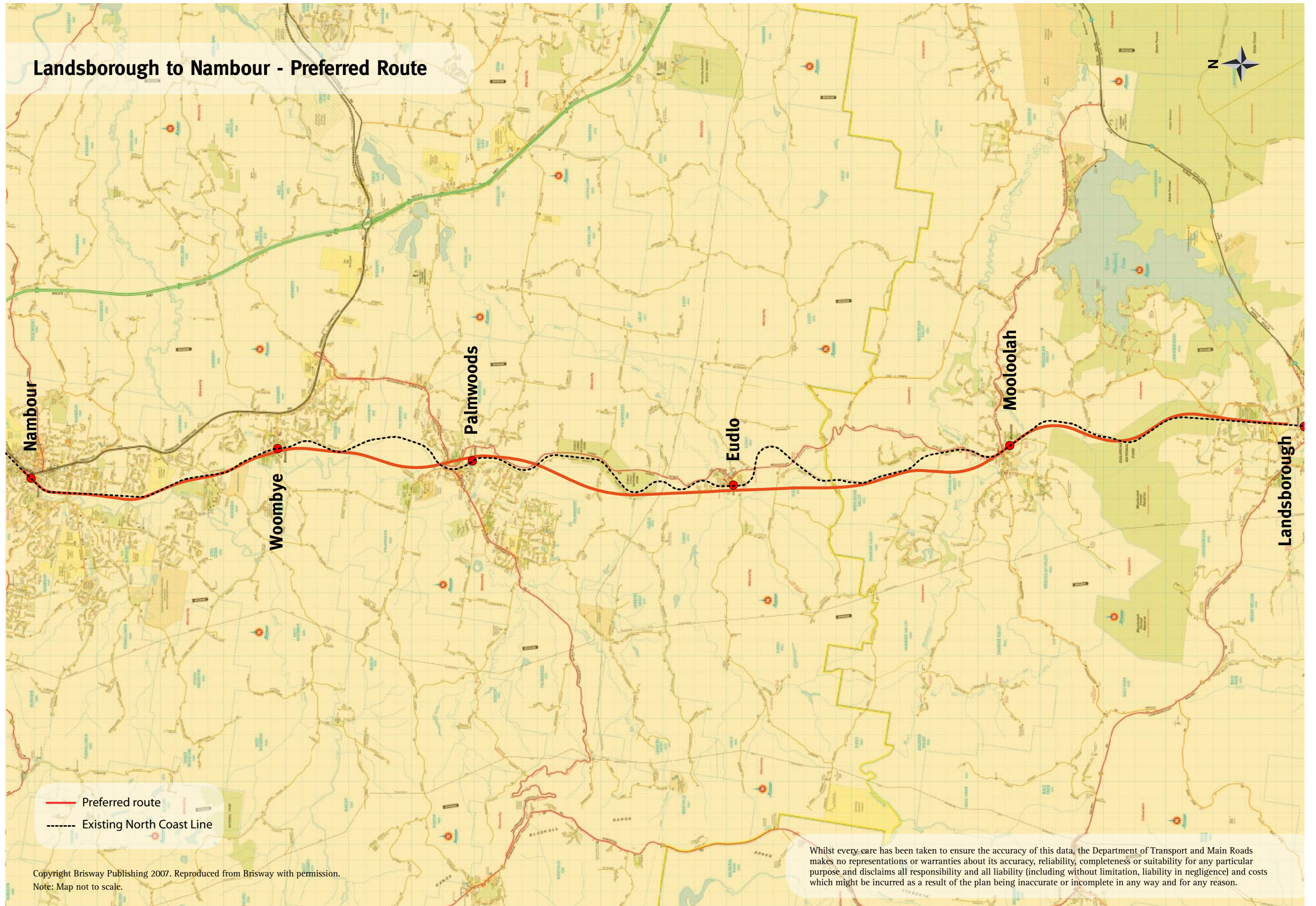


Environmental Impact Statement
Executive Summary
July 2009



Queensland
Government

Landsborough to Nambour - Preferred Route



— Preferred route
- - - Existing North Coast Line

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Note: Map not to scale.

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Contents

1. Introduction	1	12. Nature conservation: Terrestrial fauna	38
2. Project description	10	13. Aquatic biology	41
3. Land use and infrastructure	12	14. Water resources	44
4. Land: Topography	16	15. Noise and vibration	46
5. Land: Geology and soils	18	16. Air quality	49
6. Landscape character and visual amenity	20	17. Climate and natural disasters	52
7. Transport	23	18. Waste	54
8. Economic environment	28	19. Hazard and risk	56
9. Social environment	30	20. Cumulative impacts	59
10. Cultural heritage	32	21. Special management areas	61
11. Nature conservation: Terrestrial flora	35	22. Environmental management plans	76

Limitations of this document

The environmental impact statement has been prepared by Arup solely for the Department of Transport and Main Roads, in response to the Terms of Reference prepared by the Queensland Coordinator-General.

Whilst Arup and its consultants have taken care in the preparation of the environmental impact statement, it does not accept any liability or responsibility whatsoever in respect of:

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Data and technical investigations

The investigations documented in the environmental impact statement have been undertaken in accordance with the requirements of the Terms of Reference where appropriate. Information provided by the community through submissions, meetings and discussions with members of the study team at community information sessions has also been considered during the preparation of the environmental impact statement. Whilst anecdotal in most circumstances, this information has been reviewed and considered in the assessment of impacts and finalisation of the preliminary project design.

1. Introduction

The Department of Transport and Main Roads is proposing to upgrade approximately 22 km of the North Coast Line between Landsborough and Nambour by 2026 as identified in the *South East Queensland Infrastructure Plan and Program 2008-2026*.

As part of the planning process for this upgrade, the Department of Transport and Main Roads has prepared an environmental impact statement for the Landsborough to Nambour Rail Project (the project). The project will improve the efficiency, service frequency, operating speeds and reliability of rail services on this section of the north coast line. It will provide capacity to cater for the anticipated increased demand for rail services in the corridor, arising from projected population and freight transport growth.

The project involves construction of a double-track railway between Landsborough and Nambour in a corridor that provides for up to two additional tracks if required in the future (see map on the inside front cover). The identification of a new rail corridor that allows for up to four tracks provides long-term land use certainty and flexibility, should the railway require additional tracks in the future.

The project also includes:

- Construction of maintenance and emergency service access within the corridor.
- Reprovision of roads impacted by the project.
- Protection of grade separated road/rail crossing options at Gympie Street North in Landsborough and Mooloolah Connection Road/Brays Road in Mooloolah.
- Construction of new rail stations at Mooloolah, Eudlo, Palmwoods and Woombye.
- An upgrade of Nambour station, including the provision of disabled access to current standards.
- Provision of pedestrian access, public transport interchange, car parking and station access.
- Replacement of private property accesses affected by the railway corridor.
- The relocation of utilities impacted by the project
- Construction of new tunnels south of Mooloolah and south of Eudlo.
- Decommissioning of the existing railway corridor.

The upgraded railway is proposed to be operational by 2026, in accordance with the *South East Queensland Infrastructure Plan and Program 2008-2026*, subject to whole-of-government priorities and funding availability.

The environmental impact statement has been prepared in parallel with the preliminary design phase of the project, enabling environmental considerations to be included in the design (e.g. creek crossing methods) and design aspects to be considered in the assessment of impacts. The project's environmental impact statement addresses the following:

- Land requirements and environmental, economic and social impacts generated by the project, in a corridor that allows for up to four rail tracks, maintenance and access roads, earthworks and associated infrastructure.
- Environmental, social, economic and transport impacts generated by the construction and operation of the double track railway.
- Environmental, economic, social, and transport impacts generated by the decommissioning of the existing rail.

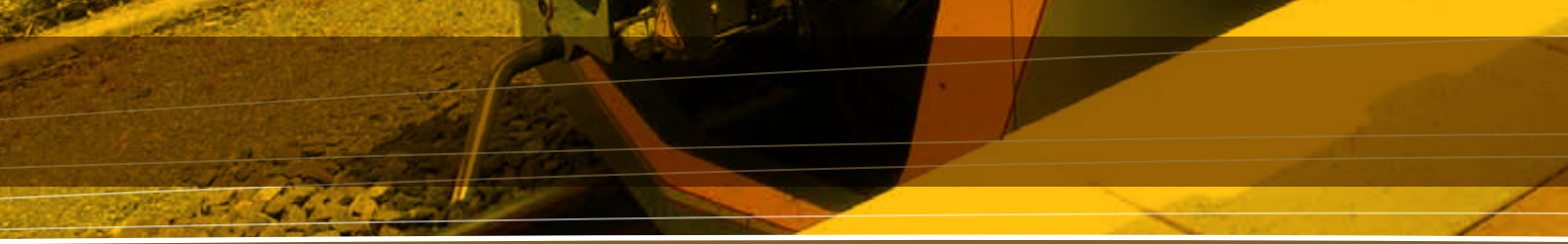
About this executive summary

This executive summary has been prepared as an overview of the key environmental, social and economic findings contained in the Landsborough to Nambour Rail Project's environmental impact statement. For a full description of the findings, it is important to view the complete environmental impact statement. Each section in this summary reflects the structure of chapters in the environmental impact statement.

Project proponent

The Department of Transport and Main Roads is the proponent for the project. The Department of Transport and Main Roads is the lead agency responsible for developing and managing the land, air and sea transport environments in Queensland. The project is one of the many rail improvement projects that the Department of Transport and Main Roads is involved with in south east Queensland, which include among others, the Caboolture to Landsborough Rail Upgrade, the Caboolture to Maroochydore Corridor Study and the Caloundra South Rail Corridor Realignment Study.

QR Limited is proposed to be the constructing authority and rail manager for the re-aligned and upgraded section of the North Coast Line between Landsborough and Nambour. QR Limited operates passenger rail services under contract to the TransLink Transit Authority and the Department of Transport and Main Roads, as well as commercial freight services.



The environmental impact statement

An environmental impact statement is a document prepared to report on the environmental, social and economic impacts of a project. It describes the existing conditions, provides information about the proposed project or works, and assesses the impacts and benefits of the changes resulting from the proposed project. The environmental impact statement also describes and assesses the management or mitigation measures that will be required to address the impacts of the proposed project.

The purpose of the environmental impact statement is to provide decision makers with an accurate and considered description of the potential impacts and benefits of the proposed project and to detail actions that need to be taken to ensure the impacts identified are avoided or minimised wherever possible.

Significant project

In July 2007 the Coordinator-General declared the project to be a 'significant project for which an environmental impact statement is required' pursuant to Section 26(1)(a) of the *State Development and Public Works Organisation Act 1971*.

In addition, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* requires activities affecting matters of National Environmental Significance to be referred to the Australian Government's Minister for the Environment, Heritage and the Arts. The project may affect matters of National Environmental Significance as a species of frog (the Giant Barred Frog – *Mixophyes iterates*) that is listed as Endangered under the Act has been found in the project area. The project was therefore referred to the Australian Government on 2 April 2008 for a decision on whether or not it constitutes a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999*. On 10 June 2008, the Australian Government advised that the project is not a 'controlled action' and therefore does not require Commonwealth assessment and approval.

The project has evolved since the time of the referral, and is expected to be refined further during the detailed design process. Following finalisation of the detailed design stage (once all additional flooding and geotechnical investigations have been completed), should there be significant changes to the current proposed design that may significantly affect matters of National Environmental Significance, it is proposed that the current referral be withdrawn and an amended referral be submitted for further assessment.

The *State Development and Public Works Organisation Act 1971* sets out the process for the preparation of an environmental impact statement for a 'significant project', with the Queensland Coordinator-General responsible for the oversight of the process and the evaluation of impacts.

This process includes:

- Preparation and public notification of draft Terms of Reference (July 2008).
- Preparation of the environmental impact statement by the proponent in response to the final Terms of Reference (issued to the Department of Transport and Main Roads by the Coordinator-General in October 2008).
- Public notification period for the environmental impact statement (July - August 2009).
- Review of public submissions by the Coordinator-General.
- Coordinator-General evaluation of the environmental impact statement and public submissions.
- Preparation and submission (if required) of a supplementary report by the Department of Transport and Main Roads that responds to the Coordinator-General's request for further information (late 2009).
- Evaluation by the Coordinator-General of information and preparation of the Coordinator-General's report regarding the environmental impact statement (late 2009), recommending whether the project should proceed and whether the project should be subject to conditions.

There are two formal mechanisms for stakeholder input in this process:

- during the public comment period for the draft Terms of Reference
- during the public comment period for the environmental impact statement.

If the project is recommended for approval by the Coordinator-General, the project will be subject to a series of other statutory approvals before construction can commence.

A number of major approval pathways for the future development of the Landsborough to Nambour Rail Project have been evaluated to determine the most appropriate approval process. It is recommended that the Department of Transport and Main Roads proceed with the option of seeking the inclusion of an exemption from development approval in the new planning scheme being prepared for the Sunshine Coast Regional Council area through the 'State interest review' step of the plan making process specified in Schedule 1 of the *Integrated Planning Act 1997*.

The Department of Transport and Main Roads (or its agent/s) will be responsible for securing all subsidiary approvals required to facilitate the development activities. Therefore, information collected and analysed as part of this environmental impact statement will need to be maintained and any key changes identified when they arise and, where appropriate, updated. Depending on the timing and method of delivery chosen for the construction of the project, further investigations may be required into specific matters necessary to obtain these approvals.

Approach

The chapters of the environmental impact statement detail the existing (or baseline) conditions in the project area with reference to a wide range of information including:

- historical and contemporary records
- data from recent field surveys and sampling in the project area
- maps and aerial photography
- data obtained from statutory bodies such as local council and government departments.

The approach to assessing impacts in the environmental impact statement has involved a description of the impacts using significance criteria followed by a description of existing or proposed mitigation measures. Criteria specific to each chapter have then been used to assess the significance of the residual impact.

In order of preference, identified impacts have been:

- 1) avoided if possible through appropriate location of the project
- 2) 'designed-out' where practicable, thereby minimising significant impacts to environmental values
- 3) mitigated through the implementation of environmental management plans to monitor and minimise impacts.

Significance criteria

The environmental impact statement has been prepared to address the requirements set by the Coordinator-General in the Terms of Reference. Each chapter includes:

- a description of the baseline environmental conditions
- an identification of the impacts of the project
- an assessment of the significance of the identified impacts
- recommended mitigation measures.

The identified impacts are assessed as either beneficial or adverse. The significance of impacts is assessed in light of significance criteria specific to each chapter. Generally, the impact significance depends on the sensitivity of the receptor and the magnitude of the change. The impacts are assessed on the following scale: negligible, low, moderate and high.

The adjacent table outlines the broad significance criteria used to assess the impacts for the project's environmental impact statement. This set of criteria has been modified as required within each chapter for assessment purposes.

Significance criteria used to assess project impacts

Significance	Criteria
High Adverse	Impact is a major problem. These impacts are likely to be important considerations at the national or State level. If adverse, they are potential concerns to the project, depending upon the relative importance attached to the issue during the decision making process. Mitigation measures and detailed design work are unlikely to remove all of the impacts upon the affected communities or interests. Residual impacts will predominate.
Moderate Adverse	Impact is moderate. While important at a State, regional or local scale, these are not likely to be key decision making issues. They represent issues where impacts will be experienced but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual impacts will still arise. Nevertheless, the cumulative impacts of such issues may lead to an increase in the overall impacts upon a particular area or on a particular resource and hence may become key decision making issues.
Low Adverse	Impact recognisable but acceptable. Only local impacts will be included in this category and are unlikely to be of importance in the decision making process. Nevertheless, they are of relevance in enhancing the subsequent design of the project and in the consideration of mitigation or compensation measures.
Negligible	Minimal change. No impacts and impacts which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
Beneficial	Impact beneficial to the environment. The beneficial impacts can also be Low, Moderate or High.

Terminology

The following terms will be referred to throughout the environmental impact statement:

- The project area is the original study area that was defined at the start of the project, consisting of a 3 km (east-west) by 22 km (south-north) area, within which constraints were identified, and a refined study focus area was determined.
- The study focus area was the refined area, within which a number of possible route options were identified, based on constraints information.
- The preferred route was identified in the Route Identification Report, and forms the basis of the project. Some refinement has been made to the preferred route since its original release in April 2008, particularly through Mooloolah and in the vicinity of the Mooloolah River and Paynter Creek.

- The project refers to the proposed railway corridor and the construction of the double track railway, as well as areas identified as required for stations, car parks, road realignments or the replacement of accesses.
- The proposed railway refers to the areas required for the track, ballast, service roads, structures, embankments and cuttings associated with both the two-track (the project) or the four-track arrangements.
- The study area was defined for the purpose of the social and economic assessments and consists of the relevant Collector District areas.

Who prepared the environmental impact statement?

The Department of Transport and Main Roads, as the project proponent, engaged the services of suitably qualified experts to carry out the extensive investigations required for the environmental impact statement.

The Department of Transport and Main Roads can be contacted via the project team:

Phone: 1800 221 991

Post: Reply Paid 4628, Sunshine Coast Mail Centre, QLD 4560

Fax: (07) 3367 1609

Web: www.landsborough-nambour.com.au

Email: info@landsborough-nambour.com.au

Public comment period

The environmental impact statement will be on public display for a minimum of six weeks, during which time the Coordinator-General will invite written comments and submissions from any interested person or party.

Submissions need to include the name, address and signature of the party(ies) making the submission and their reasons for making the submission.

The environmental impact statement can be viewed during the environmental impact statement submission period:

- online at www.landsborough-nambour.com.au
- on CD – available free of charge by request (phone 1800 221 991 or email info@landsborough-nambour.com.au)
- in hard copy at the following locations:
 - State Library of Queensland - Cultural Centre, Stanley Place, South Bank, Brisbane
 - the Office of the Member for Caloundra - Shop 1, Pia Place, 118 Bulcock Street, Caloundra
 - the Office of the Member for Glasshouse - Suite 14, Kingsgate Centre, 42 King Street, Caboolture
 - the Office of the Member for Nicklin - Shop 3, 51 Currie Street, Nambour

- Morris House Neighbourhood Centre - 478 Old Landsborough Road, Landsborough
- Mooloolah Valley Community Centre - 43 Bray Road, Mooloolah Valley
- Eudlo General Store - 7/9 Rosebed Street, Eudlo
- Palmwoods Post Office - 5 Margaret Street, Palmwoods
- Woombye Post Office - Unit 1, 12 Blackall Street, Woombye
- Nambour Community Centre - 2 Shearer Street, Nambour
- Sunshine Coast Regional Council Administration Centre (Nambour) - Cnr Currie and Bury Streets, Nambour
- Sunshine Coast Regional Council Administration Centre (Caloundra) - 1 Omrah Avenue, Caloundra.
- Sunshine Coast Regional Council Mobile Library – South
- Sunshine Coast Regional Council Mobile Library – Central
- Department of Transport and Main Roads Customer Service Centre - Cnr Stanley Street and Coronation Avenue, Nambour.

Printed copies of the environmental impact statement can also be purchased for \$300.00 (including GST, postage and handling) by calling the project information line on 1800 221 991 or emailing info@landsborough-nambour.com.au.

Written submissions

Submissions should be sent via:

Post: Coordinator-General
C/- EIS Project Manager:
Landsborough to Nambour Rail Project
Significant Projects Coordination
Department of Infrastructure and Planning
PO Box 15009 City East Qld 4002
Fax: (07) 3225 8282
Email: LNrail@dip.qld.gov.au

Submissions must arrive by 5pm (AEST) Monday 24 August 2009.

Properly made submissions

The Coordinator-General will consider properly made submissions. For an environmental impact statement, a properly made submission is one that:

- is made to the Coordinator-General in writing
- is received on or before the last day of the submission period
- is signed by each person who made the submission
- states the name and address of each person who made the submission
- states the grounds of the submission and the facts and circumstances relied on in support of the grounds.

Properly made submissions will be considered by the Coordinator-General alongside the environmental impact statement and other material relevant to the project.

Who approves the environmental impact statement?

The Coordinator-General will assess the environmental impact statement and the project and recommend whether the project should proceed. If the action is approved, the approval will be valid for a period of four years unless determined otherwise.

Project delivery

The Landsborough to Nambour Rail Corridor Study (the study) is an early component of the project. The study encompasses the work carried out to identify the preferred route for the project, undertake the preliminary design, and prepare the environmental impact statement.

The adjacent diagram shows the expected project timeline.

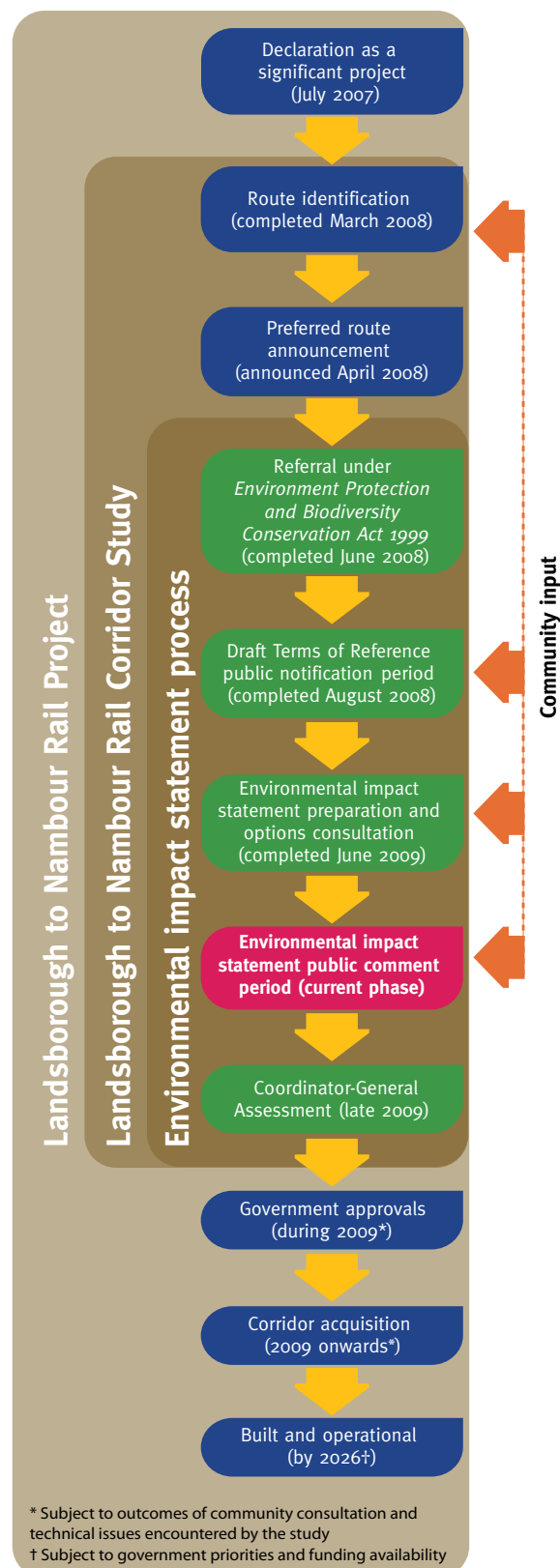
The following activities have been undertaken during the study:

- Identification of the preferred route for the proposed rail corridor - the Route Identification Report (March 2008) documents the process and reasons for the identification of the preferred route.
- Preliminary design - an appropriate level of engineering design has been carried out to allow for assessment of the impacts, determination of mitigation strategies, and to provide sufficient information for the process of acquisition of land for the project to begin.
- Preparation of an environmental impact statement for the project in accordance with the provisions of the *State Development and Public Works Organisation Act 1971*.

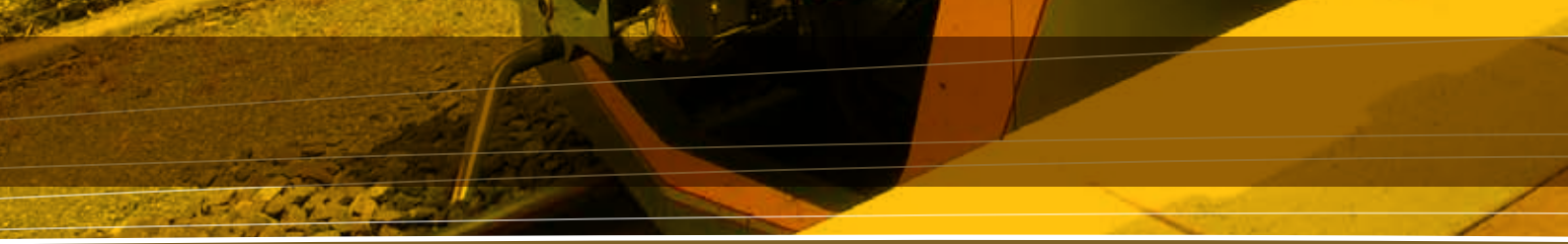
Consultation with stakeholders including all levels of government, the local community and other interested parties has provided important information of value to all three activities listed above.

The next phase of the project involves evaluation and approvals. Upon completion of this phase, the formal process of land acquisition for the project can proceed. Detailed design, construction and commissioning of the double-track railway will follow, though the exact timeframes for this are not yet determined. The diagram beside shows the staging and timeframes for the project, which are subject to:

- future infrastructure delivery priorities and funding decisions of the Queensland Government
- outcomes of community consultation and technical issues identified during the study.



Project timeline



Background and need for the project

The north coast line runs between Brisbane and Cairns and serves the needs of commuting trips, longer distance recreational and tourist trips, and industry. The North Coast Line is unique in Queensland because of the mix of traffic it carries and the wide variation in operating characteristics of the rolling stock involved.

The current rail alignment between Landsborough and Nambour is winding and undulating. This significantly impacts upon achievable operating speeds for this section of the track, with some services limited to speeds of 50 km/hr in some sections. This section of the north coast line is single track, with passing loops at stations. Mooloolah, Eudlo, Palmwoods and Woombye all have a single platform. The current configuration of passing loops and single platforms at stations results in delay to the running time of some passenger services, due to the need to wait in passing loops for express services or services passing in the opposite direction, and then turn back to access platforms. There are numerous at grade crossing points, including open level crossings, an occupational crossing and pedestrian crossings along the existing corridor, which can cause delays and safety and road traffic concerns.

Population growth in the Sunshine Coast region is expected to increase the demand for passenger and tourism rail travel. Increases in demand for rail freight are also likely as a result of growth in container movements through the Port of Brisbane. These factors will challenge the capacity of the existing Sunshine Coast rail infrastructure to support an acceptable level of rail service in the future.

The ability to provide additional services on the North Coast Line south of Nambour is currently limited by long sections of winding single track, restricted speed operations and congestion due to competing passenger and freight demands. Furthermore, continuing urban growth and development is likely to compromise future corridor opportunities for rail infrastructure.

Policy framework

Several policies and plans relating to transport provision have been identified as relevant to the project.

National Strategy For Ecologically Sustainable Development (1992)

This sets out the broad strategic and policy framework under which it is intended that governments will cooperatively make decisions and take actions to pursue Ecologically Sustainable Development in Australia. Since its introduction, it has gradually been integrated into local, State and national policy.

South East Queensland Regional Plan

South east Queensland is recognised as one of Australia's fastest growing regions. The *South East Queensland Regional Plan*

2005–2026 provides a framework for managing rapid growth, associated change, land use and development through a series of strategic directions and regional policies over the next 20 years. The development of an integrated transport system throughout south east Queensland is identified as a 'desired regional outcome' in the plan, with rail playing a key role in achieving this outcome.

The Draft South East Queensland Regional Plan 2009–2031, which refines and modifies the strategic directions, principles and policies of the South East Queensland Regional Plan 2005 to respond to the emerging issues, is expected to be finalised in July 2009. The draft plan includes the Caboolture to Nambour rail improvement projects in the network plan 2009–31 and the North Coast line is mapped as a priority freight route.

South East Queensland Infrastructure Plan and Program (2008–2026)

The *South East Queensland Infrastructure Plan and Program (2008–2026)* sets out a framework for the provision of infrastructure over the next 20 years in south east Queensland. It establishes timeframes and funding patterns, with a focus on the provision of regional level infrastructure. The *South East Queensland Infrastructure Plan and Program* also details the mechanisms by which the objectives of the South East Queensland Regional Plan will be met over the next 20 years. Increasing the capacity of the North Coast Line is identified as an infrastructure priority for the region.

Integrated Regional Transport Plan For South East Queensland (1997)

The *Integrated Regional Transport Plan for South East Queensland* sets out a 25 year vision for the transport system and is 'a blue print for the transport system which meets the region's looming transport challenges'.

TransLink Network Plan for South East Queensland (2007)

The *TransLink Network Plan for South East Queensland* guides how public transport will be improved across south east Queensland. It identifies public transport service and infrastructure improvements over the next 10 years (the 10 year program) and details a four year action plan for specific infrastructure investments. Strategic priorities of the plan include improving speed, frequency and reliability of public transport, and delivering public transport infrastructure that will attract and cater for growth in the south east Queensland region.

Rail Network Strategy for Queensland

The aim of the *Rail Network Strategy for Queensland* is to identify specific strategies relating to policy and planning for the future of Queensland's rail infrastructure and rail corridors. The strategy is concerned with the land and fixed rail infrastructure forming the rail network.

Other projects in the region

There are numerous infrastructure projects (including rail and other services) in varying stages of delivery across south east Queensland. The following projects are underway across the Sunshine Coast, and have been deemed relevant due to their proximity to the project area, or because they would contribute benefits to the regional public transport network. The map on the following page shows the location of a number of these projects.

Public Transport Projects in the Sunshine Coast Region

The South East Queensland Regional Plan 2005-2026, South East Queensland Infrastructure Plan and Program 2008-2026, and TransLink Network Plan 2007 all identify the strategic objective of improving public transport services across the wider Sunshine Coast Region. Projects and longer term initiatives, listed in the table below, include the improvement of rail and bus service routes and frequencies, and investigation of future corridors for public transport provision.

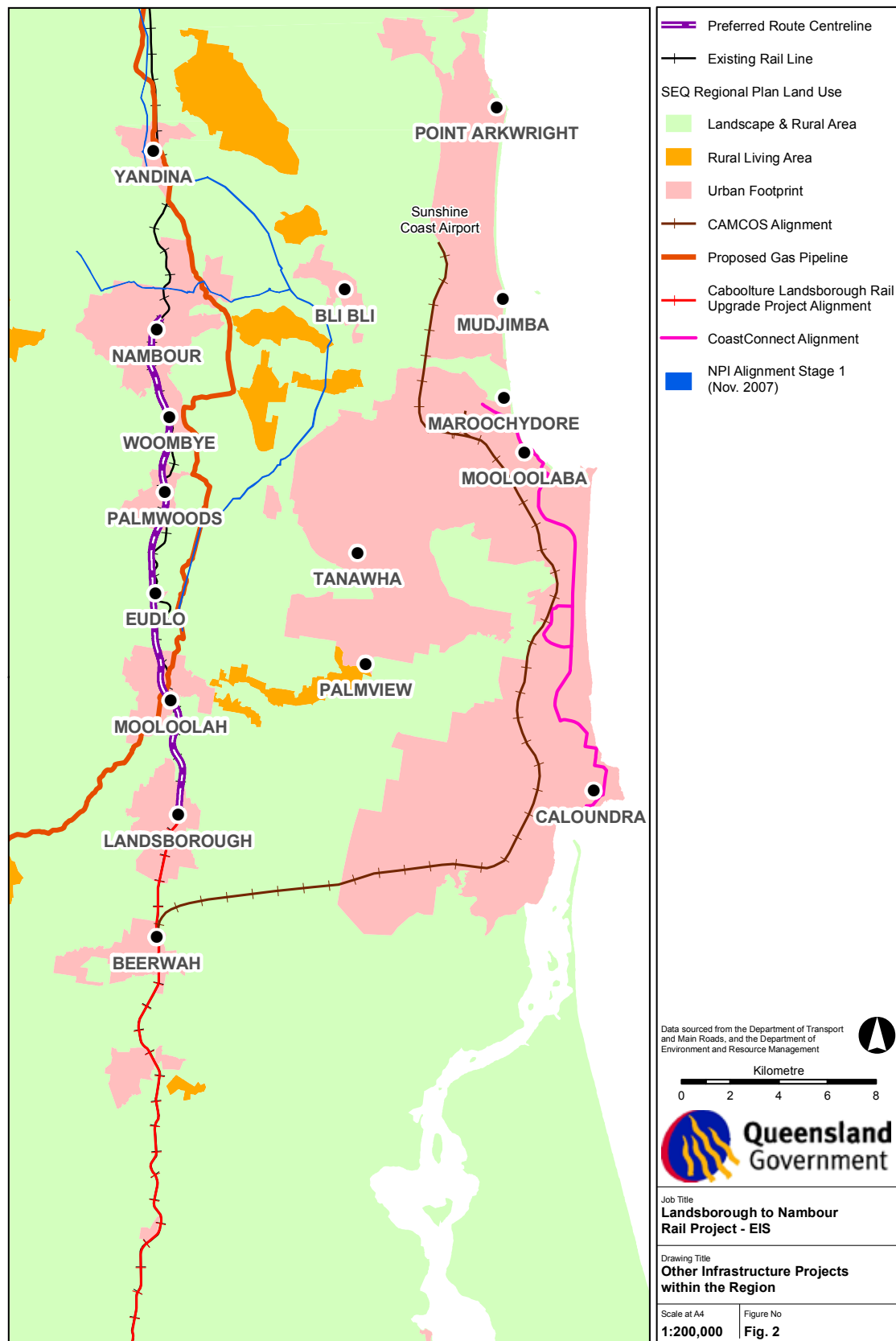
Other transport initiatives for the Sunshine Coast	
Project/Study	Discussion
Caboolture to Landsborough Rail Upgrade	This project lies directly to the south of the project area. Stage one of the project includes: - realignment and duplication of 14 km of rail line between Caboolture and Beerburum - upgrades to the Elimbah and Beerburum rail stations. Construction of stage one is expected to be completed in 2009 Stage two of the project includes: - realignment and duplication of 17 km of existing railway line between Beerburum and Landsborough - upgrades to the Glasshouse Mountains and Beerwah rail stations Construction of this section needs to be completed prior to the commencement of construction of the Landsborough to Nambour Rail Project.
Caboolture to Maroochydore Corridor Study	The Caboolture to Maroochydore Corridor Study identified a corridor for the implementation of a passenger rail service branching off the North Coast Rail Line at Beerwah and extending through to Caloundra and Maroochydore. This study was completed in 2001. Two realignments to the corridor are currently being investigated at Caloundra South and Maroochydore.
CoastConnect	CoastConnect: Caloundra to Maroochydore Quality Bus Corridor, is a road-based solution to give buses priority on main roads between Caloundra and Maroochydore.

Other projects

During the study, several other infrastructure projects were identified in the project area as listed in the following table.

Other infrastructure projects in the project area	
Project/Study	Discussion
Proposed Gatton to Gympie gas pipeline	A corridor has been identified for a future gas pipeline between Gatton and Gympie. The corridor runs from the south-west to north-east into Mooloolah, crossing the project area to continue on the eastern side of Eudlo, Palmwoods, Woombye and Nambour. Timing for the design and construction of this pipeline could not be confirmed at the time of writing.
Northern Pipeline Interconnector	The Northern Pipeline Interconnector - Stage 1, is a 47 km, mostly underground pipeline running from Landers Shute to Morayfield. The easement for stage one of the Northern Pipeline Interconnector project lies to the east of the proposed rail corridor.
SunCoast-Palmwoods to West Maroochydore-Pacific Paradise corridor	The SunCoast project involves the duplication of the 132 kV transmission lines primarily in the existing easement from the existing Powerlink Palmwoods substation to the existing Energex West Maroochydore substation. The existing easement traverses the project, passing over both the existing rail and the proposed rail corridor approximately 1 km to the north of the town of Eudlo.

Other projects in the project area



Project alternatives and options

Project alternatives

A number of alternatives to the project were explored during the study. These include:

- do nothing, which would result in:
 - The continuation of slow speeds.
 - Contradiction of the TransLink Network Plan's strategic priority of delivering fast, frequent and reliable services.
 - Deterioration of the service provided to rail users.
 - Higher maintenance and operational costs compared with a consistent speed alignment.
 - Limited public transport options, affecting mobility for people who do not have private transport.

The do-nothing option is not compatible with the Government's objectives stated in the *South East Queensland Regional Plan*, the *South East Queensland Infrastructure Plan and Program*, the *TransLink Network Plan* and the *Rail Network Strategy*. It would result in the degradation of the service to rail users and increased costs to run the service. It would indirectly encourage the use of the car. The do-nothing option is not considered desirable.

- upgrade of the existing corridor, which would result in:
 - Achievable speeds still being below 60 km/hr in places due to the horizontal and vertical alignment of the corridor.
 - Services no longer having to wait in passing loops for other services to pass.
 - Resumption of land along the existing rail corridor to accommodate two tracks, access and maintenance roads, platform and station works, and to preserve the potential for future tracks if required in the long-term.
 - Realignment or replacement of roads, including bridges with limited scope for identifying optimal road crossing points.
 - Potential to improve achievable speeds in some locations with curve easings, with similar land requirements to those required for an offline upgrade.
 - Cost and operational implications (i.e. service disruptions, more night works, closures) for the construction of long sections of track adjacent and parallel to existing track

- Limitations around tunnels as the existing tunnel only has sufficient width for a single track and the safe working distance for construction of a second tunnel is five tunnel widths from the existing tunnel.
- Higher maintenance and operational costs due to the winding, undulating horizontal and vertical alignment.

Upgrading the existing corridor with or without curve easing would go some way towards achieving the Government's objectives. These would increase capacity and provide some travel time benefits through the removal of delays at passing loops, but would still have significant property impacts, slower travel times and generate additional maintenance and operational costs compared to the proposed new corridor. Generally, the upgrading of the existing corridor (with or without curve easings) is considered not to be an optimal outcome, as these options do not deliver the best return for the significant investment required and would still have significant property and environmental impacts.

Route options

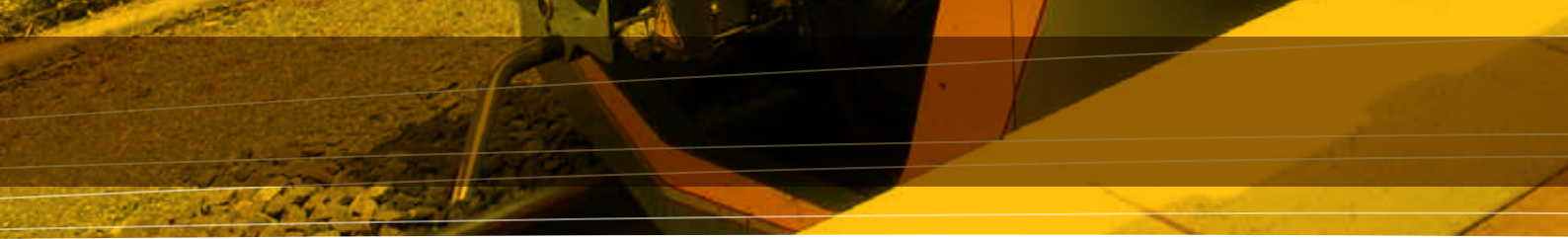
The Route Identification Report (March 2008) identified the preferred route for the proposed rail corridor after reviewing a range of identified feasible alternatives for the location of the corridor.

Route options were developed and evaluated against technical design objectives, transport objectives, environmental, economic and land use constraints. Information provided by the community during the early stages of the project was also considered in the development and assessment of route options.

A study focus area was defined, and divided into five sections, to assist in the route evaluation process. These were:

- Landsborough: Section A
- Mooloolah: Section B
- Eudlo: Section C
- Palmwoods to Woombye: Section D
- Nambour: Section E

The sections were defined at points where it was considered possible to interchange between route options, and therefore allow the study team to assess each individual route segment and identify a preferred route for each section.



Section A - The preferred route for section A was selected as it was considered to have a lesser impact on Dularcha National Park than other routes considered.

Section B - The preferred route for section B was selected as it maintains the Mooloolah station close to the existing station location and town centre, and was considered to present comparatively lesser environmental impacts than routes to the east. A refinement of the Mooloolah River crossing and of the section in the Mooloolah town centre has subsequently occurred to improve environmental outcomes and to address community feedback.

Section C - The preferred route for section C avoids traversing large areas of flood-prone land. It also avoids impacting on areas identified as important for federally listed species within the eastern portion of Eudlo Creek National Park. The segment in Eudlo town centre has subsequently been refined to locate the station on a straight segment of the proposed rail corridor.

Section D - The preferred route for section D had fewer property impacts and provided a better alignment standard than other options considered. The route was then further refined to reduce the impacts on Paynter Creek.

Section E - The preferred route for section E was considered to have lesser property and environmental impacts than the other options.

The best performing route sections from sections A through E were then combined to provide a continuous route from Landsborough to Nambour. Some refinement and adjustment was necessary at points where different route sections were joined to make up the preferred route for the proposed rail corridor. Further information about the route identification process can be found in the Route Identification Report (March 2008).

2. Project description

The project involves the upgrade of 22 km of the North Coast Rail Line between Landsborough and Nambour, in the Sunshine Coast hinterland. The project begins directly north of Landsborough station, passing through the towns of Mooloolah (Mooloolah Valley), Eudlo, Palmwoods, Woombye, and ending at Nambour station.

The project involves the construction of a double-track railway to a minimum 80 km/hr, desirable 160 km/hr design standard, together with access roads for maintenance and emergency services. The project also involves station upgrades, such as the provision of disabled access to current standards, pedestrian access, public transport interchange, car parking and access, as well as road network alterations and the replacement of private access to properties affected by the project.

While the project only involves construction of a double-track railway, the identified corridor allows for the provision of up to two additional tracks if required in the future. This provides long-term land use certainty and the flexibility to cater for very long-term demand without further disruption to local communities.

Project construction is currently assumed to be staged over approximately six years between 2020 and 2026. Major work programs are expected to include site preparation, worksites and storage, earthworks and tunnel construction, construction of bridges and structures, tracklaying, transport logistics, storage and handling, progressive revegetation and landscaping, construction of new stations and road realignment and temporary sidetracking.

Capacity projections undertaken for the project show that the proposed double-track railway has the potential to double freight capacity and quadruple passenger capacity.

Landsborough to Mooloolah

The following describes the project's characteristics between Landsborough and Mooloolah. The project:

- Starts to the north of Landsborough Station.
- Includes a grade separated (road over rail) crossing of Gympie Street North.
- Requires the realignment of the local road network and private property access affected by the grade separation.
- Crosses Addlington Creek on a structure that allows for fauna to move under the structure.
- Is located on the eastern side of the existing rail corridor through Dularcha National Park for a distance of 700 m before closely following the existing railway for a further 600 m through the national park.
- Crosses to the western side of the existing railway before reaching Rose Road.
- Passes under Rose Road in a new tunnel that is initially a cut and cover tunnel (for 170 m) before entering a 250 m bored, twin tunnel approximately 20 m to the west of the existing rail tunnel.
- Approaches Mooloolah on the western side of the existing railway.
- Crosses a southern tributary of the Mooloolah River on a bridge that is 40 m long.

Mooloolah to Eudlo

The following describes the project's characteristics between Mooloolah and Eudlo. The project:

- Aligns with the existing rail corridor south of the southern branch of the Mooloolah River.
- Crosses the southern branch of the Mooloolah River on a bridge structure that is 50 m long.
- Allows for a three track layout through Mooloolah which involves the construction of a new track on the western side of the existing tracks and identifies land for a fourth track, if required in the future.
- Allows for reconfiguration of Mooloolah station.
- Preserves an option to the south of the existing open level crossing for the future implementation of a grade separated (road over rail) crossing of the railway in Mooloolah.
- Follows the existing railway to the north of Mooloolah Station.
- Allows for the realignment of Neill Road to provide 5.5 m clearance and immunity to at least the 20 year ARI (average recurrence interval) flood event.
- Passes over the realigned section of Neill Road just north of the Mooloolah township and the Mooloolah River to the west of the existing railway on a bridge structure that is 290 m long.
- Passes under a northern section of Neill Road in a cutting approximately 9 m below the existing surface level, with Neill road being reinstated on a bridge structure above the new railway.
- Runs to the west of the existing railway, through another cutting approximately 11 m below surface level, on approach to The Pinch Lane.
- Passes under The Pinch Lane in a new tunnel located approximately 70 m to the west of the existing tunnel; includes initially a cut and cover tunnel (for 140 m) and a 310 m bored, twin tunnel and then exits through a cut and cover tunnel section that is approximately 50 m long.

Eudlo to Palmwoods

The following describes the project's characteristics between Eudlo and Palmwoods. The project:

- Continues on the western side of the existing railway to the north of the tunnel through cut and embankment sections.
- Crosses over Logwoods Road and Highlands Road on bridge structures that provide 5 m and 5.5 m clearances respectively.
- Comprises a new Eudlo station to be located north of Highlands Road to the west of the existing station.

- Passes over Eudlo Creek on a bridge structure to the north of Eudlo station.
- Continues on a short section of embankment before reaching a cut and cover tunnel section approximately 230 m long.
- Allows for the reinstatement of Eudlo School Road over the cut and cover tunnel.
- Passes under the existing Palmwoods West to Maroochydore Energex 132 kV transmission line (proposed to be duplicated in the Suncoast power project) in the cut and cover tunnel section.
- Crosses the Culgoa Road reserve and continues north on an embankment.
- Requires a new property access road to be constructed under the railway to provide access to properties on the western side of the new railway and to reconnect Culgoa Road reserve to Paskins Road.
- Requires realignment of the southernmost section of Paskins Road.
- Requires realignment of Leeons Road (over the new railway) and extension of Toby Court through to Paskins Road.
- Crosses a realigned (to the east) Eudlo Road twice before aligning with the existing railway.

Palmwoods to Woombye

The following describes the project's characteristics between Palmwoods and Woombye. The project:

- Follows the existing railway for 300 m before shifting to the east
- Comprises a new Palmwoods station to be located north of the existing station
- Continues north on a 880 m long structure passing over Chevallum Road (at a height of approximately 6 m), Palmwoods Bowls Club car park (at a height of approximately 8.9 m), the Kolora Park 'duck ponds' (at a height of approximately 12 m), Woombye-Palmwoods Road (at a height of approximately 11 m), the existing railway (at a height of approximately 13 m), and a realigned section of Spackman Lane
- Requires the realignment and regrading of Chevallum Road within the existing road reserve to provide a 6 m clearance under the new railway
- Requires the realignment of the Nicklin Road and Chevallum Road intersection within the road reserve
- Requires the realignment of the northern end of Spackman Lane to pass under the new railway at a clearance of at least 5.5 m above the road

- Continues on a 280 m long structure in the area adjacent to Paynter Creek.
- Approaches Woombye station on an embankment on the western side of the existing railway.

Woombye to Nambour

The following describes the project's characteristics between Woombye and Nambour. The project:

- Passes to the west of the existing railway.
- Requires the realignment of Back Woombye Road over the new railway.
- Comprises a new Woombye Station to be constructed to the north of the Back Woombye Road overpass.
- Crosses Paynter Creek on a structure approximately 20-30 m west of the existing rail bridge over this creek. Runs adjacent to the western side of the existing railway or within the existing rail reserve for approximately 2.5 km.
- Uses retaining walls on the western side of Petrie Creek to minimise encroachment into the creek.
- Requires the construction of a new road overpass at Arundell Avenue.
- Allows for station upgrades at Nambour Station
- Drops back to a single track corridor to the north of Nambour Station.

3. Land use and infrastructure

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 3 – Land use and infrastructure.

Existing conditions

The proposed upgrade of the railway line between Landsborough and Nambour will occur within the western part of the Sunshine Coast region. It traverses six townships (Landsborough, Mooloolah, Eudlo, Palmwoods, Woombye and Nambour) which have strong identities based on their history as railway towns. The project area consists of a mix of residential, rural residential, rural, commercial, open space and recreation, community, and industrial areas. Its tenure is predominantly freehold land with reserves, national parks, State forest, and State land.

Both State and local governments have planned for the future development of the project area through the South East Queensland Regional Plan, the draft Caloundra Local Growth Management Strategy and the draft Maroochy Local Growth Management Strategy.

The South East Queensland Regional Plan identifies all towns, with the exception of Eudlo, as being within the urban footprint. This signals the intent for future growth to occur in these areas, subject to physical and environmental constraints. The South East Queensland Regional Plan also identifies Nambour as a Major Activity Centre. The increase in future development in the town centres will be able to benefit from the rail services and commercial activities.

The existing (or baseline) conditions in the project area are as follows:

Tenure

- predominantly freehold land in private tenure
- several parcels of State owned land
- lands leased including the existing railway and the Woombye Lawn Bowls Club
- three protected areas – Dularcha National Park, Marie Higgs Conservation Park and Eudlo Creek National Park
- large forest reserve, to the west of Dularcha National Park, and other smaller reserves (generally close to water courses)
- road reserves and easements.

Land use and zoning

Land use within the project area is characterised by residential developments clustered around the economic and community service centres within each of the towns. The density of residential areas disperses on the town fringes into a rural landscape, which comprises mostly small rural holdings. The South East Queensland Regional Plan seeks to reinforce this pattern of development to protect the rural landscape from urban encroachment.

Future planned land use

The township areas and some adjacent rural residential and rural lands are included in the urban footprint for all townships along the proposed rail corridor, excluding Eudlo. The areas between and around the townships are included in the Regional Landscape and Rural Production Area. These areas are generally to be retained for rural activities and urban development in these areas is unlikely to be approved.

The South East Queensland Regional Plan seeks to accommodate growth by increasing densities in urban centres rather than a continuing pattern of suburban sprawl. In the life of the current regional plan, urban development in the Sunshine Coast region is focused in the coastal areas with a comparatively small area of developable land identified around the townships in the project area. Whilst these could be expanded as the South East Queensland Regional Plan is periodically reviewed, it is anticipated that the strategic intent of constraining urban sprawl and maintaining green spaces will be upheld.

Native title

The project area is within an area over which no registered or unregistered native title claims currently exist. However, in the past, two previously registered claims (by the Jinibara People and the Gubbi Gubbi No.2) were over the area. The Jinibara People have a registered native claim for lands situated to the west of the current railway alignment. Those people who were applicants on the previous Jinibara People and the Gubbi Gubbi No. 2 claims are the current Aboriginal Parties for the lands to the west and east of the project.

Properties required for the project could potentially be the subject of Native Title Claims in the future. These include unallocated state land, water ways that are not part of a private property, national park land and State forest land.

Land of environmental value or concern

The proposed rail corridor was selected to avoid or minimise impacts to areas of environmental value or concern wherever feasible. Areas of environmental value that are likely to be affected by the project are discussed in detail in Chapter 21, Special Management Areas, and include:

- creeks and habitat areas associated with listed threatened species (Addlington Creek, Mooloolah River and Eudlo Creek)
- Dularcha National Park
- The Pinch Lane (bioregional wildlife corridor)
- Eudlo Creek National Park
- Paynter Creek
- Petrie Creek.

In addition to the areas listed above, the following areas have been identified as of value or concern to local residents:

- Federation Walk - Eudlo
- Kolora Park - Palmwoods.

Extractive resources

A search of the Department of Employment, Economic Development and Innovation Interactive Mines and Tenures Mapping database has identified that there are no mining leases, mineral development licenses, petroleum leases or mining claims in the project area.

Contaminated land

A search of the contaminated land register was undertaken for properties directly affected by a land requirement for the project. This search identified that a number of properties are on the Environmental Management Register of the former Environmental Protection Agency, now Department of Environment and Resource Management. These are predominantly railway lands.

Good Quality Agricultural Land

Good Quality Agricultural Land data was collated from Caloundra City Plan and Maroochy Plan (in which Good Quality Agricultural Land is called Agricultural Protection) and were used to identify the areas affected by the project. From this data it is recognised that there are Good Quality Agricultural Land areas within the project area.

Infrastructure

Existing infrastructure in the project area that may be affected by the project includes roads, road and rail bridges, water mains, powerlines (including a 132 kV transmission line), telecommunication cables and optic fibres, whilst future infrastructure includes the Northern Pipeline Interconnector, the duplication of the 132 kV transmission line and the proposed gas pipeline between Gympie and Gatton.

Impact assessment

The project will result in a corridor approximately 20.8 km long and between 20 m and 74 m wide (maximal earthworks width) within which the new two-track railway will be constructed. Potential impacts to land uses associated with the construction and operation of the project are discussed in this section. The potential impacts of the project to existing land use, planned land use and infrastructure include:

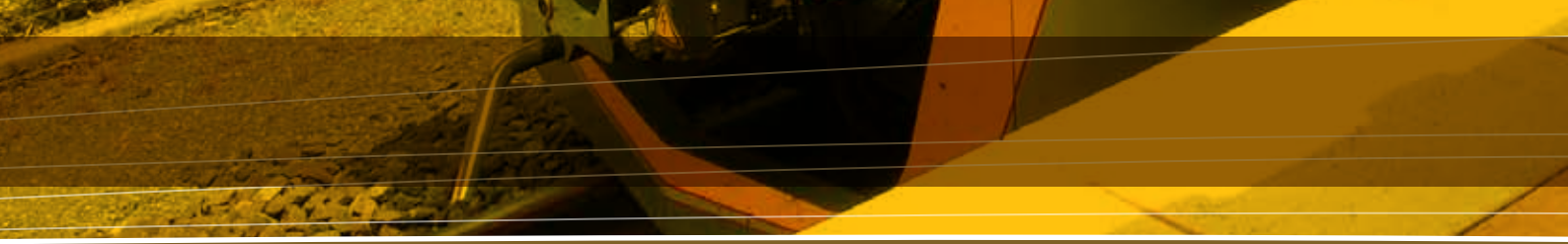
- land acquisition/resumption impacts
- construction impacts
- operational impacts
- decommissioning impacts and benefits.

Tenure

Land required for the project will be acquired by the Department of Transport and Main Roads prior to the construction phase of the project and will ultimately be transferred over to Unallocated State Land, and subleased for rail purposes.

Land tenure affected by the project includes:

- 145 freehold properties
- 34 sections of the existing North Coast Line
- three national park properties (Dularcha National Park and Eudlo Creek National Park)
- three State Land properties (including Kolora Park in Palmwoods and Crown Land in Mooloolah)
- seven Reserve Land properties (including Landsborough Recreational Reserve, Pound Reserve (Old Mellum Cemetery) Mooloolah Pony Club and Woombye Recreational Grounds)
- two lands leased properties (excluding the existing rail corridor)
- two properties identified as rail purposes but not part of the existing rail corridor.



Land use and zoning

The project has a land requirement from 162 properties (excluding land already leased for railway purposes). This includes (categorised by general land use planning designations):

- 14 Rural Residential properties
- 27 Commercial/Industry/Business properties
- 68 Rural properties
- three Community Purpose properties
- four properties identified as Open Space, Conservation or Waterways
- 37 Residential properties.

Of the 162 properties, 26 of these have been identified as government owned (State or local government), with the remainder privately owned.

Future planned land use

The need for an improved public transport system in the region, including an upgraded rail service, is recognised within the local government planning framework, but provision of infrastructure to achieve this outcome is not addressed in local government land use planning, as this is a State government responsibility.

As the project requires consideration of planning beyond the completion of the rail project in 2026, which exceeds the life span of the current South East Queensland Regional Plan and local government planning schemes, it is intended that these plans would, in time, be amended to reflect the opportunities and constraints arising from the project.

In recognition of this, the environmental impact statement identifies land use opportunities that may be suitable for location in land areas released by the decommissioning of the existing railway. It is understood that the Sunshine Coast Regional Council will develop a masterplan for the railway townships, to address the potential land use changes in the railway townships of the project area and help guide the adaptation of townships in the lead up to construction of the project.

Extractive resources

The project will not have a significant impact on extractive resources. However, the construction of the project would require hard rock resources, especially for ballast. The sourcing of this material will need to take into consideration transport impacts and benefits, availability and longevity of nearby resources, and other demands for the use of the same resource.

Good Quality Agricultural Land

The following Good Quality Agricultural Land and Agricultural Protection areas will be affected by the project:

- east and west of the existing railway - Landsborough
- large crop land bordered by the Mooloolah River and Neill Road - Mooloolah
- east of Paget Street in Mooloolah
- some rural properties along Neill Road - Mooloolah
- north and south of Highlands Road - Eudlo
- north and south of Logwoods Road - Eudlo
- north of Toby Court - Palmwoods
- rural properties along Spackman Lane - Palmwoods
- rural properties between Paynter Creek and Taintons Road - Woombye
- north of Victory Park - Woombye.

Approximately 50 of the 68 rural zoned properties affected by a land requirement for the project have been identified as being actively used for grazing, crops or horticultural purposes.

Infrastructure

Existing infrastructure potentially affected by the project includes:

- Telstra optic fibres and copper cables
- Optus Vision Stream
- Energex cables
- Aquagen water supply main.

The Northern Pipeline Interconnector, which runs to the east of the project, the Energex SunCoast Power project and the Gatton to Gympie gas pipeline will be constructed in the vicinity of the rail corridor. Given the proposed timeframes for these projects, it is assumed that they will be in place by the time of construction of the project. The project is not expected to interfere with the proposed corridors for the Northern Pipeline Interconnector and the future gas pipeline. The Energex SunCoast Power project involves the construction of an additional transmission line on an existing easement that crosses the project to the north of Eudlo. The proposed rail corridor runs in a cut and cover tunnel in this location and will not impact the SunCoast Power project.

Where other linear infrastructure (such as the Optus (formerly Visionstream) communications cable) cross the project, relocation of this infrastructure may be required.

Mitigation measures

The following mitigation measures are recommended to address project impacts on land use:

Construction

- Ensure regular communication with land owners and relevant stakeholders about the project.
- Provide appropriate compensation under relevant legislation and policy for property owners affected by land requirements.
- Ensure timely notification of planned construction activities to avoid impacts to existing land uses in proximity to the corridor, where possible.
- Provide temporary access for rural properties immediately affected by the railway corridor to mitigate disruption to productivity.
- Provide temporary access to and from commercial, community and open space and recreation areas.
- Provide noise and safety barriers to mitigate noise and any safety hazards during construction, where required (as discussed in Chapter 15, Noise and Vibration).
- Identify land use opportunities within the surplus rail land for the potential relocation of businesses affected by a land requirement.
- Rehabilitate rural land used for agricultural purposes such as grazing and crops by revegetating affected areas as soon as possible once construction works are complete in an area.
- Stage construction so as to delay the need to relocate commercial businesses, particularly within Mooloolah.
- Consult with owners where the relocation of infrastructure is required (i.e. Optus communication cable).

Operation

- Rehabilitate areas impacted during construction but not required for operation or maintenance of the railway.
- Encourage the establishment of appropriate new uses in the surplus rail land areas adjacent to the railway stations, particularly in Mooloolah, Palmwoods and Woombye.
- Replace and enhance open space and recreation areas lost during construction, in particular in Mooloolah, Eudlo, Palmwoods and Woombye.
- Encourage the provision of a park or open space between the project and the Urban Footprint in Eudlo, that is closely integrated with the Federation Walk area.
- Facilitate pedestrian and cyclist connectivity through the station precincts.

- Integrate existing and future commercial, community and residential areas with the new railway stations where feasible and desirable.
- Provide good-quality noise barriers to minimise noise impacts, particularly in residential and rural residential areas, where required.
- Incorporate Crime Prevention Through Environmental Design principles into station precincts and their connections to township areas.

Decommissioning

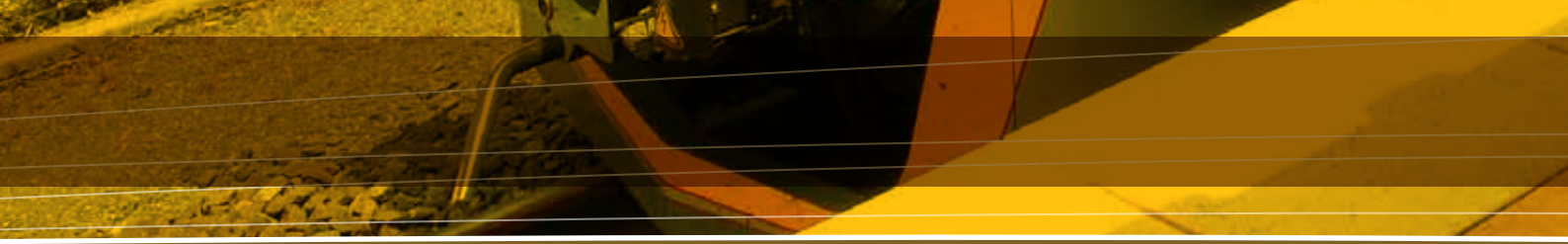
- Consider the reuse of existing station buildings and related infrastructure in new station design where appropriate.
- Recommend to the Sunshine Coast Regional Council potential uses for railway land not required for the project.
- Explore opportunities for rehabilitating and reconnecting fragmented vegetation through the decommissioning of sections of the existing railway not required for the new railway.
- Explore opportunities for reusing sections of the existing railway not required for the new railway for recreational uses such as walk, cycle, and equestrian tracks (i.e. 'rail trails') particularly around Landsborough, Mooloolah and Eudlo.

Summary

The project will impact on the various land uses in the area as certain aspects of the project may be considered incompatible with some adjacent land uses. Due to the linear nature of the rail infrastructure, it has not been possible to avoid the loss of residential, rural, commercial, industrial, open space and recreation areas. The project will result in land acquisition, possible land fragmentation and temporary disruption to some commercial and rural activities.

Once mitigation measures have been implemented, the residual impact of the project on the land use and infrastructure within the project area is as follows:

- land resumption impacts on land tenure, including severance - **low adverse**
- construction impacts on current and planned land uses and infrastructure - **moderate adverse**
- operation impacts on current and planned uses - **negligible to beneficial**
- decommissioning impacts on land use, safety and aesthetics - **beneficial**.



4. Land: Topography

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 4 – Land: Topography.

Existing conditions

The Blackall Range runs parallel to the project area to the west. In the project area, high relief east-west trending ridges are the main topographic features, most noticeably between Landsborough and Mooloolah and between Mooloolah and Eudlo. The regional topography in the area of the project can be broadly divided into two main zones:

- A region of moderate to high relief terrain, at higher elevations, exists about 5 to 10 km to the west of the site. This region is the source of the eastward flowing drainage lines that occur in the site area.
- A region of moderate to low relief and lower elevations exists in the area of the project. However, the terrain becomes of higher relative relief and elevation towards the southern end of the site, where a series of ridges and valleys extend across the route. These ridges represent the edge of the high relief region occurring to the west.

The natural ground level is typically about 35 m AHD (Australian Height Datum) in the south and falls toward the north to about 15 m AHD. Natural slopes are typically about 15° in the undulating hills in the north and increase southward where maximum natural slopes are typically between 15° and 25°.

The highest elevation within the project area is approximately 140 m on the western border of the project area between Landsborough and Mooloolah.

As a result of the topography, the existing rail line has sharp curves and steep gradients which limits rail speeds to 50 km/hr in some areas. The project area does not have any significant peaks which dominate the terrain but rather undulates with many areas of slope greater than 20 percent.

The following describes the topography in and around each township in the project area:

- **Landsborough** - The topography is generally flat from Landsborough to south of Rose Road, before rising to an east-west trending ridge line, where the existing rail line passes under Rose Road in a tunnel.
- **Mooloolah** - The area close to Mooloolah is undulating, with an east-west ending ridge to the south, a relatively level area around the township itself, and rising to another east-west ridge north of Mooloolah, where the existing rail passes through a tunnel below The Pinch Lane. The central plain area is crossed by a number of natural drainage lines.

- **Eudlo** - Around Eudlo, the topography is dominated by the level alluvial plains associated with Eudlo Creek, before rising to the north towards a west to east trending ridge.
- **Palmwoods to Woombye** - The town of Palmwoods is located on a slope that trends down towards the duck pond in Kolora Park. The existing rail infrastructure is a significant element in the town, and also limits the movement of high vehicles from east to west. This area comprises a generally level and low lying area adjacent to Paynter Creek.
- **Nambour** - The section from Woombye to Nambour is undulating, with low lying areas to the west of the existing railway.

Impact assessment

The preferred route for the project has been developed to avoid areas of steep slopes and high ground wherever possible. There are several ridge lines traversing the project area from east-west, which are unavoidable. At these ridge crossing points, the route has been identified to allow for the optimal crossing location, which is generally in close proximity to the existing rail tunnels at Rose Road and The Pinch Lane. Allowance for construction of new tunnels, whilst keeping the existing tunnels and track operational, has also dictated the project design in these locations. New tunnels cannot be constructed in close proximity to existing operational tunnels. Therefore this was a significant constraint to the siting of the preferred route in two locations.

Cuttings

There are eight major cuttings occurring along the proposed rail corridor (i.e. cuttings greater than 10 m deep along the centreline). The majority of these cuttings occur in the southern portion of the project within the higher relief region. However, numerous cuttings of lower height occur in other areas of the project.

The following impacts have been identified for cuttings:

- a reduction in stability resulting in increased erosion and sensitivity to flooding
- extensive cutting can affect the habitat connectivity for a significant number of species
- the formation of a scar from cut and tunnelling activities
- landscape and visual impacts
- increased severance effect on land uses.

Embankments

A significant component of the proposed rail alignment is above the existing ground level. However, in most cases when more than 10 m of formation fill is required, bridge structures or viaducts have been chosen as an alternative to earth structures. In general, the exception to this is in the higher relief, and less populated areas, where embankments have been chosen.

Embankments have not been proposed in areas identified as subject to potential flood risk. Where embankments intersect natural drainage lines, culvert structures or fauna passages are proposed.

The following impacts have been identified for embankments:

- high embankments can restrict habitat movement for a significant number of species
- a reduction in stability, resulting in increased erosion and sensitivity to flooding
- visual and aesthetic impacts
- increased stormwater runoff due to varying gradients on embankments
- water flow restriction due to unnatural formations.

Structures

Structures are preferred to embankments as the impact to the natural terrain is reduced. Structures (or bridges) are proposed in the following locations:

- north of Vidler Court (approximately 4.5 m above surface level, and 40 m long abutment to abutment)
- at a tributary of the South Branch of the Mooloolah River (approximately 6 m above the river bed, and approximately 45 m long)
- South Branch Mooloolah River (approximately 8 m above the river bed and 55 m long)
- Mooloolah River (maximum height above the river bed of 10.5 m, 300 m long)
- Eudlo Creek floodplain (maximum height above surface level of 9 m, approximately 600 m long)
- Eudlo Creek (maximum height above the river bed of 12 m, approximately 220 m long)
- Paskins Road/Culgoa Road property access (maximum height 8 m, 20 m long)
- from the new Palmwoods station to Spackman Lane (ranging in height between 6 m and 14.5 m above surface level, 800 m long)
- the area adjacent to Paynter Creek (maximum height of around 4.5 m, approximately 260 m long)
- Paynter Creek in Woombye (maximum height of around 9 m above the creek bed, approximately 100 m long)
- the area adjacent to Petrie Creek (maximum height of approximately 9 m, but over undulating terrain, approximately 470 m long)
- Arundell Avenue (maximum height approximately 7 m, providing vehicle clearance of at least 5.5 m, approximately 25 m long).

The provision of bridges at waterway crossings will reduce the impact of the project on water flows. Bridging the rail over existing roads would limit the operational impacts of the project on the road network.

Mitigation measures

The following mitigation measures are proposed for cuttings:

Design

- Cut and cover structures and tunnels have been proposed to minimise the need to excavate extensive cuts. Whilst cut and cover would still require excavation to the same depth as a typical cutting, the footprint of the impact is minimised, as there is no need for stepping of the edges or setbacks.

Construction

- Where possible, revegetation will be carried out using native species.
- A weed management plan will be followed to avoid the spread of weeds into environmentally sensitive areas.
- Retaining walls are proposed to mitigate the impacts on the residential properties surrounding the railway in Nambour.

The following mitigation measures are proposed for embankments:

- Where feasible, embankments will be revegetated to aid in stabilisation, to mitigate visual impacts, and to prevent the incursion of weeds.
- A weed management plan would be followed to avoid the spread of weeds into environmentally sensitive areas.

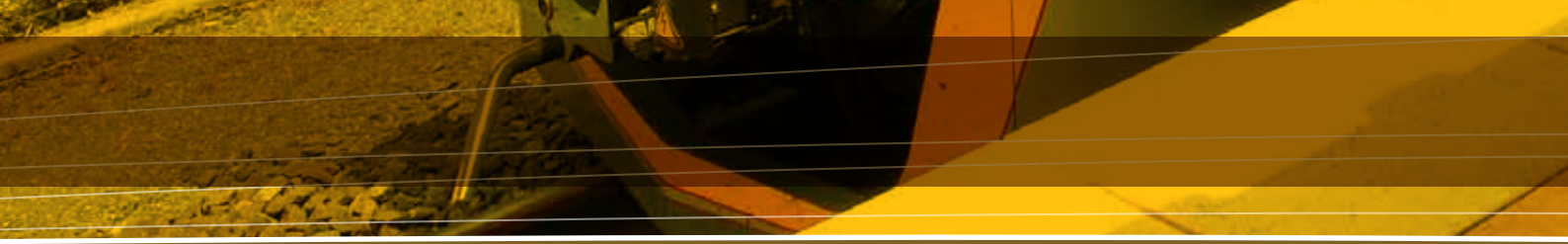
Summary

The project traverses an area of challenging topography, including steep ridges, and significant floodplains. The topographical impacts of crossing these areas result in a permanent change to the natural surface, and therefore topographic impacts were best addressed during the selection of the preferred route for the proposed rail corridor and the preliminary design phase.

The preferred route for the project was selected on the basis that it avoided areas of steep slope requiring significant cuts and tunnels, wherever feasible. It also was selected on the basis that it was considered to have the shortest crossing of floodplain areas, and that these issues could be mitigated through design. Cut and cover tunnels and tunnel sections have been incorporated into the design to reduce the areas affected.

Once mitigation measures have been implemented, the residual impact of the project on topography within the project area is as follows:

- locally - moderate adverse
- regionally - negligible.



5. Land: Geology and soils

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 5 – Land: Geology and soils.

Existing conditions

The project area is underlain by Triassic Landsborough Sandstone. Some areas of Quaternary alluvium and colluvium are shown where drainage channels occur. The alluvium is typically associated with low lying, low relief wetlands, while the sandstone is typically associated with moderate relief terrain with some higher relief ridges.

Alluvium – The thickness of the alluvial material is likely to vary significantly, from less than 1 m to greater than 10 m. This material is typically underlain by the Landsborough Sandstone.

Colluvium – As the colluvium occurs relatively low in the landscape, it is expected to comprise finer grained materials (sands/silts/clays). This material is typically underlain by the Landsborough Sandstone.

Landsborough Sandstone – Two units of the Landsborough Sandstone are present in the area, mapped as ‘Triassic/Jurassic – Landsborough Sandstone’. They are anticipated to be very similar in terms of engineering properties.

Structure – No major faults are mapped in the area, though small scale faulting could be present due to the geological structure in the area.

Acid sulfate soils – Acid sulfate soils are associated with low lying areas below 5 m AHD (Australian Height Datum), such as the alluvial plains where groundwater is generally close to the surface. As such, the main risk zones are likely to be associated with the drainage features and in the vicinity of wetlands, should they be disturbed. A review of the acid sulfate soils risk maps published by the Department of Environment and Resource Management notes that no risk zones are present to the south of Palmwoods, however, the alluvial plains associated with Petrie Creek and Paytner Creek are designated acid sulfate soil risk zones.

Acid sulfate rock – Acid sulfate rocks becomes an issue when sulphide bearing (commonly pyrite) rocks are disturbed and weathered. The resulting oxidation releases weak acids which may be washed into the groundwater and represent a threat to the environment. The Landsborough Sandstone may contain minor amounts of pyrite within the thin bands of shale or within veins.

Ground conditions – Based on information from test pits and boreholes remote from the site, the topsoil is likely to be about 0.1 m to 0.3 m thick and comprises sands, clays and organic matter. Below this lie residual soils typically less than 3 m thick

and alluvium that may be more than 10 m thick. Landsborough Sandstone generally occurs at depths greater than 3 m and may include some shale, mudstone and coal.

Impact assessment

Acid sulfate soils and rocks

No risk zones have been identified to the south of Palmwoods, but the alluvial plains associated with Petrie Creek and Paytner Creek are designated acid sulfate soil risk zones.

Areas around footings and bridge piers, or areas of excavation are the most at risk of disturbing acid sulfate soils.

Source of construction materials

Construction material requirements will comprise:

- general structural embankment fill
- sub-ballast capping
- ballast aggregate materials (coarse gravel laid to form a bed for the railway).

According to preliminary estimates, approximately 900,000 m³ of material will be cut and filled within the project, and 200,000 m³ of fill will be removed to spoil. Excess material from project works is likely to be suitable for general fill and embankment works. This material will be transported from its excavation site to sites where it is needed for fill. Excess material from project works is unlikely to be suitable for track ballast. This material will likely be imported from the surrounding area. The nearby Parklands Blue Metal reserve may be a potential source, and subject to staging of the project, it may be possible to recycle ballast from the existing railway in some locations.

Transport and handling

Local roads are expected to be used for construction traffic and the movement of fill materials. The roads listed below are considered likely to be utilised for the supply of construction materials, such as ballast and fill, equipment and personnel involved in the construction process:

- Bruce Highway
- Glass House Mountain Road
- Mooloolah Connection Road
- Eudlo Road
- Palmwoods Mooloolah Road
- Ilkley Road
- Chevallum Road
- Woombye Palmwoods Road
- Nambour Connection Road
- Kiel Mountain Road.

Cuttings

There are eight major cuttings (cuttings greater than 10 m deep) along the proposed rail corridor, with numerous smaller cuttings.

Stock piles

Prior to commencing earthworks the top soil will be stripped and stockpiled for later use in any landscaping. The topsoil is expected to be approximately 0.1 m to 0.3 m thick. These stock piles will be protected to prevent erosion. Sediment protection would also need to be provided to prevent material entering water courses during rain events.

Excavatability

The excavatability of the materials encountered and ease of ripping is dependent on a number of construction and design factors. As a general guide, the excavatability of the materials is expected to reduce considerably with depth, with the upper residual soils being relatively easily ripped while the deeper fresh sandstone may require blasting. Further detailed geotechnical investigations are required to accurately assess excavatability for the project.

Embankments

The following batter slopes for embankments are considered appropriate for preliminary design purposes:

- residual soil and extremely weathered rock: 1 vertical unit for every two horizontal units (1V:2H) – a flatter slope
- distinctly weathered to fresh sandstone: 1 vertical unit for every one 1 horizontal unit (1V:1H) – a steeper slope
- shales, claystone, mudstones, coal: 1 vertical unit for every 2.5 horizontal units (1V:2.5H) – a flatter slope.

Residual soils, shales, claystone, mudstone and coal are easily eroded materials and are likely to require surface protection.

Bridges and structures

A significant component of the proposed rail alignment is above the existing ground level. However, in most cases, when in excess of 10 m of formation fill is required, viaducts have been chosen as an alternative to earth structures. In general, the exception to this is in the higher relief and less populated areas, where embankments have been chosen.

Foundations for structures

Viaducts and bridges are a significant component of the project. The foundations chosen for the various footings will depend on a number of factors, including the load imposed on each footing, the drainage characteristics of the ground, the height of the structure, the strength of the subsurface and compressibility/consolidation characteristics of the ground amongst other factors.

Tunnels

A number of tunnels and cut and cover tunnels are proposed for the project. These include:

- Rose Road, Mooloolah (170 m cut and cover, followed by 250 m twin bored tunnels)
- The Pinch Lane, Eudlo (140 m cut and cover, followed by 310 m twin bored tunnel, followed by 50 m cut and cover)
- Eudlo School Road (130 m cut and cover, with reinstated Eudlo School Road over the top)
- North of Eudlo (230 m cut and cover, proposed to minimise the construction footprint (preferred to wider cutting)).

Mitigation measures

The following mitigation measures are proposed to manage project impacts:

- Conduct detailed acid sulfate soils sampling and prepare management plans as part of the detailed design phase.
- Incorporate scour into the design of bridge footings for active drainages.
- Conduct geotechnical investigations to inform the detailed design process (especially in relation to tunnels).
- Implement erosion and sediment control measures during construction.
- Avoid carrying out earthworks after heavy rain.
- Use slope stabilisation measures on slopes that are susceptible as required.
- Use tunnel linings if required, depending on ground water conditions.
- Stockpile top-soil during construction activities for re-use
- Re-use fill gained from construction activities along the project if possible.
- Source appropriate ballast material and investigate the potential for re-using ballast material from the existing railway.
- Install drainage channels at the top of the batter crests to prevent face erosion.
- Test soils in the vicinity of the existing railway for contamination and determine if these need to be removed.
- Carry out soil sampling to determine levels of contamination where the existing railway will be decommissioned for other uses.

Summary

Once mitigation measures have been implemented, the residual impact of the project on geology and soils within the project area is negligible to beneficial.

6. Landscape character and visual amenity

Twenty-five view points within the project area were selected to assess the impacts related to the project. Examples of these viewpoints include:



Viewpoint 4 - Rose Road Landsborough, looking south-west



Viewpoint 9 - Bray Road, Mooloolah, looking east



Viewpoint 17 - Kolora Park, Palmwoods, looking west

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 6 – Landscape character and amenity.

Existing conditions

The project area lies within the local government area of the Sunshine Coast Regional Council. Key characteristics that describe the existing landscape and visual context include:

- A distinctive topographic mix of high, steep undulating land and lower floodplain areas.
- The Blackall Range running parallel to the project area to the west.
- East-west running ridges bisecting the project area at a number of points, most noticeably between Landsborough and Mooloolah, and between Mooloolah and Eudlo, and numerous smaller ridges and steep slopes also traversing the project area.
- Settlement areas of Landsborough, Mooloolah, Eudlo, Palmwoods, Woombye and Nambour around the existing railway corridor stations.
- national parks, forested and other vegetated areas.
- Floodplains linked to Addlington Creek, South Mooloolah River, Mooloolah River, Eudlo Creek, Acrobat Creek, Paynter Creek and Petrie Creek bisecting the landscape with dense riparian vegetation.
- Agricultural small holdings comprising cropping and grazing activities generally clear of vegetation with perimeter fences that pattern the landscape and are lined with rows of established trees.
- Scattered individual rural dwellings and rural residential subdivisions.
- An existing, predominantly single track, railway corridor with overhead power supply and associated infrastructure (such as signage, level crossings, bridges, signals, trains, treeless corridor, stations).
- Minor roads connecting small settlements to regional civic centres, tourist attractions, individual properties and railway stations.
- Recreational facilities (sports fields, equine grounds etc) generally located on the outskirts of settlements and in close proximity to the existing railway corridor.

Broad landscape values for south east Queensland are shown in scenic amenity maps produced for the South East Queensland Regional Scenic Amenity Study 2004. This study used survey data of scenic preference and visual exposure to predict the scenic value of sites in south east Queensland. According to the scenic amenity maps, large sections within the project area are considered to have a high scenic amenity profile. These areas are generally located in the areas between the railway townships along the existing rail corridor.

The majority of potential viewers within the study area are residents living within settlements and/or within close proximity of the route. Other receptors include:

- train customers
- railway workers
- road users travelling along roads in close proximity to the proposed rail corridor
- agricultural workers
- pedestrians and cyclists
- users of recreational and public space
- users of heritage areas/structures
- local businesses and their patrons
- users of civic facilities (churches, hospitals, schools, health centres etc)
- visitors and tourists
- industrial workers.

Impact assessment

Impacts on visual amenity resulting from the proposal will be derived primarily from:

- The widening of the existing railway corridor.
- Creation of a new railway corridor that will form a linear feature cutting across the landscape, the majority of which will remain treeless.
- Clearance of vegetation to create either a widened or a new corridor.
- Associated railway infrastructure (structures, railway on embankment/in cutting, tunnels, signals, level crossings, surface materials, substations and service equipment, etc.).
- New bridge structures (i.e. rail bridges over creeks and flood risk areas, rail bridges over roads and road bridges over rail).
- Trains passing at increased intervals, introducing increased movement within the landscape and townscape, particularly within pedestrian, residential and recreational areas.
- Overhead power lines along the length of the route that will introduce new vertical elements and clutter into the landscape.
- New railway stations at Mooloolah, Eudlo, Palmwoods, and Woombye (may consist of a platform, shelter, location/direction signage, ticket machines, security items such as CCTV, fencing and lighting).
- A new platform and access facilities (lifts, etc) at Nambour.

Mitigation measures

Appropriate mitigation measures vary greatly due to the wide variety of visual settings that the project will traverse and the range of views. Proposed mitigation measures include:

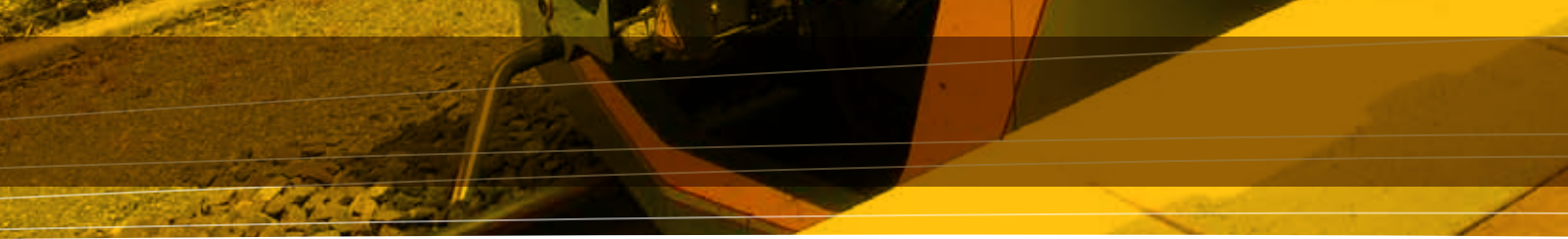
- Landscape planting within the railway reserve to screen the project from views, where feasible. This may also assist with slope stabilisation, erosion control and habitat connectivity.
- Landscape planting in strategic locations outside the railway reserve to provide additional screening. Opportunities exist to integrate landscaping with noise barriers to reduce the visual impact of noise mitigation barriers.
- Sensitive architectural design of bridges, station buildings and other major structures, including consideration of scale, form, material, colour and compatibility with nearby architectural character.
- Consideration of visual impacts in the choice of electrification mast structures.

Pole structures are generally favoured from a visual point of view over gantry structures.

Summary

The full effect of landscape mitigation may take some years to be achieved. The residual impact assumes any planting reaching a semi-mature stage. In some cases visual mitigation has the potential to dramatically influence the residual impact, while in others there is limited potential for impacts to be reduced.

Once mitigation measures have been implemented, the residual impact of the project on landscape character and visual amenity at each viewpoint is listed in the following table.



Residual impact assessment				
Viewpoint	Visual Modification (level of reduction in visual amenity before mitigation)	Visual Sensitivity	Impact Before Mitigation	Residual Impact After Mitigation
1 – Gympie Street North, Landsborough	large	local	high adverse	moderate adverse
2 – Vidler Park, Landsborough	moderate	neighbourhood	low adverse	negligible
3 – Tiverton Place, Landsborough	moderate	neighbourhood	low adverse	low adverse
4 – Rose Road Landsborough, looking south-west	large	local	high adverse	high adverse
5 – Rose Road, Landsborough, looking north-east	large	local	high adverse	high adverse
6 – Mooloolah Recreation Grounds	moderate	local	moderate adverse	low adverse
7 – Mooloolah Connection Road, Mooloolah	large	local	high adverse	negligible to beneficial
8 – Jones Street, Mooloolah	large	neighbourhood	moderate adverse	negligible to beneficial
9 – Bray Road, Mooloolah	large	local	high adverse	negligible to beneficial
10 – Neill Road, Mooloolah	large	neighbourhood	moderate adverse	low adverse
11 – Karanne Drive, Mooloolah	small	neighbourhood	negligible	negligible
12 – Neill Road, Mooloolah Valley	moderate	neighbourhood	low adverse	low adverse
13 – Logwoods Road, Eudlo	large	neighbourhood	moderate adverse	moderate adverse
14 – Highlands Road, Eudlo	large	neighbourhood	moderate adverse	moderate adverse
15 – Corner of Beech Lane and Eudlo School Road	moderate	neighbourhood	low adverse	low adverse
16 – Nicklin Road, Palmwoods	moderate	local	moderate adverse	negligible
17 – Kolora Park, Palmwoods	large	local	high adverse	moderate adverse
18 – Margaret Street, Palmwoods	small	local	low adverse	negligible to beneficial
19 – Main Street Palmwoods	small	local	low adverse	negligible to beneficial
20 – Palmwoods Hotel	moderate	local	moderate adverse	negligible to beneficial
21 – Dana Court, Palmwoods	moderate	neighbourhood	low adverse	negligible
22 – Memorial Park, Woombye	small	local	low adverse	low adverse
23 – Woombye Pony Club	large	local	high adverse	high adverse
24 – Countryview Street, Woombye	moderate	neighbourhood	low adverse	negligible
25 – Arundell Avenue, Nambour	not perceivable	neighbourhood	negligible	negligible

7. Transport

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 7 – Transport.

Existing conditions

The existing north coast line between Landsborough and Nambour is approximately 22 km long. It passes through two tunnels, one to the south of Mooloolah Station (at Rose Road) and one to the south of Eudlo Station (at The Pinch Lane). The project area is located to the west of the Bruce Highway, which consists of four lanes between Caboolture and Cooroy. The railway townships within the project area are connected to each other and the Bruce Highway by two-lane roads of varying quality, traversing areas of steep terrain and floodplain.

Within the project area there are:

- local and State controlled roads
- three open level crossings
- one occupational level crossing
- ten Queensland Rail crossings
- two pedestrian crossings (at Palmwoods and Woombye)
- various road bridges over the existing railway (some of these are single lane and of poor construction)
- passing loops at each station.

Rail services

CityTrain

According to 2008 timetables, there are 12 weekday CityTrain rail services travelling south from Nambour, two of which originate at Gympie North and Cooroy respectively. An additional evening service runs on Fridays at 8.15 pm. These services are supplemented by 12 Railbus services on weekdays. Of the supplementary Railbus services, five of these run express from Nambour to Landsborough. Service frequency (between 4.35 am and 6.37 pm Monday to Thursday), on this section is:

- CityTrain services only: approximately half hourly during the morning peak, then seven trains in 10 hours averaging a rate of one service every 85 minutes
- CityTrain and Railbus services (Nambour to Landsborough express): five between 7.15 am and 1.35 pm averaging a rate of one every 76 minutes
- CityTrain and Railbus services (all stops between Nambour and Landsborough): two between 7.45 am and 9.00 am, then five services at a rate of almost one an hour between 12.55 pm and 6.00 pm.

There are 13 northbound weekday services running to Nambour station. Two of these services continue north, to Cooroy and Gympie North respectively. These services are supplemented by 11 Railbus services on weekdays (one of which starts at Caboolture with no prior connecting northbound rail service). Of the 11 supplementary Railbus services, five of these run express from Landsborough to Nambour. Service frequency (between 5.33 am and 11.02 pm Monday to Friday) on this section is:

- CityTrain services only: five services between 5.50 am and 12.46 pm approximately one every 86 minutes, then one almost every 30 minutes between 4.03 pm and 6.07 pm followed by three services between 7.27 pm and 11.02 pm
- CityTrain and Railbus services (Landsborough to Nambour express, times quoted from Landsborough): approximately one an hour from 9.04 am to 10.55 am, followed by one at 12.55 pm and one at 4.12 pm
- CityTrain and Railbus services (all stops between Landsborough and Nambour, times quoted from Landsborough): five services between 8.28 am and 5.04 pm averaging a rate of one service every 102 minutes, followed by a 30 minute frequency between 6.14 pm and 6.44 pm.

Long distance passenger services

Long distance passenger services utilise this section of the north coast line. Electric TiltTrain services to Bundaberg and Rockhampton stop at Nambour and Landsborough. Diesel TiltTrain services between Brisbane and Cairns stop only at Nambour. The Sunlander and Spirit of the Outback stop at Nambour. The table below shows the weekly frequency of long distance passenger services using timetable information from QR Limited for 2008-2009.

TravelTrain Service	Frequency (weekly)	
	Northbound	Southbound
Sunlander	3	3
TiltTrains	15	15
Spirit of the Outback	2	2
Total services	20	20

Rail freight

QR Limited and Pacific National operate freight services on the existing rail corridor. These services are focussed on freight forwarding, sea freighting and livestock. Freight forwarding and sea freighting are quite regular in frequency, while livestock has some seasonal variation. Freight services are generally scheduled in and around existing passenger services.

The table below outlines the average number of freight services currently operating on this section of the North Coast Line.

Average number of freight services	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	16	21	23	21	22	23	10

Source: Caboolture to Landsborough Rail Study

Currently, freight operations through the area are constrained not only due to the substandard vertical and horizontal track geometry, but also due to the short length of passing loops between Caboolture and Landsborough and Landsborough and Palmwoods. Freight operations on this section of the corridor are also constrained by operating hours at the various freight handling facilities to the north and south of the project area, and also by constraints on other parts of the rail network. This also influences the length of freight trains, scheduling, and frequency of freight services, given that the North Coast Line is currently a single track between Beerburrum and Cairns (with limited exceptions).

The road network

The project area is located to the west of the Bruce Highway, which consists of four lanes between Caboolture and Cooroy. The Bruce Highway forms part of the National Highway network. North of Nambour Connection Road, the Bruce Highway carries approximately 43,600 vehicles per day according to the former Department of Main Roads Traffic and Speed Census 2007.

The railway townships within the project area are connected to each other and the Bruce Highway by two-lane roads of varying quality, traversing areas of steep terrain and floodplain. Some are characterised by poor pavement quality and poor horizontal and vertical alignment. Several single lane bridges are also present in the project area.

Bus services

Bus services in the project area are concentrated in Nambour, with some services provided to Woombye and Landsborough. Limited services (other than the Railbus) are currently provided to Palmwoods, Eudlo and Mooloolah. Generally, bus services operate on an irregular frequency with headways (i.e. time between services) varying between 30 and 180 minutes.

Travel times

According to 2008 timetables, travel times between Landsborough and Nambour for CityTrain services range from 24 to 45 minutes, for a distance of 22 km. This variation in travel time can be attributed to some services waiting in passing loops for express services or services travelling in the opposite direction to pass. Additionally, services travelling north in the

morning peak have been observed entering the Mooloolah passing loop to allow another service to pass, before turning back to the south, to re-enter the main line and access the platform (located on the east) at Mooloolah.

In comparison, using the RACQ trip planner, travel times by car between Landsborough and Nambour are estimated at:

- Approximately 30 km, at 30 minutes travel time (via Steve Irwin Way, the Bruce Highway, and Nambour Connection Road). This is the less direct route, but quicker than the more direct road option below due to the higher speed road environments.
- Approximately 27 km, at 37 minutes travel time (via the railway townships between Landsborough and Nambour). This is the more direct route, but slower than the above road option, due to the use of roads with a lower speed environment.

Travel time modelling

Modelling (based on a set of assumptions) has identified that the project should deliver the following travel time savings based on the comparison of the simulated existing and simulated proposed track configurations:

- CityTrain services and electric TiltTrain services - up to 36 percent (a saving of 9 minutes 40 seconds for CityTrain and 6 minutes 52 seconds for electric TiltTrain (diesel TiltTrain has not been modelled))
- diesel TravelTrains - up to 41 percent (a 10 minute 53 second time saving)
- intermodal freight (containers) - up to 38 percent (a 10 minute 27 second saving)
- bulk freight (such as livestock) with 1 locomotive - between 14 to 23 percent, depending on the direction of travel (savings of between 4 minutes 15 seconds and 7 minutes 31 seconds).

These time savings, when combined with the time savings associated with the Caboolture to Landsborough upgrade, could result in a saving of up to 17 minutes and 40 seconds on a trip between Caboolture and Nambour.

Capacity analysis

The existing single track alignment will support an hourly passenger train service pattern, and freight growth up to 2024, providing freight transport is excluded from the corridor between 6:00 am and 10:00 am, and is restricted to southbound only between 4:00 pm and 7:00 pm. The main capacity constraints of the current railway are the turnback times at Nambour station and delays associated with passing requirements at stations (i.e. trains waiting in passing loops for express or services travelling in the opposite direction) to pass.

Under the existing scenario, the current single track rail line between Landsborough and Nambour will reach capacity by 2024. However, if it is possible to spread freight services throughout the day (and all other assumptions are correct), the single line section provides an additional two years capacity.

The introduction of the double track railway allows for a significant increase in train paths, enabling up to four times as many passenger services and twice as many freight services to operate within this section of the North Coast Line.

Current CityTrain services

The proposed service level for CityTrain services assumes a service frequency of 15 mins during the AM and PM peak (assumed two hour period) and 30 minutes during all other operating hours (assumed 18 hour operating period). The following tables outlines the current and proposed number of passengers services.

Day	Northbound	Southbound
Current CityTrain services (2008) Monday to Friday	13	12 (13 on Friday)
Proposed CityTrain services	45	45

Current freight services

In 2008, the weekly total of freight services was 136, an average of 19 freight services per day.

The following scenarios have been used in the freight services capacity analysis:

- Extrapolated scenario, which is the ultimate capacity for the future infrastructure, based on current times when freight services are run (i.e. accounting for existing freight curfews).
- Spread scenario, which assumes freight can be spread through the day, except for the peak.

The following table outlines the daily freight capacity for the dual track between Landsborough and Nambour, for both the extrapolated and spread scenarios.

Current	Intermodal (containerised)	Bulk
Current- extrapolated	17	3
Current- spread	33	3
Proposed- extrapolated	39	5
Proposed- spread	53	6

Freight forecasts were also undertaken. The high growth freight forecast indicates that freight demand on the section of the North Coast Line between Northgate and Nambour, could grow to up to 348 services weekly by 2026. This equates to approximately 50 services per day.

It is important to note that whilst this environmental impact statement documents freight forecasts and freight capacity, the demand for freight transport via rail will be market driven.

Impact assessment

The potential impacts to the transport infrastructure associated with the construction and operation of the project include:

- impacts to rail services and improvement to public transport services and facilities
- impacts on road and rail traffic during construction
- impacts to other public transport
- road network impacts
- station upgrades
- transport-related environmental issues.

Rail infrastructure

The project will require the following changes:

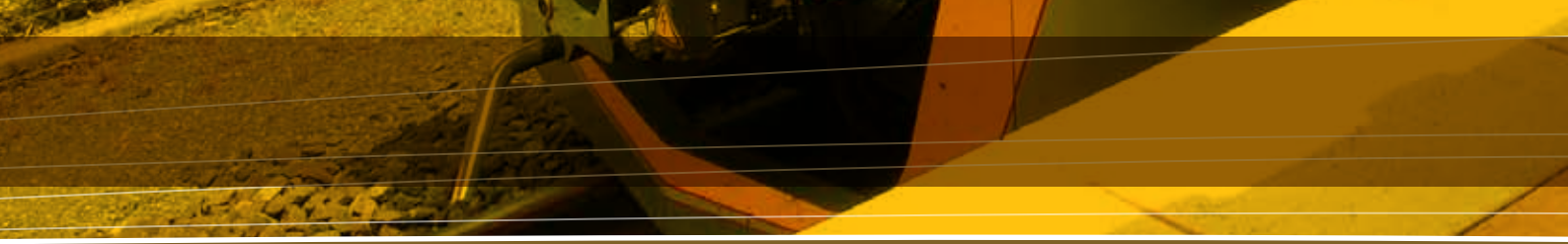
- rebuilding of Mooloolah station
- relocation of Eudlo, Palmwoods and Woombye stations
- upgrade of Nambour station with the existing station incorporated into the station design.

Landsborough station has recently been refurbished and will not be impacted by the project.

Rail services (passenger and freight)

During construction, passenger and freight rail services are likely to experience some disruptions.

For CityTrain passenger services, disruptions may be due to station closures, changes to station access and parking, and short-term replacement of some CityTrain services with Railbus services. Similarly, TiltTrain and TravelTrain services that stop at Landsborough and/or Nambour Station may be disrupted, or require temporary alternate stops.



All passenger and freight services may be disrupted by scheduled track possessions (temporary closures), particularly when construction of sections of track close to the existing track are underway. These areas include the section between Landsborough and Dularcha National Park, south of Mooloolah Station to north of Mooloolah Connection Road/ Bray Road, the approach to the existing Palmwoods station, and the approach to Nambour. The windows for track possession are extremely limited, and usually occur on weekends, primarily affecting freight service scheduling.

Road network

During construction, temporary road closures or detours are likely to be required for roads impacted by the project. Furthermore, some properties may temporarily lose access to roads that they use as their primary access, particularly the properties on Eudlo School Road, Toby Court, Leeons Road and Spackman Lane. A construction traffic management plan will be required, and ongoing consultation with the Sunshine Coast Regional Council, local residents, business operators, transport operators, and the local community will be required to ensure up to date information about road network issues is widely available.

Bus services

The project will result in short-term increased local demand for Railbus Services during construction. Some bus stops may be temporarily relocated during construction, or permanently relocated as part of improved station precincts.

Railbus services should no longer be necessary once the upgrade is completed and the improved rail services are operational.

Open level crossings

The environmental impact statement proposes two scenarios for dealing with open level crossings within the project area:

1. Preserve options for future grade separation of road/rail crossings, but keep open level crossings operational until such time as risk and traffic congestion dictate the need for their closure.
2. Construct grade separated road/rail crossings before or at the time of the project's construction.

If operational at the time of construction of the project, temporary closures of the open level crossings on Gympie Street North and Bray Road/Mooloolah Connection Road will be required.

Rail and road bridges

A number of road and rail bridges will be established or replaced during the construction of the project. The following design parameters for the design of road and rail bridges have been established:

- rail over road crossings – minimum 5.5 m clearance where possible
- road over rail crossings – minimum 6.7 m clearance.

The project will be crossed by the following new road bridges:

- Neill Road, Mooloolah (north) – the railway passing under Neill Road in a cutting, with a proposed bridge consistent with the existing terrain
- Eudlo School Road, Eudlo (cut and cover construction approach proposed)
- Leeons Road, Palmwoods (bridge on embankment, providing access to Toby Court)
- Back Woombye Road/ Old Palmwoods Road, Woombye (extension of Blackall Street, connecting to Back Woombye Road)
- Blackall Range Road - replacement of existing single lane structure with a two lane bridge.

These proposed crossings will remove the following substandard existing road/rail crossing points:

- Highlands Road – replacing the existing 3.1 m clearance underpass with a 5.5 m clearance bridge
- Eudlo School Road- replacing the existing 2.4 m clearance underpass with a cut and cover tunnel
- Back Woombye Road- replacing the existing 2.9 m clearance underpass with a road over rail bridge with a clearance of approximately 7 m
- Blackall Range Road bridge- replacing the existing single lane bridge with a two lane bridge.

These road bridges will also provide for pedestrian and cyclist access.

Passing loops

Passing loops will no longer be required once the double-track railway is constructed. However, QR Limited has recommended that a freight refuge be included as part of the project. It is proposed that this freight refuge is built in the vicinity of Mooloolah within the proposed rail corridor footprint.

Construction traffic

Detailed design and construction of the project will result in additional traffic on the roads in the vicinity of the project. Activities that will generate traffic include:

- geotechnical investigations (requiring site access for drill rigs, usually mounted on small trucks or utility vehicles)
- clearance of vegetation
- earthworks (excavation of cuttings and construction of embankments and transportation of materials for fill)
- construction of bridges
- excavation of tunnels
- track laying (including foundations, ballast, tracks)
- station construction (including platforms, station buildings, lifts, pedestrian over bridges, car parks, bus interchange and pedestrian accesses)

- electrification, and installation of signalling
- commissioning.

At this early stage of the project, it is not possible to accurately estimate the volume of construction traffic, as the exact construction methods and staging are not yet known. As a guide, based on the volume of excess fill that will need to be removed, (900,000 m³ excavated – 650,000 m³ fill required = 250,000 m³ excess material), then a single dump truck with a 12.5 m³ capacity would require 20,000 movements, which could be potentially halved by using truck and trailer to remove the excess fill.

Wherever possible, it would be appropriate for construction workers to be encouraged to use rail transport. However, depending on their work schedules, and their place of residence, this may not be a realistic objective.

Due to the volume of materials that can be excavated and re-used, a mitigation of the construction traffic generation would be to stockpile the materials at strategic locations in the project area, so that construction traffic movements are limited to on-site movements.

Mitigation measures

- Ensure rail station design is consistent with the scale and character of the townships.
- Maintain access to stations during construction by using temporary platforms and car parking arrangements where required.
- Consider staging and temporary access requirements during the design phase.
- Minimise the footprint of earthworks and land requirements.
- Provide bus services to replace train services during period of disruption.
- Stage construction at stations to minimise impacts on the operation of the existing railway.
- Construct grade separated road/rail crossings at a time when risk and traffic congestion dictate the need for their closure.
- Prepare construction traffic management plans for relevant activities to be approved by Council and QR Limited prior to the commencement of construction.
- Construct new permanent accesses where accesses are impacted by the project.
- Provide temporary roads and alternative routes to replace roads closed by construction activities.
- Consider the aesthetics, noise mitigation requirements, construction materials and safety and access provisions during the detailed design process

- ensure bridges comply with current design standards for road design
- consider re-use of sections of the existing railway not required for the new railway for recreational purposes
- consider the removal of bridges not required for the new railway for safety, environmental or maintenance minimisation reasons.

Summary

Once mitigation measures have been implemented, the residual impact of the project on topography within the project area is as follows:

Potential Impact	Residual Impact Significance
Design	
Rail services	Beneficial (local, regional, State, long-term)
Construction	
Passenger rail services	Moderate adverse (short-term, local)
Bus services	Low adverse (short-term, local)
Effects on road network	Low adverse (short-term, local)
Upgrade/Closure of existing bridges	Low adverse (short-term)
Construction access	Low adverse (short-term)
Construction traffic	Low adverse (short-term)
Operation	
Rail service capacity frequency and travel times	Beneficial
Freight rail services	Beneficial (regional, State, long-term)
Bus services	Negligible and Beneficial (long-term, local and regional)
Effects on road network	Beneficial (long-term, local, regional)
Open level crossings	Grade separation- long-term beneficial
Decommissioning	
Opportunities for recreational trails and cycle paths	Beneficial- subject to further decisions on connectivity and maintenance priorities

8. Economic environment

The following presents a summary of the key findings. For more detail see the environmental impact statement Chapter 8 – Economic environment.

Existing conditions

Key demographic trends for the study area include:

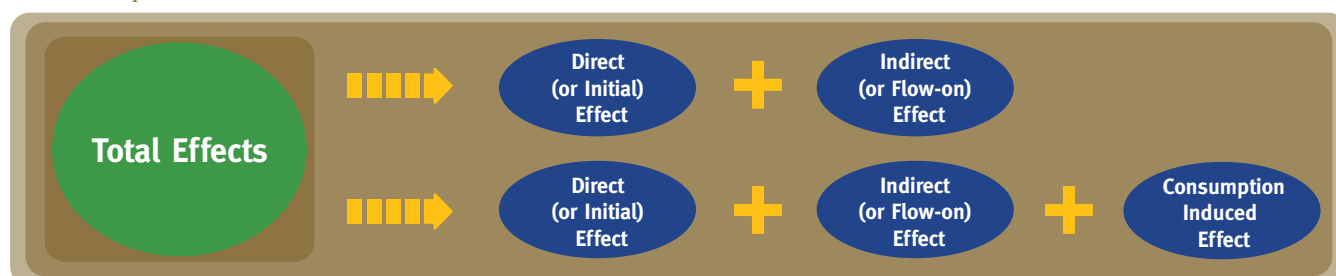
- 54,702 people live within the study area (based on 2006 Census data) equating to 19.8 percent of the Sunshine Coast's total population.
- The study area has high levels of home ownership (35.3 percent of dwellings are fully owned and 38.4 percent of dwellings being purchased) compared to south east Queensland (30.6 percent fully owned and 35.9 percent being purchased). Subsequently, there were lower rates of rental tenure in the study area (20.7 percent of total dwellings) compared to south east Queensland (27.6 percent).
- Separate dwellings were the dominant type of dwelling in the study area, with low proportions of semi-detached and attached dwellings (i.e. units, apartments, townhouses and duplexes) when compared to south east Queensland.
- Households in the study area were automobile dependent, with very low levels of public transport used as a main mode of travel to work.
- Nearly one fifth (18 percent) of all people employed in the study area worked as technicians or trades workers. Other occupational groups with a high proportion within the study area included professionals and labourers. Although the professionals occupation group is the second largest by proportion in the study area, it is well below the proportion of professional employees in south east Queensland and Queensland (where in both cases it is the highest proportion of occupations).
- The study area had an employment self-sufficiency ratio of 87.76 percent with approximately 16,916 jobs in the area and 19,275 employed residents. Employment self sufficiency is a measure of the total number of jobs in a region over the employed residents in the region and, thus, accounts for journey to work movements (residents leaving the region for work and employees entering the region for work).
- The self-containment rate for the study area is 66 percent, and is a measure of employed residents who live and work in the region over the total number of employed residents. There were 12,741 residents of the study area also working in the study area.
- According to Real Estate Institute of Queensland data, the median house price for the study area ranged between \$288,500 and \$385,000 for urban residential and \$386,000 and \$510,000 for acreage living.
- Each of the townships in the project have some form of tourist accommodation varying from unpowered campsites to exclusive rainforest and mountain retreats.
- There is potential for future dwellings in the townships in the project area in line with policy decisions made in Council's growth management plans and the South East Queensland Regional Plan and the varied environmental constraints in each township.

Impact assessment

The purpose of assessing economic impacts is to examine how the project affects the economy of south east Queensland and Queensland through all of the linkages between industries in the economy. It is the sum of the direct contribution (or 'economic stimulus') of the project, and the 'indirect' contribution ('flow-on effect') to the economy. The final result is an overall picture of the project's total economic contribution.

The total impact or contribution consists of 'direct effects' (also known as the 'initial effect') and 'indirect effects' (also known as the 'flow-on effects'). The direct effect measures the level of output, employment or value added directly generated through the

Economic Impact Assessment



construction project. In the case of the Landsborough to Nambour Rail Project, the direct effect in the construction phase would be the total construction, planning and management costs.

The 'indirect contribution' to the economy of the study area exists because the construction processes would require purchase of inputs from companies who would in turn spend those dollars on their inputs, and so on. The indirect contribution therefore traces the flow of money spent in the south east Queensland and Queensland economy and is the measure of the additional value generated in the economy due to implementation of the project. Calculation of the total indirect contribution is based on all expenditures associated with the project.

These indirect contributions can be measured in terms of the dollars of spending that they generate, in terms of the value added they generate and also the additional jobs they generate in other sectors of the economy.

Construction impacts

The capital cost of the project has been estimated to be approximately \$1.7 billion.

South east Queensland

- The total impact of the project on the south east Queensland economy during the entire construction period will be approximately \$3.2 billion.
- The total impact consists of a direct and indirect (flow-on) component. The direct impact to the economy will be approximately \$1.27 billion, and the flow-on impact induced in the economy will be around \$1.94 billion.
- Assuming a seven-year construction period, the project will directly contribute \$180.7 million annually to the south east Queensland economy and will induce a further \$277 million annually in flow-on contributions. This will total approximately \$457.7 million annually.

Queensland

- The total impact of the project on the wider Queensland economy will be approximately \$4.57 billion for the construction period.
- The direct output contribution to the economy will be approximately \$1.58 billion, or the total cost of the project. This direct impact will generate a flow-on impact in the economy of around \$2.99 billion.
- During the construction period (seven years), the direct annual impact to the Queensland economy will be approximately \$225.6 million. Around \$427.5 million will be induced in the economy annually as an indirect effect of the construction period processes, making a total annual impact of \$653.5 million dollars over the construction period.

Employment impacts

South east Queensland

- The project will support approximately 659 jobs directly in the south east Queensland economy on average during the construction period.
- The flow-on output generated through the construction period will support approximately 1,269 jobs in the economy.
- On average for the life of the construction, the project will support approximately 1,928 total jobs at any particular point in time, whether directly or indirectly.

Queensland

- The project will support approximately 2,786 jobs directly in the Queensland economy on average during the construction period.
- These jobs are made up of 850 direct jobs held in the economy as a result of the value of the construction processes, and a further 1,936 jobs on average induced in the Queensland economy due to the flow-on effects of the project's output.

Housing impacts

- Some residential properties will need to be resumed for the project, but it is reasonable to expect that some of these will seek to re-establish in the area, stimulating additional demand and development.
- It is estimated that for the project to proceed, there will be approximately \$105.8 million dollars spent on land acquisition.
- During the construction of the project, it is also expected that there will be an increase in housing demand to accommodate workers and this will encourage new housing development.
- It is expected that rail project workers will come from the local area where possible; however the sourcing of workers will be dependant on the economy and labour market conditions at the time of construction. A significant workforce, from outside of the area, is likely to require short to medium term accommodation.
- There will also be some short-term disruption to some residential properties along the corridor as the project proceeds, however in the longer term the attraction of high quality rail services is expected to stimulate new housing development.
- High quality public transport has the potential to attract residential development, particularly when stations are well designed and supported by transit oriented development.

Other economic impacts

Apart from the quantifiable economic impacts associated with the spending arising from the project (as detailed in the previous section), there are other economic impacts which have not been costed but nevertheless should be considered.



These include:

- travel time savings (passenger and freight)
- increased regional public transport connections leading to increased choice of travel destinations
- savings related to private vehicle operating costs
- reduction in the growth of road accidents through improved utilisation of public transport along the corridor
- concentration of industries due to public transport options
- social connectivity
- higher patronage on public transport due to reduced travel times and increased comfort
- reduction in social exclusion.

Mitigation measures

The following mitigation measures are proposed to manage the economic impacts arising from the project:

- Work with the Local Government Authority to identify suitable areas for the relocation of businesses impacted by the project.
- Inform businesses with direct property impacts early to allow strategies for relocation if possible.
- Limit construction impacts (noise, dust etc) on local businesses.
- Prepare and implement a skills development plan (in line with the Queensland State Government's 10 Percent Policy) to be monitored by the Department of Education and Training.
- Utilise local businesses where possible through a Local Industry Participation Plan (under the Local Industry Policy).
- Prepare an accommodation strategy to enhance use of local rental and short-term accommodation, and limit adverse impacts (e.g. inflated rents, loss of tourist capacity).
- Consider appropriate uses for the decommissioned rail line, such as rail trails and rehabilitated areas, to encourage tourism activity in the area.

Summary

The project will have a significant economic benefit for south east Queensland and Queensland through the injection of project spending into the economy. The localised adverse impacts associated with construction activities need to be carefully managed while benefits can be enhanced through specific strategies. Key benefits of the project include:

- a total of \$3.2 billion of output generation into the south east Queensland economy over the entire construction period (seven years), and a total of 1,928 jobs on average at any point in time

- a total of \$4.57 billion of output generation into the Queensland economy (including south east Queensland) over the entire construction period (seven years) and a total of 2,786 jobs on average at any point in time
- savings in time taken to travel for commuters, local passengers, long distance tourist trips and freight
- savings in private vehicle operation costs and reduction in the growth of road accidents
- improvements in the overall public transport network
- enhancement of local business opportunities and employment clusters
- improved social connectivity.

9. Social environment

A number of issues and considerations have been determined through the review of the relevant State and local government policies and strategies. The issues and considerations to be noted for the social impact assessment are as follows:

- The delivery of integrated public transport is a key regional outcome defined in the South East Queensland Regional Plan and as such, the upgrades to the North Coast Line on the Sunshine Coast are identified as priority projects in the South East Queensland Infrastructure Plan and Program.
- The project has the potential to contribute to the achievement of well connected communities by increasing the efficiency and frequency of rail services between activity centres on the Sunshine Coast.
- Access to improved public transport services is considered a priority for communities on the Sunshine Coast.
- The hinterland communities within the study area are unlikely to experience significant growth over the next 20 years, with the exception of Nambour and Beerwah (Major Activity Centres). However, the communities may expect further residential development beyond 2026. Based on the current planning intentions, future development within the study area is expected to complement the existing rural character and amenity of the communities concerned.
- No major community infrastructure projects are identified for the study area. Major Activity Centres (Nambour and Beerwah) will continue to function as service centres for the hinterland communities on the Sunshine Coast, and future facilities and service provision will be directed to these activity centres.

The following presents a summary of the key findings. For more detail see the environmental impact statement, Chapter 9 – Social environment.

Existing conditions

- The study area had a lower annual growth rate during the period 2001–2006 than the rest of the Sunshine Coast.
- Within the study area, 1.7 percent of the population identified themselves as being of Indigenous descent in the 2006 Census. This was slightly lower than in south east Queensland, where 1.8 percent of all respondents nominated as being of Indigenous descent.
- A large proportion of the population within the study area is aged between 35 and 54 years of age and this population is ageing in line with the Sunshine Coast region based on 2006 Census data.
- A significant number of people within the study area are aged 5–14 years, most probably representing the offspring of people within the 35–54 age group.
- Couple families with children were the dominant family type across the study area. This was closely followed by couple families without children and one parent families. This is similar to both south east Queensland and Queensland's household composition.
- Households in the study area were automobile dependent, with very low levels of public transport used as a main mode of travel to work.
- Communities located within the project area, with the exception of Nambour, are cohesive communities consisting of small populations.

Impact assessment

The following impacts related to the project's social environment have been identified:

- The project is likely to deliver positive impacts on localities that have been identified to accommodate future population growth (i.e. Mooloolah, Palmwoods, Woombye and Nambour).
- The project is likely to have some impacts on property values in the short to medium-term especially for properties directly adjacent to the proposed rail corridor. In the long-term, property values are likely to increase as accessibility to high frequency rail services becomes more desirable and living close to the rail line becomes an accepted part of the lifestyle for rail town communities.
- The new rail corridor will affect approximately 64 hectares of urban footprint, with around 6 hectares of surplus rail corridor land made available for re-use in the townships.
- The likely impacts on community wellbeing would be largely associated with the resumption of properties and the subsequent changes to the demographics of the affected rail towns.

- In the long-term, the level of community wellbeing in the affected rail towns is likely to increase through the potential creation of employment and business opportunities, increased health benefits related to the use of public transport (as opposed to the existing dependence on motor vehicles), improved patronage and improved community safety.
- With many of the affected communities consisting of small populations, there will be negative impacts on community wellbeing, resulting from the resumption of properties.
- The impact on community wellbeing at the regional level is likely to be the improvement in connectivity between the rail towns with each rail town having a distinct town centre/station with a range of opportunities for local businesses and community activities.
- In general, residents' access to community infrastructure and open space facilities would be improved through the implementation of the project.

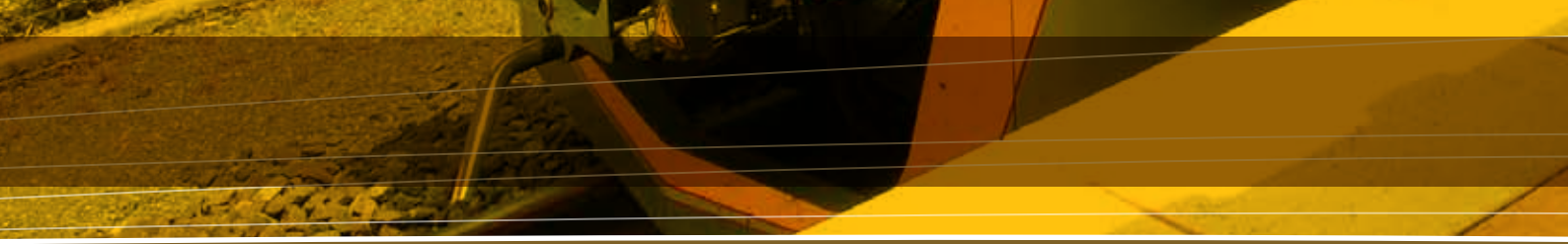
Mitigation measures

- Design new or improve existing rail stations to complement the towns' identity as 'rail townships'.
- Consider recreational uses for the decommissioned railway, such as a shared cycle/pedestrian trail.
- Make recommendations to the Sunshine Coast Regional Council regarding re-use of surplus railway land for consideration as part of Council's current master planning for the railway townships along the proposed corridor.
- Compensate land owners (in line with relevant legislation) where there is a land requirement for the project and ensure community development programs are delivered to support affected families and communities.
- Continue to consult with the community through the detailed design phase for the project.

Summary

The assessment of the social impacts for the project found both positive and negative impacts. Once mitigation measures have been implemented, the residual impact of the project on the social environment within the project area is as follows:

Potential Impact	Residual Impact Significance
Opportunities for improved business and community activities around the rail stations	Beneficial
Loss or change in residential amenity and lifestyle values	Negligible
Impact on township character	Negligible to beneficial
Impact on the natural environment valued by the local community	Low adverse



Potential Impact	Residual Impact Significance
Potential relocation or loss of facilities considered to be of high community value	Moderate adverse
Impact on Nambour in reinforcing its role as a Major Activity Centre	Beneficial
Regional impact: contribution to achieving the objectives of the SEQ Regional Plan	Beneficial
Impact on property values	Beneficial in the long-term
Reduction in land availability for housing as a result of a wider corridor	Negligible in the long-term
Impact on housing affordability	Beneficial in the long-term
Resumption of properties	High adverse in the short-term
Changes to the demographics of the towns	Minor adverse in the short-term; Beneficial in the long-term
Possibility of improved and new business and social opportunities for residents	Beneficial
Improve resident access to public transport	Beneficial
Possible improvements in surveillance and safety around the station	Beneficial
Opportunity to provide cycle and pedestrian linkages between the towns with the decommissioning of the existing railway corridor	Beneficial

10. Cultural heritage

The environmental impact statement process triggers the need for the development of a Cultural Heritage Management Plan to protect and preserve Aboriginal cultural heritage. The development of the Cultural Heritage Management Plan requires formal notification of the Aboriginal Parties pursuant to section 91 of the *Aboriginal Cultural Heritage Act 2003* followed by endorsement of those Aboriginal Parties who respond to the notification. The development of a Cultural Heritage Management Plan will provide protection and/or management of cultural heritage values for any objects or areas found during cultural heritage surveys and consultation with Elders nominated by Aboriginal Parties.

Aboriginal Parties and landowners were notified on 12 January 2009 of the proponent's intention to prepare a Cultural Heritage Management Plan for the project. The Jinibara People have given written notice to the Department of Transport and Main Roads of their intention to take part in the Cultural Heritage Management Plan.

A cultural heritage assessment was undertaken for the project to qualify the presence of cultural heritage (non-Indigenous) items within and in the vicinity of the project area, and consider the impact of the proposed project and the residual effects on these sites, precincts and character areas.

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 10 – Cultural heritage.

Existing conditions

Aboriginal cultural heritage

A number of known sites of Aboriginal cultural heritage are located in the vicinity of the project. These include a burial cave, an Indigenous place, a significant place, scattered artefacts and other isolated finds.

The project area lies within an area that has no registered or unregistered native title claims. Two previously registered claims were located in the area. These parties with formerly registered claims are being consulted in the process of preparing the project's Cultural Heritage Management Plan.

Relevant Aboriginal Parties in the vicinity of the project area:

- The Jinibara People have a registered native title claim over lands situated to the west of the current railway.
- To the east of this corridor, the previous registered Gubbi Gubbi No 2 native title claim existed until its discontinuation by the Federal Court in 2004.

Historical (non-Indigenous) cultural heritage

The history of the rail towns dates back to the late 1800s when settlements began to emerge, principally due to the development of transport infrastructure between Brisbane and northern settlements such as Gympie. Road development, particularly for Cobb and Co coaches, first opened up the region to closer settlement. The advent of rail in 1891 further boosted the development of these towns. The development of this infrastructure connected the towns and their produce (mainly timber, fruit and sugar cane) to the economically important southern markets. Tourism also came to have an impact in the second half of the twentieth century.

National and Commonwealth Heritage Lists

The National and Commonwealth Heritage Lists are compiled by the Australian Heritage Council and provide an inventory of Australia's natural and cultural heritage places. Sites and places of historic (non-Indigenous) cultural heritage significance listed on the National Heritage List or Commonwealth Heritage List are protected under the *Environmental Protection and Biodiversity Conservation Act 1999*.

There were no sites registered on the National Heritage List or Commonwealth Heritage List identified within the project area.

Former Register of the National Estate

An online search of the former Register of the National Estate was conducted to identify places and sites of cultural heritage significance. The Register of the National Estate is maintained by the Australian Heritage Council and is an inventory of Australia's natural and cultural heritage places that are worth conserving for the future. The Register of the National Estate was frozen on 19 February 2007, which means that no new places can be added or removed, however the Register will continue as a non-statutory register until February 2012. Sites nominated on the Register of the National Estate and located within the project area include:

- pedestrian rail crossing bridge and waiting shed, Mooloolah
- Palmwoods to Buderim tramway route
- north coast railway national parks, north coast railway line
- nurses quarters at Nambour Hospital, Hospital Road, Nambour.

Queensland Heritage Register

The Queensland Heritage Register is maintained by the Cultural Heritage Branch of the former Environmental Protection Agency now Department of Environment and Resource Management, with the aim of protecting historic cultural heritage for future generations. All sites and places of historic (non-Indigenous) cultural heritage significance listed on the register are protected under the *Queensland Heritage Act 1992*. A number of sites within or in the vicinity of the project area are listed on the Queensland Heritage Register. These include:

- Dularcha Tunnel (1.5 km south of Mooloolah Township)
- the former Landsborough Shire Council Chambers (6 Maleny Street, Landsborough)
- Palmwoods to Buderim Tramway Track Foundation and Formwork Remnants (Chevallum Road, Palmwoods to Telco Road, Buderim)
- Nambour section of the Moreton Central Sugar Mill Cane Tramway (Mill Street, Currie Street and Howard Street, Nambour).

In addition to these heritage listed sites, the Department of Environment and Resource Management is undertaking a State wide survey of potential sites for recommendation for inclusion on the Queensland Heritage Register.

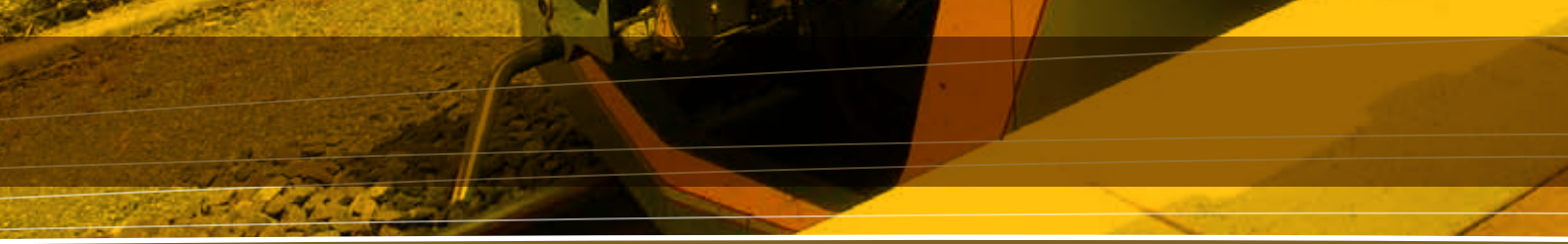
These included:

- Landsborough Air Raid Shelter - Landsborough Station, Landsborough
- Old Bruce Highway Rest Areas - Jowarra, Steve Irwin Way, Landsborough
- Bankfoot House - 1998 Old Gympie Road, Glass House Mountain
- Old Bruce Highway Road Rest Areas - Nambour Connection Road
- Big Pineapple - Nambour Connection Road, Nambour.

Local Government Registers

Historic heritage places of local significance within and in the vicinity of the project area recognised by relevant local government agencies include:

- churches in Landsborough, Palmwoods and Nambour
- the former Landsborough Shire Chambers
- a former police station, shire office, shops, hall, post office, hospital, Masonic Lodge, cinema
- Landsborough School of Arts Memorial Hall
- Mellum Club Hotel, Landsborough
- Landsborough Railway Station and Footbridge
- Landsborough Air Raid Shelter
- Peace Memorial Park, Landsborough
- Mooloolah Railway Shelter
- Dularcha Railway Tunnel
- a number of early 19th and 20th century houses
- Eudlo State School
- Eudlo general store
- Eudlo Community Hall
- shops in Palmwoods (Main Street and the current IGA)
- Palmwoods Railway Station and goods shed
- Palmwoods Memorial Hall
- soldiers memorial in Woombye Memorial Park
- Woombye Schools of Arts
- railway bridge, Currie Street Nambour
- Club Hotel Nambour
- Royal George Hotel Nambour
- Moreton Mill Weir
- Nambour Museum
- Petrie Park
- Mill Manager's home and two others (Nambour).



QR Limited Heritage Register

QR Limited maintain an internal database of sites and places which are considered to contain heritage value. A review of the QR Limited Heritage Asset Register Records revealed several sites of significance within the project area. These include:

- Landsborough Crane
- Landsborough Train Station and Foot Bridge
- Landsborough Air Raid Shelter
- Palmwoods to Buderim Tramway Route
- Palmwoods Train Station
- Palmwoods Goods Shed
- Woombye Station
- Nambour Station.

Other sites of cultural heritage significance

A number of other sites of cultural heritage significance were identified during field surveys. These include:

- a RSL memorial – corner of Cribb and Maleny Streets, Landsborough
- a number of late 19th/early 20th century houses and other historic houses
- CWA Park and Hall – Landsborough Road, Landsborough
- a Pet Cemetery – Tunnel Ridge Road, Landsborough
- a number of parks
- Mooloolah Public Hall
- Mooloolah Masonic Hall
- a number of old bridges and culverts
- Mooloolah Valley Community Centre
- Eudlo Centenary Memorial Tree
- Eudlo skate park
- Eudlo Creek Timber Mill
- Sir Francis Nicklin Clock – Main Street Palmwoods
- Kolara Park (including the freshwater lagoon, walking trail, mature planting and railway workers cottages)- Palmwoods
- Woombye war cemetery
- scout hall – Woombye
- soccer fields (former showgrounds) – Woombye
- former station master's office – Nambour
- former sugar mill engineer's office – Nambour.

Precincts

A precinct is defined as an area where there is a density of heritage sites and places of significance interrelated by common historical themes, functionality or aesthetics. Individual sites and places within a precinct may be of significance. Conversely, a range of sites and places within a precinct may not be individually of higher levels of heritage significance, but may, as part of the overall precinct, contribute to the precinct's significance. Both the former Caloundra City Council and former Maroochy Shire Council identified precincts within their jurisdiction. These include:

- eastern residential area, Landsborough
- Cribb Street precinct, Landsborough
- Rosebed Street precinct, Eudlo
- Main Street precinct, Palmwoods
- Blackall Street precinct, Woombye
- Currie Street precinct, Nambour
- lower Blackall Terrace precinct, Nambour.

Impact assessment

Aboriginal cultural heritage

Most sites of Aboriginal cultural heritage significance within the project area are not located in the immediate vicinity of the project and are unlikely to be directly affected by the project. However, a burial site identified by the Aboriginal and Torres Strait Islander Cultural Heritage Register is located in Kolara Park in Palmwoods, in close proximity to the project. The railway will be on a bridge structure at this location. The construction of the piers and associated construction access tracks could potentially affect the burial site. Measures proposed in the project Environmental Management Plan and the Cultural Heritage Management Plan will prevent and mitigate impacts on registered and unknown sites of Aboriginal significance, including the burial site in Kolara Park.

All undeveloped areas in the project area could potentially contain sites of Aboriginal cultural significance. A survey of the project area will be undertaken as part of the development of a Cultural Heritage Management Plan.

Historical cultural heritage

Impact on heritage sites, places and precincts is possible where:

- a new rail and/or road infrastructure is introduced to the existing railway alignment
- a new rail and/or road infrastructure is introduced to areas not previously designated for a railway alignment
- new railway stations make existing railway stations redundant
- the project impacts visually on heritage sites and places.

Outside of these activities, impact on cultural heritage sites and places within the project area is not expected.

Mitigation measures

A number of mitigation measures are proposed to address the project's cultural heritage impacts.

Aboriginal cultural heritage

- Prepare a Cultural Heritage Management Plan with the appropriate Aboriginal parties prior to the commencement of construction.

Historical cultural heritage

- Prepare a detailed conservation management plan for sites where impacts cannot be avoided.
- Consult with the Department of Environment and Resource Management regarding management plans for sites of State significance and the Sunshine Coast Regional Council for sites of local significance.
- Appoint a heritage archaeologist to be on-call for the duration of the construction period to assess unexpected finds.
- Implement buffer zones around known heritage sites.
- Prohibit heavy construction vehicles from using bridges of heritage significance.
- Consider suitable design, re-use and interpretation of heritage elements in the design of new stations (especially Mooloolah and Palmwoods), bridge structures (especially in Palmwoods) and related areas.
- Create archival records (including photographs) of heritage sites and lodge these with libraries and Council.

Summary

The project area currently is within an area over which no registered or unregistered Native Title claims exist. However, previously registered Native Title claims guide the selection of the Aboriginal parties. Sites of Aboriginal cultural heritage significance are known to exist in the project area. A Cultural Heritage Management Plan will be developed for the project prior to the ground investigations and construction works being undertaken.

This historic cultural heritage assessment for the proposed Landsborough to Nambour Rail Project determined that a range of impacts on historical cultural heritage values are associated with the project. Of most significance is the cumulative effect on the towns that exist within the proposed rail corridor and broader project area.

Once mitigation measures have been implemented, the residual impact of the project on the cultural heritage aspects of the project area is as follows:

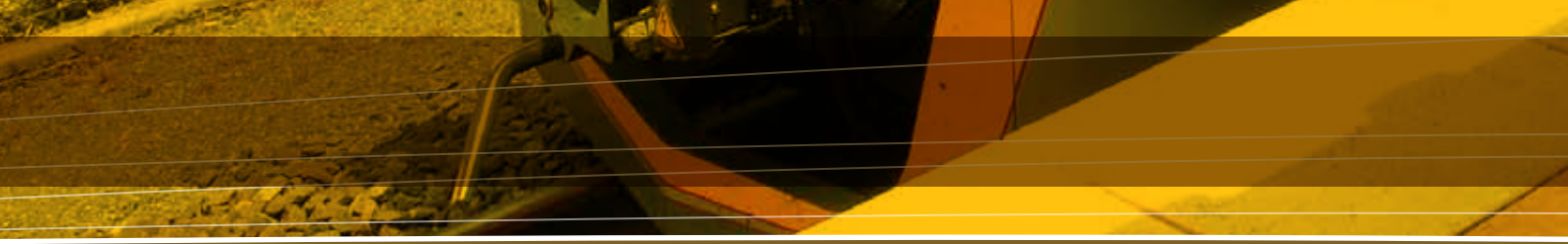
Heritage Site, Place or Precinct	Residual Impact
Mooloolah Station Pedestrian Rail Crossing Bridge and waiting shed, Bray Road, Mooloolah	Low-Moderate Adverse
Palmwoods Station and Goods Shed, Railway Street, Palmwoods	Low-Moderate Adverse
Former dairy, 87 Neill Road, Mooloolah	Low-Moderate adverse
Eudlo Creek National Park, Palmwoods (part of North Coast Railway National Parks)	Low-Moderate Adverse
Palmwoods Kolora Park, freshwater lagoon, walking trail and mature plantings, Chevallum Road, Palmwoods	Low-Moderate Adverse
Scout hall, Woombye	Moderate Adverse
Soccer fields, Woombye (west side of train tracks near station)	Moderate Adverse
Timber and metal road bridge, Blackall Range Road, Woombye	Low-Moderate Adverse
Woombye Station, Woombye	Low-Moderate Adverse

11. Nature conservation: Terrestrial flora

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 11 – Nature conservation: Terrestrial flora.

Existing conditions

The project traverses conservation areas (including two National Parks) and as well as modified and developed areas including small rural townships, residential areas, open fields and plantations. The majority of remaining vegetation within the project area is of good quality and as such it has been mapped as remnant vegetation and classified as 'regional ecosystem' types by the Queensland Herbarium and afforded protection under the *Vegetation Management Act 1999*. The vegetation is concentrated along creeks, ridge lines and within protected areas.



These are areas that have not yet been affected by clearing or urban development. There are 20 regional ecosystems within the project area. Of these, two regional ecosystems are 'Endangered' and nine are 'Of Concern'. Several significant flora species that are protected under the *Nature Conservation Act 1992* or the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* are also known from the local area.

Remnant vegetation communities

- The project traverses 20 identified regional ecosystems (18 mapped by Queensland Herbarium and two that are not mapped but were identified during field surveys).
- Of the 20 regional ecosystems identified within the project area, two are 'Endangered', nine are 'Of Concern' and nine are 'Not of Concern'.
- All large areas of vegetation are mapped as remnant and there are no significant areas of regrowth in the project area.
- There are no Threatened Ecological Communities within the project area and the nearest Wetland of International Significance was the Moreton Bay Ramsar site (approximately 17 km south-east of the project area).

Biodiversity Values

Two locations within the project area stand out as having particularly high biodiversity value. These are Dularcha National Park and the higher country between Mooloolah and Eudlo (The Pinch Lane area).

Other locations associated with high biodiversity values include Eudlo Creek National Park, Paskins Road towards the southern end of Palmwoods and the remnant riverine vegetation of Paynter Creek.

Significant Species

A review of existing information and databases indicated the potential for 20 threatened flora species to occur within the project area. Plant species that provide habitat and/or food for 'Rare' and 'Threatened' fauna species also exist within the project area.

Old Growth Trees

Large trees were observed in Dularcha and Eudlo Creek National Parks, especially blackbutt (*Eucalyptus pilularis*) and flooded gum (*Eucalyptus grandis*). The large mature trees observed had not yet shown old growth characteristics (i.e. trees that have attained sufficient size and age to produce hollows because of decay, damage and limb dropping). They are potentially a valuable source of seed for ecosystem regeneration, and provide the over-arching structure which protects other vegetation. Large trees of this type were also observed on surrounding private property, often in proximity to the national parks.

Many of the watercourses along the corridor have large flooded gum. These large trees have similar ecological values to those observed in the national parks, with the additional value of bank stabilisation.

Horticultural crops and cultural value

Within the project area there are several places where vegetation exists that may not be of high ecological value but have cultural or economic value. Large individual trees or stands of trees may have cultural value and agricultural areas often have an economic and lifestyle value. Examples of locations where there is vegetation with cultural or economic value are described below:

- One large relict rainforest tree (brown beech, *Pennantia cunninghamii*) was observed along Spackman Lane, in a disturbed (non-remnant) area. It has been identified as an important local tree because it is one of few remaining large rainforest trees in the area. Rainforest trees of this size (trunk diameter of approximately 1 m) are uncommon in the project area.
- There is a significant community vegetation project at Eudlo. The Eudlo and Ilkley Landcare Group have established an advanced rainforest regeneration area (in conjunction with QR Limited) adjacent to Eudlo railway station and Eudlo Creek. It is called 'Federation Walk' and presents as a narrow rainforest planting of about 30 m x 300 m.
- There are two significant occurrences of horticultural crops in the vicinity of the alignment: an area east of Spackman Lane, Palmwoods and Birdwood Nursery, south of Nambour.

Weeds

Infestations of lantana (*Lantana camara*) and other weeds were observed throughout the project area, and regularly along the existing railway corridor. These infestations are consistent with areas that have been cleared. Other weeds common in the project area include cat's-claw creeper (*Macfadyena unguis-cati*), silver-leaf desmodium (*Desmodium uncinatum*) and mother of millions (*Bryophyllum spp.*).

Impact assessment

Potential impacts on terrestrial flora related to the construction and operation of the project include:

- clearing of remnant vegetation
- reduction of flora habitat and biodiversity
- removal of individual species of significance
- reduction of vegetated corridor functionality
- remnant vegetation edge effects
- riparian vegetation disturbance
- removal of horticultural crops and vegetation of cultural significance.

It is estimated that approximately 22 ha of remnant vegetation will be removed, including a total of 5.3 ha of riparian vegetation. This represents approximately 25 percent of the total area of the proposed rail corridor. The majority of the vegetation to be cleared is 'Not of Concern' remnant vegetation. The project will not result in the removal of an entire regional ecosystem or waterway ecosystem from the locality. The project will result in the creation of 4,850 m of new edge that is susceptible to edge effects. Edge effects are defined as an area where the project traverses remnant vegetation and there has been no edge previously in that location.

Mitigation measures

Environmental offsets are a mechanism that can be used in environmental management to compensate for the impacts of developments on ecologically significant features. They are used to counterbalance unavoidable negative environmental impacts, where all other steps have been taken to avoid or minimise an impact but the residual impact still remains. Under the *Vegetation Management Act 1999*, the project is associated with a requirement to provide an offset of approximately 27.5 ha of remnant vegetation within the region. Whilst this will address the net loss of vegetation, it is still necessary to minimise impacts within the project area. In order to mitigate these impacts, the following measures are proposed:

Design

- Avoid significant areas of vegetation, horticultural crops and flora of cultural value during the design phase (where possible).
- Use bridges over significant riparian areas that allow for retention of groundcover or understorey vegetation where possible.
- Use tunnels and cut and cover construction methods to reduce the impact on bioregional corridors.
- Avoid further fragmentation of vegetation through national parks.
- Minimise the width of the rail corridor where possible.

Construction

- Obtain vegetation clearing permit/s from the Queensland Department of Environment and Resource Management as required under the *Vegetation Management Act 1999*.
- Minimise clearing to that which is necessary for construction activities.
- Carry out clearing activities in accordance with a Vegetation Management Plan.
- Install vegetation clearance markers (e.g. flagging tape, marker paint, high visibility poly-web fencing) prior to the commencement of vegetation clearance.

- Minimise clearing to ground level, where possible, and undertake slashing of existing vegetation layers or clearing with minimal ground disturbance (e.g. chain saw) so that the soil seed bank is retained.
- Survey areas to be cleared prior to construction to identify if there are any 'Threatened' plant species or old-growth trees in or directly adjacent to the corridor.
- Translocate 'Rare' or 'Threatened' plant species prior to the start of clearing activities.
- Lop or prune trees within the clearing zone where possible rather than remove them.
- Implement erosion and sediment control measures during construction activities.
- Use appropriate certification/wash down of vehicles used for construction activities to limit the spread of weeds.
- Salvage felled vegetation for use, such as mulching of smaller stems and branches, and sale of larger timber to contractors.
- Locate features such as fill stockpiles, access tracks and site facilities within the construction zone or in areas of existing disturbance.

Operation

- Rehabilitate construction areas that are not required for the operation of the railway using locally sourced plant stock where available.
- Establish a native plant nursery or make arrangements with an existing local supplier to ensure large quantities of appropriate vegetation is available for rehabilitation activities.
- Carry out vegetation offset activities.
- Monitor and maintain rehabilitated sites.
- Manage weeds within the rail corridor and in rehabilitated sites in line with a weed management plan.

Decommissioning

- Investigate opportunities to rehabilitate areas of the existing railway that are not required for the new railway.

Activities may include:

- removal of any fencing or sound proofing
- removal of rail infrastructure (including track and overhead powerlines)
- removal of embankment, i.e. ballast
- removal of contaminated materials – it should be noted that there is potential for the rail verges to be contaminated due to almost 100 years of weed control, including spraying of herbicide

- restoration of topography to suit existing landscape
- delineation of any recreational tracks
- site preparation (decompacting / ripping and topsoil) in area for planting
- mulching in area for planting
- planting (tubestock or seeding or hydromulching)
- regular maintenance (e.g. weed management) and monitoring.

Summary

Once mitigation measures have been implemented, the residual impact of the project on terrestrial flora within the project area is as follows:

- clearing of remnant vegetation - **moderate adverse** (short-term) and **low adverse** (long-term)
- reduction of flora habitat and diversity - **low adverse**
- removal of individual species of significance - **negligible to low adverse**
- reduction of vegetated corridor functionality - **low to moderate adverse**
- remnant vegetation edge effects - **moderate adverse**
- riparian vegetation disturbance- **low adverse**.

12. Nature conservation: Terrestrial fauna

The project traverses a significant area of remnant vegetation that can be categorised into a diversity of habitats, including eucalypt open forest, eucalypt woodlands, wet sclerophyll forest, riparian rainforest, paperbark wetlands, swamps and notophyll vine forest. With such a range of habitats and a large area of remnant vegetation, it can be expected that the project area would support a high diversity of terrestrial fauna, including some species of conservation significance. The majority of these fauna are likely to be concentrated around the southern portion of the project area from Landsborough to Palmwoods due to there being more remnant vegetation here.

In the southern portion of the project area, there are several areas of valuable habitat, including Dularcha National Park, Eudlo Creek National Park and two Bioregional Wildlife Corridors (in the areas around Rose Road and The Pinch Lane). There are also several major waterways that support remnant riparian rainforest, namely Addlington Creek, South Mooloolah River, Mooloolah River and Eudlo Creek. The areas of valuable habitat in the northern portion of the project area are limited to Paynter Creek and Petrie Creek.

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 12 – Nature conservation: Terrestrial fauna.

Existing conditions

Fauna habitat characteristics

Vegetation within the project area can be divided into seven basic types of habitat based on structure and resource composition. Each of these habitats will support different vertebrate communities. Each habitat type is described below:

- Rainforest/notophyll forest: at several locations within the project area, the riparian corridors are associated with notophyll forests. These areas provide high quality habitat for the Endangered Giant Barred Frog (*Mixophyes iteratus*) where permanent slow-flowing pools of water are present.
- Wet sclerophyll forests often occur in close proximity to rainforests but are distinct in having a tall canopy of eucalypt species. Beneath the canopy are scattered rainforest shrubs, although generally the sub-canopy is much more open than true rainforest.
- Alluvial sclerophyll forests which are eucalypt forests on alluvial soils, are not common within the project area. Those that are present are often degraded through cattle grazing activities and the associated introduction of exotic grass species.
- Dry hillside sclerophyll forests, which are open dry sclerophyll forests with a mix of eucalypt species, are common in the project area, particularly on ridgelines such as those occurring along Rose Road and The Pinch Lane.
- *Melaleuca* wetlands, which are low-lying areas dominated by *Melaleuca quinquenervia*, are not common within the project area. Three notable areas are associated with low-lying waterways in the southern portion of Dularcha National Park.
- Open pasture, which are highly modified habitats where most native vegetation has been removed to facilitate cattle grazing, are abundant within the project area. The resulting habitats usually have very simple habitat structure with no vertical complexity and a dense, low ground layer of introduced grasses.
- Two other highly modified habitats were observed within the project area. Parks and gardens associated with towns and urban areas are inhabited by a variety of species that are typically generalists.

Wildlife corridors

Wildlife corridors allow both plants and animals to disperse, migrate or move from one area of habitat to another. They are therefore important to local and regional biodiversity values. The Biodiversity Assessment Mapping Methodology process for south east Queensland has identified corridor values that are considered to be of State, regional or local value. The proposed project bisects two areas mapped as valuable corridors:

- Vegetation located around Dularcha National Park is considered to be of local corridor value. This vegetation is therefore considered important for local wildlife movements.
- Vegetation associated with The Pinch Lane is considered to be of State corridor value and is therefore important for State wildlife movements.

In addition to these two Biodiversity Assessment Mapping Methodology recognised corridors, vegetation in Eudlo Creek National Park and surrounding areas would be likely to provide east-west movement opportunities to local fauna populations. Narrow, riparian vegetation along creek lines and rivers are also known to facilitate fauna movement, particularly for birds. Important local fauna movement corridors in the project area are Addlington Creek, Mooloolah River, Eudlo Creek, Paynter Creek and Petrie Creek.

Abundance and diversity of species

A total of 158 terrestrial vertebrate species were recorded from the project area including 15 amphibians, 10 reptiles, 109 birds and 24 mammals. Fifteen species of butterflies were opportunistically recorded. The majority of fauna recorded during the field investigation are not 'Threatened' under any legislation, however, 12 species are listed as 'Endangered', 'Vulnerable' or 'Rare' under the *Nature Conservation Act 1992* (NCA). Two species are listed under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An additional two listed species under *Nature Conservation Act 1992* were not detected but local records and suitable habitat suggest they occur.

Zoological Name	Common Name	Status		Likelihood
		NCA	EPBC Act	Occurrence
Butterflies				
Ornithoptera richmondii	Richmond Birdwing	V		Recorded
Amphibians				
Adelotus brevis	Tusked Frog	V		Recorded
Crinia tinnula	Wallum Froglet	V		Recorded
Mixophyes iteratus	Giant Barred Frog	E	E	Recorded

Reptiles				
Erotoscincus graciloides	Elf Skink	R		Recorded
Birds				
Accipiter novaehollandiae	Grey Goshawk	R		Recorded
Lophoictinia isura	Square-tailed Kite	R		Recorded
Rallus pectoralis	Lewin's Rail	R		Moderate
Calyptrorhynchus lathamii	Glossy Black-Cockatoo	V		Known
Ninox strenua	Powerful Owl	V		Known
Tyto tenebricosa	Sooty Owl	R		Recorded
Mammals				
Phascolarctos cinereus	Koala (south east Queensland)	V		Recorded
Pteropus poliocephalus	Grey-headed Flying-fox	LC	V	Recorded

Queensland's Nature Conservation Act 1992 (NCA Status)

- E = Endangered
- V = Vulnerable
- R = Rare
- LC = Least Concern wildlife

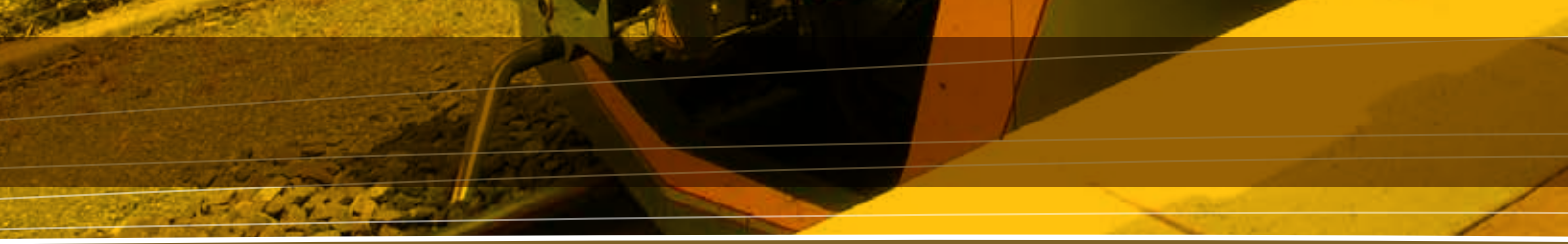
Australian Environment Protection and Biodiversity Conservation Act 1999 (EPBC Status)

- E = Endangered
- V = Vulnerable
- M = Migratory Species

Environmental Protection Agency's Biodiversity Assessment and Mapping Methodology (BAMM Status)

- Recorded = Recorded during surveys for the project
- Known = Known to occur through previous surveys or discussions with local landholders with reputable vertebrate identification skills
- Low = A low likelihood of occurring
- Moderate = A moderate likelihood of occurring with the possibility that transient individuals may use suitable habitats sporadically
- High = Species expected or considered highly likely to occur.

As the Giant Barred Frog is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act*, the project was referred to the Australian Government, which advised that it was not a 'controlled action'.



Pests

Five feral vertebrate species were noted during the survey:

- *Bufo marinus* Cane Toad
- *Streptopelia chinensis* Spotted Turtle-dove
- *Passer domesticus* House Sparrow
- *Vulpes vulpes* European Fox
- *Canis familiaris* Dog/Dingo.

Impact assessment

With regard to the potential impacts of the project on ecological values, the Department of Transport and Main Roads has made an undertaking to strive towards a policy of “No Net Loss” for biodiversity. This policy assumes that appropriate compensatory measures would be undertaken by the Department of Transport and Main Roads to ameliorate the impacts of the project on the project area. Acceptable compensatory measures include (but are not limited to) habitat acquisition and rehabilitation. It is the proponent’s intent that areas of equal or higher conservation value would be sought for acquisition and/or rehabilitation (in line with the offsets policy under the *Vegetation Management Act 1999*) to compensate for the loss and/or degradation of natural habitat within and adjacent to the project.

The main potential impacting processes to terrestrial fauna associated with the construction and operation of the project are:

- clearing of remnant vegetation
- habitat fragmentation and reduction in wildlife corridor functionality
- decreasing condition of habitat (unviable patch size/ edge effects)
- introduction of feral animals
- fauna mortality and animal welfare
- removal of significant species.

Mitigation measures

Design

- The amount of significant fauna habitat impacted by the project has been minimised.
- Stations have been located as close as possible to existing stations or located in areas of low habitat value.
- The project has been kept as close as possible to the existing alignment in significant areas of habitat, such as Dularcha National Park.
- To minimise vegetation clearing, tunnels have been incorporated into the design.

- The width allowed for the construction of the corridor has been minimised, where possible, in sensitive areas through the use of retaining walls and tunnels.
- Bridges over significant waterways have been designed, where practical, to reduce the amount of clearing required.
- Bridges have generally been located in areas where the riparian vegetation has been degraded or is narrow, to reduce the impact on higher quality vegetation.
- Fauna-friendly crossing structures have been considered wherever possible in the design of the new railway. This is essential at Addlington Creek (north).
- Fauna bridges or overpasses installed at major wildlife corridors are either constructed by tunnelling underground and leaving the ground surface intact, or by construction of a bridging structure over the disturbance corridor.
- Fauna guide fencing would be constructed within 100 m of either side of fauna crossing structures.
- In significant habitat areas where fencing is required to prevent public access, it is recommended that the fencing be fauna friendly with a 30 cm gap at the bottom to allow movement beneath.
- Incorporation of needs of significant species into the design of bridges and fauna crossings.

Construction

- Clearing along the proposed rail corridor to be limited to the amount necessary to undertake earthworks and to minimise the construction corridor where possible.
- Construction access tracks are to be located to avoid mature, remnant trees as much as possible.
- Hollow logs, rocks and large debris will be salvaged for use in habitat enhancement within areas for rehabilitation.
- Necessary slashing will be limited to a minimum height of 200 mm, to allow for the retention of ground layer and understorey vegetation elements in all areas not directly utilised for infrastructure construction or access track purposes.
- Ground cover and understorey vegetation will be retained under bridges.
- All materials and waste (including general human waste) will be stored in designated areas that are at least 50 m away from waterway corridors and designated areas to be designed to ensure no off-site impacts occur (e.g. bunding should be placed around fuel and chemical storage areas).
- Soil stability will be maintained in all disturbed areas, by means of erosion control mechanisms, including sediment barriers, berms, batters, fabric covers and/or mulching, temporary and permanent drains, etc.

- Engage an experienced spotter catcher to check vegetation for the presence of fauna immediately prior to its clearing.
- Time vegetation clearance to avoid peak breeding seasons of significant fauna.
- The location of nests / dens or fauna is to be clearly marked with flagging tape and these areas to be buffered by 10 m and retained until the fauna has moved on of its own volition.

Operation

- Manage vegetation offsets to replace areas of remnant regional ecosystems in accordance with the *Vegetation Management Act 1999*.
- Control and/or remove any weeds in the corridor that have been introduced or exacerbated as a result of the project.
- Rehabilitate areas necessary for construction, but not required for the operational phase.
- The operational phase is to be overseen by an environmental officer, who will periodically monitor weed cover, replanting success and report necessary maintenance to operational management.
- Undertake regular weed control at underpass locations by slashing grasses and removing silt that may cause water to pond.
- Design and implementation of an ongoing monitoring, trapping and eradication program that targets pest animals and trapping procedures to be undertaken by suitably trained personnel.
- Maintain fauna fencing.
- Monitoring of fauna strike incidents, so that any 'hot spot' areas can be identified and measures put in place to ameliorate the problem.

Decommissioning of the existing railway

- Rehabilitate sections of the existing railway that are not required for the operation of the new railway.

Summary

Once mitigation measures have been implemented, the residual impact of the project on terrestrial fauna within the project area is as follows:

- clearing of remnant vegetation - moderate adverse (short-term) and low adverse (long-term)
- habitat fragmentation and reduction in wildlife corridor functionality - low to moderate adverse
- decreasing condition of habitat - moderate adverse
- introduction of feral animals - low adverse
- fauna mortality and animal welfare - low adverse
- removal of significant species - low adverse and potential moderate adverse for *Mixophyes iteratus*.

13. Aquatic biology

The key ecological functional groups considered are:

- aquatic macrophytes (aquatic plants that are typically large enough to be visible to the naked eye) and habitats
- macroinvertebrates (animals without backbones that are visible to the naked eye)
- fish (freshwater)
- turtles (freshwater).

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 13 – Aquatic biology.

Existing conditions

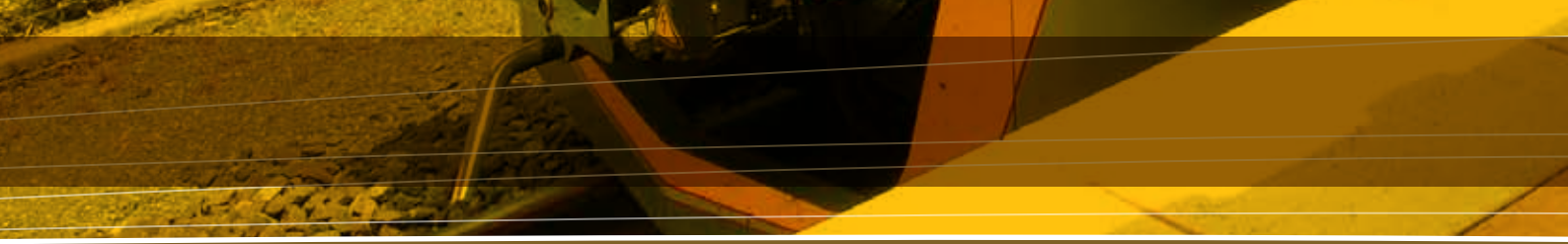
The project area incorporates three catchment areas (Pumicestone Passage, Maroochy and Mooloolah) and numerous creeks and drainage lines. These waterways traverse a variety of land uses including conservation, rural, rural residential, residential and small townships. As such, the extent and quality of the riparian zones (areas along the water's edge) vary significantly. The diversity and abundance of aquatic flora and fauna across the project area were expected to vary between catchments, as a reflection of riparian zone condition and water quality. It should be noted that the project does not cross any waterways associated with the Pumicestone Passage Catchment, but it does incorporate a small area of associated terrestrial environment.

Aquatic habitats

The following broad aquatic habitat features occur within the project area:

- semi-perennial freshwater rivers and streams
- low order ephemeral streams and drainages
- Palustrine (non tidal) wetlands.

Four of the waterways in the project area (Addlington Creek, South Mooloolah River, Mooloolah River and Eudlo Creek) have been recognised as habitat for *Environment Protection and Biodiversity Conservation Act 1999* listed Giant Barred Frog (*Mixophyes iteratus*).



Catchment Condition

Findings from the 2006 Ecosystem Health Monitoring Program assessment of the freshwater reaches of the Maroochy and Mooloolah catchments (i.e. northern and southern sections of the project area, respectively) can be summarised as follows:

Maroochy catchment - overall score of C- , streams generally in fair condition, nutrient cycling was poor, water quality, ecosystem processes and fish indicators are good.

Mooloolah catchment - overall score of B, streams generally in good condition, riparian vegetation in the upper catchment in good condition, all other indicators, apart from nutrient cycling score well.

Generally, the waters within and adjacent to the project area have been degraded by catchment clearing and ongoing human disturbances, though good quality habitat does occur in some places. Stream condition within the project area was rated as poor to good (20 to 80 percent).

Site-specific aquatic habitat features

Field surveys revealed a number of key conditions of micro-habitats in the creeks within the project area:

- Aquatic macrophyte cover was consistently low at most sampling sites.
- Wetted stream width ranged from 2 to 8 m for all sites, with the exception of a site on Petrie Creek, which had a mean width of 17 m.
- Mean water depth was variable among sites, ranging from 0.2 to 1.6 m.
- Most sites had a high cover (typically >15 percent) of large and small woody debris, root cover and leaf litter.
- Over-stream riparian vegetation cover was generally high throughout the project area.
- Generally, substrates were moderately compacted at all sites, with sediments composed of a mixture of sand and mud.

Overall, these habitat features were consistent (within each site) between the September 2007 and January 2008 surveys, with some exceptions.

Water quality

The water quality of waterways within the project area is described in detail in Chapter 14 – Water resources. Most water quality parameters are typically within or below the guidelines for slightly disturbed lowland rivers in south east Australia. The main exceptions to this are dissolved oxygen and turbidity.

Wetlands

No Ramsar or Nationally Important (Environment Australia 2001) wetlands were recorded within the project area. The Moreton Bay aggregation is the closest Ramsar site, located at the most downstream extent of the Pumicestone catchment (i.e. estuarine sections of Pumicestone Passage).

Aquatic macrophytes

Surveys recorded a scarcity of aquatic macrophytes within the project area. However, it is acknowledged that significant rainfall prior to the survey may have resulted in the loss of some aquatic vegetation. Aquatic macrophytes were observed at approximately one third of the sampling sites.

Aquatic macrophyte species richness at these five sites was low, with a total of 12 species recorded in the project area. These results conform with the State of the Rivers reporting for the project area catchments, which also found limited freshwater aquatic vegetation.

None of the aquatic macrophyte species that were observed in the survey are listed as 'Rare' and/or 'Threatened' species. This in line with a review of the *Environment Protection and Biodiversity Conservation Act* -Protected Matters Report (2007) and a search of the Wildlife Online Database (Environment Protection Agency, 2007) that did not reveal aquatic flora of conservation significance within the project area.

Introduced weed species were commonly observed at survey sites, forming approximately one third of the aquatic macrophyte flora. None of these introduced species are declared weeds under the *Land Protection (Pest and Stock Route Management) Act 2002*.

Freshwater fish

A total of 24 freshwater fish species have previously been recorded within the catchments traversed by the project area. This number includes:

- at least eighteen species native to the catchment, most of which can be broadly described as common and widespread. The exceptions to this are Oxleyan Pygmy Perch (*Nannoperca oxleyana*), Honey Blue-eye (*Pseudomulig mellis*) and the Ornate Rainbowfish (*Rhadinocentrus ornatus*).
- Three exotic species, namely: Swordtail (*Xiphophorus helleri*), Platy (*Xiphophorus maculatus*) and the Eastern Gambusia or Mosquito Fish (*Gambusia holbrooki*).

Due to the impact that exotic fish species can have on native species and aquatic habitat, these species are considered noxious. Eastern Gambusia is declared a pest species under the *Fisheries Act 1994* and *Fisheries Regulation 1995*.

During sampling investigations for the project, 15 species, representing eight families, were collected across 14 sampling sites. In total, eight families were recorded within the project area during both sampling exercises. The most species-rich families were the *Eleotridinae* (gudgeons), represented by five species, followed by the *Melanotaeniidae* (rainbowfish) and the exotic family *Poeciliidae*, which were each represented by two species.

Eudlo and Petrie Creeks were the only sites where native, large-bodied fish of potential fisheries significance were recorded (i.e. Spangled Perch, Freshwater Eels and Freshwater Catfish). These species, together with Australian Bass, are likely to occur throughout all the larger streams within the project area (Paynter, Petrie and Eudlo Creeks and both branches of the Mooloolah River).

Ewen Maddock Dam, immediately downstream of the project area, has been stocked with Australian Bass, Southern Saratoga, Spangled Perch, Golden Perch (*Macquaria ambigua*), Freshwater Catfish, Freshwater Eels (*Anguilla spp.*) and possibly Mary River Cod (*Maccullochella peelii mariensis*). The dam is the key recreational fisheries resource within the immediate vicinity of the project area. Within the project area, there is likely to be some recreational fishing effort at Paynter, Petrie and Eudlo Creeks and both branches of the Mooloolah River, although fishing effort is expected to be low compared to levels in the coastal and estuarine reaches of these catchments. There is no commercial catch data for the project area.

Macro-invertebrates

It is expected that the project area provides habitat for diverse and productive freshwater macro-invertebrate communities. However, limited information is available as fauna have generally only been identified to family level in most catchment-wide assessments.

No threatened aquatic macro-invertebrate species listed under Commonwealth (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation (Wildlife) Regulation 2006*; *Fisheries Act 1992*) legislation are known or likely to occur within the project area. The Biodiversity Assessment Mapping Methodology Priority Species for the south east Queensland region (Environment Protection Agency 2005) and the International Union for Conservation of Nature Red list identify several aquatic invertebrate species of regional or local significance within the wider region.

In addition to species of conservation significance, macro-invertebrate communities in the project area are generally important in controlling processes that maintain aquatic ecosystems, and are therefore considered to have high ecological values. With the exception of freshwater crayfish (*Cherax spp.*), which are of recreational importance, the project area does not support preferred habitat of macro-invertebrates species of direct fisheries significance.

Freshwater turtles

Three species of freshwater turtle are known to occur within the project area, including the Saw-shelled Turtle (*Elseya latisternum*), Eastern Snake-necked Turtle (*Chelodina longicollis*) and Krefft's River Turtle (*Emydura macquarii kreftii*). Both Saw-shelled and Krefft's River turtles were observed during the aquatic surveys undertaken for the project's environmental impact statement (at Eudlo and Petrie Creeks, respectively).

All freshwater turtle species known to occur within the project area are typically widespread and abundant throughout the broader region. None are listed as threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* or *Nature Conservation Act 1992*.

Impact assessment

Most potential impacts are generally applicable throughout the project area and primarily include impacts to riparian and stream habitat integrity, as well as to aquatic fauna passage. Potential impacting processes to aquatic flora, fauna and their habitat primarily result from the construction of the project and the decommissioning of the existing railway. These include:

- vegetation clearing and physical disturbance (a total of 5.23 ha of riparian vegetation will be cleared due to the construction of the rail corridor)
- water quality modifications
- creation of in-stream barriers (i.e. culverts and other structures)
- creation of habitats favouring pest species.

Mitigation measures

Design

- Design the corridor to minimise number of waterway crossings.
- Design the corridor to align with existing waterway crossings, where practicable.
- Design the corridor to minimise barrier effects.
- Simulate 'natural' habitats and light penetration within culverts where possible.

Construction / Decommissioning

- Minimise vegetation clearing at or adjacent to waterways.
- Protect and rehabilitate native riparian and in-stream vegetation.
- Minimise physical in-stream disturbance and water quality modifications.
- Minimise works in riparian, bank or in-stream areas.
- Minimise disturbance to stream bed and banks.
- Install and maintain erosion and sediment controls.
- Time in-stream works to avoid key migration periods, when feasible.

- Prevent or minimise water pooling in areas disturbed by project works.
- Maintain (or imitate) stream flow patterns as closely as possible.
- Contain disturbed sediments.
- Store and handle chemicals appropriately and prevent leakage from construction site.
- Ensure water released from site is of similar quality to the receiving waters.

Operation

- Monitor and control weed encroachment in cleared area, or revegetate if possible.
- Conduct ongoing water quality monitoring.

Summary

Once mitigation measures have been implemented, the residual impact of the project on aquatic biology within the project area is as follows:

- vegetation clearing and physical disturbance (a total of 5.23 ha of riparian vegetation will be cleared due to the construction of the rail corridor) – **Low adverse**
- water quality modifications – **Low adverse**
- creation of in-stream barriers (i.e. culverts and other structures) – **Low adverse to negligible**
- creation of habitats favouring pest species – **Low adverse to negligible**.

14. Water resources

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 14 – Water resources.

Existing conditions

Surface water

The following named watercourses pass through the study area:

- Mellum Creek (Pumicestone Passage Catchment)
- Addlington Creek (Flows into Ewen Maddock Dam – tributary of Mooloolah River)
- South Mooloolah River (tributary of Mooloolah River)
- Mooloolah River
- Acrobat Creek (tributary of Eudlo Creek)
- Eudlo Creek (tributary of the Maroochy River)
- Paynter Creek (tributary of the Maroochy River)
- Petrie Creek (tributary of the Maroochy River).

Many of these waterways are significant from an ecological, recreational and visual perspective. The mouth of the Maroochy River (which Eudlo, Paynter and Petrie Creeks flow into) is a fish habitat area. The Ewen Maddock Dam Water Resource Catchment Area also partially covers the southern end of the project area. Pumicestone Passage (which Mellum Creek flows into) is one of four passage type estuaries in Queensland. Its mangrove fringed wetland contains extensive seagrass meadows and is a valuable nursery area for commercial and recreational fisheries.

Of international significance, the Passage is listed under the Ramsar Convention as an important feeding and roosting site for migratory birds. The project does not cross Mellum Creek at any stage, nor does it affect the Mellum Creek/Pumicestone Passage Catchment (which is to the south of the project).

A search of the Department of Environment and Resource Management water permits was conducted to ascertain the level of surface water usage in the project area. A total of 164 permits were recorded with most licenses related to irrigation. These include riparian water access, license to take water, license to interfere by impounding flow and license to interfere with the course of flow. These licenses were scattered along each of the major waterways affected by the preferred route for the proposed rail corridor.

Ecosystem Health Monitoring Program

The project area traverses three river catchments with varying water quality (as measured by the South East Queensland Healthy Waterways Ecosystem Health Monitoring Program):

- Pumicestone Passage Catchment
 - freshwater - streams generally in fair condition
 - estuarine - fair water quality throughout most of the zone with generally poorer water quality found in the northern reaches
- Mooloolah River Catchment
 - freshwater - streams generally in very good condition
 - estuarine - consistently good to excellent water quality throughout the estuary due to strong tidal flushing and no nutrient point source discharges
- Maroochy River Catchment
 - freshwater - streams generally in fair condition
 - estuarine - varying conditions within the catchment

Water sampling undertaken for the environmental impact statement concurs with findings from the South East Queensland Healthy Waterways Ecosystem Health Monitoring Program. Variations in water quality are shown across the waterways in the project area but the surface water quality in the project area is generally fair to good.

Hydrology and flooding

- The Mooloolah River, Eudlo Creek and Paynter Creek are prone to significant flooding.
- The South Mooloolah and Mooloolah Rivers are known to support significant fauna species, including the Giant Barred Frog (*Mixophyes iteratus*).
- Waterways in the project area are generally highly modified with limited remnant vegetation and in some cases are dominated by weeds (especially Addlington, Paynter and Petrie Creeks).
- Waterways around Addlington Creek are known to provide good habitat for native frogs and fish.
- The integrity of the banks of major and minor waterways is dependent on their level of vegetation (i.e. waterways that are not vegetated are generally poor and in most areas the banks have visible signs of erosion and collapse).
- The aquatic habitat values of Eudlo Creek are limited to those areas in the national park.
- Paynter Creek is noted to support a high number of native fish and Platypus (*Ornithorhynchus anatinus*).

Groundwater

Seventy-eight registered groundwater bores (classified as sub-artesian) have been identified in the project area. The presence of groundwater bores in the project area indicates the importance of the groundwater resources to the local community. Areas of groundwater are also important from a biological diversity perspective. Groundwater dependent ecosystems include ecosystems that rely on groundwater to exist, and can include wetlands, vegetation, mound springs, river base flows, cave ecosystems, playa lakes and saline discharges, springs, mangroves, river pools, billabongs and hanging swamps.

As there is limited information available regarding the bores within the project area, detailed hydrological studies are required to determine the full extent of the interaction between the groundwater, groundwater dependent ecosystems and surface water systems, especially in terms of identifying discharge and recharge areas.

Impact assessment

Key potential project threats from a water resources perspective were identified early in the impact assessment process to provide information assisting the selection of the project. Most potential impacts are generally applicable throughout the project area and primarily include impacts to riparian and stream integrity, as well as to water quality. Potential impacting processes to surface water and groundwater resources primarily result from the construction of the project and the decommissioning of the existing railway, as follows:

- vegetation clearing and channel disturbance
- surface water quality modifications
- groundwater quality modifications
- reduction in groundwater resources
- alteration in surface water flows.

Mitigation measures

A number of mitigation measures will be implemented to minimise impacts on water resources within the project area. These include:

- Design the rail on structures using relevant standards in flood prone areas.
- Design bridges and culverts to allow continued water movement.
- Minimise use of in-stream barriers during construction.
- Minimise riparian vegetation removal.
- Minimise works in riparian, bank or in-stream areas.
- Monitor and controlling weed encroachment in cleared area, or revegetate if possible.
- Conduct further investigations into geology and acid sulfate soils.
- Install stormwater management devices.
- Implement erosion and sediment control measures.
- Stabilise exposed/disturbed soils during construction activities.
- Manage fuel and chemical handling, storage, distribution and spill response during construction.
- Use bunded areas to store harmful substances.
- Rehabilitate disturbed areas post construction.
- Carry out regular water quality monitoring (surface and ground water).
- Conduct further investigations into the location of aquifers and water quality.
- Relocate groundwater extraction points where necessary.
- Manage fuel and chemical handling, storage, distribution and spill response during construction.

Summary

The proposed rail link crosses more than 50 waterways, many of which are permanent in nature. Potential impacts associated with the project are mostly related to construction impacts, disturbance of the ground surface near waterways and unsustainable use of groundwater resources which can be readily mitigated through good site practice and adherence to the project's Environmental Management Plan.

Taking into account the localised nature of all potential impacts to water resource values of the project area, it is considered that the overall impact of the project on water resources is of low adverse significance.

15. Noise and vibration

Operating railways generate airborne noise due to the rolling associated with the railway car wheels on the track, and the engine and exhaust noise of diesel locomotives. Braking, bearings, couplings, traction motors, air conditioning, fans and horns are also sources of operational noise. Gaps, joints and turnouts in the track can also contribute to noise. Tracks that have steeper gradients and tight curves generate additional noise from the need to accelerate and brake, to negotiate these changes in track conditions. Airborne noise may also be generated by fixed railway equipment such as substations, tunnel ventilation plant and station public announcement systems. Track maintenance also generates noise from rail grinding, tamping, and operation of machinery (engines and warning signals).

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 15 – Noise and vibration.

Existing conditions

Legislation and guidelines

The following legislation and guidelines have been used to determine applicable criteria for the project:

Legislation:

1. *Environmental Protection Act 1994* (reprint No.9). Where the local government for the local government area is not the administering authority or there is no provision of a local law in force for the relevant section, the noise standard as defined in Division 3 applies.
2. *Environmental Protection (Noise) Policy, 2008*, is a policy which subsists beneath the *Environmental Protection Act 1994* and the purpose of the policy is to achieve the object of the Act in relation to the acoustic environment.
3. *Environmental Protection Regulation, 2008*, subsists beneath the *Environmental Protection Act 1994* and sets the standards to which noise measurements must conform.

Guidelines:

1. QR Limited Code of Practice, Railway Noise Management, November 2007.
2. Department of Transport and Main Roads Interest in Planning Schemes 3 – Planning for Rail Noise.
3. *Ecoaccess Noise and Vibration from Blasting Guideline, 2006*.
4. *Ecoaccess Assessment of Low Frequency Noise Guideline, Draft*.

Noise monitoring

Noise monitoring was conducted during August and September 2008 at a number of points along the existing railway. The results from monitoring indicate that outside dwellings, the Queensland Environmental Protection (Noise) Policy's (2007) acoustic objectives are currently being met in most residential locations. Residences located in higher density urban areas in the vicinity of main townships have higher noise levels and night time background noise levels were higher in areas closer to the railway line.

Existing ambient environment

The majority of the project area is an open rural environment. Main towns along the railway have more densely populated residential areas, generally localised to small catchments around the train stations. As well as noise from the existing rail alignment, road traffic is a significant noise source in the area. The Bruce Highway is approximately 5 km to the east and provides access to main towns within the project area. A sub-arterial road, Eudlo Road, Mooloolah Valley to Nambour Connection Road, Nambour, follows the length of the existing rail alignment.

Noise sensitive receptors

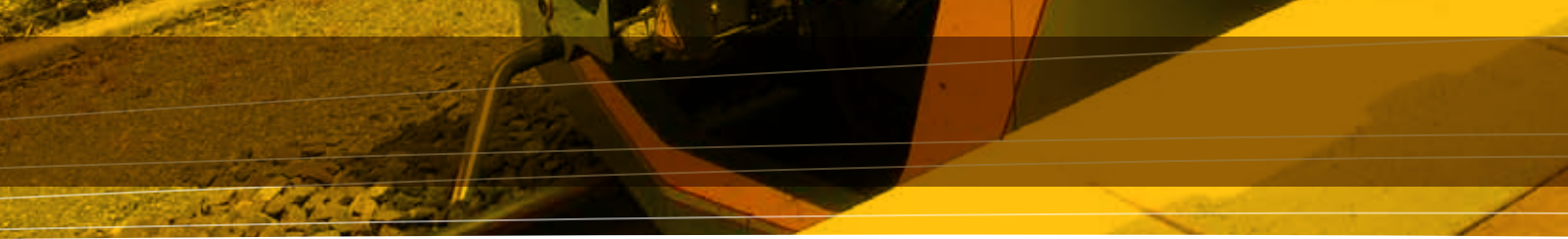
Noise sensitive receptors are defined as any of the following:

- dwelling
- library and educational institution (including a school, college and university)
- childcare centre or kindergarten
- school or playground
- a hospital, surgery or other medical institution
- commercial and retail activity
- a protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest, under the *Nature Conservation Act 1992*
- a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment.

As shown in the table below, noise sensitive receptors have been identified within 200 m of the project:

Description	Location
Schools	- Nambour Christian College, McKenzie Road, Woombye - Eudlo State School, Highlands Road, Eudlo - Maroochy Shire Council Child Care, 28 Mill Street, Nambour
Residences	A number of residential properties are within 200 m of the proposed realignment. These are located in the following townships: - Nambour - Burnside - Palmwoods - Woombye - Coes Creek - West Woombye - Eudlo - Mooloolah Valley - Landsborough - North Landsborough
Nursing Homes	Sundale Garden Village, 61 Jubilee Drive, Palmwoods
Places of Worship	- Uniting Church Australia, 3 Florence Street, Nambour - Baptist Union of Queensland, 27 Coes Creek Road, Burnside - Nambour 7th Day Adventist Church, 77 Coes Creek Road, Palmwoods - Brisbane Congregation Jehovah's Witnesses, 45-55 Blackall Range Road, Woombye - Evangelical Lutheran Trinity Congregation, 29 Back Woombye Road, Woombye - The Corporation of the Synod of the Diocese of the Anglican Church, 9-13 Hill Street, Palmwoods
Commercial Properties	A number of commercial properties are within 200 m of the proposed realignment. These are located in the following townships: - Nambour - Burnside - Palmwoods - Woombye - Coes Creek - West Woombye - Eudlo - Mooloolah Valley - Landsborough - North Landsborough

Description	Location
Recreational Parks	- Jubilee Park, 6 Hospital Road, Nambour - Moss Day Park, Washington Street, Nambour - Erbarcher Road Park, Nambour - Carter Road Park, Nambour - Park and Recreation Greenhaven, Palmwoods - Huntingdale Drive Parks, Nambour - Puch Street Reserve for Parks and Gardens, Coes Creek - Palmway Close Park, Woombye - Blackall Street Reserve for Park and Recreation, Woombye - Woombye Recreation Ground, Back Woombye Road, Woombye - Palm Grove Park Reserve for Park and Recreation, Palmwoods - Reserve for Parks and Gardens, Merriman Court, Palmwoods - Reserve for Park and Playground, 13 Main Street, Palmwoods - Reserve for Park and Recreation, Tunnel Ridge Road, Landsborough - Reserve for Park and Gardens, Coljohn Street, Landsborough - Reserve for Park and Gardens, Rose Road, Landsborough - Reserve for Park, Bray Road, Mooloolah Valley - Reserve for Public Purposes, Sandy Road, Mooloolah Valley - Reserve for Park and Recreation, Neill Road, Mooloolah Valley - Reserve for Park and Gardens, Paget Street, Mooloolah Valley - Reserve for Park, Myla Road, Landsborough
Bushland Recreational Parks	- Eudlo Creek National Park, Paskins Road, Palmwoods - Reserve for National Park, Tunnel Ridge Road, Landsborough



Impact assessment

Noise modelling

Noise modelling was undertaken to predict the impact of the project on future noise levels. There are several factors that would cause future railway noise levels to differ from current noise levels. These are:

- change in traffic volume (see Chapter 7 – Transport for more detail)
- change in traffic composition
- change in locomotive design
- alteration of the rail alignment and height of the rail line relative to receivers
- elevation of the rail alignment onto bridge structures.

Vibration

Operating railways generate ground vibration, due to the rolling contact of steel wheels on the railway tracks. Ground-borne vibration spreads through the ground and may be transmitted into buildings via the foundations. Within buildings, it may be manifested as either:

- vibration that is directly perceptible to occupants
- noise that is radiated by the vibrating surfaces of the building (referred to as *ground-borne noise*).

There are no existing standards defining limits for ground-borne noise from operating railways in Queensland. For at-grade track, airborne noise impacts would be expected to dominate over any ground-borne noise effects. Therefore, ground-borne noise has not been assessed any further. Similarly, ground-borne vibration impacts would not be expected to be significant compared to airborne noise impacts.

Construction noise

Construction activities, such as jack hammering and piling works, have the potential to adversely impact the surrounding environment. However, the impact of construction noise is temporary in nature, and once sections of the realignment have been completed, the ambient noise environment would return to an acceptable level.

When the final construction methodology is determined during the detailed design phase of the project, construction noise will be reviewed with the aim of minimising the impact on the community.

Operational noise

In more open areas, where there is a clear line of sight to the railway, sound from the railway may be more noticeable than in a densely built up area. This is due to a range of factors including:

- Background noise levels in an urban environment will most likely be higher than a rural area. Where noise from a source may only just be audible above background noise levels in an urban environment, the same source in a rural environment may be more audible due to the lack of masking background noise present.
- Urban areas are much more densely built up environment and are more likely to have other structures breaking up the line of sight to the noise source, creating a barrier effect.

The proposed alignment has currently been designed to accommodate trains at 160 km/hr in straight sections, with 100 km/hr limits for 1,000 m radius curves. The bend leading into Nambour is restricted by existing constraints, providing a radius of 300 m which allows a maximum speed of 60 km/hr.

The proposed rail corridor is likely to reduce existing operational noise levels through the improved alignment. The proposed corridor removes many tight radius curves which are often the source of flanging and wheel squeal noise, which is due to the train wheels scraping along the edge of the rail rather than rolling, and also reducing the need for repeated accelerating and braking.

The predicted noise impact of the project for the year 2026 has also been based on the use of new generation locomotives. These locomotives have lower noise emission levels than current generation locomotives. The selection of new locomotives would reduce the impact of freight train movements on the surrounding environment.

Mitigation measures

Design

- Consider the length, height and materials for noise treatments in consultation with the community during the detailed design process.
- Seek opportunities to integrate noise treatment measures into future urban design within the townships.
- Examine methods for noise mitigation on structures such as the Palmwoods bridge.

Construction

Although there are no construction noise limits defined by Queensland legislation, noise mitigation strategies should be implemented where practical to reduce the potential for adverse noise impacts and complaints.

Mitigation methods for construction noise can be separated into strategies for:

- construction noise monitoring
- source noise control and work practice strategies
- community liaison.

Where the project is in proximity to sensitive receptors, construction will be generally limited to the following times:

- Monday – Friday, 7.00 am – 8.00 pm
- Saturday, 7.00 am – 1.00 pm.

However, construction will occasionally take place outside of normal working hours, in particular where the project could interfere with the operation of the existing railway. When construction is required outside of the ‘standard hours’, consultation with the affected residents will ensure that suitable mitigation measures are in place to minimise the disturbance and that the affected residents are fully aware of the times, duration and nature of the planned construction activities.

Operation

Further attenuation of noise levels can be achieved through the use of noise barriers. Noise barriers placed between the source and receptor break up the direct line of sight to the noise source and results in attenuation relative to an uninterrupted path. For noise barriers to be effective, they must be placed as close to the source or the receiver as possible.

- Noise barriers are visually intrusive, and can potentially compromise employee safety around the rail line (e.g. for maintenance crews, by limiting sight lines and exit routes). QR Limited’s Code of Practice acknowledges that the height of noise barriers needed to limit the noise levels to the planning levels may not be acceptable to all residents. QR Limited sets a maximum height limit of six metres for noise barriers.
- To maximise the effectiveness of the barriers, they should be positioned as close to the noise source as possible. This is difficult with railways due to track access requirements. The further the noise barrier is from the source of noise, the less effective it becomes at attenuating noise.

Noise modelling has predicted that a number of noise barriers will be required along the proposed rail corridor. Barrier heights and exact locations need to be investigated further in the detailed design phase of the project and assessed for individual residences. Areas where noise barriers are mitigating single residences should be investigated further, as due to the length of the barrier required, barriers along the railway may not be the most effective method of mitigating noise.

Summary

Much of the project area is generally a low-level noise environment. Existing major noise sources are vehicular traffic on main roads, such as Eudlo Road and Woombye-Palmwoods Road, and rail noise from the existing alignment.

Once mitigation measures have been implemented, the residual impact of the project related to noise and vibration is as follows:

Potential Impact	Residual Impact
Excessive noise at nearby residences	Negligible – moderate adverse
Existing land use	Low adverse
Future land use	Negligible

16. Air quality

Air pollutants considered in the assessment of the project’s air quality impacts include nitrogen dioxide (NO₂), sulfur dioxide (SO₂), fine particles (PM₁₀) and nuisance dust. The impact the project has on greenhouse gas emissions is also discussed in this section.

A number of activities were undertaken to inform this section, including:

- a review of existing databases, information and reports
- analysis of spatial data (mapping).

Existing conditions

Legislation and policy

National Environment Protection Measures (NEPMs) are broad framework-setting statutory instruments defined in the *National Environment Protection Council (Queensland) Act 1994*. NEPMs outline agreed national objectives for protecting or managing particular aspects of the environment. There are two NEPMs relevant to this project:

- Ambient Air Quality NEPM
- National Pollutant Inventory NEPM.

The Environmental Protection (Air) Policy 2008 (EPP (Air)) sets out a schedule of maximum ambient pollutant concentrations consistent with the National Environment Protection (Ambient Air Quality) Measure for various substances and their associated environmental values.

Potentially sensitive receptors

- dwellings, permanent or impermanent (hotels, motels, holiday accommodation, caravans, camping sites)
- child care institutions (child care centre, kindergartens, schools, or other educational institutions)
- medical facilities including medical centres, nursing homes
- places of worship (churches etc.)
- commercial receptors, including shops, businesses (excluding childcare centres and medical facilities), industrial and other commercial premises.

Air pollution sources

According to the National Environment Protection Measures defined in the *National Environment Protection Council (Queensland) Act 1994*, the following sources of pollutants were identified (in the reporting period 2006–2007) for each postcode within the project area:

4550 (includes Landsborough)

- carbon monoxide (CO) from motor vehicle emissions (approximately 2,000,000 kg/year)
- total volatile organic compounds (approximately 1,000,000 kg/year) primarily from plant sources
- nitrogen oxides (NOx) from motor vehicle emissions (approximately 380,000 kg/year)
- particulates (PM10) primarily from food product manufacturing (approximately 160,000 kg/year).

4553 (includes Mooloolah)

- carbon monoxide (CO) primarily from motor vehicle emissions (approximately 2,800,000 kg/year)
- oxides of nitrogen (NOx) primarily from motor vehicle emissions (approximately 440,000 kg/year)
- particulates (PM10) primarily from burning activities and wildfire (approximately 54,000 kg/year).

4554 (includes Eudlo)

- total volatile organic compounds primarily from plant sources (approximately 790,000 kg/year)
- carbon monoxide (CO) primarily from motor vehicle emissions (approximately 390,000 kg/year)
- nitrogen oxides (NOx) primarily from motor vehicle emissions (approximately 62,000 kg/year).

4555 (includes Palmwoods)

- carbon monoxide (CO) primarily from motor vehicle emissions (approximately 1,100,00 kg/year)
- total volatile organic compounds primarily from plant sources (approximately 830,000 kg/year)
- ammonia all from livestock (approximately 23,000 kg/year).

4559 (includes Woombye)

- total volatile organic compounds primarily from plant sources (approximately 830,000 kg/year)
- nitrogen oxides (NOx) primarily from motor vehicle emissions (approximately 220,000 kg/year)
- ammonia primarily from livestock (approximately 18,000 kg/year).

4560 (includes Nambour)

- carbon monoxide (CO) primarily from motor vehicle emissions (approximately 4,900,00 kg/year)
- total volatile organic compounds primarily from plant sources (approximately 3,700,000 kg/year)
- nitrogen oxides (NOx) primarily from motor vehicle emissions (approximately 720,000 kg/year)
- ammonia primarily from livestock (approximately 99,000 kg/year)
- particulates (PM10) primarily from construction material mining (approximately 98,000 kg/year).

Environmental factors such as fire management, physical landform, local vegetation, geology and soil types, hydrology and meteorology will also influence the air quality in the area surrounding the project.

Meteorological conditions

The project is within an area characterised by a subtropical climate with very humid and very warm summers with mild and dry winters. Average annual meteorological conditions are listed in the table below based on a review of data from the Bureau of Meteorology's Caloundra Signal Station, which is the closest weather station to the project.

Average annual meteorological conditions from the Caloundra Signal Station

Temperature	▪ mean daily max. temperature: 23.8°C ▪ mean daily min. temperature: 16.5°C
Humidity	Mean annual relative humidity: ▪ at 9.00 am: 73 percent ▪ at 3.00 pm: 67 percent
Rainfall	▪ mean annual rainfall: 1578.1 mm ▪ highest rainfall is in March, lowest in September ▪ highest rainfall is in summer, lowest in winter ▪ mean number of clear days per annum: 101.5 ▪ mean number of rainy days (rain ≥ 1mm) per annum: 65.1

Average annual meteorological conditions from the Caloundra Signal Station

Wind	At 9.00 am, the prevailing synoptic winds blow from the south-east and south-west in summer and winter respectively. At 9.00 am approximately: ▪ 30 percent of days blow at 0 - 10 km/h ▪ 30 percent of days blow at 10 - 20 km/h ▪ 30 percent of days blow at 20 - 30 km/h ▪ 5 percent of days blow at 30 - 40 km/h ▪ 5 percent of days blow at more than 40 km/h At 3.00 pm, the prevailing synoptic winds blow from the north-east and south-east in summer and winter respectively. At 3.00 pm approximately: ▪ 7 percent of days blow at 0 - 10 km/h ▪ 25 percent of days blow at 10 - 20 km/h ▪ 50 percent of days blow at 20 - 30 km/h ▪ 13 percent of days blow at 30 - 40 km/h ▪ 5 percent of days blow more than 40 km/h
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Regional data

The Department of Environment and Resource Management, as part of its ongoing air quality monitoring, has a monitoring station at Mountain Creek (Mountain Creek Primary School) which records ozone, particulates, nitrogen oxides and meteorological conditions. Although it is approximately 13 km to the east of the project, it is the closest air quality monitoring station and provides an indicative assessment of the ambient air quality in the project area.

A review of the air quality monitoring data (www.epa.qld.gov.au/projects/air/) on 8 October 2008 showed that air quality was classified as 'fair'. There are, however, specific trends throughout the year for each of the detected pollutants. These trends may be a result of pollutants or climatic factors i.e. the position of the Mountain Creek Monitoring Station relative to the prevailing winds. The following is a summary of each pollutant:

- Ozone – air quality ranges throughout the year from 'very good' to 'good'
- PM10 – air quality is considered 'good'
- Nitrogen dioxide – air quality is considered 'very good'.

Greenhouse gas emissions

The greenhouse effect is a term used to describe the process whereby outgoing radiation from the earth is absorbed and re-radiated by water vapour droplets and carbon dioxide (CO₂) and other greenhouse gases in the atmosphere.

QR Limited has undertaken a comprehensive inventory of its greenhouse gas emissions associated with the operation of a railway. In QR Limited's Greenhouse Challenge Cooperative Agreement, the organisation's energy usage has been recorded and reported back to the year 1990. QR Limited's total greenhouse gas emissions for the 1998/99 financial year were approximately 1.2 million tonnes of CO₂ equivalent (CO₂e).

However, this is the total emissions associated with QR Limited operations only and does not take into account the reduction of greenhouse gas emissions that are associated with the modal shift from road to rail transportation of people or freight. In addition, it is likely that the expansion of railway operations since the 1998/1999 financial year has increased this figure.

The transition of users from vehicles to train will mean that the project provides an overall potential saving of greenhouse gas emissions of 42,000 tonnes CO₂e annually during operation of the railway.

Impact assessment

Construction

- exhaust emissions from site plant, equipment and vehicles (contributing to greenhouse gas emissions)
- dust emissions from site activities
- potential for mobilisation of airborne contaminants from contaminated land
- potential for discharge of toxic fumes or dangerous substances
- ensure emissions from all construction vehicles comply with the appropriate standards and regulations
- minimise vehicle kilometres during construction where possible
- limit the use of power on site.

Operation

In terms of emissions from locomotives, passenger rail transport typically has lower emissions of particulates than road travel, except where older diesel locomotives are used. Some passenger and rail freight locomotives can be more polluting in terms of sulphur dioxide than road travel. QR Limited has made a commitment to continual improvement with regard to greenhouse gas emissions, so the introduction of new generation locomotives is anticipated to occur during the lead up to construction.



Mitigation measures

Design

- Utilise Ecologically Sustainable Design principles in the design of buildings for the project.

Construction

- Prepare a construction environmental management plan prior to commencement of construction activities.
- Plan to prevent dust emissions where possible, in the first instance, rather than applying dust suppression methods.
- Identify appropriate water sources for dust suppression purposes (water used should not lead to soil contamination) and where water resources are scarce, dust stabilisers to be used.
- Damp down of site haul roads during prolonged dry periods.
- Clean hard-surfaced site entrance roads regularly.
- Ensure that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage away from site boundaries, restricting drop heights of materials, using watersprays where practicable to reduce dust emissions).
- Ensure that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials – ‘covered loads’).
- Confine vehicles to designated haul routes within the site
- Ensure surfaces of haul roads are made of an appropriate material to minimise dust.
- Restrict vehicle speeds on haul roads and other unsurfaced areas of the site.
- Erect hoardings and gates to prevent dust breakout
- Carry out dust monitoring to ensure the success of dust control measures used.
- Cease construction until conditions generating dust have subsided if available dust suppression methods fail to adequately prevent or suppress nuisance dust.

Operation

- Source traction and station power from lower carbon energy sources.
- Develop a staff education program regarding energy efficiency in stations.
- Conduct driver training in energy efficient operation of trains.
- Monitor power use and publicise results.
- Maximise passenger numbers through initiatives such as Travel Smart programs, appropriate timetabling and suitable facilities for all passengers.
- Provide appropriate waste receptacles for staff and passengers with adequate signage for general and recyclable waste.

Summary

With appropriate mitigation measures in place, the impacts from the construction of the project on air quality should be negligible to minor adverse. In balance, the impacts of the operation of the railway are considered negligible.

The construction activities will contribute to an increase in greenhouse gas emissions although it is unlikely that this will be significant compared to State or national inventories. It has therefore been assessed as low adverse.

17. Climate and natural disasters

This section discusses local climate characteristics, seasonal conditions (for consideration particularly during the construction phase), extreme climatic events and climate change as it relates to the project.

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 17 – Climate and natural disasters.

Existing conditions

General

The project area is located within the coastal lowlands of the south east Queensland region and is classified as having a subtropical climate with no dry season.

- mean annual rainfall around 1,578 mm with the majority received in the summer months (December–April)
- mean daily temperatures between 25–27 °C in summer and 10–14 °C in winter
- surface winds generally reflecting the diurnal pattern of land and sea breezes
- prevailing winds generally south-easterly during summer and south-westerly during winter
- onshore winds dominant in the afternoon (ranging from north-easterlies to south-easterlies throughout the year) and winds generally stronger later in the day.

Climate change

Temperatures have been rising across Queensland since 1920, with a faster rate of temperature rise recorded since 1950 (Climate Change in Queensland 2008 Report). The rate of temperature increase ranges from 0.07 °C/decade in the far north to 0.32 °C/decade in the south west of the state. Queensland now experiences more days with temperatures above 35 °C and fewer nights below 5 °C.

Changes in rainfall

- Since the early 1950s, there has been an observed decline in rainfall throughout Queensland, particularly coastal areas.
- A greater proportion of total rainfall now falls in extreme events, and there are longer periods between rainfall events.
- Queensland rainfall is greatly influenced by El Niño events and, as a result, the number of tropical cyclones in the Queensland region has declined since the 1970s, largely due to the increased incidence of El Niño's.
- In the project area and surrounds, the wettest months of the year are January, February and March and the driest months of the year are June, August and September.

Extreme climatic events

- The Sunshine Coast's sub-tropical climate brings with it periods of prolonged and intense rainfall, severe storms, monsoonal (wet season) rains, tropical cyclones and storm surges. All of these factors contribute to the likelihood of flooding.
- The months between November to February coincide with the summer storm and cyclone season and the increased likelihood of flooding presents significant additional risk.
- Storm surges are usually associated with tropical storms and cyclones. Storm surges involve rapid seawater flooding resulting from a combination of high tides and heavy seas.
- The high wind risk from tropical cyclones can extend as far as 50 km from the coast. The intensity and frequency of tropical cyclones crossing the coastline is likely to increase. Around eight major cyclones have impacted the area since 1954.
- The number and frequency of extremely hot days is expected to increase from an average of one per year currently experienced in Brisbane to a potential of six days per year.
- Sea levels are projected to rise by at least 59 cm by 2100 due to thermal expansion alone. An additional rise of a further 20 cm is possible from the contribution of ice melts from the polar ice caps and ice sheets.

Impact assessment

The potential impacts of local climate and seasonal climate fluctuations on the project include:

Temperature

- An increased risk of bushfires with the number of days of very high and extreme fire danger increasing.
- An increase in extreme weather events such as floods and droughts.
- Dry conditions are likely to increase the amount of dust generated from construction activities.

- Increased wind speeds during a storm are likely to increase the impact of dust generating activities.
- High humidity, high temperatures and intense sunshine can potentially affect construction workers, resulting in dehydration, sunburn and/or sunstroke.
- Potential for the spread of insect-borne diseases (like dengue fever) during warmer, wetter episodes.
- The number of days with temperatures greater than 35 °C is projected to increase resulting in increased bushfire risks.
- Heatwaves are likely to impact community health and the demand for power and also increase the risk of the rail track buckling (as the rail temperature rises above the neutral temperature, longitudinal forces can cause the rail to buckle sideways, which, in extreme cases, can result in serious derailments).

Rainfall

- Increased severity of drought and evaporation from water storages.
- Increased risk, incidence and severity of bushfires.
- Heavy rainfall events are likely to be more extreme and more frequent possibly leading to riverine flooding and increased erosion of river banks.
- Erosion is likely to increase following a severe storm or flood event.
- Wet weather is likely to hamper construction activities and vehicle access to construction sites.
- Potential changes to flood risk and frequency, with potentially higher flood levels and greater risk to infrastructure.

Extreme climatic events

- The frequency of tropical cyclones is expected to increase and consequently thunderstorms and other severe weather events due to expected higher wind speeds.
- Extreme climatic events can damage both rail and associated infrastructure, including possible electricity shutdown at stations.
- Severe storms which bring hail, lightning and high winds are expected to economically impact the project from potential infrastructure construction delays and personnel issues relating to health and safety. The impacts are more likely to be localised than that of a tropical cyclone and more likely to occur in the summer months (November – February). The effects may include damage from torrential rain, high wind, hail and lightning.
- Localised flooding can also occur when parts of the storm water drainage systems (such as pipes, gully traps and minor culverts) are blocked or capacity is exceeded.

- A cyclonic event or severe storm has the potential to cause flooding of construction areas.

Sea Level Rise

- Sea level rise as a result of climate change may increase the risk of river flooding and storm surge events in the project area.

Mitigation measures

Design

- Avoid areas subject to flooding.
- Refine flood allowances during the detailed design phase.

Construction

- Construction in sensitive areas (close to embankments, flood risk areas and areas of unstable vegetation) that involves earthworks leaving large areas exposed for extended durations be minimised and restricted to months of least rainfall May-November.
- Control dust at all times but particularly during windy periods.
- Use of erosion and sediment control measures during construction to prevent increased erosion and sedimentation during rainfall events.
- Monitor both long and short-term weather forecasts during the construction period.
- Implement a Health and Safety Management System to ensure appropriate procedures are in place to prevent health and safety incidents arising as a result of extreme climatic events (i.e. to reduce the risk of dehydration, heat stroke or sunburn that may affect project personnel during construction, particularly during heatwaves).
- Modify work hours during heatwaves so as to limit number of hours construction personnel are exposed to high temperatures.
- Monitor both long and short-term weather forecasts during the construction period.
- Postpone construction work during periods of cyclones, severe storms and other extreme climatic events.
- Prepare a disaster management plan and an emergency management plan for the project's construction.
- Utilise earthworks stabilisation measures, such as revegetation with appropriate native species, dust suppression and construction staging so that large areas are not exposed (or left untreated) for extended durations.

Operation

- Design to avoid high flood risk areas.
- Implement earthworks stabilisation measures such as revegetation with appropriate native species.
- Follow a Health and Safety Management System during

operations to ensure appropriate procedures are in place to prevent health and safety incidents arising as a result of extreme climatic events.

- Resistance to buckling will be developed during the commissioning of the railway by limiting speed of rail traffic.
- Observe speed restrictions during times of high temperatures in accordance with QR Limited's Safety and Security Standard SAF/STD/0075/CIV Hot Weather Precautions for Track Stability.
- Monitor the condition of the tracks regularly, particular during heat waves, to prevent damage to the tracks.
- Prepare a disaster management plan and an emergency management plan for the operation of the project.

Decommissioning

- Consider flooding during planning for the re-use of sections of the existing railway not required for the new railway.

Summary

Local climate, extreme climatic events and climate change have the potential to have an influence on the environment in the project area during construction or operation of the project. Mitigation measures that have been proposed are considered adequate to reduce the impact of these conditions or events to negligible or minor adverse.

18. Waste

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 18 – Waste.

Existing conditions

- General waste bins are located at each station within the proposed rail corridor.
- Three existing sewage-pumping stations are located in the area, two at Palmwoods and one in Nambour.
- A medium-sized sewerage pressure main runs along the existing rail corridor connecting Palmwoods to Woombye.
- Eudlo is not sewered and there are no plans within the 20 year horizon to sewer the township.
- General domestic waste is collected on a weekly basis, and taken to landfill sites in either Nambour or Coolum.
- Waste is also sent to the Buderim Resource Recovery Centre and or rural transfer centres in Yandina, Mapleton and Kenilworth.
- QR Limited is currently pursuing alternative sleeper technologies to replace more than nine million timber sleepers in the rail network.

Impact assessment

All of the construction sites along the project area will have similar construction waste characteristics due to materials used and the construction method. Waste would be generated from the following activities:

- vegetation clearing, resulting in:
 - aesthetic impacts
 - potential distribution of weeds
 - interruption of nutrient cycles
 - potential fire hazard
- construction activities (encompassing waste from the construction of the project and the decommissioning of the existing railway, including the demolition of stations), resulting in:
 - general impacts of landfill which are mostly the land clearance required to site the landfill facility
 - contamination of groundwater and/or aquifers by leakage (unlikely impact)
 - residual soil contamination after landfill closure (unlikely impact)
 - release of methane generated by decaying organic waste (unlikely impact)
- decommissioning the existing railway (i.e. metal tracks, timber and concrete sleepers and ballast), resulting in:
 - land clearance required to site the landfill facility
 - possible contamination from treatment used on sleepers could affect groundwater and soil
 - possible contamination of ballast from sources like oil and hazardous chemicals from the trains
 - release of metal contaminants from tracks
 - release of methane generated by decaying timber sleepers
- washing down equipment and machinery, resulting in:
 - runoff potentially containing oils, sediments, weed seeds and detergents
 - use of a temporary site office (waste could include food scraps and other organic waste, sewerage (blackwater) garden clippings, toiletries, recyclable and non-recyclable packaging and office waste), resulting in:
 - contamination arising due to litter
 - aesthetic impacts of litter
 - increase in waste going to landfill

- odour (related to sewerage)
- contamination if accidentally released into the surrounding environment (related to sewerage)
- use of hydrocarbons, resulting in:
 - potential for a hydrocarbon spill to occur
- transportation of waste soil, resulting in:
 - potential to transport seed stock of weed species and thus allow the weeds to spread
 - dust impacts from soil stockpiles
- occurrence of stormwater, resulting in:
 - the potential spread of contamination to surface water and groundwater
 - an increase erosion from exposed soil and stockpiles.

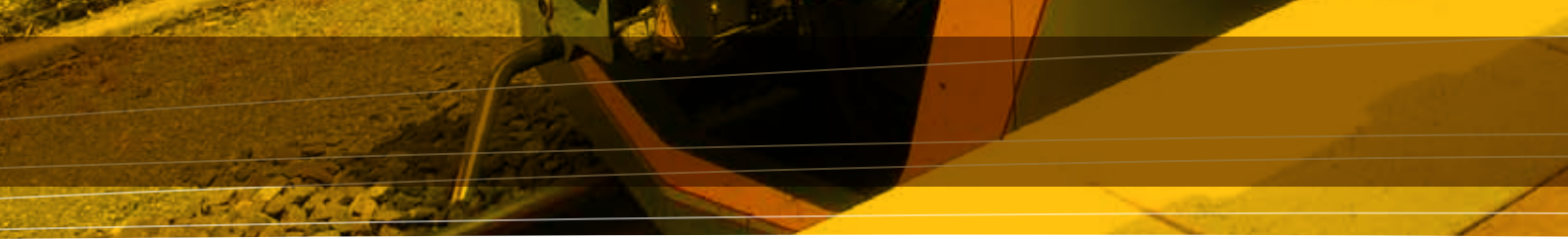
The main waste streams that will result from the operation of the project include:

- General waste from station staff and railway patrons such as food scraps and other putrescible waste, garden clippings, toiletries, waste from train bins, recyclable and non-recyclable office waste and packaging.
- Wastewater and sewage generated from station and train facilities.
- Hazardous and regulated waste are listed in Schedule 7 of the Environmental Protection Regulation 1998 [Qld] such as hydrocarbons form oils used for train operation and maintenance.

Impacts from hazardous and regulated waste can range from environmental contamination to aesthetic impacts and impacts associated with landfill. At this stage, there is limited information available on the generation of regulated and hazardous waste, however it is expected that minimal quantities of hazardous waste will be generated from the project.

Mitigation measures

- Position construction sites and/or buildings on previously cleared land where possible.
- Mulch, stockpile and spread vegetation with topsoil during rehabilitation activities where possible.
- Reduce and or collect packaging from construction activities.
- Sort, stockpile and contain recyclable and non-recyclable waste.
- Use leftover concrete to form materials suitable for alternative projects or crushed for road base and bedding material.



- Use timber sleepers to form materials suitable for alternative projects or sell for use in furniture manufacture.
- Arrange for transfer of the waste to an appropriate facility.
- Dispose of non-recyclable waste to a designated landfill using a licensed contractor.
- Re-use ballast (railway bedding material) from the existing railway in the new railway if not contaminated.
- Use a suitable wash down facility located away from waterways, and where possible have a sump guard to collect any grease, oil and other contaminants that can be removed by an appropriate and approved disposal method.
- Use sealable litter bins to avoid the dispersal of litter and minimise the attraction of vermin, insects and pests.
- Use of a mobile composting facility (e.g. Bokashi Bin) for food scraps.
- Treat sewerage using an approved septic or anaerobic treatment system where possible, or connect with the municipal waste sewage infrastructure, depending on location of the site.
- Use self composting toilets and /or waterless urinals where possible.
- Store, transport, and use hazardous and hydrocarbon waste in accordance with the relevant legislation, regulations and standards and appropriately contained so as to avoid release of the waste into the environment.
- Dispose of hazardous and hydrocarbon waste using appropriately licensed transporters and waste management facilities.
- Provide a spill kit to manage potential hydrocarbon spills.
- Re-use excess soil in other areas of the project if practical.
- Dispose of excess soil at the nearest approved location, generally by agreement with landowners or local council.
- Locate and manage spoil disposal sites to reduce erosion, runoff into local waterways and to prevent the distribution of weeds.
- Monitor water (treated or partially treated) discharged to the environment to ensure it meets regulatory requirements and any requirements set out in the weed management plan.

Summary

Once mitigation measures have been implemented, the residual impact of the project in relation to waste is as follows:

Potential Impact	Residual Impact Significance
Construction and Decommissioning	
Debris from vegetation clearance	Low adverse
Building waste	Low adverse
Waste from railway sleepers, and ballasts	Low adverse, to beneficial
Wash down waste water	Negligible
General waste from staff	Negligible
Sewage (blackwater)	Negligible
Hazardous and regulated waste	Negligible
Hydrocarbon waste from end-use	Negligible
Soil waste	Negligible
Operation	
Waste water from stations and trains	Negligible
Sewage from stations and trains	Negligible
General waste from station staff and patrons	Negligible

19. Hazard and risk

This section documents the hazard and risk assessment that has been undertaken for the project's environmental impact statement and the measures to be adopted in managing these hazards and risks. The hazard and risk assessment considered sources of risk related to natural hazards, human activity, and technological or technical issues, and the potential impact of these risks to persons, the environment or the community and property. In this context, natural hazards refer to flood, bushfire or landslide. The hazard and risk assessment has not considered commercial risks associated with the construction or operation of the project. Also included is a description of health and safety measures for the project and emergency management procedures to be employed.

This hazard and risk assessment undertaken for the purposes of the environmental impact statement is broad and qualitative and will form part of the larger risk management process which will need to be continued throughout the life of the project and be linked to Queensland Transport and QR Limited risk management processes.

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 19 – Hazard and risk.

Existing conditions

Natural hazards

Natural hazard management areas (related to bushfire, flood and landslide) have been identified in the relevant planning schemes of the former Caloundra City and Maroochy Shire Councils in areas that the project passes through. These areas require consideration as natural hazard management areas under State Planning Policy 1/03 Mitigating the Adverse Effects of Bushfire, Flood and Landslide. These areas include:

- areas identified as reflecting medium and high bush fire risk (the project passes through areas that are classified as medium bushfire risk in the relevant planning schemes)
- land of 15 percent and greater slope and land known or suspected of being geologically unstable
- areas subject to flood inundation.

Dangerous goods

Given the nature of the construction works, there is the potential for dangerous goods including explosives to be used or stored onsite during the construction phase. The most likely source of any chemical spill during construction would be oil or diesel from plant and machinery or from small quantities stored at construction areas.

The north coast line is also used for the transport of Dangerous Goods. The operator of the railway is responsible for the preparation of management plans for these events.

Rail safety

The Department of Transport and Main Roads and the Australian Transport Safety Bureau publish investigations into serious rail incidents, which are available online. No safety reports related to the section of the north coast line between Landsborough and Nambour were identified.

Hazard and risk assessment

The project is believed to be both a safe and efficient means of passenger and freight transport, though all developments present some level of risk. These risks can be identified through a hazard and risk assessment, to ensure appropriate management measures can be implemented to reduce or remove the risk.

The hazard and risk assessment for the project has been carried out in accordance with the principles set out in Australian Standards/New Zealand Standards Risk Management Standard 4360:2004 (which supersedes 4360:1999). The hazard and risk assessment seeks to identify risks during the construction, operational and decommissioning phases of the project and to document proposed mitigation and management measures.

Methodology for the hazard and risk assessment

In adopting the recommended methodology for implementing risk assessments in line with AS 4360 the following steps have been followed:

- **establish context** – define the basic parameters within which the risk must be managed and set the scope for the process
- **identify risks** – identify the risks to be managed using an identification and analysis process
- **analyse risks** – develop an understanding of risks which provides an overview of whether the risks should be treated and how they should be treated
- **evaluate risks** – focuses decisions based on the outcomes of risk analysis and identifies which risks need treatment and treatment priorities
- **treat risks** – identifies options for treating risks, assesses options and proposes appropriate treatment plans
- **review risks** – ensures that any changes to project scope are re-examined and the risk assessment amended accordingly if required.

Risk identification

Risks have been identified for the project in the context described above and are related to the following activities:

Construction

The main risks identified during the construction of the railway are the following:

- tunnelling and excavation
- track construction
- hazardous materials
- risk to wildlife during clearing
- commissioning of the electrical system
- construction in the vicinity of powerlines (including 33kV, 132kV and local feeder services)
- road incidents due to temporary side tracking detours
- environmental incidents such as fuel spills, sedimentation of waterways, and erosion
- delivery of pre-cast products by road (e.g. bridge girders).

Operation

The risks associated with the operation of the new railway are similar to the risks associated with the operation of the existing railway. The project and improved design standards are likely to reduce other operational risks by:

- reducing trespass opportunities (modern standard fencing and station design)

- improving poor standard road crossings (i.e. where low height road underpasses are replaced as a result of the project) are also a benefit of the project
- lengthening and raising of platforms to improve passenger safety at stations (currently stations at Mooloolah, Eudlo, Palmwoods and Woombye do not cater for a full train length).

Over time, grade separation is likely to be introduced in place of the existing open level crossings at Gympie Street North and Mooloolah Connection Road/ Bray Road, which should result in a risk reduction of train accident involving other vehicles, pedestrians or cyclists. Where grade separation is not immediately constructed, the number of tracks and the speed of the trains passing through these crossing points will need to be a consideration in the decision on the timing of the grade separation.

The project crosses areas of steep slopes where significant cuttings are required. Tunnels are proposed to reduce the risk of landslide. However detailed geotechnical investigations are required to determine the extent of the risk and the most appropriate construction methods in the conditions identified. The project is on structure in the areas most likely to be affected by flooding and therefore it is less sensitive to flood risk compared to the existing alignment.

The tunnels would be longer in the project and therefore the consequences associated with the risk of fire, explosion, flooding and earthquakes are likely to be more severe. Mitigation measures would include the design of a safe escape route and the provision of appropriate ventilation, drainage and lighting.

Risk mitigation/management

The proposed management measures for environmental and community impacts are described in the environmental impact statement, specifically Chapter 22 - Environmental management plans. Mitigation measures which will be managed through other procedures e.g. health impacts associated with the handling of dangerous goods will be addressed in a health and safety plan.

Health and safety

All construction and operational works carry with them a level of potential health and safety risk both to the project personnel and to other stakeholders such as landowners and road users.

With a significant number of construction staff and an average expected workforce numbering approximately 12 operational employees (assuming no more than two staff in attendance at stations), along with the increased passenger and freight driver requirements, there is a duty of care to manage the health and safety interests of all those working on the various project stages and living within the vicinity of the project.

As the anticipated operator of the project upon commissioning, QR Limited occupational health and safety processes will be relevant to the project. QR Limited is committed to continually improving occupational health and safety performance and has a Zero Harm strategy focused on:

- zero incidents
- zero injuries
- zero work-related illnesses
- zero environmental incidents.

QR Limited places a strong emphasis on employee safety and well-being, passenger safety and well-being and public safety and wellbeing.

Health and safety risks specific to this project have been identified through the hazard and risk assessment and with reference to the *Queensland Workplace Health and Safety Act 1995*.

A safety in design assessment will also need to be undertaken prior to the detailed design of the project to provide information regarding existing and future health and safety risks to designers, constructors and operators.

Emergency management planning

Potential emergency situations that could arise during the construction and operation of the project have been determined through the hazard and risk assessment and could include the following:

- natural hazards such as flood, landslide, fire or cyclone
- spills of hazardous materials during construction
- accidents involving explosives during construction
- accidents at road or rail crossings (particularly if grade separation does not occur as part of the initial construction of the project)
- derailments
- accidents involving spills of hazardous materials or other materials
- accidents involving spills of hazardous materials or other materials on a bridge or structure over waterways or public thoroughfares
- third party damage
- assaults at stations.

The hazard and risk assessment did not identify any of the above risks to be of a high level. However, risk identification is an ongoing process throughout the life of the project as new emergency risk situations could arise. Emergency situations require effective planning and management to reduce the impact arising from the situation. This information is usually documented in an emergency management plan specific to the project.

QR Limited (Network Access) requires any potential operator wishing to gain access to the QR Limited network to prepare the following:

- An acceptable Emergency Response Plan, to be used in the event of a derailment or other emergency on the network.
- An Environment Investigation and Risk Management Report that must include appropriate actions/responses to an incident (should one occur).

Summary

Natural hazard management areas have been identified in the relevant planning schemes of the shires through which the project passes. Areas of flood, bushfire and landslide risk occur adjacent to or within the project area and therefore require consideration under State Planning Policy 1/03 Mitigating the Adverse Effects of Bushfire, Flood and Landslide. It is considered that the project meets the requirements of this State Planning Policy and can demonstrate overriding need.

In addition to the natural hazards identified in the project area, human activity and technological issues can also present hazards. The hazard and risk assessment has been undertaken for the project in accordance with the principles set out in Australian Standards/New Zealand Standards Risk Management Standard 4360:2004 (which supersedes 4360:1999). The risks identified in the hazard and risk assessment are considered to be at most medium level risks, which in the context of the hazard and risk assessment means that existing measures in place for the construction or operation of the project are considered sufficient to manage the identified risks.

During construction, the construction contractor will also have a safety management plan in place and an emergency management plan which will determine day-to-day procedures and responsibilities for health and safety and emergency planning.

20. Cumulative impacts

Cumulative impacts can be defined as:

- The interrelationships between impacts - Interactive effects arise where effects from one environmental element bring about changes in another environmental element.
- The sum of the project's impacts when added to those of other past, present or future projects - Cumulative impacts may result from a number of activities with similar impacts interacting with the environment in a region.

This section explores the interrelationships between the residual environmental impacts described in the environmental impact statement that remain significant after mitigation methods have been put in place. These types of impacts relate to a variety of issues including social, economic, ecological issues. The likely

cumulative effects that could occur as a consequence of the project in conjunction with the development of other projects that are currently in the project area are also discussed.

The aims of this assessment are to:

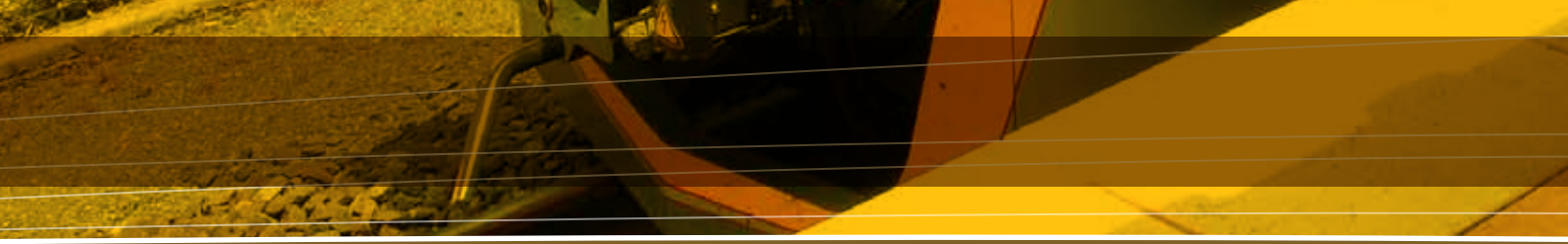
- consider the interrelationships between the impacts of the project (i.e. water, fauna, vegetation, air etc)
- identify other projects occurring within the area
- understand the potential impacts of these projects
- consider the combined effect of these impacts with the impacts identified for the Landsborough to Nambour Rail Project
- consider the opportunities that exist for efficiency gains and mitigation of environmental and property impacts through the co-location of the rail with other linear infrastructure.

The following presents a summary of the key findings. For more detail, see the environmental impact statement, Chapter 20 – Cumulative impacts.

Assessment of impact inter-relationships

The impacts of the project have been identified separately for each discipline, however, the accumulation of different impacts on the same receptor may result in a significant cumulative impact even if each impact is considered negligible when assessed separately. The following cumulative impacts have been identified for the project:

- During the construction phase of the project, local residents will be affected by a slight deterioration of air quality and an increase in noise levels. Cumulatively, this will result in a significant adverse impact during construction for sensitive land uses surrounding the rail project.
- The most significant cuts in the topography have the potential to cumulatively impact on the environment, through vegetation clearance, severance of fauna movement, as well as increased risk of landslides and flooding. Cuttings have been minimised and the cumulative impact is unlikely to be severe. Embankments can also cumulatively impact on the topography, on surface water by disturbing natural drainage patterns and on fauna movement. Structures have been proposed in areas subject to flooding to mitigate these impacts.
- The rail project is likely to cumulatively affect Kolora Park in Palmwoods in terms of land use, visual impact and cultural heritage. In Kolora Park, a structure is proposed to avoid significant changes to the topography and minimise impact on flooding, although it will result in a high adverse visual impact in this area. The structure is not likely to be as visually intrusive as an embankment and will reduce the impact on the open space land use. It is also less likely to impact on the registered site of Aboriginal significance located in close proximity to the corridor than an embankment.



- The project crosses six waterways, which could impact on terrestrial flora and fauna, aquatic biology and flooding. Risks are also associated with waterway crossings and these could be aggravated as a result of climate change.
- Vegetation clearing not only affects terrestrial flora and fauna but it could also have a cumulative adverse impact on aquatic biology, soil stability, water quality and visual amenity. The removal of riparian vegetation is particularly likely to result in significant cumulative adverse impacts. Indeed, it could potentially affect fish habitat and bank stability, increase erosion, sedimentation and pollutants from stormwater runoff reaching the streams.
- The improvements to the rail services are likely to have a long-term beneficial cumulative impact on transport and on the socio-economic environment.
- The introduction of grade separated road/rail crossings in place of the existing open level crossings will improve road traffic and safety, although it may also result in a significant adverse visual impact.
- The re-use of parts of the existing railway corridor for alternative uses, in particular for a recreational rail trail, could result in a beneficial impact on pedestrian and cycle movements, recreational land use and the social environment. However, the inclusion of a rail trail in more ecologically sensitive areas of the existing railway corridor, such as areas within Dularcha National Park, The Pinch Lane and various river and creek crossings, may be downscaled to a narrow trail to minimise disturbance in these areas. In the long-term, rehabilitation adjacent to the rail trail will increase the attractiveness of the trail, while enhancing its biodiversity value.

Description of related projects

In conjunction with other public transport projects being undertaken in the region, the project will improve public transport provision in south east Queensland and the Sunshine Coast, which is likely to result in a significant cumulative beneficial impact on the social and economic environments. Due to the increased choice of travel destinations, improved regional public transport connections will create much greater potential for residents to benefit than improvements to the services provided by the project alone.

Other infrastructure projects that the rail upgrade may affect include:

Gatton to Gympie gas pipeline

The proposed pipeline alignment runs predominately east of the rail project, from the south-west to north-east into Mooloolah, crossing the rail project to continue on the eastern side of Eudlo, Palmwoods, Woombye and Nambour. The proposed pipeline is currently in the planning stage.

The proposed pipeline alignment crosses the rail project near the Mooloolah River. Although the rail project is proposed to be on structure in this location to reduce the impacts on the Mooloolah River, cumulatively, the gas pipeline and the rail structure could have an adverse impact on the Mooloolah River, the riparian vegetation and threatened species.

Northern Pipeline Interconnector

The Northern Pipeline Interconnector enters into the project area just south of Mooloolah for approximately 2.5 km before running north-east and out of the project area at Palmwoods. The environmental impact statement for Stage 2 - Noosa water treatment plant to Landers Shute (near Eudlo) - has recently been released for public comment (January - March 2009) and the Coordinator-General is currently assessing submissions to determine whether a supplementary report to the environmental impact statement is required.

Although, the Northern Pipeline Interconnector and the project do not cross, they both affect a number of adjoining properties to the south of Mooloolah. The construction phases of the two projects are separated by over ten years and, as the construction impacts will be short-term, there will be no cumulative construction impacts on the affected properties.

Palmwoods – West Maroochydore – Pacific Paradise Power Corridor (SunCoast Power Project)

The new high voltage powerline will run from Powerlink's Palmwoods substation to Energen's existing West Maroochydore substation. The new transmission line is proposed to be located within the existing easement, therefore the operational impacts of the SunCoast Power project will not be significantly different to the existing impacts as the land affected by the easement is already cleared. The powerline will cross the rail project to the north of Eudlo. However, the rail project is proposed to run in a cut and cover structure at that location and will not impact on the new transmission line. The SunCoast Power project and the rail project are unlikely to result in any cumulative impacts.

Other projects

Other projects, such as the Landsborough Community Precinct and Nambour Structure Plan, will contribute to reinforce the attractiveness of Landsborough and Nambour. For instance, the development of an Art, Community and Heritage Precinct in Landsborough, identified in the Landsborough and District Local Area Plan (2001), is proposed to the south-west of Landsborough rail station. With the rail project, these projects are likely to result in a beneficial cumulative impact on the social and economic environment.

Opportunities also exist to link a recreational trail on the decommissioned railway with recreational trails proposed in 'Caloundra City Recreational Links and Trails' in the long term. This will enhance the benefits of the rail project on the social environment.

Summary

Some impacts of the rail project will have a cumulative effect on the environment. In particular, important cuts in the topography will have a significant adverse cumulative impact, as they will affect fauna movement, soil stability and increase risk of landslide and flooding. Riparian vegetation clearance will also result in cumulative adverse effects on terrestrial and aquatic biodiversity, soil stability and water quality. However, the rail project will also have long-term cumulative beneficial impacts on transport, safety and the socio-economic environment.

Cumulatively with other infrastructure projects on the Sunshine Coast, the rail project will improve accessibility and service provision in the region, resulting in a cumulative beneficial impact on transport and the socio-economic environment. Temporary construction impacts are not expected to result in any cumulative effects as the projects will be spread in time and geographically, thus not affecting the same receptors. However, the accumulation of low adverse impacts on the biodiversity in different locations in the region could significantly affect the regional biodiversity.

21. Special management areas

This section identifies a number of special management areas that have environmental, social, economic or cultural significance. These special management areas have unique characteristics and require careful management through the planning, construction, operational and decommissioning phases of the project. A concerted effort has been made to avoid or minimise impacts and maintain the pre-defined special values of these areas. The key driving factors for the special management areas have been the conservation of the natural environment and protection/enhancement of social values.

Special management areas include:

- waterways
 - Addlington Creek (north)
 - South Mooloolah River
 - Mooloolah River
 - Eudlo Creek
 - Paynter Creek
 - Petrie Creek
- national parks
 - Dularcha National Park
 - Eudlo Creek National Park
- tunnels
 - The Pinch Lane
 - Rose Road

- townships
 - Landsborough school and recreational precinct
 - Mooloolah
 - Eudlo
 - Palmwoods
 - Woombye
 - Nambour.

Special management actions have been identified for each special management area. These actions are usually site or issue specific, and relate to future stages of design, construction and in some cases operation. These special management actions are in addition to the project specific environmental management measures identified in Chapter 22 – Environmental management plans.

The following presents a summary of the special management actions. For more detail, see the environmental impact statement, Chapter 21 – Special management areas.

Waterways

The project affects a number of waterways that will require special management.

Addlington Creek

- Is located approximately 1 km north of Landsborough station.
- Vegetation on either side of the crossing classified as remnant Of Concern (confirmed through field survey).
- The waterway is generally quite narrow with some large deep pools and incised banks.
- Water quality is reasonable, in spite of indications of poor flow and increased nutrient levels.
- Giant Barred Frog (*Mixophyes iteratus* – listed as ‘Endangered’ under the *Environment Protection and Biodiversity Conservation Act 1999*) tadpoles were found in this creek during field survey.
- The creek is directly linked to Ewen Maddock Dam, where two *Environment Protection and Biodiversity Conservation Act* listed fish (Oxleyan Pygmy Perch *Nannoperca oxleyana* and Honey Blue Eye *Pseudomugil mellis*) are known to occur.

South Mooloolah River

- The river is located 325 m north of Dularcha National Park.
- Two branches of the river cross the project approximately 175 m apart.
- The vegetation on either side of the crossings is classified as remnant ‘Endangered’ (confirmed through field survey).
- The waterway is 2 – 8 m in width with some large deep pools and incised banks.

- The water quality in this location was reasonable, with turbidity and dissolved oxygen levels being outside acceptable ranges and with evidence of erosion and increased nutrient levels.
- Evidence of the Giant Barred Frog (*Mixophyes iteratus* - listed as 'Endangered' under the *Environment Protection and Biodiversity Conservation Act 1999*) was found during field surveys.

Mooloolah River

- The river is located to the north of Mooloolah township.
- The vegetation on either side of the crossing is classified as remnant 'Endangered' (confirmed through field survey).
- The waterway is 2 - 8 m in width with some large deep pools and incised banks.
- The water quality in this location was good with all water quality indicators returning results within acceptable levels.
- High diversity of aquatic habitats that are in good condition support a relatively rich fish community.
- Very high numbers of the potentially 'Threatened' Ornate Rainbowfish (*Rhadinocentrus ornatus*) and evidence of the Endangered Giant Barred Frog (*Mixophyes iteratus*) were found during field surveys.

The project will cross the Mooloolah River in a different location to the existing railway crossing.

Eudlo Creek

- The creek flows from Mooloolah to the north of Eudlo.
- The project crosses the creek at five points with a triple crossing between Logwoods Road and Highlands Road.
- The section between Logwoods Road and Highlands Road contains very little to no riparian vegetation, is potentially the most degraded major waterway in the project area and is currently utilised for grazing sheep.
- Some weed management and planting have been undertaken in this area.
- Current habitat values of this section of Eudlo Creek are limited.
- Three Migratory (under the *Environment Protection and Biodiversity Conservation Act 1999*) species were noted in the area during field investigations (Spectacled Monarch (*Monarcha trivirgatus*), Cattle Egret (*Ardea ibis*) and Rainbow Bee-eater (*Merops ornatus*)).
- The waterway is 2 - 8 m in width with some large deep pools and incised banks.
- The water quality in this location was quite poor with the results for turbidity and dissolved oxygen outside acceptable ranges.

The introduction of the rail to this area may result in an opportunity to rehabilitate this section of Eudlo Creek and enhance a local wildlife corridor between remnant areas to the north and south.

Paynter Creek

- The creek flows from Palmwoods to the north of Woombye.
- The project crosses the creek at three points between Palmwoods and Woombye.
- The project passes within close proximity of a 300 m stretch of the creek that is mapped as 'Of Concern' remnant vegetation, however, field surveys revealed that the vegetation can be described as remnant 'Endangered'.
- The vegetation has suffered under cattle grazing, but current owners have fenced off a large portion of the area for regeneration.
- The creek contains a diversity of aquatic habitats that are in reasonable condition supporting a relatively rich fish community.
- High numbers of the potentially 'Threatened' Ornate Rainbowfish (*Rhadinocentrus ornatus*) were found during field surveys.
- Platypus (*Ornithorhynchus anatinus*) are reported to occur and the creek may support some habitat for Giant Barred Frog (*Mixophyes iteratus*), although surveys failed to locate the species.
- The waterway is 2 - 8 m wide with some large deep pools and incised banks.
- The water quality in this location was quite poor with the results for turbidity and dissolved oxygen outside of the acceptable ranges.

Petrie Creek

- The creek flows through Nambour adjacent to the existing rail.
- The project is located to the east of Petrie Creek with two points where the earthworks associated with the project may encroach on the waterway if not managed appropriately:
 - At Greenhaven Court, the habitat value is limited, but the creek has high value as a local wildlife movement corridor and platypus (*Ornithorhynchus anatinus*) are reported to occur.
 - At Arundell Avenue, the habitat value is reasonable. The creek has high value as a local wildlife corridor. Platypus (*Ornithorhynchus anatinus*) are reported to occur, the Grey-headed Flying Fox (*Pteropus poliocephalus*) is likely to feed on fruiting trees in the area and this section of the creek is possible habitat for Giant Barred Frog (*Mixophyes iteratus*).

The project also has the potential to detract from the local wildlife corridor values of Petrie Creek, by removing part of the eastern bank.

Special management actions for waterways

Design

- All waterways will be crossed using bridge structures, except for Addlington Creek.
- Piers and footings of the bridges crossing waterways will be set back 10 - 20 m from the lower bank of the waterway to allow wildlife to move through these areas.
- Bridges will be built at a suitable height to retain vegetation under the structure where possible.
- Pre-fabricated bridge or culvert units will be used where possible to minimise the time spent at sensitive sites and the construction footprint.
- Addlington Creek will be crossed using three culverts (one for drainage and two for fauna movement) because the height of the project through this area cannot achieve enough clearance under a bridge to allow terrestrial fauna movement.

Construction

- Vegetation of a suitable height will be retained under bridges where possible.
- Sediment and erosion control measures will be implemented for construction in the vicinity of waterways.
- Construction of the waterway crossings will be undertaken outside of the peak breeding season for the Giant Barred Frog in relevant habitat areas.
- A fauna expert will be employed to determine the amount of frog activity prior to construction.
- The construction area will be minimised in the vicinity of waterways.

Operation

- Weeds will be managed under bridges and around culverts.
- Management may be required under bridges and around culverts to create and maintain suitable conditions for frog movement, particularly Giant Barred Frog (*Mixophyes iteratus*).

Decommissioning

- Existing bridges and culverts will be removed where possible once the existing railway is decommissioned.
- Areas where bridges and culverts have been removed will be rehabilitated.

Tunnels

There are two new tunnels required for the rail upgrade.

- The Pinch Lane
 - The existing tunnel is located under The Pinch Lane and is 170 m long.
 - The new tunnel will be located to the west of the existing tunnel and will be 310 m long.
- Rose Road
 - The existing tunnel runs under Rose Road and is 215 m long.
 - The new tunnel will be located to the west of the existing tunnel and will be 410 m long.

Special management actions for tunnels

Design

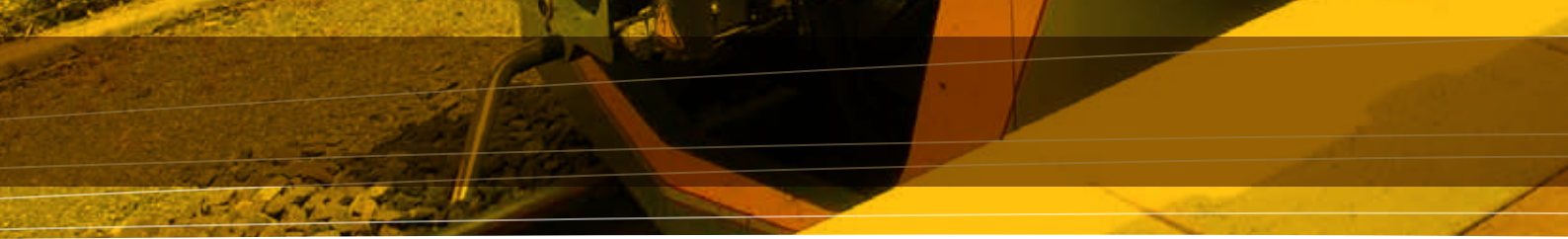
- Tunnels will be bored or blasted to avoid disturbing the land and vegetation on the ridge above the tunnel as this vegetation is associated with a bioregional wildlife corridor.
- 'Cut and cover' tunnel construction will be used where the terrain does not allow for a bored or blasted tunnel to be built.

Construction

- If blasting is used, it will be undertaken at times that are the least disruptive to fauna, i.e. in the middle of the day.
- Cut and cover tunnels will be re-vegetated after construction.
- The construction corridor width and amount of vegetation cleared will be minimised where possible.
- A fauna expert will be employed to guide clearing activities.
- Areas impacted by construction, but not required for the operation of the railway, will be rehabilitated after construction.

Operation

- Weed management along the margins of the new rail and within 'dead zones' shall be implemented to minimise edge effects.
- The potential use of the decommissioned rail tunnel at The Pinch Lane for native bat species shall be investigated. Provision of a textured roof top and treatment of tunnel entrances can enhance the suitability of the tunnel for certain target species.
- The inclusion of a rail trail shall be investigated at detailed design with regards to recreational benefits and ecological impacts. It is noted that public access to The Pinch Lane area is currently limited.



Decommissioning

- The existing rail through the bioregional corridor at The Pinch Lane shall be decommissioned and rehabilitated, with on-going weed management of the existing rail corridor until the vegetation is self-managing. Should the decommissioned railway be re-used as a recreational trail, it would be preferable for the trail to avoid the bioregional corridor as much as possible and to follow an alternative route in this section.

National parks

There are two national parks affected by the project.

- Eudlo Creek National Park
 - Is approximately 0.43 km² in size, stretching from north of Eudlo to south of Palmwoods following the existing railway.
 - Contains vegetation that is mostly of high conservation status that forms habitat for a number of significant fauna species.
 - Is isolated from other conservation areas, but is surrounded by a significant amount of remnant vegetation.
 - Is currently split in two by the existing railway.
- Dularcha National Park
 - Is approximately 1.38 km² in size stretching from north of Landsborough to south of Mooloolah following the existing railway.
 - Contains vegetation that is mostly of high conservation status that forms habitat for a number of significant fauna species.
 - Was originally declared a national park to protect the scenery along the rail corridor.
 - Mooloolah Forest Reserve runs along its western boundary contributing to the significance of the conservation area.
 - Is currently split in two by the existing railway.

Special management actions for national parks

Design

- Dularcha National Park
 - The proposed rail corridor has been kept as close to the existing railway as possible to minimise fragmentation of the national park.
 - Rail design speeds have been reduced to keep the project within the existing rail corridor where possible.

- Three fauna friendly culverts will be constructed to replace existing culverts that are unsuitable for fauna movement.
- A new tunnel will be constructed under Rose Road to accommodate the new railway which will avoid clearing vegetation along the ridge line.
- Eudlo Creek National Park
 - The proposed rail corridor is located to the west of the existing railway, giving the opportunity to consolidate the national park through the decommissioning of the existing railway.
 - Fauna underpasses will be built to encourage wildlife to move between the national park and surrounding remnant vegetation areas.

Construction

- The corridor width and amount of vegetation cleared during construction will be minimised where possible.
- Areas impacted by construction, but not required for the operation of the railway, will be rehabilitated after construction.
- Environmental offsets will be provided for remnant vegetation that has to be removed.
- A fauna expert will be employed to guide clearing activities.
- Hollow logs, rocks and large debris will be salvaged for use in rehabilitation activities.
- Construction of the waterway crossing in the Eudlo Creek National Park will be undertaken outside of the peak breeding season for the Giant Barred Frog.
- Sediment and erosion control measures will be implemented for construction in the vicinity of waterways.

Operation

- Weeds will be managed along the new rail corridor.
- Fauna underpasses will be monitored to ensure they are functioning properly.

Townships

All of the townships along to proposed rail corridor have been nominated as special management areas due to the project's impact on each town.

Landsborough school and recreation precinct

The Landsborough school and recreation precinct encompasses the Landsborough State Primary School facilities, which extend from Gympie Street North to the Landsborough Recreational Reserve. The project follows the existing rail corridor past the Landsborough primary school and the recreational reserve, with land requirements from the primary school sports oval and the recreational reserve. The option developed for this area includes:

- The requirement of a portion of land along the eastern edge of the Landsborough State Primary School sports field.
- Removal of vegetation along the sports field's boundary requiring the installation of appropriate fencing.
- The requirement of a portion of land along the western edge of the Landsborough Recreational Reserve (also known as the Landsborough Sportsground)
- Replacement of the open level crossing at Gympie Street North with a road overpass that maintains access across the railway and between the school and its sports field.
- Realignment of the Tytherleigh Avenue and Gympie Street North intersection.
- Re-establishment of property accesses in the vicinity of the new Gympie Street North overpass, including the replacement of parking facilities for the school.

Special management actions

A number of actions are proposed to mitigate project impacts.

Design

- Access and car parking arrangements for the school and its sports field were taken into consideration during the design process.
- A safe access point for students, staff and the community to pass between the sports field and school is required.
- Land requirements from the recreational reserve will be minimised through the use of retaining walls and other design elements.

Construction

- Temporary car parking and student drop off areas will be provided for the duration of construction.
- Construction activity will occur within school holidays where possible.

- Construction activities will be scheduled to minimise disturbance during events at the Landsborough Recreational Reserve where possible.
- A traffic management plan will be developed for local traffic during construction.

Operation

- There are no operational impacts in this area that will require mitigation.

Decommissioning

- No decommissioning activities will be required in this area as the existing rail corridor will be re-used as part of the proposed rail corridor.



Existing: View across the Landsborough State Primary School sports field.



Proposed: View of the new road overpass at Gympie Street North from the Landsborough State Primary School sports field.

Mooloolah

The township of Mooloolah, in the Mooloolah Valley, is currently serviced by the existing north coast line. Facilities at the station include a waiting shed, ramp access, car parking, bus stop and a timber pedestrian overbridge. The waiting shed and timber pedestrian over bridge are listed on the former Register of the National Estate. The waiting shed is also listed on the National Trust Register, and is recognised in local heritage nominations. The existing platform at Mooloolah is on the eastern side of the existing railway, and is only long enough for the first three cars of a six car train to allow passengers to board and alight.

The railway is crossed by Mooloolah Connection Road on the east and Bray Road on the west, at an open level crossing. This existing open level crossing is controlled by boom gates, flashing light protection and pedestrian gates. The station is directly to the south of the open level crossing.

A significant amount of feedback was gathered from the Mooloolah community during community consultation phases. Key issues identified include:

- Station design needs to fit with the historic context of the township.
- The impact of the new railway needs to be minimised for business and private property.
- Heritage features of the railway precinct need to be retained.
- Connectivity between the eastern and western sides of the town is important for pedestrians, cyclists and horses and their riders.

As a result of this feedback, a new road and rail option for the Mooloolah township was developed. The option includes:

- An initial three-track layout for the new railway that is wholly within the existing corridor and at a similar height to the existing railway through the township.
- The identification and protection of the land required for a fourth track if needed in the future.
- Preservation of properties and businesses along Karanne Drive until a fourth track is needed.
- Realignment of Neill Road under the new railway to the north of Mooloolah with a clearance of 5.5 m and improved flood immunity.
- Protection of an option for the replacement of the open level crossing with a road bridge at a time when risk and traffic congestion considerations determine the need for closure of the existing crossing.

Special management actions

A number of actions are proposed to mitigate project impacts:

Design

- Design allows for the staged implementation of road network changes in line with risk and traffic congestion considerations.
- Heritage values of the pedestrian overbridge and waiting shed will be recognised and reflected in future station and surplus rail land planning.



Existing: View along Mooloolah Connection Road to the existing open level crossing



Proposed: View of the new Mooloolah Station area (after removal of the existing open level crossing).

- Design of the station and the eventual road overpass needs to be consistent with the context of the historic rail township, similar to the recent Landsborough Station upgrade.
- Road overpass will be an open structure to allow views and movement under the structure.
- Visual, noise, lighting and landscaping considerations will be integrated into the design of the road overpass.
- Community consultation will be ongoing during the detailed design phase, particularly in relation to the station design.

Construction

- Traffic will be managed during the construction of the project and the road overpass.
- If constructed early, the road overpass has the potential to alleviate some traffic impacts associated with the rail upgrade.

Operation

- The central express track will be used to provide additional capacity for non-stopping services.

Decommissioning of surplus rail land

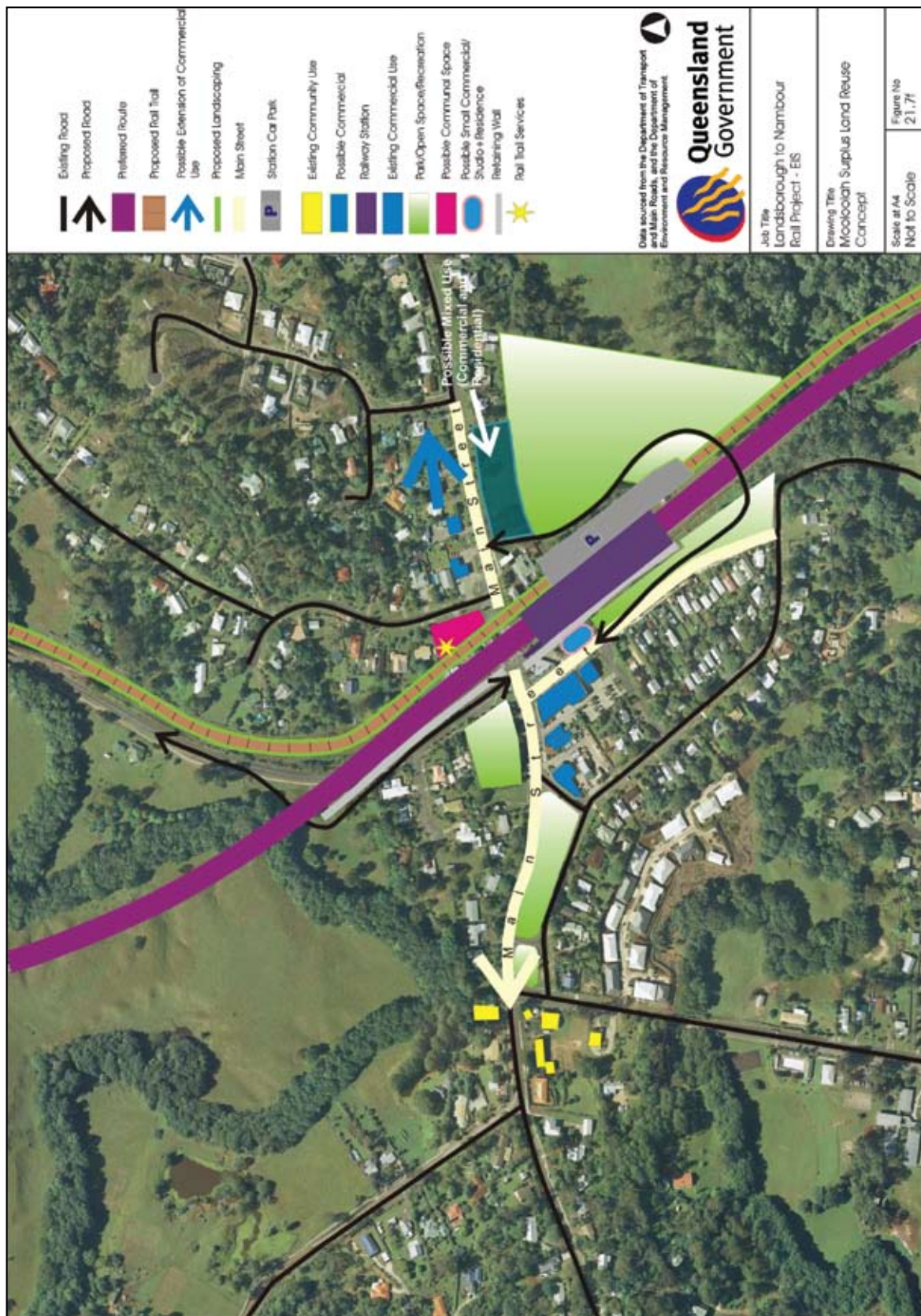
- Opportunities for the re-use of surplus rail land have been recommended to the Sunshine Coast Regional Council for consideration as part of Council's current masterplanning activities for the railway towns. These are shown on the map on the following page.



Existing: View along Neill Road.



Proposed: View of the new railway from Neill Road (including the rail overpass) looking towards the north of Mooloolah Station.



Surplus rail corridor land reuse concept for Mooloolah

Eudlo

The township of Eudlo is currently serviced by the existing north coast line. Facilities at the station include a pedestrian shelter, steep ramp access, car parking and bus stop. The platform at Eudlo is on the eastern side of the existing railway, and is only long enough for one car of a six car train to allow passengers to board and alight. The station is directly to the west of Eudlo Primary School and the centre of town (general store and community hall). The rural fire brigade facilities are located close to the existing station.

A number of key issues for the Eudlo township were identified through feedback gathered from the community. These include:

- The need to maintain safe and secure access to the new station given that it is further from the township.
- Impacts on the re-vegetated Federation Walk area need to be minimised.
- The station needs to be designed to fit with the historic context of the township.

The road and rail option developed for Eudlo includes:

- A new station located approximately 90 m to the west of the existing station.
- A station car park located on the eastern side of the Federation Walk area.
- Clearing of some trees in the Federation Walk area to provide safe and visible access to the station from the township.
- Re-vegetation of parts of surplus railway land to replace lost vegetation.

- The new railway will pass over Highlands Road.
- Eudlo School Road will pass over the railway.

Special management actions

A number of actions are proposed to mitigate project impacts.

Design

- Pedestrian access will be incorporated into the station design.
- Station design will be consistent with the context and scale of the railway township.

Construction

- Some trees from the Federation Walk area will be cleared to maintain a physical and visual link between the station and the town.
- Construction impacts on traffic and current land uses will be minimal as the proposed location for the new station is to the west of the township.

Operation

- There are no operational impacts in this area that will require mitigation.

Decommissioning of surplus rail land

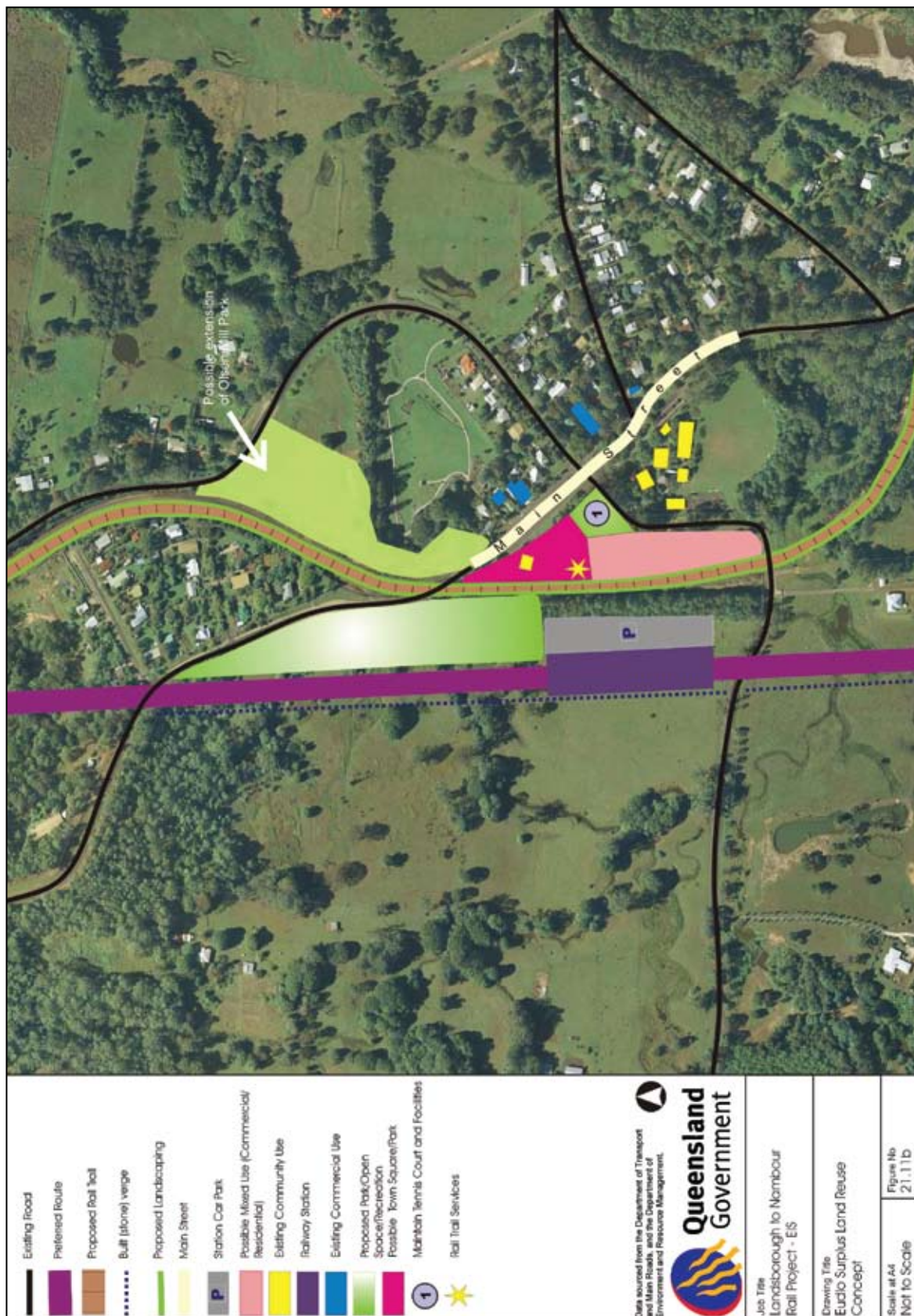
- Opportunities for the re-use of surplus rail land have been recommended to the Sunshine Coast Regional Council for consideration as part of Council's current masterplanning activities for the railway towns. These are shown on the map on the following page.



Existing: View to the proposed new Eudlo station area (looking east from Highlands Road).



Proposed: View of the new Eudlo station area looking east from Highlands Road.



Surplus land reuse concept for Eudlo

Palmwoods

Palmwoods is located approximately 4 km north of Eudlo and 3 km south of Woombye. The project passes to the east of the existing railway line and station area, at a similar level. The alignment of the existing railway cuts through Palmwoods on the eastern side of the commercial precinct. It winds through residential development and around the bowls club and Kolora Park. Although the town has largely expanded around the existing railway, it splits the town into two halves. The existing alignment is slow due to tight curves and steep grades.

Kolora Park is a central feature of Palmwoods. It is located east of the existing railway and is recognised for its values to the community and tourists. Historical evidence has revealed that the water body associated with the park was originally utilised as source water for the rail. From an ecological perspective, Kolora Park supports two regional ecosystems and a large water body. This water body is connected to Paynter Creek, which is a large creek system extending north to Woombye. Kolora Park has been noted to support a variety of bird life.

Key issues for the Palmwoods community highlighted through community feedback include:

- The impact on Kolora Park needs to be minimised.
- Connectivity between the rail station and the township is important to the community.
- Appropriate noise treatments need to be incorporated into the bridge structures.
- The station design needs to fit with the historic context of the township.
- Surplus railway land should be used to link the new station to the township.

The road and rail option for Palmwoods has not changed since the options consultation phase, although community feedback has been taken into consideration for activities around the rail corridor. The option includes:

- The railway will be realigned to pass to the east of the town centre at a similar height to the existing railway.
- The new railway will be built on a bridge structure through the township to minimise impacts on Kolora Park and Paynter Creek and to ensure flood immunity further along the rail corridor.



Existing: View to the existing railway from Main Street.



Proposed: View of the new Palmwoods station looking east from Main Street

- The rail station to be located partly on the structure approximately 8 m above ground level.
- The new railway to pass over the Palmwoods bowls club car park on a bridge structure.
- Chevallum Road to be realigned to pass under the new railway with clearance of approximately 5.5 m.
- Decommissioning of the existing railway will provide opportunities to use surplus rail land to improve access between the station area and the township.

Special management actions

Design

- The use of a bridge structure through Palmwoods will minimise the impact on Kolora Park and Paynter Creek.
- Community consultation will be ongoing during the detailed design phase, particularly in relation to the visual and noise impact of the bridge structure.
- Chevallum Road has been redesigned to accommodate the proposed railway.
- Chevallum Road and Nicklin Road intersection will be realigned.

- The initial two tracks will be built on a single bridge with additional tracks added on a separate bridge structure if required.
- Noise barriers will be designed to take into consideration surrounding land uses and the heritage values of the railway township.

Construction

- Vegetation under the bridge structure will be selectively cleared to retain vegetation of up to 10 m tall.
- Construction tracks will be created within the existing rail corridor or the new rail corridor, and will not affect remnant vegetation in the area.
- Sediment and erosion control measures will be implemented to protect waterways during construction.

Operation

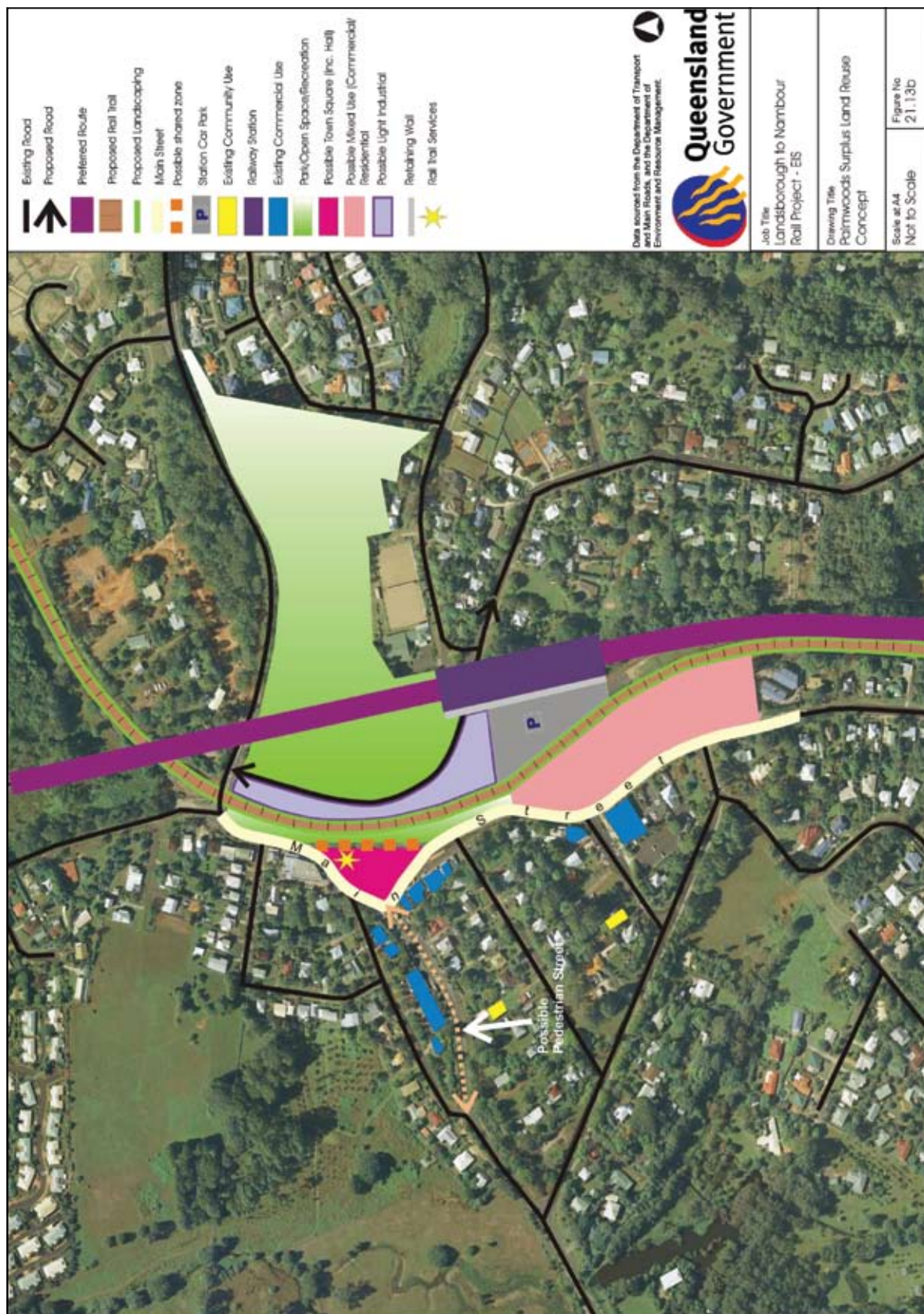
- Noise barriers will mitigate the operational noise impact of the new railway.

Decommissioning of surplus rail land

- Opportunities for the re-use of surplus rail land have been recommended to the Sunshine Coast Regional Council for consideration as part of Council's current masterplanning activities for the railway towns. These are shown on the map on the following page.



Proposed: View of the railway over Kolora Park and Woombye Palmwoods Road (looking from the road)



Surplus land reuse concept for Palmwoods

Woombye

Woombye is located approximately 3 km north of Palmwoods and 4 km south of Nambour. The project passes approximately 50 m to the west of the existing railway line and station area, at a similar level. The existing Woombye station is located to the west of the town centre, at the end of Blackall Street. Blackall Street is the main commercial/business precinct of Woombye. Woombye has direct access onto the Nambour Connection Road, and the Queensland Department of Transport and Main Roads and the Sunshine Coast Regional Council are currently examining alternate road network provisions to improve connectivity between Woombye and Nambour.

The existing road network connecting Woombye to the west currently passes in a loop under the railway bridge at Paynter Creek, north of the existing station. The Woombye soccer fields and sports grounds are located to the west of the existing railway, at the Woombye showgrounds. Various sport and recreational pursuits occur in this area. The Woombye scout hut and a church are also located in the area to the west of the existing railway.

The road and rail option for Woombye has not changed since the options consultation phase, although community feedback has been taken into consideration for activities around the rail corridor. The option includes:

- The station to be located approximately 50 m to the west of the existing station.
- Station car parking to be located to the east of the new railway.
- Back Woombye Road to be realigned over the new railway to provide a connection to Blackall Street.

- Connectivity needs to be maintained between the town and the station.
- The road connections around the railway need to be improved.

Special management actions

Design

- Park and ride opportunities in Woombye in line with Department of Transport and Main Roads and Sunshine Coast Regional Council's plans for the road network in this area will be considered.

Construction

- A traffic management plan will be developed for local traffic during construction.

Operation

- There are no operational impacts in this area that will require mitigation.

Decommissioning of surplus rail land

- Opportunities for the re-use of surplus rail land have been recommended to the Sunshine Coast Regional Council for consideration as part of Council's current masterplanning activities for the railway towns. These are shown on the map on the following page.



Existing: View to the proposed Woombye station area looking from the east.



Proposed: View of the new Woombye station looking from the east



Surplus land reuse concept for Woombye

Nambour

Nambour station is located approximately 4 km north of Woombye. Nambour has the largest residential area in the project area. Nambour is designated as a Major Activity Centre, in the South East Queensland Regional Plan. Nambour is both the service and administrative centre of the former Maroochy Shire, which is now part of the Sunshine Coast Regional Council. Its businesses support local residents and those in surrounding townships and the hinterland. Some businesses also support the tourism industry in the region.

Nambour's primary industry has been sugar, with extensive cane fields surrounding the town, and the Moreton Sugar Mill in the town centre. However, the mill itself was closed in 2003, and the site is the subject of future redevelopment interest. Currently, industrial uses are located on adjacent land to the west of the existing alignment, on the corner of Arundell Avenue and extending along Perwillowen Road.



Existing: View to the existing Nambour Station area from the corner of Currie Street and Civic Way



Proposed: View of the redeveloped Nambour station from the corner of Currie Street and Civic Way

Special management actions

Design

- Existing station building should be integrated into future station upgrades to maximise the re-use of existing structures.
- Lifts and pedestrian bridges will be integrated into design of the upgrade.

Construction

- Mitigation measures will be implemented to minimise noise and dust in construction areas.

Operation

- Noise barriers will be constructed to the south of Nambour station on the eastern boundary of the existing railway to mitigate noise impacts from the rail upgrade.

Decommissioning of surplus rail land

- No decommissioning activities will be required in this area as the existing rail corridor will be re-used as part of the proposed rail corridor.

22. Environmental management plans

The Environmental Management Plan for the project sets out the environmental issues that will be encountered by the project and contains clear commitments to manage these issues. It is a description of proposed measures to be implemented to help achieve and maintain acceptable levels of the environmental impacts identified in the environmental impact statement and a tool to help meet the requirements of relevant legislation and best practice environmental management.

The purpose of the Environmental Management Plan is to identify all potential environmental impacts and mitigation measures together with corrective action if an undesirable impact or unforeseen level of impact occurs.

The aims of the Environmental Management Plan are to:

- Provide auditable proponent commitments with practical and achievable plans for the management of the project such that environmental requirements are complied with.
- Produce an integrated planning framework which provides for comprehensive monitoring and control of construction and operational impacts.
- Provide local, State and Commonwealth authorities and the scheme proponent with a framework to confirm compliance with their policies and requirements.
- Provide the community with evidence of the management of the project in an environmentally acceptable manner.

Refer to the environmental impact statement, Chapter 22 – Environmental management plans, for details of the project's environmental management plan.





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