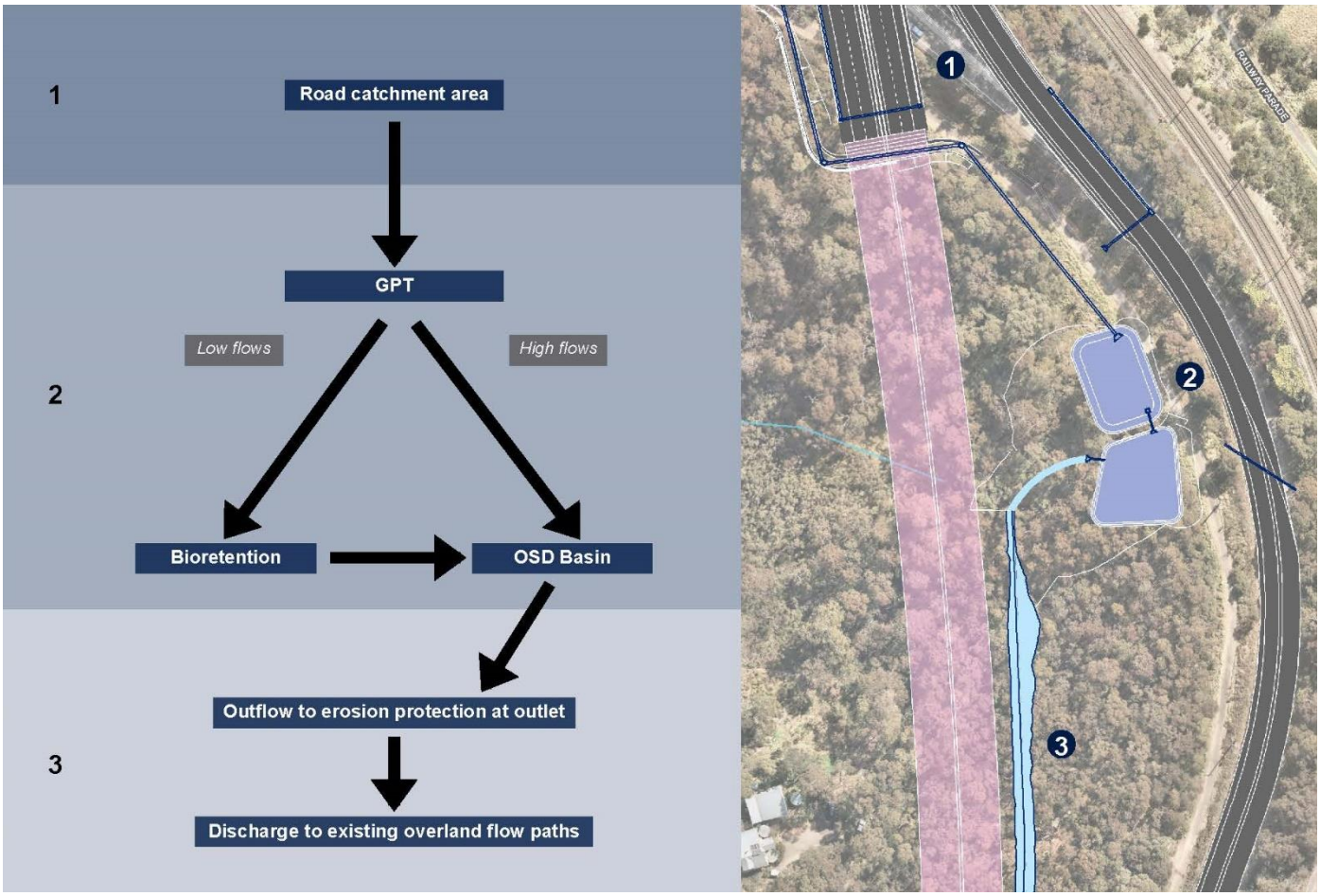
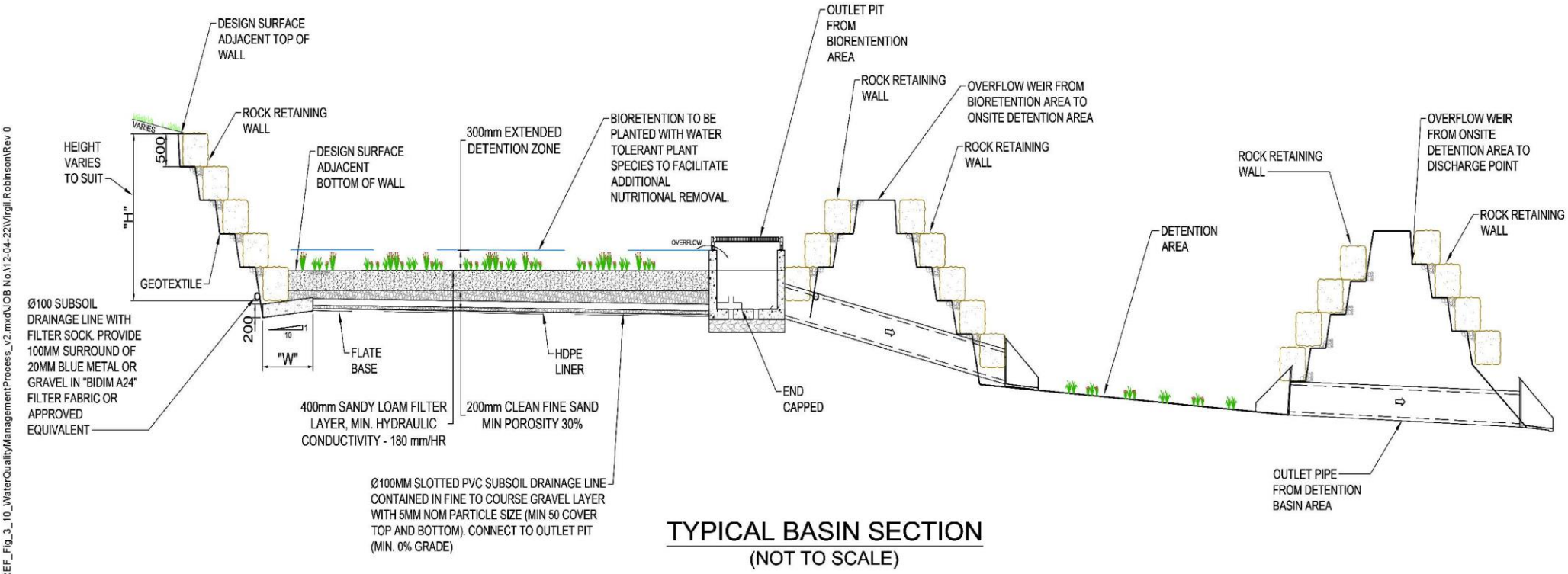


Figure 3-11: Water quality management process

Figure 3-12: Indicative treatment at basin outlet (source: Blue Mountains City Council)



TYPICAL BASIN SECTION
(NOT TO SCALE)

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Source: Aurecon

FIGURE 3-13: Typical basin cross-section

Bus facilities

There would be no changes to existing bus routes due to the proposal.

There are existing bus stops on the Great Western Highway at Bonnie Doon Reserve, Nellies Glen Road and Foy Avenue along the Katoomba to Medlow Bath section. These would be reinstated in slightly different locations to allow public and school bus services to continue to operate. This would include:

- the bus stop at Bonnie Doon Reserve would shift further west from its current location into a dedicated bus bay
- the bus stop opposite Nellies Glen Road would be relocated further north to be opposite Explorers Road on the service road
- the bus stop at Foy Avenue would remain on the western side of the intersection.

Reinstatement and installation of the bus stops would be undertaken in consultation with local bus operators.

There are no bus stops along the Medlow Bath to Blackheath section.

Active transport trail

There are many active transport trails and hiking routes that fall within or connect to the proposal area. The main one of these is the Great Blue Mountains Trail, which mostly follows the alignment of the Great Western Highway. The proposal would relocate, upgrade and connect with existing sections that make up the Great Blue Mountains Trail along the Katoomba to Medlow Bath section as well as provide a new publicly accessible trail in the Medlow Bath to Blackheath section. The sections of trail that are proposed or would be upgraded as part of the proposal as well as existing active transport links throughout the proposal area are shown in Figure 3-14a-b.

Active transport trails would also serve as a maintenance access trail to utilities, water quality basins, local streets and other walking trails in the area.

Along the Katoomba to Medlow Bath section:

- the existing active transport trail would start from the western end of Rowan Lane, Katoomba
- from Rowan Lane, a section of active transport trail would be upgraded along the Great Western Highway to Nellies Glen Road via the reinstated Bonnie Doon Reserve bus stop
- on Nellies Glen Road, the upgraded active transport trail would be able to access the heritage interpretation area via the new carpark, or continue on the existing Great Blue Mountains Trail diversion to Six Foot Track and Explorers Road
- north of the upgraded Great Western Highway / Explorers Road intersection, the existing active transport trail would be retained, with a short deviation around the western abutment of the bridges
- the existing active transport trail would continue for about 250 metres before joining a section of upgraded trail, allowing users to access the existing trail network along Foy Avenue
- west of the upgraded Great Western Highway / Foy Avenue intersection, an upgraded active transport trail, would traverse along the highway connecting into Bellevue Crescent, providing access to Medlow Bath.

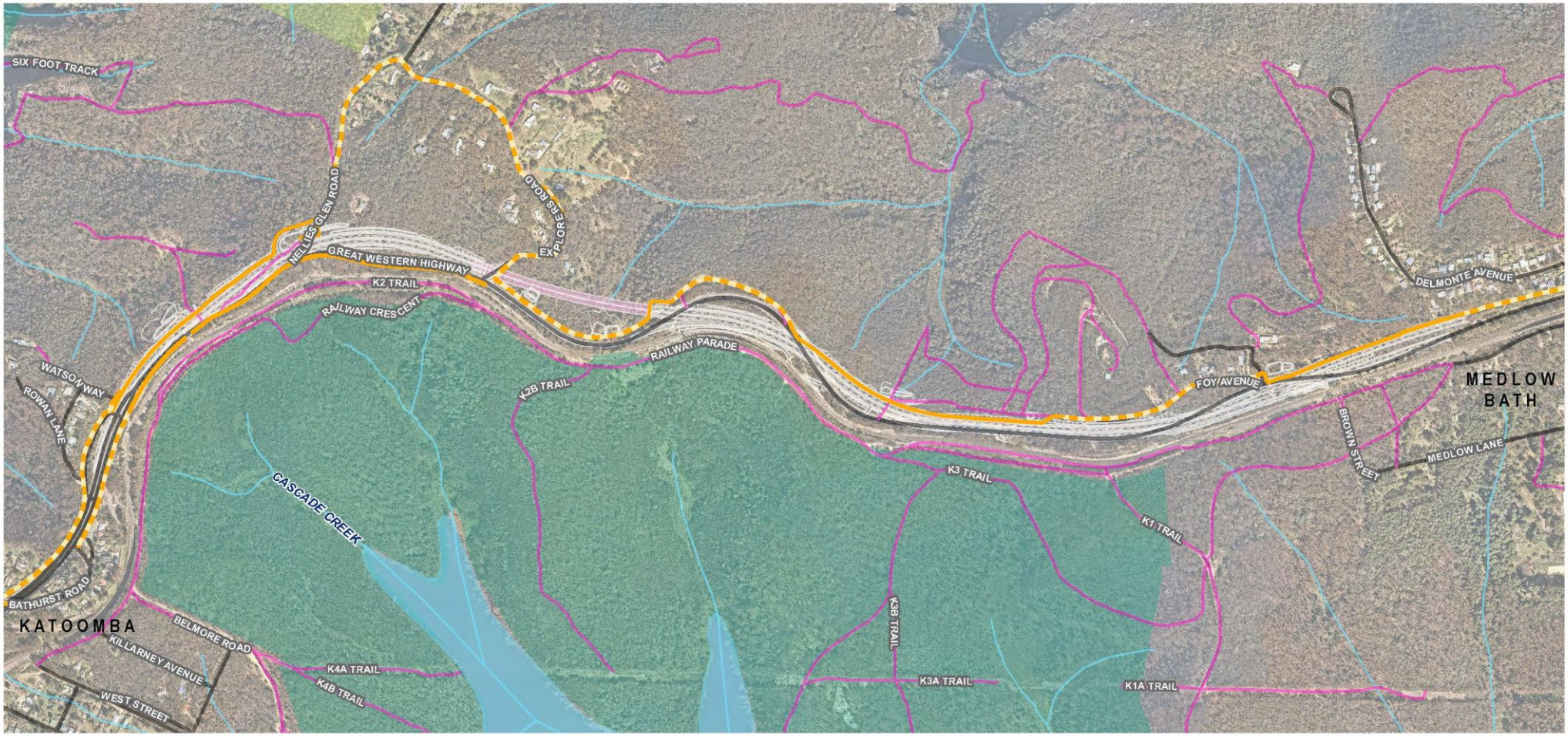
In addition, Transport are investigating further opportunities to connect a new section of active transport trail on the eastern side of the highway from Katoomba to Explorers Road. This would be between the road and rail corridors through to Explorers Road and provide improved grades for walking and cycling. Transport would continue to discuss this opportunity with stakeholders as the proposal progresses.

Along the Medlow Bath to Blackheath section:

- the proposal would provide a new length of active transport trail on the eastern side of the Great Western Highway connecting from the Medlow Bath Railway Station via Coachhouse Lane alongside the Blue Mountains National Park to Tennyson Road, Blackheath
- the future connection of the active transport trail would likely extend to Evans Lookout Road as part of the adjoining Blackheath to Little Hartley Upgrade
- this section would also serve as a maintenance access trail to utilities, water quality basins and the Blue Mountains National Park trails in the area

The proposal would not alter the existing Great Blue Mountains Trail along Station Street.

Upon completion of construction, this trail would provide uninterrupted pedestrian and cyclist access between Katoomba and Blackheath. The trail would be sealed with bitumen, asphalt or surfaced with concrete as appropriate along the length.



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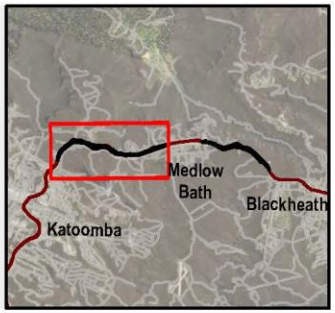
The design
Main road
Track and path - existing
Active transport trail - existing
Active transport trail - upgraded
Bridge
Blue Mountains National Park
Ngula Bulgarabang Regional Park



Source: Aurecon, Mott MacDonald, LPI, Nearmap

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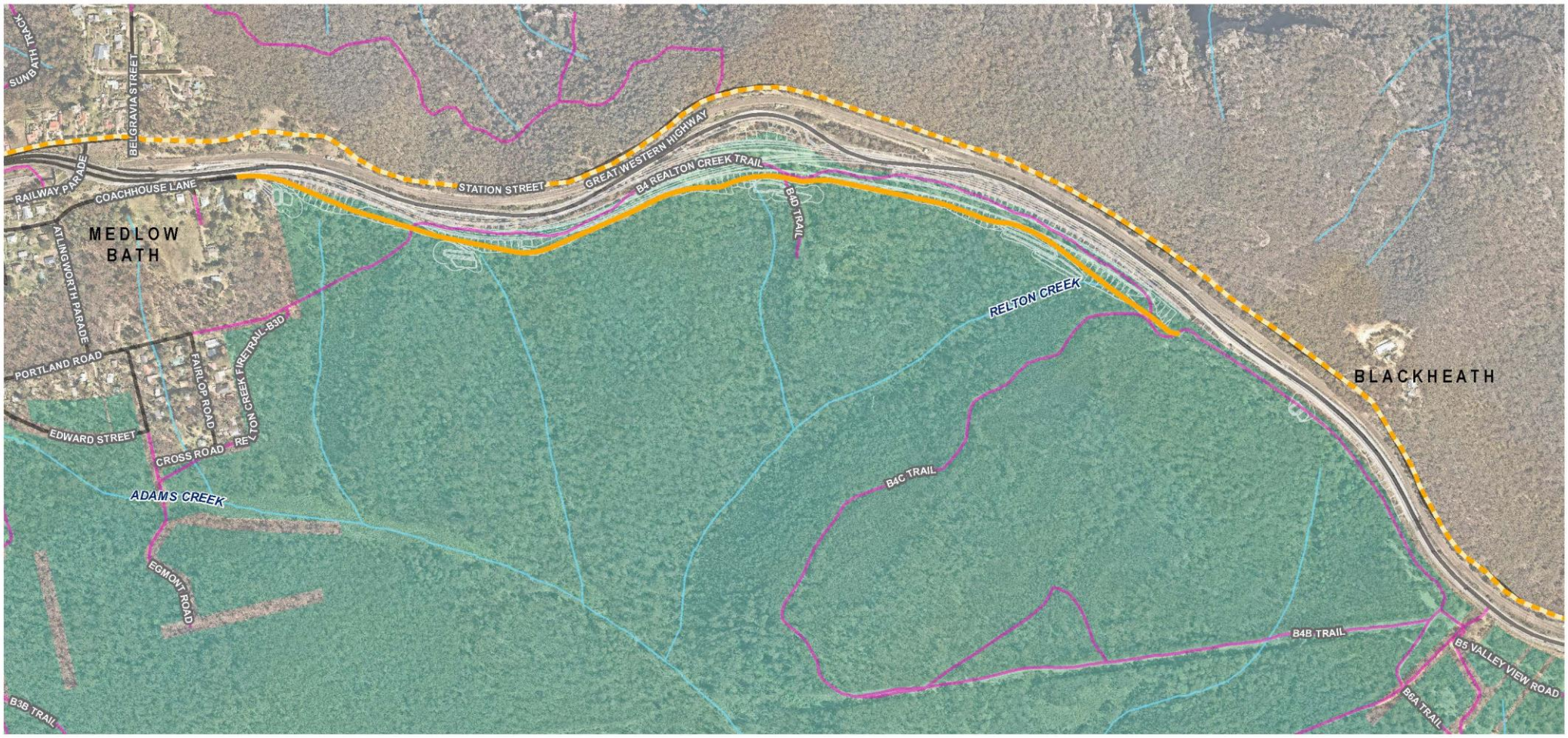
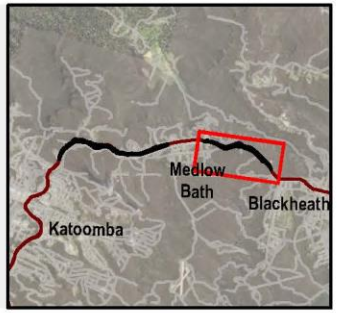
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-14a: Active transport links



The design
Main road
Track and path - existing
Active transport trail - existing
Active transport trail - upgraded
Blue Mountains National Park



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Source: Aurecon, Mott MacDonald, LPI, Nearmap

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Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-14b: Active transport links

Property access

Where the proposal would interrupt access to properties, all properties would be provided with restored or new permanent access arrangements. There are no privately owned residential properties with access directly onto the Great Western Highway. However, there are a number of uninhabited land holdings within the Katoomba to Medlow Bath section adjoining the highway with direct accesses that would be disrupted by the proposal. These would be reinstated in consultation with the relevant landowner.

There are a number of rail corridor access gates and access to rail infrastructure that would be re-established. Due to the separated median between the eastbound and westbound carriageways, access to the rail corridor would be left-in and left-out only from:

- the eastbound carriageway and new local service road in the Katoomba to Medlow Bath section
- the westbound carriageway in the Medlow Bath to Blackheath section.

A rail access strategy has been developed in consultation with Sydney Trains to maintain access to the rail corridor and to other rail assets.

Along the Medlow Bath to Blackheath section, the proposal would include a new trail that would be used for active transport and maintenance requirements. This trail would be within the road reserve, but would replicate an existing trail that currently is within the Blue Mountains National Park and is used for maintenance and emergency access. As such, this trail would retain this purpose and would provide access to other existing trails in the national park. This would be facilitated with gates in the national park fence line.

Some property acquisition would be required as part of the proposal, as outlined in Section 3.6.

Urban design and landscaping

An urban design and landscape strategy has been developed for the proposal from the urban design objectives and principles (refer to section 2.3.3).

The strategy includes urban design direction for elements including the proposed bridge location (Katoomba to Medlow Bath section only), retaining walls, exposed cut, fill embankments, bicycle and pedestrian connections and vegetation to be consolidated into the proposed design to maintain the existing character of the local area. The urban design and landscaping strategies implemented would be finalised during detailed design.

Refer to the Urban Design Concept, Landscape Character and Visual Impact Assessment Report attached to the REF as Appendix G for further detail.

Supporting infrastructure

The proposal would feature supporting road infrastructure, flag lighting at intersections, signage and street furniture, which would be confirmed during detailed design and likely include provision of:

- safety and median barriers, where required to protect vehicles, pedestrians and cyclists from hazards
- traffic control facilities and integrated transport systems (ITS) including traffic monitoring units, closed-circuit television cameras, variable message signage (VMS), variable speed limit signs, integrated speed and lane use signs, overheight vehicle detection and associated utilities
- guide, regulatory, tourism and warning signs for road users
- line marking along the road corridor and retroreflective raised pavement markers on all lane, edge and barrier lines
- roadside furniture, including fencing, to manage property access and allow safe use of active transport.

3.3 Construction

This section summarises the likely construction methodology, work hours, plant and equipment, and associated activities that would be used during construction of the proposal.

Construction of the proposal could commence in 2023 with early works, however the main construction is anticipated to commence from late 2024 and last for a period of about:

- 36 months for the Katoomba to Medlow Bath section
- 30 months for the Medlow Bath to Blackheath section.

3.3.1 Construction boundary

The construction boundary consists of the proposed road design as well as areas required for construction of the proposal. These include:

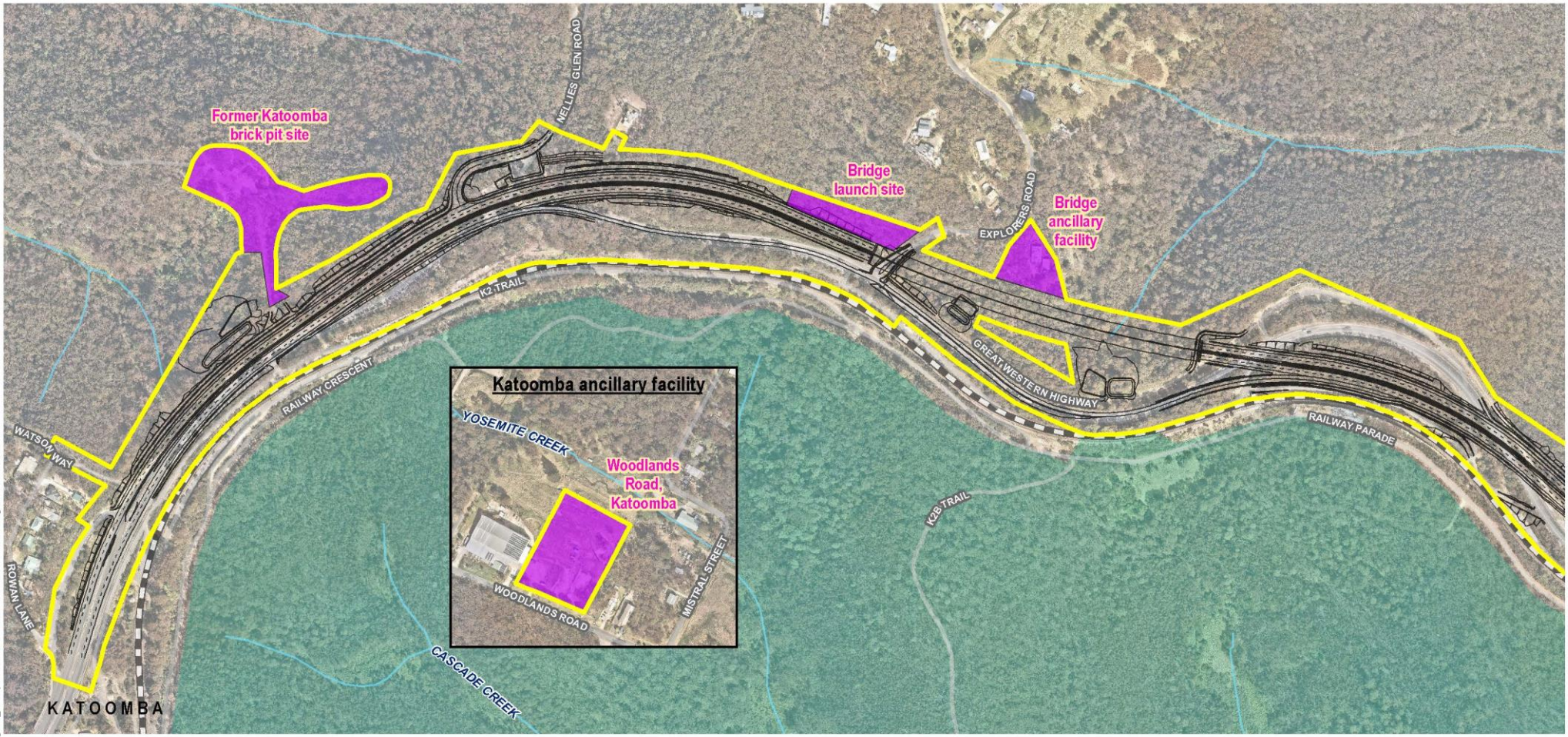
- ancillary facilities, including bridge launching sites for the Katoomba to Medlow Bath section and water quality treatment
- areas required for construction access
- typically, a 15-metre buffer around the road alignment, subject to environmental and engineering constraints.

The rail corridor was considered an engineering constraint and was avoided where possible, even if the distance was less than 15 metres.

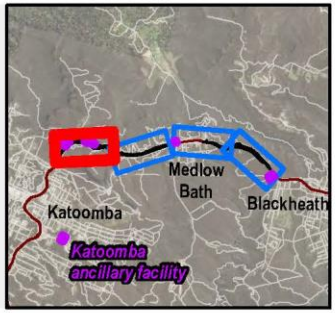
The construction boundary has been adopted as the proposal area in this REF to assess impacts of the proposal.

The proposed construction boundary is shown in Figure 3-15a-d and is indicative only. Construction work may occur anywhere within the construction boundary at the discretion of the construction contractor. It would be subject to refinement during detailed design and construction. The construction area and key construction features are detailed in the following sections.

Refer to section 3.4 for details on proposed ancillary facilities.



The design
Proposed construction boundary
Proposed ancillary facilities
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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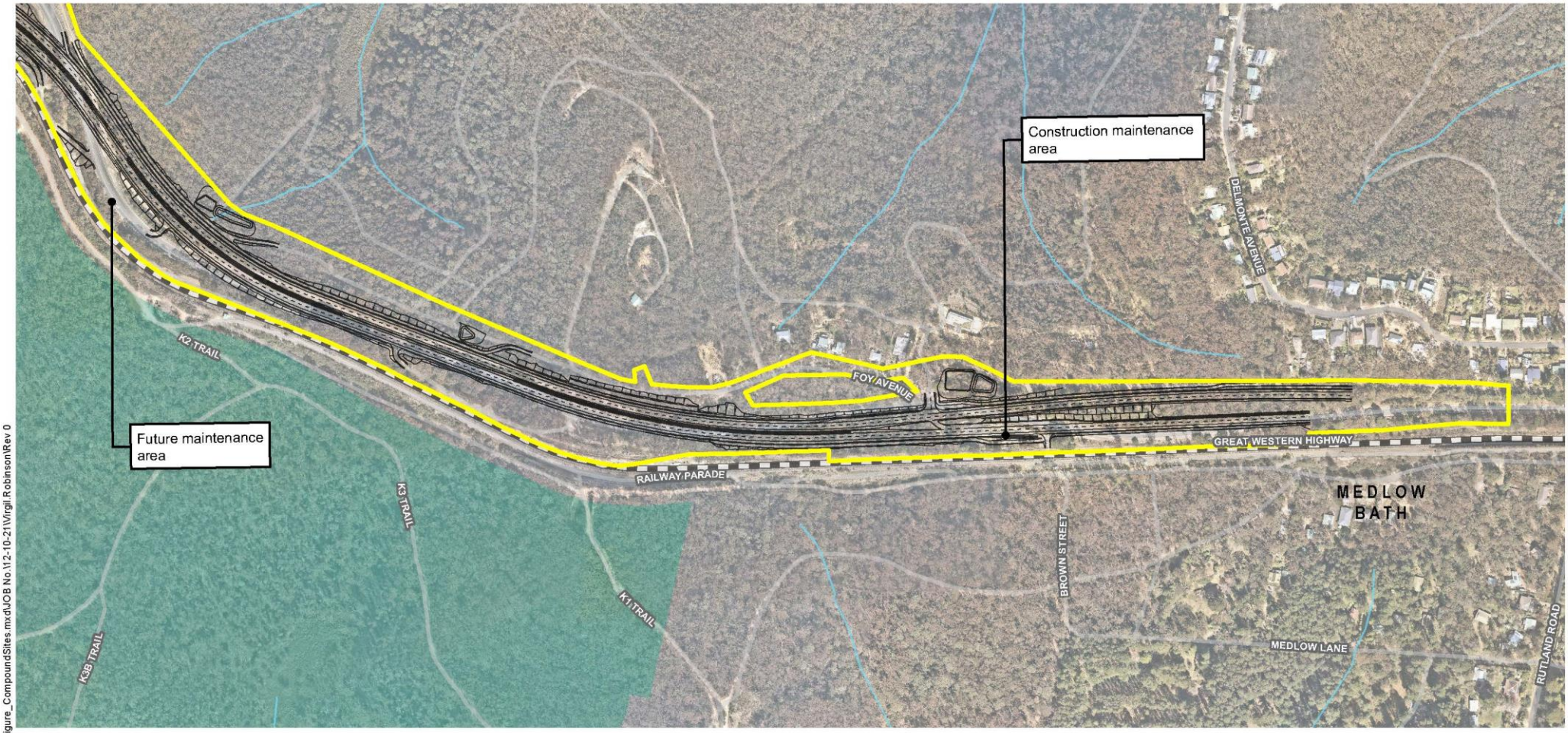
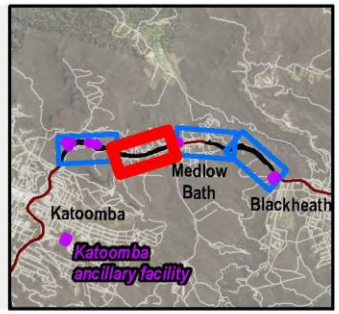
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-15a: Construction areas



The design
Proposed construction boundary
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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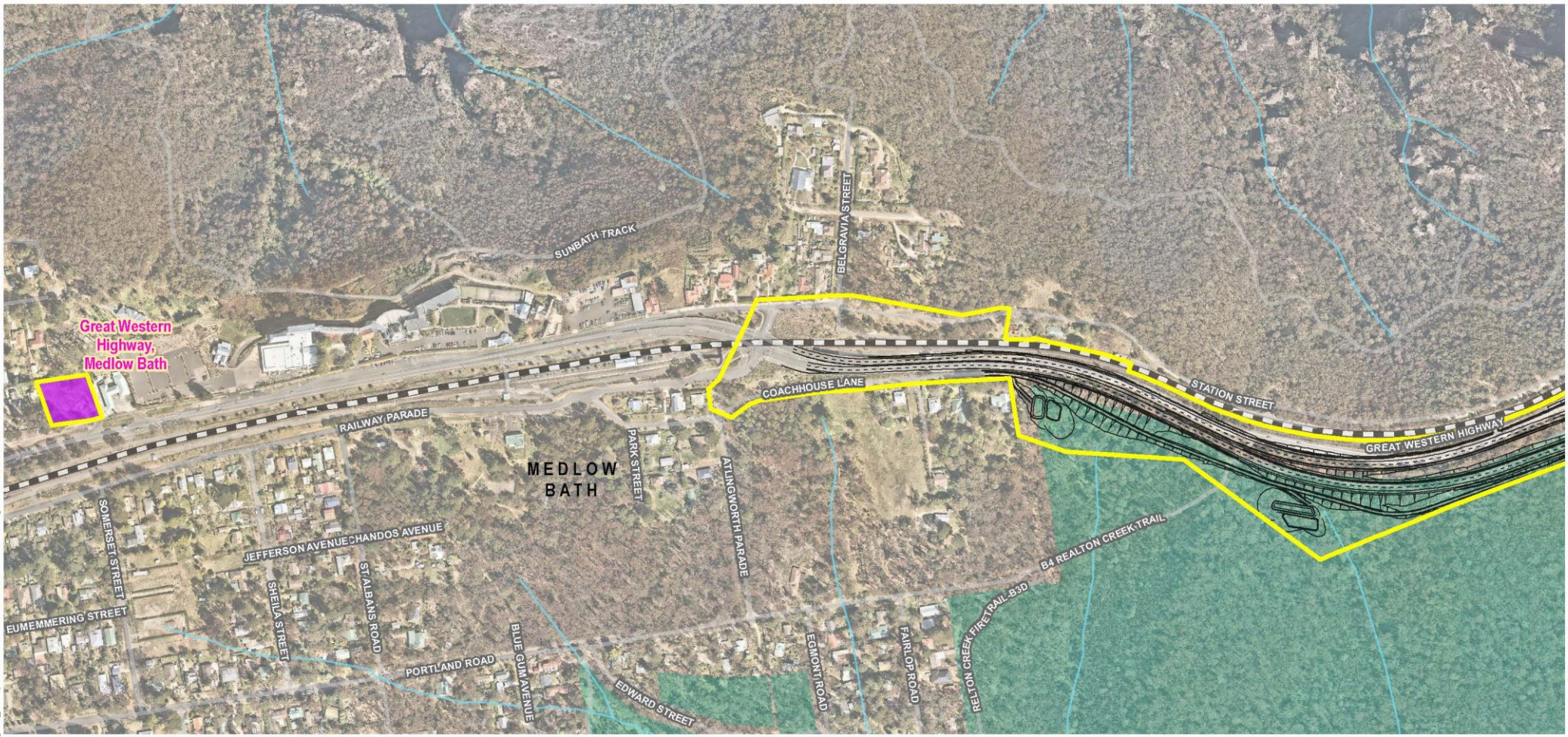
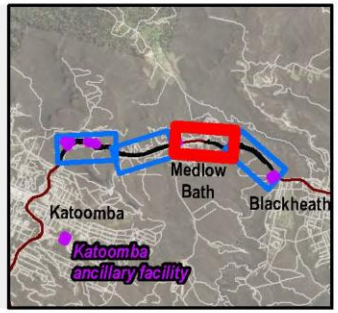
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-15b: Construction areas



The design
Proposed construction boundary
Proposed ancillary facilities
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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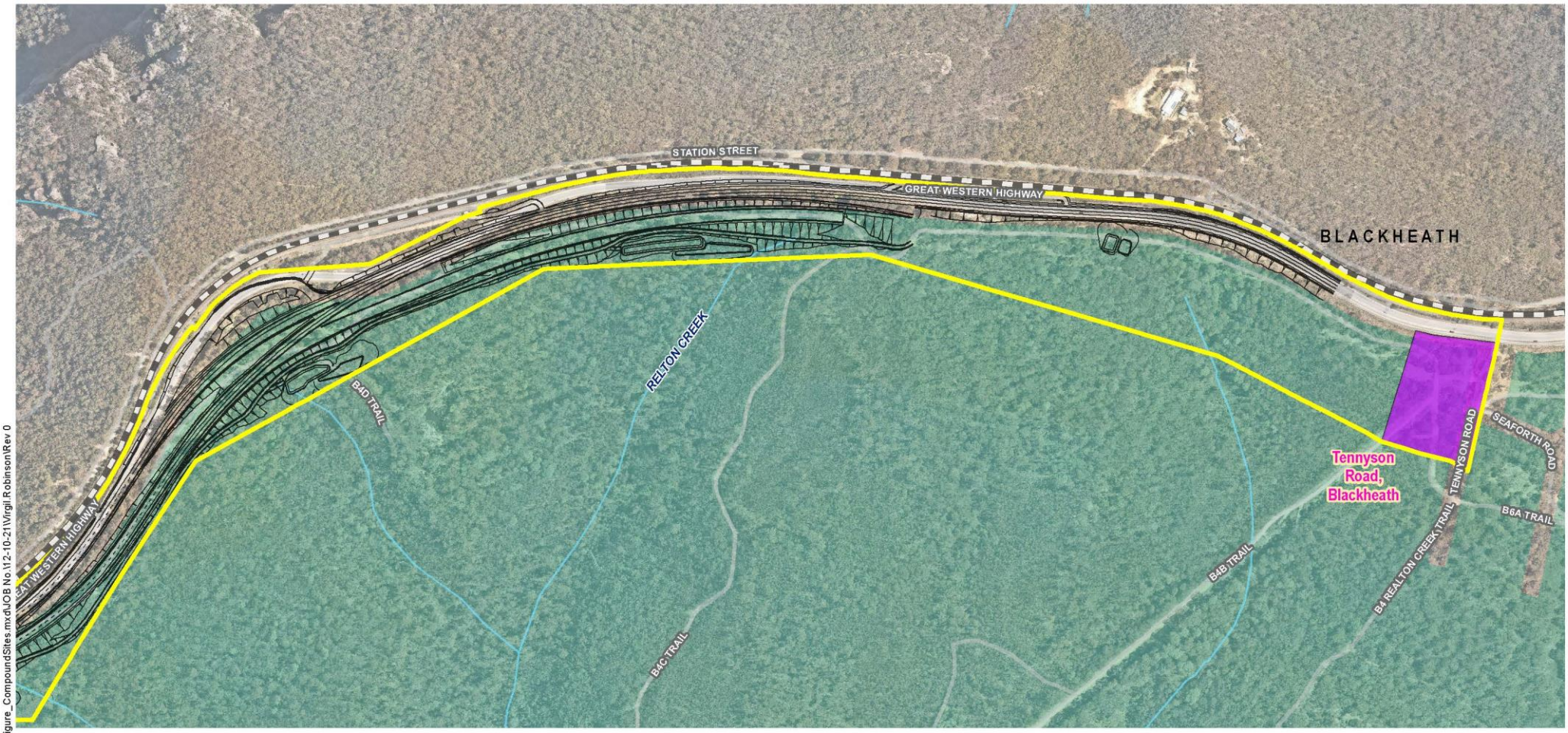
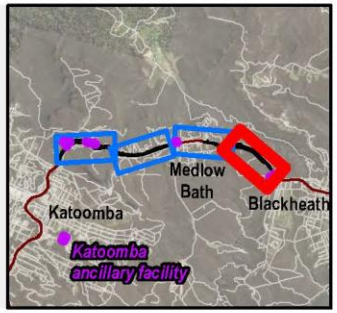
Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-15c: Construction areas



The design
Proposed construction boundary
Proposed ancillary facilities
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

1:6,250@A4
0 100 200m

Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-15d: Construction areas

3.3.2 Construction staging

The proposal forms part of the broader Great Western Highway Upgrade Program, which comprises a number of projects. Timing of the different projects may overlap. It is anticipated that there would be some overlap of construction activities between this proposal and the Medlow Bath Upgrade. A construction strategy is being considered across the Katoomba to Blackheath Upgrade and the Medlow Bath Upgrade to minimise construction impacts and impacts to the travelling public at Medlow Bath and across the Blue Mountains. Construction staging across the entire Great Western Highway Upgrade Program would be considered during detailed design and pre-construction to plan the construction sequencing of the projects.

The Medlow Bath Upgrade is anticipated to be the first project within the program to commence construction. Construction of the Medlow Bath Upgrade is anticipated to commence from late 2022 and is likely to still be under construction when the sections in the Katoomba to Blackheath Upgrade (this proposal) commence construction. This is staged to deliver access improvements in Medlow Bath as soon as possible. Construction of the two projects would be staged to minimise the impacts of multiple construction projects running in and around Medlow Bath at the same time.

While the sequencing of construction of the proposal has not yet been determined, the two sections of this proposal could be constructed concurrently. The design has maximised offline work to reduce impact on the Great Western Highway traffic. Early work would likely be considered across both sections for activities such as:

- utility relocations
- national park boundary establishment
- early installation of water quality devices.

3.3.3 Construction activities

The proposal is expected to involve the following general work sequence:

- site preparation
- site establishment
- utility relocations
- roadwork
- bridge and drainage work
- landscaping and finishing work.

The potential work activities for each stage are listed in Table 3-5. Construction activities would be carried out in accordance with a construction environmental management plan (CEMP) to ensure work complies with Transport's commitments and legislative requirements. Construction activities may be carried out in a staggered approach, with some overlap. Detailed work methodologies would be identified by the construction contractor. The work methodology may be modified or refined during detailed design due to engineering constraints or to minimise environmental impacts, including:

- onsite conditions identified during pre-construction activities
- ongoing refinement of the detailed design
- outcomes of community consultation, including submissions on the REF.

Construction activities would be carried out in accordance with a CEMP to ensure work complies with Transport's commitments and legislative requirements. Construction activities may be carried out in a staggered approach, with some overlap. Detailed work methodologies would be identified by the construction contractor.

Table 3-5: Potential pre-construction and construction activities

Stage	Activities	Katoomba to Medlow Bath section			Medlow Bath to Blackheath section		
		Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce	Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce
Site Preparation	• Clearing trees, mulching • Utility investigations • Potential removal of redundant utilities and relocation of existing ones	8	6	13	6	6	10
Site establishment	• Clearing and grubbing • Topsoil stripping • Hardstand construction • Utilities services • Material storage areas • Temporary security fencing • Temporary pedestrian fencing • Temporary access road to compound sites • Installation of water quality and sediment control measures • Temporary traffic control barriers, signage and lighting along the full length of the existing roadway in order to separate the construction site from passing traffic	6	15	35	6	15	30
Earthworks	• Embankment foundation treatments • Construction of the new fill embankments • Excavation of major cuttings	40	50	10	28	50	10
Roadwork	The work would be split into constructing the off-line carriageways first, before construction the second carriageway for each section (refer to Section 3.3.8). Road construction would include: • Removal and demolition of existing pavements • Embankment foundation treatments • Construction of the new embankment • Excavation of cuttings	40	20	75	28	14	50

Stage	Activities	Katoomba to Medlow Bath section			Medlow Bath to Blackheath section		
		Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce	Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce
	• Utility work typically including communications, power, gas, water and sewer (where necessary) along with ITS and TCS networks • Construction of the pavement layers including the subbase and asphalt layers • Retaining walls • Tie-ins to existing pavement at the eastern and western limits.						
Bridge work	• Bridge foundation piling, pile caps and piers, headstock and abutment construction • Casting of the twin bridges decks from a casting yard at the southern end of the bridge using stressing equipment and hydraulic jacks and sliding bearings for launching of the bridges	78	40	80	N/A – no bridge work in this section		
Drainage work	• Construction of larger transverse drainage structurers (box culverts) • Installation of drainage pit and pipe systems • Construction of the open drainage channels and permanent controls.	78	40	80	57	28	56
Finishing work	• Installation of sign structures including piling, concrete work and installation of overhead steel structure • Installation of road furniture (i.e. lighting, safety barriers and guideposts) • Pavement marking • Installation of urban design treatments and features • Landscaping work • Removal of all remaining temporary work such as traffic control barriers, ancillary facilities and lighting • Rehabilitation work will include batter protection and landscaping plus reinstatement of all disturbed areas.	8	25	40	8	19	28

3.3.4 Construction hours and duration

Proposed working hours

The standard working hours defined in the Interim Construction Noise Guideline (DECC, 2009) (ICNG) are:

- Monday to Friday: 7am to 6pm
- Saturdays: 8am to 1pm
- Sundays and Public Holidays: no work.

It is acknowledged that in conjunction with the broader Great Western Highway upgrade program, there would be ongoing construction impacts to the local and regional community along the Great Western Highway for a decade or more. This would include amenity impacts, construction traffic and highway disruptions.

Extended working hours

To reduce the overall construction timeframe of the proposal to provide relief to the Blue Mountains community from a number of longer term construction projects, Transport for NSW is seeking approval for 'extended construction hours' for this proposal. This would provide additional work hours at the end of each day (Monday to Friday) and on Saturday afternoon outlining that maximum hours that could be worked. Extended construction hours would apply across the full length of the proposal and would be limited to daylight hours, with potentially shorter working periods throughout winter months. The proposed extended construction hours are:

- Monday to Friday: 6am to 7pm
- Saturday: 8am to 5pm
- Sunday and Public Holidays: no work.

Most construction work would be carried out within these proposed working hours. This would include:

- ancillary facility operation including stockpiling and general office duties
- removal and delivery of materials, plant, and equipment such as cranes
- establishment of temporary traffic management controls and facilities enabling traffic switches so that traffic flows can be maintained during construction
- earthworks, including haulage, placement, and compaction
- bridge structure works when launching the bridge deck
- piling driving and/or boring at bridges and retaining walls
- utility adjustments and relocations
- pavement and concrete finishing works.

The reasons for the proposed extension of hours, and for out-of-hours work, are presented in the following section.

Night work

Certain work may still need to occur outside these hours (known as night works) to minimise disruption to customers, pedestrians, road users and nearby sensitive receivers. Any night work would be undertaken in accordance with the Construction Noise and Vibration Guidelines (Roads and Maritime, 2016). Typically, specific work and activities that may be required to be undertaken out-of-hours would include:

- tie-in work at either end which would require some night-time work for asphalt paving to maintain safety of road users

- adjustment to line marking
- temporary safety barrier placement
- work in the rail corridor
- traffic switches and utility work to reduce inconvenience to road users, avoid traffic delays during daytime or peak traffic periods and to provide safety for construction workers working on the existing highway
- minor services adjustment
- ancillary facility operations required to support any activities which may occur out of hours
- concrete batch plant operations.

A concrete batch plant is proposed to be located at the Woodlands Road, Katoomba ancillary facility (refer to Section 3.4). To provide concrete, the batch plant would need to operate 1.5 hours before and one hour after the proposed construction work hours.

Justification for the extended working hours

Transport is investigating opportunities for longer standard construction hours for the proposal to complete the construction of the proposal sooner to allow relief from construction for the travelling public and local communities from the construction activities. In particular, this is due to the construction that would be occurring for the Great Western Highway Upgrade Program between Katoomba and Lithgow for up to nine years which would result in construction and consultation fatigue to communities along the Great Western Highway.

By extending standard working hours by two hours every day and four hours on a Saturday, this would:

- reduce the volume of traffic on the roads during peak hours due to construction staff and some construction vehicles travelling to and from the work site outside peak traffic periods
- potentially bring forward the opening date for the proposal and minimising overlapping construction timeframes for different Great Western Highway Upgrade Program projects
- cause less traffic disruption and noise and visual amenity impacts to the community, local business, motorists, pedestrians and cyclists as work would be completed earlier than currently predicted
- provide a safer road and active transport network earlier than planned.

Longer working days would result in a direct increase in productivity across the proposal, making maximum and most efficient use of existing equipment and resources. This would result in a safer work environment and a more attractive employment proposition.

The proposed extended construction working hours would be unlikely to result in significant impacts on the amenity of affected sensitive receivers. This is because of the location of the proposal in a mostly sparsely populated area. In particular, through the Medlow Bath to Blackheath section, sensitive receivers that would be impacted by amenity are located at the northern end of Medlow Bath, with no receivers located along the remaining length.

The implementation of management measures identified in Chapter 7 would make sure impacts were limited, including for sensitive receivers near Katoomba and Medlow Bath.

The proposed construction hours and consideration of the effects would be discussed with the community and potentially affected receivers before construction. The assessment of construction noise is presented in Section 6.6.4.

Consultation proposed for the extended working hours

Section 2.3 of the ICNG indicates construction activities are permissible outside of standard hours for “public infrastructure works that shorten the length of the project and are supported by the affected

community". Community consultation would be required for extended working hours in line with guidance from the ICNG. This consultation would occur during the public display of this REF.

The community consultation would include:

- Identification of receivers potentially impacted by construction activities through the construction noise assessment (refer to Section 6.6.4). Impacts would be based on predicted noise impacts from the adopted extended working hours.
- Notification of identified receivers by mail of the proposed hours, including request for comment and feedback. This would include justification for the proposed extended working hours along with the benefits the community can expect.
- Individual interviews or public meetings to address any further issues where the community or individual residents request further clarification on the proposed hours. Discussions would be sufficiently detailed to provide a general summary of the expected impacts and an explanation of how the proposed working hours relate to individual receivers.
- Provision of complaints management procedures which would be in place during the work to property owners.

While community consultation would be ongoing, feedback received during this consultation period would inform the final adopted working hours for the proposal.

3.3.5 Plant and equipment

The plant and equipment which would be used construction of both sections of the proposal includes:

- water trucks, street sweepers, road saws, rollers, road saws, trench compactors, concrete trucks, semi-trailers and spoil trucks (truck and dog)
- welding equipment, air compressors, concrete saws, generators, concrete vibrators, concrete pumps, jack hammer
- excavators (8-30 tonnes)
- asphalt pavers
- asphalting equipment
- cranes of various sizes up to 250 tonnes
- articulated dump trucks (Moxy), scrapers, excavators to 60T, D10/D11 dozers and crusher for the conveyor feed
- batch plant equipment (subject to detailed design) and related heavy machinery.

The plant and equipment which would be used only as part of the Katoomba to Medlow Bath section to construct the twin bridges includes:

- over-road conveyor for transportation of excavation material from a major cutting north of the bridge site to fill embankment on the other side of the road
- stressing and hydraulic jacking equipment required for the twin bridges construction.

3.3.6 Earthworks

A range of earthworks would be required for the proposal. This would involve fill embankments and cut embankments, shown on Figure 3-1a-f and Figure 3-2a-e. Where there are spatial or environmental constraints, retaining walls would be used to minimise the impact footprint. These would support the widened road carriageways over the steeply sloping terrain across the length of the proposal.

The Katoomba to Medlow Bath section would result in about 272,000 cubic metres of cut material, with about 124,000 cubic metres being reused in this section as fill material. Some of the cut material is

anticipated to be considered unsuitable for use in road construction and, where possible, this material would be used in landscaping mounds along the proposal.

The Medlow Bath to Blackheath section would result in about 61,000 cubic metres of cut material, all being reused in this section as fill material. However, there would still be a shortfall of material required in this section. Additional cut material (around 63,000 cubic metres) would be transported from the Katoomba to Medlow Bath section for reuse as fill.

Geotechnical investigations conducted have identified that Banks Wall Sandstone cut during construction would be suitable for use as fill in retaining walls within the Katoomba to Medlow Bath section. Further investigations would be carried out during detailed design to determine suitability for cut material to be used in retaining walls within the Medlow Bath to Blackheath section.

Surplus material that cannot be used on-site or on adjacent projects would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility. Transport are also reviewing old quarry and mining sites in the area that may be suited to filling with excavated natural material to remediate these areas.

Details of the cuts and fills required for the proposal are outlined in Table 3-6. The final earthwork requirements and source of materials would be confirmed during detail design.

Table 3-6: Earthworks

Feature	Description	Katoomba to Medlow Bath section location	Medlow Bath to Blackheath section location
Cuts	Where the depth of excavation for the road pavement extends below the top of rock level, vertical or near vertical cut rock faces would be constructed. The residual soil/fill would typically be cut at a slope between 2V:3H and 1V:2H.	• Ch 300-370 • Ch 550-750 • Ch 830-1090 • Ch 1620-1900 (two cuts at this location) • Ch 2480-2750 (two cuts at this location) • Ch 3300-3560	• Ch 5340-5420 • Ch 5436-5485 • Ch 6370-6650
Fills	Where the new road alignment sits above the existing ground levels, built up fill retaining walls would be required. Reinforced soil wall construction would be the recommended option where possible along the proposal. Retaining walls would be up to 17 metres in height for the Katoomba to Medlow Bath section.	• Ch 325-552 • Ch 774-837 • Ch 1100-1197 (two fills at this location) • Ch 1624-1653 • Ch 1926-2200 • Ch 2777-3008 • Ch 3120-3300 • Ch 3386-3556	• Ch 4730-4830 • Ch 4820-5080 • Ch 5170-5270 (two fills at this location) • Ch 5790-6013 • Ch 6100-6234 • Ch 6140-6423

3.3.7 Source and quantity of materials

About 76,000 cubic metres of asphalt would be required for the proposal. In-situ concrete would also be required for the proposal, including for the twin bridges, Type F safety barriers, twin rail barriers, kerbs, active transport trails and the foundation for signs, VMS and ITS gantries.

Materials would be sourced from appropriately licensed commercial suppliers in nearby areas. None of the materials proposed to be used are considered to be in short supply. However, a concrete batching plant may be set up by the contractor to supply the proposal. On-site production of concrete would allow for project control over the quality, quantity and timing of concrete material for construction activities. It would also reduce the time required to transport concrete from its production to its use, which may result in a

higher quality product and reduce the number of heavy vehicles required on the wider road network. New concrete technologies would be considered in aid of avoiding acidic runoff into the surrounding environment.

Surplus material that cannot be used on-site or on adjacent projects would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility.

The amount of water that would be required during construction is unknown at this stage. The amount would depend on material sources and methodologies applied by the contractor. Water would be obtained from the town water supply.

3.3.8 Traffic management and access

Construction traffic

Construction of the proposal would generate light and heavy vehicle movements. Vehicle movements would mainly be associated with:

- delivery of construction materials including concrete and precast structural elements
- spoil removal
- importation of fill material for earthworks
- delivery and removal of construction equipment and machinery
- workers travelling to, from and within the construction site.

Construction traffic impacts are assessed in Section 6.7.4.

Temporary traffic management and controls

The construction of the proposal would be staged to allow the Great Western Highway to remain open to traffic during construction. Construction of the off-line carriageways[1] would occur first, including the construction of the twin bridges within the Katoomba to Medlow Bath section, while traffic remains on the existing highway. Once complete, the traffic would be switched onto the new carriageways while the second carriageway for each section is completed and redundant pavement removed. The upgraded sections would then be opened to traffic.

Construction vehicles and plant would use the Great Western Highway to reach the construction sites. Most heavy vehicle access to construction sites and egress would be provided via slip lanes and/or side roads. The two local roads which would be used by heavy vehicles would be Explorers Road, Katoomba and Evans Lookout Road, Blackheath to access ancillary facilities on these roads (refer to Section 3.4).

In most cases, the construction would be undertaken away from live traffic, however, where work is required in proximity to live traffic, work zones would be created behind safety barriers where construction work can be completed safely and during standard construction working hours, to avoid the need for lane closures. During construction, when workers or construction zones are close to traffic, speed limits may be reduced during construction to:

- 60 kilometres per hour on the Great Western Highway

[1] For the Katoomba to Medlow Bath section, the off-line carriageway would be the westbound carriageway. For the Medlow Bath to Blackheath section, the off-line carriageway would be the eastbound carriageway.

- 40 kilometres per hour on side roads.

Where this is not practical (particularly during tie-in work), construction work would be undertaken out of peak traffic periods using temporary traffic management arrangements, such as night-time and weekend lane closures, and relevant traffic controls.

There are few properties with direct access to the Great Western Highway within the proposal area. These are mainly Sydney Trains property and asset accesses or to recreational areas, including the Blue Mountains National Park (within the Medlow Bath to Blackheath section). Access to these properties would be maintained throughout construction by providing temporary or escorted property access where required.

There would be temporary closure of Nellies Glen Road and Explorers Road during construction of the Katoomba to Medlow Bath section. However, these roads would not be closed concurrently and, because they are connected, access would be maintained to properties on these roads. Explorers Road would be temporarily closed once Nellies Glen Road has been upgraded. During this temporary closure, the upgraded Nellies Glen Road intersection would provide both left-in and left-out access to and from Explorers Road. Access would also be maintained to other local roads during construction.

Bus stops on Great Western Highway (at Bonnie Doon Reserve and Foy Avenue) would be temporarily relocated or closed during construction. Any proposed relocations or closures would be confirmed pre-construction in consultation with bus companies.

Part of the Great Blue Mountains Trail within the Katoomba to Medlow Bath section near Bonnie Doon Reserve and Nellies Glen Road would be temporarily closed during construction off the off-line carriageway.

Section 6.6 provides a more detailed assessment of traffic and transport impacts.

3.4 Ancillary facilities

A range of ancillary facilities would be required to support construction, including:

- site compounds that incorporate site offices, car parking, sheds, workshops and storage
- areas for the delivery and storage of bridge structural elements
- bridge launching site (Katoomba to Medlow Bath section only)
- a concrete batch plant
- areas for capturing and treating water from construction areas
- stockpile sites for materials, spoil and mulch
- demolition compound for processing components of the demolished bridge.

Six potential ancillary facilities have been identified that could be used by construction contractors. These sites were identified in areas that maximised the use of existing infrastructure, buildings and / or vacant land. These facilities are at:

- Woodlands Road, Katoomba
- Former Katoomba brick pit site
- Bridge launch site, on Explorers Road
- Bridge ancillary facility, on Explorers Road
- Great Western Highway, Medlow Bath
- Tennyson Road, Blackheath.

Initial work at these sites would be required at the start of construction, and could include vegetation clearing, installation of environmental controls, construction of hardstand areas and access roads and provision of additional or augmented utilities and services (where required).

These ancillary facilities are further described in Table 3-7 and evaluated against the ancillary facility assessment criteria in Table 3-8. The sites and surrounding environmental features are shown in Figure 3-15a-d (refer to Section 3.3.1). Sites that are not located on Transport-owned property would be acquired or leased during construction pending agreement between the landowner and Transport.

Table 3-7: Proposed ancillary facilities

Ancillary facility	Description
Woodlands Road, Katoomba	The potential uses for the Woodlands Road ancillary facility include: • a concrete batching plant • bulk material storage • construction worker parking and site offices.
Former Katoomba brick pit site	The potential uses for the former Katoomba brick pit site include: • construction worker parking • a main site office • cut spoil material management and rehabilitation. For the Stage 2 work, a secondary site would be established along the old highway for overnight parking of a construction plant plus construction worker amenities and parking facilities.
Bridge launch site, on Explorers Road	To incrementally launch the new twin bridges within the Katoomba to Medlow Bath section, a launching facility would also need to be constructed on Explorers Road. The launching facility would include: • a casting bed – including an adjustable formwork mould for casting segments, laydown area and various small plant (e.g. concrete pumps) • a launch pad – including a paved area, various supports and guides to hold the superstructure and hydraulic jacks • other minor ancillary features – including concrete truck receival area.
Bridge ancillary facility, on Explorers Road	The bridge ancillary facility would support the construction activities at the bridge launch site within the Katoomba to Medlow Bath section. The potential uses for the bridge ancillary facilities include: • construction worker parking • material storage and laydown areas • bridge engineer site offices.
Great Western Highway, Medlow Bath	The ancillary facility on the Great Western Highway in Medlow Bath would be a community information facility and office. This would cater for a small number of staff only and minimal off-street parking. The ancillary facility would be established as part of the Medlow Bath Upgrade. This facility would be reused for the purpose of this proposal. As it will have already been established and assessed as part of the Medlow Bath Upgrade, it is not assessed in Table 3-8.
Tennyson Road, Blackheath	The potential uses for the Blackheath site include: • construction worker parking • bulk material storage and laydown area • a main site office. Once constructed, the off-line eastbound and westbound stubs which are designed to connect to eventually connect to the Blackheath to Little Hartley Upgrade may be able to be used to access this ancillary facility.

Table 3-8: Ancillary facility assessment

Criteria	Woodlands Road, Katoomba	Former Katoomba brick pit site	Bridge launch site	Bridge ancillary facility	Evans Lookout Road, Blackheath
Operational during a flood event and avoid or minimise impacts to surrounding properties	Yes	Yes	Yes	Yes	Yes
More than 40 metres from a watercourse	Yes	Yes	Yes	Yes	Yes
At least 100 metres from residential dwellings	Yes	Yes	No	No	Yes
In an area of low ecological value	Yes – site cleared	Yes – however, vegetation clearance may be required for site access	Yes – however, vegetation clearance required	Yes – however, vegetation clearance restricted due to nearby Blue Mountains Swamp TEC	No – currently part of Blue Mountains National Park
In plain view of the public to deter theft and illegal dumping	Yes – the property has street frontage within an industrial area	No – set back from the Great Western Highway and secluded by existing vegetation	No – set back from Explorers Road and secluded by existing vegetation	No – set back from Explorers Road and Great Western Highway and secluded by existing vegetation	Yes – visible from the Great Western Highway
Outside the drip line of trees	Yes	Yes	No – currently vegetated	No – currently vegetated	No – currently vegetated
On relatively level ground	Yes – the part of the property identified to be used as an ancillary facility is level, however there is a steep decline at the rear of the property	Yes	Partially	Partially	Yes
Away from areas of heritage value	Yes	No – lies within Bonnie Doon Reserve (local heritage listing)	No – lies within Pulpit Hill and Environs (local heritage listing)	Yes	Yes

As outlined in Section 3.3.8, the off-line carriageways (the westbound carriageway for the Katoomba to Medlow Bath section and the eastbound carriageway for the Medlow Bath to Blackheath section) would be constructed first. Once these new carriageways are constructed, they would be used in a contraflow operation. At this time, the existing Great Western Highway road corridor would be closed to traffic for construction. During this phase of construction, there may be additional smaller ancillary facilities or storage

areas established along the existing road corridor within the proposal area for activities including parking construction plant.

Should the need for additional or alternative ancillary facilities be identified during detailed design and construction planning, the positioning of additional or alternative sites would be undertaken in consideration of the site assessment criteria outlined in Table 3-8. The construction contractor would consult with the Transport Senior Environment Officer to confirm the suitability of any additional ancillary facilities and whether any additional environmental controls or assessment are required.

3.5 Public utility adjustment

Public utility adjustments and relocations would be required for the proposal. The list of relocations and adjustments required are detailed in Table 3-9. This would include:

- electricity supply
- telecommunications
- mains water.

While some impacted utilities are located adjacent to the rail corridor in both sections, utility relocations and adjustments along the Great Western Highway would largely occur on the side of each section where the new carriageway would be built.

Other utilities identified within the proposal area would be protected during construction of the proposal. Further work during detailed design may result in changes to the required relocations and adjustments. All utility adjustments or relocations would be finalised in consultation with utility providers during detailed design.

Table 3-9: Utilities impacted by the proposal

Section	Utility type and provider	Service type	Location	Requirement
Katoomba to Medlow Bath section	Electricity supply (Endeavour Energy)	11kV overhead high voltage transmission line, including poles	Great Western Highway at: • Ch240-1240 • Ch1560-660 • Ch1900-2720 • Ch3090-3460	Relocation required
		Electrical supply to rail building	Great Western Highway, west of Explorers Road, at Ch1560	Relocation required
		Electrical supply to potential mobile tower	Eastern end of Foy Avenue, at Ch2640	Relocation required
	Telecommunications (Telstra)	Aerial coaxial cable	Great Western Highway between Rowan Lane and Nellies Glen Road	Relocation required
			Great Western Highway between Foy Avenue and Delmonte Avenue	Relocation required
		Conduit (P100)	Great Western Highway / Explorers Road intersection	Further investigations to determine whether relocation is required
Medlow Bath to Blackheath section	Electricity supply (Endeavour Energy)	11kV overhead high voltage transmission line, including poles	Great Western Highway at: • Ch4800 • Ch4880-6889	Relocation required

Section	Utility type and provider	Service type	Location	Requirement
	Electricity supply within the rail and road corridors (Transport for NSW)	Rail 11kV overhead and underground high voltage transmission network	Rail corridor near Coachhouse Lane	Relocation required
		Light columns	Great Western Highway near Coachhouse Lane	Relocation required
	Telecommunications (Telstra)	Conduit (P100)	Great Western Highway between Coachhouse Lane (Ch4850) and Ch6270	Relocation required
	Telecommunications (Optus)	Optic fibre	Western end of Coachhouse Lane	Further investigations to determine whether relocation is required
	Water (Sydney Water)	Water main (200-250)	Western end of Coachhouse Lane	Relocation required
		Water main (DN300 DICL)	Great Western Highway between Ch5150 and Ch6610	Relocation required
Both sections of the proposal	Telecommunications (Telstra)	Direct buried cable	Great Western Highway	N/A – cable is redundant
	Water (Sydney Water)	Water main (DN150 AC)	Great Western Highway	N/A – disconnected water main

3.6 Property acquisition

3.6.1 Katoomba to Medlow Bath section

The Katoomba to Medlow Bath section would require the acquisition and leasing of both public and private land, as shown in Table 3-10 and Figure 3-16a-b. Acquisition would include:

- 21 properties to be fully acquired
- 15 properties to be partially acquired.

The extent of property acquisition would be refined and confirmed during detailed design in consultation with the property owners. Property acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Property adjustment plans would be developed in consultation with the relevant property owner.

In addition, there are a number of properties that would be partially or fully leased for construction activities. These include properties that would be used as ancillary facilities. Leased land would be rehabilitated and returned to the property owner once the construction of the proposal is completed.

The Katoomba to Medlow Bath section would also require the use of public land already owned by Transport, which is shown in Figure 3-16a-b only.

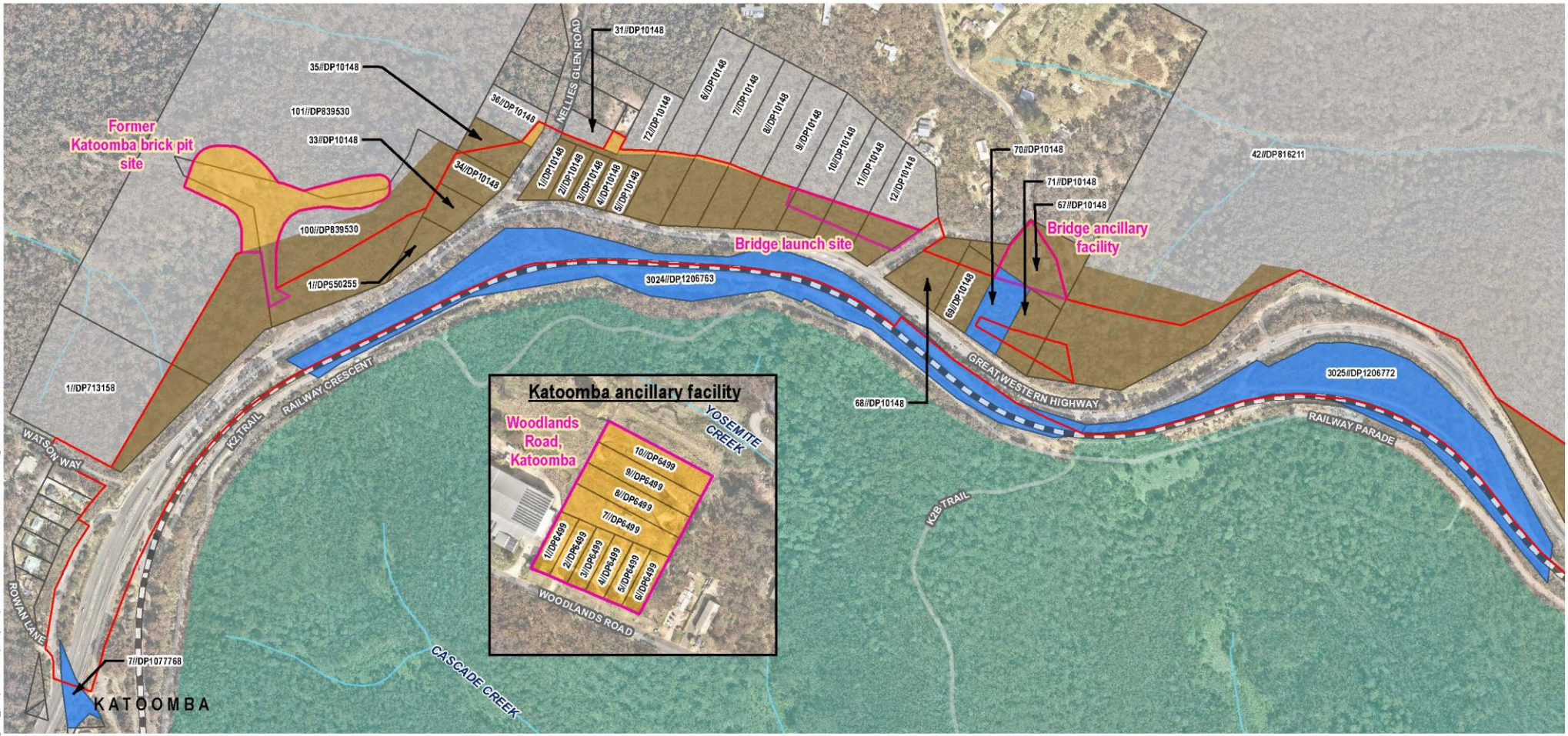
Table 3-10: Proposed property acquisition and leases – Katoomba to Medlow Bath section

Lot and DP	Total property area (square metres)	Acquisition area (square metres)	Lease area (square metres)	Type of Acquisition or lease	Current owner	Land use zone (LEP)[1]
Lot 1 DP10148	1700	1700	0	Full acquisition	Blue Mountains City Council (BMCC)	C2, SP2
Lot 2 DP10148	1250	1250	0	Full acquisition	BMCC	C2, SP2
Lot 3 DP10148	1200	1200	0	Full acquisition	BMCC	C2, SP2
Lot 4 DP10148	1100	1100	0	Full acquisition	BMCC	C2, SP2
Lot 5 DP10148	1050	1050	0	Full acquisition	BMCC	C2, SP2
Lot 6 DP10148	8750	3000	150	Partial acquisition and lease	BMCC	C2, SP2
Lot 7 DP10148	7650	2800	150	Partial acquisition and lease	BMCC	C2, SP2
Lot 8 DP10148	7000	2450	50	Partial acquisition and lease	BMCC	C2, SP2
Lot 9 DP10148	7100	2300	0	Partial acquisition and lease	BMCC	C2, SP2
Lot 10 DP10148	6250	1900	0	Partial acquisition and lease	BMCC	C2, SP2
Lot 11 DP10148	5600	1850	0	Partial acquisition	BMCC	C2, SP2
Lot 12 DP10148	6500	2200	0	Partial acquisition	BMCC	C2, C3, SP2
Lot 31 DP10148	1600	0	350	Lease	BMCC	C2, SP2
Lot 33 DP10148	1800	1800	0	Full acquisition	BMCC	C2, SP2
Lot 34 DP10148	2400	2400	0	Full acquisition	BMCC	C2, SP2
Lot 35 DP10148	2650	2650	0	Full acquisition	BMCC	C2
Lot 36 DP10148	2800	0	300	Lease	BMCC	C2
Lot 67 DP10148	5850	5850	0	Full acquisition	Private	C2, C3
Lot 68 DP10148	3550	3550	0	Full acquisition	BMCC	C3, SP2
Lot 69 DP10148	3200	3200	0	Full acquisition	Private	C3, SP2
Lot 71 DP10148	3200	3200	0	Full acquisition	Private	C2, C3, SP2
Lot 72 DP10148	3650	900	200	Partial acquisition and lease	BMCC	C2
Lot 1 DP116050	3500	0	3500	Lease	Private	IN 1
Lot 219 DP1211208	200	200	0	Full acquisition	BMCC	SP2
Lot 220 DP1211208	200	200	0	Full acquisition	BMCC	SP2
Lot 208 DP1218075	700	700	0	Full acquisition	The State of NSW	SP2
Lot 11 DP16634[2]	998	998	0	Full acquisition	Private	C4, SP2
Lot 15 DP16634[2]	996	996	0	Full acquisition	Private	C4, SP2
Lot 16 DP16634[2]	1006	91	0	Partial acquisition	Private	C4, SP2
Lot 26 DP16634[2]	1011	135	0	Partial acquisition	Private	C4, SP2
Lot 1 DP550255	1500	1500	0	Full acquisition	BMCC	C2, SP2
Lot 1 DP6499	900	0	900	Lease	Private	IN 1
Lot 2 DP6499	900	0	900	Lease	Private	IN 1
Lot 3 DP6499	900	0	900	Lease	Private	IN 1
Lot 4 DP6499	900	0	900	Lease	Private	IN 1

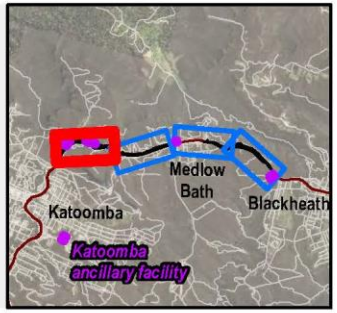
Lot and DP	Total property area (square metres)	Acquisition area (square metres)	Lease area (square metres)	Type of Acquisition or lease	Current owner	Land use zone (LEP)[1]
Lot 5 DP6499	900	0	900	Lease	Private	IN 1
Lot 6 DP6499	900	0	900	Lease	Private	IN 1
Lot 7 DP6499	2300	0	2300	Lease	Private	IN 1
Lot 8 DP6499	2050	0	2050	Lease	Private	IN 1
Lot 9 DP6499	2050	0	2050	Lease	Private	IN 1
Lot 10 DP6499	2050	0	2050	Lease	Private	IN 1
Lot 1 DP713158	20350	3700	0	Partial acquisition	BMCC	C2, C4, SP2
Lot 11 DP732317	153,000	5400	3200	Partial acquisition and lease	Private	C2, C3, SP2
Lot 13 DP732317	9300	9300	0	Full acquisition	Private	C3, SP2
Lot 178 DP751657	2000	2000	0	Full acquisition	The State of NSW	SP2, SP2
Lot 215 DP751657	1450	1450	0	Full acquisition	The State of NSW	SP2
Lot 42 DP816211	1,503,050	31,150	0	Partial acquisition	Private	C2, C3, SP2
Lot 100 DP839530	24200	15,700	5650	Partial acquisition and lease	Minister administering the EP&A Act 1979	C2, SP2
Lot 101 DP839530	123,950	7950	4650	Partial acquisition and lease	Minister administering the EP&A Act 1979	C2, SP2

Note 1: C2 Environmental Conservation; C3 Environmental Management; C4 Environmental Living; IN1 General Industrial; SP2 Infrastructure.
Note 2: Disclaimer: Property boundaries shown on Figure 3-16b for Lot 11 DP16634, Lot 15 DP16634, Lot 16 DP16634 and Lot 26 DP16634 are indicative only and are based on detailed Land Title searches. Further survey will be carried out to confirm these boundaries.

The Katoomba to Medlow Bath section is within an area covered by the Deerubbin Local Aboriginal Land Council. There are no Native Title claims on any land within this section. However, the section would require full property acquisition of Lot 215 DP751657 (1447 square metres of Crown land) which is subject to an Aboriginal land claim which has not yet been determined. Transport would continue to consult with the Deerubbin Local Aboriginal Land Council and Crown Lands during detailed design about this impact.



Proposal area
Proposed ancillary facilities
Area subject to lease
Area subject to acquisition
Transport owned land
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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Projection: GDA2020 MGA Zone 56

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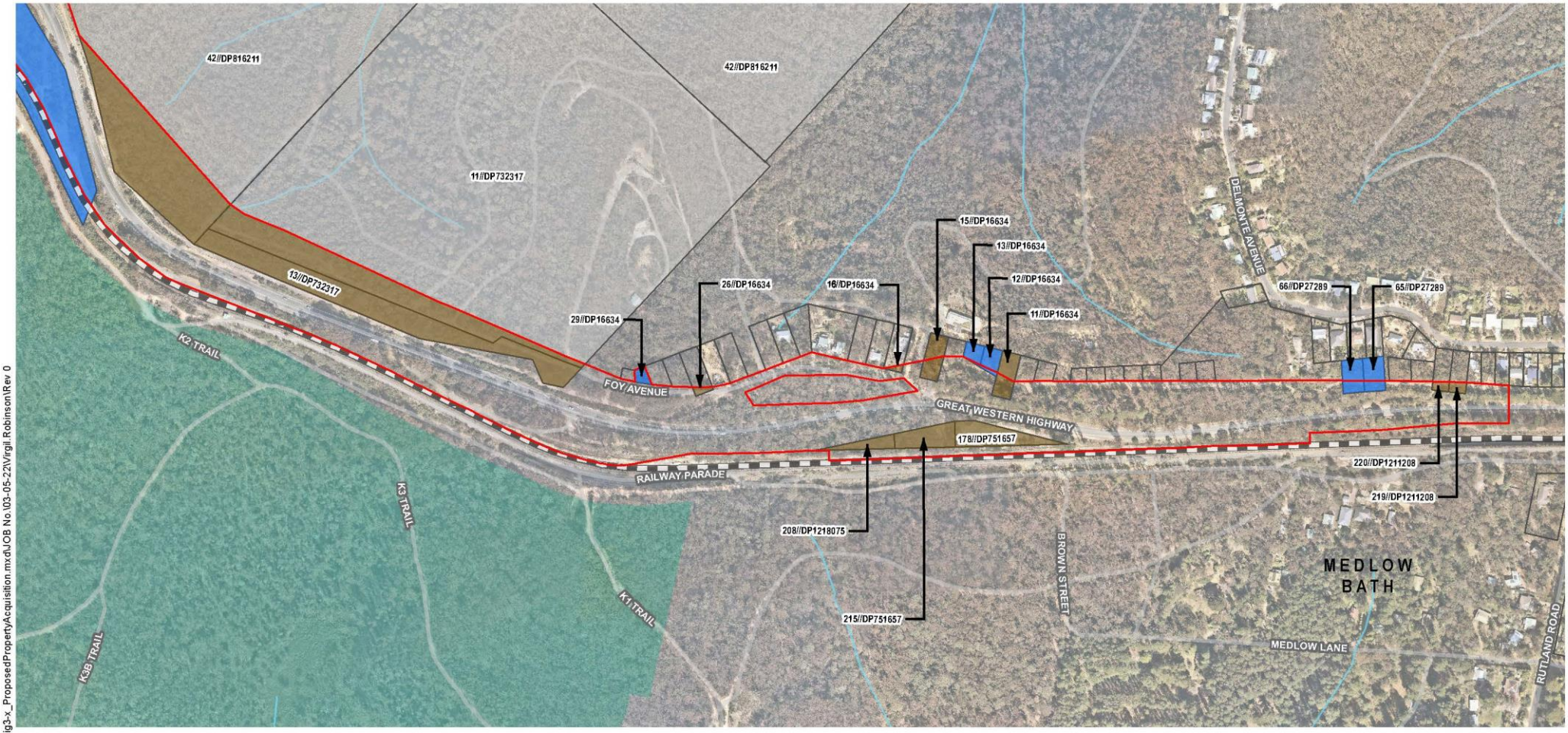
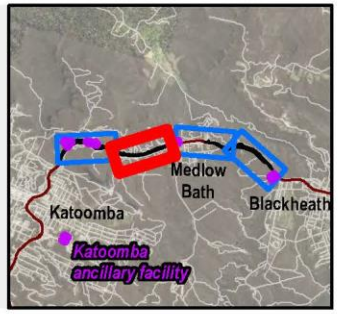
FIGURE 3-16a: Proposed property acquisition - Katoomba to Medlow Bath section



Proposal area
Area subject to acquisition
Transport owned land
Blue Mountains National Park
Main Western Railway

Disclaimer: Property boundaries for Lot 11 DP16634, Lot 15 DP16634, Lot 16 DP16634 and Lot 26 DP16634 are indicative only and are based on detailed Land Title searches. Further survey will be carried out to confirm these boundaries.



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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Projection: GDA2020 MGA Zone 56

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FIGURE 3-16b: Proposed property acquisition - Katoomba to Medlow Bath section

3.6.2 Medlow Bath to Blackheath section

The Medlow Bath to Blackheath section would require the use of public land already owned by Transport (refer to Figure 3-17a-b). As such, no further private or council-owned properties would be acquired for this section of the proposal.

In addition, there are a number of properties that would be fully leased for construction activities (refer to Table 3-11). These include properties that would be used as ancillary facilities. Leased land would be rehabilitated and returned to the property owner once the construction of the proposal is completed.

This section also includes land currently owned by the NSW Department of Planning and Environment (DPE) and managed by the National Parks and Wildlife Service (NPWS).

Transport submitted a proposal to revoke a section of national park estate in 2021 (refer to Table 3-11 and Figure 3-17a-b). The submission addresses the requirements of NPWS *Revocation, recategorisation and road adjustment policy*, including an outline of the potential impacts of the revocation. A compensation package will also be negotiated with NPWS. This revocation would transfer ownership of the land to Transport.

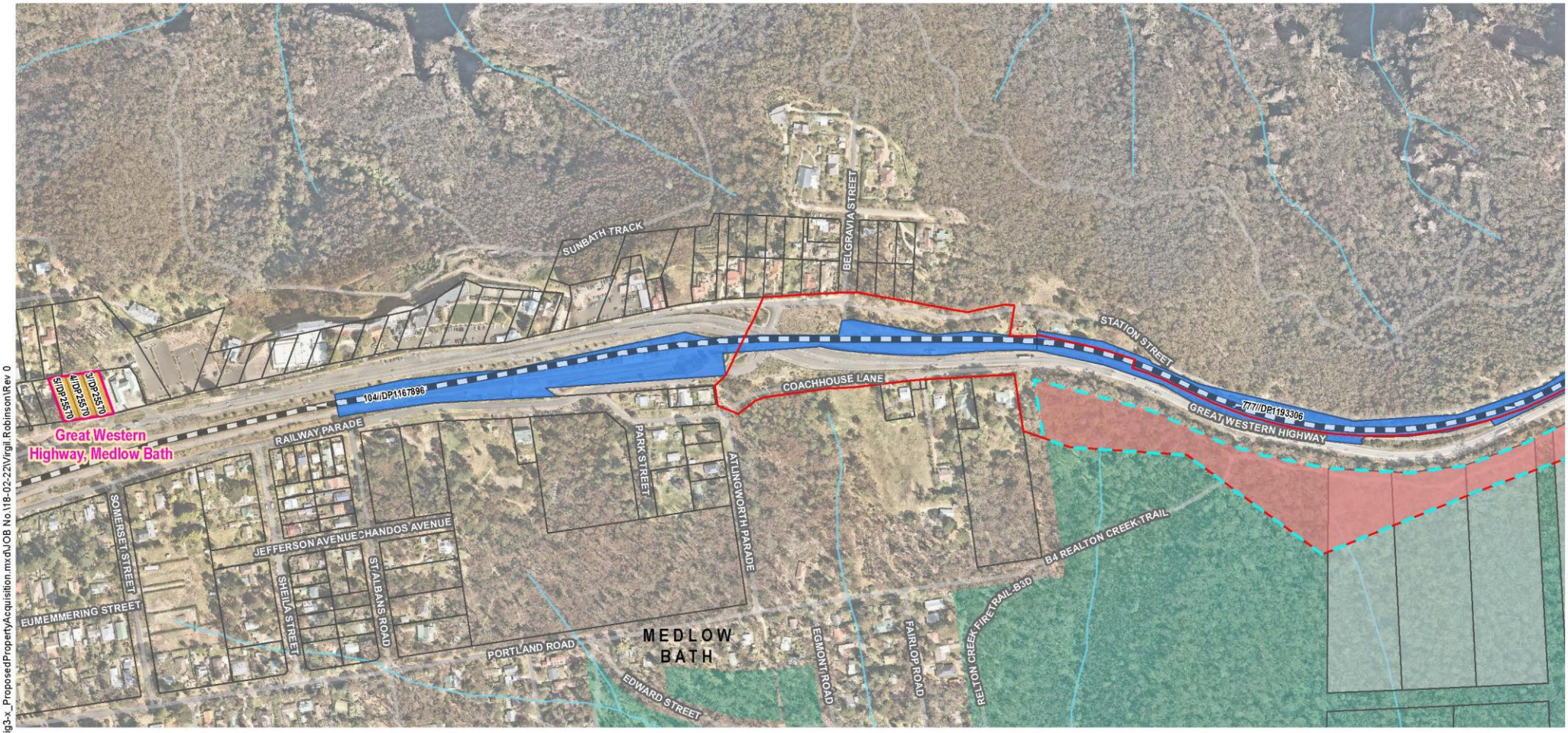
Transport intends to exclude from its determination any work requiring revocation until such time that a decision has occurred, via an Act of Parliament. Due to this process occurring concurrently to the environmental approval prepared in this REF, this land would not be acquired until after determination of the REF.

Table 3-11: Properties within proposal area – Medlow Bath to Blackheath section

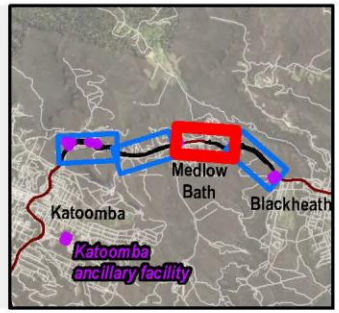
Description	Total property area (square metres)	Area within proposal area (square metres)	Acquisition type	Current owner	Land use zone (LEP)[1]
Lot 3 DP25570	900	900	Lease	Private	C4
Lot 4 DP25570	900	900	Lease	Private	C4
Lot 5 DP25570	900	900	Lease	Private	C4
Area subject to proposed Blue Mountains National Park revocation	237,500	150,550	n/a – revocation to occur prior to determination of this REF	DPE. Land is currently reserved under the *National Parks and Wildlife Act 1974*.	C1

Note 1: C1 National Parks and Nature Reserves; C4 Environmental Living.

The Medlow Bath to Blackheath section is within an area covered by the Deerubbin Local Aboriginal Land Council. There are no Native Title claims or Aboriginal claims for Crown land on any land within this section. However, it is noted that the proposal area is adjacent to a parcel of land that has a determined land claim on it. The proposal would not impact on this parcel of land.



Proposal area
Proposed ancillary facilities
Area subject to lease
Transport owned land
Proposed Blue Mountains National Park revocation - Great Western Highway Upgrade Program
Proposal area subject to proposed Blue Mountains National Park revocation
Blue Mountains National Park
Main Western Railway



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Source: Aurecon, Mott MacDonald, LPI, DPIE, Nearmap

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Projection: GDA2020 MGA Zone 56

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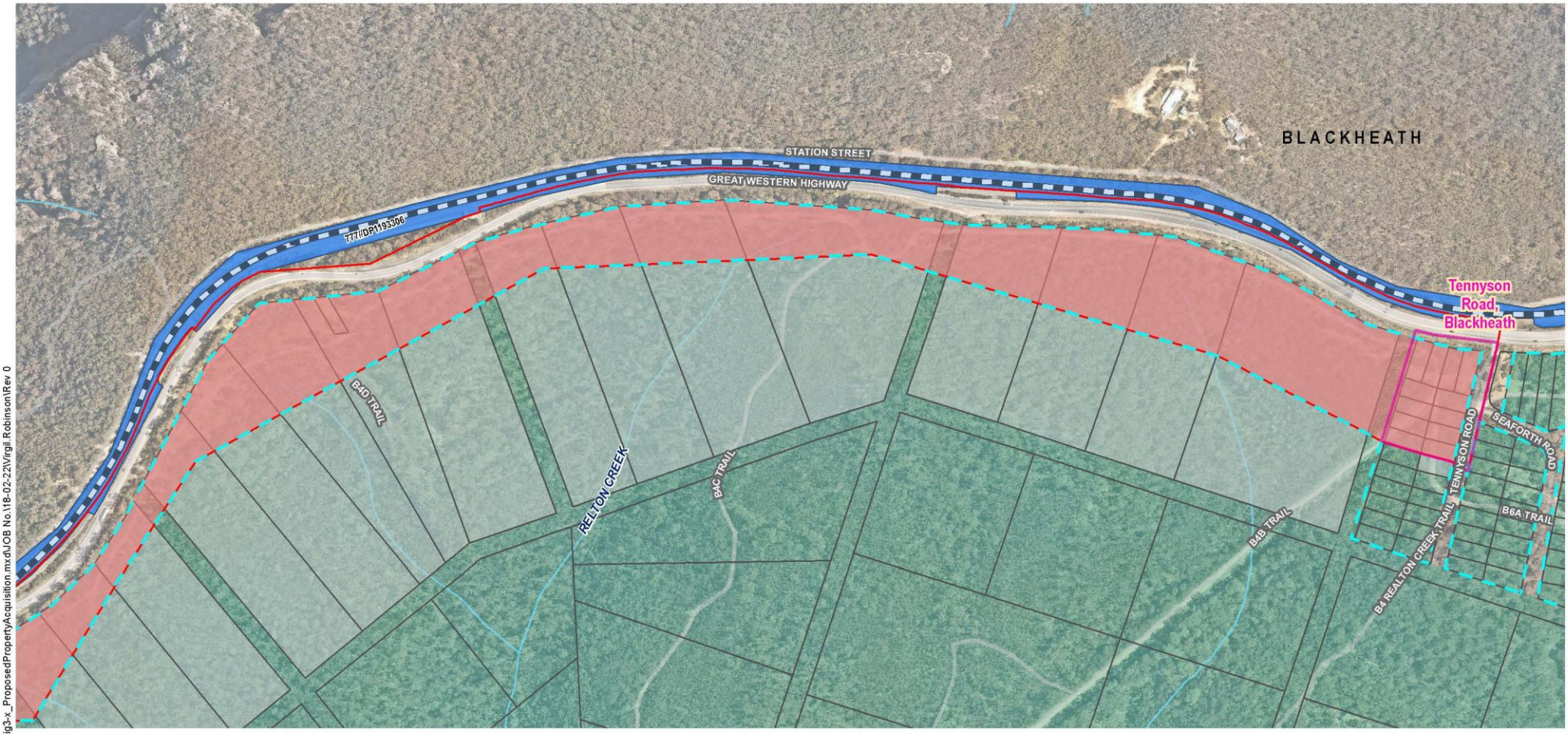
FIGURE 3-17a: Proposed property acquisition - Medlow Bath to Blackheath section



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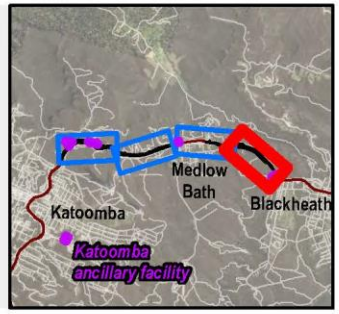
- Proposal area
- Proposed ancillary facilities
- Transport owned land
- Proposed Blue Mountains National Park revocation - Great Western Highway Upgrade Program
- Proposal area subject to proposed Blue Mountains National Park revocation
- Blue Mountains National Park
- Main Western Railway



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Projection: GDA2020 MGA Zone 56

Great Western Highway East **Review of Environmental Factors**

FIGURE 3-17b: Proposed property acquisition - Medlow Bath to Blackheath section