APPENDIX P

Landscape and Visual Impact Assessment Technical Report

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Inland Rail

North Star to Border

Appendix P: Landscape and Visual Impact Assessment Technical Report

Inland Rail Package 270: North Star to Border

Landscape and Visual Impact Assessment

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1. Summary

This Landscape and Visual Impact Assessment (LVIA) has been prepared by Lat27 Pty Ltd (Lat27) on behalf of AECOM Australia Pty Ltd for the Future Freight Joint Venture (FFJV) as part of an Environmental Impact Statement (EIS) for the Inland Rail Project between North Star and the New South Wales (NSW)/Queensland (QLD) Border (NS2B).

The Inland Rail Programme (Inland Rail) is a major national interstate freight route project connecting regional Australia to domestic and international markets. Australian Rail Track Corporation (ARTC) is seeking approval to construct and operate the NS2B section of Inland Rail (the proposal) which extends approximately 30 kilometre (km) in length. This will complete one of the key missing links and connect the Narrabri to North Star (N2NS) Project in NSW with the Border to Gowrie (B2G) Project in QLD.

1.1. Key elements of the proposal relevant to LVIA

The elements of the proposal that are relevant to the LVIA include the:

- Construction impacts: including laydown areas and associated borrow pits
- New track: Approximately 25 km of new track within the existing non-operational Boggabilla rail corridor and approximately 5 km of new track within a greenfield rail corridor
- Crossing loop and turnouts: One crossing loop, designed to accommodate trains up to 1,800 m long, with provisions to accommodate trains up to 3,600 m long if required in the future
- Bridges : Eleven new bridges (rail over road and rail over water) including an approximately 1.8 km long viaduct over the Macintyre River and Whalan Creek (connecting into QLD)
- Drainage: Reinforced concrete pipe culverts and reinforced concrete box culverts. Scour protection measures will generally be installed around culverts to avoid erosion
- Embankment and catch drains adjacent to the proposed alignment to divert surface runoff the nearest bridge or culvert location
- Level crossings: New and existing level crossings – both passive and active including lighting
- Ancillary works: Ancillary infrastructure including signalling and communications infrastructure, signage, fencing and utilities
- Presence of the freight train: Presence of double stacked trains, with a height of 6.5 metres (m) and up to 3.6 km long.

1.2. The landscape of the LVIA study area

The alignment begins north of the township of North Star, travelling north along the existing Boggabilla Rail corridor, towards the NSW/QLD border. Between these settlements, the proposal traverses a landscape that is largely rural, comprising agricultural and pastural landscapes and open woodland. The landscape is fairly flat with subtle undulations, typically between 220 m AHD (Australian Height Datum) to 260 m AHD. It is traversed by a network of creeks including Whalan Creek, Forest Creek, Back Creek and Mobbindry Creek that are tributaries of the Macintyre and Dumaresq rivers defining the Qld/NSW border. There are no national parks or other nationally-protected landscapes within the LVIA study area.

1.3. Landscape and visual impacts

The LVIA identified and assessed the impact of the proposal on landscape, visual and lighting amenity through a combination of desk and field work, including GIS analysis, Visibility Analysis Mapping (VAM) and preparation of illustrative cross-sections and visualisations.

Six Landscape Character Types (LCTs) have been identified within the study area, which are assessed to receive impacts of up to low significance (Landscape Type A: Vegetated Water Courses – River) associated with the Macintyre River Crossing.

In this flat to gently undulating landscape, visual impacts are contained by the presence of vegetation and landform. There are relatively few visual receptors with much of the landscape comprising isolated farmsteads set on large private farms. The main views are obtained from local roads including North Star Road and the Bruxner Way.

As part of the visual assessment, six representative viewpoints have been selected and assessed for both construction and operation phases of the proposal. During construction, the greatest visual impact identified was up to Moderate significance, relating to three viewpoints (Viewpoint 2: North Star Road looking north, Viewpoint 5: Bruxner Way, looking east and Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah).

For visual impacts during operation, the greatest impact identified of up to High significance relates to one viewpoint (Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)) relating to the introduction of the railway bridge and viaduct over the Macintyre River on the Toomelah Aboriginal Community and associated heritage area. This is considered to be the most significant visual impact of the proposal. Other visual impacts are of lower significance, relating to isolated homesteads during construction.

For lighting impacts the greatest impact identified of up to Negligible significance relates to viewpoints - Viewpoint 2: North Star Road looking north and Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah).

Cumulative impacts, particularly the effects in combination with the adjoining N2NS and B2G Inland Rail projects have been considered. Cumulative impacts during both construction and operation are of Low consequence and there are no identified cumulative impacts associated with night lighting.

1.4. Mitigation opportunities

The design has incorporated some mitigation measures that are considered as initial mitigations, and which have been considered in the impact assessment. The LVIA has also identified a range of additional mitigations including protection of existing vegetation, rehabilitation of disturbed vegetation, opportunities to undertake additional planting to buffer views and opportunities for urban design of key structures. These have potential to enhance the legacy of the proposal and would reduce the residual impact of the proposal on some landscapes and views.

2. Scope of report

This LVIA has been prepared by Lat27 on behalf of FFJV as part of an EIS for the proposal.

The Inland Rail is a major national interstate freight route programme between Melbourne and Brisbane. ARTC proposes to construct and operate the NS2B section of Inland Rail which extends approximately 30 km in length. The location of the proposal is shown in Figure 1: Inland Rail regional and Figure 2: LVIA study area (refer Appendix A) and is discussed in more detail below. The proposal connects to the adjacent projects of N2NS in the south and NSW/QLD B2G in the north.

The elements of the proposal that are relevant to the LVIA include the:

- Construction impacts: including laydown areas and associated borrow pits
- New track: Approximately 25 km of new track within the existing non-operational Boggabilla rail corridor and approximately 5 km of new track within a greenfield rail corridor
- Crossing loop and turnouts: One crossing loop, designed to accommodate trains up to 1,800 m long, with provisions to accommodate trains up to 3,600 m long if required in the future
- Bridges : Eleven new bridges (rail over road and rail over water) including an approximately 1.8 km long viaduct over the Macintyre River and Whalan Creek (connecting into QLD)
- Drainage: Reinforced concrete pipe culverts and reinforced concrete box culverts. Scour protection measures will generally be installed around culverts to avoid erosion
- Embankment and catch drains adjacent to the proposed alignment to divert surface runoff the nearest bridge or culvert location
- Level crossings: New and existing level crossings – both passive and active including lighting
- Ancillary works: Ancillary infrastructure including signalling and communications infrastructure, signage, fencing and utilities
  Presence of the freight train: Presence of double stacked trains, with a height of 6.5 metres and up to 3.6 km long.

The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also a controlled action under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Australian Minister for the Environment and Energy.

Lat27 has been engaged by FFJV to prepare this LVIA to support preparation of an EIS for the NS2B section of Inland Rail. The LVIA is required to address issues related to landscape and visual amenity required by the NSW Government Secretary's Environmental Assessment Requirements (SEARs).

2.1. NSW Government Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements, SSI 18_9371, issued 8 August 2018 for the Inland Rail NS2B proposal require consideration of visual amenity issues as described in Table 1.

Table 1: Secretary's Environmental Assessment Requirements compliance

Key issue and desired performance outcome	Requirement	Current guidelines	Relevant section where SEARs requirement is addressed
18. Visual Amenity The proposal minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	• The Proponent must assess the visual impact of the proposal (including permanent spoil mounds, borrow sites, rail formation, bridges, viaduct, and over or underpasses) and any ancillary infrastructure on: o Views and vistas o Streetscapes, key sites and buildings o Heritage items including aboriginal places and environmental heritage o Private landowners and the local community. • The Proponent must provide artist impressions and perspective drawings of the proposal to illustrate how the proposal has responded to the visual impact through urban design and landscaping.	• AS4282-1997 Control of the obtrusive effects of outdoor lighting • Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS 2012) • NSW Sustainable Design Guidelines Version 4.0 (TfNSW 2017) • Technical guideline for Urban Green Cover in NSW (OEH 2015)	• Visual impact assessment of the proposal and ancillary infrastructure, including the proposed construction camp within North Star Sports Club complex is detailed in Section 9 • Impact on landscape character including relevant buildings and heritage information is included in Section 8 and relevant viewpoints in Section 9 • Mitigation is described in Section 12 and supported by artistic impressions and perspective visualisations of the proposal included in Section 9 and at full scale in Appendix B (Viewpoints)

3. Objectives of the LVIA

The purpose of the LVIA is to:

- Identify the urban design and landscaping aspects of the proposal and its components
- Assess the impact of the proposal on the urban, rural and natural fabric
- Explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape
- Identify urban design strategies and opportunities to enhance healthy, cohesive and inclusive communities
- Assess the visual impact of the proposal and any ancillary infrastructure on:
    - Views and vistas
    - Streetscapes, key sites and buildings
    - Heritage items including Aboriginal places and environmental heritage
    - The local community
- Provide artist impressions and perspective drawings of the proposal to illustrate how the proposal has responded to the visual impact through urban design and landscaping.

Key objectives of the LVIA are to:

- Undertake a baseline assessment describing existing environmental values of the LVIA study area with respect to landscape character and visual amenity including scenic viewpoints
- Describe the existing landscape or visual values including reference to any values identified in planning schemes (landscape receptors) and identify those people who experience and value views of the landscape (visual receptors)
- Identify key proposal risks on landscape and/or visual values during the day (and consider the potential for any night time impacts)
- Evaluate the significance of the impacts of the proposal activities on landscape, views and visual receptors during construction and operation phases of the proposal during day and night including cumulative impacts
- Describe any proposal modifications or management techniques that can mitigate identified landscape and visual impacts and consider the likely significance of residual impacts once these measures have been implemented
- Illustrate the visual impacts using visualisation techniques to assist members of the public in understanding potential impacts.

4. Legislation, policies, standards and guidelines

The purpose of this section is to identify and discuss the relevance of any legislative or policy level objectives and standards that exist to protect or manage the landscape and visual values in the context of the proposal.

The purpose of LVIA is to assist in creating a design that is integrated into its landscape context across the whole proposal. For this reason, it is necessary to consider policies and guidelines (particularly at the higher national, State and regional level that may extend beyond the immediate context in which the proposal is sited as well as those that apply at the local level). As an example, consideration of urban design principles set out in both NSW and QLD guidelines will ensure that a common approach is adopted to design and mitigation which fulfils the separate requirements of these jurisdictions while ensuring design consistency across borders.

Similarly, as landscape and visual impacts may cross boundaries, most obviously views between adjoining local council areas, consideration has also been given to the policies applying to adjacent jurisdictions at the local level.

Relevant guidelines that have informed the LVIA methodology are discussed in Section 5. The LVIA has also been informed, where appropriate, by the Infrastructure Sustainability Council of Australia (ISCA) standards and guidelines including:

- Infrastructure Sustainability Council of Australia Version 1.2 (including Technical Manual, Scorecard and supporting materials) (ISCA, 2016)
- Infrastructure Sustainability Council of Australia IS Technical Manual Version 1.2. (2017)
- Infrastructure Sustainability Council of Australia. Version 1.2 Scorecard (April 2018 release) (ISCA, 2018).

Legislation, policies, standards and guidelines that have been considered in this LVIA are described below and, where applicable, shown on Figure 3: Regional scenic amenity and planning designations (refer Appendix A).

4.1. National

The national regulatory context for LVIA practice and policy is summarised in Table 2. The following documents referenced in the SEARS are considered relevant:

- AS4282-1997 Control of the obtrusive effects of outdoor lighting
- Disability (Access to Premises – Buildings) Standards 2010.

Table 2: Regulatory Context – National

Legislation, policy or guideline	Relevance to the proposal
National	
AS4282-1997 Control of the obtrusive effects of outdoor lighting This standard sets out guidelines for the control of the obtrusive effects of outdoor lighting and gives recommended limits for the relevant lighting parameters to contain these effects within tolerable levels. It refers to the potential effects of lighting systems on receptors including nearby residents and users of adjacent roads. It does not apply to road lighting or lighting systems that are of a cyclic or flashing nature. This Standard is also required for consideration as part of the Dis-5 Light Pollution credit in the IS Rating Scheme.	• Lighting is proposed as part of the proposal (see Section 1 for details) • AS4282-1997 is relevant to the consideration of spill lighting associated with a project • The standard notes that the determination of when the spill light becomes obtrusive to others is difficult since both physiological and psychological effects are involved • It provides a common basis for assessment of developments that provide outdoor lighting • Key aspects for consideration include the level of lighting existing in the area, the times the proposed lighting is likely to operate (with different standards applied before and after an established curfew hour – typically 11 pm), and the type of lighting uses • Public lighting is excluded because it is provided to facilitate all night safety and security • Section 2.4 states that "people will have a range of reactions to the installation of outdoor lighting; responses may vary from positive acceptance to outright rejection. The degree of response will depend, in part on the nature of surrounding developments, past experiences, novelty of the installation, and frequency and times of operation." • Table 2.1 of the Standard sets out recommended maximum values (lux levels – a standard measurement of light intensity) for the control of obtrusive light • Illuminance reduces in proportion to the inverse of the square of the distance from the floodlight – therefore, the further away a light source is from a receptor the lower the potential illuminance • The objective of design is to ensure that direct view of the bright parts of floodlights are prevented from positions at eye height of neighbouring properties • As all proposed lighting is for safety purposes during construction (refer Section 7) a full quantitative lighting assessment is not deemed to be required. However, the general principles of AS4282 have been used to inform the qualitative lighting assessment methodology (described in Section 5.10).
AS4970: Protection of Trees on Development Site	• This Standard provides guidance on the principles for protecting trees on land subject to development. Where development is to occur, the Standard provides guidance on how to decide which trees are appropriate for retention, and on the means of protecting those trees during construction work. • The Standard does not apply to the establishment of new trees.
Disability (Access to Premises – Buildings) Standards 2010 This is a legislative document that provides a nationally applicable set of provisions that detail what must be done to provide for non-discriminatory access to public buildings for people with disability.	• The proposal is mostly located in a rural area within privately-owned land with limited public accessibility limiting the applicability of the Disability (Access to Premises – Buildings) Standards. However, accessibility needs to be considered where the alignment passes through settlements and in recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. It will also be relevant to the design of accommodation camp and site offices that are proposed as part of the proposal. • The objects of these Standards are to: o Ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with a disability o Give certainty to building certifiers, building developers and building managers that, if access to buildings is provided in accordance with these Standards, the provision of that access, to the extent covered by these Standards, will not be unlawful under the Act

4.2. State and regional

The NSW State and regional regulatory context for LVIA practice and policy is summarised in Table 3. This comprises the following documents referenced in the SEARs and/or identified as being relevant to this proposal through the LVIA process:

- Beyond the Pavement: RTA urban design policy, procedures and design principles (Roads and Maritime Services (RMS), 2014)
- The Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RTA 2018)
- Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012)
- NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017)
- Crime prevention and the assessment of development applications (DUAC, 2001)
- Urban Green Cover in NSW – Technical Guideline. (NSW OEH, 2015)
- Healthy Urban Development Checklist (NSW Health, 2009)
- New England North West Regional Plan 2036 (NSW Government Planning and Environment (2016).

Table 3: Regulatory Context – NSW State and Regional

Legislation, policy or guideline	Relevance to the proposal
NSW (State level)	
<u>Beyond the Pavement: RTA urban design policy, procedures and design principles (RMS, 2014)</u> Beyond the Pavement is a high-level urban design policy produced by Roads and Maritime Services (RMS) formerly known as the Road and Traffic Authority (RTA) that systematically incorporates urban design thinking into infrastructure proposals, with a focus on delivering improved design outcomes and higher levels of community satisfaction. This Guideline is referenced in the IS Technical Manual as part of the Urb-1 Urban Design credit in the IS Rating Scheme	• This plan is relevant to the entirety of the proposal, as it is important to consider the broader impacts of the proposal and associated infrastructure (including infrastructure associated with temporary construction such as laydown yards, camps and construction lighting) upon existing built form, communities and the natural environments the Proposal transects. • The key purpose of this policy is to ensure that during construction and operation: o Existing landscape and built environment qualities are understood and protected o Built projects contribute to the quality of the built environment in urban and rural contexts, and create a legacy for the future o The quality of life of local communities is protected or improved in terms of connections, access to facilities, proximity to noise, views, safety and sense of place • The guidance considers "…roads and bridges can be impressive and attractive feats of engineering which add visual interest and identity to the environment, or, if not designed well, can be visually unappealing and fail to be embraced by the community". Relevant to the LVIA, this report states that: • The architectural and landscape quality of transport infrastructure should be visually pleasing • Transport infrastructure should fit sensitively into its natural setting, protecting the scale and unique qualities of the places in which it is situated • Major built elements can add character and help transform areas for the better • The design quality of structures and elements contributes to how a place looks and feels and how robust and durable it is • Major structures (such as bridges) associated with the entry to country towns should be planned and designed with special care as they can form 'gateways' and signature landmarks in the landscape

Legislation, policy or guideline	Relevance to the proposal
	• Tunnel portals should be distinctive and elegant, address their rural or urban context • The location, scale and design of earthworks and structures should be kept in character with the existing landscapes and neither intrude into views from key sites and nearby properties, nor affect sites which may be of significant heritage or conservation value, or that have visual prominence or value • The retention of views helps define the scenic quality of a road or a journey • Views and viewpoints to heritage bridges, abutments and buildings should be maintained, as far as possible • Signage should be designed and located to minimise the visual impact on heritage buildings and ensembles, as well as structures of heritage significance, such as bridges, Aboriginal heritage and culture, historic roads and the broader landscape of which these are part • Vegetation contributes to the uniqueness of a place, the 'greening' of a corridor and the overall tree cover of an area • Plantings in towns, cities and the countryside or along roads that can be considered to have heritage value, even if their heritage value has not yet been assessed and formally listed on an environmental plan or register should be preserved and respected.
The Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RTA 2018). This practice note applies to projects which RMS is seeking determination and approval to proceed. Therefore, it applies principally to road projects. It recognises the importance of landscape character and visual impact assessment to determine impacts on the character and views within a place to ensure a good urban design outcome.	The purpose of this practice note is to: • Inform the development of the preferred route and concept design to avoid and minimise impacts up front • Inform RMS, other agencies and the community about what avoidance, management and mitigation strategies would be implemented • Nine principles are described • The note differentiates between the assessment of impact on an area's built, natural and cultural character or sense of place and the assessment of impacts on views • The impact assessment process is based upon assessment of sensitivity to change and magnitude (scale, character, distance) of the proposal on an area or view • A range of attributes for the assessment of landscape character are described and the guidance requires desk and field-based study to break the study area down into character zones • The visual assessment methodology includes defining the extent of visibility, identifying key viewpoints and their sensitivity in order to assess visual impacts • Guidelines are given for refining the concept through siting and mitigation using the RMS suite of urban design guideline documents including construction and operation phases.
Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012) The purpose of this document is to help design teams produce bridges of aesthetic value.	• This document is relevant to the assessment of the design of the bridge structures. This report states that: o Bridge design should consider the visual impact of proposed infrastructure on the local context and be contextually appropriate o Bridges along the route should be designed to create a visually consistent design language, that assists in placemaking and wayfinding

Legislation, policy or guideline	Relevance to the proposal
NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) These guidelines are a key tool in helping to realise sustainable proposal outcomes and seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure proposals.	• The guidelines incorporate the following key aims: o Minimising impacts on the environment, whether through transport operations, infrastructure delivery or maintenance o Procuring, delivering and promoting sustainable transport options that achieve value for money and reduced life cycle costs o Developing, expanding and managing the transport network that is sustainable and climate resilient • The guidelines outline several sustainability initiatives (14 compulsory requirements and two sub requirements) that project teams are required to implement at each project delivery stage • Note: This guideline is typically applicable to passenger rail within urban centres, however key principles have been considered where relevant.
Crime prevention and the assessment of development applications (DUAC, 2001) These guidelines are intended to assist councils identify crime risk and minimise opportunities for crime through the appropriate assessment of development proposals. This Guideline provides a framework for the Hea-2 Crime Prevention credit in the IS Rating Scheme.	• The proposal is mostly located in a rural area within privately-owned land with limited public accessibility limiting the applicability of the CPTED guidelines. However, CPTED needs to be considered where the alignment passes through settlements, near recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. • The guidelines describe several basic CPTED principles to assess development applications including surveillance (both direct and indirect), access control, territorial reinforcement and space management. These principles apply to both construction and operation project phases.
Urban Green Cover in NSW – Technical Guidelines. (NSW OEH, 2015) These guidelines offer built environment professionals practical information and typical details to encourage best practice applications of green cover, to minimise urban heat impacts across NSW.	• The Project is mostly located in a rural area crossing privately-owned land with limited public accessibility limiting the applicability of the Urban Green Cover guidelines. However, the principles outlined in this document need to be considered where the alignment passes through urban areas, settlements and/or in recreational areas where people may be present close to the alignment. • The document aims at Increasing green cover to mitigate rising temperatures in the following ways: o Protecting and enhancing existing local green spaces o Designing eco-friendly buildings and infrastructure o Supporting existing green space networks
Healthy Urban Development Checklist (NSW Health, 2009). The checklist is intended to assist health professionals to provide advice on urban development policies, plans and proposals. It is a tool for reviewing and commenting on development plans and providing input and advice from the earliest possible phases of the urban planning and development process.	• This document acknowledges the influence of the built environment on public health, while exploring ways to more actively engage health professionals and research in the urban planning and development process • The application of this checklist is limited, due to its intention for use primarily by health services workers and the exclusion of large infrastructure projects from its application, since such projects are subject to other processes like environment impact assessment • While not directly applicable, the key principles outlined in this checklist may still serve as a useful guide for comment and advice on this proposal.

Legislation, policy or guideline	Relevance to the proposal
New England North West Regional Plan – 2036 The New England North West Regional Plan 2036 is a 20-year blueprint for the future. The rail alignment passes through Gwydir Shire Council, Moree Plains Shire Council and is within proximity to Inverell Shire Council within this region of NSW. The NSW's State Government's vision for the Region is: 'A sustainable future that maximises the advantages of the region's diverse climates, landscapes and resources'. This Plan will guide the NSW Government's land use planning priorities and decisions to 2036. It is not intended to be a step-by-step approach to all land use planning. Rather, it provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions.	• Key directly or indirectly relevant goals, directions and actions from the plan relevant to the proposal LVIA are outlined below: • Goal 2: A healthy environment with pristine waterways • Direction 11: Protect areas of potential high environmental value: o 11.1 Focus development to areas of least biodiversity sensitivity and implement the 'avoid, minimise, offset' hierarchy to biodiversity and areas of high environmental value o 11.2 Ensure local plans consider areas of high environmental value to avoid potential development impacts o 11.3 Encourage the identification of vegetated areas adjacent to aquatic habitats and riparian corridors in local plans • Goal 3: Strong infrastructure and transport networks for a connected future • Direction 13: Expand emerging industries through freight and logistics connectivity. This supports projects such as Inland Rail through: o 13.1 Implement local planning controls to protect freight and logistics facilities from encroachment of sensitive land uses o 13.2 Work with the Australian Government and councils as the Melbourne to Brisbane Inland Rail Corridor project progresses o 13.3 Integrate cross-border transport planning between NSW and QLD • Direction 14: Enhance transport and infrastructure networks: o 14.1 Protect freight and utility infrastructure and corridors through local plans and strategies to protect network opportunities and distribution from incompatible land uses or land fragmentation o 14.2 Minimise the impact of development on the regional and State road network and rail corridors by identifying buffer and mitigation measures • Planning will encourage infrastructure delivery that targets the needs of its local communities: o Gwydir: Gwydir has abundant environmental assets, including part of Mt Kaputar National Park and Copeton Dam, and the Gwydir and Horton rivers. This rich environment underpins the area's important tourism sector. Managing these assets will deliver a healthy environment and a strong economy. o Moree Plains: The Plan states that Moree is one of the key locations for the potential Melbourne to Brisbane Inland Rail. Moree has abundant tourism assets, including artesian spa baths, art deco architecture and water park. These assets continue to draw tourists and contribute to attractive lifestyles.

The following documents that apply to Qld have also been considered and, where relevant, applied to the LVIA process for this proposal to ensure consistency of approach for the landscape assessment and mitigation approach across the Inland Rail Programme. They are summarised in Table 4.

- Road Landscape Manual (RLM) (TMR, 2013)
- Crime Prevention through Environmental Design (CPTED) (Queensland Government, 2007)
- South East Queensland Regional Plan (SEQRP) ShapingSEQ (Queensland Government, 2017)
- Darling Downs Regional Plan (Queensland Government, 2013).

Table 4: Regulatory Context – Qld State and Regional

Legislation, policy or guideline	Relevance to the proposal
Qld (State level)	
Road Landscape Manual (RLM) (Department of Transport and Main Roads (DTMR), 2013) This manual aims to facilitate the understanding of, and procedures associated with, the assessment, design and management of roads as they affect the Queensland landscape. It sets out principles for the design of roads to assist in their integration in their natural, cultural and urban landscape settings. Appendix 2 describes the process for visual assessment required in the planning and design of Queensland roads.	• The proposal requires the realignment and redesign of numerous local and main roads • Key principles for the design of roads outlined in the manual are integration, context sensitive design, collaboration, sustainability and liveability • Road landscape integration requires that a consistent and harmonious approach is adopted, reflecting and referencing the surrounding natural and built landscape to achieve integration • Context sensitive design solution recognises and respond to the road landscape setting to provide "a transportation facility that fits its setting…that leads to preserving and enhancing scenic, aesthetic, historic, community and environmental resources, while improving and maintaining safety, mobility, and infrastructure conditions." • The manual describes a range of acceptable approaches for the design of hard and soft landscape and urban design elements, including earthworks, vehicle bridges, tunnels, buffer planting etc. • The visual assessment methodology does not directly apply as it is intended for the assessment Main Roads projects. However, the principles have informed the Inland Rail assessment methodology below) • The landscape and urban design guidelines inform the design and the mitigation of impacts of Inland Rail on the roads within the LVIA study area.
Crime Prevention through Environmental Design (CPTED) (Queensland Government, 2007) The CPTED Guidelines for Queensland seek to promote the incorporation of CPTED principles into the planning, design and management of development in Queensland. They aim to guide and encourage public and private developers to design with CPTED in mind.	• The proposal is mostly located in a rural area within privately-owned land with limited public accessibility limiting the applicability of the CPTED guidelines. However, CPTED needs to be considered where the alignment passes through settlements and in recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. • The Guidelines describe several principles to inform design including surveillance (both direct and indirect), legibility, territoriality, ownership, management and vulnerability • The guidelines address a range of scales from planning through to detailed design and include strategies for signage, public artwork, materiality (functional and robust without being harsh) • Key relevant principles include design of the built environment to reduce or limit risk from assault by providing well-lit, active and overlooked places and pedestrian and cyclist systems and routes to important places and avoiding the creation of hidden spaces close to pedestrian/cyclist travel routes in the public realm • Elements such as landscaping, walls, fences, buildings, passages, bridges, tunnels and street furniture are to be designed to avoid hidden places close to paths or hidden corners, blind spots or bends that create places of concealment • It is recommended to avoid, where possible, pedestrian/cyclist tunnels, bridges or other movement predictors (especially closed ones) which limit surveillance and response options.

Legislation, policy or guideline	Relevance to the proposal
Qld (Regional level)	
Darling Downs Regional Plan (2013) The Darling Downs Regional Plan provides strategic direction and policies to deliver regional outcomes which align with the state's interests in planning and development. It is focussed on delivering regional policy aimed at achieving specific regional outcomes. The region includes Goondiwindi Regional Council and Toowoomba Regional Council through which Inland Rail passes.	• Key regional policies are to protect Priority Agricultural Land Uses while supporting co-existence opportunities for the resources sector and provide certainty for the future of towns in the region • The plan states the importance of the regional landscape values stating "the region has some of the state's best assets, with high value scenic and natural amenity, vibrant towns and strong communities underpinned by a diverse range of cultural values. The region encompasses a variety of regional landscapes, including urban and rural holdings, agricultural production, resource and mine sites, and protected areas." • The Plan addresses the increasing importance of the region for tourism noting increasing growth with visitors coming to experience scenic, natural, cultural and heritage attractions • The Plan also emphasises the importance of the region for freight connectivity, noting the eastern Darling Downs is at the junction of several strategic highways and railway lines and is the major transport and service hub of the region. This area facilitates the movement of goods and resources between Queensland's south-east and west, enabling access to domestic and international markets through the strategic port facilities along the east coast. The plan also notes that the eastern area of the Darling Downs region contains the region's largest population centre, Toowoomba—the largest non-capital inland city within Australia. • The Plan highlights the balanced approach that needs to be taken to managing the environmental, community and economic values of the Darling Downs, which applies to all projects including Inland Rail.

4.3. Local

The proposal passes through jurisdictions of Gwydir Shire and Moree Plains Shire. The provisions of these council's respective planning schemes and associated strategy documents apply as follows:

- Gwydir Local Environmental Plan 2013
- Gwydir Shire Community Strategic Plan
- Gwydir Destination Management Plan (2017)
- Gwydir Shire Tourism Plan 2006-2011
- Moree Plains Local Environment Plan 2011
- Moree Plains Shire Growth Management Strategy
- Moree Plains Shire Community Strategic Plan 2011
- North West NSW – Destination Management Plan (2013).

The LVIA study area, beyond the proposal disturbance footprint (as described in Section 5), also includes parts of the following Local Authorities in NSW and Queensland, so these plans have been reviewed for relevance to the proposal:

- Inverell Local Environmental Plan 2012
- Inverell Development Control Plan 2013
- Inverell Community Strategic Plan 2009-2029
- Inverell Shire's Road Map for the Future
- Goondiwindi Regional Council Planning Scheme Adopted 14 March 2018.

All the planning schemes recognise and protect areas valued for their landscape and/or scenic qualities, arising from nature conservation or rural characteristics. The key policies at the local level are summarised in Table 5 and Table 6.

Table 5: Regulatory context – NSW local

Legislation, policy or guideline	Relevance to the proposal
NSW (Local level)	
North West NSW – Destination Management Plan (2013) The Inland Regional Tourism Organisation (RTO) adopted a series of DMP's for Inland NSW. The Region was divided into 'clusters' of local government areas (LGAs), with some of the clusters overlapping.	• Narrabri, Moree Plains and Gwydir Shires are grouped together as the North West cluster in the Plan, with this cluster also recognising Inverell Shire to the east, and the Northern Inland cluster (Walgett to Bourke area) to the west • Key actions identified in the Plan include improving the presentation of towns and villages, and increasing their level of interest and appeal through outdoor dining and public art.
Destination Country and Outback NSW Destination Management Plan 2018-2020 Destination Country and Outback NSW (DNCO) is one of six Destination Networks established by the NSW Government.	• The networks are responsible for driving the growth of the visitor economy in each respective region to help achieve the NSW Government's overnight visitor expenditure goal for 2020 • This document highlights the criticality of preserving and enhancing local cultural, heritage and natural assets is to the long-term viability of regional country towns.
Gwydir Local Environmental Plan 2013 This Plan aims to make local environmental planning provisions for land in Gwydir in accordance with the relevant standard environmental planning instrument under section 33A of the Act.	• The preferred alignment crosses land zoned as RU1 Primary Production in the Gwydir Local Environment Plan Land Zoning Maps (Sheet LZN_001A). • The primary objectives of this zone are to: o Encourage sustainable primary industry production by maintaining and enhancing the natural resource base o Encourage diversity in primary industry enterprises and systems appropriate for the area o Minimise the fragmentation and alienation of resource lands o Minimise conflict between land uses within this zone and land uses within adjoining zones • Clause 5.9 outlines measures to preserve the amenity of the area, including biodiversity values, through the preservation of trees and other vegetation • Clause 5.10 states that developments will not adversely affect the heritage significance of a heritage item, and not have any significant adverse effects on the amenity of the surrounding area. This includes heritage items, environmental and conservation areas, Aboriginal objects and places of significance, and heritage views. • Clause 6.10 states that earthworks associated with developments will not have a detrimental impact on environmental functions and processes; neighbouring uses; cultural or heritage items; features of the surrounding land; the likely future use or redevelopment of land; the existing and likely amenity of adjoining properties; or any waterway, drinking water catchment or environmentally sensitive area.

Legislation, policy or guideline	Relevance to the proposal
Gwydir Shire Community Strategic Plan 2017-2027 (2017) The Community Strategic Plan is a high-level plan providing information on the local community's goals and aspirations for the future.	• This plan has five key focus areas: o A healthy and cohesive community (Social) o Building the business base (Economic) o An environmentally responsible shire (Environment) o Proactive regional and local leadership (Civic Leadership) o Organisational management (Governance) • Key community aspirations in the Plan highlight that level of interest surrounding Inland Rail, and the need for development and support of tourism and tourism infrastructure, including wayfinding signage within the shire • The Plan encourages the adoption of planning for balanced growth and good design, whereby impacts on the natural environment are minimised.
Gwydir Destination Management Plan (2017) The purpose of the Gwydir Shire DMP is to provide the direction and framework for taking Shire's visitor economy forward over the next five years.	• The primary goal of this Plan is to increase visitor expenditure within the Shire, with resultant economic and social benefits for the Shire community • The Vision is that" "Gwydir Shire will have a strong, diversified and sustainable visitor economy, which enhances our lifestyle, respects our environment, and generates significant social and economic benefits for our community. Our Shire will be known for its picturesque setting, unique and impressive landforms, riverside camping and vibrant events. Visitors will be warmly welcomed and encouraged to 'Live the Gwydir Good Life'." • A key part of the Shire's promise to visitors is "Beautiful setting with stunning landscapes and unique landforms" "Tourism also adds to the vibrancy of the area… is a source of new residents for the Shire, with some visitors deciding to settle in the area, attracted by the setting (scenery), lifestyle, affordability and services available". • Key priorities of the plan relevant to LVIA assessment are the: o Retention and protection of the lifestyle, heritage, cultural, landscape and environmental assets that form the basis for tourism within the Shire o Promotion of the Moree-Croppa Creek-North Star route as a scenic alternative to the Newell Highway o Provision of comprehensive way-finding, facility and event signage, as well as effective signage for villages to encourage passing traffic to stop • The future of North Star Caravan Park is uncertain and needs to be determined.

Legislation, policy or guideline	Relevance to the proposal
Gwydir Shire Tourism Plan 2006-2011 The purpose of the Gwydir Shire Tourism Plan is to provide the direction and framework for guiding tourism.	• North Star region is known for its rural scenery, and tourism in the region is highly dependent on highway travellers/passing traffic • Tourist traffic on Boggabilla Road is increasing, with drivers seeking an alternative to the Newell Highway • The presentation of North Star is noted as its greatest weakness • The caravan park, at the south eastern gateway to the village Is stated as presenting poorly and contributing to a negative first impression of the village • Travellers staying overnight in the village are often opting to camp at the War Memorial Park rather than at the Caravan Park due to the poor quality of facilities • This Plan highlights the significance that the appearance of a village plays in enticing travellers to stop • The key goal of this Plan respective to North Star is to improve the presentation, signage and provision of visitor information services • Suggested improvements from the Plan to improve the town's visual amenity include: o Gateway entry signs to the village and a general tidy-up of the entrances o Provision of a map/information directory in the War Memorial Park o Directional signage to key town attractions and amenities o Corridor tree planting along the main routes through the village o Beautification of the General Store - Park precinct, including refurbishing the railway station area o Upgrade of the existing caravan park (or relocating or redeveloping the park).
Moree Plains Local Environment Plan 2011 The aim of the Moree Plains Local Environmental Plan (LEP) 2011 is to guide planning decisions for Moree Plains Local Government Area through zoning and development controls, which provide a framework for the way land can be used. The LEP is the main planning tool to shape the future of communities and ensure local development is done appropriately.	• The LVIA study area includes land zoned "Rural – Primary Production" in the Moree Plains Local Environment Plan zoning maps. • Key relevant objectives for development include: o The proposed development would not adversely affect the heritage significance of the heritage item, including its setting, or the heritage significance of the Aboriginal place of heritage significance o The proposed development should not have any significant adverse effect on the amenity of the surrounding area o Earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land o The proposed development should not have a detrimental effect on the likely future use or redevelopment of the land or on the existing and likely amenity of adjoining properties.

Legislation, policy or guideline	Relevance to the proposal
Moree Plains Shire Growth Management Strategy (2009) The Growth Management Strategy provides a future direction for the settlements and land within the shire. The document provides a description of the physical, social and economic environment of the Shire as well as the planning context. The development pattern of the Shire is described and the issues during the future of the shire have been discussed. The strategy then makes several recommendations for future action.	• The LVIA study area falls within this Council area • The unique rural landscape character of the Moree Plains Shire is noted as a visual resource as it generates tourism, development and environmental management • The strategy notes the importance of recognising the visual amenity of open paddocks, distant views, heritage items and rural activities • Controls which may be considered for retaining the rural character include: o Planting controls for screening undesirable elements and incorporating buffers to significant environmental communities o Building controls for siting development and advertising o Planning controls for lot sizes, the design and siting of residential dwellings and ancillary buildings, in relation to the visual amenity of road corridors.
Moree Plains Shire Community Strategic Plan (2011) The purpose of the Moree Plains Shire Community Strategic Plan – "Moree Plains 2027 – Your Shire. The Plan. Our Future" - is to identify the community's main priorities and aspirations for the future and plan strategies to achieve them.	• The LVIA study area falls within this Council area • This plan has limited applicability to the proposal. It does include two environmental objectives that should be considered when assessing the impact of the proposal: o E3.1 Enhance the character of our local area through good design and protection of Aboriginal and other heritage sites o E3.2 Improve the appearance of our town and villages.
Moree Plains Shire DCP (2013) This Development Control Plan (DCP) provides specific, more comprehensive guidelines for certain types of development, or area specific requirements for localities.	• The LVIA study area falls within this Council area • This document does not directly apply to rail projects • However, Appendix 3 – Sample Plant Species includes guidance on the type of plant species that are considered suitable for use in the District.
Inverell Local Environmental Plan (2012) The aim of the Inverell Local Environmental Plan is to guide planning decisions for Moree Plains Local Government Area through zoning and development controls. It is noted the Inverell Development Control Plan 2013 and Community Strategic Plan 2009-2029 Inverell Shire's Road Map for the Future were also reviewed but did not have any meaningful implications for the proposal.	• The proposal does not directly fall within this council area. However, since the intent of the design is to provide a unified approach that integrates to the greatest extent possible with the wider landscape this Plan was reviews to determine if there were any objectives relevant to the current assessment, given its proximity to the Macintyre River. • Land in proximity to the LGA border is zoned 'E4 – Environmental Living'. Key relevant objectives include: o Proposed development should conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views o Proposed development should not have any significant adverse effect on the amenity of the surrounding area o Earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Table 6: Regulatory Context – Qld Local

Legislation, policy or guideline	Relevance to the Inland Rail C2K Project
Qld (Local level)	
Goondiwindi Regional Council Planning Scheme Adopted 14 March 2018 The scheme divides the area into zones with associated codes.	• The proposal does not directly fall within this Council area. However, the proposal joins the B2G alignment on the NSW/QLD border at the proposed Macintyre River bridge. Accordingly, the LVIA study area includes part of the Goondiwindi Regional Council Area so the potential for cross-border impacts have been considered. • The B2G alignment predominantly traverses land zoned as Rural, including land within the Alluvial Plains, Kumbarilla Rises and Horticulture 1,2 and 3 precincts • Part 3, Strategic Framework includes the following specific outcomes that reference amenity and rural landscape as follows: • 3.6.1 Community Identity: (1) The unique identity of the towns of Goondiwindi Region is recognised and strengthened through appropriate development outcomes that protect and enhance the character of the town centres, heritage places and, more generally, the scenic amenity values of the rural landscape that provide the settings for these towns. • 3.6.2.1 Town Character Specific Outcomes: (a) The traditional town character integral to the identity of Goondiwindi Region is preserved and promoted through development that maintains the unique built form character and identity of each town centre; and (b) The dominance of natural landforms and open space in the Rural Area identified on Strategic Framework Map 1— Settlement Pattern and associated landscape and scenic amenity values that provide the setting for the towns are maintained. • Section 3.6.4 states that open space, sport and recreation facilities network should be: (ii) protected from the encroachment of incompatible development in order to protect the health wellbeing, amenity and safety of the community. • Section 3.6.5 outlines specific outcomes relating to Cultural Heritage requires that (b) Development on or adjacent to a place or structure of cultural heritage significance maintains the architectural or historical significance of the place or structure through a sensitive design outcome, having regard to the scale, form, materials, setting architectural theme and style of existing development • Section 3.6.6.1 outlines specific outcomes relating to Scenic Amenity and Regional Landscape Character requiring protection of the productive use of rural land and the dominance of natural landforms and open space over built form in rural areas • Section 3.8.4.1 outlines specific outcomes for the Rail Network, requiring it is protected from development, including that which has the potential to generate reverse amenity impacts • Section 6.2.9.2 Purpose and Overall outcomes for Rural Zone areas includes provisions for amenity and rural landscape as follows: (e) a general low rise and low intensity scale of development is maintained consistent with the predominant rural character of the zone and visual prominence of environmental and landscape features in the rural landscape (f) the viability of rural activities, are protected from the encroachment of incompatible development such as sensitive land uses; (g) uses other than rural activities are located in the Rural zone only where those uses: (i) do not impact adversely on the amenity of the Rural zone;

Legislation, policy or guideline	Relevance to the Inland Rail C2K Project
	(ii) have a demonstrated need to co-locate with rural activities or natural or cultural resources… (v) protect the landscape values and scenic amenity of the Rural zone. (q) places, buildings or items of cultural heritage or heritage character are protected and enhanced by development to preserve the historic character and identity of the locality • Section 8.2.4.2 Heritage Overlay Code Purpose includes provisions for amenity and rural landscape requiring (a) the heritage significance of individual sites and places is conserved: (b) development on a local heritage place remains compatible with the heritage significance of the place by (iii) protecting, as far as practicable, the context and setting of the local heritage place.

5. Methodology

The LVIA methodology has been developed with reference to guidelines and techniques used in Australia and internationally, including:

- Australian Institute of Landscape Architects (AILA) Queensland (2018) Guidance Note for Landscape and Visual Assessment (GNLVA)
- Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RTA 2018)
- The Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3), Routledge
- The Landscape Institute and the Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment, Second Edition (GLVIA2), Spon Press
- South East Queensland Regional Plan (SEQRP) Implementation Guideline No 8 Identifying and protecting scenic amenity values, Queensland Government (2007)
- Landscape Institute (2018) Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment, Public Consultation Draft 2018-06-01
- Landscape Institute (2011) Landscape Institute Advice Note 01/09: Use of photography and photomontage in landscape and visual assessment
- Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity Scottish Natural Heritage and The Countryside Agency (2006)
- Australian Standard 4282 – Control of Obtrusive Effects of Outdoor Lighting (1997)
- The Institution of Lighting Engineers UK (2005) Guidance Notes for Reduction of Obstructive Lighting.

As described in the GNLVA (AILA, 2018):

> "*Landscape and Visual Assessment (LVA) is an essential tool of reconciling development with landscape and scenic values and promoting better outcomes for our communities*."

5.1. Definition of the LVIA study area

For the purposes of the landscape and visual impact assessment, a LVIA study area has been defined as the area illustrated in Figure 2: LVIA study area (refer Appendix A). This aims to establish the area within which the proposal has any potential to influence landscape and/or visual values and receptors, defined as a 10 km offset from the centre line of the rail alignment, based on:

- Assumptions regarding the likely extent of visibility of projects of this nature, based on experience of previous similar projects in Australia such as the LVIA for the Southern Freight Rail Corridor (SFRC) (AECOM 2008). It is considered unlikely that any visual receptors located beyond the boundary of the 10 km LVIA study area will be able to obtain any views of the proposal. However, it is noted that the proposal connects to the adjacent Narrabri to North Star (N2NS) and NSW/Qld Border to Gowrie (B2G) Inland Rail Projects, considered further in Section 11.
- The horizontal and vertical alignment for the proposal
- Visibility analysis mapping (VAM), as described overleaf, which establishes the theoretical viewshed of the proposal based on landform
- Refinement during the field survey stage.

5.2. Desktop assessment

A desktop analysis of existing landscape character and visual amenity for the proposal site and wider study area was undertaken to inform this LVIA. This included analysis of the underlying topography, land cover and landscape values. Information sources that have been identified and reviewed through the desktop analysis include:

- Relevant planning schemes, policies and guidelines from local councils and the State Government (refer Section 4)
- Publicly available information on recreation spaces and public visitor areas
- Traffic count data
- Digital aerial photography (imagery obtained 2018 from Google Earth)
- Cadastral data (showing roads, property boundaries and built areas)
- NSW and Qld IBRA bioregion and sub bioregion data (ERIN)
- STREM (DEM1S) data – landform and topography
- EPBC Tool – matters of national significance
- DNRM – watercourses and drainage features
- DEHP – matters of State significance
- NSW Digital Topographic Database (DTDB) and Department of Finance, Services and Innovation GIS layers - including “Named Water Course” and “Hydroline” information
- Other GIS information available online
- Publicly available LVIAs that have been prepared for similar projects within Qld or NSW, such as the Southern Freight Rail Corridor (SFRC) Landscape and Visual Impact Assessment prepared by AECOM (2008).

5.3. Visibility analysis mapping study

The VAM (sometimes also known as a ‘Zone of Theoretical Visibility’ (ZTV) study) comprises a digitally mapped representation of the area within which a proposed development may have an influence or effect upon views and visual amenity. It is used as a desktop tool to inform the visual assessment, including selecting representative viewpoints for more detailed assessment through field survey.

ESRI ArcGIS 10.5.1 software has been used to model the VAM. The viewshed analysis tool in ArcGIS was used to identify the cells in the Digital Elevation Model (DEM) that are potentially visible from the observation features, which are selected mapped points along the rail alignment at approximately 500 m intervals and their known elevations. The DEM was derived from a combined DEM lidar survey (resampled to a raster size of 20 m) within 5 km and SRTM data (DEM1s) beyond this distance (at 30 m resampled back to 20 m).

Cells in the DEM that are in the theoretical visible line of sight of each part of the rail line are given the value of 1 (potentially visible). Cells that are not in the line of sight of each observation feature, due to being obscured by intervening landform, are given the value of 0 (not visible). The digitally-mapped representation indicates how many of the observation points are theoretically visible based on topography over the extent of the study area: No colour is applied to areas that are not visible from any observation points with blue, turquoise, yellow, orange and red colour added with increasing number of observation points potentially visible (up to a maximum of 52).

The calculation of the VAM does not consider any built development, which can locally reduce the availability of receptors views. However, based on field observations, it is considered that because built development within the LVIA study area is generally minimal, it would be unlikely to meaningfully affect the extent of the identified visible zone. VAMs also do not account for vegetation which can significantly affect visibility locally and over large forested areas (such as State forests) but provide a coarse level of analysis to guide the fieldwork as described below.

An additional VAM was produced during the assessment period indicating the height of the double stacked train (i.e. to a height of 7.5 m above the rail alignment).

Further analysis was undertaken to compare the VAM of permanent infrastructure with the VAM of the double stacked train. This assisted in determining the extent to which the operational rolling stock may affect visibility of the proposal. Preparation of a VAM comparing the difference between operational infrastructure and the rolling stock assisted further.

Collectively the VAM outputs were used with other desk top information (such as cadastral information indicating the likely presence of visual receptors) to assist in identifying view sheds and potential major views and outlooks for further analysis in the field, to meet the requirements of the SEARs to assess the visual impact of the proposal and any ancillary infrastructure on views and vistas as required by the NSW Government SEARs that are described in Section 2.1 above.

5.4. Field survey

A field visit to assess the LVIA Study Area was carried out between 5 and 7 September 2018. This was undertaken by a landscape planner with extensive experience in LVIA accompanied by a landscape architect skilled in landscape photography.

The purpose of the field assessment was to ground truth the findings of the desktop assessment and to assess landscape character and visual amenity, including identifying sensitive viewpoints requiring further assessment. Photographs were taken to:

- Portray landscape character
- Inform the viewpoint assessment from representative viewpoints
- Provide base images to produce visualisations.

The field visit focused on aspects of the landscape with potential to be of the greatest sensitivity to the proposal and to understanding the proposal infrastructure that is most likely to affect landscape character and visual amenity values.

5.5. Stakeholder and community consultation inputs

Community perception is an important consideration in assessing the landscape and visual impact of the proposal. A stakeholder and community engagement process has been developed for the proposal, undertaken by others (including as part of the Social Impact Assessment).

Key issues raised by stakeholders and the community in relation to the visual amenity of the proposal included the visual impacts during operation, and the need to consider mitigation strategies such as tree screening.

5.6. Identification of potential proposal impacts

This component of the LVIA includes describing permanent infrastructure that is likely to be associated with the proposal within the LVIA study area, such as the presence of embankments, bridges, cuttings, fencing, level crossings and borrow pits.

The potential for impacts of different types across a range of project phases, scales and timeframes are considered, including:

- Temporary (short-term) and permanent (long-term)
- Reversible and irreversible
- Beneficial, neutral and adverse
- Daytime and night-time (lighting)
- Construction and operation
- Cumulative.

These potential impacts are further discussed in Section 7.

5.7. LVIA methodology overview

The LVIA methodology is a significance assessment as described in the EIS' Chapter 10: Assessment methodology. The significance assessment method has been applied to environmental values that will be impacted by the proposal where impacts cannot be quantified. Unlike some other technical disciplines there are no established, measurable thresholds of significance for defining either landscape or visual impacts, although there are some standards associated with lighting. The purpose of the LVIA process is to determine the level of significance of impacts on the landscape and visual resource, during day and night, during both construction and operation phases of the proposal.

The significance of a potential impact is assessed in terms of the sensitivity (or vulnerability) of the environmental value, and the magnitude of the potential impact. The LVIA significance methodology is, therefore, determined by considering the sensitivity of the landscape or visual receptor and the magnitude of change to the receptor anticipated as a result of the proposal.

It is noted that the LVIA methodology has defined its own thresholds for sensitivity and magnitude that are different to the criteria in Chapter 10: Assessment methodology of the EIS and follow criteria and principles more widely-used for the assessment of landscape and visual impacts. This is because many landscape values, including views, are rarely listed on statutory State, national or international registers. Assessment at the LGA level of landscape and visual values is also not always available and is frequently inconsistent. Therefore, establishing common criteria specific to landscape and visual values is more likely to result in a fair assessment of values and sensitivity. Similarly, magnitude criteria need to be defined that recognise the range of factors relevant to LVIA, for example the number of people experiencing a change in view and the intensity of the change.

The significance assessment matrix has also been streamlined to remove 'major' for sensitivity and magnitude established in Chapter 10: Assessment methodology of the EIS since these thresholds are difficult to translate to landscape and visual values. For example, 'major sensitivity' elements are not anticipated to be present since there are no 'entirely intact' landscapes within the LVIA study as all have been influenced by human activities. Similarly, 'major magnitude' is unlikely because any proposal impacts on landscape or visual values would be reversible, with sufficient time and budget.

Although related, landscape, visual and lighting impacts are considered separately for clarity. This process is illustrated on Plate 1 and described in further detail in Section 5.8, Section 5.9 and Section 5.10.

Plate 1: Landscape and visual impact assessment process

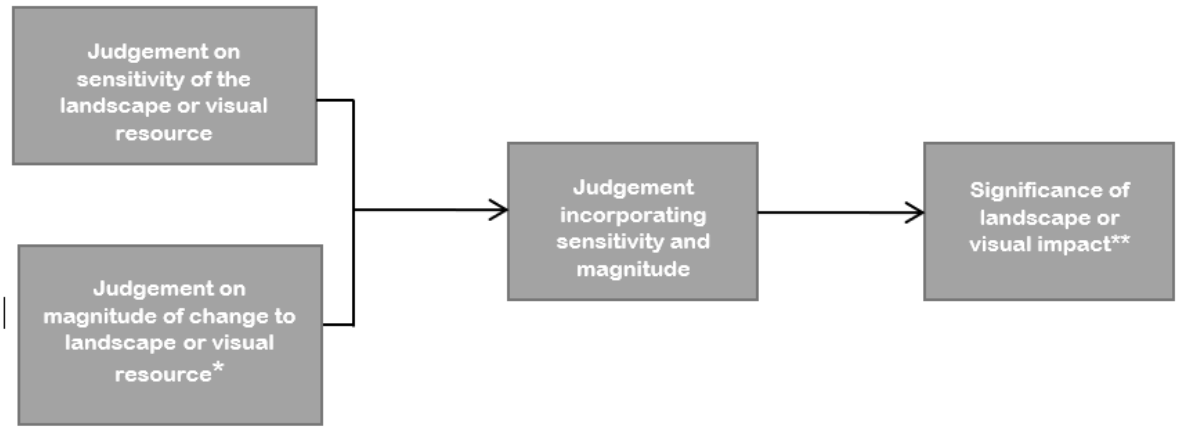


Figure notes:

* There is no standard methodology for the quantification of the magnitude of effects; however, it is generally based on the scale or degree of change to the landscape resource, the nature of the effect and its duration.

** Overall landscape impact is determined by combining the sensitivity of the landscape resource with the magnitude of landscape change. Professional judgement used to determine the overall significance of impact based on these two elements.

While the values placed on views and landscapes may be culturally influenced, the GNLVA (AILA, 2018) states the following general principles have been consistently found in scenic preference studies and community consultation:

- Water and natural elements are preferred over urban scenes
- Mountains and hills are preferred over flat land
- Views are preferred which include both mid-ground elements (with some detail discernible) and a background
- Views with skyline features and views which include focal points are preferred
- Views dominated by, or with a high proportion of attractive features (such as mountains) are considered to be more attractive, and hence more important to retain, than those with only a minor or distant proportion of such elements
- Panoramic views with a number of such distinctive elements are more attractive and worthy of protection than narrow view corridors or a line of sight to a single element
- Diversity is generally preferred over uniformity, and heritage over modernity, but these need to be balanced with preferences for consistency and coherence of built form, which are also valued
- Viewpoints (including residences and public places) may have primary views in one direction (e.g. to an attractive or distinctive feature) and secondary views in other directions. The distinction may be related to desirability of views (e.g. river views), viewing distance, or to the orientation of viewpoints (e.g. lookouts)
- Discordant elements which contrast markedly with their otherwise-attractive settings are often regarded as having a detrimental impact on amenity. This depends on the viewing distance and proportion of view affected, and overall design
- Views from accessible public spaces (e.g. streets, lookouts, parks, etc.) are valued more than views available only from private residences.

5.8. Landscape impact assessment methodology

The landscape assessment is based upon an analysis of landscape character, including those landscape features that contribute to the amenity of the area; particularly any landscape values identified in legislation or planning documents during the desktop phase or through community and stakeholder consultation.

Landscape Character Assessment (LCA) is a tool for identifying what makes one place different from another. It identifies what makes a place distinctive, without necessarily assigning a value to it. This approach has been used to establish the existing character of the landscape to provide a framework for measuring the impact of the proposal on landscape character. LCTs have been defined and, where necessary, these have been further subdivided into geographically distinct LCAs. The general character of the landscape and the identified landscape character types are described in Section 6 and Section 6.2.

Landscape sensitivity

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 and values. Therefore, assessment of sensitivity is based on the scale and location of the proposal and how this relates to the landscape characteristics of the LVIA study area. For example, undulating forested landscapes may be sensitive to removal of vegetation and creation of cuttings. Sensitivity to change also considers landscape values protected by legislation or policies (such as National Parks or locally-valued landscapes protected in a local planning scheme).

Levels of sensitivity vary according to the type of development and the nature of the landscape. Key aspects that have been considered when identifying the level of sensitivity associated with each landscape character type include:

- The landscape's inherent values (e.g. perceptual qualities, cultural importance, and any specific values that may apply such as landscape planning designations, as described in Section 4: Legislation, policies, standards and guidelines
- The landscape's ability to absorb changes associated with the proposal (e.g. the extent to which the proposal may fit or be absorbed into the landform, land use, pattern, scale or texture of the existing landscape).

A guide to these is shown in Table 7.

Table 7: Defining landscape sensitivity

Sensitivity of landscape	Attributes of landscape sensitivity categories
High	A landscape protected by national designation and/ or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.
Moderate	A moderately valued landscape, perhaps a regionally important landscape and/or protected by regional/State designation, or where its character, land use, pattern and scale may have some capacity to accommodate a degree of the type of change envisaged.
Low	A landscape valued to a limited extent, perhaps a locally important landscape or where its character, land use, pattern and scale is likely to have the capacity to accommodate the type of change envisaged.
Negligible	A landscape which is not valued for its scenic quality or where its character, existing land use, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change.

Magnitude of change to landscape amenity

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

Magnitude of change is described as Negligible (barely perceptible change), Low (noticeable change), Moderate (considerable change) or High (dominant change), as illustrated in Table 8. The descriptions of magnitude and sensitivity are illustrative as there is no defined boundary between the categories described.

Table 8: Defining magnitude of change to landscape character

Magnitude of change	Typical examples
High	Dominant change: A clearly evident and frequent/continuous change in landscape characteristics affecting an extensive area, which is likely to fundamentally change the character of the landscape.
Moderate	Considerable change: A considerable change in landscape characteristics, frequent or continuous and over a wide area or a clearly evident change, but over a restricted area.
Low	Noticeable change: A noticeable change in landscape characteristics over a wide area or a considerable change over a restricted area but will not fundamentally change the character of the landscape.

Magnitude of change	Typical examples
Negligible	Barely perceptible change: An imperceptible, barely or rarely perceptible change in landscape characteristics.

Significance of landscape impact

An evaluation of overall potential effects on landscape character is based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of landscape impacts exist; therefore, professional judgement and experience are applied to identify the level of significance. Each landscape receptor is assessed on its own merits, as factors unique to each circumstance need to be considered. However, there are general principles which can be used as a guide to this process that provide transparency about how judgements have been made. The overall significance of change to landscape amenity is determined by using Table 9.

Table 9: Determining level of effect on landscape values

Level of effect		Magnitude of change in landscape amenity			
		High (Dominant change)	**Moderate (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of landscape	**High**	**Major**	**High**	**Moderate**	**Low**
	Moderate	**High**	**Moderate**	**Low**	**Low**
	Low	**Moderate**	**Low**	**Negligible**	**Negligible**
	Negligible	**Low**	**Low**	**Negligible**	**Negligible**

In instances where there is no magnitude of change and no potential impacts on landscape character are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in Table 10.

Table 10: Significance Classifications

Significance	Description
Major	Arises when an impact will potentially cause irreversible or widespread harm to an environmental value that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
High	Occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the environmental value. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
Moderate	Results in degradation of the environmental value due to the scale of the impact or its susceptibility to further change even though it may be reasonably resilient to change. The abundance of the environmental value ensures it is adequately represented in the region, and that replacement, if required, is achievable.
Low	Occurs where an environmental value is of local importance and temporary or transient changes will not adversely affect its viability provided standard environmental management controls are implemented.
Negligible	Does not result in any noticeable change and hence the proposed activities will have negligible effect on environmental values. This typically occurs where the activities are in already disturbed areas.

5.9. Visual assessment methodology

Identification and description of visual receptor audiences and viewpoints

The visual assessment is based upon an analysis of views and viewsheds; particularly any major views or outlooks identified in legislation or planning documents during the desktop phase or through stakeholder and community consultation.

Visual receptor audiences are assessed and described in terms of the views which can be obtained from selected representative viewpoints within the LVIA study area. The specific viewpoints used for the assessment have been selected based upon outputs from the VAM study and field survey (as described in Section 5.3 and Section 5.4 respectively). Consistent with typical landscape and visual assessment practice, viewpoints located on private properties have not been visited or assessed. Where appropriate and possible, publicly-accessible locations nearby have been selected to represent these private views.

Potential representative visual audiences and receptors have been identified based on a range of parameters including:

- Proximity of the receptor: the most affected visual receptors are anticipated to be located within a 5 km radius of the proposal unless located at an elevated vantage point
- Type of visual receptor/visual receptor audience, for example:
    - A permanent resident of a dwelling or homestead
    - Drivers or passengers of vehicles passing through the study area
    - Members of the public accessing marked recreational areas (for example in National Parks, State Forests, cycle ways, footpaths and public parks and sportsgrounds)
    - An industrial or commercial worker (excluding those employed as part of the proposal).

These visual receptor audiences and representative viewpoints are discussed further in Section 6.3 and Section 9.

Visual sensitivity

The sensitivity of each viewpoint, and the visual receptor audiences which it represents, is dependent upon the:

- Importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- Type of the visual receptor audience and their likely interest in the view (e.g. residents, visitors to important/valued landscapes or visitors to non-designated areas, motorists)
- Volume of visual receptors and the duration of time that receptors spend experiencing the view.

The GLVIA (2002) states 'changes affecting large numbers of people are generally more significant than those affecting a relatively small group of users.' Similarly, GLVIA (2013) states the visual receptors most susceptible to change include '… residents at home…people, whether residents or visitors who are engaged in outdoor recreation, including use of public rights of way whose attention or interest is likely to be focused on the landscape and on particular views; …communities where views contribute to the landscape setting enjoyed by residents in the area'.

This guidance is reflected in the method used to assess the sensitivity of the viewpoints to the proposal, for example, views from a regionally important location where viewers' interest is specifically focussed on the landscape (such as views from a scenic viewpoint in a national park) have been judged as having a high sensitivity to change as have large numbers of residential viewers. In contrast, passing transient views from cars or small numbers of isolated rural properties are typically judged to have lower sensitivity.

Levels of sensitivity, shown in Table 11 vary according to the type of development and the visual receptor audience.

Table 11: Defining viewpoint sensitivity

Sensitivity of viewpoint	Attributes of viewpoint sensitivity categories
High	Large numbers of viewers or those with proprietary interest and prolonged viewing opportunities such as residents and users of attractive and/or well-used recreational facilities. Views from a regionally important location whose interest is specifically focussed on the landscape e.g. national park.
Moderate	Medium numbers of residents (e.g. rural communities and townships) and moderate numbers of visitors with an interest in their environment e.g. visitors to State forests, including bush walkers, horse riders, trail bikers. Larger numbers of travellers with an interest in their surroundings e.g. local designated scenic routes.
Low	Small numbers of visitors with a passing interest in their surroundings or transient views e.g. those travelling along principal roads. Viewers whose interest is not specifically focussed on the landscape e.g. workers, commuters, truck drivers. Isolated or small clusters of rural residential properties.
Negligible	Very occasional numbers of viewers with a passing interest in their surroundings e.g. those travelling along minor roads and views from the air.

Magnitude of change to visual amenity from representative viewpoints

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 change also depends on the loss, change or addition of any feature in the field of view of the receptor; or any change to the backdrop to, or outlook from, a viewpoint. The assessment assumes a worst-case scenario without any mitigation (excepting that inherent in the proposal). The level of effects on a view depend on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the proposal.

Magnitude of change is described as barely perceptible, noticeable, considerable or dominant, as illustrated in Table 12. Full descriptions on the magnitude of change from each representative viewpoint are discussed further in Section 9.3.

Table 12: Defining Magnitude of Change to Visual Amenity

Magnitude of change	Typical examples
High	Dominant change: Major changes in view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view. Generally, short distances (typically <250 m) to the nearest project infrastructure.
Moderate	Considerable change: Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a more wide-ranging, less concentrated change across a wider area. Generally, short to medium views (typically 250 m-1 km) to the nearest project infrastructure.
Low	Noticeable change: Minor changes in views at long distances or visible for a short duration, and/or are expected to blend in with the existing view to a moderate extent. Generally, medium to long distance views (typically 1 km-2.5 km) to the nearest project infrastructure.
Negligible	Barely perceptible change: Change which is barely visible at a very long distance or visible for a very short duration, and/or is expected to blend with the existing view. Distant views (generally > 2.5 km) to the nearest project infrastructure.

Significance of visual impact

Impacts on the visual resource have been described by representative views in the study area. Impacts can be short term (i.e. those occurring during installation/construction of a development) or long term (i.e. those lasting for the life time of the proposal). Additionally, they can be wide spread (i.e. taking up a large proportional change in the view) or localised.

The evaluation of overall potential impacts on visual amenity is based on the sensitivity of existing views to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of impacts on visual amenity exist; therefore, professional judgement and experience are applied in order to identify the level of significance. Each viewpoint is assessed on its own merits, as factors unique to each circumstance need to be considered. However, the general principles outlined in Section 5.7 and this section provide transparency about how judgements have been made. The overall significance of change to visual amenity and individual viewpoints is determined by using Table 13.

Classification of significance of impacts is considered as described in Table 10.

Table 13: Determining level of effect on visual values

Level of effect		Magnitude of change in visual amenity			
		High (Dominant change)	Moderate (Considerable change)	Low (Noticeable change)	Negligible (Barely perceptible change)
Sensitivity of views	High	Major	High	Moderate	Low
	Moderate	High	Moderate	Low	Low
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Low	Low	Negligible	Negligible

In instances where there is no magnitude of change and no potential impacts on visual amenity are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in Table 10.

Preparation of visualisations

Visualisations are artist's illustrations that aim to represent an observer's view of a proposed development. For the purposes of this assessment, visualisations have been prepared to represent the potential visual impact of the presence of the proposal from a selection of the representative viewpoints identified. Visualisations have been used to:

- Assist with community and stakeholder consultation through providing an artist's impression of features of the proposal that affect key views identified in the assessment
- Illustrate the visual impact assessment to assist in the interpretation of the findings
- Validate the assessment of magnitude of change
- Inform the development of mitigation measures by identifying opportunities and benefits for proposal modifications or landscape and urban design proposals to assist integrate the proposal into its visual and landscape setting, such as screen planting or alternative materials.

Visualisations have not been prepared for all viewpoints. Visualisations have been selected on the basis of those illustrating key infrastructure elements likely to be of interest to the community and/or the most sensitive viewpoints.

The methodology for the visualisation production has been based on State and international guidance including the GNLVA (AILA, 2018), GLVIA (LI, 2013) and Landscape Institute Advice Note 01/09: Use of photography and photomontage in landscape and visual assessment (LI, 2011). Consideration has also been given to the Landscape Institute Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment, Public Consultation Draft 2018-06-01 (LI 2018).

The visualisations have been generated using the following sequential method:

- Step 1: Select and prepare candidate field imagery for photomontage base (field panorama preferred viewpoint):
    - Select preferred field photo location as part of representative LVIA condition
    - Choose a sequence set of field photos from this location representing 75° horizontal field of view (H-FOV) (generally two to three overlapping images)
    - Create combined panorama from raw imagery and crop to 75°
    - Note GPS location of chosen panorama camera position
- Step 2: Assemble 3D design model on terrain model for each viewpoint:
    - Import georeferenced 2 km x 2 km meshed terrain model Triangular Irregular Network (TIN) to SketchUp as base for proposal design visualisation
    - Drape georeferenced high resolution ortho aerial photography (ECW via AutoCAD) onto TIN Mesh
    - Create surface meshes from 3D Civil design geometry strings and insert into terrain model (12D Exports to DWG – Then inserted into SKP with geo-reference)
    - Add Structural Design Geometry of bridges and other design structures. (Export from Revit as IFC and inserted)
    - Cross check master assembly of geometries against contemporaneous general arrangement plans, sections and other details documents
    - Cross check to ensure civil geometry closely matches terrain model (especially batters/earthworks)
- Step 3: Camera match field panorama in 3D design model:
    - Create camera frame in 3D model with 75° H-FOV
    - Locate approximate camera position in model based on GPS coordinates and Field Notes, set bearing and set camera height to photographer's eye height. Generally positional accuracy at this stage is +/- 5 m
    - Create positional massing of existing site features (buildings, power poles, isolated trees, fencing and others) that are identifiable on both aerial and site photography.
    - Fine-tune camera position by superimposing field panorama and 3D model viewport. Positional iterations at this stage aim to locate 3D camera within 1 m of actual field position
- Step 4: Site detail and entourage:
    - Create or import site furniture or design detail, materials, planting, texture necessary or having significant visual impact or effect on visual character of the scene
    - Create and insert suitable distribution of entourage and vehicles. Generally, this means illustrating a track use condition showing proximity of typical representative double-stacked freight traffic
- Step 5: 3D Rendering and photomontage creation:
    - Render 3D model at suitably high resolution for desired production outputs. For this LVIA reporting this is 7,500 x 2,500 pixels
    - Composite rendered image with field panorama image using Adobe Photoshop

- Postprocessing and repair to existing site features. Remove and demolished site features (such as poles, trees and buildings) and make good any ground features to be altered permanently during construction
- Mask parts of rendered image that can be better represented by parts of field image (generally terrain)
- Introduce new elements to the view including any proposed mitigation measures such as vegetation.

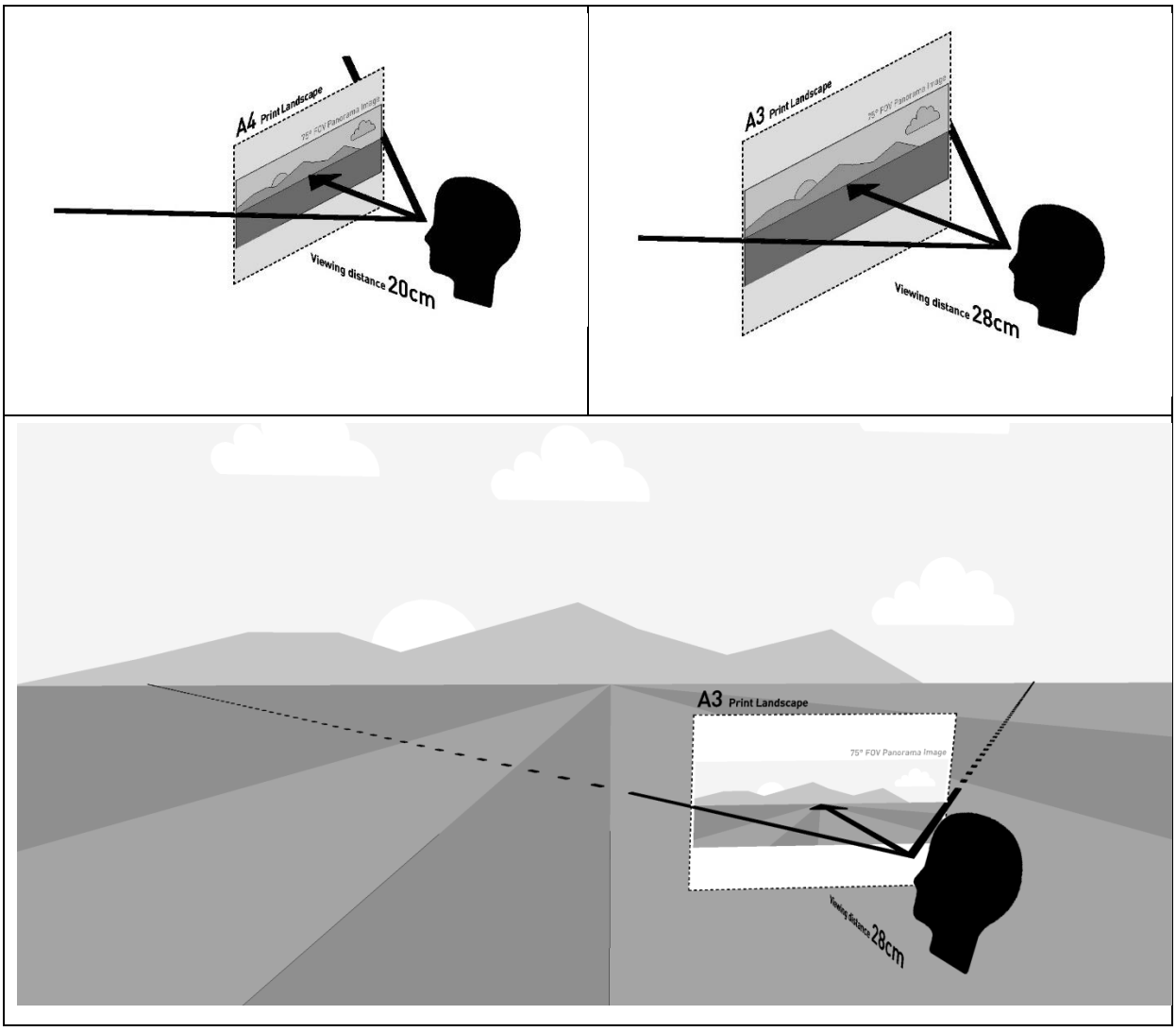
To ensure the photomontages consistently present a view which is representative of the human eye, the field assessment photographs were taken at average human viewing height (typically considered to be 1.5 m). The photos were taken using a Canon EOS 6D Mark II body with a Sigma 50 mm f/1.4 DG JSM lens. The Canon EOS 6D is a full sensor lens. Using a 50 mm lens it has an equivalent Field of View (FoV) as a Standard Single Lens Reflex (SLR) using 35 mm film and 50 mm focal length, which is the standard (albeit technologically outdated) recommendation for obtaining photographs that are representative of the human field of vision (40 degrees).

Photo stitching software and Adobe Photoshop were used to piece together the adjoining images to produce a field of vision of approximately 75° that is considered representative of the human field of view. Although the parameters of human vision when stationary is often quoted as falling between the 45-60° (SNH, 2006), humans generally move their eyes, heads and bodies as necessary to experience a view. Therefore, a wider FOV (75°) has been used for the photomontages, which is in line with good practice.

Photomontages and visualisations should be viewed at the correct 'viewing distance'. Very simply, if the hard copy of the visualisation is held too close to the eye, the elements in the scene will appear too big; if it is held too far away, the elements will appear too small; and there is only one distance at which the photograph will match the real scene (the correct viewing distance).

The visualisations have been illustrated on A4 landscape pages, although could be printed at A3. The recommended viewing distance for each photomontage is determined by the image size and field of view and is represented in Plate 2.

Plate 2: Recommended viewing distance and aspect control for photomontages and visualisations



5.10. Lighting assessment methodology

The lighting assessment is based upon an analysis of representative views identified through the visual assessment. Lighting impacts are considered during both construction and operation phases of the proposal.

Lighting for construction activities will comprise night time lighting of compounds and works areas including the workers accommodation camp. Permanent lighting associated with the proposal will be minimal comprising only the train headlight and safety lighting associated with features such as carparks, level crossings. Therefore, light spill during the construction and operational phase has been assessed through a high-level qualitative assessment.

As there is no prescribed assessment method for assessing the impacts of lighting on visual amenity, guidance and terminology has been taken from Australian Standard 4282 – Control of Obtrusive Effects of Outdoor Lighting (1997) and Guidance Notes for Reduction of Obstructive Lighting (2005) prepared by The Institution of Lighting Engineers UK. This information has then been combined with the standard method of assessment for impacts on visual amenity. Visual receptor audiences are assumed to be the same as those identified in the visual impact assessment process. The assessment is qualitative, and these locations have not been visited at night to measure existing light levels. Consideration has also been given to the relevant provisions of ISCA Dis-5 Light Pollution as discussed in Section 4.

Judgement of visual sensitivity to lighting

The sensitivity of each representative viewpoint to changes in after-dark lighting conditions due to the proposal has been based upon elements illustrated in Table 14 including the:

- Proximity of the viewpoint to the greatest lighting source that is associated with the proposal
- Public and private accessibility of the representative viewpoint location and the likely number of viewers who will visit the viewpoint.

Full descriptions on the judgements of visual sensitivity to lighting from each representative viewpoint are discussed in Section 10.

Table 14: Defining viewpoint sensitivity to lighting

Sensitivity of viewpoint	Attributes of visual sensitivity categories
High	Easily accessible at night with large numbers of viewers or those with proprietary interest and prolonged viewing opportunities located at very close distances (typically less than 200 m) to the light source.
Moderate	Relatively accessible at night with medium numbers of viewers and close to the site or easily accessible with propriety interest but located some distance (typically up to 500 m) from the light source.
Low	Typically, location not accessed at night, with small numbers of visitors with a passing interest in their surroundings e.g. those travelling along principal roads or greater numbers of viewers but located at considerable distance from the light source (typically less than 1 km).
Negligible	Rarely accessed at night. Rural locations with very occasional numbers of viewers with a passing interest in their surroundings e.g. those travelling along minor roads and views from the air or located at greater than 1 km from the light source.

Magnitude of change to lighting from representative viewpoints

The magnitude of change to views and visual amenity due to lighting depends on the nature, scale and duration of the change to lighting that is expected to occur. The magnitude of change also considers any change to the backdrop of, or outlook from, the representative viewpoint. The assessment assumes a worst-case scenario without mitigation.

The level of effect on a view depends on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view and angle of view.

To enable the judgement of the magnitude of changes in lighting, Table 15 considers the existing condition against the potential condition. These conditions include intrinsically dark, predominantly dark, predominantly lit, or brightly lit landscapes as a measure of change in visual conditions:

- Intrinsically dark– Inherently remote rural landscapes with minimal artificial lighting other than that which is localised lighting of a dwelling. Typically, no street lighting and no industrial lighting.
- Predominantly dark – Commonly rural residential landscapes where dwellings are still largely isolated from one another, creating a relatively dark atmosphere with intermittent sources of lighting (such as street lighting). Industrial lighting may occur in predominantly dark landscapes; however lengthy distances between these sites and residential dwellings result in minimal lighting spill onto private property.
- Predominantly lit – Commonly small towns with standard elements of lighting such as street lighting and lighting from residential dwellings, commercial businesses and some industrial lighting
- Brightly lit – Town/city centres or large-scale industrial landscapes with high levels of lighting.

The outcome of this judgement will result in either a high, moderate, low or negligible change to lighting conditions from the representative viewpoint. Full descriptions on the magnitude of change from each representative viewpoint are discussed in Section 10.

Table 15: Defining magnitude of change to lighting amenity

Magnitude of change	Typical examples
High	Dominant change: Occurs when an intrinsically dark landscape becomes brightly lit.
Moderate	Considerable change: Occurs when an intrinsically dark landscape becomes predominantly lit or a predominantly dark landscape becomes brightly lit.
Low	Noticeable change: Occurs when an intrinsically dark landscape become predominantly dark, a predominantly dark landscape becomes predominantly lit or a predominantly lit landscape becomes brightly lit.
Negligible	Barely perceptible change: Occurs when a landscape experiences negligible changes from the existing lighting conditions to the proposed lighting conditions.

Significance of lighting impact

This evaluation considers sensitivity of each representative night time viewpoint and the magnitude of change that is likely to occur. The general principles outlined in Section 5.7 and this section provide transparency about how judgements have been made. The overall significance of change to lighting amenity and individual viewpoints is determined by using

Table 16.

Classification of significance of impacts is considered as described in Table 10.

Table 16: Determining level of effect of lighting

Level of effect		Magnitude of change to lighting amenity			
		High (Dominant change)	**Moderate (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of viewpoint to lighting	**High**	Major	High	Moderate	Low
	Moderate	High	Moderate	Low	Low
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Low	Low	Negligible	Negligible

In instances where there is no magnitude of change and no potential impacts on lighting amenity are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in Table 10.

5.11. Mitigation

Mitigation describes measures that can be implemented to avoid or reduce potential impacts to as low as reasonably practicable, based on the hierarchy of avoid, minimise, manage and offset. The aim of mitigation identified in the LVIA is to protect identified landscape and visual values. Measures may be implemented through proposal design, construction methods, operating and/or maintenance procedures.

Some measures to avoid, mitigate and manage potential impacts form part of ARTC's standard environmental management procedures and, therefore, constitute the base case prior to the implementation of the identified mitigation measures.

Additional mitigation and management measures proposed as a result of the findings of this LVIA may be incorporated into the proposal to further reduce identified impacts. These comprise a range of generic measures that are applicable to a component across the proposal as well as identification of measures that are specific to an infrastructure component or particular location. The mitigation measures are described in Section 11.

Residual impacts relate to any changes in the overall level of effect for potential impacts post the implementation of mitigation. This potentially includes measures that avoid an impact occurring or reduce the magnitude of change. The residual impact assessment is determined using the same process as for the landscape, visual and lighting assessment methodology described above. The residual impact assessment is presented in Section 11.

6. Description of existing landscape and visual amenity values

6.1. Regional landscape context

The proposal is located in central northern NSW, near Boggabilla and North Star, and approximately 18 km southeast of Goondiwindi in Qld. The Site and its wider landscape context are illustrated in Figure 1: Inland Rail regional and Figure 2: LVIA study area in Appendix A.

Settlement and infrastructure

The alignment is situated in a predominantly rural area comprising isolated rural settlements, open wooded and pastoral and agricultural landscapes. The LVIA Study Area has both a rich indigenous and colonial history and has been heavily modified by agriculture, farming and settlement in the region. The nearest town is Boggabilla, located approximately 8.5 km to the west of the northern extent the study area. Goondiwindi, the closest regional centre is in Queensland approximately 18 km to the northwest. There are two small rural settlements situated within proximity to the study area. Approximately 1.5 km to the south of the southern extent of the study area is the village of North Star, which has a population of 260 (North Star State suburb), (Australian Bureau of Statics (ABS) Census Data, 2016). The indigenous Toomelah Community (Toomelah Locality, ABS Census Data, 2016) with a population of 202 is located approximately 2.5 km west of where the alignment crosses the Macintyre River and NSW/Qld border.

Bruxner Way, Kildonan Road and North Star Road are the key routes within the LVIA Study Area, with Annual Average Daily Traffic (AADT) of 297, 142 and 292 vehicle movements a day respectively. Kildonan Road is promoted by Goondiwindi Regional Council as the 'Border Rivers Tourist Drive', an alternative route to the Cunningham Highway to access the town of Yelarbon. Other key roads to note include the Cunningham Highway approximately 12 km to the north of the study area and the Newell Highway approximately 7 km (at its closest distance) to the west.

The proposed alignment links to the south with the adjacent N2NS Project. Approximately 25 km of the alignment follows the existing non-operational Boggabilla Branch Line. This connects through approximately 5 km of new track within a greenfield corridor to the proposed B2G Project at the NSW/QLD border. Other than the existing rail line, there is little built infrastructure in the local area, except for localised powerlines and agricultural buildings.

Agricultural infrastructure includes grain silos; notably the GrainCorp grain silo on the outskirts of North Star, visible from North Star Road and the town.

Geology, landform and hydrology

As illustrated on Figure 4: Landform and hydrological context (refer Appendix A), landform within the Study Area and wider landscape is very flat, typically from 220 m AHD (Australian Height Datum) to 260 m AHD and characterised by branching streams incised into alluvial plains, with multiple anabranches, effluent channels and lagoons. These auxiliary channels drain water away from the main channel when river water levels are high.

The main watercourses in the Study Area are the Macintyre and Dumaresq rivers, significant river systems that define the NSW/QLD border. The alignment traverses the Macintyre floodplain, and many small tributaries of the Dumaresq River, including Whalan Creek, Forest Creek, Back Creek and Mobbindry Creek. All creek tributaries fall within the Border-Rivers catchment.

Geology mapping was obtained from the Australian 1:250 000 Geological Series Goondiwindi map sheet (SG5610) (Geoscience Australia 2017). The geology underlying the study area principally comprises Quaternary alluvial flats. The wider area has some small isolated areas of Tertiary basalt.

Soils, vegetation and rural land use

Existing land use within and adjacent to the proposal study area is shown on Figure 5: Land use (refer Appendix A). As this shows, use is predominantly rural, characterised by board acre cropping (including cotton, wheat, chickpeas, oats and barley) and pastoral or grazing properties for livestock production (predominantly beef cattle and sheep) on vertosols, sodosols and dermosols. Irrigated cropping occurs more frequently within close proximity of the Macintyre and Dumaresq rivers, supported by extensive irrigation infrastructure including large field dams.

Extensive areas within the LVIA study area have been cleared for agricultural production. Native remnant vegetation is largely influenced by floodplains and alluvial fans and comprises small open woodlands, tree belts associated with edge of local and State roads and scattered riparian vegetation associated with creeks. Most waterways intersecting the alignment are lined by narrow remnant corridors of River Red Gym (*Eucalyptus camaldulensis*) with surrounding Myall (*Acacia pendula*), Rosewood (*Alectryon oleifolium*) and Belah (*Casuarina cristata*) woodlands. River red gums (*Eucalyptus camaldulensis*), river oaks (*Casuarina cunninghamiana*) and river paper-barks (*Melaleuca* spp.) characteristically line the deeper main channels and waterways.

Designated landscapes

There are no national parks or other nationally-protected landscapes within the Study Area. Dthinna Dthinnawan Nature Reserve and Dthinna Dthinnawan National Park are located around 28 km to the east of the Study Area. The nature reserve covers an area of 1870 ha, while the national park is 27,803 ha. Much of the reserve is dominated by towering black cypress, white cypress, smoothed barked apple and dirty gum trees, and the park contains a wide range of Aboriginal sites. The park has 70 km of horse-riding trails, and there are picnic and barbecue facilities located at the heritage Iverary Homestead, which offers wildlife, walking, mountain biking and 4WD tours of the area. Due to their distance from the proposal, these areas would not be affected so are not considered further in this assessment.

IBRA classifications

The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia developed by the Australian Government department formerly known as Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment and Energy). IBRA represents a landscape-based approach to classifying the land surface of Australia. The IBRA data consists of two datasets: IBRA bioregions, which are a larger scale regional classification of homogenous ecosystems; and sub regions, which are more localised.

Whilst bioregions have been defined mainly for the purposes of ecosystem planning and monitoring, the nominal attributes that make up IBRA are climate, lithology/geology, landform, vegetation, flora and fauna and land use, which are themes typically used to define landscape character at a high level. On 5th July 2012, IBRA 7.0 was released, which delineates 89 biogeographic regions and 419 sub regions, each reflecting a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment across Australia. The bioregion information enables a high-level desktop understanding of the different landscape settings of the LVIA proposal area. The descriptions for the sub-regions that accompany IBRA 7.0 are not currently published. However, upon request, the Queensland Government Environmental Resources Information Network (ERIN, 2012, personal communication) supplied descriptions of each of the sub-bioregions in the LVIA proposal area for the IBRA5.1 dataset (which follows similar boundaries).

As shown on Figure 6: Interim Biogeographic Regionalisation Australia (refer Appendix A), the proposal site falls within the BBS Brigalow Belt South and DRP Darling Riverine Plains Bioregions. Most of the central part of the study area falls within the DRP03 Castlereagh-Barwon Subregion. To the southern end of the study area, towards North Star, the alignment traverses both the BBS21 Northern Basalts and BBS22 Northern Outwash Subregions. North of the Macintyre River, a small portion of the study area falls within the BBS19 Moonie-Common Floodout. These are described in Table 17.

Table 17: IBRA Sub bioregion descriptions

IBRA Subregion Name, Code and Total Area (Ha)	Description
Northern Basalts BBS21 545396 Ha	Northern Basalts subregion consist of Tertiary basalts over Jurassic quartz sandstones and alluvial sediments derived from these with landforms characterised by undulating low stony hills, long slopes with sandy wash and heavy clays from the valley floors. Black loams are present on basalt ridges, while deep sands exist on sandstone and texture contrast soils on slopes. Heavy grey clay occurs on alluvial flats. Brigalow, belah, whitewood, wilga, budda and poplar box occur on basalt hills while silver-leaved ironbark, spotted gum and smooth-barked apple occur on stony hills. River red gum, belah myall and poplar box are present on basalt flats. Silver-leaved ironbark and white cypress pine occur in sandstone rocks, with smooth-barked apple, white cypress, Blakely's red gum, Moreton Bay ash, poplar box, wilga, rough- barked apple, bull oak, on lower sandstone slopes. White box, with silver-leaved ironbark, white wood, bull oak and brigalow occur on alluvial clays. River red gum grown along all streams.
Northern Outwash BBS22 700495 Ha	Northern Outwash subregion consists of Tertiary and Quaternary alluvial fans and stream terraces while characteristic landforms are generally sloping plains with alluvial fans that are coarser and steeper than the Gwydir Fans downstream. Typical soils are red loams and heavy brown clays while vegetation is characterised by poplar box with white cypress pine, wilga and budda on red soils, belah and brigalow on brown clays.
Moonie-Commonron Floodout BBS19 802963 Ha	Moonie R. - Commoron Creek Floodout is level to gently undulating country on Quaternary alluvium derived from sandstone to east and overlying the Griman Creek Formation. These are also areas of partly consolidated Tertiary alluvial deposits. Soils include grey clays, brown clay loams, sandy solodics and solodised solonetz. Major vegetation types include brigalow (*Acacia harpophylla*) and/or belah (*Casuarina cristata*) open forest often with molly box (*Eucalyptus pilligaensis*) and narrow–leaved ironbark (*E. crebra*) cypress pine (*C. glaucophylla*) open forest/woodland.
Castlereagh-Barwon DRP03 4394293 Ha	Macintyre - Weir Fan subregion consists of extensive plains on overlapping low angle alluvial fans of several rivers. Sediment derived from Jurassic sandstones are present on the Castlereagh fan and from basalts on the Namoi fan. The structure is the same as for Bogan-Macquarie with channels, floodplains, crevasse splays, levees, source bordering dunes and through flow swamps of past and present river systems. Grey and brown clays occur on the plains and depressions with brown loamy sands, pale yellow or red sands, and texture contrast soils on the low rises of former levees and channels. The vegetation of the subregion features river red gum on larger streams. Coolabah with occasional myall, river cooba, whitewood belah and clumps of river paperbark also occur. Mitchell grass with few trees occur on clay plains while poplar box with wilga, whitewood, belah, white cypress pine, silver-leaf ironbark and occasional brigalow occur on higher red soils.

6.2. Landscape character baseline

The identified LCTs and LCAs falling within the LVIA Study Area are shown on Figure 7: Landscape character (refer Appendix A) and summarised in Table 18.

Table 18: Landscape Character Types and Areas

Landscape Character Type (LCT)	Associated Landscape Character Areas (LCAs)
LCT A: Vegetated Watercourses - Rivers	• Macintyre River Vegetated Watercourse (LCA A1) • Dumaresq River Vegetated Watercourse (LCA A2).
LCT B: Vegetated Watercourses - Creeks and Channels	• Whalan Creek Vegetated Watercourse (LCA B1) • Forest Creek Vegetated Watercourse (LCA B2) • Mobbindry Creek Vegetated Watercourse (LCA B3) • Back Creek Vegetated Watercourse (LCA B4) • Swamp Creek Vegetated Watercourse (LCA B5) • Dry Creek Vegetated Watercourse (LCA B6) • Mungle Creek Vegetated Watercourse (LCA B7) • Mungle Back Creek Vegetated Watercourse (LCA B8).
LCT C: Irrigated Croplands	• Kurumbul Irrigated Croplands (LCA C1) • Melon Ridge and Humptybung Irrigated Croplands (LCA C2).
LCT D: Dry Croplands and Pastures	• Dumaresq Dry Croplands and Pastures (LCA D1) • Tucka Tucka Dry Croplands and Pastures (LCA D2) • Coppymurrimbilla Dry Croplands and Pastures (LCA D3) • Newell Dry Croplands and Pastures (LCA D4) • Burringbar Dry Croplands and Pastures (LCA D5) • Forest Creek Dry Croplands and Pastures (LCA D6) • Bruxner Dry Croplands and Pastures (LCA D7) • North Star Dry Croplands and Pastures (LCA D8) • Getta Getta Dry Croplands and Pastures (LCA D9).
LCT E: Rural Settlement	• Boggabilla Township (LCA E1) • North Star Village Rural Settlement (LCA E2) • Kurumbul Rural Settlement (LCA E3) • Toomelah Indigenous Settlement (LCA E4).
LCT F: Vegetated Grazing	• Brigalow Creek Vegetated Grazing (LCA F1) • Kildonan Vegetated Grazing (LCA F2) • Boggabilla Vegetated Grazing (LCA F3).

For clarity, full descriptions of these areas are included together with the impact assessment in Section 8.

6.3. Visual assessment baseline

Visual audiences and receptors

A number of visual receptor audiences have potential to be affected by the proposal including:

- Local residents and workers in townships (North Star, Toomelah and Kurumbul)
- Local residents and workers on rural properties
- Travellers on main roads
- Tourists on numerous local roads including users of ‘scenic drives’
- Recreational users.

The identified scenic drives and location of potential sensitive receptors across the LVIA study area are shown on Figure 8: Tourist drives and sensitive receptors (refer Appendix A).

Viewpoint selection

Representative views from a range of visual audiences are assessed in detail in Section 9.3

The identified viewpoints are shown on Figure 9: Key visual receptors and location of representative viewpoints (refer Appendix A) and are summarised in Table 19 (see Section 9 for full details).

Table 19: Viewpoint selection

Viewpoint name	Anticipated approximate distance to alignment	Key visual receptors
Viewpoint 1: Corner of Capernum Street and David Street, North Star	Alignment is approximately 1.5 km north of this viewpoint.	Represents typical and accessible views of residents, students and staff of North Star Public School and of visitors, workers and tourists travelling north along North Star Road towards Goondiwindi.
Viewpoint 2: North Star Road looking north	This viewpoint is within the disturbance footprint of the alignment.	Represents typical and accessible views of residents and of visitors, workers and tourists travelling along North Star Road.
Viewpoint 3: North Star Road, looking east	Alignment is approximately 400 m to the east of this viewpoint.	Represents typical and accessible views of residents, visitors, workers and tourists travelling along North Star Road.
Viewpoint 4: Bruxner Way. Looking northwest	Alignment is approximately 400 m to the west of this viewpoint and 900 m to the north.	Represents typical and accessible views of residents and of visitors, workers and tourists travelling along the Bruxner Way.
Viewpoint 5: Bruxner Way, looking east	This viewpoint is within the disturbance footprint of the alignment.	Represents typical and accessible views of residents and of visitors, workers and tourists travelling along the Bruxner Way.
Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Alignment is approximately 50 m east of this viewpoint.	Represents typical and accessible views of residents and of visitors, workers and tourists travelling along Tucka Tucka Road (including residents of Toomelah Indigenous community).

As described previously, the selection of the viewpoints is based upon accessibility, anticipated receptor concern (particularly in locations with many viewers, such as towns or highways), the likely extent of impact and providing a representative selection of views and viewer settings across the proposal.

7. Potential impacts

7.1. Proposal description

Key components of the proposal to be assessed in this LVIA are described in Table 20.

Table 20: Key components of the proposal

Component	Key visual receptors
Start and finish point	North Star to the NSW/Qld border
Local government areas	Gwydir Shire Council and Moree Plains Shire Council
Length of alignment	30 km (25 km along former alignment)
Track dimensions	Rail corridor approximately 30 m wide with some variance up to around 65 m for bridges; consisting of single track dual gauge railway line with crossing loops.
Train lengths	Up to 1,800 m with future provision to accommodate double stacked trains up to 3,600 m long.
Expected completion	2024

7.2. Key sources of potential impact

Impacts are considered during construction and operation. Table 21 describes potential impacts during the construction phase. Mitigation measures are discussed in Section 12.

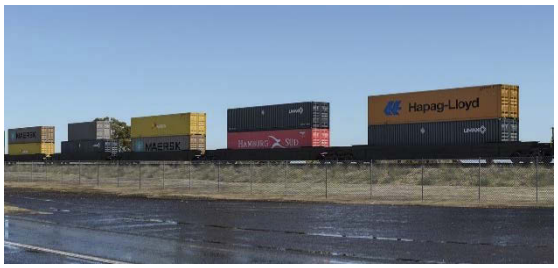
Construction phase

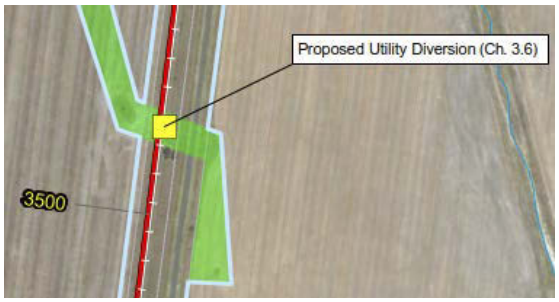
Table 21: Potential proposal impacts during construction phase

Construction activities and infrastructure	Indicative imagery
Construction Phase	
Demolition of Existing Infrastructure The demolition and removal of existing redundant rail infrastructure would convey construction traffic to and within the construction areas resulting in short-term impacts on landscape and visual values.	 Source: Lat27
Vegetation clearing and associated earthworks Much of the landscape is already cleared for agricultural purposes. Where required, large-scale machinery will be used to assist in vegetation clearance or trimming activities. This will generate traffic on surrounding roads. Temporary stockpiles of cleared vegetation may also be present. Topsoil, subsoil, rock and other unsuitable materials will be removed where necessary to create stable and level areas for infrastructure to be constructed. This will result in the temporary presence of exposed areas of land.	 Source: ARTC

Construction activities and infrastructure	Indicative imagery
Road and rail construction The construction of new infrastructure along the proposal alignment would result in construction traffic travelling to and within the construction areas and result in short-term impacts on landscape and visual values.	 Source: FFJV
Bridge Construction Bridges, culverts, and viaducts and (as detailed in Operation impacts below) will be constructed over creeks, rivers, flood plains and existing road corridors. The construction of new infrastructure would convey construction traffic to and within the construction areas resulting in short-term impacts on landscape and visual values.	 Source: ARTC
Borrow pits Borrow pits are required to provide fill material for the proposal. There are 11 potential sites proposed, some of which lie beyond the study area, but all of which have been assessed in this LVIA. Of these, 10 are existing borrow pits while one is a new potential borrow pit location (Site 2). Landscape and visual impacts associated with borrow pits include clearance of vegetation, presence of bare soil associated with earthworks and landform modification.	 Source: Lat27
Creation of stockpiles (existing material from site) Stockpiles of materials cleared from site will be present in the laydown areas in the temporary (construction) footprint, where they will be stored prior to use, re-use or disposal. This includes ballast from the existing rail corridor; rail tracks and soil from cut and fill sites.	 Source: Lat27
Creation of stockpiles (material delivered to site) Stockpiles of materials delivered to site will be present in the laydown areas and beside the existing rail corridor, where they will be stored prior to use. This includes ballast, soil, rock protection and rail materials including tracks and sleepers.	 Source: ARTC
Associated construction equipment Large-scale construction equipment and machinery such as cranes, excavators, trucks, water trucks, scrapers, graders, heavy bulldozers, generators and dump trucks will be required for construction activities.	 Source: ARTC

Construction activities and infrastructure	Indicative imagery
Construction accommodation camp and workers Presence of construction workers wearing high visibility Personal Protective Equipment (PPE). The construction workforce is expected to peak at around 350 team members in Quarter 3 of 2022. One construction camp is proposed in North Star (east of Wilby Street and north of North Star Road). This will comprise an amenities building, accommodation units with associated communal areas.	 Source: ARTC  Preliminary location of North Star construction camp (area shown in yellow). Source: FFJV
Construction traffic movement There will be increased traffic movement on existing main roads and side roads. This will include a variety of vehicle types. A traffic impact assessment has been undertaken as part of the EIS and this detailed the impacts to traffic numbers. Refer to the traffic impact assessment undertaken by the FFJV located in the Appendix of the EIS.	 Source: Lat27
Temporary construction lighting Site preparation activities undertaken to provide access to the rail corridor are commonly conducted during daylight hours. However, some activities may be undertaken outside of standard daytime hours. Night lighting would be required at the construction camp, site offices, traffic management/road diversions and fuel storage areas. The primary light source will likely be from temporary security lighting and lighting towers. The number and details of the lighting requirements is yet to be determined and will be available after detailed design and a construction plan has been developed.	 Source: FFJV

Construction activities and infrastructure	Indicative imagery
Embankments and mounding Many embankments and mounding will be created to accommodate the proposed rail corridor. This will be evident in areas where there is a change in levels with the existing ground. In addition, culverts and bridges will be constructed over creeks and existing road corridors.	**Low embankment**  Source: Lat27 (Visualisation) **High embankment**  Source: Lat27 (Visualisation)
Shipping containers and storage sheds Shipping containers will be delivered to construction sites via crane trucks and then stored in laydown areas. The containers commonly contain construction equipment.	 Source: FFJV
Site offices and associated car parking areas The proposal will require a number of temporary buildings on site. This will include site offices and workshops, as well as car parking areas. This will bring additional traffic, staff and machinery to the LVIA study area. The new, temporary built forms may be uncharacteristic elements in a predominantly rural landscape. Five locations are proposed to have site offices: • CMP000.1: North Star Rd-Construction Camp • LDN007.4: North Star Rd-Satellite Offices • LDN020.0: North Star Rd Southern NS2B main site offices • LDN029.8: Tucka Tucka Rd-Satellite Offices • LDN035.6: Eukabilla Rd-Northern NS2B main site offices.	 Source: FFJV

Construction activities and infrastructure	Indicative imagery
Construction of drainage infrastructure including concrete piping Temporary and permanent drainage infrastructure will be present, including areas near existing road corridors.	 Source: FFJV
Signage A large number of signs will be displayed around construction sites, especially where existing road corridors are in close proximity to the proposed rail corridor. Signage will include speed signs, stop signs, and safety signs and construction signage such as truck access signage.	 Source: FFJV
Relocation of Utilities During construction, utilities that may be impacted by the proposal will be decommissioned, protected or relocated. There are two locations where electricity poles must be relocated outside of the rail corridor.	 Source: FFJV

Operation phase

Table 22 describes potential impacts during the operation phase of the proposal.

Table 22: Potential proposal impacts during operation phase

Operation activities and infrastructure	Indicative imagery
Operation Phase	
Lighting infrastructure No permanent lighting is proposed for the proposal. However, there will be standard flashing lights associated with two proposed active level crossings at: • North Star Road at Ch 7.0 km • North Star Road at Ch 19.9 km	 Source: ARTC

Operation activities and infrastructure	Indicative imagery
Freight trains Trains may be at times visible in the landscape from existing roads and residential properties. The current assumption is that there will be on average 14 train movements per day in 2025 (increasing to a maximum 21 trains per day in 2040). These will be 1.8 km long (potentially up to 3.6 km long in the future) and single stacked but, eventually, may be double stacked up to around 6.5 m high. It will take a minimum 2.5 minutes for a train to pass. The train will have a headlight.	 Source: ARTC  Source: ARTC
Rail over road bridges These bridges are an obvious visible feature for viewers and are typically landmarks for motorists. The proposal has two proposed rail over road bridges, typically proposed as single track, Super-T girder type structures. The name of key rail over road bridges (two in total) and an approximate length for each bridge are as follows: • Bruxner Way Rail Bridge: 114 m • Macintyre River Viaduct: 1,750 m (passes over Tukka Tukka Road and the Macintyre River)	**Rail bridge over road**  Source: Lat27 (Visualisation)
River and creek bridges Rail over water bridges are typically lower, with their height determined by flood levels, except where they also pass over adjacent roads. They are also an obvious built landmark for viewers where visible from main roads and residential areas. The name of key rail over water bridges (10 in total) and an approximate length for each bridge are as follows: • Mobbindry Creek Rail Bridge: 112 m • Mobbindry Floodplain Rail Bridge: 182 m • Back Creek Rail Bridge: 70 m • Forest Creek Rail Bridge: 42 m • UT1 Forest Creek Rail Bridge: 136 m • Melonenkamm Rail Bridge: 160 m • Whalan Floodplain #1 Rail: 136 m • Whalan Floodplain #2 Rail: 126 m • Whalan Floodplain #3 Rail: 126 m • Macintyre River Viaduct: 1,750 m (also passes over Tucka Tucka Road)	**Rail bridge over waterway**  Source: Lat27 (Visualisation)

Operation activities and infrastructure	Indicative imagery
Level crossings Crossings occur where the rail alignment intersects a road. Infrastructure includes rail tracks, crossing protection measures (as required) and signage. Two active level crossings are proposed (with lights and barriers), located at: • North Star Road at Ch 7.0 km • North Star Road at Ch 19.9 km. One passive level crossing is proposed, located at: • Forest Creek Road at Ch 12.2 km.	**Passive level crossing**  Source: FFJV **Active level crossing**  Source: FFJV
Railway tracks Where buffers (for example, vegetation and topographic features) do not exist, the railway tracks are likely to become a visible element of infrastructure in the landscape, commonly sighted from adjacent roads and residents' properties. The proposal alignment largely follows an existing rail alignment with a new connection over the Macintyre river at the QLD border).	 Source: ARTC
Culverts A total of 39 culvert locations were identified during the reference design phase. The number of culverts and their locations will be further refined during the detailed design phase. Culvert banks are required where the route crosses small creeks, drainage lines and waterway crossing.	 Source: ARTC
Embankments, abutments and retaining walls Embankments and mounding will be created to accommodate the proposed rail infrastructure.	 Source: Lat27
Fencing Fencing will be provided along the rail corridor as required. This will typically be rural stock fencing. Security fencing will be provided at the rail yards. Fauna fencing will be considered in some places. It is noted that permanent noise barriers are not anticipated for this proposal, although localised temporary noise barriers may be required during construction.	 Source: FFJV  Source: FFJV

7.3. Illustrative cross sections of typical conditions

Figure 14 to Figure 21 illustrations have been prepared to indicate typical cross sections of the rail and associated components found across the proposal alignment.

It is noted that these images are indicative artist's impressions only, and representative of typical conditions found within the proposal rail corridor. The sections are not specific to any one location, and do not illustrate the provision of any additional mitigation measures. For full details on cross sections at particular locations refer to the relevant engineers' drawings.

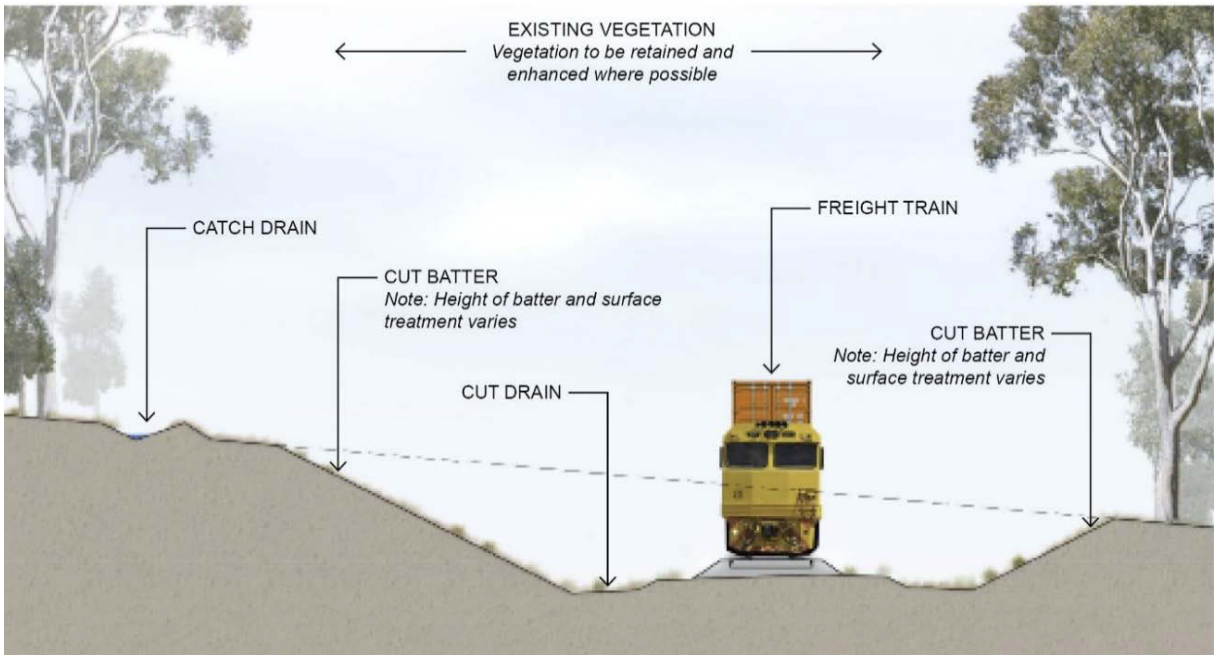


Figure 14: Typical cut

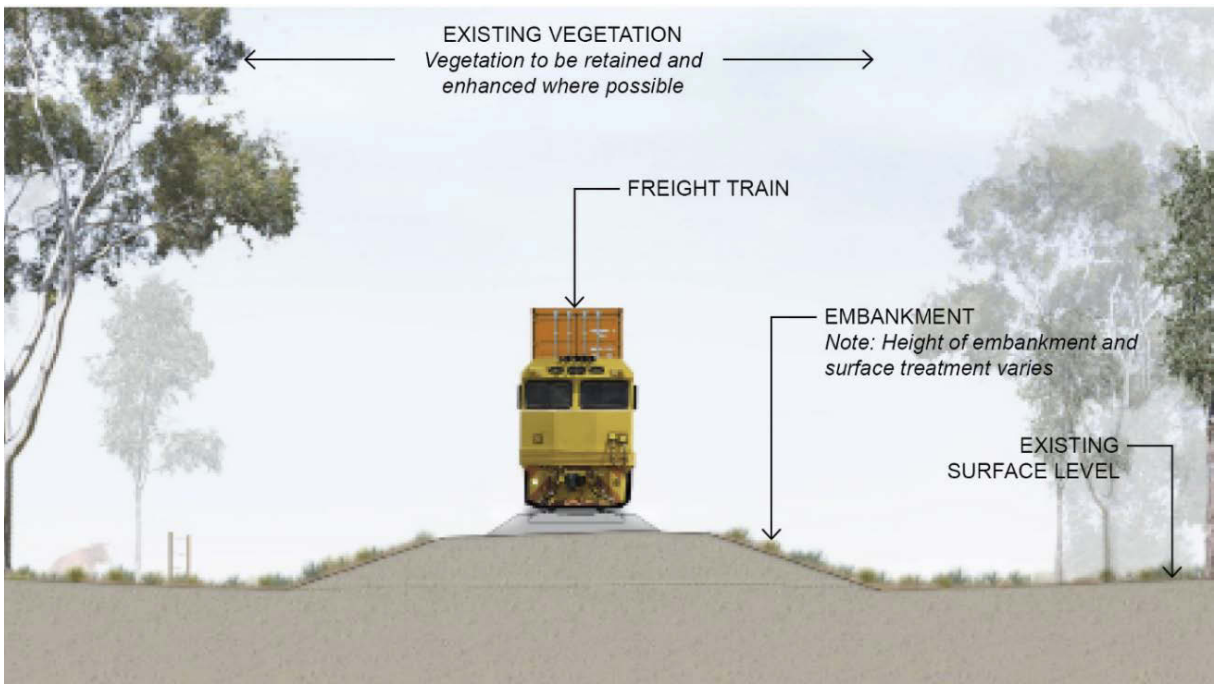


Figure 15: Typical low embankment

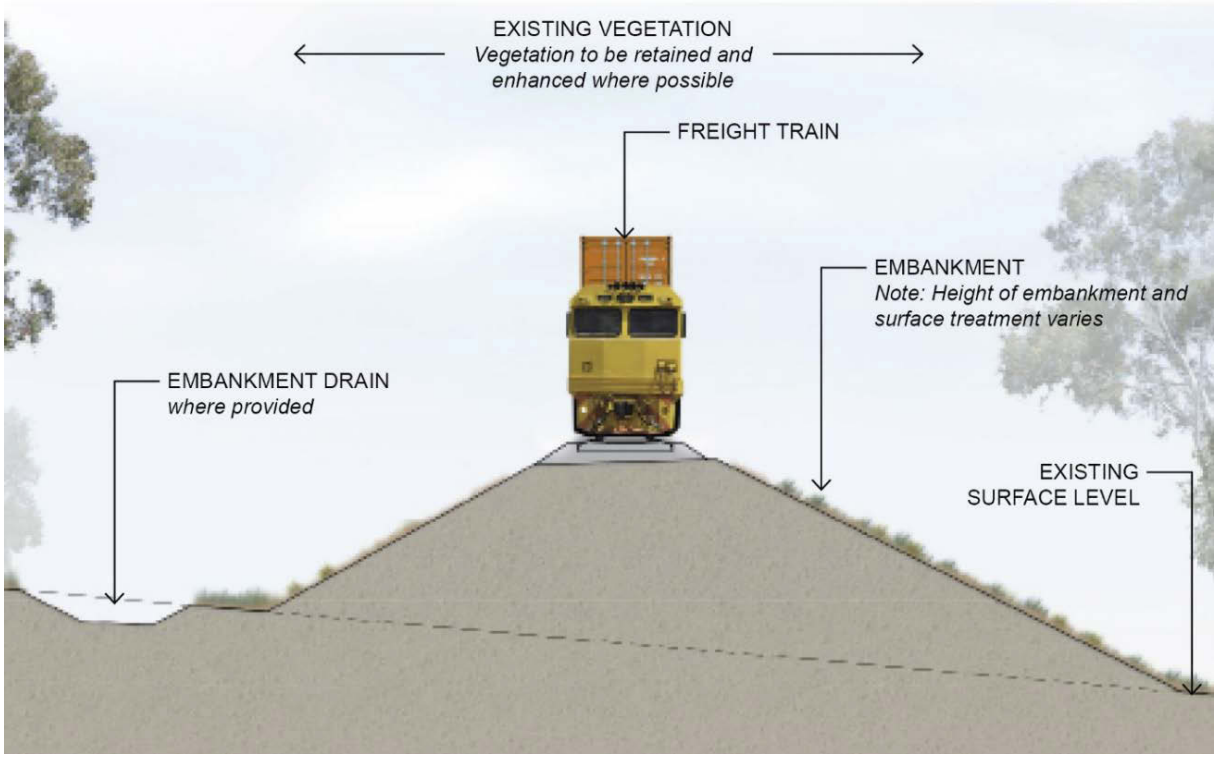


Figure 16: Typical high embankment with drain

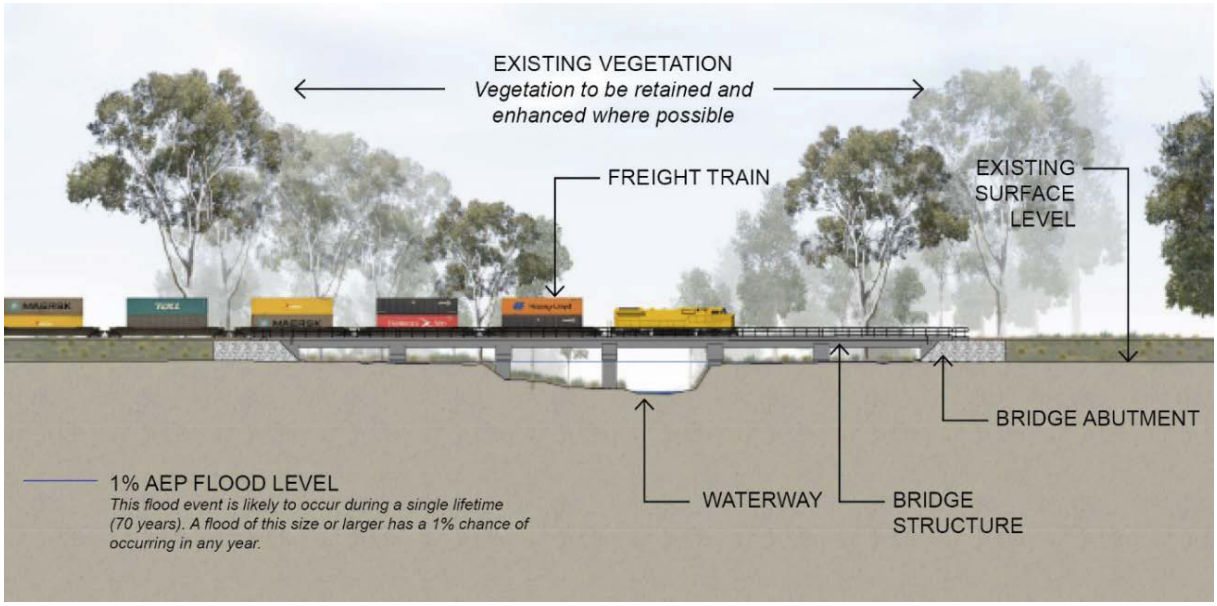


Figure 17: Typical creek crossing

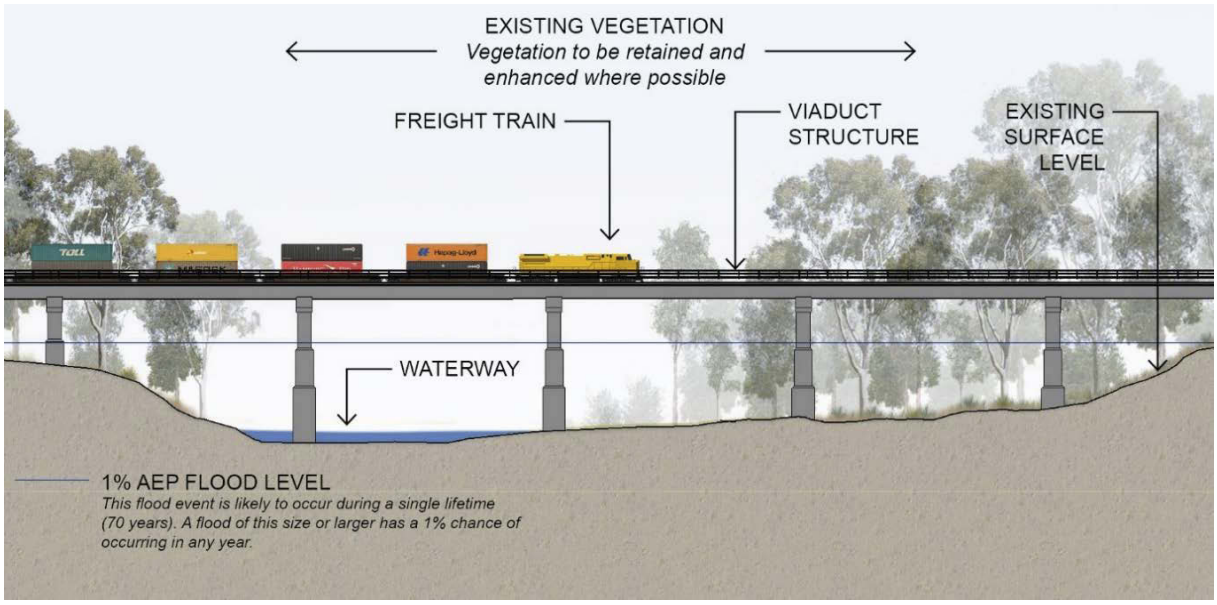


Figure 18: Typical river crossing

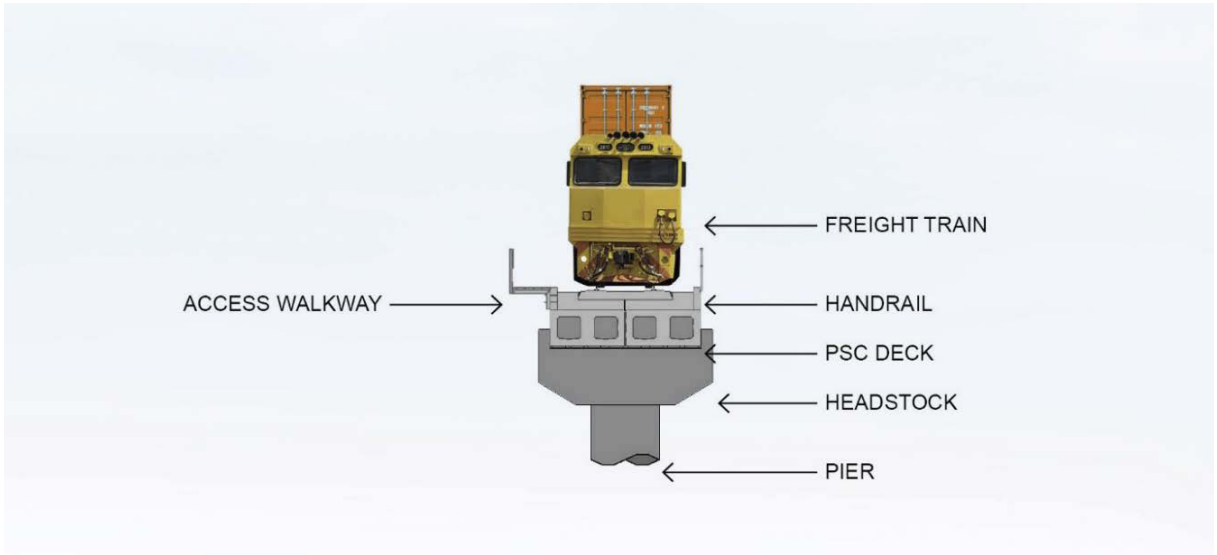


Figure 19: Typical pier with slab span

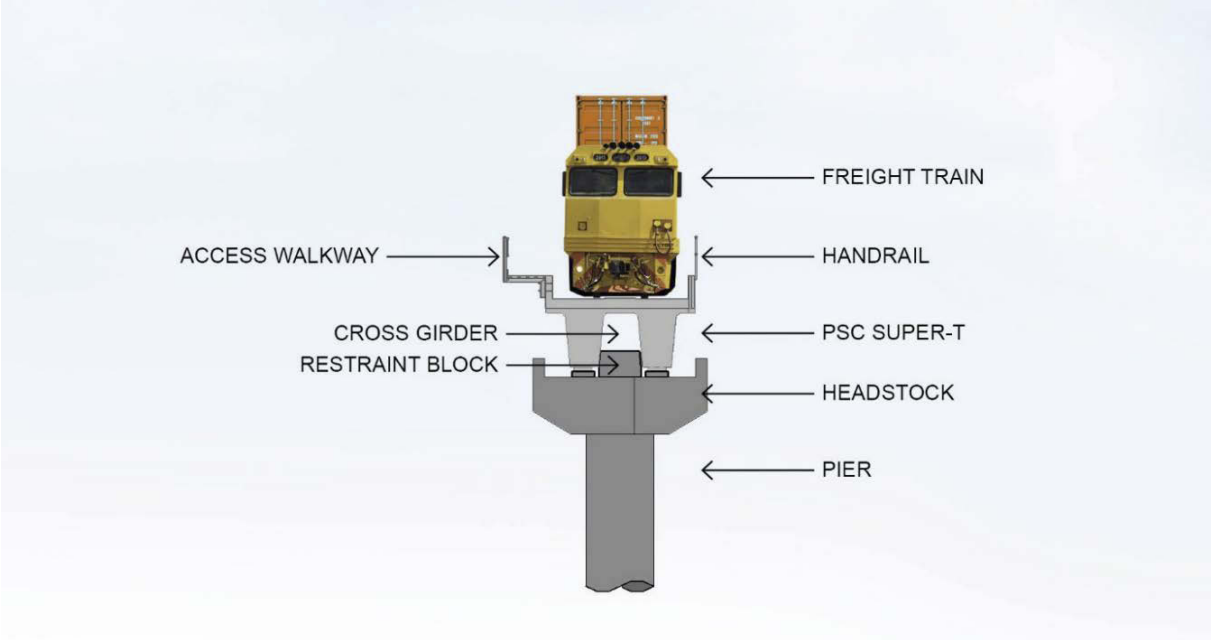


Figure 20: Typical pier with super-T girder

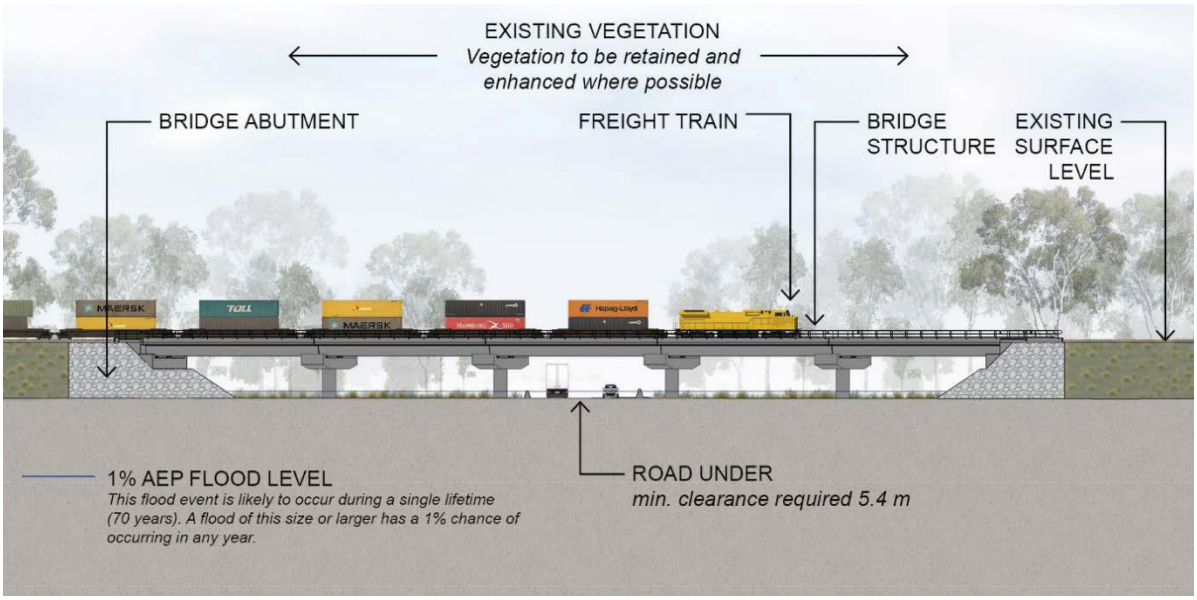


Figure 21: Typical rail over road bridge

8. Landscape impact assessment

8.1. Landscape character assessment

Six LCTs have been identified within the LVIA Study Area (refer Table 18). These are identified in Figure 7: Landscape character (refer Appendix A). Four LCTs are intersected by the proposal:

- LCT A: Vegetated Watercourses – Rivers
- LCT B: Vegetated Watercourses – Creeks and Channels
- LCT C: Irrigated Croplands
- LCT D: Dry Croplands and Pastures.

Two other LCTs are present in the wider LVIA Study Area but not are not directly intersected by the alignment; as no meaningful impacts are anticipated and they are not considered further:

- LCT E: Rural Settlement (noting parts of these are affected by adjacent Inland Rail projects)
- LCT F: Vegetated Grazing.

These LCTs are described in Table 23 to Table 27. These tables also assess the likely sensitivities for each identified LCT in relation to the proposal and provide a preliminary indication of the likely magnitude of change and consequent likely significance of that effect on landscape amenity.

Construction impacts on landscape character are temporary and relate to things like removal of vegetation which persist into the operational phase. Therefore, the assessment presented below is a combined assessment of impacts during both construction and operation, reflecting elements removed or disturbed during construction as well as the introduction of structures that affect the perception and character of the landscape over the longer term.

Landscape Character Type A

Table 23: Summary description of LCT A: Vegetated Watercourses – Rivers

Type A: Vegetated Watercourses - Rivers	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located in the northern extent of the Study Area, associated with the corridors of the Macintyre and Dumaresq Rivers. There are two Landscape Character Area of this type in the Site – the Macintyre River Vegetated Watercourse (LCA A1) and the Dumaresq River Vegetated Watercourse (LCA A2). These areas merge at the confluence of the two river systems, near the indigenous settlement Toomelah.
Typical character images:	
	 

Type A: Vegetated Watercourses - Rivers	
  	
Key characteristics	• Network of river valleys that are low lying in relation to the surrounding landscape and often incised into the landscape with steep banks • Typically, well-vegetated river banks with mature River red gums (*Eucalyptus camaldulensis*), river oaks (*Casuarina cunninghamiana*) and river paper-barks (*Melaleuca* spp.) which line the river banks • Visually interesting natural character • Are not the subject of any landscape planning designations but likely to be valued for scenic amenity • Adjoining ox-bow lakes valued for nature conservation, including some areas that are used for recreation purposes, such as camping.
Precedent modifications and infrastructure elements	• Natural landscape with few built infrastructure elements • Occasional irrigation pump stations located along the river system • Bondi Road bridge crossing (note, this lies just beyond LVIA study area boundary and is currently disused).
Landscape Character Sensitivity Assessment	• High degree of perceived naturalness, with little evidence of human uses and modifications to the waterways • Significant fringing vegetation on the river banks and floodplains contain views to and from the waterways, reducing the sensitivity • Parts of the Macintyre River near of Toomelah, as well as Rainbow Reserve and lagoon (over the border in Qld are listed as cultural heritage sites and are known to be of value to the local aboriginal community • The overall sensitivity is considered to be, at greatest, **Moderate**. This recognises the relatively intact and high quality of the landscape and its value for the local aboriginal community. However, it is noted that there are no formal landscape designations.
Impact Assessment	
Magnitude of Change Assessment	• The proposed alignment will cross the Macintyre River, approximately 2.6 km west of Toomelah community • New bridge and railway infrastructure will result in highly localised removal of vegetation and the intrusion of built infrastructure within what is currently a relatively un-developed landscape • This location and the river crossing will only be visible from Tucka Tucka Road, primarily impacting residents of Toomelah community. • The overall magnitude of change is predicted to be **Low**. A very localised area of this LCT will be affected but there will be no fundamental change to the character of this LCT.
Significance of Effect	• The effect of the proposal on LCTA: Vegetated Watercourses – Rivers is **Low**.

Landscape Character Type B

Table 24: Summary description of LCT B: Vegetated Watercourses - Creeks and Channels

Type B: Vegetated Watercourses - Creeks and Channels	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located through the LVIA Study Area, associated with the many small tributaries that traverse the alignment. There are eight Landscape Character Area of this type – the Whalan Creek Vegetated Watercourse (LCA B1), Forest Creek Vegetated Watercourse (LCA B2), Mobbindry Creek Vegetated Watercourse (LCA B3), Back Creek Vegetated Watercourse (LCA B4), Swamp Creek Vegetated Watercourse (LCA B5), Dry Creek Vegetated Watercourse (LCA B6), Mungle Creek Vegetated Watercourse (LCA B7) and Mungle Back Creek Vegetated Watercourse (LCA B8).
Typical character images:	
     	
Key characteristics	• Includes creeks and low-lying effluent channels that form part of the lower Border Rivers Valley Floodplain and catchment, conveying large amounts of floodwaters away from the Macintyre River when in flood • Remnant areas of flood-dependent forest/woodlands and wetlands.
Precedent modifications and infrastructure elements	• Relatively natural landscape with minimal infrastructure, comprising road and existing rail bridges over the main creek channels within the LVIA study area • Generally fringing vegetation has been retained and creates a buffer between adjacent broad acre agricultural areas • Electrical infrastructure including utility poles typically follows the road alignment.
Landscape Character Sensitivity Assessment	• Moderate degree of perceived naturalness, with some instances of evidence of human uses and modifications to the waterways • Significant fringing vegetation contain views to and from creek lines, reducing the sensitivity • The overall sensitivity is **Low**. This recognises that there are no formal landscape designations associated with this LCT and the landscape does not appear to be used by the local community for recreation. Additionally, parts of the LCT is already affected by the presence of rail infrastructure (albeit some of which is disused) so it has capacity to accommodate further change.

Type B: Vegetated Watercourses - Creeks and Channels	
Impact Assessment	
Magnitude of Change Assessment	• The proposed alignment typically follows the existing rail alignment, and will include nine creek crossings, where the alignment crosses Whalan Creek, Whalan floodplain, Forest Creek, Back Creek and Mobbindry Creek • New bridge and rail way infrastructure, as well as associated drainage infrastructure (e.g. culverts) will result in localised removal of vegetation • Typically, these works be replacing existing infrastructure within the existing rail alignment • Where the alignment deviates from the existing rail corridor, views to creek and floodplain infrastructure will be evident from Bruxner Way and Tucka Tucka Road. Due to the transient nature of views from the main road, the primary impact will be on residents of the Toomelah community travelling along Tucka Tucka Road. • The overall magnitude of change is predicted to be low.
Significance of Effect	• The effect of the proposal on LCTB: Vegetated Watercourses – Creeks and Channels is **Negligible**.

Landscape Character Type C

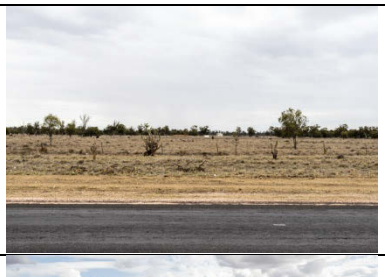
Table 25: Summary description of LCT C: Irrigated Croplands

Type C: Irrigated Croplands	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located to the immediate north and south of the Macintyre and Dumaresq rivers. There are three Landscape Character Area of this type in the Site – the Kurumbul Irrigated Croplands (LCA C1), Melon Ridge (LCA C2) and the Humptybung Irrigated Croplands (LCA C3). These four Character Areas are typically located in areas with highly fertile vertosol soils.
Typical character images:	
	    

Type C: Irrigated Croplands	
Key characteristics	• Extensively developed agricultural areas with levee banks constructed to protect irrigated agriculture and urban centres from flood inundation • Typically located in areas with highly fertile vertosol soils • Extensive large and relatively flat open fields of irrigated cropland • Landscape substantially cleared of vegetation, except at the periphery, along creeklines (LCT B) on the skyline and local roads • In addition to irrigated production, current land use activities include grazing, dryland farming, irrigated and intensive industries such as feedlots, forestry and recreation.
Precedent modifications and infrastructure elements	• To enhance agricultural productivity, works have been built on the floodplain to improve land used for grazing, dryland cropping and irrigated cropping • Typically, works such as levees, earthworks, banks and channels have been built to protect crops, land, stock and properties from flooding, provide on farm access, and to manage and store irrigation, stock and domestic water.
Landscape Character Sensitivity Assessment	• The Irrigated Croplands landscape type is predominantly visually open, with a sparsely settled rural character and no large-scale infrastructure elements. It has long distant views and strong skylines, interrupted by irrigation infrastructure (e.g. levees and earthworks) • Vegetation is extensively cleared and very sparse • Due to the extensively modified character of the landscape and local value of the landscape in terms of landscape amenity the overall inherent sensitivity is considered to be **Low**.
Impact Assessment	
Magnitude of Change Assessment	• Impact on private land and valuable irrigated areas has been minimised by utilising the existing non-operational rail alignment for most of the proposal's alignment • The primary impact will be on private land where the alignment deviates from the existing rail corridor • Due to the transient nature of views from the main road, the property owners of affected properties and travellers along Bruxer Way will be most affected • It should be noted that new earthwork infrastructure within this landscape will be consistent with the current landscape character. • The overall magnitude of change is predicted to be **Low**.
Significance of Effect	• The effect of the proposal on LCTC: Irrigated Croplands is **Negligible**.

Landscape Character Type D

Table 26: Summary description of LCT D: Dry Croplands and Pastures

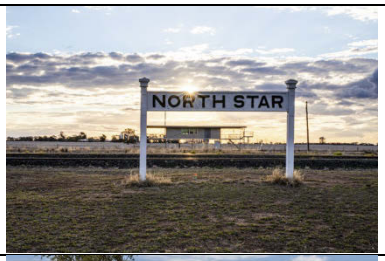
Type D: Dry Croplands and Pastures	
Landscape Baseline Assessment	
Location and boundaries	This landscape extends across the southern parts of the proposal study area and is largely defined by extensively cleared open rural properties utilised for agriculture and livestock production. There are nine character areas – the Dumaresq Dry Croplands and Pastures (LCA D1), Tucka Tucka Dry Croplands and Pastures (LCA D2), Coppymurrimbilla Dry Croplands and Pastures (LCA D3), Newell Dry Croplands and Pastures (LCA D4), Burringbar Dry Croplands and Pastures (LCA D5), Forest Creek Dry Croplands and Pastures (LCA D6), Bruxner Dry Croplands and Pastures (LCA D7), North Star Dry Croplands and Pastures (LCA D8) and the Getta Getta Dry Croplands and Pastures (LCA D9).
Typical character images:	
     	
Key characteristics	• Soils comprise sodosols and vertosols • The sodosols have a gravelly, sandy character, often exposed in areas and vulnerable to tunnel and gully erosion • The vertosols, are typically cracking clay soils with high nutrients capable of supporting agriculture • Generally, the landscape is very flat, typically between 220 m and 260 m AHD • Land use is predominantly rural, characterised by broad acre dryland cropping and pastoral properties for livestock production, interspersed by incised branching creek lines, many of which are seasonal with multiple anabranches. These include Forest Creek, Back Creek, Swamp Creek, Dry Creek, Mobbindry Creek Mungle Creek and Mungle Back Creek. • Vegetation comprises native roadside shelter belts and sporadic riparian vegetation associated with creek lines • Transport corridors are straight in character reflecting the flat topography, with subtle kinks associated with topographic variation that connect the key settlements and rural properties. Main roads are sealed but other roads are typically unsealed gravel • Open and exposed character with long distant views and strong skylines, except where views are contained by roadside or creek-side vegetation

Type D: Dry Croplands and Pastures	
	• Sparsely settled landscape, with only property homesteads and cottages, and small rural 'villages' such as North Star. Farmsteads are typically located on gently elevated areas • Harmonious but fairly typical rural character, which is valued at a local level by local communities and visitors.
Precedent modifications and infrastructure elements	• Highly modified for agricultural practices, including clearing and levelling of land for cultivation of arable farmland and pastures for grazing • Construction of roads, railways and bridges • Electrical infrastructure including utility poles.
Landscape Character Sensitivity Assessment	• The Dry Croplands and Pastures landscape type is predominantly visually open, with a sparsely settled rural character and little large-scale infrastructure. It has long distant views and strong skylines • Roadside shelter belts and sporadic riparian vegetation associated with creek lines and flood channels provide some screening • Due to the simple character of the landscape and local value of the landscape, which is not protected in any planning scheme, the overall inherent sensitivity is considered to be **Low**.
Impact Assessment	
Magnitude of Change Assessment	• Impact on private land, including agricultural and pastoral areas has been minimised by utilising the existing non-operational rail alignment for most of the proposal's alignment • Any impacts within this LCA will be due to localised vegetation removal and increased embankment heights • Overall, therefore, the impact on this LCT is **Low**.
Significance of Effect	• The effect of the proposal on LCTD: Dry Croplands and Pastures is **Negligible**.

Landscape Character Type E

Table 27: Summary description of LCT E: Rural Settlement

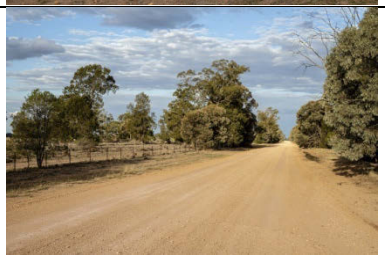
Type E: Rural Settlement	
Landscape Baseline Assessment	
Location and boundaries	Four rural settlements are located within the LVIA Study Area. They include the town of Boggabilla, the small settlements of North Star and Kurumbul and Toomelah Indigenous community. Accordingly, there are four landscape character areas: • Boggabilla Township (LCA E1) • North Star Village Rural Settlement (LCA E2) • Kurumbul Rural Settlement (LCA E3) • Toomelah Indigenous Settlement (LCA E4).

Type E: Rural Settlement	
Typical character images:	
     	
Key characteristics	• Small rural towns, villages and communities are low-scale built form with limited services • Typically, single storey buildings of varying age and condition. • Larger settlements (Boggabilla, North Star and Toomelah) have social infrastructure including parks, public schools and sport facilities • Historic railway station and platforms signs are located throughout the corridor • Boggabilla (LCA E1) is a small town located southeast of Goondiwindi • North Star (LCA E2) is a small rural village surrounded by agricultural land, servicing the local farming community (closest to the adjoining N2NS Project). The existing Boggabilla Branch Line runs alongside the town and terminates to the north of the village. • Kurumbul (LCA E3) is a very small village with no services located in the northern extent of the LVIA Study Area (closest to the adjoining B2G Project). The South Western railway line runs through the centre of the community. • Toomelah (LCA E4) is an Indigenous settlement situated near the confluence of the Macintyre and Dumaresq rivers.
Precedent modifications and infrastructure elements	• Presence of roads, railways and bridges • Electrical infrastructure including utility poles • Infrastructure associated with agricultural production and the rail line (e.g. Silos and storage sheds)
Landscape Character Sensitivity Assessment	• The Rural Settlements landscape type is predominantly visually open, with a sparsely settled rural character and some localised large-scale agricultural infrastructure • Street trees and remnant vegetation provide some screening effect. • The sensitivity of these settlements is considered to be **Moderate**. While not valued within planning schemes, these settlements have a distinctive character with some elements of interest (such as buildings and silos) and are also likely to be valued by the people that reside in or visit them.

Type E: Rural Settlement	
Impact Assessment	
Magnitude of Change Assessment	• The proposal alignment does not pass directly through any of these settlements • Boggabilla is located some distance from the alignment so will have no impact • Both North Star and Kurumbul are situated close to existing railway infrastructure and will be affected by adjacent Inland Rail projects – N2NS and B2G respectively. Therefore, the impact of this proposal is nil but cumulative impacts need to be considered (refer Section Figure 11). • Toomelah is closest to the alignment but is not directly impacted by the proposal • Therefore, the magnitude of change on the Rural Settlement LCT is **No Impact**.
Significance of Effect	• The effect of the proposal on LCTE: Rural Settlement is **No Impact**.

Landscape Character Type F

Table 28: Summary description of LCT F: Vegetated Grazing

Type F: Vegetated Grazing		
Landscape Baseline Assessment		
Location and boundaries	This landscape type is typically located in the northern most extent of the study area, and is characterised by poorer quality soils, remnant vegetation and cattle and sheep grazing. There is one Landscape Character Area of this type in the Site –Boggabilla Vegetated Grazing (LCT F3).	
Typical character images:		
		
		

Type F: Vegetated Grazing	
Key characteristics	• Very sparsely settled landscape with large land holdings (stations) and scattered farmsteads • Pasture land with broad areas of open wooded remnant vegetation, typically denser along creek and drainage lines • Roads are typically straight in character and unsealed gravel. Views in most instances are contained by roadside shelter belts • Harmonious but fairly typical rural character.
Precedent modifications and infrastructure elements	• Highly modified for agricultural practices, including clearing and levelling of land for cultivation of pastures for grazing of cattle and sheep • Construction of roads • Electrical infrastructure including utility poles.
Landscape Character Sensitivity Assessment	• The Vegetated Grazing landscape type is predominantly visually contained, with a sparsely settled rural character and little large-scale infrastructure. Long distant views are possible at breaks in roadside shelter breaks. • Harmonious but fairly typical rural character, which is valued at a local level by local communities and visitors • Due to the simple character of the landscape and local value of the landscape the overall inherent sensitivity is considered to be **Low**.
Impact Assessment	
Magnitude of Change Assessment	• The alignment does not transect this landscape type, therefore any impacts on this landscape type would be indirect • Due to the distance from the alignment it is anticipated that there would be no impacts.
Significance of Effect	• The effect of the proposal on LCT F: Vegetated Settlement is **No Impact**.

9. Visual impact assessment

This section describes the visual assessment including the findings of the Visibility Analysis Mapping (VAM) and the impact assessment for the selected representative viewpoints.

9.1. Visibility analysis mapping

The visibility mapping is shown on the following figures (refer Appendix A):

- Figure 10: Visual Analysis Map – permanent infrastructure
- Figure 11: Visual Analysis Map – rolling stock
- Figure 12: Visual Analysis Map – difference.

Figure 10 and Figure 11 show that the proposal is theoretically visible for a wide area within the proposal study area. As would be anticipated, the rolling stock map shows a slightly higher extent of theoretical visibility than the railway track infrastructure at formation level. However, the general pattern is the same with visibility contained by relatively small changes in elevation, to the south-east, south-west and northern extent of the study area. It is noted that those parts of the study area with potential to experience views are typically of between 1 and 15 observation points (areas shown as blue or turquoise on the figure). However, an area of more elevated land to the west of the alignment indicates that high numbers of observation points are theoretically visible (areas shown on the figure in yellow, orange and red). This would not be the case due to the effects of distance.

In interpreting this data, it is also important to note that in the general nature of the landscape is very flat. Within this context, remnant vegetation, vegetated creek lines and roadside shelter belts are extremely effective in containing views. Therefore, the actual visibility will be substantially less than indicated based on theoretical landform modelling.

Figure 11 shows that the difference in visibility to passing rolling stock compared to permanent infrastructure is more pronounced within elevated parts of the study area. Low-lying creeks and drainage channels have considerably reduced visual sensitivity.

It is also important to consider that, in general, the proposed alignment is replacing existing infrastructure and utilising the existing rail corridor. In greenfield areas, typically the number of sensitive receptors is low, and the alignment is not near main roads or settlements. At greater distances from the alignment, the railway will blend into the overall landscape view, becoming a part of the rural character, while views to rolling stock will be transient.

9.2. Illustrative sections

The following sections have been prepared to illustrate the typical modifications associated with the proposal:

- Typical Cut
- Typical Low Embankment
- Typical High Embankment with Drain
- Typical Creek Crossing
- Typical River Crossing (e.g. Macintyre River Bridge)
- Typical Pier with Slab Span
- Typical Pier with Super-T Girder
- Typical Rail over Road Bridge (e.g. Bruxner Way Bridge).

9.3. Viewpoint assessment

The identified viewpoints are shown on Figure 9: Key visual receptors and location of representative viewpoints (refer Appendix A) and the assessment of each is described in Table 29 to Table 34.

Viewpoint 1

Table 29: Likely visual effect of the proposal on Viewpoint 1: Corner of Capernum Street and David Street, North Star, looking northwest

VP1: Corner of Capernum Street and David Street, North Star, looking northwest	
Visual Baseline Assessment	
 **Existing view from Viewpoint 1** Refer **Figure 22: Viewpoint 1** in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°55'33.636" S 150°23'37.805" E • Elevation: 260.0 m • North-westerly view from the corner of Capernum Street and David Street, on the outskirts of North Star • Proposed alignment is situated along the existing rail corridor, approximately 1.5 km north of this viewpoint, although noting the N2NS alignment is located 150 m to the west of this viewpoint • Proposed construction camp is located approximately 500 m to the southeast of this viewpoint • Represents typical accessible views of residents of North Star, students and staff of North Star Public School and of visitors, workers and tourists travelling through North Star towards Goondiwindi • North-westerly views from this point provide open views towards existing rail infrastructure and the proposed alignment, including landscapes typical of the Dry Croplands and Pastures (LCT D).
Key visual sensitivities	• Receptors include residents of North Star (who are likely to be interested in the view) and travellers passing through North Star – close to North Star Road, an alternative scenic route to the Newell Highway • The presence of existing rail infrastructure (Boggabilla Branch Line) and grain silos, power poles and powerlines reduce the overall sensitivity of this view • This viewpoint it is considered to have a **Moderate** sensitivity overall to the change proposed, due to the Moderate sensitivity of viewers (e.g. nearby residents).
Visual Evaluation	
Construction	
Magnitude of Change Assessment	• While construction works will predominantly be occurring within the existing rail corridor, the construction of the alignment and the presence of extensive laydown areas situated in close proximity to residential properties of North Star and the nearby location of the proposed construction camp (500 m to the south east of this viewpoint)would cause a clearly perceptible change in the landscape character of this viewpoint. • While not within this view, the proposed construction camp and associated laydown areas will be clearly evident for residents of North Star who are situated approximately 300 m to the west of the proposed construction camp location, and immediately adjacent laydown areas.

VP1: Corner of Capernum Street and David Street, North Star, looking northwest	
	• The proposed construction camp will include the provision a sewage treatment plant, amenities building, dining room, accommodation units with associated communal areas and other associated service infrastructure. • It is noted that vehicular access for the construction camp will be off North Star Road, approximately 575 m from the nearest residential receptor. • Very close views from this viewpoint and surrounding residential properties within North Star towards proposed laydown areas and the proposed construction camp would result in a clearly perceptible change in the view, however as these impacts are temporary, this is considered to represent a **Moderate** magnitude of change.
Significance of effect (Construction)	The effect of the proposal on VP01 during construction is considered to be **Moderate** (although noting that cumulative effects will be experienced with the N2NS alignment).
Operation	
Magnitude of Change Assessment - Permanent Infrastructure	• The nearest section of the proposal is approximately 1.5 km to the north of this viewpoint. The skyline is already affected by the presence of powerlines, and existing grain silos and infrastructure associated with the existing rail line. The magnitude of change on this receptor is anticipated to be noticeable, therefore **Low**, due to the following factors: o Noticeable change due to an increase in embankment height, due to the replacement of existing rail infrastructure at a height varying from +0.088 m to +0.693 m above the existing surface level. • Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character. • It has been assumed that no noise barriers will be required through this section. • At this distance, whilst the alignment will be evident it will not change the fundamental visual character of the landscape, as it will be simply replacing existing infrastructure. It is unlikely that height increases less than 1 m would be perceivable from this distance, and the alignment will largely replicate the existing view.
Magnitude of Change Assessment - Train	• Movement of double stacked freight trains up to 1.80 km long (potentially up to 3.6 km long in the future) with a height of 6.50 m at speeds of up to 115 km/hr will have a considerable impact on residents of North Star. This is considered to be a **Moderate** magnitude of change – noting there would be approximately 14 train movements per day upon the completion of all 13 sections of Inland Rail in 2025.
Significance of effect (Operation)	The effect of the proposal on VP01 during operation is considered to be up to **Moderate**.

Viewpoint 2

Table 30: Likely visual effect of the proposal on Viewpoint 2: North Star Road, looking north east

VP2: North Star Road, looking north east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 2** Refer **Figure 23: Viewpoint 2 and** *visualisation* in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°51'30.539" S 150°24'14.022" E • Elevation: 240.0 m • Northerly view along North Star Road, near existing level crossing and private property 'Ohmi' • Proposed alignment is situated along the existing rail corridor, approximately 35 m to the west of this viewpoint. • Represents typical and accessible views of residents of Ohmi and of visitors, workers and tourists and local rural residents travelling along North Star Road towards Goondiwindi. • Northerly views from this point provide close views towards existing rail infrastructure and the proposed alignment, including landscapes typical of the Vegetated Watercourses - Creeks and Channels (Type B) and Dry Croplands and Pastures (Type D) landscape types.
Key visual sensitivities	• Low sensitivity of transient receptors, predominantly travellers along North Star Road, an alternative scenic route to the Newell Highway and nearby isolated rural residents (AADT around 292 northbound and 317 southbound of which around 25% are heavy vehicles). • Residents of Ohmi will be interested in the visual amenity of the landscape. • The presence of existing rail infrastructure (decommissioned) and powerlines reduces the overall sensitivity of this view. • This viewpoint it is considered to have a **Low** sensitivity overall to the change proposed, due to the low sensitivity of viewers (e.g. travellers along North Star Road and isolated rural residents).

VP2: North Star Road, looking north east	
Visual Evaluation	
Photomontage	
 **Photomontage view from Viewpoint 2: North Star Road, looking north east (75º field of view)** Refer **Figure 23: Viewpoint 2 and** *visualisation* in Appendix B for appropriate scaled image.	
Construction	
Magnitude of Change Assessment (Construction)	• Construction works will occur within and alongside the existing rail corridor, therefore the construction of the alignment would cause a noticeable change in the landscape character of this viewpoint. • Due to the historic clearing, vegetation clearing for the construction of the proposed alignment, service road and laydown area in this area will not significantly impact the visibility of the alignment. • Construction works will impact the isolated rural properties in the area, notably 'Ohmi' which is approximately 60m to the east of the alignment. This is considered to be a dominant change with a **High,** albeit temporary, magnitude of change.
Significance of effect (Construction)	The effect of the proposal on VP02 during construction is considered to be **Moderate**.
Operation	
Magnitude of Change Assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 35 m to the west of this viewpoint. The proposed alignment runs along or close to the existing decommissioned Boggabilla Branch Line. The magnitude of change on this receptor is anticipated to be noticeable, therefore low, due to the following factors: o Noticeable change due to the replacement of existing rail infrastructure and new level crossing o Within the proximity of the North Star Road crossing the rail alignment is typically close to or at existing surveyed surface level o Due to the sparse nature of existing remnant vegetation, vegetation clearing will have very minimal impact o Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character • At this distance, while the proposed alignment will be more evident than the existing rail line, it will not change the fundamental visual character of the landscape. It is likely that further along the alignment (visible from rural property 'Ohmi') increases in the embankment height would be noticeable. However due to the speed at which people are driving along North Star Road and the isolated nature of sensitive receptors, the change would be minimal and **Low**.

VP2: North Star Road, looking north east	
Magnitude of Change Assessment - Train	• Views of the movement of double stacked freight trains up to 1.80 km (potentially up to 3.6 km long in the future) long with a height of 6.50 m at speeds of up to 115 km/hr will have a considerable impact on residents of Ohmi. This is considered to be **Moderate**.
Significance of effect (Operation)	The effect of the proposal on VP02 during operation is considered to be **Low.**

Viewpoint 3

Table 31: Likely visual effect of the proposal on Viewpoint 3: North Star Road, looking north east

VP3: North Star Road, looking north east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 3** Refer **Figure 24: Viewpoint 3** in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°46'13.32" S 150°24'23.826" E • Elevation: 220.0 m • North-easterly view North Star Road, approaching the intersection with the Bruxner Way • Proposed alignment is situated along the existing rail corridor, approximately 400 m to the east of this viewpoint • Represents views of local residents, visitors, workers and tourists travelling along North Star Road. There are no residential properties at this location. • North-easterly views from this point provide open views towards existing infrastructure and the proposed alignment, including landscapes typical of the Vegetated Watercourses - Creeks and Channels (Type B) and Dry Croplands and Pastures (Type D) landscape types.
Key visual sensitivities	• Low sensitivity of receptors, predominantly travellers along North Star Road, an alternative scenic route to the Newell Highway (AADT around 292 northbound and 317 southbound of which around 25% are heavy vehicles) • The presence of existing rail infrastructure (decommissioned) reduces the overall sensitivity of this view • This viewpoint it is considered to have a **Low** sensitivity overall to the change proposed, due to the type of viewers (e.g. travellers experiencing transient views along North Star Road).

Visual Evaluation	
Construction	
Magnitude of Change Assessment (Construction)	• Vegetation clearing for the construction of the alignment and proposed laydown area will have minimal impact due to how sparse vegetation is in this location • Construction works will occur within and alongside the existing rail corridor, therefore the construction of the alignment would cause a noticeable change in the landscape character of this viewpoint, however this would be temporary representing a **Low** magnitude of change.
Significance of effect (Construction)	The effect of the proposal on VP03 during construction is considered to be **Negligible**.
Operation	
Magnitude of Change Assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 400 m to the east of this viewpoint. The proposed alignment runs along or close to the existing decommissioned Boggabilla Branch Line. The magnitude of change on this receptor is anticipated to be considerable, therefore **Moderate**, due to the following factors: o Noticeable change due to an increase in embankment height, varying from +0.310 m to +3.408 m above the existing surface level and the provision of new rail infrastructure, including the Forest Creek Rail Bridge o Vegetation clearing for the construction of the proposed alignment will have minimal impact due to how sparse vegetation is in this location o Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character. • At this distance, whilst the proposed alignment will be more evident than the existing rail line, it will not change the fundamental visual character of the landscape. It is likely that height increases would be considerable, although due to the speed at which people are driving along North Star Road the change would only be experienced for a short duration. This represents a **Moderate** magnitude of change.
Magnitude of Change Assessment - Train	• Movement of double stacked freight trains up to 1.80 km long (potentially up to 3.6 km long in the future) with a height of 6.50 m will only be experienced occasionally due to the low number of travellers on this road. Therefore, the magnitude of impact is considered to be **Low**.
Significance of effect (Operation)	The effect of the proposal on VP03 during operation is considered to be **Low.**

Viewpoint 4

Table 32: Likely visual effect of the proposal on Viewpoint 4: Bruxner Way looking northwest

VP4: Bruxner Way looking northwest	
Visual Baseline Assessment	
 **Existing view from Viewpoint 4** Refer **Figure 25: Viewpoint 4** in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°45'11.214" S 150°25'11.448" E • Elevation: 230.0 m • North-easterly view North Star Road, approaching the intersection with the Bruxner Way • Proposed alignment is situated along the existing rail corridor, approximately 500 m to the west of this viewpoint • Intersection with North Star Road, and proposed bridge structure is approximately 1 km north of this viewpoint • Represents typical and accessible views of residents and of visitors, workers and tourists travelling along the Bruxner Way towards Goondiwindi • North-westerly views from this point provide open views towards existing infrastructure and the proposed alignment, including landscapes typical of the Vegetated Watercourses - Creeks and Channels (Type B), Irrigated Croplands (Type C) and Dry Croplands and Pastures (Type D) landscape types.
Key visual sensitivities	• Receptors predominantly comprise travellers along the Bruxner Way (AADT around 279 eastbound and 297 westbound of which up to 50% are heavy vehicles) • The presence of existing rail infrastructure (decommissioned Boggabilla Branch Line) reduces the overall sensitivity of this view • This viewpoint it is considered to have a **Low** sensitivity overall to the change proposed, due to the transient nature of viewers including high numbers of heavy vehicles travelling along Bruxner Way.
Visual Evaluation	
Construction	
Magnitude of Change Assessment (Construction)	• Vegetation clearing will have minimal impact due to how sparse vegetation is in this location. Construction works will occur within and alongside the existing rail corridor, therefore the construction of the alignment would cause a noticeable change in the landscape character of this viewpoint, however this would be temporary resulting in a **Low** magnitude of change.
Significance of effect (Construction)	The effect of the proposal on VP04 during construction is considered to be **Negligible.**

VP4: Bruxner Way looking northwest	
Operation	
Magnitude of Change Assessment – Permanent Infrastructure	• The nearest section of the alignment is approximately 500 m to the west of this viewpoint. The existing rail line is somewhat screened by vegetation. The magnitude of change on this receptor is anticipated to be barely perceptible, therefore negligible, due to the following factors: o Negligible change due to the reinstatement of existing infrastructure within or in very close proximity to the existing rail corridor, screening foreground vegetation and the proposed alignment height varying from -0.237 m to +1.794 m above the existing surface level, which would be barely perceptible at this distance. o Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character. o The alignment will 'blend' into the existing view to a considerable extent. • This represents a **Negligible** magnitude of change.
Magnitude of Change Assessment – Train	• Movement of double stacked freight trains up to 1.80 km long (potentially up to 3.6 km long in the future) with a height of 6.50 m will be evident to travellers on Bruxner Way but only experienced occasionally due to the low number and transient nature of travellers on this road. Therefore, the magnitude of impact is considered to be **Low**.
Significance of effect (Operation)	The effect of the proposal on VP04 during operation is considered to be **Negligible**.

Viewpoint 5

Table 33: Likely visual effect of the proposal on Viewpoint 5: Bruxner Way, looking east

VP5: Bruxner Way, looking east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 5** Refer **Figure 26: Viewpoint 5 and** *visualisation* in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°41'29.886" S 150°24'54.329" E • Elevation: 220.0 m • Easterly view from the Bruxner Way, towards proposed road realignment and Bruxner Way Rail Over Road bridge • Proposed alignment is situated approximately 50 m to the east of this viewpoint

VP5: Bruxner Way, looking east	
	• Represents typical and accessible views of residents of local rural properties, and of visitors, tourists and workers travelling along the Bruxner Way • Easterly views from this point provide open views towards the proposed alignment and the proposed Bruxner Way Rail Bridge (over road), including landscapes typical of the Irrigated Croplands (Type C) landscape type.
Key visual sensitivities	• Low sensitivity of receptors, including travellers along the Bruxner Way and workers on local rural properties (AADT around 279 eastbound and 297 westbound of which up to 50% are heavy vehicles) • The presence of existing rail infrastructure (power poles and powerlines) reduces the overall sensitivity of this view • This viewpoint it is considered to have a **Low** sensitivity overall to the change proposed, due to the low sensitivity of viewers (e.g. travellers along Bruxner Way).
Visual Evaluation	
Photomontage	
 **Photomontage view from Viewpoint 5: Bruxner Way, looking east (75º field of view)** Refer **Figure 26: Viewpoint 5 and** *visualisation* in Appendix B for appropriate scaled image.	
Construction	
Magnitude of Change Assessment	• Significant areas within area are proposed as construction laydown areas • Construction of proposed embankments, rail and bridge infrastructure, and the realignment of the Bruxner Way will cause disturbance within the landscape • Demolition of existing Bruxner Way and redundant rail infrastructure will also occur • At this distance, construction works and laydown areas will be highly evident and change the visual character of the landscape, albeit temporarily. This is considered to be a **High** magnitude of change.
Significance of effect	The effect of the proposal on VP05 during construction is considered to be a **Moderate** impact.
Operation	
Magnitude of Change Assessment – Permanent Infrastructure	• The nearest section of the alignment is approximately 50 m to the east of this viewpoint. The proposed alignment will head north-east veering away from the existing highway alignment. The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: o Dominant change due to proposed earthworks and the provision of new rail infrastructure, including the Bruxner Way Rail Bridge, Whalan Tributary 1 Rail Bridge and the realignment of the Bruxner Way to the east

VP5: Bruxner Way, looking east	
	○ Height of proposed embankments varies, with the maximum proposed height being approximately 7.60 m above natural ground ○ Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character • At this distance, the alignment and associated infrastructure will be clearly evident, and represent a dominant change the visual character of the landscape by introducing new, dominant visual elements into the landscape, considered to be up to **High** magnitude of change.
Magnitude of Change Assessment – Train	• Movement of double stacked freight trains up to 1.80 km long (potentially up to 3.6 km long in the future) with a height of 6.50 m experienced at close distance will have a considerable impact on travellers on Bruxner Way. Therefore, the magnitude of impact is considered to be **Moderate**.
Significance of effect (Operation)	The effect of the proposal on VP05 during operation is considered to be up to **Moderate**.

Viewpoint 6

Table 34: Likely visual effect of the proposal on Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)

VP6: Tucka Tucka Road, looking east (near access road to Toomelah Community)	
Visual Baseline Assessment	
 **Existing view from Viewpoint 6** Refer **Figure 27: Viewpoint 6 and** *visualisation* in Appendix B for appropriate scaled image.	
Location and description	• GPS Location: 28°40'11.034" S 150°26'59.705" E • Elevation: 220.0 m • Easterly view from Tucka Tucka Road, approaching the turn-off to Toomelah Indigenous Community • Proposed alignment and Tucka Tucka Road Rail Bridge is situated approximately 50 m to the east of this viewpoint • The Macintyre river and proposed Macintyre River Viaduct is situated approximately 450 m to the north of this viewpoint • Representative of potential views of residents of local rural properties, residents of Toomelah and of visitors and workers travelling along Tucka Tucka Road. This view is considered representative of the worst-case impacts on the Toomelah community, noting that the main residential area of the community is located approximately 2.5 km to the east of this vantage point.

VP6: Tucka Tucka Road, looking east (near access road to Toomelah Community)	
	• Easterly views from this point provide open views towards the proposed alignment, including Tucka Tucka Road Rail Bridge, Macintyre River Viaduct and Whalan Creek Rail Bridge, including landscapes typical of the Vegetated Watercourses - Rivers (Type A) and Vegetated Watercourses - Creeks and Channels (Type B) landscape types.
Key visual sensitivities	• Moderate sensitivity of receptors, including residents of Toomelah Indigenous Community and a relatively low number of travellers along Tucka Tucka Road (AADT 241 eastbound and 190 westbound, around 10% of which are heavy vehicles) • The presence of existing power poles and powerlines reduces the overall sensitivity of this view • This viewpoint it is considered to have a **Moderate** sensitivity overall to the change proposed, due to the low number of viewers (e.g. travellers along Tucka Tucka Road) but reflecting the fact that this viewpoint is being used to represent views from the Toomelah community within a heritage area.
Visual Evaluation	
Photomontage	
 **Photomontage view from Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah) (75º field of view)** Refer **Figure 27: Viewpoint 6 and** *visualisation* in Appendix B for appropriate scaled image.	
Construction	
Magnitude of Change Assessment	• Significant construction areas within this viewpoint are proposed including a major construction laydown area, and satellite offices • Construction includes localised vegetation clearing, building the proposed embankments, and constructing rail and bridge infrastructure, which will cause considerable disturbance within the landscape • Tucka Tucka Road is the access road for residents of Toomelah Indigenous Community, therefore construction works could impact the views of local residents • At this distance, construction works, vegetation removal and laydown areas will be highly evident, and fundamentally change the visual character of the landscape • This represents a **Moderate** magnitude of change.
Significance of effect (Construction)	The effect of the proposal on VP06 during construction is considered to be **Moderate**.

VP6: Tucka Tucka Road, looking east (near access road to Toomelah Community)	
Operation	
Magnitude of Change Assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 50 m to the east of this viewpoint. The proposed alignment will cross the existing Tucka Tucka Road and head north towards the Macintyre River. The magnitude of change on this receptor is anticipated to be dominant, therefore High, due to the following factors: o Widespread change due to proposed earthworks and the provision of new rail infrastructure, including the Tucka Tucka Road Rail Bridge, Macintyre River Viaduct and the Whalan Creek Rail Bridge. o Nearest embankments are approximately 600 m to the south of this viewpoint on the other side of Whalan Creek. Height of proposed embankments varies, with the maximum proposed height being approximately 5.0 m above natural ground. o Where required, fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is typically proposed that will be in keeping with the existing rural character. • At this distance, the alignment and associated infrastructure will be dominant evident, and fundamentally change the visual character of the landscape by introducing new, dominant visual elements into the landscape, representing a **High** magnitude of change.
Magnitude of Change Assessment – Train	• Movement of double stacked freight trains up to 1.80 km long (potentially up to 3.6 km long in the future) with a height of 6.50 m experienced at close distance will have a considerable impact on travellers on Tucka Tucka Road and Toomelah Settlement. Therefore, the magnitude of impact is considered to be **Moderate**.
Significance of effect (Operation)	The effect of the proposal on VP06 during operation is considered to be **High**.

The selected views described above all fall within NSW. Views from other parts of the LVIA Study that fall within Qld looking towards the proposal have been considered. It was determined that views of the rail bridge over the Macintyre River are relatively inaccessible to the public on the Qld side of the border. The potential viewpoints identified in Queensland (for example in Rainbow Reserve accessed from Kildonan Road) are affected primarily by the B2G Project rather than this proposal (and are considered in the B2G LVIA) so are not considered further here.

9.4. Visual Impact of Borrow Pits

A desktop assessment was undertaken of the potential impact of proposed borrow pits on landscape and visual values, as identified in Table 35. Based on investigations during reference design phase, 11 borrow pits sites have been identified with the potential to provide material for the proposal.

Of these, 10 are existing and therefore impacts on landscape and visual values would be limited to localised increases in their extent including vegetation clearance and earthworks. Only one potential new borrow pit site is identified, which would, if utilised, result in the localised clearance of vegetation and earthworks.

All proposed borrow pit sites are located on private property and relevant land owners have been consulted throughout the reference design phase. It is noted that the provision of and extent of borrow pits is subject to detailed design and further consultation with land owners, and therefore no viewpoint has been selected to specifically illustrate the visual impact of the proposed borrow pits.

Table 35: Visual impact of proposed borrow pits

Borrow Pit Site Number/ Location	Existing/New	Potential Visual Impact
1: Wearne Road (Site 4)	Existing	Private land located on private access drive with existing screening vegetation. Pit extension largely into agricultural land, therefore considered to have no impact on visual values
2: 1069 B Bore Road, North Star (Site 5)	Existing	Private land located on private access drive 6 km from Newell Highway. Would result in some vegetation clearance, however this would be barely perceptible and therefore result in a negligible level of effect on visual values.
3: Wearne Road (Site 7 and 7b)	Existing	Private land located behind existing buffer vegetation around 400 m east of Edward Street/North Star Road. Would result in additional vegetation clearance. Potential for some visual impact, likely to result in a low level of effect on visual values.
4: 7409 North Star Road (Site 8)	Existing	Private land located around 1 km west of Edward Street/North Star Road. Existing site is densely vegetated and already affected by extensive earthworks, however this is screened by existing buffer vegetation. Would result in additional vegetation clearance and removal of buffer vegetation. Potential for some visual impact, likely to result in a low level of effect on visual values.
5: Lot 12 Bruxner Way, Boonal (Site 9)	Existing	Private land located around 750 m south of Bruxner Way. Existing site is heavily vegetated and affected by extensive earthworks, however this is screened by existing buffer vegetation. Would result in additional vegetation clearance. Potential views from parts of Bruxner Way, likely to result in a low level of effect on visual values.
6: 19911 Bruxner Way, Boonal (Site 11)	Existing	Private land located within existing vegetation around 2.8 km southwest of Bruxner Way. Would result in additional localised vegetation clearance around existing earthworks but site well-screened and remote from public views, therefore this would be barely perceptible and therefore result in a negligible level of effect on visual values.
7: 31486 Newell Highway, Boggabilla (Site 13)	Existing	Private land located around 50 m west of Newell Highway. Would result in additional localised disturbance around existing earthworks, largely affecting agricultural land. Potential views from parts of Newell Highway but likely to be largely screened by existing vegetation adjoining the Highway. Existing site, therefore changes would be barely perceptible and result in a negligible level of effect on visual values.
8: 1257 Forest Creek Road (Site 25)	Existing	Private land located via private access drive approximately 650 m from nearest residence and over 0.75 km from Forest Creek Road with narrow band of existing screening vegetation along road. Would result in additional vegetation clearance however pit extension is largely into agricultural land and would be barely perceptible and therefore result in a negligible level of effect on visual values.
9: 647 Hohns Road (Site 26)	Existing	Private land located behind existing buffer vegetation close to small local road (unsealed). Would result in some vegetation clearance, however this would be barely perceptible and therefore result in a negligible level of effect on visual values.
10: Site 1	Existing	Private land located around 1 km west of North Star Road and 750 m south of Minilya Road. Existing site is affected by earthworks; however, site is screened by dense vegetation. Would result in additional vegetation clearance however this would be barely perceptible and therefore result in a negligible level of effect on visual values. due to vegetated nature of site.

Borrow Pit Site Number/ Location	Existing/New	Potential Visual Impact
11: Site 2	New	Private land located around 750 m east of North Star-Croppa Creek Road. Site is densely vegetated elevated land surrounded by low lying agricultural land. Would result in considerable vegetation clearance, however this would be barely perceptible and therefore result in a negligible level of effect on visual values due to distance from nearby public roads and screening by topography.

10. Lighting Impact Assessment

This section considers the impact of proposal lighting.

As described in Section 7, construction lighting will only be associated with the construction camp in North Star village, site offices and fuel storage areas. It may also be used at bridge laydown areas. In terms of operational lighting, the only proposed permanent lighting is associated with safety lighting at the controlled level crossing on North Star Road near Ohmi homestead. There would also be transient lighting associated with train headlights.

10.1. Lighting assessment

On this basis, most of the assessed viewpoints would not receive any lighting impacts. Therefore, only the following viewpoints have been assessed, which are reported in Table 36 to Table 37.

- Viewpoint 2 (construction and operation)
- Viewpoint 6 (construction).

Viewpoint 2

Table 36: Likely visual effect of the proposal lighting on Viewpoint 2

VP2: North Star Road, looking north east	
Lighting Assessment	
Visual Evaluation	
Sensitivity Assessment	• **Low** as described for daytime assessment. There will be few receptors in this location at night – the residents of Ohmi are the key night-time viewers.
Magnitude of Change Assessment (construction)	• During construction it is anticipated that minimal works will be undertaken at night. However, there may be short-term construction works after dark that may require lighting. Additionally, the laydown area proposed within this view would be lit. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be 'predominantly dark' representing a noticeable **Low** magnitude of charge.
Significance of Effect (construction)	**Negligible.**
Magnitude of Change Assessment (operation)	• The active crossing proposed would be controlled by automatic warning systems including flashing lights and would be visible from the rural property 'Ohmi' • There would also be short-term impacts due to the headlight on the passing freight train which would last for a duration of up to 2.5 minutes • This would, at worst, change a 'intrinsically dark' landscape into a 'predominantly dark' landscape representing a noticeable change considered to have a **Low** magnitude of change.
Level of Effect (operation)	**Negligible.**

Viewpoint 6

Table 37: Likely visual effect of the proposal lighting on Viewpoint 6

VP6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	
Lighting Assessment	
Visual Evaluation	
Sensitivity Assessment	• This viewpoint is representative of views experienced by a low number of motorists travelling along Tucka Tucka Road • These travellers are typically residents of Toomelah Indigenous Community and are considered to have an interest in their night time surroundings, however due to the distance from the settlement this viewpoint is considered to have **low** sensitivity at night.
Magnitude of Change Assessment (construction)	• During construction it is anticipated that minimal works will be undertaken at night. However, there may be short-term construction works after dark that may require lighting. Additionally, the proposed bridge laydown area andsite office within this view would be lit. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be 'predominantly dark' representing a noticeable **Low** magnitude of charge.
Significance of Effect (construction)	**Negligible.**
Magnitude of Change Assessment (operation)	• There would be no permanent lighting associated with the new Tucka Tucka Road Bridge (over road) and Macintyre River Viaduct • There would be very short-term impacts due to the headlight on the passing freight train which would last for a duration of up to 2.5 minutes. • Overall, the impact would be **Negligible**.
Level of Effect (operation)	**Negligible.**

11. Cumulative impacts

Cumulative impacts are those that result from the successive, incremental and or combined effects of an action, project or activity when added to other existing, planned and or reasonably anticipated future ones (World Bank IFG Good Practice Handbook).

11.1. Cumulative LVIA methodology

The aim of the cumulative LVIA, is to describe and assess the ways in which the proposal could have additional impacts when considered in combination with other proposed built developments in the area. For the purposes of cumulative LVIA, the assessment considers if the cumulative impact would be:

- Combined: for example, two or more projects visible from one viewpoint
- Successive: two or more projects visible from one location and with the same viewfield
- Sequential: developments viewed at different times for example passing along a road.

The cumulative impact assessment methodology follows a qualitative method based on a three-step process, as follows:

- Identification of proposed developments lying within or around the Study Area
- Identification of Area of Influence (AOI) for the landscape and visual assessment, within which it is anticipated that cumulative effects could occur
- Cumulative impact assessment based on the assessment matrix set out in Table 38 and impact significance assessment matrix set out in Table 39.

Table 38: Relevance factors for assessing cumulative impact

Aspect	Relevance Factors		
	Low	**Medium**	**High**
Probability of Impact	1	2	**3**
Duration of Impact	1	2	**3**
Magnitude/Intensity of Impact	1	2	**3**
Sensitivity of Receiving Environment	1	2	**3**

Table 39: Impact significance for assessing cumulative impact

Aspect	Sum of relevance factors	Consequences
Low	1-6	Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general project monitoring program.
Medium	7-9	Mitigation measures likely to be necessary and specific management practices to be applied. Specific approval conditions are likely. Targeted monitoring program required, where appropriate.
High	10-12	Alternative actions should be considered and/or mitigation measures applied to demonstrate improvement. Specific approval conditions required, Targeted monitoring program necessary, where appropriate.

11.2. Cumulative impact area and project inclusion

The cumulative LVIA is based on descriptions of other similar scale projects to the extent that such data was publicly available at the time of this assessment. The cumulative situation may change as applications are made or withdrawn.

A provisional review has been conducted to streamline the assessment process to eliminate, or scope out projects, which are anticipated to generate negligible landscape and visual impacts. Due to the potential for sequential impacts, for example when driving through the landscape, a wider Area of Influence (AOI) than the LVIA study area was considered, extending 50 km (approximately 30 mins drive or more). Beyond this distance, it is considered that there would be no reasonable expectation of cumulative impact being registered by a viewer.

A number of projects were identified and considered for the cumulative impact assessment but were discounted on the basis of location (distance from the proposal) or lack of available information. Projects not included within the LVIA cumulative impact assessment on this basis include:

- Moree Solar Farm – 10 km south of Moree, off the Newell Highway in Northern NSW
- Hunter Gas Pipeline – Newcastle to Narrabri
- White Rock Wind Farm - 20 km south-west of Glen Innes, 40 km east of Inverell NSW
- Sundown Solar Farm – South of Gwydir Hwy, 30 km east of Inverell (NSW)
- Bonshaw Solar Farm – Bruxner Highway, 16 km south of Bonshaw and 66 km north of Inverell (NSW)
- Sapphire Solar Farm – Located 30 km east of Inverell.

Based on this assessment, the projects considered to have potential cumulative landscape and visual impacts are shown on Figure 13: Cumulative LVIA (refer Appendix A). Table 40 sets out the key criteria for inclusion of a project. The selected projects are described in Table 41.

Table 40: Project inclusion criteria – cumulative impact assessment

No.	Consequences
a)	Are Currently being assessed under Part 1 of the Chapter 3 of the *Environmental Protection Act 1994* (Qld) (EP Act) and, as a minimum, have an initial advice statement (IAS) available on the Qld Department of Environment and Heritage Protection's (EHP) website.
b)	Have been declared a 'coordinated project' by the Coordinator-General under the SDPWO Act and an EIS is currently being prepared or is complete, or an IAS is available on the Qld Department of State Development, Infrastructure and Planning (DSDIP) website.
c)	May use resources located within the region (including materials, groundwater, road networks or workforces) that are the same as those to be used by the ARTC Inland Rail Project.
d)	Could potentially compound residual impacts that the ATRC Inland Rail Project may have on environmental or social values.

Table 41: Projects included in the LVIA cumulative impact assessment

Project and Proponent	Location	Description	EIS status	Lifespan (years)	Relationship to Inland Rail (NS2B)	Selection criteria
Border to Gowrie – Inland Rail (ARTC)	NSW/QLD Border to Gowrie	Comprised of approximately 146 km of new dual gauge track and 78 km of upgraded track from the NSW/Qld border, near Yelarbon, to Gowrie Junction, northwest of Toowoomba in Queensland.	Project feasibility	2016 – 2024/2025	Potential overlap on construction commencement for B2G and finalisation of NS2B.	b)
Narrabri to North Star – Inland Rail (ARTC)	Narrabri (NSW) to the village of North Star in NSW	An upgrade to approximately 188 km of track within the existing rail corridor and construction of approximately 1.6 km of new rail corridor.	Project assessment (late 2017 – late 2018)	2016 – 2024-2025	Potential overlap of finalisation of N2NS and commencement of NS2B.	b)
Newell Highway Upgrade, Moree and North Moree	Newell Highway, Narrabri to Moree and North Moree	The project includes planning for up to 30.2 km (made of three segments) of new road pavement, intersection improvements and widening of road shoulders. This will improve safety for motorists and reduce future maintenance requirements.	Preliminary Environmental Investigation (Nov 2017)			c)
Newell Highway upgrade Mungle Back Creek to Boggabilla	85 km north of Moree, Mungle Back Creek to Boggabilla	This will improve safety for motorists and reduce future maintenance requirements. The project includes major work on 18 km of new road pavement, 3.5 m wide lanes in each direction, intersection	Environment Protection License acquired, construction contract awarded to Fulton Hogan Construction Pty Ltd, in August 2018.	Expected completion in 2021	Potential overlap of construction kick-off for the Project and completion of this project. Increased heavy vehicle traffic on the Newell Highway.	c)

Project and Proponent	Location	Description	EIS status	Lifespan (years)	Relationship to Inland Rail (NS2B)	Selection criteria
		improvements, widening of road shoulders and provision of two new overtaking lanes.				

11.3. Cumulative impact assessment

Cumulative impacts to the landscape and visual amenity of the proposal will be largely the product of:

- Temporal construction impacts – presence of construction traffic, workforce and machinery operating on adjoining projects at the same time
- Spatial operational impacts – the residual impact of the visibility of infrastructure of identified projects to sensitive receptors.

In terms of temporal impact, the N2NS and B2G projects immediately adjoin the proposal at the southern and northern ends respectively. There is potential overlap of finalisation of N2NS construction activities and commencement of the proposal and commencement for B2G and finalisation of NS2B. The Newell Highway upgrades may also overlap resulting in the perception of relatively high amounts of construction activity within the AOI. As the duration of these activities is low, the impacts temporary and there are relatively few sensitive receptors it is considered that the significance of this cumulative impact during construction is low.

In terms of spatial impacts, the N2NS and B2G projects immediately adjoin the proposal and will, in practice, be viewed as part of the same integrated project (Inland Rail). Additionally, much of the alignment of these projects is located along existing former rail alignments so the contrast with the current condition will be lower than in a 'greenfield' situation. Overall, therefore, these projects are anticipated to result in a low level of cumulative impact.

Due to the low level of lighting proposed for the proposal, there are not anticipated to be any significant cumulative lighting impacts associated with these projects.

Overall, the cumulative landscape and visual impacts in the region are likely to be **Low**. This is summarised in Table 42.

Table 42: Summary of cumulative impact assessment

Residual cumulative landscape and visual impact.	Consequence
Construction impacts associated with views of increase in construction traffic and construction areas.	**Low**
Operation impacts associated with views of combined and sequential views of adjoining projects.	**Low**
Impacts of night lighting.	**Nil**

12. Mitigation and residual impact assessment

12.1. Mitigation

This section outlines the initial mitigation measures included in the proposal design and identifies proposed mitigation measures to manage predicted environmental impacts in the preconstruction, construction and construction and operational phases of the proposal.

12.2. Initial mitigation – design measures

The mitigation measures presented in Table 43 have been incorporated into the proposal design. These design measures have been identified through collaborative development of the design and consideration of environmental constraints and issues, including proximity to sensitive receptors. These design measures are relevant to both construction and operational phases of the proposal. It is also considered that the proposal addresses the relevant provisions of ISCA Version 1.2 in relation to Hea-2 Crime Prevention, Dis-5 Light Pollution and Urb-1 Urban Design to a level appropriate to the current design stage.

Table 43: Initial mitigation measures relevant to landscape and visual amenity

Aspect	Initial Mitigations
Landscape and visual issues	• The design has been developed to utilise the existing rail corridor to protect and minimise land severance and impacts to natural and rural landscapes to the greatest extent possible. In total 25 km out of 30 km is located along a former/existing rail alignment. • The proposal has been aligned to be co-located with existing road infrastructure where possible • The disturbance footprint defined in proposal design has aimed to minimise vegetation clearing extents to that required to construct and operate the works. • The alignment has sought to reduce the extent of impact on watercourses and their landscape setting • The extent of cut and fill including the height of structures and embankments has been kept to the minimum consistent with required engineering design and requirements for cross-corridor connectivity for people and vehicles • The alignment has been kept away from settlements to the greatest extent possible (consistent with the existing rail alignment).

12.3. Proposed mitigation measures

In order to manage and mitigate impacts, a number of mitigation measures and design objectives are proposed for implementation in future stages of design and delivery to achieve a further reduction in significance from the initial significance rating. These proposed mitigation measures respond to proposal specific issues and opportunities, address legislative requirements, accepted government plans, policy and practice.

Table 44 presents these proposed mitigation measures in accordance with the proposal phase during which they would be implemented, as follows:

- Detailed design
- Preconstruction
- Construction
- Operation.

These mitigation measures include proposal-wide considerations as well as location or issue specific measures in response to impacts identified in the LVIA.

Table 44: Additional mitigation measures relevant to landscape and visual amenity

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design	Landscape and visual values	**Landscape and visual impacts due to vegetation removal** • Clearing extents of visually significant vegetation are further limited during the detailed design phase to that required to enable the works. Particular locations include: o Between North Star Road and Scotts Road (approx. Ch 8.2 km to Ch 9.2 km) o Between North Star Road and the alignment (generally) o Adjacent Wilby Street in North Star o Associated with watercourses as described below • Prepare a Rehabilitation and Reinstatement Plan to guide the approach to rehabilitation following the completion of construction. The Plan should include and clearly specify: o Location of areas subject to rehabilitation and/or reinstatement/stabilisation details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives.
		Landscape and visual impacts on watercourses • Develop the detailed design to further minimise impacts to waterways, riparian vegetation and in-stream flora and habitats. Particular locations include Back Creek, Forest Creek, Whalan Creek and the Macintyre River and their tributaries • Adopt a crossing structure hierarchy: bridges preferred to culverts, however local conditions and constructability impacts must be considered when determining the preferred environmental solution: aim to avoid, then minimise the extent of waterway diversions or realignments.
		Visual impact of rail infrastructure • Infrastructure (such as structures, embankments/cuttings and bridges) should be designed following an integrated design process about landscape character and views as identified in the LVIA seeking to: o **Legacy**: create a consistent legacy of treatments along the Inland Rail Programme alignment to enhance the overall recognition and legacy of the proposal o **Bridges**: through detailed design ensure that bridges contribute to an overall coherent sense of design, respect their surroundings

Delivery Phase	Aspect	Proposed mitigation measures
		and consider connectivity, CPTED and graffiti issues. e.g. In particular consider urban design input to: o Macintyre river/Whalan Creek bridge crossing and viaduct (around Ch 30.6 km): Potential urban design input to the Macintyre Bridge during detailed design phase could enhance its visual amenity and potential to create a legacy of elegant waterway crossings o Bruxner Way overbridge (around Ch 25.6 km): Additional urban design input to the Macintyre Bridge during the detailed design phase could enhance its visual amenity and potential to create a legacy of elegant bridge structures. o **Embankments:** minimise the extent to which landform (embankments) restricts views or affects views from nearby residences, to the greatest extent possible, including through sensitive stabilisation, revegetation or – where appropriate – screen planting. o **Cuttings:** minimise the extent of cut batters noting that this has already been addressed to the greatest extent possible.
Detailed design (continued)		**Landscape design treatments** • Develop a Proposal Landscape and Rehabilitation Plan and associated detailed landscape design with landscaping treatments determined in accordance with the conditions of approval and with reference to the key landscape characteristics and elements identified in this LVIA with particular emphasis on sensitive design that is appropriate to the setting as described below. **Rural and natural landscapes** • The landscape design shall respect and enhance the rural landscapes. Considerations include: o Design of the landscape earthworks and planting to, screen and integrate the railway and associated structures and features, wherever practicable and appropriate to the character and maintenance of desired views. This includes further opportunity for design of targeted planting of buffer/shelterbelts adjacent to major earthworks within the rail corridor to the extent consistent with safety. For example, planting strips could be introduced adjacent to significant embankments and structures (such as associated with bridge crossings) to reduce visual impact and assist in integrating the landform and structures into the existing landscape setting (which, it is noted, already incudes similar shelterbelts beside roads and riparian vegetation along watercourses). o The landscape design shall seek to enhance the features and qualities that give the landscape its particular characteristic, ensuring the design responds to the natural patterns of the rural or natural landscape • Where appropriate consult with local stakeholders and landowners during design (and construction) in order to understand the landscape context and the particular qualities of landscapes. **Ecologically sensitive areas** • Design to provide opportunities for ecological gain to benefit biodiversity. This includes: o Development of diverse planting and seed mixes to maximise and connect habitat types for ecological gain o Enhancement of landscape corridors and ecological links across the landscape by, where possible, joining or re-joining fragmented areas of habitat o Landscape design and planting to incorporate ecological requirements to benefit the characteristic and visual amenity of local landscapes including through revegetation with locally indigenous species.

Delivery Phase	Aspect	Proposed mitigation measures
		Heritage landscapes • Heritage landscapes: through detailed design: o Seek to further limit direct impacts or impacts to the setting of identified items of Aboriginal, historic or natural heritage significance, to the greatest extent possible • Consider the development of interpretation strategy and wayfinding to assist in the interpretation of visual elements of heritage significance such as old rail lines, bridges, buildings or other items of visual value.
		Light impacts • Opportunity for vegetation screening or 'at receptor' mitigation such as light blocking curtains to minimise impacts on affected properties including the rural property 'Ohmi' (around Ch 7.1 km). Selection of at-property mitigation measures and treatments will be undertaken in consultation with affected landowners.
Preconstruction	Landscape and visual values	**Visual impacts of pre-construction activities** • Develop a Rehabilitation and Landscaping Management Plan as part of the Environmental Management Plan (EMP) to minimise disturbance to landscape and visual amenity values during the construction period.
Construction	Landscape and visual values	**Landscape and visual impacts due to damage to vegetation** • Minimise disturbance to avoid impacts to native vegetation and habitats as far as practicable • Consider selective retention of existing mature trees within laydown areas, in particular in North Star (adjacent Wilby Street and within the construction camp footprint) where views towards the proposed construction camp will be clearly evident, to provide some screening of construction activities and provide a framework for restoration planting following completion of works (in consultation with the affected land owner(s)). • Construction areas including compounds, stockpiles, fuel storage, laydown areas, staff parking to be located outside the tree protection zone as defined in AS4970-2009: Protection of trees on development sites.
		Visual impacts of construction activities • Minimise construction compounds close to sensitive receptors to the greatest extent possible • Minimise height of all stockpiles to the greatest extent possible to reduce their visual impact; including minimising height of topsoil stockpiles to 2.5 m • Temporary treatments: Temporary treatments (such as hoardings and screens) to site compounds should be considered to assist in reducing visual impacts. These include: o Site compounds – opportunities to utilise features on temporary fencing/hoarding. This may include art-based treatments to assist with screening the works from the public and using information boards (or similar) to educate the public about the construction works.

Delivery Phase	Aspect	Proposed mitigation measures
		Landscape and visual impacts due to borrow pits • Borrow pits to be rehabilitated at the conclusion of the construction of the proposal. Rehabilitation should occur to minimise long term landscape and visual impacts, respond to the intended land use, be in accordance with the relevant strategic framework and best practice, and in consultation with the affected land owner(s).
	Lighting	**Light impacts of construction activities** • Avoid night works to the greatest extent possible close to people's houses and, where unavoidable construction light impacts are predicted through the development of the detailed design and associated construction plan, consider attenuation measures in discussion with affected landowners.

A range of additional legacy opportunities have been identified that provide opportunities to enhance the outcomes of the proposal for affected communities. As these are not strictly mitigation to address identified impacts they are included in Chapter 18: Sustainability of the North Star to NSW/QLD Border EIS.

12.4. Residual Impact assessment

Potential impacts to landscape and visual amenity associated with the proposal in the construction and operation phases are outlined in Table 21 and Table 22. These impacts have been subjected to a significance assessment as per the methodology described in Section 5.

The initial impact assessment is undertaken on the basis that the design measures (or initial mitigations) detailed in Table 43 have been incorporated into the proposal design.

Proposed mitigation measures, described in Table 44, were then applied as appropriate to the phase of the proposal to reduce the level of potential impact.

The residual risk level of the potential impacts was then reassessed after the proposed mitigation measures were applied. The initial significance levels were compared to the residual significance levels in order to assess the effectiveness of the proposed mitigation measures.

In conclusion, the proposal is assessed to have the following impacts, shown in Table 45 on landscape and visual values.

Table 45: Impact Assessment summary

Aspect	Phase	Landscape Character Type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
Landscape impacts	**Construction/Operation**	LCT A: Vegetated Watercourses - Rivers	Moderate	Low	Low	Low	Low
		LCT B: Vegetated Watercourses – Creeks	Low	Low	Negligible	Low	Negligible
		LCT C: Irrigated Croplands	Low	Low	Negligible	Low	Negligible
		LCT D: Dry Croplands and Pastures	Low	Low	Negligible	Low	Negligible
		LCT E: Rural Settlement	Moderate	No Impact	No Impact	No Impact	No Impact
		LCT F: Vegetated Grazing	Low	No Impact	No Impact	No Impact	No Impact
Visual impacts	**Construction**	Viewpoint 1: Corner of Capernum Street and David Street, North Star	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 2: North Star Road looking north	Low	High	Moderate	High	Moderate
		Viewpoint 3: North Star Road, looking east	Low	Low	Negligible	Moderate	Low
		Viewpoint 4: Bruxner Way. Looking northwest	Low	Low	Negligible	Low	Negligible
		Viewpoint 5: Bruxner Way, looking east	Low	High	Moderate	High	Moderate
		Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Moderate	Moderate	Moderate	Moderate	Moderate
Visual impacts	**Operation**	Viewpoint 1: Corner of Capernum Street and David Street, North Star	Moderate	Up to Moderate	Moderate	Up to Moderate	Moderate
		Viewpoint 2: North Star Road looking north	Low	Moderate	Low	Moderate	Low
		Viewpoint 3: North Star Road, looking east	Low	Moderate	Low	Moderate	Low

Aspect	Phase	Landscape Character Type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
		Viewpoint 4: Bruxner Way. Looking northwest	Low	Low	Negligible	Low	Negligible
		Viewpoint 5: Bruxner Way, looking east	Low	High	Moderate	High	Moderate
		Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Moderate	High	High	High	Moderate
Lighting impacts	**Construction/Operation**	Viewpoint 1: Corner of Capernum Street and David Street, North Star	No impact	No impact	No impact	No impact	No impact
		Viewpoint 2: North Star Road looking north	Low	Low	Negligible (construction and operation)	Low	Negligible (construction and operation)
		Viewpoint 3: North Star Road, looking north east	No Impact No impact	No Impact No impact	No Impact (construction) No impact (operation)	No Impact No impact	No Impact (construction) No impact (operation)
		Viewpoint 4: Bruxner Way, looking northwest	No impact	No impact	No impact	No impact	No impact
		Viewpoint 5: Bruxner Way, looking east	No impact	No impact	No impact	No impact	No impact
		Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Low No impact	Low No impact	Negligible (construction) Negligible(operation)	Low No impact	Negligible (construction) Negligible(operation)

Table Notes:

[#1] Includes implementation of initial mitigations specified in Table 43.

[#2] Includes implementation of additional mitigations and controls as identified in Table 44.

13. Conclusions and recommendations

13.1. Summary of landscape impacts

Six Landscape Character Types with associated character areas were identified through the landscape assessment process. A summary of the overall likely landscape impact anticipated during the construction and operation of the proposal for each Landscape Character Type is presented in Table 46.

Table 46: Summary landscape assessment (construction and operation)

Viewpoint name	Landscape Sensitivity	Magnitude of change	Potential landscape effect
LCT A: Vegetated Watercourses - Rivers	Moderate	Low	Low[1 and 2]
LCT B: Vegetated Watercourses - Creeks and Channels	Low	Low	Negligible[1 and 2]
LCT C: Irrigated Croplands	Low	Low	Negligible[1 and 2]
LCT D: Dry Croplands and Pastures	Low	Low	Negligible[1 and 2]
LCT E: Rural Settlement	Moderate	No Impact	No Impact[1 and 2]
LCT F: Vegetated Grazing	Low	No Impact	No Impact[1 and 2]

Table Notes:

[1] Initial mitigation only

[2] Assessment including additional mitigation measures

This shows that the proposal is not considered likely to result in any impacts on landscape character and amenity during construction or operation of above low significance. These impacts will be managed through the implementation of the mitigation measures described in Section 12.

13.2. Summary of visual impacts

Based on digital mapping (VAM) and the field survey, six representative viewpoints were selected for detailed assessment. Cross-border views from QLD were considered but were not considered to be prominent. A summary of the baseline analysis and overall likely visual impact anticipated during the construction of the proposal is summarised for each viewpoint in Table 47.

Table 47: Summary preliminary visual assessment (Construction)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Corner of Capernum Street and David Street, North Star	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 2: North Star Road looking north	Low	High	Moderate[1 and 2]
Viewpoint 3: North Star Road, looking north east	Low	Low	Negligible[1 and 2]
Viewpoint 4: Bruxner Way, looking northwest	Low	Low	Negligible[1 and 2]
Viewpoint 5: Bruxner Way, looking east	Low	High	Moderate[1 and 2]
Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Moderate	Moderate	Moderate[1 and 2]

Table Notes:

[1] Initial mitigation only

[2] Assessment including additional mitigation measures

This shows that the proposal is considered likely to result in visual impacts of up to Moderate significance during construction. A summary of the overall likely visual impact on the same representative viewpoints during the operation of the proposal is summarised in Table 48.

Table 48: Summary preliminary visual assessment (Operation)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Corner of Capernum Street and David Street, North Star	Moderate	Up to Moderate	Moderate[1 and 2]
Viewpoint 2: North Star Road looking north	Low	Moderate	Low[1 and 2]
Viewpoint 3: North Star Road, looking north east	Low	Moderate	Low[1 and 2]
Viewpoint 4: Bruxner Way, looking northwest	Low	Low	Negligible[1 and 2]
Viewpoint 5: Bruxner Way, looking east	Low	High	Moderate[1 and 2]
Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Moderate	High	High[1]
		Moderate	Moderate[2]

Table Notes:

[1] Initial mitigation only

[2] Assessment including additional mitigation measures

This shows that the proposal is considered likely to result in only one visual impact of High significance during operation relating to the presence of the railway bridge crossing the natural landscape of the Macintyre River valley in the vicinity of Toomelah Aboriginal settlement and heritage area. Other impacts of up to Moderate significance include views from North Star and from Bruxner Way.

Consideration was also given to the potential impacts of the borrow pits that will be used to extract material for use as fill for the proposal. In total there are 11 potential sites proposed, some of which lie beyond the LVIA Study Area. Of these, 10 are existing borrow pits, while one new potential borrow pit on private property has been identified. Most of these pits are existing, located on private land, at a distance from important viewing locations and are largely screened by existing mature vegetation. Therefore, impacts of up to Low significance are associated with three of the sites – Wearne Road (Site 7 and 7b), North Star Road (Site 8), Bruxner Way (Site 9), due to the greater number of receptors in these areas, greater sensitivity of the landscape and/or more open views into the proposed borrow pit.

These impacts will be managed through the implementation of the mitigation measures described in Section 12.

13.3. Summary of lighting impacts

As there is limited project lighting proposed, most of the viewpoints are not anticipated to be affected by permanent night lighting and would be, at most, affected by short-duration impacts of up to 2.5 minutes due to the headlight of the passing train. A summary of the baseline analysis and overall likely visual impact anticipated during the operation of the proposal is provided for each viewpoint (as described above) is presented in Table 49.

Table 49: Summary lighting assessment (Construction and Operation)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Corner of Capernum Street and David Street, North Star	No impact	No impact	No impact[1 and 2]
Viewpoint 2: North Star Road looking north	Low	Low	Negligible (construction and operation) [1 and 2]
Viewpoint 3: North Star Road, looking north east	No Impact	No Impact	No impact[1 and 2]
Viewpoint 4: Bruxner Way, looking northwest	No impact	No impact	No impact[1 and 2]
Viewpoint 5: Bruxner Way, looking east	No impact	No impact	No impact[1 and 2]
Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah)	Low	Low	Negligible (construction) [1 and 2]
		Negligible	Negligible (operation) [1 and 2]

Table Notes:

[1] Initial mitigation only

[2] Assessment including additional mitigation measures

13.4. Impact assessment summary

In conclusion, the proposal is assessed to have the following impacts, shown in Table 50 on landscape and visual values.

Table 50: Impact Assessment summary

Impact	Significance
Landscape impacts during construction and operation	For landscape impacts during construction and operation, the greatest impact identified of up to **Low** significance is on LCT A Vegetated Watercourses – Rivers.
Visual impacts during construction	For visual impacts during construction, the greatest impact identified of up to **Moderate** significance for three viewpoints (Viewpoint 2: North Star Road looking north, Viewpoint 5: Bruxner Way, looking east and Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah).
Visual impacts during operation	For visual impacts during operation, the greatest impact identified of up to **High** significance relates to one viewpoint (Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah).
Lighting impacts	For lighting impacts the greatest impact identified of up to **Negligible** significance relates to three viewpoints (Viewpoint 2: North Star Road looking north, Viewpoint 3: North Star Road, looking north east and Viewpoint 6: Looking in a north-easterly direction along Tucka Tucka Road (towards access road to Toomelah).
Cumulative impacts during construction	Low consequence
Cumulative impacts during operation	Low consequence
Cumulative impacts of night lighting	Nil

Table Notes: Impact significance in the summary table above is given for the most significant impact identified for each attribute prior to any mitigation.

13.5. Conclusions

The landscape between North Star and the QLD/NSW Border is a working agricultural landscape characterised by generally flat irrigated and non-irrigated croplands interspersed by a network of vegetated watercourses. Historically, a freight rail has existed for much of the proposed alignment and there is a legacy of operational and abandoned rail infrastructure throughout the area.

The proposal would introduce 30 km of rail into the landscape, of which 25 km would be along the existing non-operational Boggabilla line.

It is considered that the proposal addresses the relevant provisions of ISCA Version 1.2 in relation to Hea-2 Crime Prevention, Dis-5 Light Pollution and Urb-1 Urban Design to a level appropriate to the current design stage.

The key landscape and visual impacts of the proposal relate to the removal of vegetation, the raising of embankments and creation of new rail bridges.

Six Landscape Character Types have been identified which have impacts of up to low significance (Landscape Type A: Vegetated Water Courses – River).

In this flat to gently undulating landscape, visual impacts are contained by the presence of vegetation and landform. There are relatively few visual receptors with much of the landscape comprising isolated farmsteads set on large private farms. The main views are obtained from local roads including North Star Road and the Bruxner Way.

Six representative viewpoints have been assessed. The most significant visual impact of the proposal, rated as ‘High’, relates to the introduction of the railway bridge over the Macintyre River on the Toomelah Aboriginal Community and associated heritage area. Other visual impacts are of lower significance, relating to isolated homesteads during construction.

Lighting impacts were identified of up to negligible significance.

Cumulative impacts, particularly the effects in combination with the adjoining N2NS and B2G Inland Rail Projects have been considered but it is considered that the consequence of these cumulative impacts is low.

In conclusion, the requirement for specific mitigation to manage landscape and visual impacts is very limited. A range of opportunities to enhance the legacy of the proposal on landscape and visual values have been identified for consideration and these have potential to result in some reductions to the residual impact and would enhance the outcome of the proposal on landscape and visual values.

14. Glossary

14.1. Acronyms

AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
AOI	Area of Influence (for cumulative assessment)
AHD	Australian Height Datum
AILA GNLVA	Australian Institute of Landscape Architects
B2G	Border to Gowrie – Inland Rail Project from NSW/Qld border to Gowrie
DTMR	Department of Transport and Main Roads
DTDB	NSW Digital Topographic Database
ERIN	Environmental Resources Information Network
GNLVA	Guidance Note for Landscape and Visual Assessment (AILA)
GLVIA	Guidelines for Landscape and Visual Impact Assessment
ISCA	Infrastructure Sustainability Council of Australia
kV	Kilo Volts
LCA	Landscape Character Area
LCT	Landscape Character Type
LGA	Local Government Area
LVA	Landscape and Visual Assessment
LVIA	Landscape and Visual Impact Assessment
NSW	New South Wales
N2NS	Narrabri to North Star – Inland Rail Project from Narrabri to North Star
NS2B	North Star to Border – Inland Rail Project from North Star to NSW/Qld border
OQTA	Outback Queensland Tourism Association
Qld	Queensland

14.2. Glossary of assessment terms

Amenity	The pleasantness of a place as conveyed by desirable attributes including visual, noise, odour etc.
Artist's impression	An indicative visual representation illustrating the appearance of a proposal. Typically to communicate a concept when photomontages are not available and /or when accuracy cannot be assured.
Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, and often conveys a distinctive sense of place. This term does not imply a level of value or importance.
Effect	The landscape or visual outcome of a proposed change. It may be the combined result of sensitivity together with the magnitude of the change.
Impact	The categorisation of effects. Legislative context is considered in defining impacts and their significance.
Landscape	Landscape is an all-encompassing term that refers to areas of the earth's surface at various scales. It includes those landscapes that are: urban, rural, and natural; combining bio-physical elements with the cultural overlay of human use and values.
Landscape Character Type	Distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern.
Landscape Character Area	These are single unique areas and are the discrete geographical areas of a particular Landscape Character Type.
Magnitude of change	The extent of change that will be experienced by receptors. This change can be adverse or beneficial. Factors that could be considered in assessing magnitude are: the proportion of the view/landscape affected; extent of the area over which the change occurs; the size and scale of the change; the rate and duration of the change; the level of contrast and compatibility.
Mitigation	Measures to avoid, reduce and manage identified potential adverse impacts.
Proposal	The Inland Rail North Star to Border Project.
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 are located.
Route	A primary description of the path which a railway will follow.
Receptor	A place, route, viewer audience or interest group which may require assessment.
Sensitivity	Capacity of a landscape or receptor to change without losing valued attributes.
Study Area	LVIA Study Area (discipline study area); comprising land within the potential viewshed of and forming the wider landscape context of the proposal.

Values	Any aspect of landscape or views people consider to be important. Landscape and visual values may be reflected in local, state or federal planning regulations, other published documents or be established through community consultation and engagement, or as professionally assessed.
View	Any sight, prospect or field of vision as seen from a place, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, mid ground and/or foreground elements or features.
Viewpoint	The specific location of a view typically used for assessment purposes.
Viewshed	Areas visible from a particular location (may be modelled or field-validated).
Visual catchment	Areas visible from a combination of locations within a defined setting (may be modelled or field-validated).
Visual audience	Groups of visual receptors with common attributes and sensitivities to changes in views (e.g. residents, golfers, road travellers, walkers, shoppers, beach goers, farmers, recreational users).
Visual absorption capacity	Potential for a landscape or scene to absorb a particular change without a noticeable loss of valued attributes.
Visual amenity	The attractiveness of a scene or view.
Photomontages/ Visualisations	A visual representation of a proposal from a particular receptor viewpoint, on a photographic base. The methodology for the preparation of any photomontage and its accuracy should be defined.
Scenic amenity	A measure of the relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public. (Department of Natural Resources, 2001).

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APPENDIX P

Landscape and Visual Impact Assessment Technical Report

Appendix A Plans

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

APPENDIX A: PLANS

The following plans prepared by FFJV have been used to inform and illustrate this assessment:

Figure 1: Inland Rail regional

Figure 2: LVIA study area

Figure 3: Regional scenic amenity and planning designations

Figure 4: Landform and hydrological context

Figure 5: Land use

Figure 6: Interim Biogeographic Regionalisation Australia

Figure 7: Landscape character

Figure 8: Tourist drives and sensitive receptors

Figure 9: Key visual receptors and location of representative viewpoints

Figure 10: Visual Analysis Map – permanent infrastructure

Figure 11: Visual Analysis Map – rolling stock

Figure 12: Visual Analysis Map – difference

Figure 13: Cumulative LVIA

Map by: GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-201808061159_LVIA\NS2B\390-ELE-201808061159_Fig1_Project Context_rev7.mxd Date: 7/11/2019 09:03

Legend

- Localities
- North Star to NSW/QLD border alignment
- Adjoining alignments
- NSW/QLD border
- NS2B LVIA study area

A4 scale: 1:1,800,000

0 10 20 30 40 50km

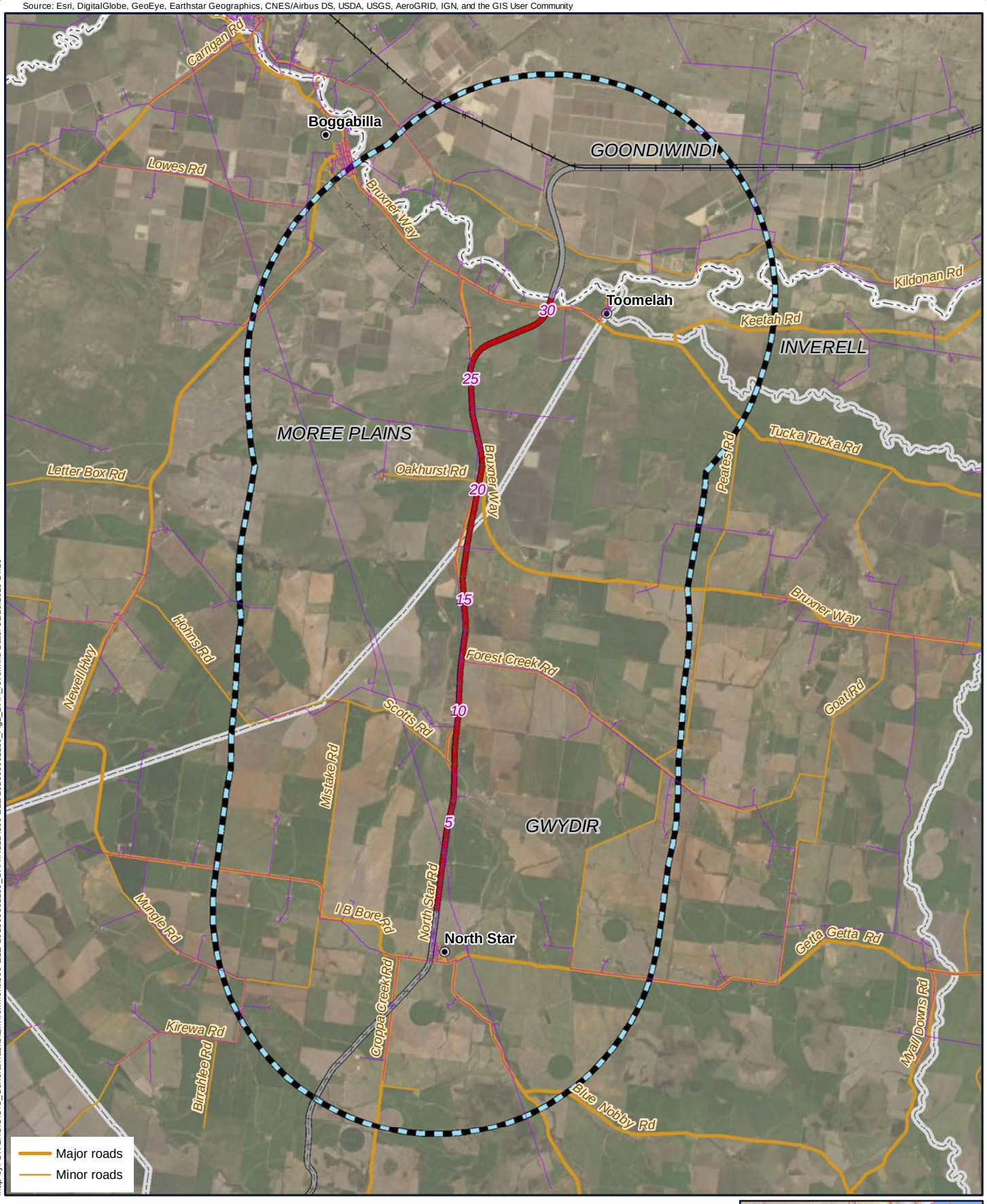
Future Freight
Integrating Community, Environment and Engineering

Date: 29/10/2019 Version: 7

Coordinate System: GDA 1994 MGA Zone 56

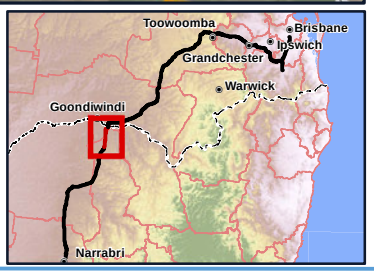
North Star to NSW/QLD border

Figure 1:
Inland Rail regional context



Legend

- 5 Chainage (km)
- Localities
- Powerlines
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- NSW/QLD border
- Local Government Areas
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

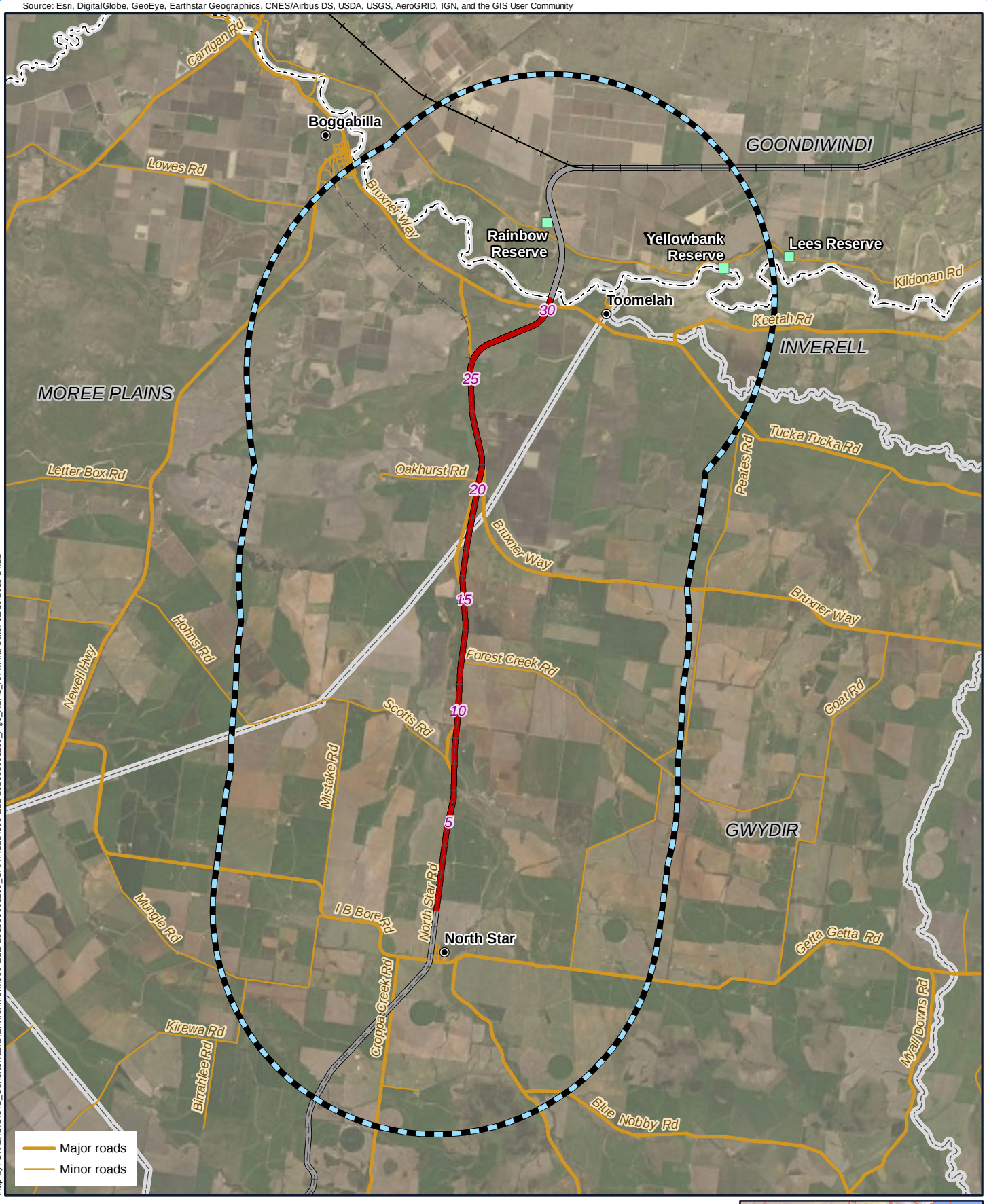
Date: 29/10/2019 Version: 6

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 2: Landscape and visual impact assessment study area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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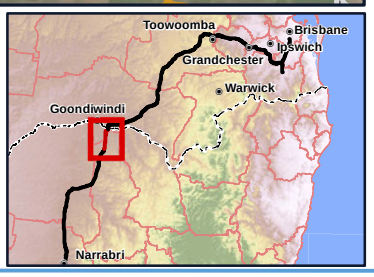
Legend

- 5 Chainage (km)
- Localities
- Reserves
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- NSW/QLD border
- Local Government Areas
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

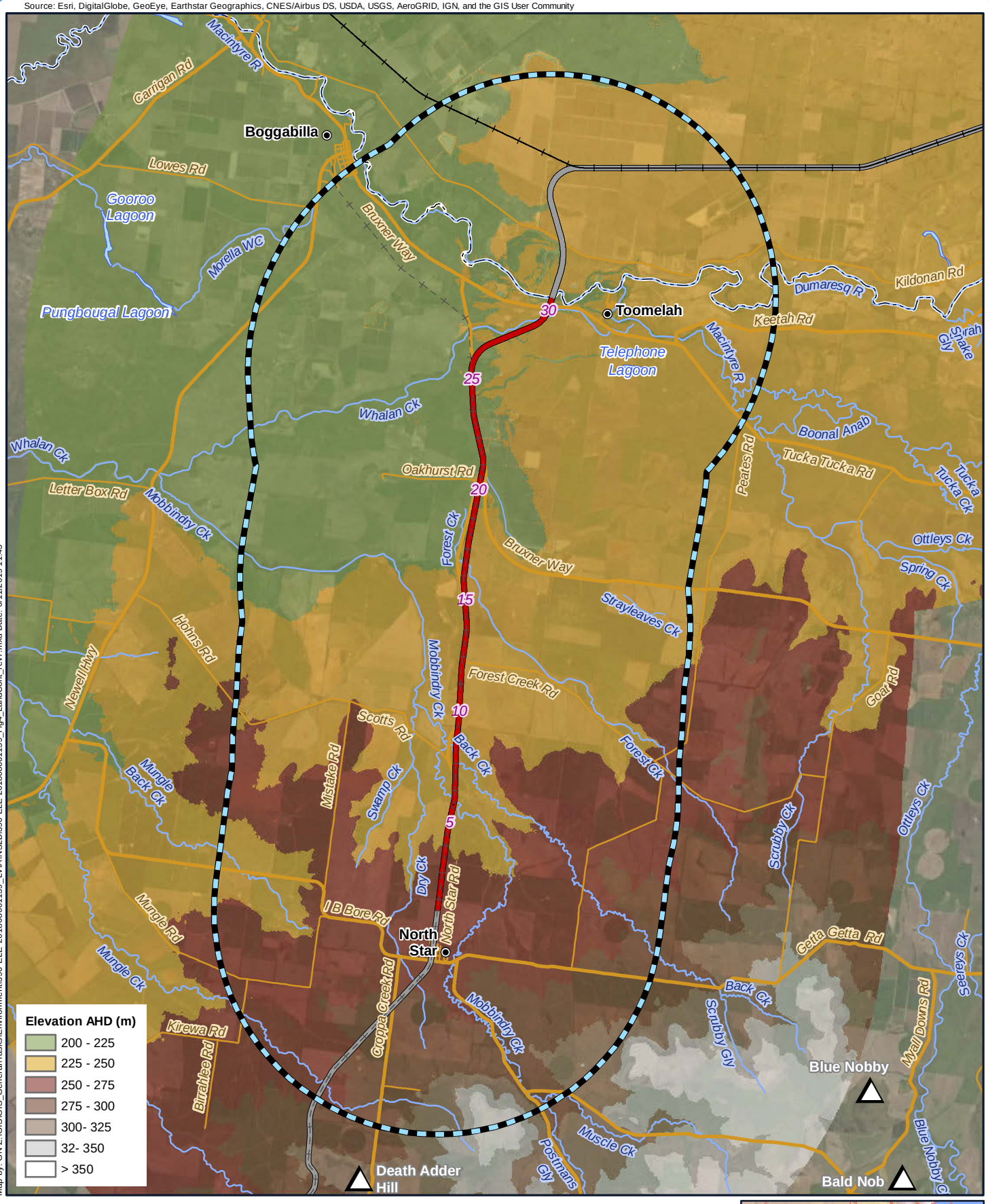
Future Freight
Integrating Community, Environment and Engineering

Date: 29/10/2019 Version: 4

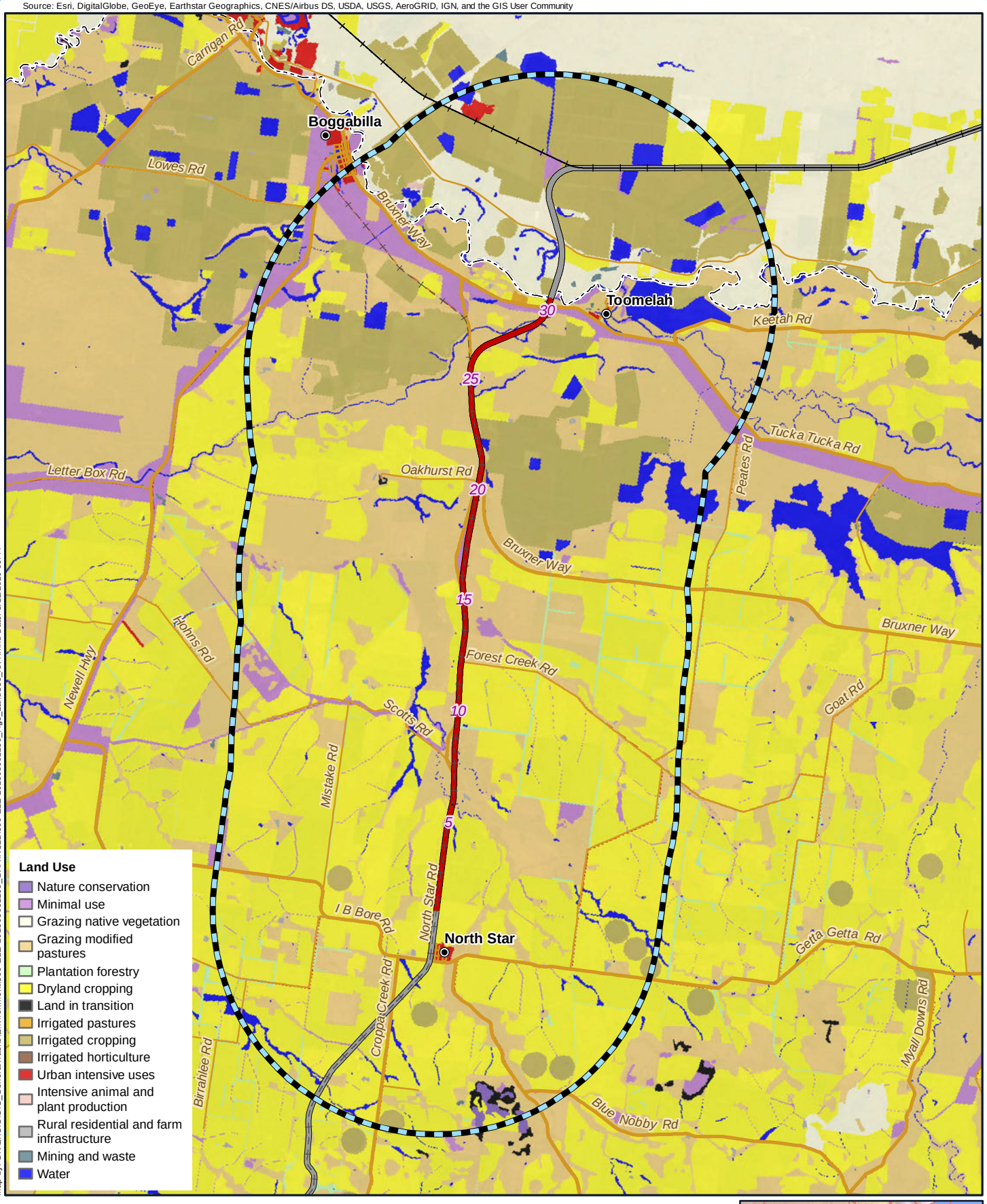
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 3: Regional Scenic Amenity & Planning Designations


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Boggabilla
Toomelah
North Star
Death Adder Hill
Blue Nobby
Bald Nob
Macintyre R
Carrigan Rd
Lowes Rd
Gooroo Lagoon
Morella WC
Pungbougal Lagoon
Bruxner Way
Whalan Ck
Letter Box Rd
Mobbindry Ck
Oakhurst Rd
Forest Ck
Telephone Lagoon
Dumaresq R
Kildonan Rd
Keetah Rd
Snake Gly
Srah
Boonal Anab
Tucka Tucka Rd
Tucka Ck
Peates Rd
Ottleys Ck
Spring Ck
Strayleaves Ck
Forest Creek Rd
Goat Rd
Hohns Rd
Newell Hwy
Scotts Rd
Mistake Rd
Swamp Ck
Back Ck
Mungle Back Ck
Mungle Rd
Mungle Ck
Dry Ck
I B Bore Rd
North Star Rd
Croppa Creek Rd
Kirewa Rd
Birrahlee Rd
Scrubby Ck
Getta Getta Rd
Myall Downs Rd
Seavers Ck
Scrubby Gly
Muscle Ck
Postmans Gly
Blue Nobby Ck
30
25
20
15
10
5
Elevation AHD (m)
200 - 225
225 - 250
250 - 275
275 - 300
300- 325
32- 350
> 350
Map by: GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-201808061159_LVIA\NS2B\390-ELE-201808061159_Fig4_LandCont_rev7.mxd Date: 6/11/2019 11:45
Legend
Chainage (km)
Localities
Mountain
Existing rail (operational)
Existing rail (non-operational)
Adjoining alignments
North Star to NSW/QLD border alignment
Major roads
Minor roads
NSW/QLD border
Watercourses
Waterbodies
LVIA study area
Toowoomba
Brisbane
Ipswich
Grandchester
Warwick
Goondiwindi
Narrabri
A4 scale: 1:230,000
0 1 2 3 4 5km
Future Freight
Integrating Community, Environment and Engineering
Date: 29/10/2019 Version: 7
Coordinate System: GDA 1994 MGA Zone 56
North Star to NSW/QLD border
Figure 4:
Landform and Hydrological Context

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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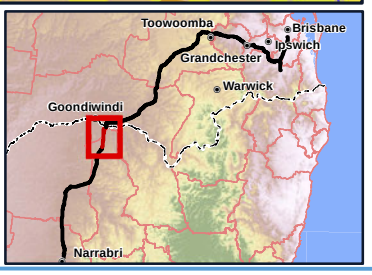
Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



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0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

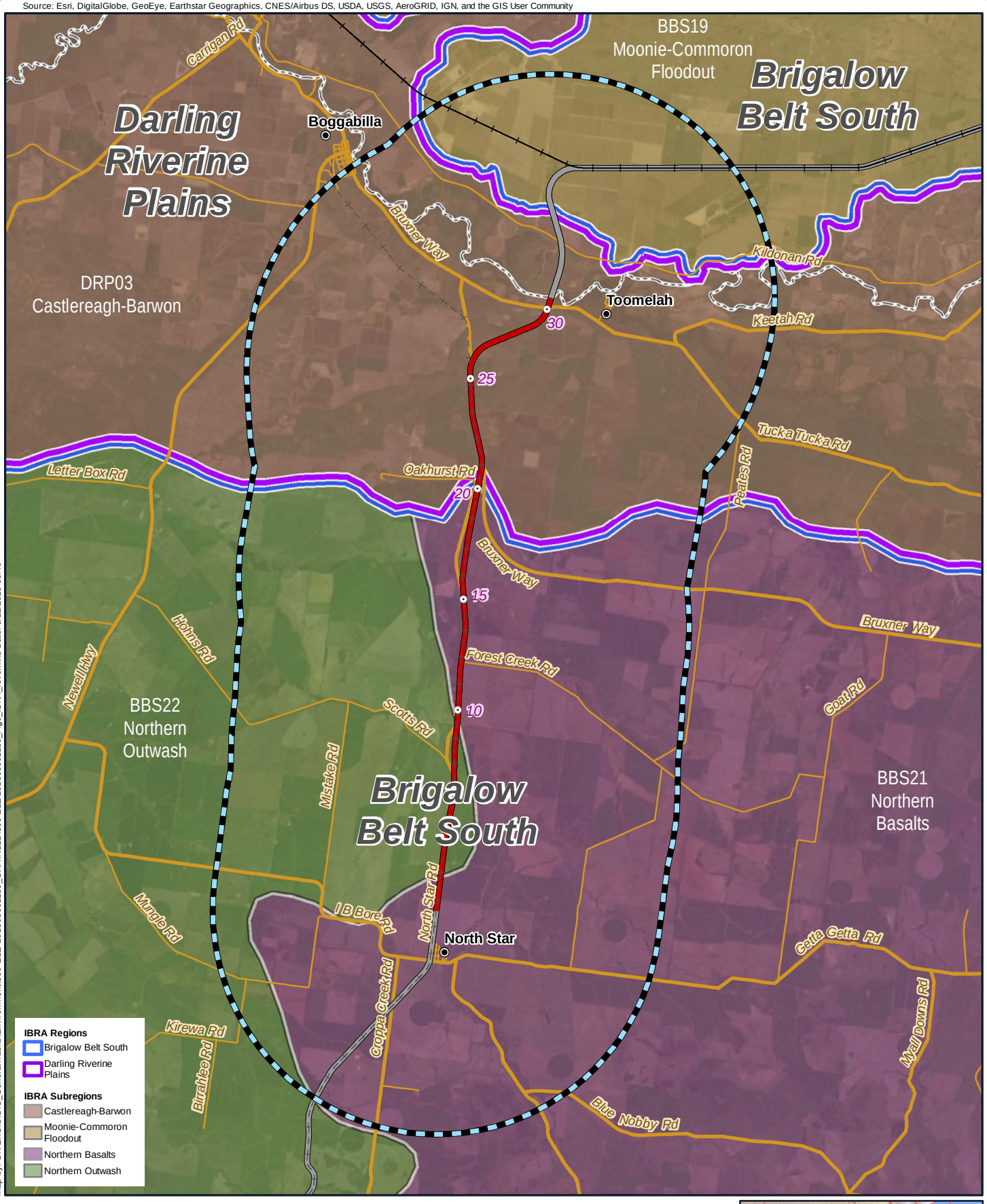
Date: 29/10/2019 Version: 7

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 5:
Land Use Context

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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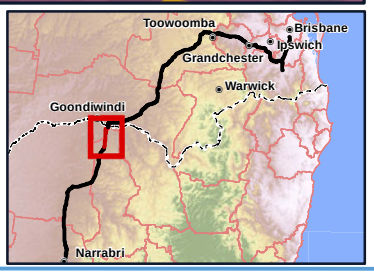
Legend

- Localities
- 5 Chainage (km)
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

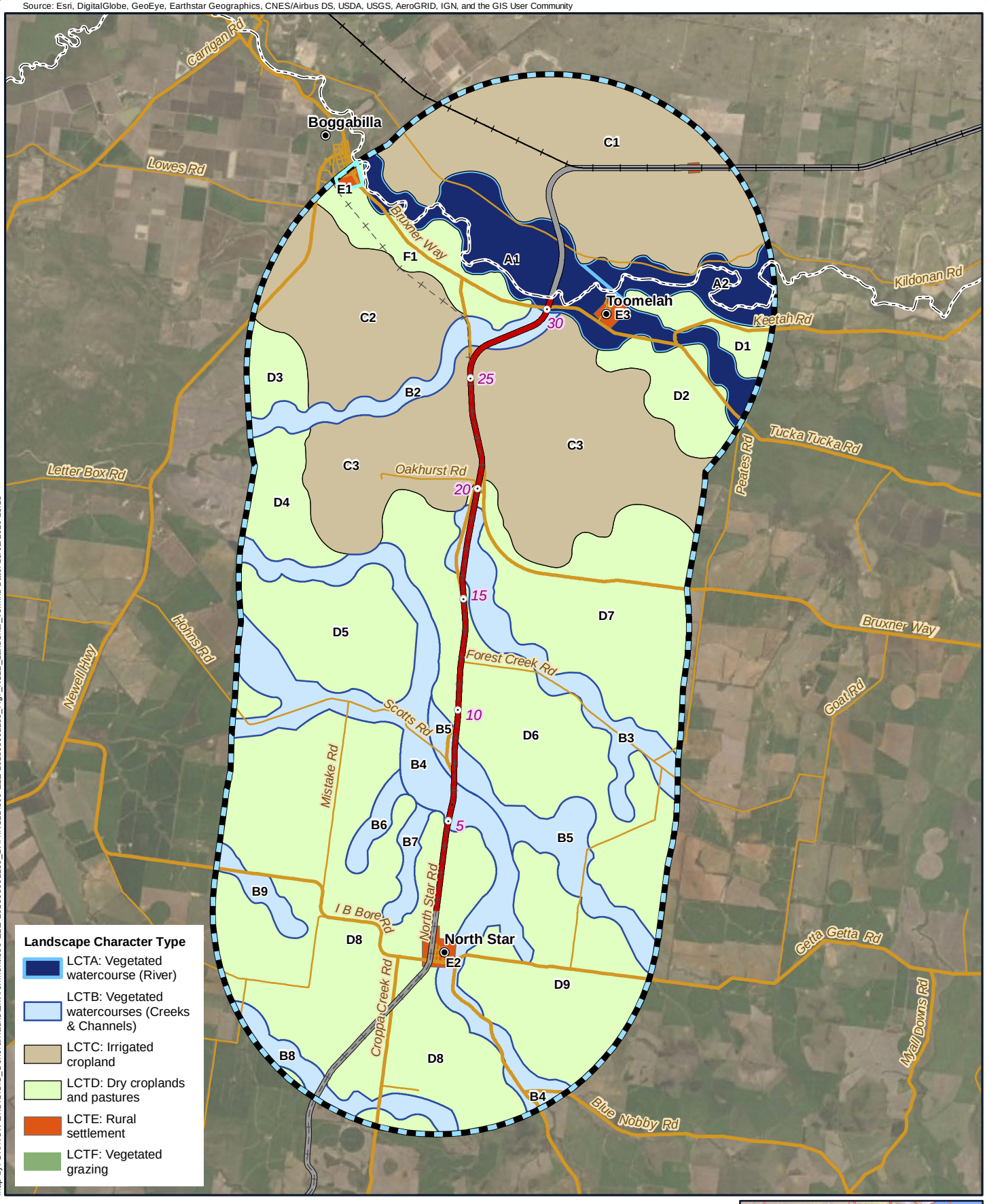
Future Freight
Integrating Community, Environment and Engineering

Date: 29/10/2019 Version: 6

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

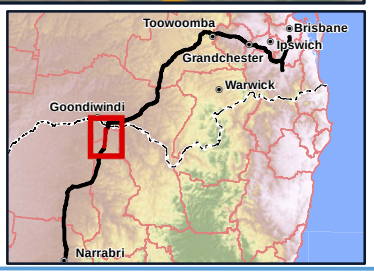
Figure 6: Interim Biogeographic Regionalisation Australia



Map by: GN/NCW Z:\GIS\GIS_General\Tasks\Environment\390-ELE-201808061159_LVIA\NS2B\390-ELE-201808061159_Fig7_NS2B_LandChar_v3.mxd Date: 13/02/2020 13:18

Legend

- Localities
- 5 Chainage (km)
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

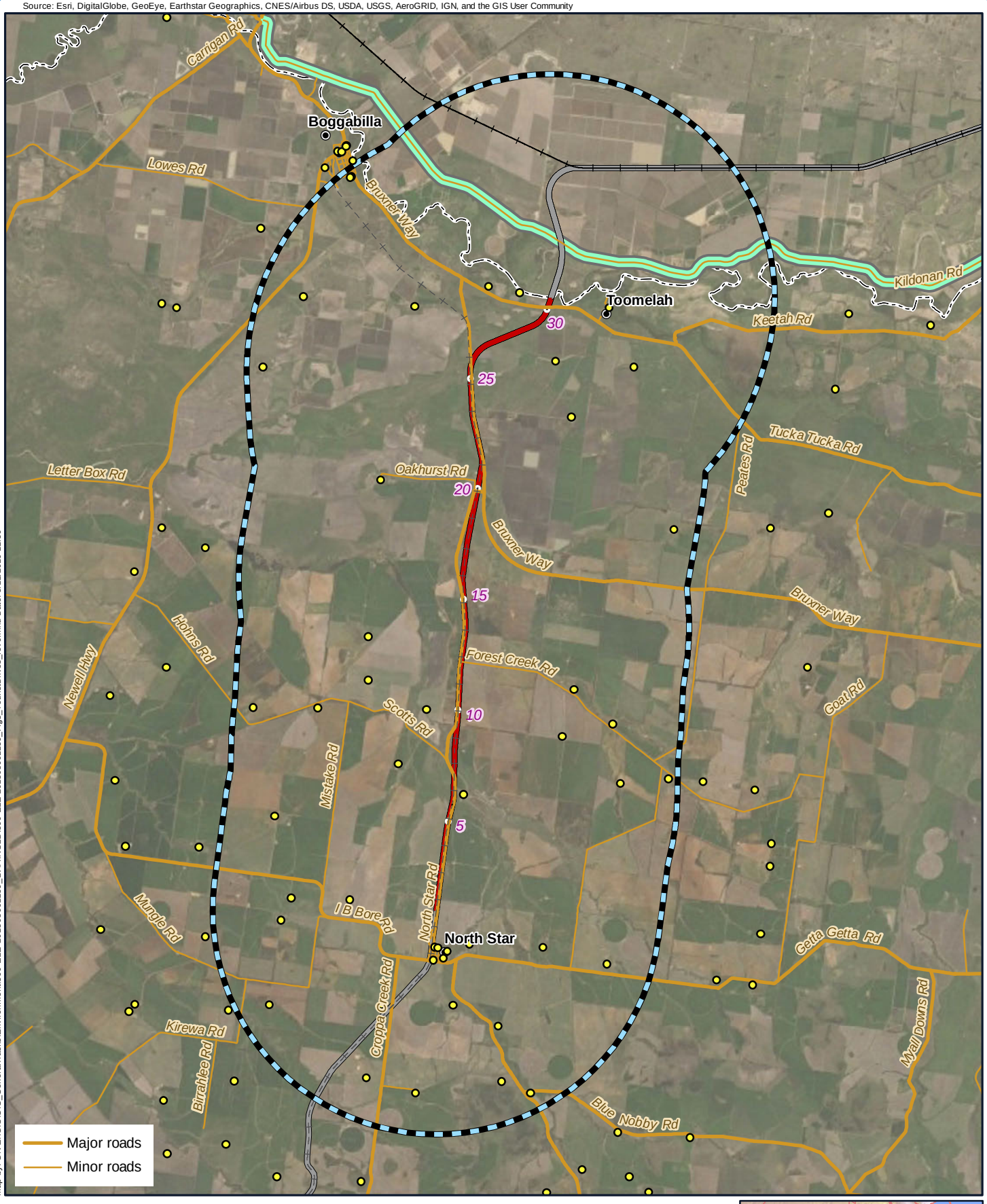
Future Freight
Integrating Community, Environment and Engineering

Date: 13/02/2019 Version: 2

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

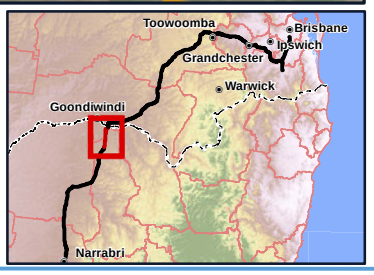
Figure 7:
Landscape Character Assessment



Map by: GN Z:\GIS\GIS_GeneralTasks\Environment\390-ELE-201808061159_LVIA\NS2B\390-ELE-201808061159_Fig8_TouristDrives_rev6.mxd Date: 5/11/2019 11:50

Legend

- Localities
- 5 Chainage (km)
- Sensitive receptor/Homestead
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- NSW/QLD border
- Border Rivers Tourist Drive (local drive)
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

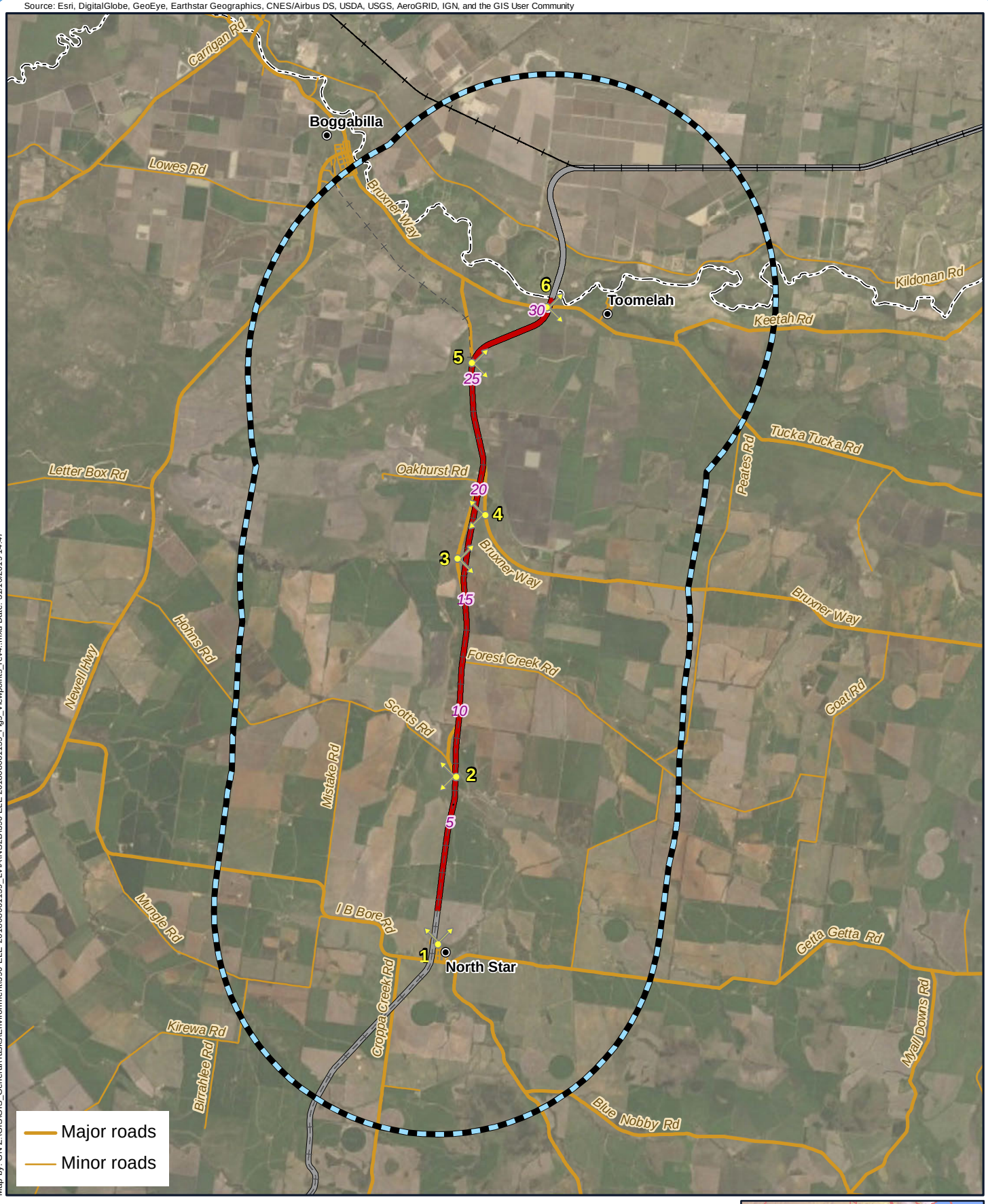
Future Freight
Integrating Community, Environment and Engineering

Date: 29/10/2019 Version: 6

Coordinate System: GDA 1994 MGA Zone 56

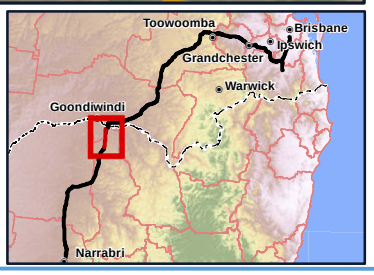
North Star to NSW/QLD border

Figure 8:
Tourist Drives and Sensitive Receptors



Legend

- Viewpoints
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

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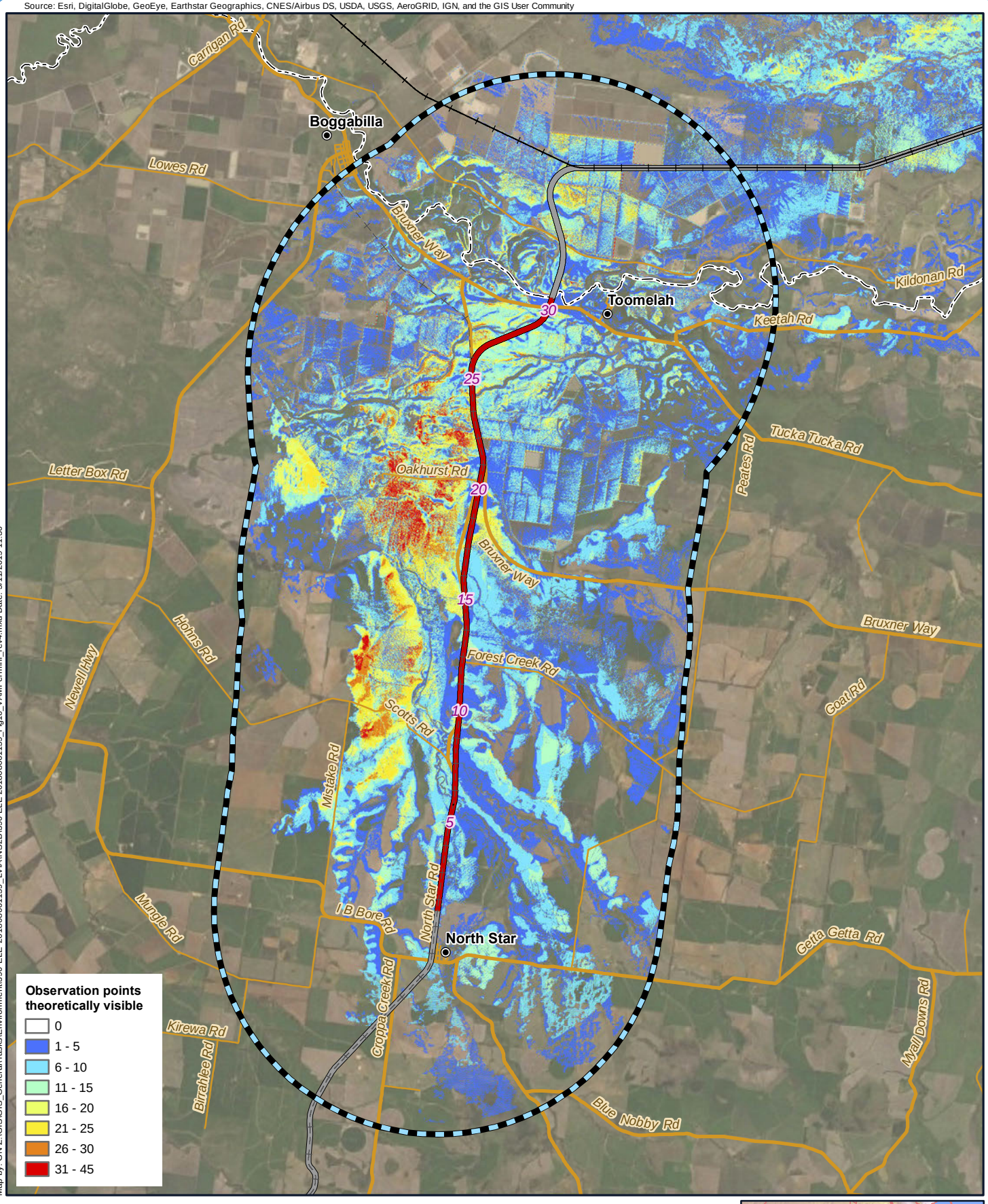
Coordinate System: GDA 1994 MGA Zone 56

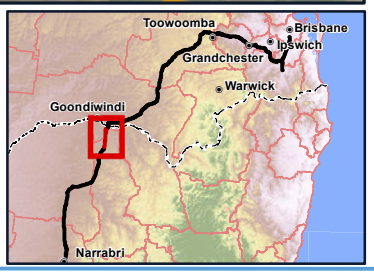
North Star to NSW/QLD border

Figure 9: Key visual receptors and location of representative viewpoints



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

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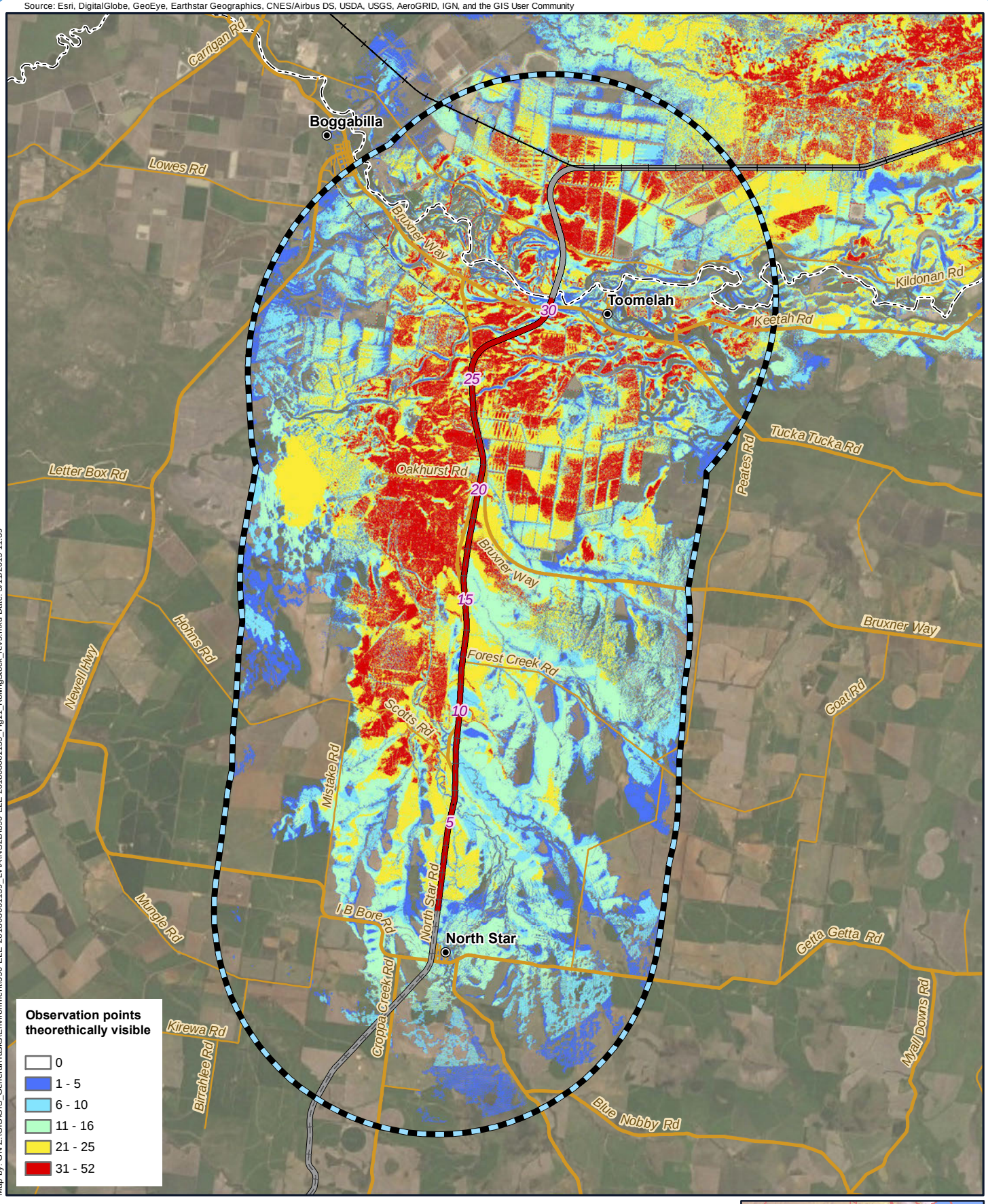
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

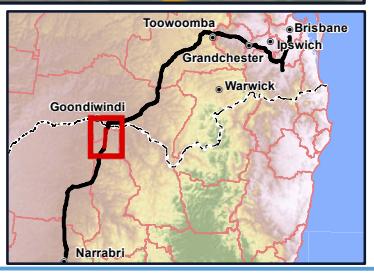
Figure 10:

Visual Analysis Map – Permanent Infrastructure



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

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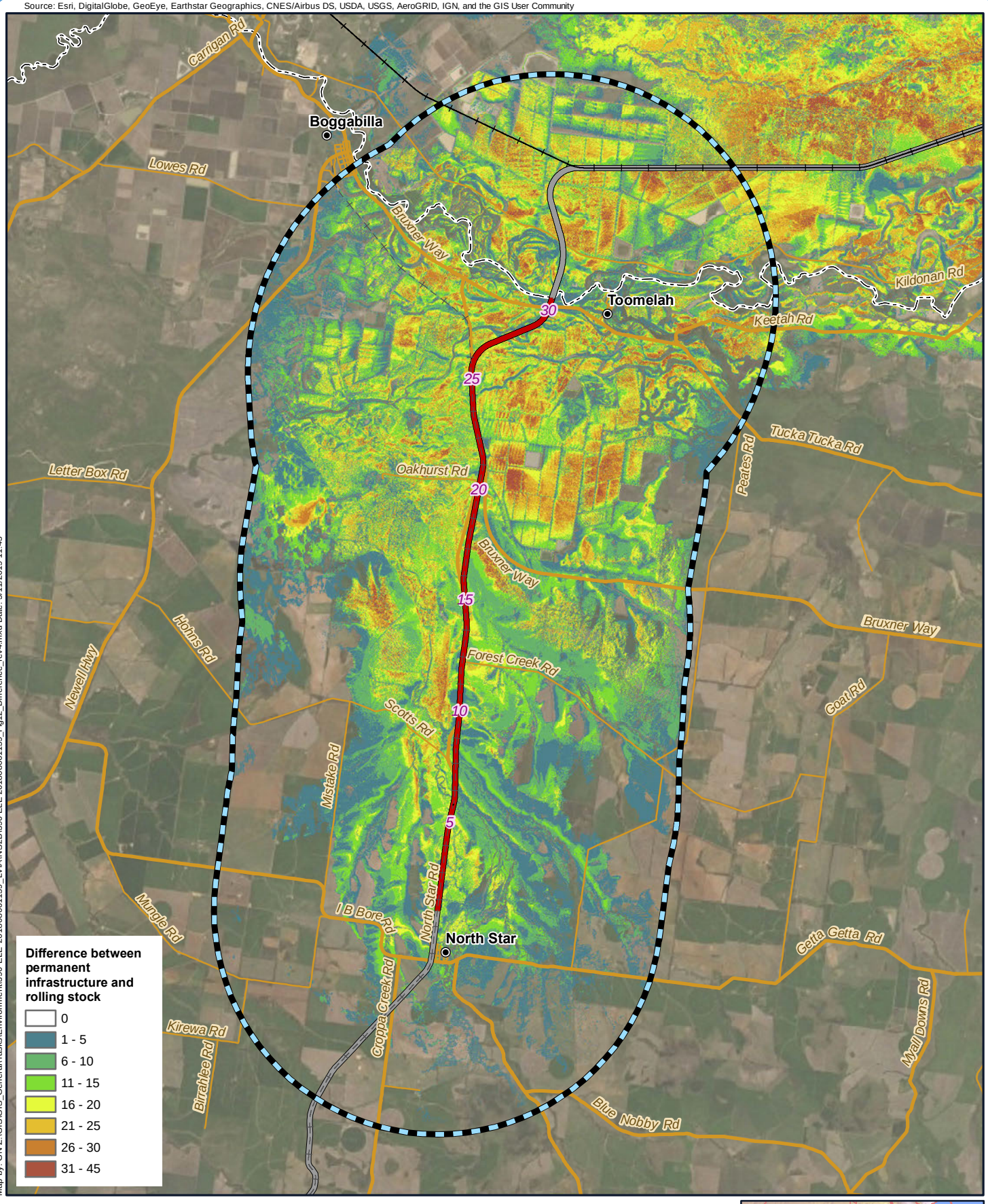
Coordinate System: GDA 1994 MGA Zone 56

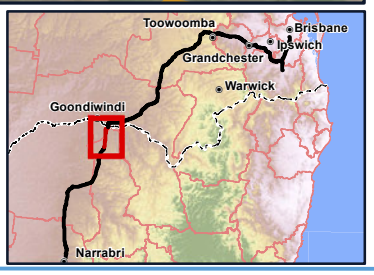
North Star to NSW/QLD border

Figure 11:
Visual Analysis Map – Rolling Stock



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border
- LVIA study area



A4 scale: 1:230,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

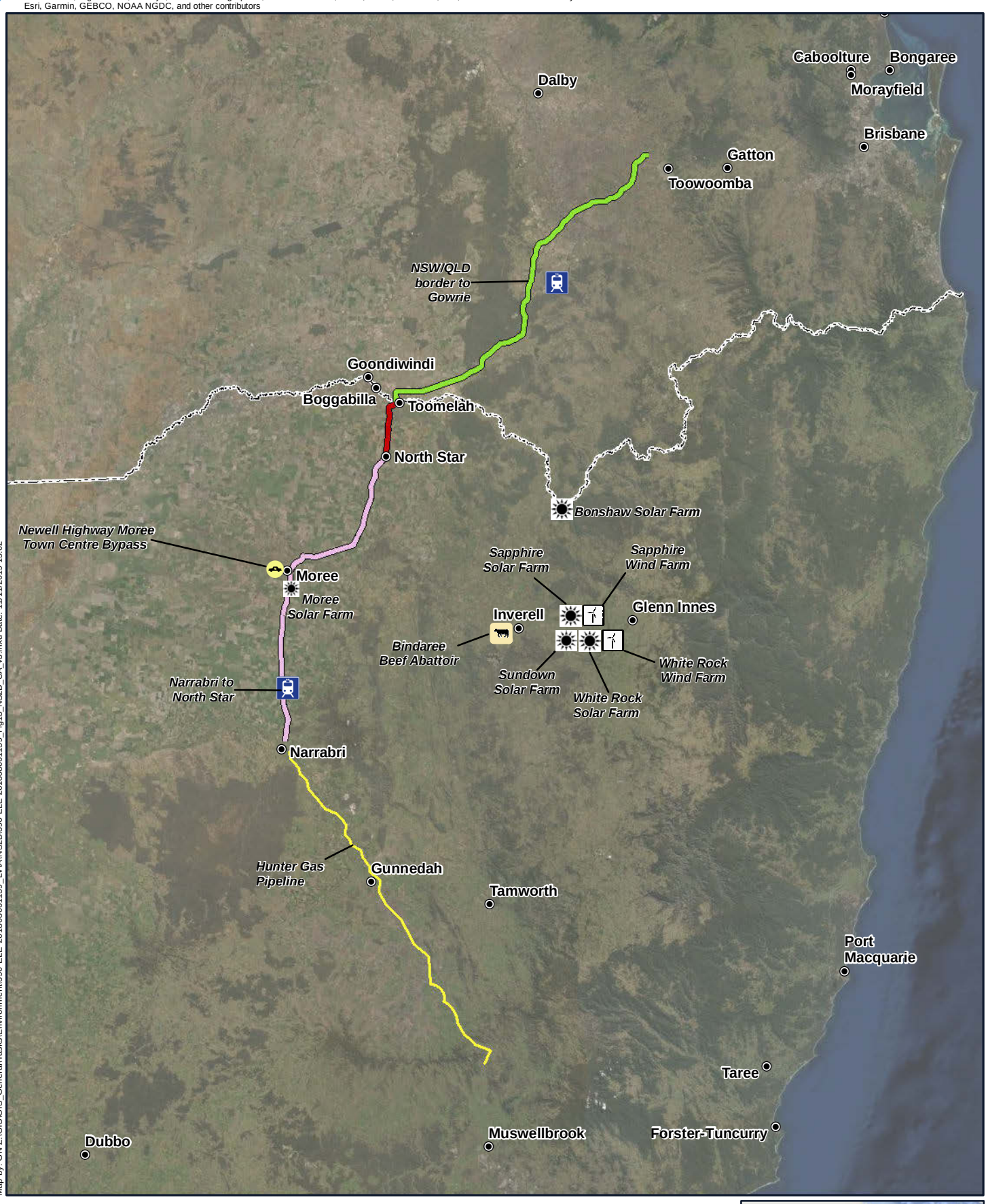
Date: 30/10/2019 Version: 4

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 12:

Visual Analysis Map – Difference Analysis


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
Caboolture
Bongaree
Dalby
Morayfield
Brisbane
Gatton
Toowoomba
NSW/QLD border to Gowrie
Goondiwindi
Boggabilla
Toomelah
North Star
Bonshaw Solar Farm
Newell Highway Moree Town Centre Bypass
Moree
Moree Solar Farm
Sapphire Solar Farm
Sapphire Wind Farm
Inverell
Glenn Innes
Bindaree Beef Abattoir
Sundown Solar Farm
White Rock Wind Farm
White Rock Solar Farm
Narrabri to North Star
Narrabri
Hunter Gas Pipeline
Gunnedah
Tamworth
Port Macquarie
Taree
Dubbo
Muswellbrook
Forster-Tuncurry
Map by: GN Z:\GIS\GIS_GeneralTasks\Environment\390-ELE-201808061159_LVIA\NS2B\390-ELE-201808061159_Fig13_NS2B_CA_v3.mxd Date: 11/11/2019 15:02
Legend
Localities
North Star to NSW/QLD border alignment
NSW/QLD border
Brisbane
Melbourne
A4 scale: 1:2,750,000
0 20 40 60 80 100km
Future Freight
Integrating Community, Environment and Engineering
Date: 31/10/2019 Version: 2
Coordinate System: GDA 1994 MGA Zone 56
North Star to NSW/QLD border
Figure 13:
Cumulative LVIA

APPENDIX

P

Landscape and Visual Impact Assessment Technical Report

Appendix B Viewpoints

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

APPENDIX B: VIEWPOINTS

The following viewpoints prepared by FFJV have been used to inform and illustrate this assessment:

Figure 22: Viewpoint 1: Corner of Capernum Street and David Street, North Star

Figure 23: Viewpoint 2: North Star Road looking north

Figure 24: Viewpoint 3: North Star Road looking north east

Figure 25: Viewpoint 4: Bruxner Way, looking north west

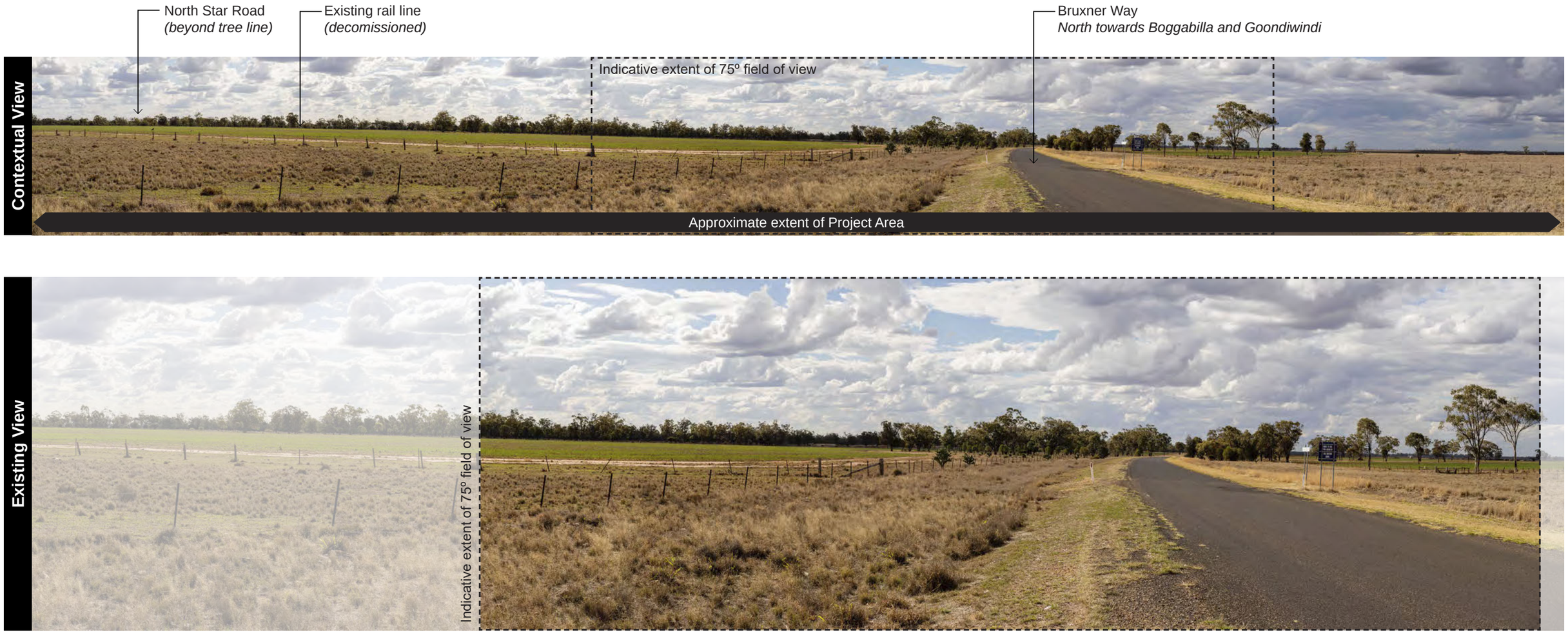


Figure 26: Viewpoint 5: Bruxner Way, looking north east

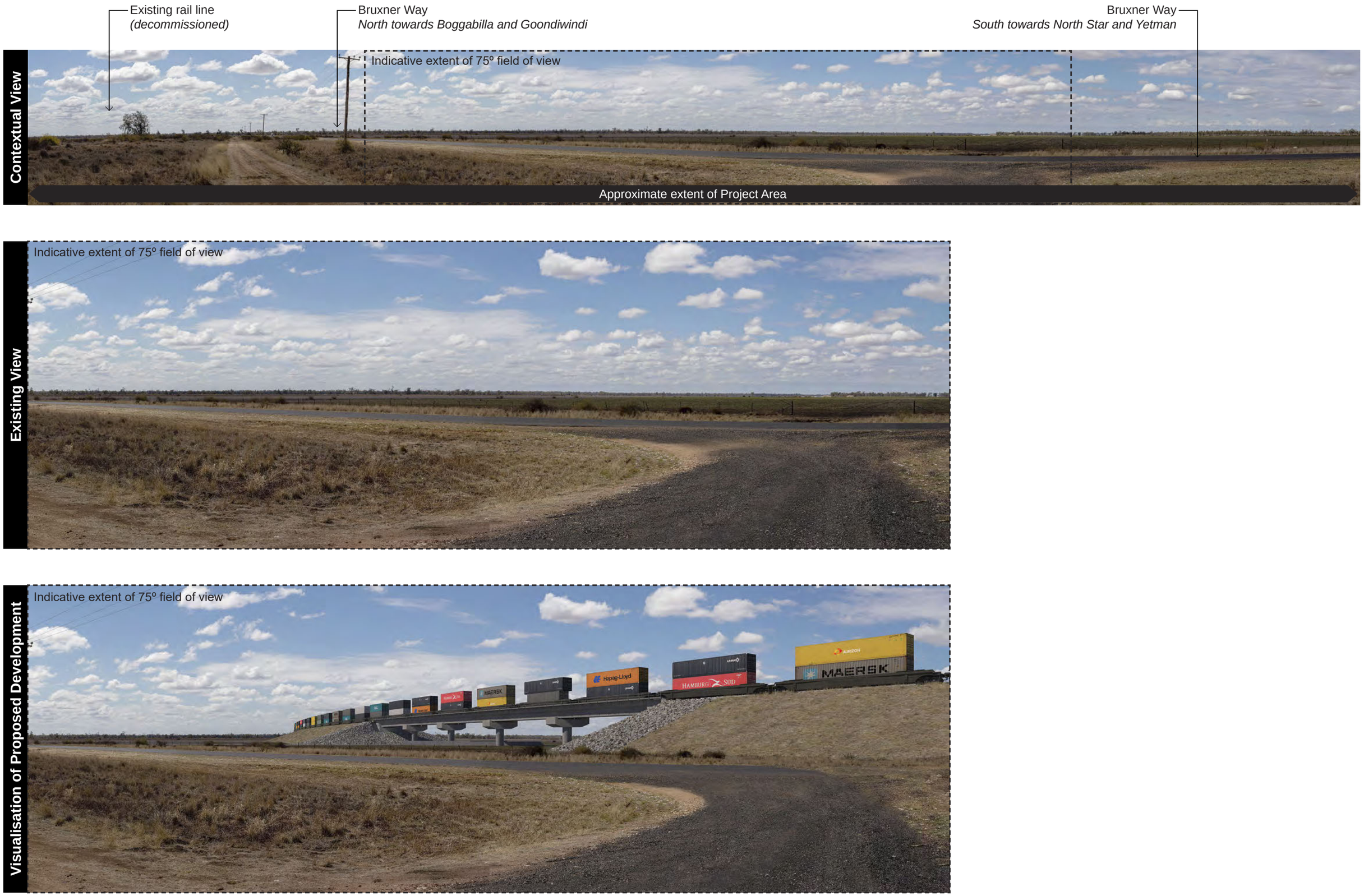


Figure 27: Viewpoint 6: Tucka Tucka Road, looking east (access road to Toomelah Community)