

6. LANDSCAPE CHARACTER IMPACT

6.1 LANDSCAPE CHARACTER ASSESSMENT

6.1.1 Overview

Landscape character assessment helps determine the overall impact of the project on an area's character and sense of place, including all built, natural and cultural aspects. It is one way of measuring how well the proposed works fits into the built, natural and community context. This is achieved by assessing the likely impact of proposed works on the aggregate of an area's built, natural and cultural character or sense of place.

The method to measure impact is based on the combination of the **sensitivity** of the existing area to change and the **magnitude** (scale, character, distance) of the proposed works within that area - also refer **Figure 1**.

For the purposes of assessment, the concept design is assessed, that is the integrated engineering and urban design concept as illustrated in **section 5**, including location, the vertical and horizontal alignment and overall three dimensional form of the road, heights of cuttings and fill embankments, the location and form of bridges and the landscape at an early stage of growth.

The assessment is undertaken consistent with *EIA-N04*. The impacts identified in the assessment would be avoided and minimised where possible through refinement of the concept design prior to its finalisation - refer **section 8**.

6.1.2 Landscape Character Zones

The landform and vegetation, views and vistas, settlement pattern and built structures within and adjoining the study area combine to define the landscape character of the study area.

As outlined in **section 2.4.8** five LCZs were defined in the area surrounding the project, namely (refer **Figure 19**):

1. Bringelly - between Mersey Road and the transmission line easement
2. Duncans Creek - the Duncans Creek catchment around Willowdene Avenue
3. Luddenham Plateau - between Eaton Road and Littlefields Road
4. Cosgrove Creek - between Adams Road and Elizabeth Drive
5. Mulgoa-Orchard Hills - north of Littlefields Road.

Planned Land Use Changes

While the character of parts of the Bringelly, Luddenham Plateau and Cosgrove Creek LCZs is likely to change substantially with the development of the Western Sydney Airport, the WSPGA and the SWPGA, areas west of the new The Northern Road alignment and north of the Water NSW supply pipelines are unlikely to change in the foreseeable future (refer **sections 2.2.1** and **2.2.3**).

Based on planned land use changes, the study area in the future will likely feature two distinct characters:

- Urban development (including the Western Sydney Airport and associated residential/ employment/ industrial areas) in the north, east, and south
- Rural areas (including rural residential and Defence land) in the north and west-also refer **Figure 5**.

The LCZs were described in detail in **section 2.4.8**. The following provides the assessment of the likely impact of the proposed works on the identified LCZs.

LANDSCAPE CHARACTER IMPACT

6.1.3 Common landscape character impacts - lighting

Lighting impacts would be common to all LCZs. They can be differentiated into temporary impacts during construction, and permanent impacts resulting from upgrades to existing lighting or new lighting.

Lighting impacts during construction

Construction would require some works at night and lighting will be installed on the roadside. As such, the immediate area surrounding the project activities, and the roadside during operation, will be subject to artificial lighting, essentially creating permanent 'daylight' conditions.

Ecological light pollution

Ecological light pollution may potentially affect nocturnal fauna by interrupting their life cycle. Some species such as light tolerant bats may benefit from the lighting due to increased food availability (insects attracted to lights) around these areas. Due to the frequency and sustained nature of the lighting, it is unlikely that animals will habituate to the light disturbance and a long-term impact in the area of lighting is likely. For more information refer to the *Biodiversity Assessment Report* (Appendix I of the EIS).

Impact on residents and communities

During construction, areas closest to construction compounds and construction works may experience temporary adverse changes to local amenity due to light spill from any night-time construction works. If unmanaged, noise, light spill, and dust from construction activities may impact on the health and wellbeing of some residents and occupants of buildings nearest to construction works.

All night work and lighting would be carried out in accordance with statutory requirements and guidelines to ensure that there are no unacceptable lighting impacts. A construction management plan would be prepared by the contractor selected to construct the proposed upgrade. This would need to detail the measures taken to reduce potential adverse impacts on people and communities as a result of night time works and associated increased light levels. They may include items such as lighting levels, projection angles and direction and length and frequency of exposure.

Lighting impacts during operation

Street lighting would be provided along the full length of the project to light the carriageway and shared path. Street lighting would be designed to ensure relevant guidelines are adhered to with regards to the required light levels and the need to manage light spill, pollution and glare.

Increased traffic and light spill from the roadway will add to the changes to the visual environment as a result of the proposed upgrade. They represent a notable change from the existing The Northern Road which has limited lighting.

They may impact on the use and enjoyment of rural properties and in particular the night-time amenity given the existing relatively low night-time light environment. This would affect areas where the upgrade follows the existing road character but in particular those areas near to the proposed new road alignment and bypass of Luddenham town centre that are currently remotely located relative to the road network.

While these changes may be a concern for affected property owners, these are expected to be minor in the context of the project as a whole. Further, they are consistent with the planned land use changes and progressive urbanisation anticipated for much of the area.

LANDSCAPE CHARACTER IMPACT

6.2 LCZ 1: BRINGELLY

6.2.1 Existing landscape character

LCZ 1 is generally an open and expansive rural landscape, interspersed with remnant vegetation, farm dams and buildings.

Topography and views

LCZ is bisected by a north-south ridge that crosses the existing The Northern Road approximately half-way within the character zone. The LCZ 1 is generally gently sloping topography. There are occasional views of the Blue Mountains to the west.



Figure 28: Location of the Bringelly LCZ

Hydrology

LCZ 1 lies high up in the catchment of Badgerys and Duncans Creeks. Badgerys Creek and a small tributary cross The Northern Road north of Dwyer Street.

Vegetation

LCZ 1 has largely been cleared for rural purposes. Remnants of Cumberland Plain Woodland are primarily found along the road edge, along creek lines and along property boundaries.

Built form and heritage

The small amount of built form in this zone consists primarily of rural residential buildings and structures set back from the road. There are a number of sheds used for agricultural purposes.

Consistent with the current rural character and low levels of development The Northern Road is a relatively small rural road that generally follows and integrates with the natural form of the landscape.



Figure 29: The mix of open pastures and remnants with mid-distance views

LANDSCAPE CHARACTER IMPACT

The study area features one Aboriginal heritage site and no Non-Aboriginal heritage items. For more detail refer *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

The distribution of vegetation and topography results in a largely open spatial quality with generally mid-distance views across the landscape. Small areas such as along Badgerys Creek are more enclosed.

Connectivity and access

The Northern Road is the primary access route. A small number of local roads including Mersey and Dwyer Roads also provide access to rural properties in the area. There are access tracks associated with utility easements, however, there are no existing bus stops, or designated cycle or pedestrian paths.

Key activity areas

The Northern Road is the key activity area within LCZ 1, carrying large volumes of local and regional traffic. Leppington Pastoral Company provides a moderate amount of activity through employment. Utility infrastructure and easements within LCZ 1 generate minor activity related to operations and maintenance.

6.2.2 The proposed works

The proposed works within LCZ 1 include:

- Construction of a new road alignment to divert around the site of the Western Sydney Airport
- Two new intersections
 - At the intersection with the existing The Northern Road to provide a southern entrance to the Western Sydney Airport, as well as access to the Leppington Pastoral Company
 - A service entrance to the Western Sydney Airport



Figure 30: The ridge west of the existing The Northern Road (shown right in the photograph) blocks views of the Blue Mountains from the majority of the existing road alignment

LANDSCAPE CHARACTER IMPACT

- An internal access road for the Leppington Pastoral Company including a cattle underpass through a culvert under the proposed new road alignment
- Cut and fill embankments up to about eight metres tall
- Five construction compounds:
 - North of The Northern Road, at the intersection with Mersey Road
 - On the southern side of The Northern Road, opposite Mersey Road
 - On the land of the Leppington Pastoral Company, north of the existing access road
 - On the land of the Leppington Pastoral Company, between the existing The Northern Road and the proposed new alignment
 - On the land of the Leppington Pastoral Company, surrounding the proposed new intersection to the Western Sydney Airport
- Removal of rural dwellings and structures
- Road drainage and water quality controls utilising swales or drainage channels, drainage inlets, culverts and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Lighting is not required on the main carriageway, but it would be provided for local road intersections as appropriate. This is yet to be determined.

6.2.3 Landscape character changes

Topography

New cut and fill embankments would be up to about eight metres high. They would stand out as unnatural landforms in the gently undulating landscape.

Hydrology

Natural creek lines would be altered through the introduction of culverts under the new alignment. Combined with the width of the road corridor this would change the extent to which creeks can be perceived and appreciated as natural landscape features. Culverts would also prevent the development of open space links along creek lines as part of future urban development and associated open space networks and regenerate native vegetation around creek crossings to provide a landscape buffer and enhance creeks as ecological corridors.

Vegetation

Remnant vegetation would be removed along the existing road corridor between Dwyer Road and the Leppington Pastoral Company, including along Badgerys Creek. This would alter the creek character and the road interface with adjoining properties.

Revegetation would be provided in the road corridor and in other areas disturbed by construction activities.

Built form and heritage

The project would require the removal of a number of buildings and sheds, primarily associated with the Leppington Pastoral Company. The new road alignment would introduce a major new built form in the landscape. Other new built forms would be the access road and culvert.

LANDSCAPE CHARACTER IMPACT

The proposed upgrade would not directly impact on Non-Aboriginal heritage items. An Aboriginal heritage site would be affected. For a discussion of the impacts on heritage values refer *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

The spatial quality within the southern section near Badgerys Creek would be modified with the removal of vegetation and the introduction of large fill embankments. They would alter views and vistas across the landscape.

Connectivity and access

Existing intersections and driveways would be changed to left-in left-out only. The u-turn facility at the entrance to the Western Sydney Airport would ensure all movement and access is maintained. The existing alignment of The Northern Road would be closed as it bisects the site of the Western Sydney Airport.

The provision of a shared path along the upgraded road would enhance opportunities for safe active transport. The provision of bus lanes would improve opportunities for future public transport.

Key activity areas

There would be no changes to activity areas as a result of the upgrade.

It is noted that the planned land use changes including development of the Western Sydney Airport and urban and residential development within the SWPGA will lead to the development of new activity areas in the future.

Construction activities

There are five sites identified for use for ancillary facilities during construction. The sites are currently largely cleared. The site on the corner of Mersey Road features a small number of scattered remnant trees.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other construction activities.

The use of the areas would temporarily alter their character; with the exception of the site around the proposed new intersection to the Western Sydney Airport, they are located adjacent to The Northern Road and would be highly visible by the large numbers of people travelling along that route.

Ancillary facilities would therefore have a temporary impact on the landscape character of LCZ 1.

6.2.4 Landscape character assessment

Sensitivity

LCZ 1 is generally an attractive rural landscape largely experienced by rural residents, workers and motorists along The Northern Road, including tourists along this designed tourist drive. It is an open landscape with relatively low levels of vegetation cover, providing mid-distance views rural views and limited glimpses to the Blue Mountains.

LANDSCAPE CHARACTER IMPACT

The rural nature of LCZ 1 is essential to its character and is highly sensitive to change, as it has a limited capacity to absorb a major new piece of infrastructure.

Due to this, the LCZ has been assessed to have **high** sensitivity

Magnitude

Features of the project within this LCZ would include the widening of approximately 700 metres of existing road and the introduction of a new road alignment through a greenfield site, with a total width of over 110 metres in some sections. It represents a major new road and built infrastructure in a setting with currently low levels of development.

Overall, the assessment indicates that the magnitude of the project would be **high**.

Landscape character impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 1 is likely to be:

Sensitivity	High
Magnitude	High
Landscape character impact	High

It is noted that major land use changes are proposed for LCZ 1 including urban (town centre and residential) development and the Western Sydney Airport.

The project seeks to support these planned changes that will themselves lead to a transformation of the landscape character of the area to meet identified community needs over the next 20 to 25 years.

LANDSCAPE CHARACTER IMPACT

6.3 LCZ 2: DUNCANS CREEK

6.3.1 Existing landscape character

LCZ 2 is characterised by a diverse pattern of large and small rural holdings, woodland remnants, pastures, food production, creek corridors and farm dams. They combined to produce an attractive and visually interesting character.

Topography and views

LCZ 2 is largely located west of the main ridge line where the topography is noticeably steeper; with a number of sharply incised steep and narrow valleys that cross Willowdene Avenue.

Due to the diverse pattern of vegetation and topography, views are generally limited to the short to mid-distance.

Hydrology

There are a large number of creek lines and ephemeral watercourses draining to Duncans Creek. They have been extensively dammed on private rural properties. Farm dams are an important visual and landscape character feature of this setting.

Vegetation

There are extensive stands of remnant Cumberland Plain Woodland along creek lines, dams and a number of ridge tops. There are also some cultural plantings associated with food production and ornamental gardens on rural properties.



Figure 32: Location of the Duncans Creek LCZ



Figure 31: The steeper and diverse landscape of the Duncans Creek Valley includes a small-scale pattern of pastures and woodland remnants

LANDSCAPE CHARACTER IMPACT

Built form and heritage

Built form in this zone is limited to rural dwellings and structures and small access roads.

The site of Lawson's Inn is partially located within LCZ 2 and has been identified as having local heritage significance. There are also a number of Aboriginal heritage items and sites. Refer *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS) and *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

LCZ 2 is a diverse zone with a generally visually contained character as views are restricted by vegetation cover and topography.

Connectivity and access

Willowdene Avenue is the main access road to rural holdings, together with Vicar Park Lane. There are no current cycle routes or pedestrian footpaths.

Key activity areas

There are no major activity areas in LCZ 2.

6.3.2 The proposed works

The proposed works within LCZ 2 include:

- Construction of a new road alignment to divert around the site of the Western Sydney Airport
- Closure of Vicar Park Lane
- One construction compound site adjacent to a farm dam between Willowdene Avenue and the proposed new alignment of The Northern Road
- Removal of rural structures



Figure 33: View along Willowdene Avenue showing the relatively steep topography and low key character of existing roads

LANDSCAPE CHARACTER IMPACT

- Road drainage and water quality controls utilising, swales or drainage channels, drainage inlets, culverts and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Lighting is not required on the main carriageway, but it would be provided for local road intersections as appropriate. This is yet to be determined.

6.3.3 Landscape character changes

Topography

A large amount of earthworks would be required to meet the geometric requirements within the steeper topography of LCZ 2. This would include batter heights in excess of ten metres in some areas, for both cut and fill. They would stand out as highly unnatural landforms.

Hydrology

All existing creek lines would be modified culverts under the new alignment. A number of farm dams would be wholly or partially filled in, including dams situated on land not currently included in the site of the Western Sydney Airport.

Vegetation

A large amount of remnant vegetation would be cleared between the Leppington Pastoral Company and Luddenham town centre. Where possible, subject to airport operational requirements and views, native revegetation would be provided within the road corridor and in areas affected by construction activities.

Built form and heritage

The new road alignment would introduce a major new built form in the landscape. It would require removal of a small number of rural structures.

The project would not directly impact on structures identified as having heritage values. However, the proposed road alignment would bisect land that forms part of the Lawson's Inn site, identified as an item of local heritage value under the Liverpool Local Environmental Plan 2008. It would further bisect several Aboriginal heritage sites. For a discussion on the likely impact on heritage items and their curtilage, refer to the *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS). For a discussion of impacts on Aboriginal heritage refer to the *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

The spatial quality of each valley would be changed as a result of major earthworks. The overall diversity of spatial character within the LCZ would not change.

Connectivity and access

Vicar Park Lane would be closed. Properties located within the Western Sydney Airport are being resumed as part of planning for the airport, removing the need for access.

As the proposed alignment deviates from the existing road through existing properties, it would result in new segments of land that require access to the proposed alignment. Changes to access arrangements for the majority of properties that currently have access directly onto The Northern Road and some

LANDSCAPE CHARACTER IMPACT

properties that have access along roads that connect to The Northern Road would occur as a result of the project. .

This applies in particular to a number of properties that are not currently located within the site of the Western Sydney Airport and that would be severed by the new road alignment. Design resolution of access, including stock access, between severed portions of farm land is yet to be finalised. Options for proposed alternative access arrangements outlined in the *Traffic and Transport Assessment* (Appendix G of the EIS).

The provision of a shared path along the upgraded road would enhance opportunities for safe active transport. The provision of bus lanes would improve opportunities for future public transport.

Key activity areas

The project elements would not result in any changes to activity areas. It is noted that the Western Sydney Airport will introduce a major new activity area.

Construction activities

During construction, an area adjoining the large u-shaped farm dam would be used for ancillary facilities. The majority of this area is currently cleared.

The site would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other construction activities.

While use of the site as a construction compound would temporarily alter the character of the landscape, the site is not readily visible from surrounding areas. It would have little impact on the landscape character of LCZ 2.

6.3.4 Landscape character assessment

Sensitivity

LCZ 2 has a scenic, undulating landscape character with extensive areas of Cumberland Plain Woodland. The landscape is largely viewed by local residents and visitors but would have a low capacity to absorb major new infrastructure.

Overall, the LCZ has been assessed to have **high** sensitivity.

Magnitude

The project within this LCZ would introduce a new road alignment through a greenfield site, with a total width of about 130 metres in some sections and requiring substantial earthworks and embankments. It represents a major new road and built infrastructure in a setting with currently low levels of development.

Overall, the assessment indicates that the magnitude of the project would be **high**.

LANDSCAPE CHARACTER IMPACT

Landscape character impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 2 is likely to be:

Sensitivity	High
Magnitude	High
Landscape character impact	High

It is noted that the Western Sydney Airport will lead to major land use changes for the parts of LCZ 2 east of the proposed road alignment.

The project seeks to support these changes. The changes will result in a progressive transformation of the landscape character of the area to meet identified community needs over the next 20 to 25 years.

However, there are no current plans for land use changes west of the proposed alignment. These areas form part of the Metropolitan Rural Area and are not likely to change in the foreseeable future. The identified high landscape character impact would have a lasting effect on these areas.

6.4 LCZ 3: LUDDENHAM PLATEAU

6.4.1 Existing landscape character

The Luddenham Plateau LCZ is characterised by a broad ridge with scenic panoramic views over a gently sloping pastoral landscape.

Topography and views

A broad ridge line runs north to south through LCZ 3 along the existing North Road alignment. The lower ground within this zone has both undulating topography and flat, open plains.

Hydrology

LCZ 3 is situated within the upper catchment of Duncans, Mulgoa, Blaxland and Cosgrove Creeks. There are only minor ephemeral watercourses. A network of farm dams provide visual interest and are an attractive and important visual and landscape character feature.

Vegetation

LCZ 3 has largely been extensively cleared for rural and urban purposes. A large woodland remains near St James Anglican Church. The remainder of LCZ 3 features limited scattered trees.

Vegetation within Luddenham town centre consists of a mix of native vegetation remnants and cultural plantings associated with residential properties. There are also pockets of freshwater wetland flora around farm dams.



Figure 34: Location of the Luddenham Plateau LCZ

LANDSCAPE CHARACTER IMPACT

Built form and heritage

The built form within Luddenham town centre generally consists of low density dwellings, as well as community buildings such as a post office, churches and schools, and a number of shops including cafes, service stations and a supermarket.

Beyond the town built form is limited and includes rural dwellings and structures.

Heritage items within the study area in LCZ 3 include the site of Lawson's Inn, remnants of The Northern Road in Eaton Road, and at 2,778 The Northern Road, the site of Miss Lawson's Guesthouse, 'Pleasant View' at 2,901 The Northern Road, and two weatherboard houses and associated huts and sheds including the Old Dairy at 2,778 The Northern Road.

Other nearby heritage items include the Luddenham Public School and St James Anglican Church and cemetery. There are also a number of Aboriginal heritage items and sites. Refer *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS) and *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

There is an open and expansive spatial quality to LCZ 3 due to the high elevation and long distance views. The sky and the landscape are the predominant visual features, together with the blue ribbon of the Blue Mountains providing a backdrop to the west.

This is in contrast with the spatial quality of Luddenham town centre which is more enclosed as a result of denser development including buildings and vegetation.

Connectivity and access

The Northern Road is the primary access route through LCZ 3, together with Elizabeth Drive. There are a number of secondary roads to surrounding areas such as Park Road and Adams Road. There is a network of local streets within Luddenham town centre. There are currently no dedicated cycle paths or footpaths beyond the Luddenham town centre.



Figure 35: Expansive sky, farm dams and the constant ribbon of the Blue Mountains in the west are characteristic features of the Luddenham Plateau

LANDSCAPE CHARACTER IMPACT

Key activity areas

Luddenham town centre functions as the local centre servicing the surrounding rural area. It is the key activity area in LCZ 3 with a public school, catholic primary school, shops, cafes, a showground and parks, as well as a number of churches.

The other key activity area is The Northern Road itself. It carries large volumes of local and regional traffic including tourism traffic.

Public domain

The public domain within LCZ 3 includes the public roads and footpaths within the Luddenham town centre. The Luddenham showground is an important community and agricultural venue. Sales Park is a major oval. Wilmington Reserve in Jamison Street also provides for community recreation.

6.4.2 The proposed works

The proposed works within LCZ 3 includes:

- Construction of a new road alignment south of Elizabeth Drive
- Widening the existing Northern Road north of Elizabeth Drive
- New intersections
 - With the existing The Northern Road south of Luddenham town centre including realignment of the existing The Northern Road
 - With the eastern part of Eaton Road
 - With Elizabeth Drive including re-alignment of Elizabeth Drive to create a four-way intersection with the existing The Northern Road
- Modifications to the existing Elizabeth Drive to provide a new left-in intersection from the proposed new Elizabeth Drive alignment and changing the existing intersection with The Northern Road to left-out only
- Cut and fill embankments up to about five and eight metres tall respectively



Figure 36: View of the Western Sydney Parklands from The Northern Road, near Luddenham Village Café

LANDSCAPE CHARACTER IMPACT

- Eight construction compounds:
 - Two compounds south of the existing The Northern Road near Eaton Road
 - One compound north of Eaton Road and west of the proposed new alignment of The Northern
 - One compound along The Northern Road, opposite 2,342 The Northern Road
 - One compound between the existing The Northern Road and the existing Elizabeth Drive
 - One compound at 2,778 The Northern Road, Luddenham
 - Two compounds south of Littlefields Road, one on each side of the corridor
- Alterations to property access to generally left-in left-out only
- Removal of rural dwellings and structures
- Partial infilling of farm dams
- Clearing of remnant vegetation and Christmas tree farms near Eaton Road and Elizabeth Drive
- Road drainage and water quality controls utilising swales or drainage channels, drainage inlets, culverts and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Lighting is not required on the main carriageway, but it would be provided for local road intersections as appropriate. This is yet to be determined.

6.4.3 Landscape character changes

Topography

The upgrade would require substantial earthworks with batters up to eight metres tall required to achieve geometric parameters for both the new alignment and upgraded section of the existing The Northern Road. They would introduce a large unnatural land form in a visually open and exposed area.

Hydrology

All existing creek lines would be modified to accommodate new culverts under the new alignment. A number of farm dams would be wholly or partially filled in.

Vegetation

The main loss of vegetation would be associated with the two Christmas tree farms, as well as a number of scattered remnants. Revegetation would be provided in the road corridor and in other areas disturbed by construction activities.

Built form and heritage

A number of buildings would require removal including near Eaton Road, near the realigned Elizabeth Drive and new intersection and between Elizabeth Drive and the Blue Mountains Honey Shed.

The project would not directly impact on structures identified as having heritage values. However, the proposed road alignment would bisect land that forms part of the Lawson's Inn site, identified as an item of local heritage value under the Liverpool Local Environmental Plan 2008. It would further bisect several Aboriginal heritage sites.

LANDSCAPE CHARACTER IMPACT

For a discussion on the likely impact on heritage items and their curtilage, refer to the *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS). For a discussion of impacts on Aboriginal heritage refer to the *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

The overall open quality of LCZ 3 would not change as a result of the project. However there are localised changes where fill embankments interrupt the open flow of the landscape towards the Blue Mountains, closing off existing views from a small number of properties east of The Northern Road.

Connectivity and access

The proposed new road alignment would bypass Luddenham town centre, reducing through traffic and delivering improved amenity in the town.

Eaton Road would be severed by the new road alignment with access maintained via the existing The Northern Road and the new intersection with the proposed new The Northern Road alignment.

Property access and access to and from the existing Elizabeth Drive alignment would be changed to left-in left-out only, with turn-around facilities provided on the existing The Northern Road and the Littlefields Road extension (refer LCZ 5). All other movements would be maintained.

The provision of a shared path along the upgraded road would enhance opportunities for safe active transport. The provision of bus lanes would improve opportunities for future public transport.

Key activity areas

The proposed upgrade would provide a bypass around Luddenham town centre and would reduce through traffic. There is the potential removal of through traffic would affect existing businesses such as service stations, food outlets that benefit from passing traffic and associated incidental trade. Potential impacts have been identified and assessed in the *Socioeconomic Assessment* (Appendix J of the EIS).

It is noted that development of employment lands within the WSPGA and the Western Sydney Airport would introduce major new activity areas in the future.

Public domain

It is anticipated that the public domain in and amenity of Luddenham town centre would be improved as a result of the proposed bypass. It would remove through traffic from the town, including large numbers of vehicles including heavy vehicles. This would improve public safety and amenity, while reducing noise and pollution, make the town a safer and more pleasant place to walk or cycle.

Construction activities

The sites identified for ancillary facilities during construction are generally cleared areas, with the exception of the Christmas tree farm near the intersection of The Northern Road and Elizabeth Drive. The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other construction activities.

Situated in prominent locations along existing major road corridors the use of the site for construction compounds or other ancillary facilities would temporarily alter the character of the landscape.

LANDSCAPE CHARACTER IMPACT

6.4.4 Landscape character assessment

Sensitivity

LCZ 3 attracts a larger number of potential viewers including residents and visitors to Luddenham and motorists and tourists along The Northern Road. Due to its open and exposed ridge top location LCZ 3 has a low capacity to absorb major changes. The elevated plateau provides a spectacular setting for views over an attractive rural landscape to the Blue Mountains.

Overall, the LCZ has been assessed to have **high** sensitivity.

Magnitude

The upgrade would introduce a major new road corridor into a rural setting in the south, and increase the width of the existing road north of Elizabeth Drive more than fourfold. This would represent a large new built form in a visually exposed area. However, the upgrade would deliver some benefit to the character and amenity of the town of Luddenham.

Overall, the assessment indicates that the magnitude of the project would be **moderate**.

Landscape character impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 3 is likely to be:

Sensitivity	High
Magnitude	Moderate
Landscape character impact	High to moderate

It is noted that the character of parts of LCZ 3 east of the road corridor around Elizabeth Drive are likely to change substantially as employment lands in the WSPGA are developed and the area transforms from a rural area.

The project seeks to support these planned changes that will themselves lead to a transformation of the landscape character of the area to meet identified community needs over the next 20 to 25 years.

There are no current plans that indicate major changes to land uses around Luddenham town centre and west of the existing alignment of The Northern Road. The identified high landscape character impact would have a lasting effect on these areas.

LANDSCAPE CHARACTER IMPACT

6.5 LCZ 4: COSGROVE CREEK

6.5.1 Existing landscape character

The landscape of LCZ 4 is comprised of a rural valley surrounded by steep slopes leading up to the ridges of the surrounding Luddenham Plateau.

Topography and views

LCZ 4 is comprised of a valley along Cosgrove Creek and its tributaries and has a relatively broad valley floor framed by steep slopes. Views are contained by surrounding ridges and range from short to long distance along the valley floor.

Hydrology

LCZ 4 lies within the upper catchment of Cosgrove Creek. It includes a number of tributaries extensively dammed to create a series of cascading dams that characterised the view along the valley.

Vegetation

LCZ 4 has largely been widely cleared. Stands of vegetation remain along creek lines and farm dams, as well as on rural properties.

Built form and heritage

The built form in this zone is limited to rural dwellings and structures.

The study area within LCZ 4 features several Aboriginal heritage sites and no Non-Aboriginal heritage items. For more detail refer *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).



Figure 37: Location of the Cosgrove Creek LCZ

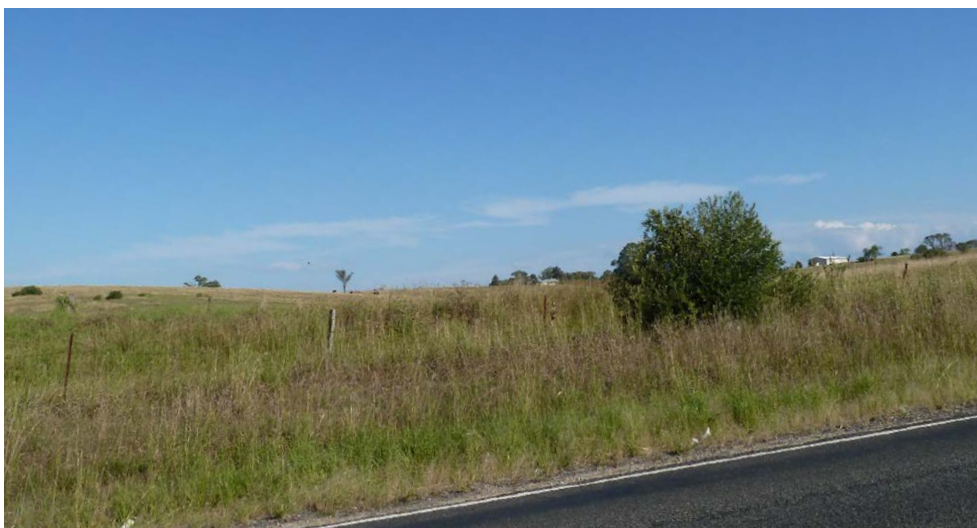


Figure 38: The steep topography between Adams Road and Eaton Road

LANDSCAPE CHARACTER IMPACT

Spatial quality

The spatial quality is that of an open valley framed by bald ridge lines.

Connectivity and access

Adams Road, a two-lane country road, is the primary vehicular link between Luddenham town centre and the north-eastern parts of Luddenham along Luddenham Road. It has been identified as a future arterial road within the WSPGA, linking to employment areas in Erskine Park together with Luddenham Road. Additionally, the proposed alignment around Luddenham town centre deviates from the existing road through existing properties. This would result in new segments of land that require access to the proposed alignment.

Key activity areas

Adams Road is the major activity areas but carries relatively low volumes of traffic.

6.5.2 The proposed works

The proposed construction within LCZ 4 includes:

- Construction of a new road alignment south of Elizabeth Drive.
- An over bridge over Adams Road consisting of twin bridges approximately 65 metres long
- Cut and fill embankments in excess of ten metres tall in some areas
- Two construction compounds north of Adams Road
- Two Variable Message Signs on the north- and south-bound approaches to Elizabeth Drive
- Partial infilling of farm dams
- Clearing of remnant vegetation
- Road drainage and water quality controls utilising swales or drainage channels, drainage inlets, culverts and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Lighting is not required on the main carriageway, but it would be provided for local road intersections as appropriate. This is yet to be determined.



Figure 39: Looking east along Adams Road showing the steep hillsides of the Cosgrove Creek Valley, as well as the series of dams stepping down along the creek

LANDSCAPE CHARACTER IMPACT

6.5.3 Landscape character changes

Topography

The upgrade would require extensive earthworks, exceeding ten metres in height for both cuts and fills. This would represent a highly unnatural and visible new landform.

Hydrology

Natural creek lines would be altered through the introduction of culverts under the new alignment. Combined with the width of the road corridor this would change the extent to which creeks can be perceived and appreciated as natural landscape features.

A number of farm dams would be wholly or partially filled in.

Vegetation

Vegetation clearing would generally be limited to small areas along existing creek lines and farm dams. Revegetation would be provided in the road corridor and in other areas disturbed by construction activities.

Built form and heritage

The new road alignment would introduce a major new built form in a landscape that has relatively low levels of development to date. With clearance requirements of six metres underneath, the Adams Road bridge would be a major new structure in the centre of the valley.

The proposed upgrade would not directly impact on Non-Aboriginal heritage items. Several Aboriginal heritage sites would be affected. For a discussion of the impacts on heritage values refer *Aboriginal Cultural Heritage Assessment Report* (Appendix M of the EIS).

Spatial quality

The Adams Road bridge and associated embankments would spatially divide the valley into two halves and interrupt open views along the valley floor.

Connectivity and access

There would be no changes to vehicular access and movement.

The provision of a shared path along the upgraded road would enhance opportunities for safe active transport. The provision of bus lanes would improve opportunities for future public transport.

Key activity areas

The project would not result in any changes. It is noted that the planned development of employment lands in the WSPGA would introduce new activity areas into LCZ 4 in the future.

Construction activities

The sites identified for ancillary facilities during construction are extensively cleared areas. They would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other construction activities.

Situated in prominent locations on the ridge tops and slopes adjoining existing road corridors the construction compounds would be highly visible from surrounding areas and would temporarily alter the character of the landscape.

LANDSCAPE CHARACTER IMPACT

6.5.4 Landscape character assessment

Sensitivity

The generally open and attractive rural valley has a low capacity to absorb major infrastructure, but has a potentially large number of viewers including residents and visitors to Luddenham.

Overall, the LCZ has been assessed to have **high** sensitivity.

Magnitude

The project would introduce a major new piece of infrastructure into a greenfield site that is a rural valley with currently low levels of development. It would include a large new bridge structure and associated earthworks located in the centre of the valley floor where it would be highly visible.

Overall, the assessment indicates that the magnitude of the project would be **high**.

Landscape character impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 4 is likely to be:

Sensitivity	High
Magnitude	High
Landscape character impact	High

It is noted that the character of parts of LCZ 4 is likely to change substantially as employment lands in the WSPGA are developed and the area transforms from a rural area.

The project seeks to support these planned changes that will themselves lead to a transformation of the landscape character of the area to meet identified community needs over the next 20 to 25 years.

LANDSCAPE CHARACTER IMPACT

6.6 LCZ 5: MULGOA-ORCHARD HILLS

6.6.1 Existing landscape character

LCZ 5 is a diverse undulating landscape with pockets of remnant woodlands, open paddocks and rural residential clusters.

Topography

A north-south ridge follows the road existing alignment, occasionally crossing it. As a result, The Northern Road slopes up and down through a series of gentle valleys, with occasional views to the Blue Mountains.

Hydrology

LCZ 5 generally follows the watershed. The main creek is unnamed ephemeral waterway and extends from Orchard Hills Golf Course across the corridor into Glenmore Park and beyond. A number of farm dams are located throughout the LCZ and can be seen from The Northern Road. They make an important contribution to the outlook from The Northern Road and the surrounding landscape character.

Vegetation

Vegetation within LCZ 5 includes large some stands of Cumberland Plain Woodland interspersed with open paddocks. Orchard Hills Golf Course is characterised by manicured and tree-lined fairways, greens and tees.

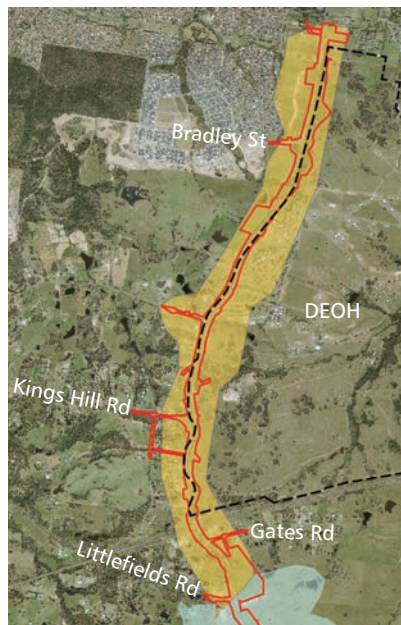


Figure 41: Location of the Mulgoa-Orchard Hills LCZ



Figure 40: The main ridge line runs west of The Northern Road for most of the Mulgoa-Orchard Hills LCZ, enclosing the road corridor and blocking views of the Blue Mountain

LANDSCAPE CHARACTER IMPACT

Built form and heritage

There are low amounts of built form consisting of rural dwellings and structures and a somewhat denser cluster of buildings within the DEOH site.

There are several Non-Aboriginal heritage items within the study area: a fruit orchard on Gates Road, the Water NSW supply pipelines, the Chaffey Brothers Irrigation Scheme Canal within DEOH and remnants of The Northern Road in Grover Crescent. For more detail refer *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS).

There are no known Aboriginal heritage sites within the study area in LCZ 5.

Spatial quality

The spatial quality is generally enclosed as a result of the interplay of topography and vegetation. There are some mid to long-distance views across open valleys, including a number of glimpses to the Blue Mountains.

Connectivity and access

The Northern Road is the primary access route through LCZ 5 and connects to the M4 Motorway to the north. Secondary roads include Littlefields, Gates, Longview, Kings Hill and Chain-O-Ponds Roads and Bradley Street. They provide access to rural residential clusters as well as the suburb of Glenmore Park beyond LCZ 5.

There are no current dedicated cycle lanes or pedestrian or shared paths.

Key activity areas

The Northern Road is the key activity area within LCZ 5, carrying large volumes of local and regional traffic. The Orchard Hills Golf Club provides a moderate amount of activity through recreation use, and the DEOH through employment and training.



Figure 42: The combination of short- and mid-distance views from the road corridor typical of this LCZ.

LANDSCAPE CHARACTER IMPACT

6.6.2 The proposed works

The project within LCZ 5 includes:

- Widening of the existing The Northern Road
- Upgrades to all intersections
- South and north bound heavy vehicle inspection areas
- Three u-turn facilities, including one near the DEOH entrance and new roundabouts in Chain-O-Ponds Road and Kings Hill Road
- Extension of Littlefields Road across The Northern Road including a new link road to Gates Road, upgrading of Gates Road and a roundabout/ u-turn facility
- Extension of Vineyard Road through the unmade road reservation to Kings Hill Road including a new roundabout/ u-turn on Kings Hill Road and a T intersection with Longview Road
- Two Variable Message Signs on the approaches to the north- and south-bound heavy vehicle inspection areas
- Removal of one rural dwelling/ structure
- Seven construction compounds
 - Along the Littlefields Road extension and new link road to Gates Road
 - North of the Water NSW supply pipelines on the eastern side of the corridor
 - At the intersection with Kings Hill Road
 - Opposite the DEOH entrance
 - On the western side of the corridor near The Northern DEOH boundary
 - On the eastern side of the corridor at The Northern project boundary (two compound sites)
- Cut and fill embankments in excess of seven metres tall in some areas
- Vegetation clearing
- Realignment of the unnamed ephemeral waterway
- Flood mitigation structures including a flood retarding basin and spillway replacing an existing dam, re-alignment of an unnamed tributary to Surveyors Creek, earth bunds, box culverts and concrete lining of an existing unlined trapezoidal channel
- Road drainage and water quality controls utilising swales, drainage inlets, culverts and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Lighting is not required on the main carriageway, but it would be provided for local road intersections as appropriate.

6.6.3 Landscape character changes

Topography

Embankments up to about seven metres tall would be required. They would represent a large unnatural landform.

LANDSCAPE CHARACTER IMPACT

Hydrology

A number of new and ungraded culverts would be required. Flood risk mitigation requires a number of notable changes including the construction of a flood retarding basin replacing an existing farm dam and including a four metre high earth embankment and spillway, realignment of an unnamed tributary to Surveyors Creek, box culverts, earth bunds, a flood bypass channel and concrete lining of an existing unlined trapezoidal channel.

A number of farm dams would be wholly or partially filled in.

These works would be located immediately adjoining The Northern Road and would result in a notable change to the existing landscape and drainage systems that are likely to be inconsistent with the current rural character the generally small scale of infrastructure along the route.

Vegetation

Large amounts of native roadside vegetation would be removed as a result of the road widening. Revegetation would be provided in the road corridor and in other areas disturbed by construction activities.

Built form and heritage

The proposed widening would result in a large increase to the built form of the road itself. It would require the removal of a number of dwellings and other structures.

Of the Non-Aboriginal heritage items within the study area, the Chaffey Brothers Irrigation Scheme Canal within DEOH and remnants of The Northern Road in Grover Crescent would be directly impacted by the proposed upgrade. The Water NSW supply pipelines pass under The Northern Road and would not be directly impacted. For more detail on the impacts on heritage items and their curtilage refer *Non-Aboriginal Heritage Working Paper* (Appendix N of the EIS).

Spatial quality

The spatial quality would likely become more open due to vegetation removal and road widening. Revegetation may partially reverse this although the new corridor width precludes a similarly enclosed character even where areas within the corridor are able to be revegetated.

Connectivity and access

Driveway access and a number of intersections would change to left-in left-out only. Modifications to the local road system and intersections including extensions of local roads and the provision of u-turn facilities would maintain full access to all properties.

The provision of a shared path along the upgraded road would enhance opportunities for safe active transport. The provision of bus lanes would improve opportunities for future public transport.

Key activity areas

The project works would require modifications to the existing golf course layout to compensate for the physical impacts (land take) of the project.

LANDSCAPE CHARACTER IMPACT

Construction activities

The sites identified for ancillary facilities during construction are generally cleared areas, with the exception of the site north of the Water NSW supply pipelines. The latter retains a larger number of scattered remnant trees.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other construction activities.

Situated in prominent locations along The Northern Road the construction compounds would be highly visible to large numbers of potential viewers and would temporarily alter the character of the landscape.

6.6.4 Landscape character assessment

Sensitivity

LCZ 5 is a largely linear zone along the existing road corridor. Due to the variable topography and tree cover, proposed changes would be more easily absorbed and not widely visible beyond the road corridor. However, the area has been identified as possessing important scenic landscape values.

Overall, the LCZ has been assessed to have **moderate** sensitivity.

Magnitude

The project would increase in road width approximately fourfold, representing a very large increase. This would fundamentally change the currently relatively small road from a low key country road to a major arterial that would be more typical of an urban context. Relative to other LCZs the project would integrate more readily with the landscape, requiring less earthworks to meet the geometric requirements.

Overall, the assessment indicates that the magnitude of the project would be **moderate**.

Landscape character impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 5 is likely to be:

Sensitivity	Moderate
Magnitude	Moderate
Landscape character impact	Moderate

LANDSCAPE CHARACTER IMPACT

6.7 SUMMARY OF LANDSCAPE CHARACTER IMPACTS

The landscape character impact assessment of the project described above represents a qualitative assessment based on five LCZs. The result of these assessments ranges from **moderate** to **high**, and is summarised in the table below.

While The Northern Road is already an arterial road, it retains a rural quality along the route that easily integrates with the surrounding landscape.

The project will fundamentally alter the character of the existing road north of Elizabeth Drive, and introduce a new road alignment into greenfield areas south of Elizabeth Drive. The change in road character, in particular the width of the road, combined with extensive earthworks and removal of vegetation and farm dams will have a considerable impact on the existing rural landscape along the route.

The project would impact on all LCZs, due to the scale of the proposed works and the high sensitivity of surrounding areas.

Landscape Character Zone	Landscape Character Impact Rating
LCZ 1	High
LCZ 2	High
LCZ 3	High to moderate
LCZ 4	High
LCZ 5	Moderate

Planned land use changes

It is noted that substantial land use changes are planned for areas along the project south of Elizabeth Drive and east of the new road alignment. They include the development of employment lands within the WSPGA, the Western Sydney Airport and the development of urban centres and residential areas within the SWPGA.

The project seeks to support these planned changes that will themselves lead to a transformation of the landscape character of the area to meet identified community needs over the next 20 to 25 years.

Nevertheless the project represents one of the first steps in this transformation and the identified impacts will be highly noticeable in an area that as yet retains its rural character.

Further, there are no current plans that indicate major changes to land uses around the Luddenham town centre and to the west of the existing alignment of The Northern Road. These areas are identified as part of the MRA and are unlikely to change in the foreseeable future.

The identified moderate to high landscape character impacts would have a lasting effect on these areas.

Residual impacts following implementation of the recommended mitigation measures are further discussed in **section 8**.

LANDSCAPE CHARACTER IMPACT

6.7.1 Summary of impacts on Commonwealth land

The majority of potential landscape character impacts to Commonwealth land would occur as a result of proposed works within

- LCZ 1 and LCZ 2 within or immediately adjacent to the Western Sydney Airport,
- LCZ 2 with regards to some parcels of Commonwealth land at Willowdene Avenue
- LCZ 5 in relation to works within or immediately adjacent to the DEOH.

Generally construction related impacts would occur as a result of proposed construction sites and ancillary facilities. For the most part, the proposed compound sites for the project would not be located directly on Commonwealth land, with the exception of site C7 on lands associated with the Western Sydney Airport in LCZ 2, and site C17 on lands at the DEOH within LCZ 5. Any potential impacts would be temporary and mitigated through the measures outlined in **section 8**.

Potential landscape character impacts during operation of the project generally relate to changes in the landscape. Impacts to Commonwealth land would include the following:

- New cut and fill embankments would stand out as unnatural landforms in the gently undulating landscape
- Natural creek lines such as Badgerys Creek within LCZ 1 would be altered which would change the extent to which these creeks can be perceived and appreciated as natural landscape features
- Removal of native vegetation in all LCZs
- In the case of LCZ 1 and LCZ 2, the new road alignment would introduce a major new built form in the landscape, including some areas directly on or immediately adjacent to Commonwealth land associated with the Western Sydney Airport
- At the DEOH within LCZ 5, the Chaffey Brothers Irrigation Scheme Canal heritage item would be directly impacted which would impact on the landscape character of the area
- At the DEOH within LCZ 5, flood mitigation measures including earth bunds, drainage channels and spillways would be potentially highly visible and inconsistent in character with the rural landscape
- Within LCZ 5 works would require modifications to the existing golf course layout on Commonwealth land to accommodate the project.

This would result in long-term impacts to Commonwealth land during operation of the project. Impacts would be minimised through the implementation of the measures outlined in **section 8**.

7. VISUAL IMPACT

7.1 VISUAL IMPACT ASSESSMENT

7.1.1 Overview

The potential visual impact of the proposed The Northern Road upgrade works has been assessed in relation to a number of key viewpoints and groups of viewpoints. The selection of viewpoints has considered the existing pattern of land use and development adjoining the study area.

Consistent with *EIA-N04*, the visual impact assessment has been carried out based on the following method:

- Assessing the visibility of the proposed works by defining a Visual Envelope Map (VEM)
- Defining the scale (magnitude) of the proposed works including temporary works
- Identifying key viewpoints and groups of viewpoints from where the proposed works will be visible
- Rating viewpoints according to their sensitivity to change, considering direction and composition of the view; and
- Assessing the level of potential visual impact of the proposed works on viewers at these viewpoints, based on the magnitude of the proposed works and the sensitivity of viewers.

VISUAL IMPACT

7.1.2 Visual catchment

The extent from which The Northern Road is visible from adjoining areas varies along the length of the study area. It is influenced by topography, vegetation, buildings and land use patterns. A detailed field and desktop assessment was undertaken to determine the area from where The Northern Road is visible. This is defined as the visual catchment or visual envelope and is illustrated in the Visual Envelope Map (VEM) - refer **Figure 44**.

Key viewpoints

A number of key viewpoints and groups of viewpoints within the visual envelope of the study area have been selected for the visual impact assessment. Locations and directions of chosen viewpoints are representative of the range of viewpoints both within and beyond the road corridor, and are indicated on **Figure 44**.

In the case of views from residential properties, views from the road corridor were analysed to identify which buildings would be visible and therefore would be able to view the proposed works in return.

7.1.3 Visual impact assessment

The chosen viewpoints essentially assess the impact of the project against two primary conditions:

- The impact from private properties or other selected locations likely to be accessed by viewers from within the visual envelope; and
- The impact upon users of the road itself or other connecting roads.

In measuring the impact of change, the following are taken into account:

- The distance between viewers and the proposed works.
- The category of viewer (i.e. the activity the viewer is engaged in when viewing the proposed works)
- The elements of the project that are visible.

The following pages quantify the visual impact at each viewpoint. The gradings are measured on their impact relative to each other within the scope of the project rather than to an absolute scale covering all potential forms of impact.

Through this process, the visual impact of the project as a whole has been identified. Design opportunities and areas requiring mitigation have emerged and these are discussed in **section 8**.

VISUAL IMPACT

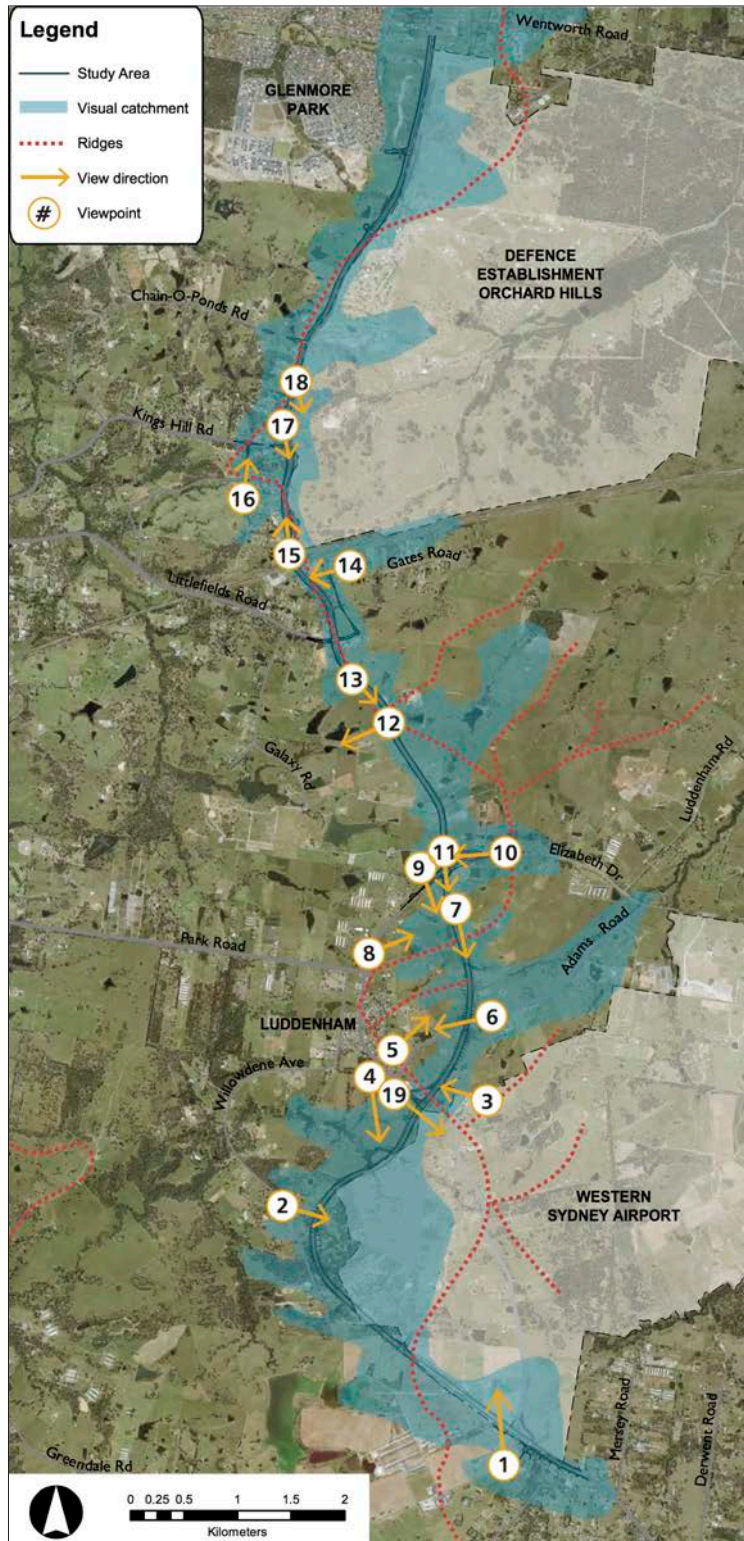


Figure 4.3: Visual Envelope and Viewpoint Location Map

VISUAL IMPACT

7.2 VIEWPOINT 1

Location description

Leppington Pastoral Company, Greendale, view from private access road looking north east.

Potential viewers

Residents, workers, and visitors to the Leppington Pastoral Company.

Visible project elements

- Elevated road alignment on fill embankments up to about 5.5 metres high
- Internal access road including culvert under the new road alignment
- New intersection including u-turn facility
- Removal of existing buildings and structures
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	Moderate	The open rural landscape with undulating topography and limited tree cover has a relatively low capacity to absorb a major new road. The sensitivity of the view is reduced by the oblique angle and the distance between the viewer and the project.
Magnitude	Moderate	The new road alignment would be elevated, introducing a highly unnatural landform out of scale with the existing landscape. The culvert and associated headwall and road would introduce further new built form. A number of mature trees would be removed.
Impact	Moderate	The visual impact is assessed to be moderate.

VISUAL IMPACT



Figure 45: Viewpoint 1 - Leppington Pastoral Company looking north east - existing



Figure 44: Viewpoint 1 - Leppington Pastoral Company looking north east - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.3 VIEWPOINT 2

Location description

Willowdene Avenue, Luddenham, looking south-east.

Potential viewers

Residents from nearby properties, rural residents, and travellers along Willowdene Road

Visible project elements

- New road alignment including fill embankments exceeding 10 metres in some areas
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The picturesque view of a diverse rural landscape interspersed with remnant vegetation has a low capacity to absorb a major new piece of infrastructure.
Magnitude	High	This view will undergo a major change as a result of extensive vegetation removal and the introduction of a major new road and associated large cut and fill embankments.
Impact	High	The visual impact is assessed to be high. It may somewhat diminish over time as vegetation establishes and matures, assisting the new alignment to blend into the landscape setting.

VISUAL IMPACT



Figure 46: Viewpoint 2 - looking south-east along Willowdene Avenue - existing



Figure 47: Viewpoint 2 - looking south-east along Willowdene Avenue - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.4 VIEWPOINT 3

Location description

Eaton Road, Luddenham, at the intersection with the proposed new alignment of The Northern Road, looking west.

Potential viewers

Residents in the eastern part of Eaton Road

Visible project elements:

- Re-alignment of Eaton Road and intersection with the proposed new alignment of The Northern Road, including cut batters
- Removal of buildings and structures
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is along a small unsealed lane, in a rural residential setting along the outskirts of Luddenham. Located along a ridge line, the landscape is open with long-distance views to the Blue Mountains and interspersed with tree cover. It has a relatively low capacity to absorb a major new road infrastructure.
Magnitude	Moderate	Much of the proposed new road alignment will be in cut, reducing the extent to which the road itself will be visible. However, the cutting would alter the topography in the view. Removal of large existing trees in Eaton Road would result in notable changes to the view, creating a more open vista until proposed vegetation establishes and matures.
Impact	High to moderate	The visual impact is assessed to be high to moderate.

VISUAL IMPACT



Figure 48: Viewpoint 3 - looking west along Eaton Road - existing



Eaton Road East
re-alignment and
t-intersection
with proposed
new alignment

New vegetation on
sections of Eaton
Road no longer used

Figure 49: Viewpoint 3 - looking west along Eaton Road - photomontage (prepared by Spatial Media)

VISUAL IMPACT

7.5 VIEWPOINT 4

Location description

St James Anglican Church Cemetery, looking south.

Potential viewers

Local community of Luddenham town centre and surrounds, including Church members and visitors, families, and descendants of deceased, local residents, and motorists along The Northern Road.

Visible project elements

- New road alignment and embankments up to nine metres tall
- Modifications to farm dams
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The picturesque outlook over the diverse rural landscape would be highly sensitive to change. The view is taken from a cemetery where viewers would be highly sensitive to change in the setting.
Magnitude	Low	The new road alignment would introduce a major new built form into a greenfield site with some sections requiring large cut and fill embankments. The oblique angle of view and the distance between the proposed new alignment and the view would reduce the extent to which it would be able to be perceived in the view. The rural landscape would continue to comprise the vast majority of the view.
Impact	Moderate	The visual impact is assessed to be moderate. The impact may reduce over time as vegetation establishes and matures, assisting the new alignment to blend into the landscape setting.

VISUAL IMPACT



Figure 50: Viewpoint 4 - Looking south from St James Anglican Church Cemetery - existing



Figure 51: Viewpoint 4 - Looking south from St James Anglican Church Cemetery - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.6 VIEWPOINT 5

Location description

Wilmington Reserve on Jamison Street, Luddenham, looking north-east into Cosgrove Valley.

Potential viewers

Local community, including residents from nearby dwellings, park users, and motorists along Jamison Street.

Visible project elements

- Bridge over Adams Road and associated embankments
- New road alignment including cut and fill embankments
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The rural landscape has a low capacity to absorb the proposed introduction of a major new road. There are a large number of viewers in Luddenham that overlook the valley, including sensitive residential and recreation users.
Magnitude	Moderate	The new bridge over Adams Road and associated embankments will introduce a large new built form in the rural landscape. They will interrupt the open view along the valley. The cutting through the hillside will visibly alter the existing topography. The distance between the viewer and the proposed new alignment reduces the scale of the upgrade in the view.
Impact	High to moderate	The visual impact is assessed to be high to moderate.

VISUAL IMPACT



Figure 52: Viewpoint 5 - looking north east from Wilmington Reserve - existing



Figure 53: Viewpoint 5 - looking north east from Wilmington Reserve - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.7 VIEWPOINT 6

Location description

Adams Road, looking west.

Potential viewers

Motorists and residents on rural properties. Residents of the area accessing Luddenham town centre for services or daily needs.

Visible project elements

- New road alignment including twin bridge over Adams Road and associated fill embankments in excess of ten metres high
- Modifications to farm dams including partial filling in
- Modifications to Cosgrove Creek including culvert, headwall and transition apron
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	This view would have low capacity to absorb the proposed changes. It is situated in a rural environment on the outskirts of Luddenham where viewers would be sensitive to change. It is characterised by the rural landscape outlook, including a series of cascading farm dams along Cosgrove Creek.
Magnitude	High	The bridge over Adams Road and associated tall embankments will constitute a major new built form, out of scale and character with the existing landscape. It would block the existing open vista along the valley floor. The introduction of the new road infrastructure would substantially alter the existing view.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 54: Viewpoint 6 - looking west along Adams Road - existing



- Adams Road bridge including central pier and throw screens
- Provision for potential future widening of Adams Road
- Fill embankments >10m high

Figure 55: Viewpoint 6 - looking west along Adams Road - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.8 VIEWPOINT 7

Location description

Private property driveway at 2,901 The Northern Road, Luddenham, looking south

Potential viewers

Residents on small farms, motorists along the proposed new road alignment

Visible project elements:

- New road alignment/ Luddenham bypass including cut and fill embankments
- VMS on the southern approach to the intersection with Elizabeth Drive
- Modifications to farm dams including partial filling in
- Modifications to Cosgrove Creek including culverts
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The elevated outlook over the picturesque rural landscape would be highly sensitive to the introduction of a major new arterial road. Rural residents would be highly sensitive to change in their surroundings.
Magnitude	High	The new road alignment would introduce a major new built form into a greenfield site, requiring large cut and fill embankments, modifications to farm dams and bisecting the property.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 56: Viewpoint 7 - looking south within 2,901 The Northern Road - existing



Figure 57: Viewpoint 7 - looking south within 2,901 The Northern Road - photomontage (prepared by Spatial Media)

VISUAL IMPACT

7.9 VIEWPOINT 8

Location description

The Northern Road, Luddenham, opposite the Park Road intersection, looking east.

Potential viewers

Motorists. Residents on rural properties. Residents of the area accessing Luddenham town centre for services or daily needs.

Visible project elements

- New road alignment including cut and fill embankments
- VMS on the southern approach to the intersection with Elizabeth Drive
- Modifications to farm dams including partial filling in
- Modifications to watercourses including culverts and headwalls
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The elevated outlook over the picturesque rural landscape would be highly sensitive to change as it has limited capacity to absorb a major new arterial road. Rural residents would be highly sensitive to change in their surroundings.
Magnitude	Low	The new road alignment would introduce a major new built form into a greenfield site, requiring large embankments of about 6 metres in height, as well as modifications to farm dams and watercourses. The scale of the changes is moderated by the distance of over 800 metres between the view and the proposed upgrade. Long-distance views would not be affected and the landscape would continue to be the major feature in the view.
Impact	Moderate	The visual impact is assessed to be moderate.

VISUAL IMPACT



Figure 58: Viewpoint 8 - looking east from The Northern Road - existing



Figure 59: Viewpoint 8 - looking east from The Northern Road - still photo from project animation (source: Spatial Media)

VISUAL IMPACT

7.10 VIEWPOINT 9

Location description

Private property driveway at 2,901 The Northern Road, Luddenham, looking west

Potential viewers

Residents on small farms, motorists along the proposed new road alignment

Visible project elements

- New road alignment/ Luddenham bypass including cut and fill embankments
- Incident response facility including roads, car parks and associated building structures
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by a rural setting of pastures, remnant trees and rural dwellings. It has limited capacity to absorb the proposed changes. Rural residents would be highly sensitive to change in their surroundings.
Magnitude	High	The new road alignment and incident response facility would introduce a large amount of new built form into a greenfield site. The view would change fundamentally.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 60: Viewpoint 9 - looking west within 2,901 The Northern Road - existing



Figure 61: Viewpoint 9 - looking west within 2,901 The Northern Road - photomontage (prepared by Spatial Media)

VISUAL IMPACT

7.11 VIEWPOINT 10

Location description

Elizabeth Drive, looking west.

Potential viewers

Local and regional motorists. Residents on rural properties.

Visible project Elements

- New Elizabeth Drive alignment including widening and changes to existing road levels
- Partial removal of boundary fence
- Vegetation clearing including inside private property
- Landscape works.

Visual impact assessment

Sensitivity	Moderate	The view is along the existing Elizabeth Drive which currently remains a two lane rural road. While motorists may be accepting of a certain amount of change within the road corridor, the road passes through a rural landscape. Remnant and planted trees as well as glimpses into adjoining farmland are important visual elements that contribute to the driver experience.
Magnitude	High	There will be notable increase in road infrastructure in this view due to road widening and re-alignment. This will change the scale and scenic quality currently experienced along the drive. In addition, large amounts of mature trees lining the road would be removed changing the outlook and spatial qualities.
Impact	High to moderate	The visual impact is assessed to be high to moderate. It may reduce somewhat over time as new vegetation establishes and matures.

VISUAL IMPACT



Figure 62: Viewpoint 10 - looking west along Elizabeth Drive - existing



Figure 63: Viewpoint 10 - looking west along Elizabeth Drive - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.12 VIEWPOINT 11

Location description

The Northern Road, roundabout at the existing Elizabeth Drive intersection, looking south.

Potential viewers

Motorists along the Northern Road. Resident from surrounding areas accessing Luddenham as the local service centre.

Visible project elements

- Removal of the existing roundabout and replacement with a left-out intersection
- New road alignment and widening of The Northern Road south of the existing Elizabeth Drive intersection
- New intersection with the re-aligned Elizabeth Drive and the existing The Northern Road
- Removal of existing dwellings and associated structures
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by a pleasant outlook over the open rural landscape. Exposed on the high plateau, the view would have a low capacity to absorb the proposed changes.
Magnitude	High	The view would undergo major change as a result of road widening, re-alignment, levelling, tree removal, and earthworks. The outlook would change from a view into rural areas to one overlooking major road infrastructure.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 64: Viewpoint 11 - The Northern Road roundabout with Elizabeth Drive looking south - existing



Figure 65: Viewpoint 11 - The Northern Road roundabout with Elizabeth Drive looking south - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.13 VIEWPOINT 12

Location description

2,776 The Northern Road, Luddenham, looking west.

Potential viewers

Motorists. Residents in surrounding rural areas travelling along The Northern Road to Penrith or to access the local centre at Luddenham.

Visible project elements

- Widening of The Northern Road including additional lanes, shared path, level changes and associated earthworks
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is located along one of the most scenic sections of The Northern Road. It affords long-distance views over farmland and dams towards the Blue Mountains. These views are shared by residents in adjoining rural properties. They would be sensitive to changes in the outlook.
Magnitude	Moderate	The upgrade would fundamentally alter the existing scale and character of The Northern Road. It would result in a large increase in road infrastructure, more than doubling the existing road width, thereby increasing the prominence of the road infrastructure in the view. The panoramic outlook and background would not be affected.
Impact	High to moderate	The visual impact is assessed to be high to moderate.

VISUAL IMPACT



Figure 66: Viewpoint 12 - looking west from 2,776 The Northern Road - existing



Figure 67: Viewpoint 12 - looking west from 2,788 The Northern Road - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.14 VIEWPOINT 13

Location description

The Northern Road, adjoining 2-18 Littlefields Road, Luddenham, looking south-east.

Potential viewers

Motorists. Residents in surrounding rural areas travelling along The Northern Road to Penrith or to access the local centre at Luddenham.

Visible project elements

- Widening of The Northern Road including additional lanes, shared path, level changes and associated earthworks
- VMS on the southern approach to the intersection with Elizabeth Drive
- Land acquisition/ conversion of farm land to arterial road corridor
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is located along one of the most scenic sections of The Northern Road. The road is currently a two lane rural road along pastures separated from the road by a line of trees. The view has relatively little capacity to absorb the proposed changes and residents in adjoining rural properties would be sensitive to changes in the visual environment.
Magnitude	High	The upgrade would fundamentally alter the existing scale and character of The Northern Road in this view. It would result in a large increase in road infrastructure, more than doubling the existing road width into areas of existing pasture. It would replace the outlook over pastures with a major arterial road. New variable message sign would be a large built structure that would be inconsistent with the surrounding rural environment.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 68: Viewpoint 13 - looking south-east along The Northern Road from 2-18 Littlefields Road - existing (image supplied by Roads and Maritime)



Figure 69: Viewpoint 13 - looking south-east along The Northern Road from 2-18 Littlefields Road - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.15 VIEWPOINT 14

Location description

Gates Road, Luddenham, looking west

Potential viewers

Residents in the rural residential cluster along Gates Road.

Visible project elements

- Widening, re-grading and re-alignment of Gates Road
- T-intersection with the new link road connecting Littlefields Road to Gates Road
- Upgrade of the intersection with The Northern Road including widened verges
- Cut and fill embankments
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is along the existing small rural road. It would be seen by residents in the rural living cluster along Gates Road. These residents are likely to be sensitive to changes in their visual environment. The adjoining rural landscape including tree cover framing the road are important visual elements and have a low capacity to absorb major changes.
Magnitude	High	The construction of the new link road through a greenfield site, widening and regrading of Gates Road and associated tree and shrub removal would result in notable changes to the view. Place a greater focus on the road infrastructure in the view. It would change the existing character of Gates Road, increase road infrastructure and remove a large amount of vegetation.
Impact	High	The visual impact is assessed to be high. It may reduce somewhat over time as vegetation establishes and matures.

VISUAL IMPACT



Figure 70: Viewpoint 14 - looking west along Gates Road - existing



Figure 71: Viewpoint 14 - looking west along Gates Road - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.16 VIEWPOINT 15

Location description

2,567 The Northern Road, Mulgoa, looking north.

Potential viewers

Motorists. Adjoining rural residents as well as residents in surrounding rural areas travelling along The Northern Road.

Visible project elements

- Widening of The Northern Road including additional lanes, depressed median, shared path, level changes and associated earthworks
- Changes to property and access arrangements of existing private dwelling
- VMS on the approach to the northbound heavy vehicle inspection area at Grover Crescent
- Land acquisition/ conversion of small rural holdings land to arterial road corridor
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by the mix of rural dwelling, remnant vegetation and glimpses of the Blue Mountains. The Northern Road itself is a two-lane rural road that is subservient to the larger landscape setting. The view has relatively little capacity to absorb the proposed changes and residents in adjoining rural properties would be sensitive to changes in the visual environment.
Magnitude	High	The upgrade would fundamentally alter the existing scale and character of The Northern Road in this view. It would result in a large increase in road infrastructure, more than doubling the existing road width. Large fill batters would extend into areas of small rural holdings. The variable message sign would be a large built structure that would be inconsistent with the surrounding rural environment.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 72: Viewpoint 15 - looking north from 2,567 The Northern Road - existing
(image supplied by Roads and Maritime)



VMS on approach
to north-
bound vehicle
inspection area

North-bound
carriageway

Figure 73: Viewpoint 15 - looking north from 2,567 The Northern Road - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.17 VIEWPOINT 16

Location description

Corner of Longview and Vineyard Roads, looking north

Potential viewers

Residents of Vineyard Road

Visible project elements

- Extension of Vineyard Road to connect to Kings Hill Road through the existing unmade road reserve, associated earthworks
- T-intersection with Longview Road, including upgrades to Longview Road and Vineyard Road on the approach to the intersection such as re-grading, widened shoulders and earthworks
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The natural vegetated setting of the unmade road reserve has a low capacity to absorb new road infrastructure. Rural residents are likely to be sensitive to changes in the visual environment.
Magnitude	High	The extension of the road would change the view from a setting dominated by pasture and remnant vegetation to looking along a new road. Removal of mature trees along the boundary with 23-33 Longview Road would further change the outlook and open up views into the private property.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 74: Viewpoint 16 - looking north along Vineyard Road - existing



Figure 75: Viewpoint 16 - looking north along Vineyard Road - photomontage
(supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.18 VIEWPOINT 17

Location description

Grover Crescent, Mulgoa, looking south.

Potential viewers

Residents of Grover Crescent.

Visible project elements

- Upgrade of Grover Crescent including a new carriageway at the southern end and a new left-in only entrance from The Northern Road
- Widening of The Northern Road including additional lanes, depressed median, shared path, level changes and associated earthworks
- Upgrade of the intersection of The Northern Road with Kings Hill Road
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by an existing informal road providing access to a small rural residential cluster. Remnant and planted trees provide important elements in the view. Residents are likely to be sensitive to changes in the visual environment.
Magnitude	High	The extent and scale of formal road infrastructure will increase notably in this view. Widening of The Northern Road itself would be difficult to perceive due to the angle of the view. However, associated earthworks and removal of trees currently framing and terminating the view will be highly noticeable changes.
Impact	High	The visual impact is assessed to be high. It may reduce somewhat over time as vegetation establishes and matures.

VISUAL IMPACT



Figure 76: Viewpoint 17 - looking south along Grover Crescent - existing



Figure 77: Viewpoint 17 - looking south along Grover Crescent - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.19 VIEWPOINT 18

Location description

Defence Establishment Orchard Hills, opposite 2,359-2,365 The Northern Road, Mulgoa, looking south.

Potential viewers

Motorists. Adjoining rural residents as well as residents in surrounding rural areas travelling along The Northern Road.

Visible project elements

- Widening of The Northern Road including additional lanes, depressed median, shared path, level changes and associated earthworks
- Boundary adjustments at the Defence Establishment/ conversion of Defence land to arterial road corridor
- VMS on the approach to the southbound heavy vehicle inspection area south of Longview Road
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by a mix of woodland remnants and open pasture at the interface to the DEOH, and small rural holdings to the west. The Northern Road itself is a two-lane rural road that is subservient to the larger landscape setting. The view is generally open and has little capacity to absorb the proposed changes. Residents in adjoining rural properties would be sensitive to changes in the visual environment.
Magnitude	High	The upgrade would fundamentally alter the existing scale and character of The Northern Road in this view. It would result in a large increase in road infrastructure, more than doubling the existing road width. The variable message sign would be a large built structure that would be inconsistent with the surrounding rural environment.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 78: Viewpoint 18 - DEOH looking south from the western side of The Northern Road - photomontage - existing



Figure 79: Viewpoint 18 - DEOH looking south from the western side of The Northern Road - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.20 VIEWPOINT 19

Location description

The Northern Road, Luddenham, opposite the IGA supermarket, looking south.

Potential viewers

Motorists. Shoppers at IGA Luddenham and patrons of the Shell Service Station. Residents in surrounding rural areas travelling along The Northern Road.

Visible project elements

- Re-alignment of the existing The Northern Road and new t-intersection with the proposed new alignment including additional lanes, depressed median, shared path, level changes and associated earthworks
- Proposed new alignment of The Northern Road including fill embankments up to in excess of eight metres tall
- Extension of Eaton Road and new t-intersection with the re-aligned The Northern Road
- Partial infilling of farm dam
- Vegetation clearing
- Landscape works.

Visual impact assessment

Sensitivity	High	The view is characterised by gentle rural valley comprised of a mix of woodland remnants and open pasture, west of the existing The Northern Road. The foreground of the view is open. As a result it has little capacity to absorb the proposed changes. Residents in Luddenham town centre and from adjoining rural properties would be sensitive to changes in the visual environment.
Magnitude	High	The re-alignment of Eaton Road and of the existing The Northern Road, combined with road widening and the new road alignment through the rural valley at the southern perimeter of Luddenham town centre, will fundamentally alter this view, replacing the rural setting with large road infrastructure.
Impact	High	The visual impact is assessed to be high.

VISUAL IMPACT



Figure 80: Viewpoint 19 - looking south from The Northern Road near Luddenham IGA - existing



Figure 81: Viewpoint 19 - looking south from The Northern Road near Luddenham IGA - photomontage (supplied by Roads and Maritime, prepared by Spatial Media)

VISUAL IMPACT

7.21 VISUAL IMPACT ASSESSMENT SUMMARY

A total of 19 viewpoints form the basis of the visual impact assessment. The viewpoints are generally focused on locations that will be commonly viewed by the local community. It is generally anticipated that the viewpoints selected will provide for an even range of magnitude and sensitivity impact ratings.

Out of the 19 selected viewpoints, the range of visual impact ratings were determined to be the following:

- 12 viewpoints would have high visual impact
- 4 viewpoint would have high to moderate visual impact
- 3 viewpoints would have moderate visual impact.

Ratings of high and high to moderate impacts occur in areas where the landscape is the dominant or major element in the view and has limited capacity to absorb the proposed changes, where potential viewers are likely to have a high level of sensitivity to change, and where the magnitude of the works is both large and readily noticed, based on proximity to the viewer.

The moderate ratings occur in areas of lower sensitivity, for example in settings where infrastructure is already the predominant visual element, or where the distance between the viewer and the proposed changes is large, making it difficult to perceive the changes.

The assessment indicates that the proposed upgrade of The Northern Road would have a high visual impact on two thirds of the assessed views. Remaining visual impacts would be in the high to moderate and moderate range, indicating that the project would notably affect the views and visual qualities within the study area.

Based on this assessment a series of visual impact mitigation measures have been identified. They are discussed in the following chapter:

Viewpoint	Visual sensitivity	Magnitude of visual effect	Overall rating of visual impact
1	M	M	M
2	H	H	H
3	H	M	HM
4	H	L	M
5	H	M	HM
6	H	H	H
7	H	H	H
8	H	L	M
9	H	H	H
10	M	H	HM
11	H	H	H
12	H	M	HM
13	H	H	H
14	H	H	H
15	H	H	H
16	H	H	H
17	H	H	H
18	H	H	H
19	H	H	H

VISUAL IMPACT

7.21.1 Summary of impacts on Commonwealth land

The majority of potential visual impacts to Commonwealth land would occur as a result of proposed works within or immediately adjacent to the Western Sydney Airport, around Willowdene Avenue and within or immediately adjacent to the DEOH.

Potential construction related impacts are generally temporary and were discussed in **section 6**.

Potential visual impacts during operation of the project generally relate to changes to existing views as demonstrated in the viewpoint assessment. Impacts to Commonwealth land would include the following:

- The high visual impact identified for viewpoint 18 would effect views to and from the adjacent DEOH
- The moderate and high visual impacts identified for viewpoints 1 and 2 respectively would effect views to and from the site of the Western Sydney Airport
- The high visual impact identified for viewpoint 2 would also effect views in relation to the parcels of Commonwealth land at Willowdene Avenue.

This would result in long-term impacts to Commonwealth land during operation of the project. Visual impacts would be minimised through the implementation of the mitigation measures outlined in **section 8**. **Section 8** also provides a discussion of residual impacts following implementation of the mitigation measures.

VISUAL IMPACT

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8. MITIGATION STRATEGY

The aim of the mitigation strategy is to realise the engineering and performance objectives of the proposed upgrade while producing a design outcome that produces good urban design outcomes and has a high visual quality.

Therefore a range of mitigation measures are recommended for incorporation into the project. These measures combine with the urban concept design to develop a solution that maximises the protection of the existing visual values and landscape character of The Northern Road and adjoining areas. Mitigation measures may be considered under two categories:

- **Primary mitigation measures** are embedded in the design of the proposed works through an iterative process between the engineering and urban design teams. This form of mitigation is generally the most effective
- **Secondary mitigation measures** are designed to specifically address the remaining (residual) adverse effects arising from the proposed works.

8.1 MITIGATION TO BE INCORPORATED IN DETAILED DESIGN

Complementing the urban design for the project described in **section 5**, the following outlines additional measures to be considered during the detailed design phase. They have been developed in accordance with the urban design objectives and principles in **section 4**, and are aimed at further reducing the identified landscape character and visual impacts from **section 6** and **section 7**.

Road design

- Consider relocating the proposed north-bound heavy vehicle inspection area away from the rural residential cluster in Grover Crescent, to maintain residential amenity and minimise noise, exhaust and light pollution for adjoining residents
- Review road design levels to ensure residents' views to the Blue Mountains are maintained
- Investigate opportunities for localised increases in batter steepness to reduce the corridor footprint and to maximise retention of remnant vegetation and farm dams
- Review typical road sections and reduce the median widths, where possible based on geometric constraints and potential for future widening, to reduce the overall footprint of the corridor, while maintaining sufficient median width for vegetation
- Review the lengths of concrete nosings at intersections to minimise their lengths. Maximise soft landscaping in the median on the approaches to intersections using appropriate frangible and low-growing species to provide for sight lines
- Review the allocation and placement of the utility corridors to ensure they do not inhibit vegetation, in particular the provision of tree cover, along the corridor
- Review the design for opportunities to mitigate level changes through the median to reduce the extent of earthworks required and associated impacts on views and vegetation.

Access and connectivity

- Review the design to ensure access to residual lands particularly between The Northern Road and the Western Sydney Airport, where there are no current provisions
- Consider access to employment lands in the detailed design phase, including for pedestrians and cyclists

MITIGATION STRATEGY

- Investigate the feasibility and desirability of a shared path link along the existing The Northern Road to Luddenham, to provide a connection from the proposed new alignment to Luddenham town centre. This applies to both intersections with the Luddenham bypass. The proximity of the town centre from the southern intersection, combined with re-alignment of the existing The Northern Road provides a major opportunity to provide such a link as part of detailed design.
- Review the design to ensure it does not prevent the creation of future pedestrian and cycle links along the creek system in accordance with the principles of the *Sydney Green Grid*. In particular Badgerys Creek is planned to run through planned urban residential areas where it has the potential to function as an open space, recreation and ecological corridor.

Public domain and private recreation areas

- In consultation with the club, design adjustments to the Orchard Hills Golf Course to maintain existing functionality and PAR levels.

Lighting

- Design temporary and permanent lighting in accordance with Australian Standard *AS1158 Lighting for roads and public spaces* (AS1158) and to avoid unnecessary light spill on adjacent residents or sensitive receivers.

Bridges

- Review the structural design of the bridge to provide an elegant form
- Consider increasing the length of the bridge over Adams Road to span over Cosgrove Creek to maintain the integrity of the creek system and the character of the valley with a series of cascading dams along a natural watercourse
- Review the road design to provide a safety barrier between the carriageway and the shared path.
- Design the bridge and potential future widening of Adams Road to allow for tree planting in a central median and behind safety barriers on the approach to the bridge pier, in order to mitigate the scale and bulk of the bridge structure.

Drainage design

- Review the drainage design to minimise hard structures. Integrate WSUD and maximise soft landscape solutions to drainage channels and swales to maximise ecological outcomes and protect the water quality of major creeks
- Minimise the extent of infill of existing farm dams to retain them as essential features of the rural landscape.

Biodiversity

- Investigate opportunities to provide a fauna crossing to support existing riparian and ecological corridors in the Duncans Creek catchment
- Review the design of bridges and culverts as fish friendly crossings and ensure that they do not create barriers to fish and that impacts to the existing hydrology are minimised
- Ensure replacement or reinstatement of habitat in accordance with Roads and Maritime *Biodiversity Guidelines*, to maximise creek restoration vegetation to ecological corridors
- Enhance and restore native vegetation communities along watercourses. Ensure appropriate riparian buffers are provided for waterways and streams, in accordance with the *Biodiversity Assessment Report* (Appendix I of the EIS). Integrate the use of excess local materials such as rock and timber to help recover biodiversity and create habitat.

MITIGATION STRATEGY

Landscape and vegetation

- Review the engineering design to minimise the removal of existing vegetation within the proposed construction boundary and maximise reinstatement of native vegetation through use of appropriate species
- If the north-bound heavy vehicle inspection area near Grover Crescent cannot be re-located, investigate opportunities to provide additional visual screening to maximise residential amenity and privacy.

8.2 MITIGATION DURING CONSTRUCTION

The following mitigation measures are recommended for implementation during construction:

- Contain construction activities within the construction works zone boundary and occupy the minimum area practicable for limit impacts on adjoining areas, including the extent of native vegetation clearing
- Consider the provision of barriers to screen views from visually sensitive nearby areas such as rural dwellings, residential and recreational areas
- Construction programming must show how progressive rehabilitation of disturbed areas will be undertaken to minimise the duration and extent of temporary visual and landscape character impacts and to minimise soils exposure and the potential for erosion and dust generation
- Existing trees to be retained within construction areas are to be identified, protected and maintained in accordance with Australian Standard *AS4970 Trees on Development Sites* (AS4970), or as otherwise directed by a qualified ecologist or arborist
- The design of temporary lighting must avoid unnecessary light spill on adjacent residents or sensitive receivers and be designed in accordance with *AS1158*.

8.3 RESIDUAL IMPACTS

The residual impacts are those landscape character and visual impacts which remain after the proposed mitigation measures have been implemented.

This has been assessed both during the construction period and during the design year. The design year is typically taken to be ten to 15 years after the project has been opened to normal operation. By this time the landscape works are deemed to have reached a level of maturity that allows them to perform according to original design objectives and intent.

Irrespective of the mitigation measures and the degree to which they are implemented, the proposed upgrade will result in substantial changes to the landscape and visual character of the area surrounding the project.

While some of the changes will appear less severe over time as proposed vegetation establishes and matures, the project will result in the following long-term irreversible residual impacts:

- Alterations to the topography as a result of the required earthworks
- Filling in of farm dams and disruptions to creeks as ecological corridors through the introduction of culverts which will alter the rural outlook and natural systems long term

- The loss of views as a result of earthworks and other structures associated with the proposed upgrade (it is noted that the project would also create opportunities for new views not currently available to the general public)
- The scale of the proposed upgrade itself as a major arterial through a rural landscape including previous greenfield sites
- The introduction of lighting along the proposed upgrade will persist long-term and is required to support the safe functioning of the road.

Based on the above, the identified landscape character and visual impacts would not substantially reduce over time. That is they will remain

- In the moderate to high range for landscape character impacts
- In the moderate to high range for visual impacts.

While the impacts themselves would not reduce over time, it is likely that the perception of the severity of the impacts may reduce, as people gradually adjust to the changes in their visual environment.

Residual impacts in the context of planned land use changes

An essential part of the environmental assessment process is the consideration of known planning proposals. Of these, the planned changes for western Sydney as outlined in *A Plan for Growing Sydney* are a relevant consideration, in particular planning for the SWPGA and WSPGA.

That is, the proposed upgrade is a direct result of the WSIP that itself aims to support future growth and land use changes in the area by integrating transport in the region. The SWPGA and WSPGA will see the area south of Elizabeth Drive and east of the upgraded The Northern Road become progressively urbanised including for employment lands and the Western Sydney Airport.

The identified landscape character and visual impacts are based on the currently predominantly rural setting. Once the landscape surrounding the project transforms into an urban setting, the visual and landscape character contrast between the upgraded road and surrounding areas would reduce. As a result, the project would appear less 'out of place', reducing the severity of the landscape character and visual changes over time. That is, the identified landscape character impacts for LCZ 2 and 3 may reduce to moderate. In LCZs that would continue to have a rural interface, i.e. LCZ 1, 4 and 5, the landscape character impact would continue to remain in the moderate to high range.

Similarly, in the context of urbanisation, the visual impacts on views 3, 5-11 may reduce to range from low to moderate to high to moderate. The visual impacts on remaining views would remain in the moderate to high range.

9. CONCLUSION

The proposed upgrade extends from Mersey Road in Bringelly to Glenmore Parkway in Glenmore Park, a total length of about 16 kilometres.

The southern part of the study area is located in an area earmarked for substantial change through transformation of large tracts of land from rural to urban uses that include the Western Sydney Airport, employment lands in the Western Sydney Priority Growth Area and town centres and residential lands in the South West Priority Growth Area.

Areas to the west of the upgraded The Northern Road and north of Elizabeth Drive are planned to remain part of the Metropolitan Rural Area.

This contrast will characterise the journey along The Northern Road in both a north-south and east-west direction. It will become the defining feature of the landscape and visual character of the study area. It represents a unique opportunity to inform the urban design for the proposed works.

The scenic and landscape values of Orchard Hills are considered to be of considerable importance. They are well documented and reflected in current planning instruments and policies. The Northern Road itself is a designated tourist route with unique views towards the Blue Mountains. There is therefore a need to ensure the project retains and contributes to these values through careful design that integrates the upgraded corridor with the existing environment.

The project crosses five distinct landscape character zones and seeks to support the planned land use changes that will themselves lead to a transformation of the landscape character and visual qualities of the area in order to meet identified community needs over the next 20 to 25 years.

The project represents one of the first steps in this transformation and the identified visual and landscape character impacts will be highly noticeable in an area that as yet retains its rural character:

It would introduce a number of elements into the study area including:

- Widened carriageway including widened carriageways surface and depressed central medians, to provide between six and eight travelling lanes including two dedicated bus lanes
- A new road alignment to diver The Northern Road around the site of the Western Sydney Airport and as a bypass around Luddenham town centre.
- Upgrades to existing intersections including new traffic lights and turning lanes, u-turn facilities and new local link roads
- Earthworks including areas of substantial fill and cut
- A new bridge over Adams Road
- Modifications to existing creeks and water ways through the introduction of culverts under the road corridor and extensive infilling of farm dams
- Provision for shared paths and additional pedestrian footways.

These elements affect the existing character of the road, and surrounding areas, with landscape character impacts varying from moderate to high. These elements also alter existing views in the area. The assessment has found that the vast majority of views assessed would experience a high or high to moderate visual impact as a result of the project.

Based on these findings a series of visual impact mitigation measures have been identified. They build on the urban design objectives and principles that were developed in response to the analysis of the study area and Roads and Maritime policy. Implementation of the mitigation strategy will assist with

CONCLUSION

the integration of the project with the surrounding context, taking into account the planned land use changes.

Based on the nature of the project, some landscape character and visual impacts will not be avoided or ameliorated through mitigation measures, resulting in the following long-term residual impacts:

- Alterations to the topography
- Loss of farm dams and disruptions to creeks as ecological corridors
- Loss of views and vistas
- The proposed upgrade itself as a major arterial through a rural landscape including greenfield areas
- An increase in light levels along the route, with the potential for spill.

While landscape and mitigation measures may assist the integration of the project with surrounding areas and people may adjust to the landscape character and visual changes, the impacts themselves are not likely to significantly reduce over time, especially in those areas retaining a large rural component or situated at the interface with rural lands.

On the other hand, the area south of Elizabeth Drive and east of the upgraded The Northern Road is earmarked for significant land use changes. They are planned to become progressively urbanised including for employment lands and the Western Sydney Airport.

In these areas the contrast between the upgraded road and surrounding areas will reduce over time, with the effect of reducing the long-term landscape character impacts.

Throughout the project area, the proposed mitigation measures seek to integrate the proposed upgrade with the existing landscape while taking into account planned changes to maximise the long-term fit of the project within its setting.

The refinement of the engineering concept design based on the urban design principles and mitigation measures will help achieve the desired future character of the The Northern Road and maximise the fit of the proposed upgrade within the context of a changing landscape, while providing for safe and efficient travel both along and across the corridor.

10. References

- Busways 2015, *Greater Western Sydney Bus Network Map - Effective 29 November 2015*, Busways, Gordon NSW 2072
- CFUD 2012, *Bridge Aesthetics. Design guideline to improve the appearance of bridges in NSW*, prepared by the Roads and Maritime Services Centre for Urban Design, Transport for NSW, Chippendale, NSW 2008
- CFUD 2014, *Beyond the Pavement. Urban Design Policy Procedures and Design Principles*, prepared by the Roads and Maritime Services Centre for Urban Design, Transport for NSW, Chippendale, NSW 2008
- Commonwealth of Australia 2016, *Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies*, Attorney General's Department, Robert Garran Offices, National Circuit, Barton ACT 2600
- Cox Richardson 2015, *Draft South Western Sydney Urban Design Strategy*, prepared for Roads and Maritime Services, November 2015, Sydney
- DP+E 2014, *A Plan for Growing Sydney*, <http://www.planning.nsw.gov.au/Plans-for-Your-Area/Sydney/A-Plan-for-Growing-Sydney>, accessed 29 March 2016, Department of Planning + Environment, Sydney, NSW.
- DIRD 2015, *Western Sydney Airport. Draft Airport Plan*, prepared by Department of Infrastructure and Regional Development, Commonwealth of Australia, Canberra, ACT
- Jacobs 2016a, *Liverpool Council. Upgrade of The Northern Road. MR 154 -The Northern Road. From Jamison Road to Mersey Road. Stage 4 South. Road Alignment And Drainage Design Reference Design Drawings, Revision A, issued 09.03.16*, prepared for Roads and Maritime Services
- Jacobs 2016b, *Penrith City Council. Upgrade of The Northern Road. MR 154 -The Northern Road. Between Littlefields Road and Glenmore Parkway. Stage 5. Drainage and Utilities Design. Reference Design, Revision A, issued 04.07.16*, prepared for Roads and Maritime Services
- Jacobs 2016c, *Penrith City Council. Upgrade of The Northern Road. MR 154 -The Northern Road. Between Eaton Road and Littlefields Road. Stage 6. Road and Drainage Design. Reference Design, Revision A, issued 10.06.16*, prepared for Roads and Maritime Services
- Roads and Maritime Services 2013, *Environmental Impact Assessment Practice Note. Guideline for Landscape Character and Visual Impact Assessment. EIA-N04*, Roads and Maritime Services Centre for Urban Design, Transport for NSW, Chippendale, NSW 2008
- Penrith City Council 2014, *Penrith Development Control Plan 2014. E10 Orchard Hills*, Penrith City Council, Penrith NSW 2750
- Penrith City Council 2010, *Penrith Local Environmental Plan 2010*, NSW Legislation, <http://www.legislation.nsw.gov.au/maintop/view/inforce/epi+540+2010+cd+0+N>, accessed 17 March 2016
- Roads and Maritime Services 2015, *Western Sydney Infrastructure Plan. Delivering for growth, easing congestion and connecting communities*, Roads and Maritime Services, Transport for NSW, Chippendale NSW 2008

- Roads and Maritime Services 2016, *Western Sydney Infrastructure Plan*, <http://www.rms.nsw.gov.au/projects/sydney-west/infrastructure-plan/index.html>, accessed 29 March 2016, Roads and Maritime Services, Transport for NSW, Chippendale NSW 2008
- Roads and Maritime Services 2016, *The Northern Road Upgrade*, <http://www.rms.nsw.gov.au/projects/sydney-west/bringelly-the-northern-road-upgrade/index.html>, accessed 10 March 2016, Roads and Maritime Services, Transport for NSW, Chippendale NSW 2008
- Roads and Maritime Services 2016b, *The Northern Road Upgrade Stage 4. Between Mersey Road, Bringelly and Littlefields Road, Luddenham. February 2016*, Roads and Maritime Services, Transport for NSW, Chippendale NSW 2008
- RTA 2015, *Northern Road CPoM. Urban design considerations for The Northern Road from Narellan to Bringelly. DRAFT 1.5 November 2005*, prepared by RTA Urban Design Section, Surry Hills, NSW 2010.
- Spackman Mossop Michaels 2011, *South West Growth Centre Road Network Strategy*, prepared for Roads and Maritime Services, Transport for NSW, Chippendale, NSW 2008

