

CABRAMATTA LOOP PROJECT

TECHNICAL REPORT

TECHNICAL REPORT 10 —
LANDSCAPE AND VISUAL
IMPACT ASSESSMENT



Australian Rail Track Corporation
Cabramatta Loop Project
Environmental Impact Statement
Technical Report 10 – Landscape and Visual
Impact Assessment

August 2019

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Terminology and Abbreviations

The following section describes terminology and abbreviations used in this report.

Terminology	Description
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
Rail alignment	The exact positioning of the track, accurately defined both horizontally and vertically, along which the rail vehicles operate.
Rail corridor	The corridor within which the rail tracks and associated infrastructure would be located.
Passive Recreation	Activities such as walking or wildlife observation.
Project	The construction and operation of the Cabramatta Loop.
Project site	Refers to the area that would be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the location of construction activities, compounds and work sites, and the location of permanent operational infrastructure.
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.
Sensitive receiver	Land uses, and people that are sensitive to potential noise, vibration, air and visual impacts, such as residential dwellings, schools and recreation areas.
Study area	The study area is defined as the wider area including and surrounding the project site, with the potential to be directly or indirectly affected by the project (eg by noise and vibration, visual or traffic impacts). The actual size and extent of the study area varies according to the nature and requirements of each assessment and the relative potential for impacts
Zone of theoretical visibility	A Zone of Theoretical Visibility is the area around a designated point in the landscape from which that point is theoretical visible.
Abbreviation	Description
ARTC	Australian Rail Track Corporation
CPTED	Crime Prevention Through Environmental Design
DFSI	Department of Finance, Services and Innovation
DPE NSW	Department of Planning and Environment New South Wales
EIS	Environmental impact statement
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
LEP	Local Environmental Plan
GIS	Geographic Information Systems
LCZ	Landscape Character Zone
LGA	Local Government Area
LIEMA	Landscape Institute and Institute for Environmental Management and Assessment
LPI NSW	Land and Property Information New South Wales
LVIA	Landscape and Visual Impact Assessment
NWPS	National Parks and Wildlife Service New South Wales
NSW	New South Wales

Terminology	Description
OHW	Overhead Wire
SEARs	Secretary's Environmental Assessment Requirements
SSFL	Southern Sydney Freight Line
ZTV	Zone of Theoretical Visibility

Executive Summary

This technical report has been prepared to accompany the environmental impact statement (EIS) to support the application for the approval of the Cabramatta Loop Project. The project proposes to construct and operate a passing loop for 1,300 metre length for trains on the Southern Sydney Freight Line (SSFL) between Sydney Trains' Cabramatta and Warwick Farm stations.

GHD was commissioned to undertake a landscape and visual impact assessment to accompany the EIS. This report considers the landscape and visual impacts of the project, based on the landscape concept undertaken as part of the reference design, and addresses the relevant SEARs for the EIS as outlined in Table 1.1. The assessment included review of relevant legislation, consideration of the existing conditions, development of urban design principles and objectives and an impact assessment to determine the significance of impact as a direct result of the project. The report identifies the recommended mitigation measures for detailed design, and construction phases of the project to avoid, reduce, remedy or offset the identified impacts.

A preliminary analysis was undertaken for the landscape and visual impact assessment which informed the development of the urban design principles and objectives outlined in section 5.2. The detailed landscape and visual impact assessment was commenced and an iterative process undertaken to assist in the refinement and development of the design. This design process informed the development of the landscape concept which then formed part of the project description. The resulting landscape and visual impact assessment took the landscape concept into consideration.

A study area for the landscape and visual impact assessment was established based on the scale of the project, a desktop study of the existing environment and a site inspection.

The desktop study of geology, hydrology, soils, land use, topography, vegetation and cultural heritage, and the site inspection informed the definition of the landscape character zones within the study area. Five landscape character zones were identified within the study area these included Transport Corridor, Residential, Commercial/light industrial, Passive recreation and Active recreation.

To address the SEARs, the potential impacts on the landscape and visual environment were assessed on the five identified landscape character zones and from five publically accessible viewpoints. The impact assessment found that the most significant impacts occurred within close proximity to the project along Broomfield Street, at the Cabramatta Creek crossing and within Jacquie Osmond Reserve. The impacts were generally greater during construction than operation, this is due to the temporary nature of the construction impacts.

Recommended mitigation measures proposed for the detailed design and construction stages of the project were developed in response to the identified impacts, legislation and policy objectives, the urban design principles and objectives, the landscape concept and the Arboricultural assessment (Appendix B).

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1. Introduction

1.1 Overview

Australian Rail Track Corporation (ARTC) proposes to construct and operate a passing loop for up to 1,300 metre length trains on the Southern Sydney Freight Line (SSFL) between Sydney Trains' Cabramatta and Warwick Farm stations. The Cabramatta Loop Project ('the project') would allow freight trains to pass and provide additional rail freight capacity along the SSFL.

The project is State significant infrastructure in accordance with Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). As State significant infrastructure, the project needs approval from the NSW Minister for Planning and Public Spaces.

This report has been prepared to accompany the environmental impact statement (EIS) to support the application for approval of the project, and address the environmental assessment requirements of the Secretary of the Department of Planning and Environment (the SEARs), issued on 17 May 2018.

1.2 The project

1.2.1 Location

The project is generally located within the existing rail corridor between the Hume Highway and Cabramatta Road East road overbridges in the suburbs of Warwick Farm and Cabramatta. In addition, the project includes works to Broomfield Street adjacent to the rail corridor in Cabramatta.

The rail corridor is owned by the NSW Government (RailCorp) and leased to ARTC.

The location of the project is shown in Figure 1.1.

1.2.2 Key features

The key features of the project include:

- New rail track – providing a 1.65 kilometre long section of new track with connections to the existing track at the northern and southern ends
- Track realignment – moving about 550 metres of existing track sideways (slewing) to make room for the new track
- Bridge works – constructing two new bridge structures adjacent to the existing rail bridges over Sussex Street and Cabramatta Creek
- Road works – reconfiguring Broomfield Street for a distance of about 680 metres between Sussex and Bridge streets.

Ancillary work would include communication upgrades, works to existing retaining and noise walls, drainage work and protecting/relocating utilities. In addition, minor works in the form of new signalling would be installed at a number of locations within the rail corridor (indicative locations provided in the EIS).

The key features of the project are shown in figure 3.1. Further information on the project is provided in the EIS.



Figure 1.1 Location of the project

1.2.3 Timing

Subject to approval of the project, construction is planned to start in early 2021, and is expected to take about two years. Construction is expected to be completed in early 2023.

It is anticipated that some features of the project would be constructed while the existing rail line continues to operate. Other features of the project would need to be constructed during programmed weekend rail possession periods when rail services along the line cease to operate. Possession periods typically occur for 48 hours four times per year.

1.2.4 Operation

The project would operate as part of the SSFL and would continue to be managed by ARTC. ARTC is not responsible for the operation of rolling stock. Train services are currently, and would continue to be, provided by a variety of operators.

Following the completion of works, the existing functionality of Broomfield Street would be restored, with one travel lane in each direction, kerb side parking of both sides and a shared path on the western side of the street.

1.3 Purpose and scope of this report

The purpose of this report is to provide a landscape and visual impact assessment (LVIA) for the potential impacts from the operation and construction of the project. This LVIA addresses the relevant SEARs for the EIS as outlined in Table 1.1, as well as other recommendations identified in Table 1.2.

The report:

- reviews the relevant existing information and statutory requirements
- assesses the existing landscape and visual environment
- analyses impacts during construction and operation of the project on visual environment
- provides safeguard and mitigation measures to address potential impacts.

Table 1.1 SEARs relevant to this assessment

Requirements	Where addressed in this report
3 (2) Assessment of Key issues	
1. For each key issue the Proponent must:	Section 6.1 and 7.1
(a) describe the biophysical and socio-economic environment, as far as it is relevant to that issue	
(b) Describe the legislative and policy context, as far as it is relevant to the issue	Section 4
(c) Identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts	Section 6.3 and 7.2
(d) Demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies)	Refer to the EIS Chapter 17
(e) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant)	Section 8

Requirements	Where addressed in this report
13. Urban design & Visual Amenity	
1. The Proponent must:	Section 3 Section 5 Section 7
(a) identify the urban design and landscaping aspects of the project and its components (including noise barriers and shared pedestrian paths);	
b) Assess the impact of the project on the urban and natural fabric	Section 5 Section 7
c) Explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape.	Section 5 Section 8
d) Identify urban design strategies and opportunities to enhance healthy, cohesive and inclusive communities.	Section 3 Section 8
e) Opportunities to offset visual impacts from the loss of trees along Broomfield Street such as incorporating greening initiatives on street facing infrastructure (i.e. noise barrier)	Section 3 Section 8
2. The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project would respond to the visual impacts.	Section 7 Appendix A

Table 1.2 Fairfield City Council recommendations relevant to this assessment

Requirements	Where addressed in this report
Graffiti management on the new sound wall should be of a high standard; it is currently poor.	Section 8
All creek banks (riparian zone) should be revegetated with native species of local significance from the endangered ecological vegetation community of River Flat Eucalypt or River Flat Forest, sourced from Fairfield City Council's Local Community Nursery	Not applicable. No vegetation is proposed to be removed from creek banks. Revegetation adjacent to Cabramatta Creek will be as per the landscape concept described in section 3
Revegetation should be undertaken in accordance with council requirements (as outlined in the letter), including council approval of the vegetation management plan, proposed landscape plan and species list	Section 8

1.4 Structure of this report

The structure of the report is outlined below.

- Section 1: Introduction– provides an introduction to the report
- Section 2: Methodology – describes the methodology for the assessment
- Section 3: Project description – provides a description of the project

- Section 4: Legislation and policy – describes the relevant legislative and policy context for the assessment, and relevant guidelines
- Section 5: Urban Design – describes the existing urban design environment and the urban design principles and objectives
- Section 6: Landscape impact assessment – provides a description of the landscape character and assesses the impacts to landscape character during construction and operation
- Section 7: Visual impact assessment – provides a description of the visual environment and assesses impacts to sensitive visual receivers during construction and operation
- Section 8: Recommended mitigation measures – provides recommendations for project mitigation and / or management
- Section 9: Conclusion – concludes the key findings and recommendations from the investigation
- Section 10: References.

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2. Methodology

This LVIA has been prepared in accordance with the following:

- *Environmental Impact Assessment Guidance Note - Guidelines for landscape character and visual impact assessment* (EIA-N04), Version 2 (Roads and Maritime, 2013).
- *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition* (Landscape Institute and Institute of Environmental Management & Assessment, 2013).

2.1 Study area

The study area for the LVIA has been defined as land within one kilometre of the project. This has been determined based on the following:

- a desktop study examining aerial photographs and topographic maps considering both landform and land cover
- previous studies of a similar type
- relevant guidelines
- an analysis of the Zone of Theoretical Visibility (ZTV) mapping
- a site inspection examining the existing visual conditions.

2.1.1 Zone of Theoretical Visibility

A detailed assessment of potential visibility within the study area was calculated using topographical data. A ZTV is the area around a designated point in the landscape from which that point is theoretical visible. The ZTV was generated using the Digital Elevation Model (DEM) at a 0.5 metre resolution with the proposed height of the noise wall alignment of six metres and an observer eye height of 1.6 metres. The area of analysis was a one kilometre offset from the proposed rail alignment corridor. The DEM used in this assessment was derived from the Department of Finance, Services and Innovation (DFSI) point cloud data which has been filtered to include only the ground points.

This analysis does not take account of buildings or vegetation screening, therefore representing a worst case.

2.2 Preliminary Analysis

2.2.1 Desktop study

A desktop study was undertaken to obtain the relevant publicly available data on landscape character and visual impact at a national, regional and local level for the study area. This included a comprehensive review of GIS data sets and aerial photography based identification of potential sensitive receiver locations, later ground truthed by a site inspection.

The desktop study included the following:

- review of legislation, policy and guidelines (as identified in Chapter 4 below)
- review of GIS data sets, including geology (DPE NSW), vegetation (NPWS), soils (DPE NSW), hydrology (DFSI NSW), cultural heritage (DPE NSW), and land use (DPE NSW)
- review of aerial photography (LPI NSW and Nearmap)
- identification of potential sensitive receiver locations.

2.2.2 Site Inspection

A site inspection was undertaken by a landscape architect to verify the desktop study, allow characterisation of the landscape, identify sensitive visual receivers and observe how receivers might view the landscape. The site inspection was conducted on 23 November 2018 during fine weather conditions with clear visibility.

During the site inspection, the landscape architect drove and walked the study area to identify representative views of the site upon which the project is proposed, from publicly accessible viewpoints. At each location a photographic record of landscape features, key views and receivers were taken, along with coordinates and field notes.

2.3 Urban Design and design integration

Following the preliminary analysis, the existing urban conditions were reviewed and the existing urban environment including aspects potentially impacted by the project identified. The urban design principles and objectives were then developed. These principles and objectives were informed by the preliminary analysis, including legislation and policy review and the existing urban environment (described further in section 5.1).

The detailed landscape and visual impact assessment was then commenced and whilst the assessment was prepared, an iterative design process was undertaken with the Urban Design team to assist in the refinement and development of the landscape concept based on the potential urban landscape and visual impacts, and urban domain impacts identified. The development of this concept also included consultation with the relevant councils.

The landscape concept then formed part of the project description within this report (refer to section 3). The final landscape and visual impact assessment described in this report was based on the project description including the landscape concept.

2.4 Landscape impact assessment

Landscape refers to the overall character and function of a place. It includes all elements within the public realm and the interrelationship between these elements and the people who use it.

2.4.1 Definition of existing landscape baseline

A landscape baseline assessment was undertaken to determine the existing landscape features within the study area. This includes determination of key landscape and spatial elements, features and values. Key aspects considered include:

- land use and built form including town centres/local business areas, typical height of buildings, recreation areas and industrial precincts
- landform, topography and hydrology
- vegetation
- cultural and historical features including the presence/absence of heritage areas.

2.4.2 Landscape character zones

Landscape character considers common landscape zones defined by typical features and characteristics identified during the desktop assessment and site inspection. Defining landscape character zones identifies areas sharing the same homogenous environmental or cultural qualities or pattern such as topography, vegetation, hydrology, land use and settlement, built form scale and character, cultural and recreational characteristics.

This approach has been used to establish the existing landscape character around the project site and to provide a framework for measuring the impact of the project. This assists in:

- defining landscape elements that contribute to defining character
- defining landscape character attributes
- identifying landscape value.

The assessment of the existing environment also considers factors which have influenced landscape change in the past and those that are likely to do so in the future.

2.4.3 Landscape effects

Landscape character refers to a distinct and recognisable pattern of elements that occur consistently in a particular type of landscape. Particular combinations of geology, landform, soils, vegetation, land use and human settlement create character, which makes each part of the landscape distinct and gives each its particular sense of place.

Assessment of landscape effects deals with the effect of change and development on landscape as a resource. The assessment considers how the project would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

The consideration of potential impacts on landscape character is determined based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. The sensitivity of a landscape is judged on the extent to which it can accept change of a particular type and scale without adverse effects on existing landscape character. The level of sensitivity is determined on the basis of:

- the landscape's inherent values and any specific values that may apply such as landscape planning designations
- the landscape's ability to absorb changes associated with the project.

The magnitude of change to landscape character depends on the nature, scale and duration of the change expected to occur. The magnitude of change also depends on the loss, change or addition of any feature to the existing landscape. It is based on that part of the landscape character type which is likely to be impacted to the greatest extent by the project.

The sensitivity and magnitude of landscape effects address the following specific criteria:

- sensitivity of landscape to proposed change, based on the susceptibility to change, and the value of landscape (refer Table 2.1)
- magnitude of landscape effect, based on the size or scale of change, the geographical extent of effects, and the duration and reversibility of effects (refer Table 2.2).

A judgement is made on the overall level of significance of the landscape effect in relation to the existing conditions (refer section 2.5).

Table 2.1 Sensitivity criteria (landscape)

Rating	Criteria
High	<p>Landscape character elements in good or above average condition and/or that make a strong positive contribution to the landscape character. May include nationally important features.</p> <p>The type of development proposed could have a detrimental effect on the landscape character, condition or value. Mitigation measures are unlikely to reduce the impacts of the change.</p>
Moderate	<p>Landscape character elements in reasonably good condition and/or that make an average contribution to the local character, which may include locally important features.</p> <p>Any change caused by the proposed development would be unlikely to have a significant adverse effect on the landscape character, condition or value that could not be mitigated.</p>
Low	<p>Landscape character elements in average condition and/or that are not particularly distinctive local features.</p> <p>Development of this type is unlikely to have an adverse effect on the landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects.</p>
Negligible	<p>Elements in below average condition and/or that are not distinctive local features.</p> <p>Development of this type is very unlikely to have an adverse effect on the landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects and/or improve the urban landscape character.</p>

Table 2.2 Magnitude of change criteria (landscape)

Rating	Criteria
High	A substantial/obvious change to the landscape character due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished.
Moderate	Discernible changes in the landscape character due to partial loss of, or change to elements, features or characteristics of the landscape, however has potential to be partly mitigated. The change would be out of scale with the landscape character, and at odds with the local pattern and landform and would leave an adverse impact on the landscape character.
Low	Minor loss or alteration to one or more key landscape character elements, features or characteristics, or the introduction of components that may be new but may not be uncharacteristic within the existing landscape character.
Negligible	Almost imperceptible or no change in the landscape character as there is little or no loss of/or change to the elements, features or characteristics of the landscape.

2.5 Visual impact assessment

This visual impact assessment considers visual amenity as experienced by the users of the site and surrounds. It aims to identify the range of views to the site which may be impacted, including views from residential areas, commercial areas, parks and streets.

2.5.1 Definition of visual baseline

A visual baseline assessment was undertaken to determine the existing visual baseline environment within the study area. This includes determination of key visual elements, features and values. Key aspects considered include:

- built form and vegetation
- landform and topography
- key views and viewsheds
- visually prominent features
- visual features of interest and value.

2.5.2 Viewpoint locations

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views as a result of the change or loss of existing elements of the landscape and/or the introduction of new elements.

Visual receivers have been considered in terms of the views they are likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view. Visual receivers are identified based on:

- proximity of the receivers to the project, as the most affected visual receivers are anticipated to be located closest to the project, unless located at an elevated vantage point
- type of receiver, as different viewer types would have different perceptions of the change.

Based on the analysis of the existing landscape and visual environment, sensitive visual receivers were identified and viewpoint locations selected as representative locations for assessment.

2.5.3 Panorama and photomontage

Five viewpoint locations were chosen and existing views represented using a panorama technique. This involves combining up to three individual photographs overlapped by one third using the Adobe Photoshop software program to create a field of view of 60°.

Of the five viewpoint locations, two viewpoints were selected for the production of photomontages to represent proposed views following the completion of the project. The software used to model and render the photomontages was Autodesk 3D Studio Max. In order to achieve an accurate photomontage of the project and surrounding landscape, one metre contours were used to model the surrounding landform.

Once the 3D model incorporating both the landscape and new project elements was created, a virtual camera was placed in the software at the same location the photographs were taken. The film, focal lens and height of the virtual camera matches the real camera utilised to take the photographs. The photographs of the site were used in 3D Studio Max as a background to accurately match the 3D model with the project elements to the perspective of the photographs. From the camera view, rendered images of the project were produced to match the daylight exposure of the photographs. The rendered images were imported into Adobe Photoshop for post-production editing and collation of the photomontages.

The final result is the 3D model of the project shown in the correct 3D location in the photographs. The final images were produced to a high resolution, suitable for printing.

All photographic images were captured using a 50 millimetre fixed focal length lens on a 35 millimetre full frame format camera which has a vertical angle of 27.0° and a horizontal field of view of approximately 39.6°.

The camera was held at eye level, approximately 1.6 metres above ground level to take the photographs. GPS coordinates were also recorded on a separate hand held GPS at the locations from which the photographs were taken.

2.5.4 Visual effects

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receiver it represents) to change, and the magnitude of change that is likely to occur.

The sensitivity of each viewpoint is considered to be dependent on the:

- importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- type of visual receiver and their likely interest in the view
- receivers duration and viewing opportunity, long viewing periods vs short, transient views.

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of a change also depends on the loss, change or addition of any feature in the field of view of the receiver including an assessment of the level to which the change contrasts with the existing view or expected view of the landscape. This includes the degree of any change to the backdrop to, or outlook from a viewpoint.

The assessment considers the likely impacts of the project. The level of effects on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, and duration of view.

Steps undertaken to assess visual effects include:

- identify and map viewpoint locations
- undertake assessment of visual effects, comprising:
 - sensitivity of visual receivers to proposed change, based on: susceptibility of visual receivers to change, and value attached to views (refer Table 2.3)
 - magnitude of visual effect, based on: size or scale of change; geographical extent of effects, and duration and reversibility of effects (refer Table 2.4)
 - an assessment is undertaken of the overall level of significance of the visual effects in relation to the existing view (refer section 2.6).

Table 2.3 Sensitivity criteria (visual)

Rating	Criteria
High	Occupiers of residential properties, at home or going to or from, with long viewing periods, within close proximity to the proposed development; Communities that place value upon the urban landscape and enjoyment of views of their setting.
Moderate	Outdoor workers who have a key focus on their work who may also have intermittent views of the study area; Viewers at schools, or similar, when outdoor play and recreation areas are located within close proximity but viewing periods are limited; Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
Low	Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and therefore have short term transient views; Viewers indoor at their place of work, schools or similar.
Negligible	Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

Table 2.4 Magnitude of change criteria (visual)

Rating	Criteria
High	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished.
Moderate	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however has potential to be partly mitigated. The change would be out of scale with the existing view, and would leave an adverse impact on the view.
Low	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view.

2.6 Significance of impacts

The combination of sensitivity and magnitude determines the significance of the impact on the landscape character or representative viewpoint. Refer Table 2.5 for the matrix used to determine the significance of impact.

Table 2.5 Significance of impact matrix

Sensitivity	Magnitude of change				
		High	Moderate	Low	Negligible
	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

2.7 Recommended mitigation measures

Once the significance of impacts on all receivers were identified and rated, potential mitigation measures have been identified. Mitigation measures are developed specifically for the project and are appropriate in terms of scale, effort, expense, and applicability. Mitigation measures would include responses to either: avoid, reduce, remedy, or offset impacts, as described below:

- **Avoidance** – Avoid developments in sensitive or prominent landscapes, and avoid insensitive or visually intrusive designs. Prevention of adverse effects at source.
- **Reduction** – Reduction of adverse effects that cannot be eliminated by avoidance. The significance of adverse impacts is reduced. Seeks to limit the exposure of the receiver. Reduce the visual intrusiveness of the design and reduce the visibility of the project.
- **Remedy** – Remedy serves to improve adverse conditions by carrying out further works which seek to restore the environment eg increased planting of trees/shrubs to offset unavoidable loss of vegetation.
- **Offsetting** - The provision of alternative or compensatory measures where appropriate and feasible.

If it is not possible or practical to mitigate an impact entirely, this is described as a Residual Impact.

2.8 Assumptions and Limitations

This methodology includes the following assumptions and limitations:

- There is no national guidance on the assessment of landscape and visual impacts specific to Australia, however, the industry typically refers to Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013) and the Environmental Impact Assessment Practice Note Guideline for Landscape Character and Visual Impact Assessment EIA-N04 (2013).
- The assessment aims to be objective and describe any changes factually. While potential changes resulting from the project are defined, the significance of these changes requires qualitative (subjective) judgements. This assessment's conclusion therefore combines objective measurement and professional interpretation. While this assessment aims to be objective, it is recognised that visual impact assessment can be subjective and individuals are likely to associate different visual experiences to the study area.
- The assessment is based on the information provided to GHD at the time of writing which included a reference design and written project description. This assessment has assumed no major change key project components as part of the detailed design.

- Existing conditions were assessed during the site inspection on 23 November 2018.
- This assessment does not include landscape and visual impacts from lighting.
- During construction and commissioning there would be a number of works that would cause temporary disruption to the area, impacting visual amenity and landscape character. The significance of such impacts would depend on the nature and programme of construction activities, and the proximity of resources / receivers to the works. For the purposed of this report, general assumptions have been made in order to appraise the impact of the construction works upon landscape resources and visual amenity.
- The Arboricultural assessment (Appendix B respectively) were written by others.
- The impact ratings are dependent on high quality design and materiality, and appropriate maintenance regimes.

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3. Project description

3.1 The project site

The project site is defined as the area that would be directly affected by the construction and operational components of the project as defined in the reference design, refer to Figure 3.2.

The project site is located within the existing rail corridor between the Hume Highway and Cabramatta Road East road overbridges in the suburbs of Warwick Farm and Cabramatta. This location is between Sydney Trains' Warwick Farm Station to the south and Cabramatta Station to the north. The project site also includes additional land to the east of the existing rail corridor associated with works to Broomfield Street, a portion of Jacquie Osmond Reserve, and residential and commercial interfaces along the rail corridor.

The following section includes a description of the key project components relevant to this assessment. This description is based on the reference design and landscape concept for the project. The landscape concept for the project considers landscaping in urban areas along the extent of the project site including key areas such as Broomfield Street, adjacent to Cabramatta Creek and within Jacquie Osmond Reserve.

3.2 Operation phase

Relevant key project components are provided in the sections below.

3.2.1 New track works

The new track works would involve the following:

- providing around 1.65 kilometres of new track and realignment of 550 metres of existing SSFL track
- widening of the existing rail corridor by about five metres to the east
- modification and upgrades to signalling within the rail corridor (however no visual change requiring assessment in this report)
- new replacement fence to the rail corridor boundary to be provided on top of the proposed retaining wall in Jacquie Osmond Reserve and at the southern extent of the project site.

3.2.2 Sussex Street and Cabramatta Creek bridges

A new rail bridge would be provided above Sussex Street. It would be about 45 metres long and 4.5 metres wide and would be located to the east of the existing rail bridge over Sussex Street. The bridge is proposed to have six spans.

A new rail bridge would be provided above Cabramatta Creek. It would be about 125 metres long and 4.5 metres wide and located to the east of the existing rail bridge over Cabramatta Creek. The bridge is proposed to have eight spans.

The existing embankment and retaining wall (around 40 metres in length) between Cabramatta Creek bridge and Sussex Street bridge would be widened to support the position of the new bridges.

The proposed new bridges would be structurally independent from, and would not be connected to, the existing bridges over Sussex Street and Cabramatta Creek. The new bridges would consist of a bridge foundation with reinforced concrete headstock walls based on bored concrete piles.

3.2.3 Broomfield Street and Sussex Street works

The alignment of Broomfield Street would be reconfigured between Bridge Street and the Sussex Street bridge (a distance of about 680 metres). This would involve realigning the road and associated infrastructure to the east to allow the widening of the rail corridor by about five metres. This would result in changes to on-street parking arrangements, including a change from angled parking to parallel on the western side of the street. The existing shared path (part of the Parramatta to Liverpool Cycle Rail Trail) would also require realigning.

A temporary shared path from Sussex Street to the Cabramatta Creek shared path bridge would be provided to provide a safe route around construction worksites during construction of the bridges. The existing shared path bridge would be retained however to minimise impacts on the creek and riparian vegetation. The shared path would be reinstated in a similar position to the existing path on completion of construction works. Areas of Cabramatta Creek disturbed during the construction of the bridges and temporary shared path would be revegetated in consultation with Council.

The existing footpath and grassed verge on the eastern side of Broomfield Street would be reinstated as per the current arrangement and the existing width of the footpath would be maintained. However, the width of the grassed verge would be reduced by up to three metres to accommodate the realignment.

An indicative landscape concept has been developed which aims to reinstate trees in a similar alignment to the existing arrangement where possible and to further mitigate the impacts associated with tree removal and the hard surfaces associated with a project in an urban area such as this (ie retaining walls and noise walls). The concept will be further refined during detailed design considering additional details such as final utility locations and protection as required.

Replacement street trees would be reinstated where practicable along the eastern side of Broomfield Street. The street trees would be planted in the road reserve, within the parking lane to the north of the Junction Street intersection, and within the grassed verge to the south of the Junction Street intersection.

The western side of Broomfield Street is constrained by reduced space requirements to facilitate the parking and adjacent shared path between the road reserve and the noise wall. Trees would not be reinstated due to the reduced space. As such, compact native grasses would be planted within a narrow garden bed located between the noise wall and shared path. To the south of the intersection with Boundary Lane a catenary system with climbers would be attached to the noise wall and retaining wall. The catenary system would only be affixed to the blank noise wall panels, with the artwork panels left uncovered. The catenary system would not be installed to the north of Boundary Lane.

The retaining wall would be constructed to match the colour and look of the noise wall, where possible. Panels from the existing noise wall would be reused where practicable, particularly those with art work, the design of which the local community had input into as part of the Southern Sydney Freight Line Project which was completed in 2012 (refer to Technical Report 11 – Social impact assessment).

The indicative landscape concept for the project site is shown in Figure 3.1.

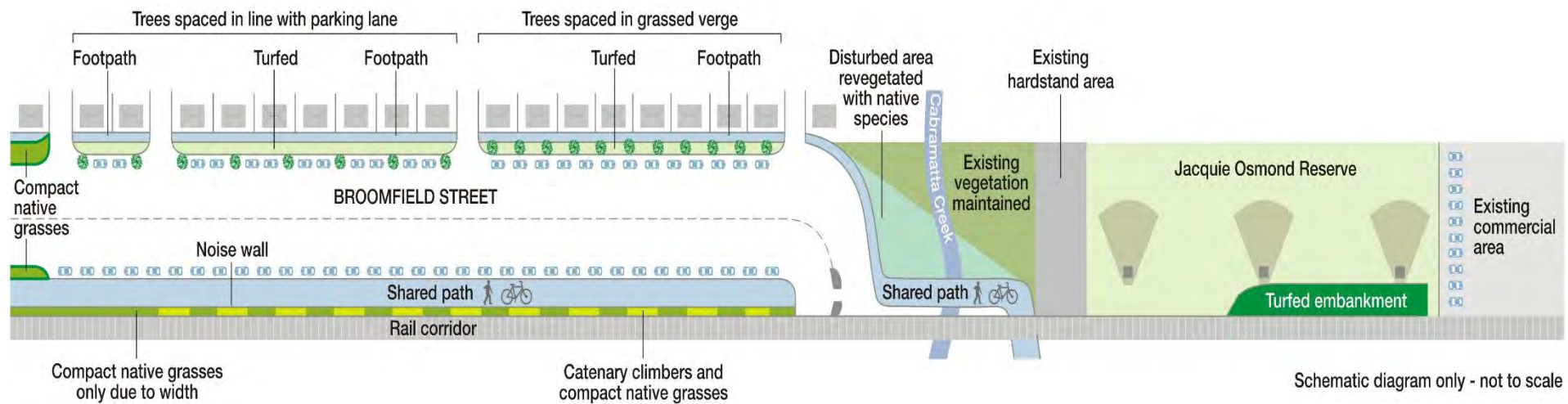


Figure 3.1 Indicative landscape concept for project site (not to scale)

3.2.4 Noise wall

The existing noise wall would be realigned to be placed on the eastern side of the new track as per the current arrangement where it is on the eastern side of the SSFL

The new noise wall would be constructed of a similar concrete material as the existing wall. Panels from the existing wall would be reused where practicable, particularly those with art work, the design of which the community living along Broomfield Street had input into (refer to Technical Report 11 – Social impact assessment). The height of the new noise wall would range from about 4.2 metres to 7.5 metres above Broomfield Street ground level, and would generally match the height of the existing noise wall.

3.2.5 Retaining walls

Due to the difference in ground level between the rail corridor and land to the east, the existing retaining walls would be relocated to the eastern side of the new track and one new retaining wall would be required at the southern extent of the project. The height of the relocated retaining walls would generally match the heights of the existing walls.

The retaining walls are proposed in four locations including Bridge Street to Sussex Street bridge (710 metres long, up to three metres high), Sussex Street bridge to Cabramatta Street bridge (40 metres long, three metres high), Jacquie Osmond Reserve (130 metres long, one to two metres high), and at the southern extent of the project site (90 metres long and one metre high).

3.2.6 Jacquie Osmond Reserve

An embankment would be constructed along the length of Jacquie Osmond Reserve between the retaining wall and the reserve (refer to section 7.2.4 regarding retaining walls). The length of the embankment is subject to detailed design, however for the purpose of this assessment it has been considered to be about 260 metres, which is about half the width of Jacquie Osmond Reserve. It would likely have a maximum height of 1.5 metres above existing ground surface a width of up to nine metres and a slope of 1:6. The existing trees would be removed for the construction of the new track. The proposed embankment would be grassed as shown in the indicative landscape concept in Figure 3.1.

While the current design doesn't anticipate a change to the softball diamonds on the east side of the SSFL rail corridor within the reserve, detailed design may anticipate a minor shift to accommodate the new track and associated infrastructure and utilities, the grassed embankment and retaining wall. This is not anticipated to be greater than around 10 metres into the reserve.

3.2.7 Operational train movements

Additional freight trains would increase from the current amount of 24 to a proposed 36 trains per day in each direction.

The project would result in train movements continuing to operate during the existing operational hours, which are 24 hours per day, 365 days per year (except during scheduled possession periods).

3.3 Construction phase

The following activities relevant to this assessment are likely to be experienced during construction:

3.3.1 General

- Establishment of construction compounds, and work sites including stockpiles and storage areas, regrading surfaces where required, delivery of plant and equipment, and installing fencing and hoarding where required in public areas.
- Tree removal along Broomfield Street and within Jacquie Osmond Reserve. The trees identified for removal are detailed in the arboricultural assessment provided in Appendix B.

3.3.2 New track works

The fencing and wall (noise and retaining wall) marking the existing eastern boundary of the rail corridor would be removed and new fencing and walls would be installed an average of about five metres east to mark the new boundary of the rail corridor.

The new track for the passing loop would be installed within the new wider rail corridor area and would include:

- excavating beside the existing SSFL track for the length of the areas of new track
- installing track drainage ballast, sleepers and rail tracks
- installing new signalling equipment and associated equipment.

3.3.3 Sussex Street and Cabramatta Creek bridge works

- road works in Sussex Street including earthworks and construction of new road pavement
- installation of temporary shared path
- construction of the new bridges
- placement of ballast, sleepers and rail on the new bridges.

3.3.4 Broomfield Street works

- relocation of below ground services and power poles
- road works including earthworks, construction of new road pavements and resurfacing of driveways
- temporary staged closures of Broomfield Street for construction.
- removal of existing retaining wall and noise wall
- construction of new retaining wall and noise wall.

3.3.5 Jacquie Osmond Reserve

- Construction of retaining wall and embankment.
- Removal of softball nets and existing vegetation along the western boundary.
- Reinstatement of chain mesh fence on top of the embankment.

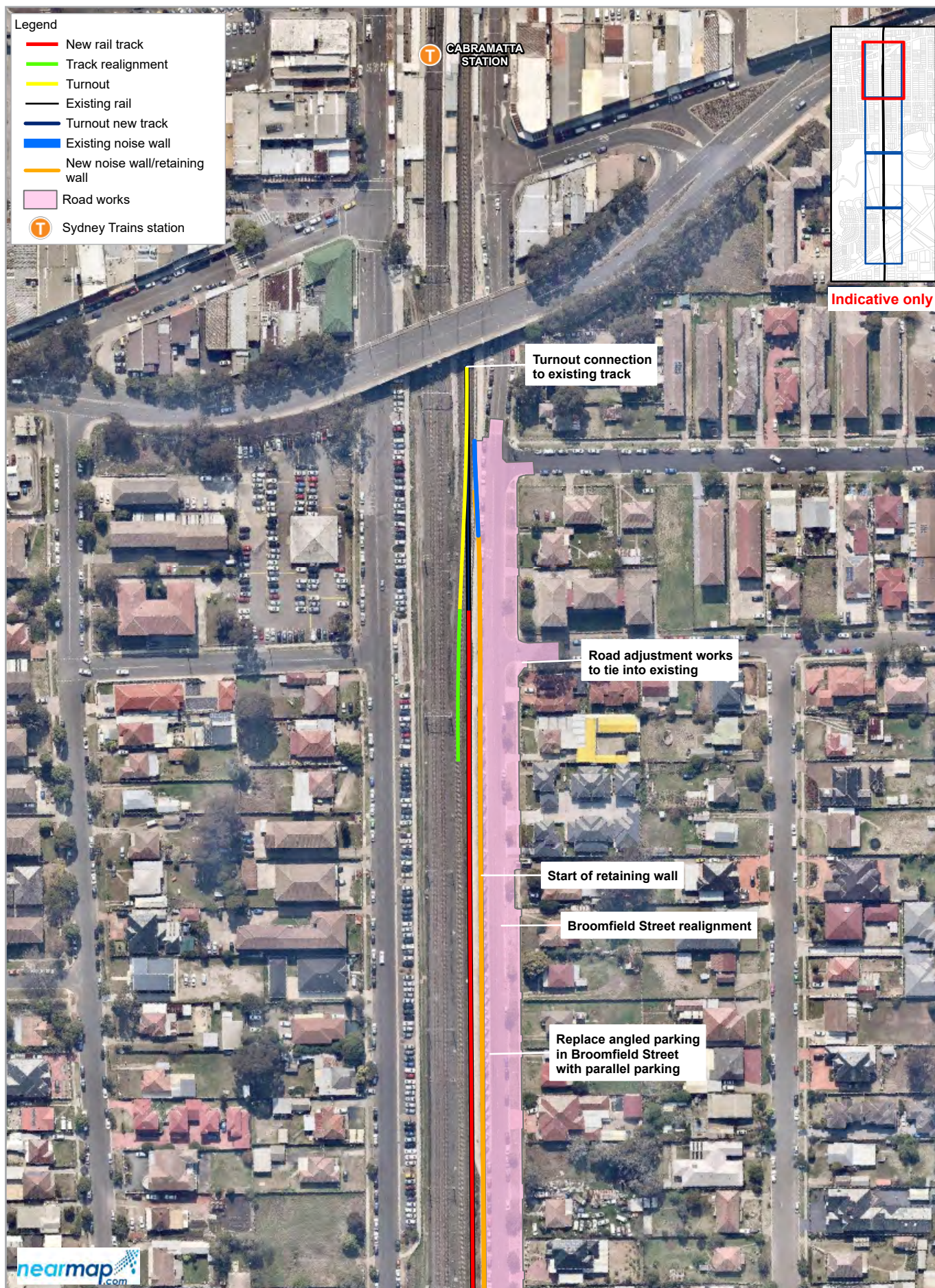
A construction compound is proposed to be located within Jacquie Osmond Reserve and in Warwick Farm Recreation Reserve. Construction works would occur over a period of about two years. Compounds would be used for the duration of the construction works and would include:

- site offices
- toilets, showers and change rooms
- meal rooms and first aid facilities
- areas for plant, equipment and material storage

- fencing and security facilities
- parking for between 60 and 80 cars.

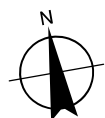
A number of sections of the shared path along the length of the project would be temporarily used as crane pads for a short duration. These include:

- southern side of Cabramatta Creek Bridge
- northern side of Cabramatta Creek Bridge
- Sussex Street Bridge.



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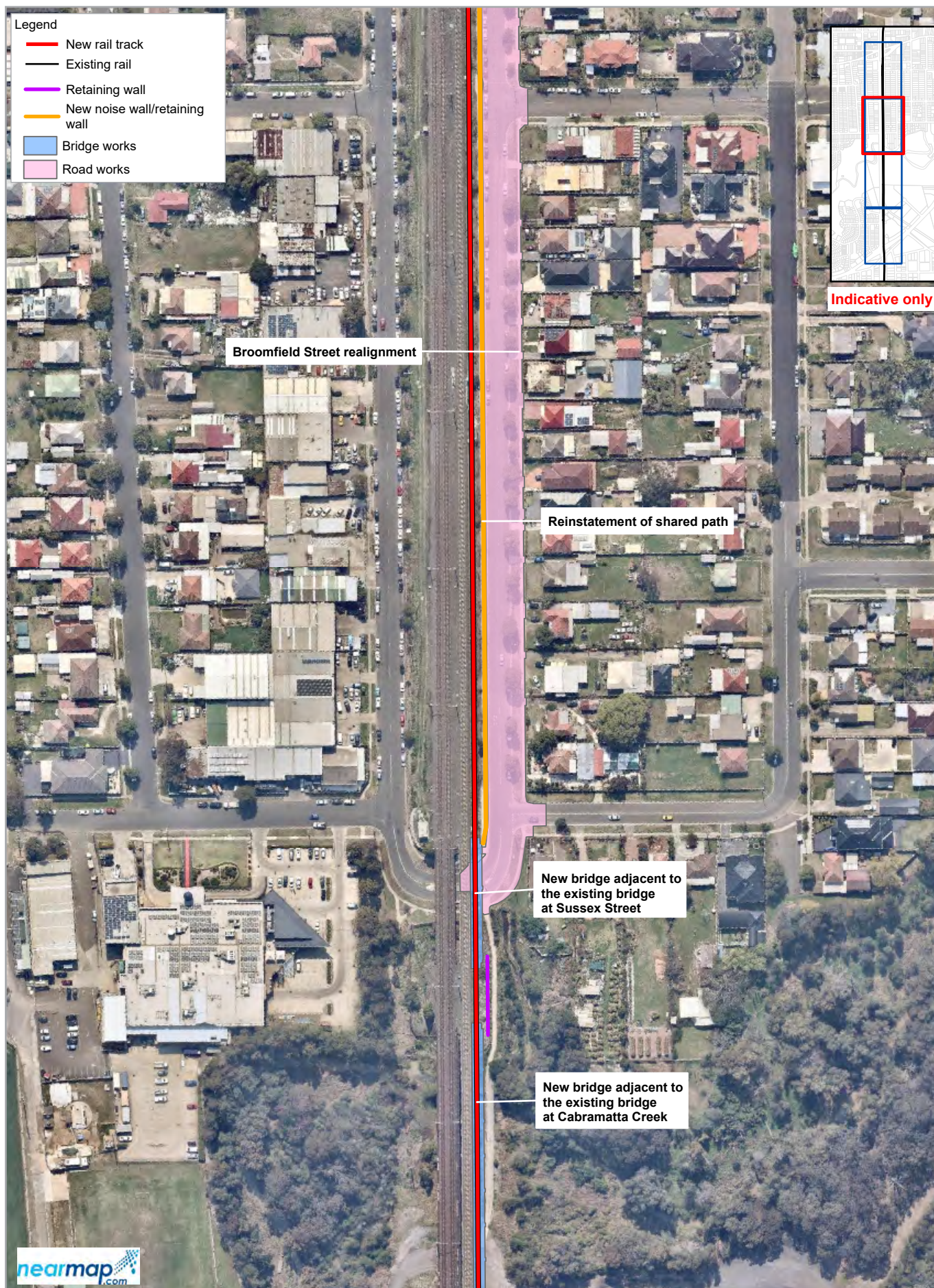


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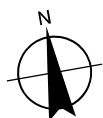
Project features

FIGURE 3.2a



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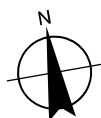
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Project features

FIGURE 3.2b



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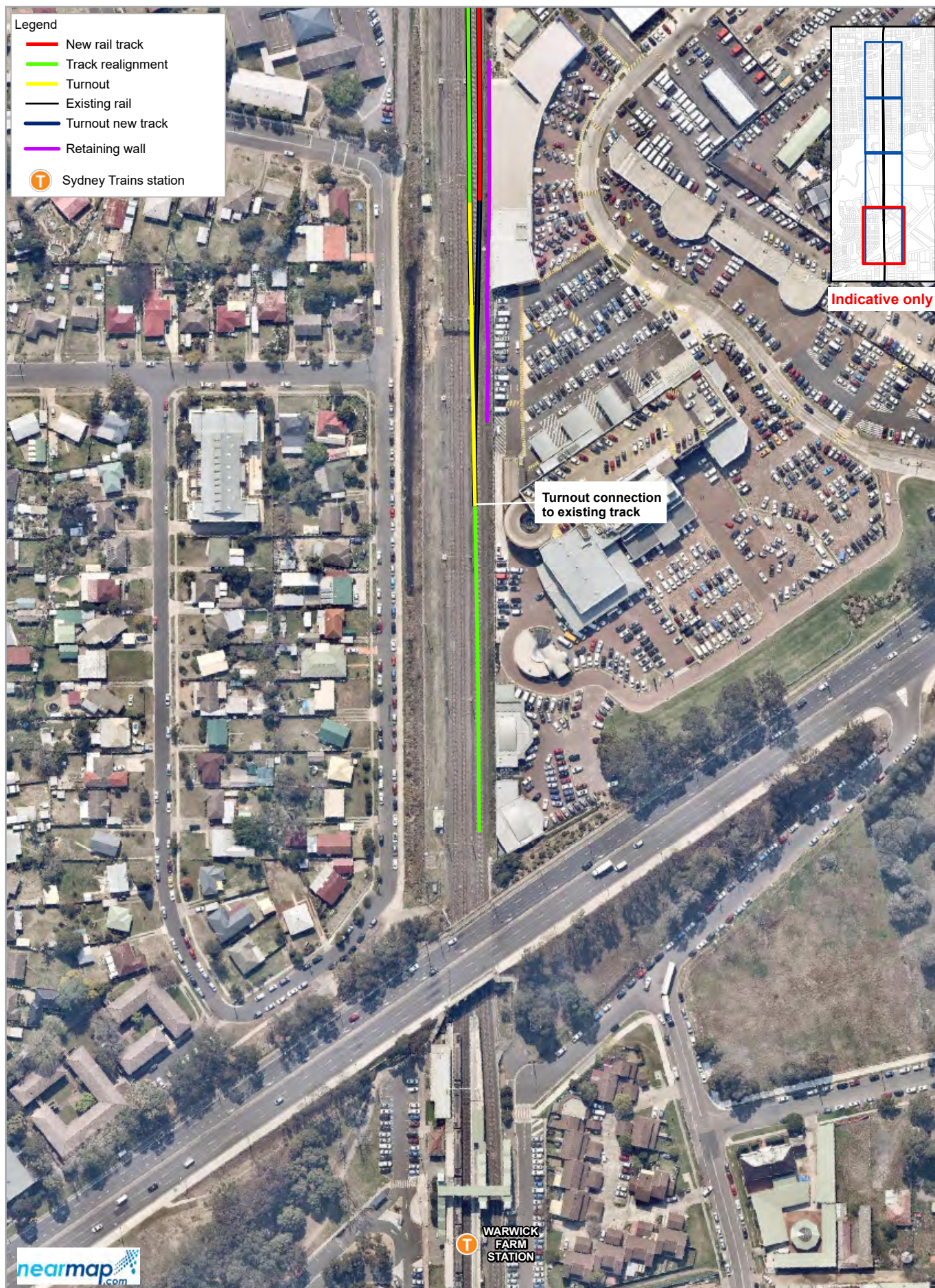


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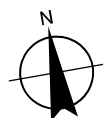
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Revision No. 0
Date 07/08/2019

Project features

FIGURE 3.2c



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Grid: AGD 1966 ISG 56 1



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Landscape and Visual Impact Assessment

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Date 07/08/2019

Project features

FIGURE 3.2d

4. Legislation and policy

4.1 Local planning policy framework

The project traverses two Local Government Area's (LGA's), the City of Fairfield to the north and the City of Liverpool to the south. The following section outlines local legislation and policy relevant to landscape character and visual amenity within the study area.

4.1.1 Fairfield Local Environmental Plan 2013

This Local Environmental Plan (LEP) includes guidance on several factors relevant to the project site surrounding the rail corridor and stations. Of particular relevance to this assessment, the Fairfield LEP identifies provisions relating to the height of buildings, heritage items and land use zones, which assist in establishing the character and values of the urban landscape, and planning objectives.

Relevant aims of the *Fairfield Local Environmental Plan 2013* include the following:

- *'to conserve the environmental heritage of Fairfield*
- *to protect and manage areas of remnant bushland, natural watercourses and threatened species.'*

Land use zones

The project is located within an urban setting which transitions from open space alongside Cabramatta Creek to the mixed use precinct surrounding Cabramatta Station. Rail corridor interfaces include low, medium and high density residential, mixed use adjacent to Cabramatta Road, and a light industrial area. Alongside Cabramatta Creek, recreational and open space areas are present, including sports fields and the Cabramatta Rugby League Club. Land use zones in and around the project site are shown in Chapter 16 (Land use and property) of the EIS.

The following have specific aims relevant to landscape and visual amenity:

Zone E2 Environmental Conservation

The following zoning objectives relate to the land associated with the Cabramatta Creek watercourse and the land interfacing the residential area east of the rail corridor.

- *'To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.*
- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.*
- *To enhance and protect riparian corridors and water quality associated with the waterways of Fairfield.'*

Zone RE1 Public Recreation

The following zoning objective relates to the playing fields west of the rail corridor and to the north of Cabramatta Creek.

- *'To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.'*

Zone RE2 Private Recreation

The following zoning objectives relate to the Cabramatta Rugby League Club west of the rail corridor on the northern bank of Cabramatta Creek.

- *‘To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.’*

Zone SP3 Tourist

The following zoning objective relate to the Warwick Hotel on Liverpool Street adjacent to the Hume highway.

- *‘To ensure that development is sympathetic to the environment and minimises risks from natural and man-made hazards.’*

Height of buildings

The Fairfield LEP includes limitations to the height of buildings within the study area. Objectives of building height limitations include:

- *‘To ensure that the height of buildings complements the streetscape and character of the areas in which the buildings are located.*
- *To minimise the visual impact, disruption of views, loss of privacy and loss of solar access to existing development.’*

Building height limits adjacent to the rail corridor are as follows:

- 9 metres east the rail corridor (from Cabramatta Creek to Boundary Lane)
- 16 metres east of the rail corridor (from Boundary Lane to Cabramatta Road)
- 9 metres west of the rail corridor (from the vicinity of Cabramatta Creek to Boundary Lane)
- 7.5 metres transitioning to 16 metres west of the rail corridor (from Boundary Lane to Cabramatta Road).

Heritage conservation

A number of areas with heritage conservation protections are present within the study area. These include the following:

- Cabramatta Public School
- Cabramatta (Cabramatta Creek), Railway Parade and Sussex Street Underbridge (I19)
- Other individual cottages, shops and churches.

Relevant objectives of the heritage conservation protection include:

- *‘To conserve the heritage significance items and heritage conservation areas, including associated fabric, settings and views.’*

4.1.2 Liverpool Local Environmental Plan 2008

This LEP includes guidance on several factors relevant to the project site surrounding the rail corridor and stations. Of particular relevance to this assessment, the Liverpool LEP identifies provisions relating to the height of buildings, heritage items and land use zones, which assist in establishing the character and values of the urban landscape, and planning objectives.

Relevant aims of the *Liverpool Local Environment Plan 2008* include the following:

- *‘to conserve, protect and enhance the environmental and cultural heritage of Liverpool.*
- *to protect and enhance the natural environment in Liverpool, incorporating ecologically sustainable development.*
- *to promote a high standard of urban design that responds appropriately to the existing or desired future character of areas.’*

Land use zones

The project is located within an urban setting which transitions from open space alongside Cabramatta Creek to residential and light industrial zones leading up to Warwick Farm Station. Rail corridor interfaces include public recreation areas, light industry and medium density residential. Land use zones in and around the project site are shown in Chapter 16 (Land use and property) of the EIS.

The following have specific aims relevant to landscape and visual amenity.

Zone R3 Medium Density Residential

The following zoning objectives relate to the residential area to the west of the rail corridor and to the north of Cabramatta Road.

- *‘To provide for suitable visual transition between high density residential areas and lower density areas.*
- *To ensure that a high level of residential amenity is achieved and maintained.’*

Zone W1 Natural Waterways

The following zoning objectives relate to the land immediately alongside Cabramatta Creek waterway.

- *‘To protect the ecological and scenic values of natural waterways.*
- *To enable the recreation enjoyment or scientific study of the natural environment.*
- *To allow development for water recreation purposes that does not have a significant adverse effect on the natural values of waterways in this zone.’*

Zone RE1 Public Recreation

The following zoning objectives relate to the land on either side of the rail corridor on the southern bank of Cabramatta Creek, including Jacquie Osmond Reserve and Warwick Farm Recreation Reserve.

- *‘To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.*
- *To ensure the suitable preservation and maintenance of environmentally significant or environmental sensitive land.’*

Height of buildings

The Liverpool LEP includes limitations to the height of buildings within the study area. Objectives of building height limitations include:

- *'To permit building heights that encourage high quality urban form.'*
- *To ensure buildings and public areas continue to receive satisfactory exposure to the sky and sunlight.*
- *To nominate heights that will provide an appropriate transition in built form and land use intensity'.*

Building height limits adjacent to the rail corridor are as follows:

- 15 metres east of the rail corridor (from the Hume Highway to Jacquie Osmond Reserve)
- 8.5 metres west of the rail corridor (from the Hume Highway to Warwick Farm Recreation Reserve)

Environmentally significant land

Cabramatta Creek is considered an environmentally significant land under the Liverpool LEP. Relevant objectives of the environmentally significant land protection include:

- *'To maintain bushland, wetlands and wildlife corridors of high conservation value.'*
- *to ensure consideration of the significance of vegetation, the sensitivity of the land and the impact of development on the environment prior to the giving of any development consent.'*

4.2 Other

Other standards and guidelines relevant to this assessment are outlined below.

4.2.1 AS4282-1997 Control of the obtrusive effects of outdoor lighting

AS4282-1997 Control of the obtrusive effects of outdoor lighting sets out guidelines for the control of the effects of outdoor lighting on surrounding properties, and the glare to users of adjacent transport systems. It also gives recommended limits for the relevant lighting parameters to contain these effects within tolerable levels. This has been referenced as part of the recommended mitigation measures provided in section 8 and would be addressed through the detailed design process through development of the Urban Design and Landscape Plan.

4.2.2 Beyond the pavement: urban design policy, procedures and design principles

This guideline recognises the influence of road and bridge infrastructure on urban and natural environments and seeks to think beyond the pavement of the road to consider the broader environments that are affected by infrastructure projects. The purpose of the policy is to ensure the qualities of the landscape are understood and protected; roads contribute to the quality of the built environment in urban and rural contexts and leave a legacy for the future; and the quality of life of communities is protected or improved – their liveability and attractiveness for investment – is protected or improved in terms of connections, access to facilities, proximity to noise, views, safety and sense of place.

Of most relevance to this report, the guidelines aim to achieve design outcomes which are sensitive to the landscape character and setting in which they are proposed, including built form and natural landforms, and seeks to retain views of scenic quality within the public domain, particularly views from movement corridors as part of a journey experience.

A number of key design guidelines and objectives were considered as part of the Urban Design principles and objectives and would be further considered as part of the detailed design process through development of the Urban Design and Landscape Plan.

Contributing to urban structure and revitalisation

- *‘Create streets and boulevards that provide a sense of place’.*

Contributing to urban structure and revitalisation

- *‘Keep the road footprint to the minimum possible to achieve a good design outcome’.*
- *‘Avoid adverse visual impacts in the planning and design of roads and wharfs’.*

Fitting with the landform

- *‘Form a road in response to topography and landform’.*

Fitting with the built fabric

- *‘Integrated noise control into road corridor and project design’.*
- *‘Avoid adverse visual impacts when planning and designing roads’.*
- *‘Design road boundaries in response to local character’.*

Responding to natural patterns

- *‘Integrate natural patterns and systems into road design’.*
- *‘Use natural characteristics in the road’s landscape design’.*

Incorporating heritage and cultural contexts

- *‘Protect bridges of heritage significance within their setting’.*

Achieving integrated and minimal maintenance design

- *‘Avoid opportunities for vandalism’.*
- *‘Consider the design quality and maintainability of major road components and individual road elements’.*

4.2.3 Bridge Aesthetics: design guideline to improve the appearance of bridges in NSW

The purpose of this guideline is to assist design teams to produce bridges of aesthetic value. The guidelines includes requirements, objectives, design principles and processes to guide the design of bridges, and encourages innovation in the path to meeting these aesthetic outcomes. The guideline is intended for all bridges, from the more common to the iconic, which includes railway bridges.

Of most relevance to this report, the guidelines recognise some fundamental aesthetics of bridge design including the relationship of the bridge to the surrounding natural and built landscape; its form, proportions and scale; and factors such as the use of texture and colour.

‘Context sensitive design of infrastructure is design that fits sensitively with the landform and the built, natural, ecological, cultural and community context. The aesthetic value of a bridge is dependent on its design response to context – the place’.

‘The visibility of the bridge is an additional important contextual factor. A bridge which is looked on by the community needs to be carefully considered in terms of its visual impact on residents and road users’.

A number of key design guidelines and objectives relevant to LVIA are outlined below.

Bridges in the landscape

- *'Minimise the profile of a bridge to allow the landscape setting to dominate the view and be appreciated from all viewpoints'*
- *'Natural vegetation should be protected and augmented'*

Bridges in urban settings

- *'Maximise views through the bridge from the urban setting'*
- *'Minimise adverse visual impacts'*
- *'Respect locally valued structures and their curtilages'*
- *'Complement local styles and materials'.*

Bridge curtilage

- *'Generally, there should be continuity between the existing landscape and the space around the bridge. Where possible, the space should be designed so that it complements the adjacent landscape character'.*

This has been referenced as part of the recommended mitigation measures provided in section 8 and would be addressed through the detailed design process through development of the Urban Design and Landscape Plan.

4.2.4 Sustainable Design Guidelines (Version 3.0)

The *Sustainable Design Guidelines Version 3.0* seeks to deliver sustainable development practices by embedding sustainability initiatives into the design and construction of transport infrastructure projects. These guidelines were developed specifically for Transport for NSW projects which are predominantly commuter facing and therefore inherently result in greater urban domain and public interface. However the guidelines have some aspects which may be relevant to this project and they have been taken from the guideline for the purpose of this assessment (refer the landscape concept discussed in Chapter 3). The guideline as a whole has not been applied to this project. Objectives which have been adopted from this guidelines as Objectives relevant to LVIA include the following:

Biodiversity and Heritage

- *'Maximise ecological values through landscape species choice, and planting density and configuration....'*
- *'Provide a vegetation cover on structures to reduce maintenance and improve amenity (eg. on noise walls)'.*
- *'Design for the interrelationship between new development/redevelopment and proximate buildings of heritage/cultural significance'.*

Water

- *'Select plant species that require minimal or no irrigation after establishment'.*

Community Benefit

- *'Use lighting, landscaping and/or public art to direct visual interest towards the structure and enhance the visual amenity of the structure'.*
- *'Provide vegetation to reduce heat islanding and increase visual attraction'.*

Amenity

- *'Minimise graffiti risks such as through treatment of fencing and other surfaces with anti-graffiti paint or coatings, vegetation cover to deter graffiti or providing designated walls for graffiti'.*

4.2.5 Urban Green Cover in NSW: technical guidelines

The *Urban Green Cover in NSW: technical guidelines* 2015 seek to minimise the effects of increased urban heat island associated with urbanisation and climate change in cities and towns, through the increase in urban green cover in urban environments. A recognised environmental benefit of urban green cover is improved visual amenity and urban design, among others.

Of most relevance to this project is the benefit of vegetation such as canopy trees, understorey planting and bioswales as well as green open spaces for their cooling provision and contribution to visual amenity.

4.2.6 Other documents

A number of documents identified in the SEARs are not relevant to LVIA as they do not address landscape character or the value of the visual environment. These documents provide information on urban design elements such as lighting, noise walls, landscaping, street trees, footpath treatments and signage, and are listed below:

- Crime prevention and the assessment of development applications (DUAC, 2001)
- Crime Prevention through Environmental Design (CPTED) (Queensland Government, 2007)
- Disability (Access to Premises – Buildings) Standards 2010

However, these documents were considered as part of the development of the urban design principles and objectives and would guide the detailed design of relevant built elements within the project site, as referenced in the mitigation measures provided in Section 8.

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5. Urban design

5.1 Existing urban condition

The urban landscape of the project site consists of the rail and road corridor, residential areas either side of the rail corridor, commercial and industrial land uses near the rail corridor and passive (Cabramatta Creek) and active recreation (Jacquie Osmond Reserve and Warwick Farm Recreation Reserve). These areas are described further below.

5.1.1 Transport corridor

This urban landscape consists of a rail corridor that rises gradually to the south from the Cabramatta Road bridge towards the Sussex Street and Cabramatta Creek bridges, sitting at elevation above adjoining roads (Railway Parade on the west and Broomfield Street on the east). A concrete retaining wall and concrete panelled noise wall are present on the western side of Broomfield Street, marking the boundary to the rail corridor. A shared path (part of the Parramatta to Liverpool Cycle Rail Trail (the Cycleway)) runs adjacent to the noise wall and retaining wall, between the rail corridor and Broomfield Street. Car parking is present on both sides of Broomfield Street as is a line of street trees which occur along the southern end of Broomfield Street towards Cabramatta Creek.

Lighting in the form of street lighting is located at intervals within the road corridor.

This area is used by road users, shared path users (cyclists and pedestrians), residents and people who park in this area from either the Cabramatta Town Centre or Cabramatta Station.

5.1.2 Commercial/industrial

This area is defined by the commercial and light industrial areas adjacent to the rail corridor. This includes Peter Warren Automotive and Hometown Warwick Farm; between the rail corridor and the Hume Highway. Currently a chain link fence runs south from Jacquie Osmond Reserve on the eastern boundary for approximately 210 metres. This then transitions to the outer shells of industrial buildings.

Users of this area include workers within the commercial and industrial facilities, and people who visit those locations for retail purposes.

5.1.3 Passive recreation

This area directly interfaces with Cabramatta Creek and the wetland area to the western side of the rail corridor. The rail corridor continues to run north-south and is suspended over dense riparian vegetation. In parallel and at a lower grade, a shared path makes provision for pedestrians and cyclists to connect from Cabramatta to Jacquie Osmond Reserve (part of the Cycleway). This shared path bridges Cabramatta Creek, by way of a small bridge crossing (also being the LGA border of Fairfield City Council to Liverpool City Council). Various elements such as poorly maintained hardscape (bollards and fencing) and softscape (verge planting) detract from the shared path bridge's aesthetic and urban quality. In addition, unmaintained planting and minimal lighting within this area impairs views and reduces the safety and function of the route.

This area is used predominantly by users of the shared path.

5.1.4 Active recreation

This area is largely defined by active recreation. This usage is facilitated by Jacquie Osmond Reserve; a reserve that is located to the east of the planned rail corridor expansion. The reserve

contains softball playing fields and cages. Lighting borders the reserve and is used during night time sports events. Currently the reserve's functions are buffered from the rail corridor by a number of trees, a chain link fence, a landscape setback zone and retaining wall with railing.

This area is used by people who use the parks for recreational purposes on a casual basis as well as sporting organisations.

5.2 Urban design principles and objectives

Four overarching principles and objectives have been developed to guide the urban design for the project. These principles have been developed to give direction to the design of the project to retain the quality of the urban environment as described in section 5.1, where the project alters existing features in the local area. As described in section 2.3, the principles have also been developed in response to the preliminary landscape and visual impact analysis, and the legislation and policy review.

The principles and objectives are as follows:

Improving the physical, aesthetic and visual environment of the project site for residents and the local community:

- Use robust, high quality and durable materials that minimise opportunities for vandalism.
- Provide simple finishes that remain subtle within the landscape.
- Maximise opportunities for tree planting in areas that have had existing trees removed.
- Reduce visual clutter to ensure heritage and landmark features are legible.
- Revegetate the corridor where possible to improve the visual quality of adjacent residential and open space.

Ensuring connectivity for the adjacent community and land uses:

- Retain and maximise the accessibility and connectivity of adjoining existing and future communities for all users including pedestrians, public transport users, bicycle riders and motorists.
- Maximise opportunities for active transport connections.

Enhancing natural and urban character areas:

- Protect creeks and creek banks by maximising tree retention and planting at creek crossings and aligning shared pedestrian/ cycle paths in close proximity to the carriageway.

Applying the use of CPTED principles through the design process:

- Maximise the visibility of footpaths and shared paths from adjoining areas for good surveillance, sight lines and ease of orientation.
- Ensure adequate lighting of public places and footpaths for safe night-time travel.
- Ensure the landscaping makes places attractive, but does not provide unsafe environments for entrapment.

6. Landscape impact assessment

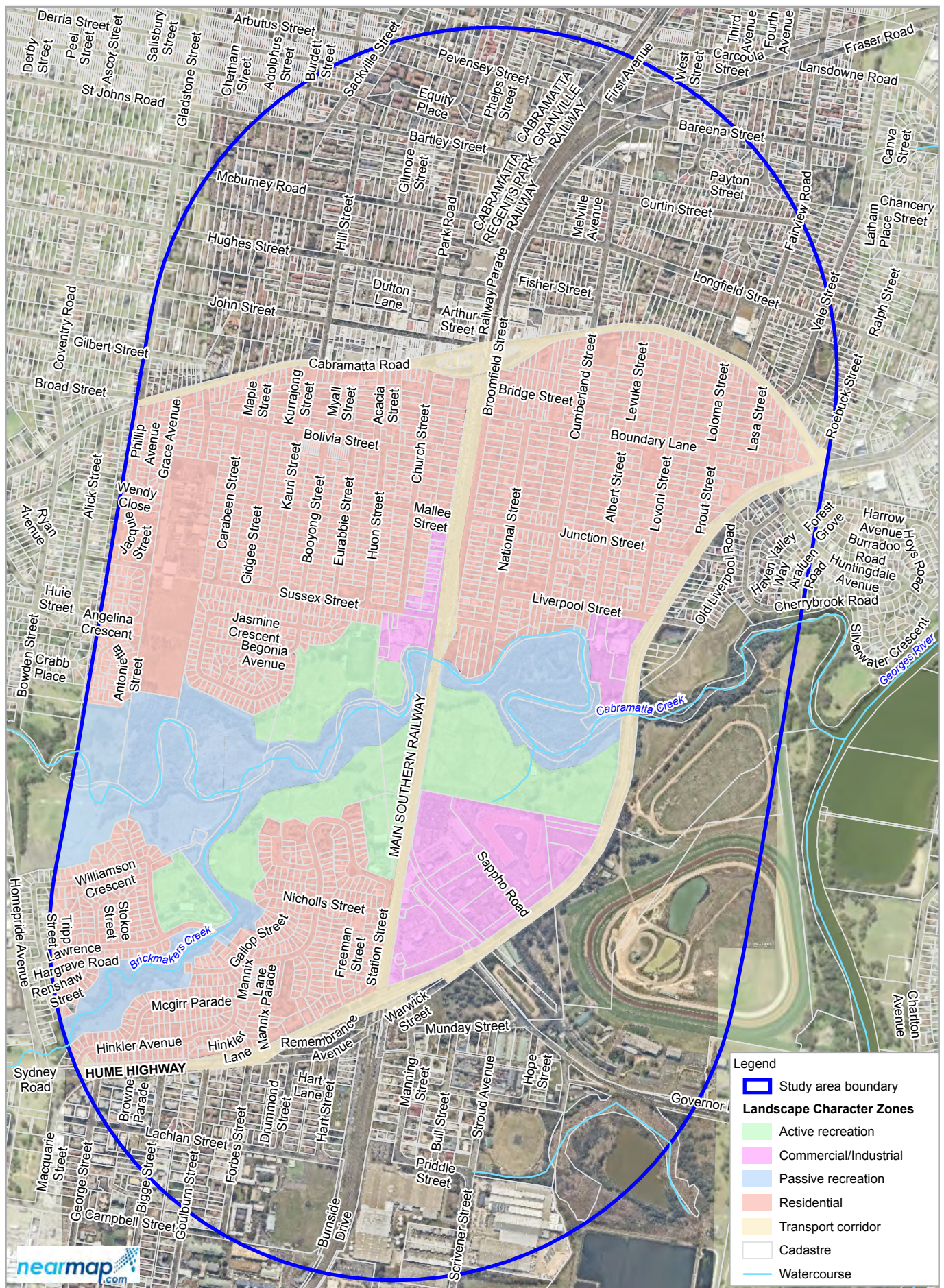
This section provides an understanding of the existing environment, identifies the Landscape Character Zones (LCZ's) surrounding the site and provides a discussion of impacts on the identified LCZ's.

6.1 Existing landscape environment

The project and surrounding study area are located within the suburbs of Cabramatta and Warwick Farm, in western Sydney. The existing environment is distinctly urban in its setting with residential areas bordered by major roads. The Hume Highway runs to the east and south of the study area, Cabramatta Road runs through the north of the study area and the SSFL runs north-south through the centre of the study area.

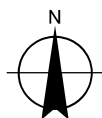
The existing landform is gently undulating with a high point in the north of the study area along Cabramatta Road. The landform slopes gently down to Cabramatta Creek which runs east-west through the centre of the study area, with the parklands and commercial area to the south of Jacquie Osmond Reserve on low lying land.

The vegetation cover consists of established street trees within the surrounding residential areas. Vegetation in the vicinity of the Cabramatta Creek corridor comprises of a combination of Cumberland Riverflat Forest ecological community adjacent to the water course, with areas of planted native species and adjacent and along the rail corridor edges.



Paper Size ISO A4
0 110 220 330 440
Meters

Map Projection: Transverse Mercator
Horizontal Datum: Australian 1966
Grid: AGD 1966 ISG 66 1



Australia Rail Track Corp Ltd
Cabramatta Rail Loop
Landscape and Visual Impact Assessment

Project No. 22-19800
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Landscape Character Zones

FIGURE 6.1