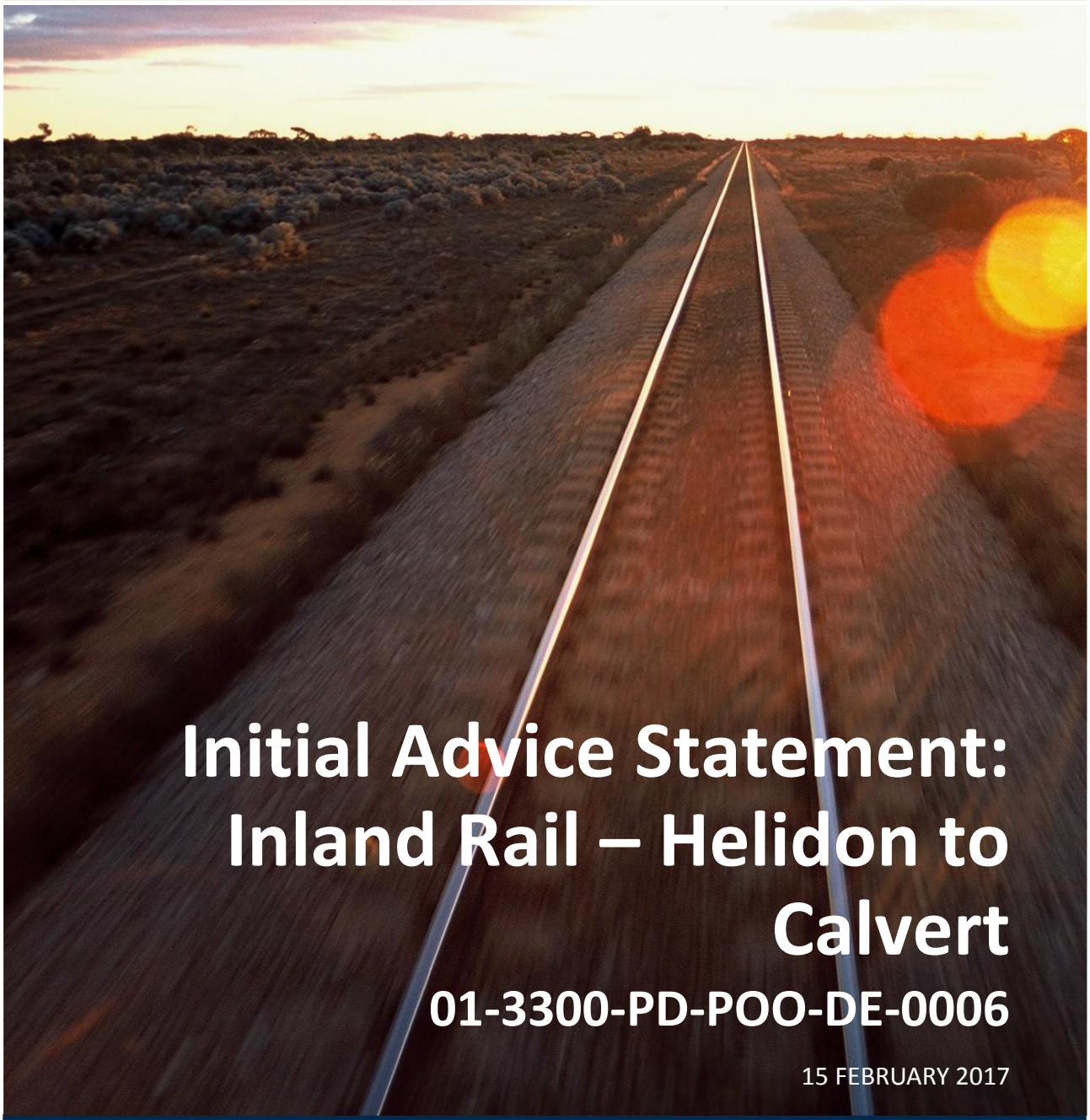
ARTC InlandRail

The Australian Government's priority freight rail project



Initial Advice Statement: Inland Rail – Helidon to Calvert

01-3300-PD-POO-DE-0006

15 FEBRUARY 2017

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EXECUTIVE SUMMARY:

Project Description

This Initial Advice Statement (IAS) has been prepared for the Australian Rail Track Corporation (ARTC) Inland Rail Helidon to Calvert Project. ARTC is an Australian Government owned corporation and current operator of the Australian freight network. ARTC currently manage and maintain approximately 8500 km of rail network across Victoria, New South Wales, South Australia, Western Australia and Queensland.

ARTC has been tasked with delivery of the Inland Rail Programme. The Helidon to Calvert Project is one of 13 separate projects that are part of the Inland Rail Programme:

Project Name	State	Description	Length (km)
Tottenham to Albury	Vic	Enhancement works	305
Albury to Illabo	NSW	Enhancement works	185
Illabo to Stockinbingal	NSW	New Railway	37
Stockinbingal to Parkes	NSW	Enhancement works	169
Parks to Narromine	NSW	Upgrade works	111
Narromine to Narrabri	NSW	New Railway	307
Narrabri to North Star	NSW	Upgrade works	186
North Star to NSW/QLD Border	NSW	New Railway	52
NSW/QLD Border to Gowrie	Qld	New Railway	197
Gowrie to Helidon	Qld	New Railway	26
Helidon to Calvert	**Qld**	**New Railway**	**47**
Calvert to Kagaru	Qld	New Railway	53
Kagaru to Acacia Ridge	Qld	Enhancement works	35
	Total	**Total**	**1,710**

Each project can be delivered independently with tie-in points on the existing railway. The business case shows that Inland Rail maximises value for money while meeting market needs and provides benefits to the Australian economy through efficient freight transport.

The Helidon to Calvert Project will be constructed as an approximately 47 km long single-track dual-gauge railway with crossing loops to accommodate double stack freight trains up to 1800 m long. The Helidon to Calvert Project will also assess the future requirements for the land provision for 3600 m trains and future duplication of the freight line Impact assessment will be undertaken for the proposed development described in the Inland Rail Business Case (2015) for rail traffic and associated activities projected at the year 2040.

The Helidon to Calvert Project will generally be within the existing Gowrie to Grandchester future public passenger transport corridor. The Project will include accommodation for two passenger tracks for a future possible public passenger service to be undertaken by the Queensland Department of Transport and Main Roads (TMR). The infrastructure requirements for the possible future passenger transport service are excluded from this Project, and would be progressed by TMR.

The Helidon to Calvert Project is one of the 'missing links' and is identified as a priority development project within the Inland Rail Programme. A preferred alignment has been identified for the Helidon to Calvert Project within a broader Study Area. This will allow for route and tunnel optimisation and other value engineering opportunities to be investigated during subsequent design development, community engagement, environmental assessment and approvals processes. The final Alignment and Project Corridor will be defined during the Environmental Impact Statement (EIS) and design development phases and will include both brownfield (within existing rail corridor) and greenfield development.

The Helidon to Calvert Project initially will require the provision of a new single track dual gauge line and crossing loops within both greenfield sections and brownfield (existing rail corridor) sections and includes a 1.1 km tunnel crossing of the Little Liverpool Range. The Helidon to Calvert Project is a new railway line, between the existing railway lines at Helidon to the existing line west of Calvert, via a new tunnel section through the Little Liverpool Range.

Given the significance and complexity of the Helidon to Calvert Project, Australian Rail Track Corporation is seeking a declaration for coordinated project status under the *State Development and Public Works Organisation Act 1971*. The Helidon to Calvert Project will also be referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and if determined to be a controlled action, it is anticipated that assessment of the Helidon to Calvert Project will be progressed under the Bilateral Assessment Agreement between the Australian and Queensland Governments.

The key reasons ARTC are seeking the coordinated project declaration are:

- To provide the public with the opportunity to comment and provide input into the Terms of Reference for the EIS, and following its development, on the draft EIS,
- To have an independent and transparent social, economic and environmental assessment of the project undertaken by the Queensland Coordinator General; and
- For the opportunity of efficient assessment of EPBC Act matters in accordance with the Queensland and Commonwealth government EPBC Act assessment bilateral agreement (if required).

The EIS will undertake a range of investigations into the potential impacts and mitigation measures required for the delivery of the Helidon to Calvert project. Those investigations will assess:

- Land use
- Flora and fauna
- Water quality
- Hazards, health and safety
- Social and economic factors
- Air quality
- Noise and vibration
- Water resources
- Waste management
- Cultural heritage; and
- Transport.

1. INTRODUCTION

1.1. Background

1.1.1. Inland Rail

The Australian Government has committed to building a nationally significant piece of transport infrastructure by constructing an inland railway between Melbourne and Brisbane, via regional Victoria, central-west New South Wales (NSW) and Toowoomba in Queensland (QLD).

The Melbourne to Brisbane Inland Rail Programme ('Inland Rail') will enhance Australia's existing rail network and serve the interstate freight market by delivering a road competitive service that will see freight delivered from Melbourne to Brisbane in less than 24 hours with reliability, pricing and availability that is equal to or better than road. Inland Rail provides a step-change in freight productivity, while also catalysing a range of potential benefits from complementary investments in land use and supply chains that leverage the enhanced logistics capabilities of Inland Rail.

The Inland Rail Programme has evolved over several decades with many alternatives and options assessed to meet Australia's growing freight transport needs. The current proposal as shown in **Figure 1-1** was confirmed in the Inland Rail Programme Business Case 2015 and the Inland Rail Implementation Group's report to the Australian Government (August 2015).

The Australian Government has prioritised the Inland Rail Programme, and in 2014 engaged the Australian Rail Track Corporation (ARTC) under the guidance of the Inland Rail Implementation Group to develop a 10-year delivery programme for Inland Rail.

The Inland Rail route, which is approximately 1700 kilometres long, will involve:

- Using the existing interstate rail line through Victoria and southern NSW
- Upgrading approximately 400 km of existing track, mainly in NSW
- Providing approximately 600 km of new track in northern NSW and South-east QLD.

Inland Rail has been divided into 13 projects, five of which are located in QLD as shown in **Figure 1-2**. Each of these projects will be delivered, and operated independently with tie-in points on the existing railway.

The Helidon to Calvert Project is the subject of this Initial Advice Statement (IAS). The Helidon to Calvert Project will provide an efficient route through the steep terrain of the Little Liverpool Ranges. It has been identified as a priority development project within the Inland Rail Programme, taking into consideration the complexity, delivery options, timing and funding requirements of the project's key scope elements. The Helidon to Calvert concept design includes a 1.1 km tunnel through the Little Liverpool Ranges, substantial viaduct structures and earthworks to facilitate the rail alignment across the undulating topography.

1.2. Purpose and Scope of the Initial Advice Statement

This IAS has been prepared for the Helidon to Calvert Project to support an application to the Queensland Coordinator-General for a 'coordinated project' declaration under Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). A coordinated project declaration means that ARTC must prepare either an EIS or an impact assessment report (IAR). Due to the nature and extent of the proposed Helidon to Calvert Project, ARTC believe that an EIS is appropriate for assessing the social, economic and environmental impacts.

ARTC are seeking a declaration that the Helidon to Calvert Project is a coordinated project due to the significant infrastructure investment and strategic direct and indirect economic benefits of creating an efficient freight route through the Lockyer Valley and the Little Liverpool Range. ARTC are also seeking to have Commonwealth matters under the EPBC Act assessed in accordance with the assessment bilateral agreement between the Queensland State Government and the Commonwealth Government, if the Commonwealth Minister determines that the Helidon to Calvert Project is a controlled action. The Helidon to Calvert Project will have complex approval and permitting requirements under Commonwealth, State and local legislation and the potential for significant environmental impact unless appropriately managed.

The IAS provides information to assist the Coordinator-General to decide whether the Helidon to Calvert Project should be declared a coordinated project, to determine the appropriate assessment process, and inform the preparation of a terms of reference for an Environmental Impact Statement (EIS) should the Helidon to Calvert Project be declared under section 26(a) of the SDPWO Act, and require an EIS.

The Helidon to Calvert Project has also been referred to the Commonwealth Department of the Environment and Energy (DotEE) for a decision as to whether the Helidon to Calvert Project is a controlled action requiring assessment and approval under the *Environment and Biodiversity Conservation Act 1999* (EPBC Act). If the Helidon to Calvert Project is determined to be a controlled action, it can be assessed by the SDPWO Act EIS process accredited under the assessment bilateral agreement between the Australian Government and the State of Queensland.

A Preferred Alignment and a broader Study Area for the Helidon to Calvert Project has been identified for consideration in the IAS and EPBC Referral. These areas have been defined to encapsulate the potential land requirements for construction of the railway and ancillary infrastructure. These aspects are discussed further in **Section 3.1**.

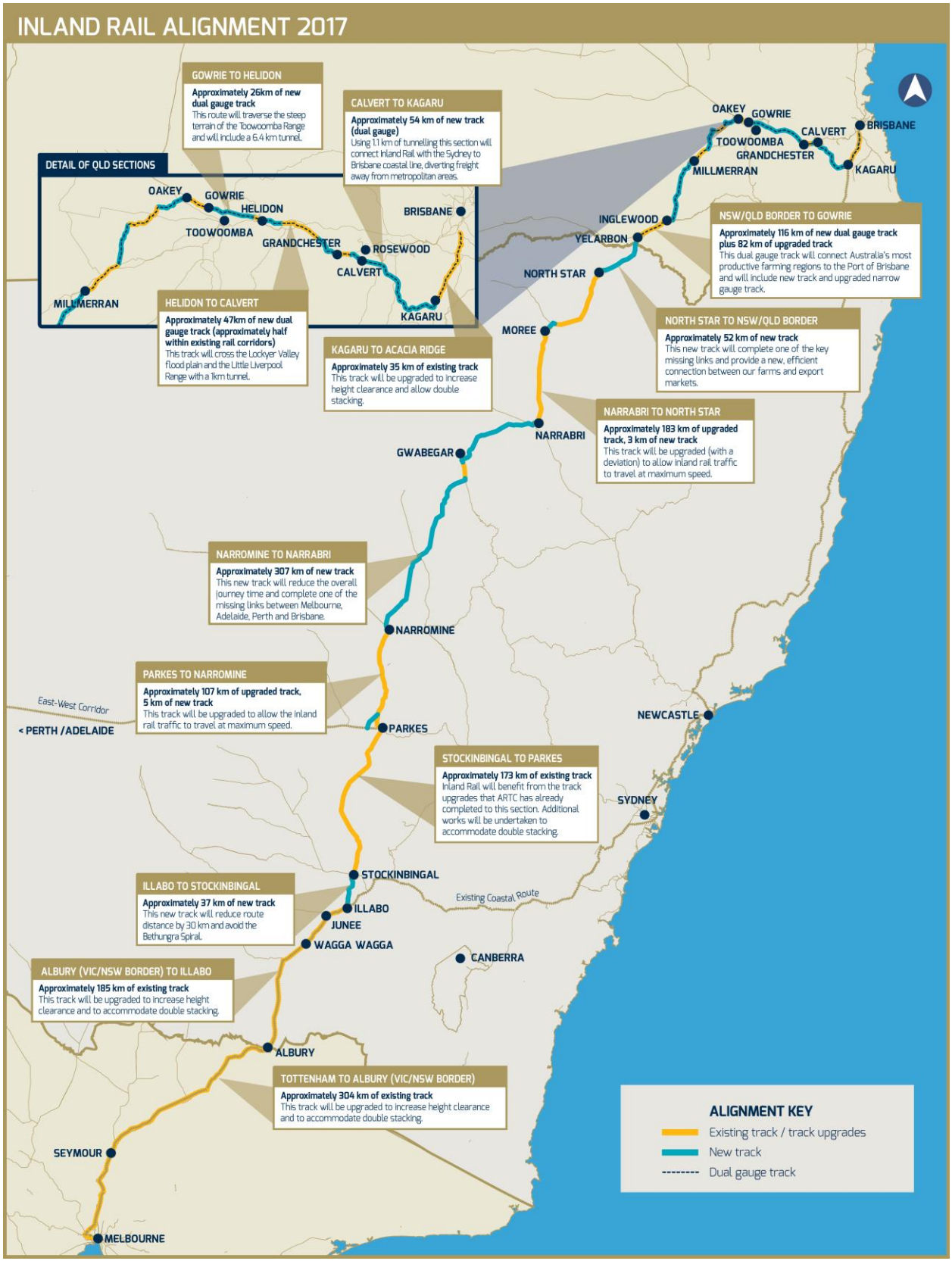


Figure 1-1 The Melbourne to Brisbane Inland Rail Programme

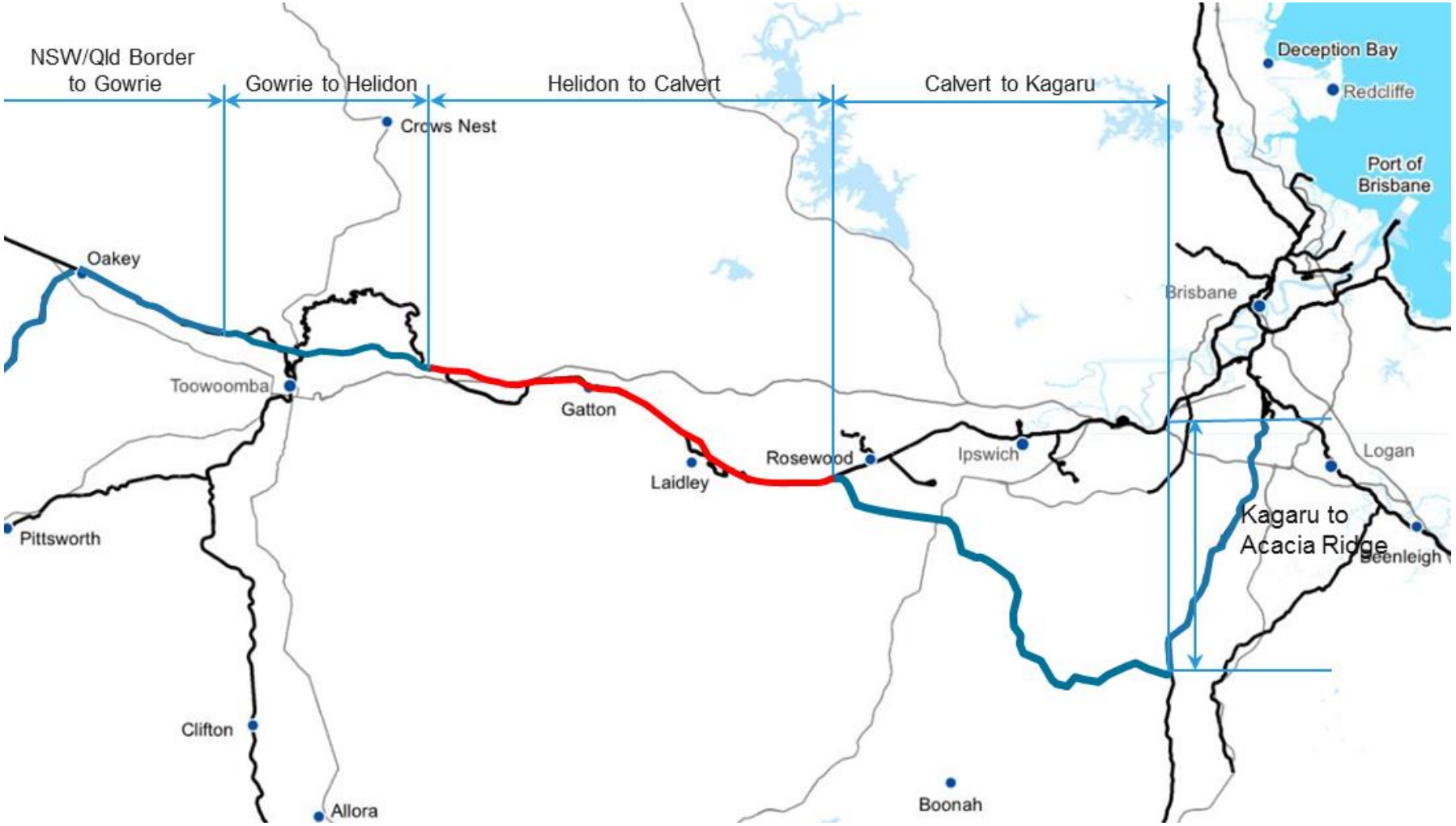


Figure 1-2 Queensland Projects of Inland Rail Programme

2. THE PROPONENT

ARTC is an Australian Government owned corporation and current operator of the Australian freight network. ARTC has been tasked with delivery of the Inland Rail Programme. ARTC was established in 1998 after the privatisation of the national rail network and Commonwealth and State Government agreement to form a 'one-stop' shop for all operators wanting access to the standardised interstate rail network.

ARTC currently manage and maintain approximately 8500 km of rail network across Victoria, New South Wales, South Australia, Western Australia and Queensland. Over the past five years alone ARTC have delivered an almost $3bn capital programme works to modernise the east coast freight rail lines and other projects to enhance the national rail network offering to customers. The Inland Rail Programme is an integral component of the future enhancement of the national rail network.

ARTC is fully capable of completing an EIS, having established an Inland Rail Programme team with in-house support from specialist consultant technical advisors from the SMEC Arup joint venture, and several specialist consultants. Packages of technical (engineering and environmental) work are also being procured from industry consultants. ARTC plan to engage with suitably qualified consultants with demonstrated experience in delivering the required social, economic and environmental impact assessment, and the associated engineering solutions for a project of this nature and scale. Procurement of specialist consultancy firms for the delivery of the EISs will occur following the finalisation of the Terms of Reference for the EIS.

ARTC have not incurred any environmental prosecutions within the last 5 years. During the execution of almost $3Bn of capital works, ARTC have incurred two penalties in New South Wales relating to minor environmental incidents including:

- NSW EPA Penalty Notice to ARTC dated 29 May 2012 for discharge of sediment-laden water at Allandale (Maitland to Minimbah Third Track Project) = $1500
- NSW EPA Penalty Notice to Transport Express JV (operating under ARTC EPL) dated 5 March 2012 for sediment and erosion control issues at Sawtell = $1500

ARTC has also previously entered into a Voluntary Enforceable Undertaking with the Commonwealth DoEE under the EPBC Act in 2011.Contact details for the Inland Rail Programme are as follows:

Inland Rail
Australian Rail Track Corporation
L12, 40 Creek Street
PO Box 2462 Queen Street
Brisbane Qld 4000
Telephone: 1800 732 761

3. NATURE OF THE PROPOSAL

3.1. Scope of the Helidon to Calvert Project

The proposed Helidon to Calvert Project is an approximately 47 km long single-track dual-gauge railway with crossing loops to accommodate double stack freight trains up to 1800 m long. It will also involve the construction of an approximately 1.1km long tunnel through the Little Liverpool Range to facilitate the required gradient across the undulating topography. The corridor will be of sufficient width to accommodate future possible upgrades of the track, including a future possible requirement to accommodate trains up to 3,600m in length.

The land requirement for the Inland Rail will comprise a corridor with an average width of 65m, with some variation to accommodate particular infrastructure and to cater for local topography. The corridor will be of sufficient width to accommodate the infrastructure currently proposed for construction, as well as future expansion, including possible future requirement for 3,600m trains, and future proofing for a possible public passenger transport service.

Initial project construction will be a single-track dual-gauge railway, with crossing loops to accommodate double stacked freight trains up to 1,800m long. Components of the construction will include infrastructure to accommodate possible future augmentation and upgrades of the track, including a possible future requirement for 3,600m trains. Clearing of the corridor will occur to allow for construction and to maintain the safe operation of the railway.

The operational phase at year 2040 will be of a single track with crossing loops to accommodate double stacked freight trains up to 1,800m long. Impact assessment will be undertaken for the proposed development described in the Inland Rail Business Case (2015) for rail traffic and associated activities projected at the year 2040.

The Project will generally be within the Gowrie to Grandchester future public passenger transport corridor. The Project will include accommodation for two passenger tracks for a future possible public passenger service to be operated by the Queensland Department of Transport and Main Roads (TMR). Requirements for rail transport infrastructure for a future possible public passenger service are excluded from this Project, and would be progressed by TMR.

A Preferred Alignment and a Study Area have been identified as shown in **Figure 3.1**. The Study Area will allow for route optimisation and other value engineering opportunities to be investigated during subsequent design development, community engagement, environmental assessment and approvals processes. Further details are included in **Section 3.4**.

3.2. Land Use

The Preferred Alignment is generally consistent with the alignment of the Gowrie to Grandchester future public passenger transport corridor protected under the *Transport Planning and Coordination Act 1994* (TPC Act) with a deviation at Helidon. The Preferred Alignment is located within the local government areas of Lockyer Valley Regional Council and Ipswich City Council. Land Use within the Preferred Alignment is predominantly rural and rural residential interspersed between the townships of Gatton, Laidley, Helidon, Grandchester and Calvert and includes significant transport infrastructure of the Warrego Highway and West Moreton Railway Line. **Section 5.5.1** provides further detail of current land uses.

The Preferred Alignment commences at Helidon deviating from the existing West Moreton Railway Line at a tie-in point along Airforce Road, immediately west of Helidon. The Preferred Alignment continues south east crossing the Warrego Highway, continuing east between the highway and the existing rail corridor until it runs immediately parallel with the existing rail corridor through Placid Hills.

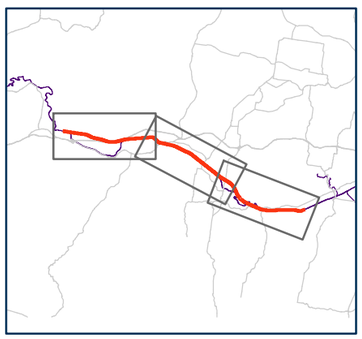
ARTC InlandRail

3300 Helidon to Calvert

Project Context

Figure 3.1

- Gowrie to Grandchester Protected Corridor
- Study Area
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Secondary road



2.5 Km

Coordinate System:
GCS GDA 1994

Paper: A3
Date: 25/01/2017
Author: IR

Scale: 1:65,000

Data Sources: Rail network: DNRM ; Road network; Protected corridor: DTMR; All other data: ARTC IR

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ARTC InlandRail

3300 Helidon to Calvert

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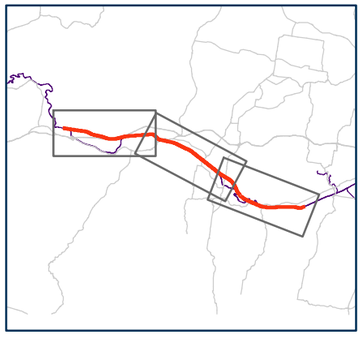

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ARTC InlandRail

3300 Helidon to Calvert

Project Context

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- Study Area
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Secondary road

Eastern Portal

Little Liverpool Tunnel

LAIDLEY

GRANDCHESTER

CALVERT

Summerholm

Laidley North

Laidley South

Woolshed

Tallegalla

The Bluff

Grandchester

Calvert

Lower Mount Walker

Laidley Rosewood Rd

Rosewood Laidley Rd

Mulgowie Rd

Boundary Rd

Mountain Rd

Sippels Rd

Odwyer Rd

Doonans Rd

Hiddenvale Rd

Grandchester Mount Mort Rd

Gehrke Hill Rd

Jackson Rd

Long Gully Rd

Henderson Rd

Johns Rd

Greet Rd

Embreys Rd

Ivy Hansens Rd

Waters Rd

Laidley Creek

Moran Creek

Brown Creek

Western Creek

Plain Creek

Lake Dyer

272 m

306 m

307 m

354 m

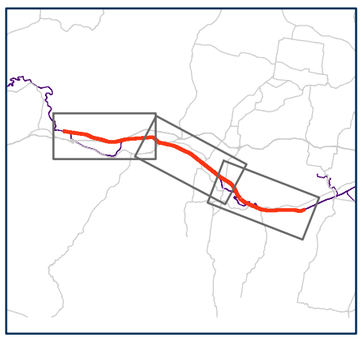
348 m

402 m

228 m

112 m

503 m



2.5 Km

Coordinate System:
GCS GDA 1994

Paper: A3
Date: 25/01/2017
Author: IR

Scale: 1:65,000

Data Sources: Rail network: DNRM ; Road network; Protected corridor: DTMR; All other data: ARTC IR

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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The new track continues parallel to the north of the existing rail line, through Gatton and the northern side of the existing Gatton rail station, through Forest Hill and then deviates from the existing rail corridor in a south east direction just north of Laidley Township across Laidley Plainlands Road. The Preferred Alignment then continues and crosses the existing rail corridor at grade near the former Yarongmulu Station (west of the existing tunnel portal under Little Liverpool Range) then continuing east before reaching a new 1.1 km tunnel section through Little Liverpool Range.

After exiting the eastern tunnel portal at the Little Liverpool Range, the Helidon to Calvert Project crosses over the existing rail line twice, bypassing the existing Grandchester Station to the south, running parallel to the existing rail corridor just to the south of the existing rail corridor, and then connecting back in to the existing rail line west of Calvert.

The intended land use for the Helidon to Calvert Project is rail and associated infrastructure, including road realignments, grade separations and ancillary infrastructure.

3.3. Project need, justification and alternatives considered

3.3.1. The Melbourne to Brisbane Inland Rail Programme Business Case

The Inland Rail Programme has been under development for many years. This has included economic analysis, route studies and preliminary engineering analysis. The original North- South Rail corridor study was undertaken in 2006, followed by the Inland Rail Alignment Study (IRAS) released in 2010. A concept business case was prepared in 2014, followed by the preparation of the Programme Business Case in 2015. The Inland Rail Programme is also recognised in the National Land Freight Strategy (Standing Council on Transport and Infrastructure 2012).

The Business Case examines the complex issue of freight movement and forecast freight demand along the east coast of mainland Australia. ARTC estimates that without Inland Rail, more than 32 million tonnes of freight will be moved on highways between Melbourne and Brisbane by 2030.

Australia is heavily reliant on efficient supply chains to provide competitive domestic freight links and gateways for international trade. Freight transport services between major population centres, particularly our capital cities, deliver millions of tonnes of freight each year and provide for the distribution of goods throughout the country. Efficient and effective domestic supply chains that are internationally competitive against import chains, support economic growth and help keep down the cost of the products we buy. It is estimated the transport and logistics sectors of the Australian economy contribute 14.5% of Gross Domestic Product (GDP), with Australia's supply chain worth an estimated $150 billion per annum. Efficient transport of Australian exports to world markets maximises the economic returns to the Australian economy. Productive ports, freight networks and other critical infrastructure is the key to efficient supply chains and to Australia's competitiveness. Better infrastructure has a critical role in lifting our nation's wealth and prosperity and the effective operation of national freight is integral to the wellbeing of all Australians. Inefficient infrastructure networks are one of the key reasons why Australia's productivity has declined and a key driver of the cost of living pressures affecting Australians. Australia's east coast comprises 70% of the country's population, 78% of Australia's national employment and generates 75% of the nation's GDP. With the population estimated to grow by 60% over the next 40 years increasing pressure will be placed on freight infrastructure and services.

The Business Case identifies that:

- Relying on road for freight transport will result in increasing safety, environmental and community impacts
- The existing rail line between Melbourne and Brisbane is constrained by passing through Sydney and can't accommodate double stacking

- Our regional suppliers have limited transport options.

The Business Case shows that Inland Rail:

- Is compatible and interoperable with high productivity train operations in the east-west corridor, to Adelaide and Perth
- Uses and enhances existing rail infrastructure where possible, making the most of recent investments
- Bypasses the congested Sydney rail network
- Improves connections with regional and local rail and road networks
- Maximises value for money, while meeting market needs
- Delivers the service that rail customers want, at a price they are willing to pay
- Provides significant social and environmental benefits
- Will cover its ongoing operating and maintenance costs, once operational
- Is good for the country's economy – increasing Australia's GDP by an estimated $16 billion by 2050 Meets Australia's strategic, long-term needs'.

The Australian Government approved funding for the Inland Rail Programme in the 2016 Federal Budget to progress the design and engineering development, and commence primary planning and environmental approvals and property acquisition for all 13 Inland Rail Projects.

3.3.2. Queensland Planning Context

ARTC is seeking that the Helidon to Calvert Project be declared a 'coordinated project for which an EIS is required' under section 26(1)(a) of the *State Development and Public Works Organisation Act 1971*.

In deciding whether to declare a project to be a coordinated project, the Coordinator General must have regard to:

- Detailed information about the project given by the proponent in an IAS
- Relevant planning schemes or policy frameworks of a local government, the State or the Commonwealth
- Relevant State policies and Government priorities
- A pre-feasibility assessment of the project, including how it satisfies an identified need or demand
- The capacity of the proponent to undertake and complete the EIS for the project
- Any other matter the Coordinator-General considers relevant.

3.3.2.1. Relevant Planning Schemes and Policy Frameworks

The *Sustainable Planning Act 2009* is the overarching framework for Queensland's planning and development system. It is supported by the Sustainable Planning Regulation 2009, state planning regulatory provisions, the State Planning Policy, regional plans, Queensland Planning Provisions and local planning schemes.

The Preferred Alignment traverses two local government areas (LGAs) including:

1. Lockyer Valley Regional Council
2. Ipswich City Council

The Project traverses areas that are within the following local government planning schemes:

- Gatton Shire Planning Scheme 2007
- Laidley Shire Planning Scheme 2003
- Ipswich Planning Scheme 2006.

The Laidley Shire Planning Scheme identifies a proposed rail corridor consistent with the Preferred Alignment on their Development Constraints Overlay Map I1 and protects it from incompatible development. The existing Gatton Shire Planning Scheme 2007 and Ipswich Planning Scheme 2006 also have provisions for development around existing and proposed transport corridors. The Gatton Shire Planning Scheme 2007 and Laidley Shire Planning Scheme 2003 will be replaced once a single planning scheme for the Lockyer Valley is prepared and adopted.

The Preferred Alignment also forms part of the rail corridor identified under the Gowrie to Grandchester Rail Corridor Study in 2003. This rail corridor was subsequently identified as a 'future public passenger transport corridor' in September 2005 in the Public Passenger Transport Guideline made under the *Transport Planning and Coordination Act 1994*.

The Helidon to Calvert Project will generally co-locate with the existing Gowrie to Grandchester future public passenger transport corridor.

3.3.2.2. Relevant State Policies and Government Priorities

The State Planning Policy (SPP) and the South East Queensland Regional Plan (currently under review) are State planning instruments under the *Sustainable Planning Act 2009*. The SPP acknowledges that key transport corridors (both passenger and freight) need to be identified and protected and linked to strategic airports and the broader transport network.

'Opportunities to integrate with Inland Rail proposals' is identified as one of the freight objectives under the South East Queensland Regional Plan (currently under review). This is further supported by the South East Queensland Rail Horizon document released in 2016, which outlines rail investment priorities for South East Queensland.

The Queensland Government's Moving Freight strategy (DTMR 2013) recognises the need for Inland Rail, and identifies the Gowrie to Grandchester corridor as part of the key linkage between the West Moreton Rail System in South-western Queensland and the Port of Brisbane.

3.3.3. Alternatives considered – Programme wide

Various alternate scenarios to the overall Inland Rail Programme have been considered and are discussed in the Business Case including:

- Do nothing: freight remains on the existing road network, regional development opportunities are not realised, and potential opportunities to reduce significant greenhouse gas emissions unlikely to be realised
- Reforms to delay or remove the need for infrastructure investment (demand management, productivity enhancement or deregulation)
- Progressive upgrades of the National Highway
- Upgrades of the existing coastal railway
- Alternate freight transport solutions including air freight (cost prohibitive) and coastal shipping (constrained by port access).

The Business Case concludes that the preferred way to achieve the programme objectives is to proceed with implementation.

3.3.4. Alternatives Considered: Helidon to Calvert Project

Alternate alignments have been investigated within the Study Area. The Preferred Alignment is the result of several iterations of option assessment, and consultation with the Queensland Government. This includes the following:

- 2003 Gowrie to Grandchester Study, undertaken by Queensland Transport (QT). The 2003 QT study was undertaken to define and protect a future railway corridor suitable for 200 km/h passenger services and freight between Gowrie and Grandchester. The 2003 QT alignment that this study identified was subsequently reserved as future public passenger transport corridor in government planning schemes.
- The 2006 North South Rail Corridor Study, commissioned by the Australian Government Department of Transport and Regional Services. This study assessed the high level viability of four north south freight corridors between Melbourne and Brisbane. The study was not designed to identify a preferred option but identified the most affordable and economic corridor within which to focus future investigation.
- 2010 IRAS undertaken by ARTC. This study set the blueprint for the development of an inland railway to meet the future freight demands of eastern Australia. This route included consideration of the Gowrie to Grandchester section of Inland Rail (including the Toowoomba Range and Little Liverpool Range crossings) which ARTC had previously identified as likely to be the critical path component for the completion of Inland Rail. An alternate alignment between Gowrie and Grandchester was selected at the conclusion of this study.
- In 2014 the decision was made to move from the 2010 IRAS alignment to an alignment between Gowrie and Calvert that comprised the previously protected corridor known as the 2003 QT - Gowrie to Grandchester route. This was based on input and further options analysis undertaken by the Queensland Department of Transport and Main Roads, building upon the existing corridor location and inclusion in planning schemes.
- 2015 Melbourne to Brisbane Inland Rail Business Case confirms the 2014 alignment decision and the 2016 ARTC Concept Assessment process proceeds in consultation with the Queensland Government on this basis.

The Preferred Alignment and wider Study Area described in **Section 3.1** is the result of further options analysis undertaken by ARTC's consultants in 2016 in consultation with the Queensland Government. The concept assessment included a review of previous options analyses, further preliminary engineering design and environmental assessment and was informed by engagement with key stakeholders including the Lockyer Valley Regional Council, Ipswich City Council, peak industry bodies and Aboriginal parties.

3.4. Components, developments, activities and infrastructure that constitute the coordinated project

Key components of the Helidon to Calvert Project include:

- Single track dual gauge rail line with crossing loops to ultimately accommodate trains up 3600 m long based on business needs, but initially constructed for 1800 m long train sets
- The approximately 1.1km Little Liverpool tunnel, bridges and viaducts to accommodate topography and project crossings of waterways and other infrastructure
- Tie-ins to the existing West Moreton Railway Line at the project boundary and other potential intermediate locations to be confirmed by operational modelling

- The construction of associated rail infrastructure including maintenance sidings and signalling infrastructure to support the Advanced Train Management Systems (ATMS)
- Ancillary works including road and public utility crossings and realignments
- Third party infrastructure requirements to be determined during future project stages (refer **Section 3.5**)
- Construction workspace and access roads.

At the request of TMR, the Helidon to Calvert Project is being developed taking into account the potential for future rail transport infrastructure for passenger services to be delivered by TMR. The resulting total corridor width will be wide enough to accommodate two dual gauge freight tracks and two narrow gauge passenger tracks. At a point in time defined by demand, business needs, operational modelling and design, the next stage of the project may include construction works for additional infrastructure within the corridor including additional track, duplication or extension of crossing loops to accommodate longer trains and passenger infrastructure.

Construction activities for the project will likely include temporary roads, upgrades and/or alterations to existing roads. The construction of the Helidon to Calvert Project may also require relocation of some services, depending on their proximity to the construction zone. These aspects will be further examined in future design stages.

The Helidon to Calvert Project description will be further refined in future design development and environmental assessment during the EIS process.

3.5. Third Party Infrastructure Requirements

Third party infrastructure requirements will be determined during future design development. Power and water supply will be required during construction of the Helidon to Calvert Project.

During the operational phase of the Helidon to Calvert Project tunnel operations will require power and water supplies for ventilation and fire and life safety. Electricity supply will also be needed for points and other infrastructure. It is anticipated that the supply of these services will be delivered by relevant providers under the terms of their respective approvals and/or assessment exemptions.

Key elements not included as part of the Helidon to Calvert Project include the following:

- Complementary infrastructure, such as metropolitan and regional freight terminals
- Upgraded fleet / rolling stock
- Complementary land use and freight precinct developments.

3.6. Timeframes for the Helidon to Calvert Project

The indicative timeframe for the Helidon to Calvert Project is as follows:

- 2017-2019: design, planning and approvals
- 2019-end of 2020: pre-construction and land acquisition
- 2020-2024: Construction
- 2024 Project Opening.

The Helidon to Calvert project has been identified as one of the priority development projects within the Inland Rail Programme, taking into consideration the complexity, procurement models and funding requirements of the project's key infrastructure tunnel, bridges, viaducts and earthworks elements.

The Helidon to Calvert Project is being developed to facilitate the future provision of a duplicated track, longer freight trains and to not preclude the possibility of future passenger services being delivered by TMR. Therefore, at a point in time yet undefined, the next stage of the project may include construction works for additional infrastructure within the identified Preferred Alignment including additional track, extension of crossing loops and passenger infrastructure, however that infrastructure shall be contained within the planning footprint of the Helidon to Calvert Project being assessed in the proposed EIS.

3.7. Construction and Operational Processes

At present, only preliminary information is available about the way in which the Helidon to Calvert Project will be designed and delivered, with future stages of design and assessment to provide further clarification of these aspects.

Pre-construction activities are anticipated to include geotechnical investigations, survey, ecological investigations and cultural heritage surveys. This will include establishment of access tracks.

Construction will involve the following:

- Site preparation, earthworks and vegetation clearing for construction accesses and laydown areas
- Early works, including relocation of impacted utilities and roads
- Resourcing all construction and construction related materials, including won material, manufactured materials and construction water
- Earthworks, including construction of embankments and fill
- Tunnelling, currently anticipated to be a mined tunnel with temporary rock support and permanent concrete lining
- Construction of bridges and viaducts at major waterways, and major infrastructure crossings (e.g. Warrego Highway)
- Construction of drainage and stormwater treatment infrastructure
- Construction of track and signalling
- Construction and implementation of environmental management measures (e.g. fauna crossings, noise treatments)
- Landscaping and rehabilitation treatments to areas disturbed during construction.

3.8. Workforce requirements during construction and operation

The Inland Rail Programme Business Case identifies an anticipated additional 16 000 jobs at the peak of construction (estimated in 2019 to 2020), an average of 800 jobs per annum over the construction period and an average of 700 additional jobs per annum over 50 years of operation (2024 to 2074). It is estimated that approximately 60% of the capital expenditure (CAPEX) for Inland Rail will be expended on projects in Queensland, and therefore an equivalent proportion of jobs. The 10 year delivery schedule would support economic activity in the regions and create regional jobs in Queensland, New South Wales and Victoria during both construction and operations.

The Helidon to Calvert Project has been identified as a priority development project within the Inland Rail Programme. The Helidon to Calvert Project area and terrain challenges are relatively comparative to the Toowoomba Second Range Crossing (TSRC) motorway which is currently under construction and reported to require a workforce of 1800 full-time jobs during its three year design and construction phase between 2016 and 2018. The construction workforce requirements for the Helidon to Calvert Project are anticipated to be of a similar quantum. The TSRC motorway has had a local focus for the recruitment of workforce, sourcing suppliers and sub-contractors from the greater Toowoomba Region, and it is anticipated that the Helidon to Calvert Project would adopt a similar approach. Depending on the timing, the construction of the Helidon to Calvert Project has the potential to generate employment continuity, employing construction personnel as demobilisation of the TSRC motorway occurs post 2018. In addition the Helidon to Calvert Project's proximity to Brisbane provides the opportunity for sourcing the construction workforce from the Brisbane Region if required. Further, the expansion in the construction sector would support additional flow on demand through the construction industry supply chain and additional spending on consumer orientated products by the construction workforce in the local area. It is postulated that indirect employment opportunities will also arise as a result of the construction and operation of the Helidon to Calvert Project. The associated supply of construction materials, the development of associated external infrastructure and complementary services as described in **Section 3.5** will require additional workforce beyond those directly associated with the Inland Rail programme.

3.9. Economic Indicators

3.9.1. Capital Cost

The Inland Rail programme will be a strategic catalyst for economic development. A conventional economic appraisal was undertaken for the Programme Business Case in line with relevant Government guidelines focusing on the direct economic benefits from increased transport efficiency and the standard indirect benefits which flow from moving freight from roads onto rail.

Major infrastructure projects like Inland Rail inevitably involve significant construction costs. Delivering Inland Rail is expected to cost approximately $10 billion. The Helidon to Calvert Project is expected to cost approximately $1 billion due to the significant infrastructure elements of the tunnel, viaduct and bridges and significant earthworks required for the Little Liverpool Range Crossing.

3.9.2. Economic Analysis

An important aspect to assist governments in deciding whether or not to invest in such projects are the benefits to the community as a whole from the investment, and whether the net benefits of the project over the life of the infrastructure are likely to exceed its net cost. The economic analysis contained within the Inland Rail business case compares a scenario where there is an Inland Railway, to one where road and rail freight would use the existing roads and coastal railway, over a fifty-year period (2025 to 75).

Comparing these two scenarios, the economic analysis indicates that Inland Rail would deliver almost $22.5 billion worth of direct and indirect benefits to the nation, based on 2015 dollars, of which approximately $6.4 billion direct operating cost savings would be accrued by freight users and assumed to flow on directly to consumers. The resulting net economic benefit of Inland Rail is expected to be approximately $13.9 billion—a benefit-cost ratio (BCR) of 2.62 based on a discount rate of 4%. That is, the benefits of Inland Rail are approximately 2.6 times the cost (when measured at the 4% discount rate).

3.9.3. Local and Regional Benefits

The business case indicates that Inland Rail will generate significant economic activity, including jobs and an increase in GDP.

Regional communities along and adjacent to the Inland Rail would benefit through more efficient and effective rail access to metropolitan and international markets. While the purpose of Inland Rail is primarily for interstate intermodal freight such as moving shipping containers, whitegoods, steel and other commodities, Inland Rail will also support minerals, regional freight and agriculture. Inland Rail will enable farmers to move agricultural commodities more efficiently to capital cities and ports for export.

3.9.4. Wider Economic Benefits

An assessment of the Wider Economic Benefits (WEBs) of Inland Rail is provided in the Addendum to the ARTC 2015 Inland Rail Programme Business Case (2015). Since the release of the 2015 Programme Business Case, stakeholder feedback has supported the role of Inland Rail in transforming the economic geography of inter-capital freight and creating additional benefits across the broader economy. This addendum therefore seeks to provide an assessment of these broader benefits in two parts:

- *A more expansive calculation of induced freight benefits that considers the benefits that may arise across the supply chain (e.g. to rail operators and retailers in the relevant markets) from the additional freight demand induced by lower supply chain costs of Inland Rail; and*
- *WEBs that arise because businesses benefit from agglomeration economies (improved accessibility to customers, suppliers and labour markets).*

It is considered that improved accessibility to customers, suppliers and labour markets (i.e. effective density or agglomeration) from the operating cost savings delivered by Inland Rail, will result in agglomeration economies. The Inland Rail operating cost savings have been estimated to effectively increase the catchment of customers, suppliers and products that may be accessed in the absence of Inland Rail resulting in an increase in productivity.

The economic appraisal results for each business case scenario including the three alternative calculations of producer surplus described previously are presented in **Table 3-1** below. These results are not cumulative.

Table 3-1 Economic appraisal results with expanded benefits*

PROGRAMME BUSINESS CASE RESULTS ($ M)	7% DISCOUNT RATE	4% DISCOUNT RATE
Programme Business Case results (August 2015)	1.02	2.62
Programme Business Case results with Wider Economic Benefits	1.06	2.74
Producer surplus of rail operators	1.08	2.81
Producer surplus of rail operators and from sale of final good	1.17	3.07
Producer surplus of businesses along all supply chain	1.52	4.15

Source: Addendum to the ARTC 2015 Inland Rail Programme Business Case (March 2016).
***(incremental to the base case, discounted, real 2014-15 dollars**

Notes: Analysed over 50 year appraisal period to 2073–74 and discounted applying real discount rates; based on P50 cost certainty; excludes Port of Brisbane Extension; assumes complementary investment on the QR network (West Moreton Railway Line and Brisbane metropolitan network) Source: PwC 2016

3.9.5. Synergies with Business and Industry

The construction and operation of inland rail will present opportunities for local and regional freight hub development. In particular, the Helidon to Calvert section is expected to provide benefits to existing and future users of the south-West Moreton Railway Line by providing improved efficiencies on the Helidon to Calvert Project, compared to the existing railway. The construction of the Helidon to Calvert Project will also provide the potential for future provision of passenger services, which in turn could support further regional economic development and growth.

3.10. Financing Requirements and Implications

The Australian Government approved funding for the Inland Rail Programme in the 2016 Federal Budget to progress the design and engineering development, and commence primary planning and environmental approvals and property acquisition. The timing of the construction phase of the Helidon to Calvert Project is dependent on funding from the Australian Government.

4. LOCATION OF KEY PROJECT ELEMENTS

4.1. Location

The Preferred Alignment for the Helidon to Calvert Project commences at Helidon deviating from the existing rail line at a tie-in point along Airforce Road, immediately west of Helidon. The Preferred Alignment continues south east crossing the Warrego Highway, continuing east between the highway and the existing rail corridor until it runs immediately parallel with the existing rail corridor through Placid Hills.

The Preferred Alignment continues parallel to the north of the existing rail line, through Gatton and the northern side of the existing Gatton rail station, through Forest Hill and then deviates from the existing rail corridor in a south east direction just north of Laidley Township across Laidley Plainlands Road. The Preferred Alignment then continues and crosses the existing rail corridor at grade near the former Yarongmulu Station (west of the existing tunnel portal under Little Liverpool Range) then continuing east before reaching a new 1.1 km tunnel section through Little Liverpool Range.

After exiting the eastern tunnel portal at the Little Liverpool Range, the Helidon to Calvert Project crosses over the existing rail line twice, bypassing the existing Grandchester Station to the south, running parallel to the existing rail corridor just to the south of the existing rail corridor, then re-joining the rail corridor and running parallel to the existing lines west of Calvert and connecting back in to the existing rail line east of Calvert.

4.2. Tenure

The Preferred Alignment intersects approximately 92 lots, the majority of which are held in freehold title. Other tenure arrangements within the Preferred Alignment include Lands Lease (e.g. railway land), State Land and Reserve Land. Land required for the Helidon to Calvert Project would be acquired in accordance with the provisions of the TIA and the *Acquisition of Land Act 1967*.

The Preferred Alignment is generally within the protected corridor for future public passenger transport under the TPC Act, however there are areas of the Preferred Alignment that fall outside the protected corridor (including the alternative alignment between the power and gas easements).

Of the properties within and adjacent to the Preferred Alignment, a number are owned by local or State government. This includes land parcels owned by TMR that were acquired within the protected corridor, other state land (e.g. reserve for recreation and drainage) and properties owned by local government such as the proposed Gatton West Industrial Zone and Laidley Cultural Centre north of Laidley.

5. DESCRIPTION OF EXISTING ENVIRONMENT

5.1. Natural Environment

5.1.1. Land

Topography

The topography from Helidon gently slopes down towards Gatton, remaining relatively flat up to Forest Hill. The topography of the Preferred Alignment traverses the Little Liverpool Range via tunnel, exiting on the descent to Grandchester. From Grandchester the landscape remains relatively flat as it approaches Calvert. Elevation ranges from 60 m AHD at Calvert to 250 m AHD in the adjacent hills. Geology and Topography are illustrated in **Figure 5-1**.

Geology

The geology from Helidon to Calvert is predominantly comprised of the Jurassic Formation with small intermittent sections of Quaternary Alluvium and Colluvium. The Jurassic Formation underlying the majority of the Study Area is comprised of the following Marburg Formation members:

- Koukandowie Formation: typically comprised of coal measure rock types, is a grey brown to grey, fine to medium grained rock of very low to low strength with sub-horizontal bedding
- Gatton Sandstone: a pale orange/brown to grey, fine to medium grained interlaminated sandstone/sandy siltstone with a low to medium strength
- Woogaroo Formation: fine to medium-grained silty sandstone, siltstone ad claystone, thin to thick bedded with minor coal.

Soils

Overlying the Marburg Formation are solodic soils generally comprising the following pedological sequence:

- Thin organic topsoil: dark shallow porous loamy soils and friable and cracking dark clays
- Sandy-silty layer: red friable earths
- Medium to high plasticity clay: deeper dark cracking clays.

These solodic soils, characterised by their sodic/saline nature, are dispersive and highly susceptible to water, transitioning from a hard material when dry to non-trafficable when wet due to their plasticity. The cracking clays also experience significant shrinkage and swelling with variations in moisture content.

The Quaternary Alluvium is typically overlain by black earth comprised of black and dark grey clays of high plasticity. These reactive soils undergo shrinkage and swelling with the addition or removal of moisture allows the mixing of organic content from the surface during the shrink/swell process.

Alluvium in the Study Area is associated with watercourses and floodplains and is closely aligned with the mapping of important agricultural areas, by Department of Agriculture and Fisheries (DAF). There are extensive areas of mapped important agricultural areas within the Study Area (the majority of the Preferred Alignment between Gatton and Laidley), associated with Lockyer Creek, Sandy Creek and Laidley Creek.

According to the Australian Soil Resource Information System (ASRIS 2011) ASS mapping, there is no known occurrence of acid sulfate soils (ASS) along the route from Helidon to Calvert. From Gatton to Forest Hill and Laidley to Calvert there is a low probability of encountering acid sulfate soils.

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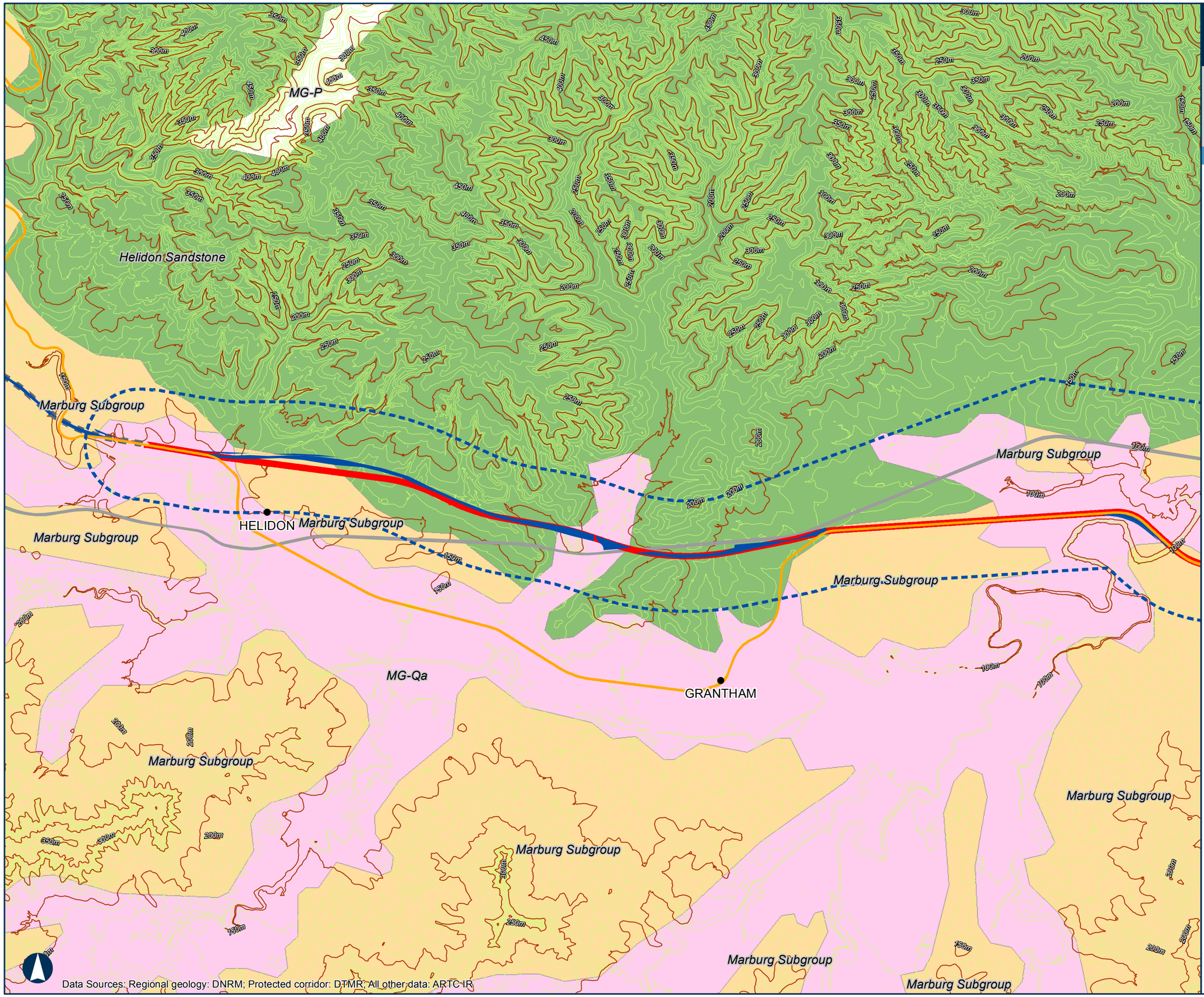
3300 Helidon to Calvert

Geology and Terrain

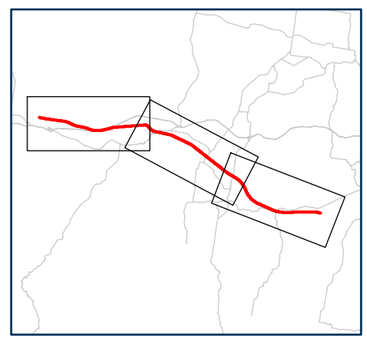
Figure 5.1



- Study Area
- Contours (50m interval)
- Contours (10m interval)
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- Gowrie to Grandchester Protected Corridor

Rock Unit (DNRM regional geology):

- Helidon Sandstone
- Alluvium (MG-Qa)
- MG-Tv
- Main Range Volcanics
- Marburg Subgroup
- Walloon Subgroup
- Water body (unspecified)
- West Moreton Rail Line
- Highway



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3300 Helidon to Calvert

Geology and Terrain

Figure 5.1

GATTON

FOREST HILL

LAIDLEY

Helidon Sandstone

Marburg Subgroup

Water body (unspecified)

MG-Qa

MG-Tv

- Study Area
- Contours (50m interval)
- Contours (10m interval)
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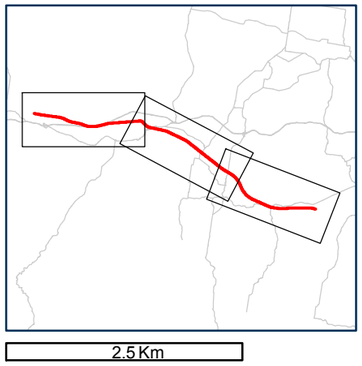

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Data Sources: Regional geology: DNRM; Protected corridor: DTMR; All other data: ARTC IR

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ARTC InlandRail

3300 Helidon to Calvert

Geology and Terrain

Figure 5.1

Marburg Subgroup
Water body (unspecified)
LAIDLEY
MG-Qa
MG-Tv
MG-Qa
MG-Tv
Marburg Subgroup
Walloon Subgroup
MG-Tv
MG-TQs
Marburg Subgroup
Walloon Subgroup
GRANDCHESTER
CALVERT
MG-Qa
Marburg Subgroup
Marburg Subgroup
Walloon Subgroup
Marburg Subgroup
Walloon Subgroup
Main Range Volcanics

Data Sources: Regional geology: DNRM; Protected corridor: DTMR; All other data: ARTC IR

- Study Area
- Contours (50m interval)
- Contours (10m interval)
- Preferred alignment (surface)
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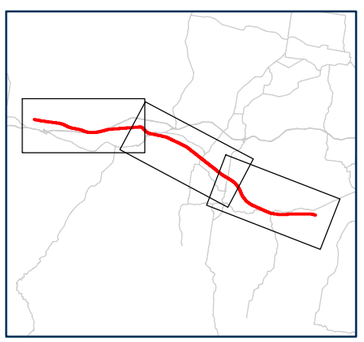
- Water body (unspecified)
- West Moreton Rail Line
- Highway



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Contaminated Land and Unexploded Ordnance

A desktop review of land uses and known contaminated areas has been conducted for the Study Area to identify potential sources of contamination.

Land uses that present a higher risk of existing contamination include areas used for industry, intensive agriculture and livestock farming, mining, storage of chemicals, gas, wastes disposal (landfills) or liquid fuel storage.

A review of aerial photography, land use mapping (Queensland Land Use Mapping Program, February 2016) and previous reports relevant to the Study Area has identified the following land uses that warrant further review of potential contamination in future project stages:

- Existing rail corridors are treated as potentially contaminated due to:
  - the unconfirmed nature of historic construction fill materials
  - the widespread historical use of the herbicide sodium arsenate which was sprayed onto the track to control weed growth
  - Potential for hydrocarbon spills and historic use of hydrocarbons to 'grease' the tracks on curves
- Quarries adjacent to the Study Area to the northeast of Helidon. Quarries may include land uses such as machinery or fuel storage which may be a source of contamination
- Livestock production, farm workshops or rural residential areas with potential contamination sources being previous storage of machinery, pesticides, hydrocarbons or other chemicals
- The majority of the Study Area between Helidon and Calvert is agricultural land, with the primary land uses mapped as grazing, production from irrigated agriculture and plantations and cropping. There is a potential for the presence of historic cattle dips, fuel and chemical storage in the Study Area.

UXO may occur in the Study Area. In Queensland, most UXO is found on land formerly used by the defence force, particularly during World War II. A search of Department of Defence mapping (Department of Defence 2016) identifies the known areas of UXO concern within or adjacent to the Study Area as shown in **Table 5-1**.

Table 5-1 Potential UXO sites within the Helidon to Calvert Region

LOT PLAN	SITE NAME	DESCRIPTION	ASSESSMENT	LOCATION
125CP907566	Queensland magazine, Helidon	Explosives storage from WWII to present. Now controlled by Queensland State Government.	This site is assessed as having a UXO contamination potential of "Other".	Immediately north of the Preferred Alignment at Air Force Road
4RP210342	Gatton Old Range	Used for mortar shoots WWII. No evidence found 1993 survey.	This site is assessed as having a UXO contamination potential of "Other"[1].	More than 500m south of the Preferred Alignment at

[1] Defence records confirm that the area was used for military training but do not confirm that the site was used for live firing. UXO or explosive ordnance fragments / components have not been recovered from the site. Defence opinion is that it would be.

LOT PLAN	SITE NAME	DESCRIPTION	ASSESSMENT	LOCATION
				Gatton

Visual Amenity

The visual amenity and scenic value of the Study Area is influenced by the topography, drainage and land use. A summary of the key contributing components is provided in the following sections.

Land use

- Open agricultural fields are a dominant feature in views across the landscape, with areas of both pastoral and arable farming. Mature vegetation frequently lines local roads with scattered trees across open pastoral fields. Arable farming becomes more evident to the east
- Local pockets of residential properties and farmsteads scatter the landscape with the larger residential areas include Helidon, Placid Hills, Gatton, Lawes, Forest Hill, Laidley Heights, Laidley, Grandchester and Calvert
- The existing rail line is often an integrated component in the landscape with vegetated earthworks. Existing train movements are relatively infrequent, resulting in a limited impact on the visual amenity.

Topography and Drainage

- The mountainous, undulating landscape, ranging from 54 m to 251 m AHD, defines the setting and backdrop in many views with the blanketed hills of the Lockyer National Park and mountainous range contributing to the rural scenic value
- The low lying creeks, including Sandy Creek, Lockyer Creek, Laidley Creek and Western Creek are lined with mature riparian vegetation and meander across the landscape.

A summary of the key Landscape Character Areas in the Study Area is provided in **Figure 5-2**.

inappropriate to assess as either slight or substantial (Department of Defence, http://www.defence.gov.au/uxo/what/Categories.asp).

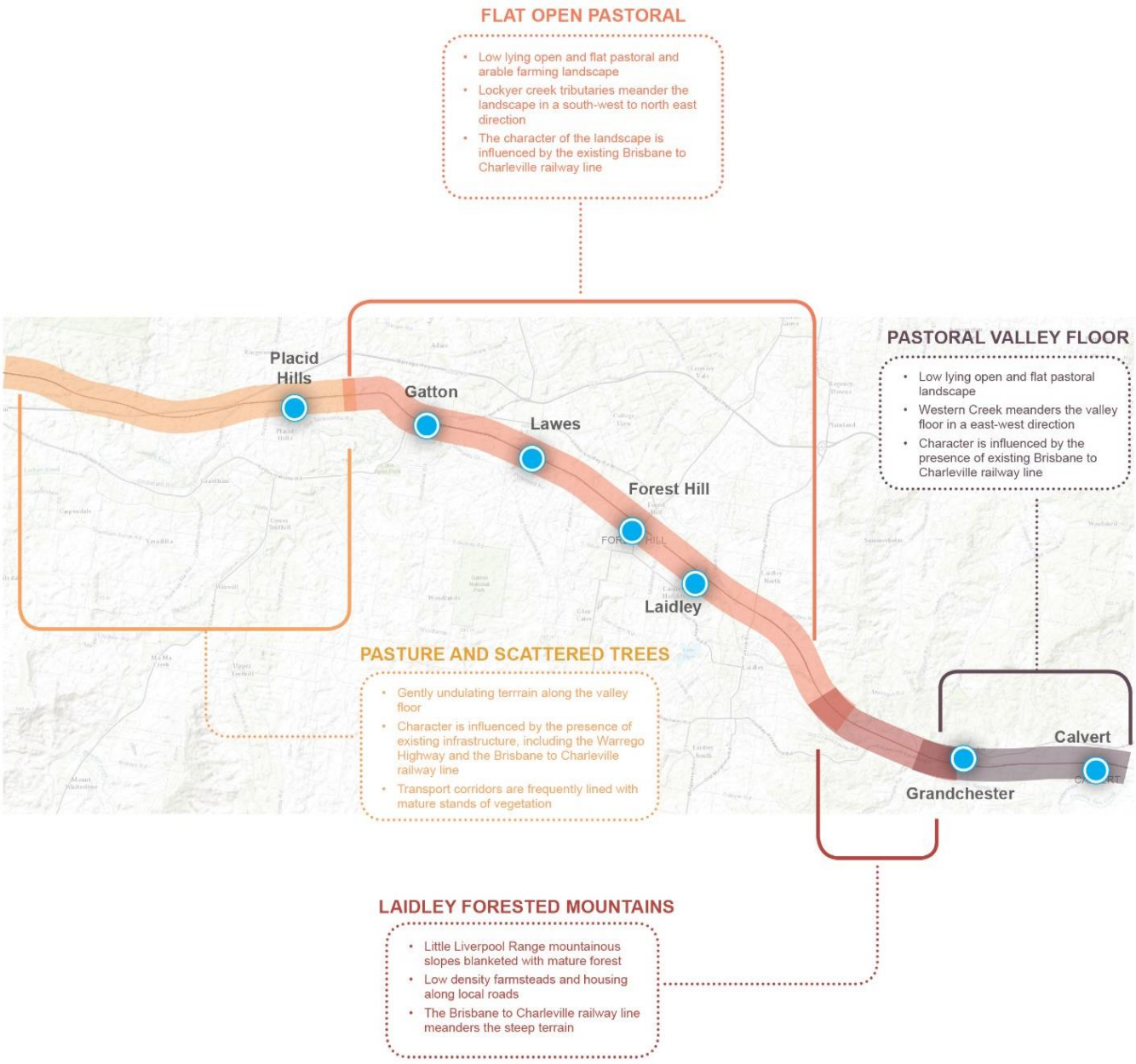

Figure 5-2 Landscape Character Areas

5.1.2. Water

5.1.2.1. Surface Water Quality

The Preferred Alignment and the wider Study Area span two catchments, with the boundary following the Little Liverpool Range between Grandchester and Laidley**.** The western section is located within the Lockyer Creek Catchment and the eastern section is located within the Bremer River Catchment. Both catchments drain toward the Brisbane River and are part of the Brisbane drainage basin. **Figure 5-3** shows the catchments and key watercourses within the Study Area.

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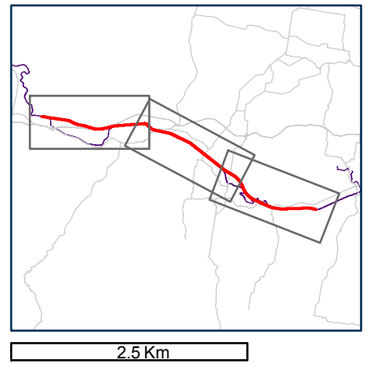
3300 Helidon to Calvert

Catchments, Waterways and Flooding

Figure 5.3

- Preferred alignment (surface)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Waterways
- Study Area
- Gowrie to Grandchester Protected Corridor
- Drainage sub basins
- Flood extents 2011 - Brisbane River (DNRM)
- Lockyer Creek Q100 modelled flood extent (Jacobs, 2014)



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Data Sources: Flood modelling: TRC, LVRC; Brisbane flood extent, Drainage sub-basins: DNRM; Protected corridor: DTMR; All other data: ARTC IR

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ARTC InlandRail

3300 Helidon to Calvert

Catchments, Waterways and Flooding

Figure 5.3

- Preferred alignment (surface)
- Preferred alignment (tunnel)
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- Flood extents 2011 - Brisbane River (DNRM)
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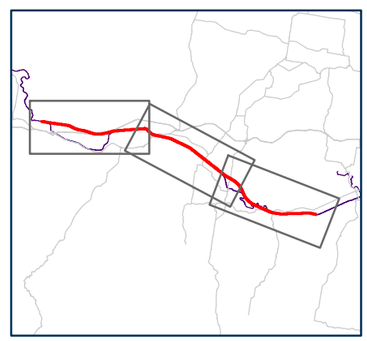

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ARTC InlandRail

3300 Helidon to Calvert

Catchments, Waterways and Flooding

Figure 5.3

- Preferred alignment (surface)
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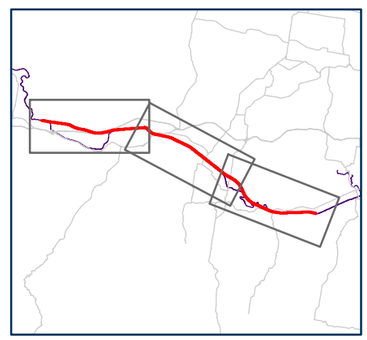

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The Preferred Alignment crosses a number of creek and tributaries, as listed in **Table 5-2**. The design details of each waterway crossing will be determined during the EIS and future design development phases, taking into consideration regulatory requirements and guidance. **Table 5-2** also identifies each waterway's status for waterway barrier works as mapped under the Fisheries Queensland GIS Layer: Queensland Waterways for Waterway Barrier Works (WWBW). This provides an indication of the level of the importance of maintaining fish passage at crossing locations and guidance on potential approval requirements under the Fisheries Act if passage is impeded. This table also identifies if the waterway is defined as a watercourse under Section 5 of the *Water Act 2000*, which indicates whether further approvals for taking or interfering with water in these watercourses would be required under this Act.

Table 5-2 Watercourses traversed by the Preferred Alignment

NAME	WWBW WATERWAY (FISHERIES ACT 1994)	DEFINED AS WATERCOURSE (WATER ACT 2000)
Tributary of Wrights Creek	green (low)	No
Wrights Creek	red (high)	No
Tributary of Wrights Creek	amber (moderate)	No
Tributary of Dinner Corner Gully	green (low)	No
Tributary of Dinner Corner Gully	green (low)	No
Dinner Corner Gully	green (low)	No
Tributary of Sandy Creek	amber (moderate)	No
Tributary of Sandy Creek	amber (moderate)	No
Sandy Creek	purple (major)	Yes
Tributary of Lockyer Creek	green (low)	No
Tributary of Lockyer Creek	green (low)	No
Lockyer Creek	purple (major)	Yes
Tributary of Laidley Creek	amber (moderate)	No
Sandy Creek	purple (major)	Yes
Laidley Creek	purple (major)	Yes
Lagoon Creek	red (high)	No
Tributary of Lagoon Creek	amber (moderate)	No

NAME	WWBW WATERWAY (FISHERIES ACT 1994)	DEFINED AS WATERCOURSE (WATER ACT 2000)
Tributary of Lagoon Creek	green (low)	No
Tributary of Western Creek	green (low)	No
Tributary of Western Creek	amber (moderate)	No
Tributary of Western Creek	amber (moderate)	No
Tributary of Western Creek	amber (moderate)	No
Western Creek	purple (major)	Yes
Western Creek	purple (major)	Yes
Western Creek	purple (major)	Yes
Western Creek	purple (major)	Yes
Tributary of Western Creek	green (low)	No

The SEQ Healthy Waterways Ecosystem Health Monitoring Program is administrated by Healthy Waterways, and monitors catchments and waterways on a monthly basis and provides an annual overview of the health of SEQ waterways including the Lockyer Catchment and the Bremer Catchment. The Bremer Catchment scored D-, having a poor environmental condition. The Lockyer Creek Catchment scored D+, also with a poor environmental condition, with the report card noting "This catchment has very low sediment and nutrient loads being generated, but poor riparian vegetation is resulting in very poor stream health".[2]

5.1.2.2. Flooding

The Preferred Alignment crosses major waterways and the floodplains of Lockyer Creek (between Helidon and Laidley), Western Creek (Grandchester) and their associated tributaries. The region surrounding the Lockyer Creek floodplain was heavily impacted during the 2011 floods, particularly around Grantham.

A Lockyer Creek flood model was developed by Jacobs in 2012 for the Lockyer Valley Regional Council (LVRC) for the purpose of development control and assessment of flood mitigation options. The model was updated by Jacobs in 2016. The existing rail line is within the modelled extent of the Lockyer Creek floodplain.

The Preferred Alignment for the Helidon to Calvert Project is within the modelled Lockyer Creek floodplain extent. The potential impacts from flooding to adjacent properties and the environment are well documented, and may result in both negative and positive impacts. The consequences vary greatly and depend on the location, duration, depth and speed of water flows relative to the vulnerability of the natural and built environment. Railways and embankments can alter flood flows and behaviour.[3] Additional discussion of the potential impact of the Helidon to Calvert Project in

[2] http://healthywaterways.org/reportcard/#/zone/1263/2015/condition
[3] http://www.chiefscientist.qld.gov.au/publications/understanding-floods/flood-consequences

relation to flooding is discussed in **Section 6.1.3.2**. Further flood assessment will be undertaken during the EIS phase to determine design details and confirm impact mitigations for the floodplain crossing.

5.1.2.3. Groundwater

The Helidon to Calvert Project is located within the groundwater resource area of the Clarence-Moreton Basin.

According to the Australian Government's Bioregional Assessments Programme, 'the groundwater-bearing sequence in the Clarence-Moreton bioregion includes shallow aquifers along river courses and floodplains and deeper formations composed of sedimentary or volcanic rocks. There are numerous alluvial aquifers in the Clarence-Moreton bioregion, of particular note is the Lockyer Valley alluvial aquifer which is economically important as it is used for irrigation and is closely managed. The Lockyer Valley alluvial aquifer is a recharge area, with groundwater flowing into the Main Range Volcanics aquifer. The Lockyer Valley alluvium extends over more than 200 km^2 and is approximately 30 to 35 m thick. The alluvium is characterised by coarse gravel towards the headwater areas in the southern tributaries where the gradient is steep; the gradient decreases towards the north-east where the alluvium is dominated by clay, sandy clay, sand, sandy gravel or gravel.

The groundwater in the headwaters of Lockyer Creek is commonly fresh, marking the strong influence of surface water as a major source of recharge to the alluvial aquifer of the Main Range Volcanics which generally contain good quality groundwater. Further down gradient, groundwater becomes more saline due to discharge from the underlying basin aquifers.

5.1.2.4. Groundwater Dependant Ecosystems

In the region, known Groundwater Dependent Ecosystems (GDEs) are limited, with the closest being approximately 5 km from the Preferred Alignment. This is likely a reflection of the lack of investigations in the area as well as the lack of conditions suitable for GDEs. Based on the Department of Environment and Heritage Protection (DEHP) mapping, no other GDEs have been predicted with high confidence within 10 km of the Preferred Alignment.

Field validation would be required to confirm the presence of GDEs during the EIS phase.

5.1.3. Air Quality and Noise

Ambient Air Quality

Ambient air quality data, published by the Queensland Department of Science, Information Technology and Innovation in the vicinity of the Helidon to Calvert Project has been utilised in this assessment and includes ambient air quality data from Toowoomba (North), Rocklea, Flinders View and Jondaryan.

The adopted background concentrations considered in the review of air quality are presented in **Table 5-3**.

Table 5-3 Adopted Background Concentrations (µg/m^3)

POLLUTANT	AVERAGING PERIOD	ADOPTED BACKGROUND CONCENTRATION (µG/M^3)	STATION
CO	8 Hour	224.7	Toowoomba
NO_2	1 Hour	42.7	Toowoomba

	Annual	16.4	Flinders View
PM_{10}	24 Hour	24.3	Jondaryan
$PM_{2.5}$	24 Hour	17.7	Flinders View

The land use in the Study Area is generally dominated by rural areas with some urbanised areas such as Gatton, Laidley and Forest Hill. Existing air quality emissions in the region will be principally related to agriculture and rural land uses, with dust generated from farming activities and wind erosion. As there are some urbanised areas in the Study Area such as Laidley and Gatton, transport related emissions will provide a secondary source of pollutants.

The Queensland Government Air Quality Index rates air quality based on the relationship between observed pollutant and pollutant goal concentrations. Using this air quality rating system, the adopted pollutant background concentrations (**Table 5-3**) in the Study Area for carbon monoxide (CO) and nitrogen dioxide (NO_2) are rated as 'Very Good', PM_{10} as 'Good', and $PM_{2.5}$ as 'Fair'.

Noise

Long-term noise monitoring within the study area undertaken in 2016 found noise levels to be typical of a rural area with low background noise levels. Elevated noise levels were present at the brownfield measurement sites that are adjacent to the existing rail lines. Detailed noise modelling will be undertaken during the EIS phase to determine the appropriate mitigation measures needed to ensure compliance with relevant policy and guidelines.

5.1.4. Ecosystems

This section describes the protected areas, mapped remnant vegetation (Queensland regional ecosystems) and mapped essential habitat likely to be present in the Study Area. Aquatic habitats (creeks in the Study Area) are also described. Matters of National Environmental Significance (MNES) are described in **Section 6.6**.

5.1.4.1. Protected Areas

There are no protected areas within the Preferred Alignment or Study Area however there are a number of protected areas to the north of the Study Area, including Lockyer National Park, Lockyer Regional Park, Lockyer State Forest and Lilydale State Forest. Lockyer Regional Park is the closest to the Study Area, more than 500 m to the north (1500 m north of the Preferred Alignment).

5.1.4.2. Matters of State Environmental Significance

Matters of State Environmental Significance (MSES) mapped within the Study Area include:

- Regulated vegetation (throughout the Study Area)
- Waterways (throughout the Study Area)
- Areas of mapped wildlife habitat associated with the creeks and tributaries intersected by existing east-west infrastructure corridors.

5.1.4.3. Ecological Corridors

A review of the Queensland Government State-wide ecological corridor mapping shows that the Lockyer Creek corridor is recognised as both state and regionally significant ecological corridors. A corridor of regional significance also traverses the Study Area at the Little Liverpool Range, east of Grandchester. These corridors provide for

connectivity beyond the Study Area. These corridors are shown in **Figure 5-4**. At the local scale, waterways and remnant vegetation across the Study Area provide for habitat connectivity.

5.1.4.4. Regional Ecosystems

The Preferred Alignment will intersect areas of regulated vegetation and mapped essential habitat particularly in the vicinity of the Little Liverpool Range. A number of Eucalypt dominated “of concern” regional ecosystems (REs) will be intersected by the Preferred Alignment.

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3300 Helidon to Calvert

Ecology, Flora and Fauna

Figure 5.4

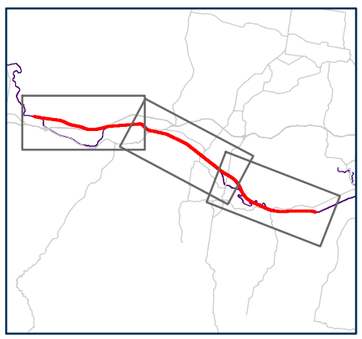
- Preferred alignment (surface)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Study Area
- Qld estate protected areas
- Gowrie to Grandchester Protected Corridor
- Essential Habitat

Remnant Vegetation (v8):

- Endangered (dominant)
- Endangered (sub dominant)
- Of concern (dominant)
- Of concern (sub dominant)
- Least concern

Statewide environmental corridors (DEHP):

- State
- Regional



2.5 Km

Coordinate System:
GCS GDA 1994

Paper: A3
Date: 25/01/2017
Author: IR

Scale: 1:65,000

Data Sources: State environmental corridors: DEHP; Essential habitat: DNRM; West Moreton rail line: DTMR; QLD protected areas: DNPSR; Remnant vegetation (v8): DSITI

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ARTC InlandRail

3300 Helidon to Calvert

Ecology, Flora and Fauna

Figure 5.4

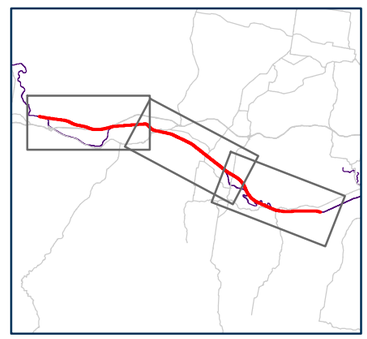
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Study Area
- Qld estate protected areas
- Gowrie to Grandchester Protected Corridor
- Essential Habitat

Remnant Vegetation (v8):

- Endangered (dominant)
- Endangered (sub dominant)
- Of concern (dominant)
- Of concern (sub dominant)
- Least concern

Statewide environmental corridors (DEHP):

- State
- Regional



2.5 Km

Coordinate System:
GCS GDA 1994

Paper: A3
Date: 25/01/2017
Author: IR

Scale: 1:65,000

Data Sources: State environmental corridors: DEHP; Essential habitat: DNRM; West Moreton rail line: DTMR; QLD protected areas: DNPSR; Remnant vegetation (v8): DSITI

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ARTC InlandRail

3300 Helidon to Calvert

Ecology, Flora and Fauna

Figure 5.4

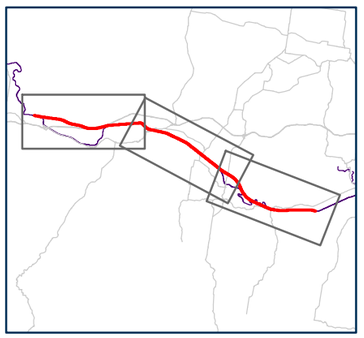
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- West Moreton Rail Line
- Highway
- Study Area
- Qld estate protected areas
- Gowrie to Grandchester Protected Corridor
- Essential Habitat

Remnant Vegetation (v8):

- Endangered (dominant)
- Endangered (sub dominant)
- Of concern (dominant)
- Of concern (sub dominant)
- Least concern

Statewide environmental corridors (DEHP):

- State
- Regional



2.5 Km

Coordinate System:
GCS GDA 1994

Paper: A3
Date: 25/01/2017
Author: IR

Scale: 1:65,000

Data Sources: State environmental corridors: DEHP; Essential habitat: DNRM; West Moreton rail line: DTMR; QLD protected areas: DNPSR; Remnant vegetation (v8): DSITI

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The REs listed in **Table 5-4** are mapped in the Study Area.

Table 5-4 REs in the Study Area

REGIONAL ECOSYSTEM	VM ACT CLASS	BIODIVERSITY STATUS	DESCRIPTION
12.3.3	Endangered	Endangered	*Eucalyptus tereticornis* woodland on Quaternary alluvium
12.3.7	Least Concern	Not of Concern	*Eucalyptus tereticornis*, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp. fringing woodland
12.9-10.2	Least Concern	Not of Concern	*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks
12.9-10.2/12.9-10.7	Least Concern / Of Concern	Not of Concern / Of Concern	*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks and *Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora spp.*, *E. melanophloia* woodland on sedimentary rocks
12.9-10.7	Of Concern	Of Concern	*Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora spp.*, *E. melanophloia* woodland on sedimentary rocks

5.1.4.5. Aquatic Ecosystems

The Preferred Alignment traverses a number of creeks and tributaries including Sandy Creek, Lockyer Creek, an unnamed tributary of Lockyer Creek, Laidley Creek, Lagoon Creek and Western Creek.

Sandy Creek in the vicinity of the Preferred Alignment crossing point is a series of lagoons and ponds. Crossings of Lockyer and Laidley Creek are located at existing crossing points.

The aquatic habitat assessment undertaken at the existing rail crossing on Lockyer Creek described the creek as a deeply incised river bed, with eroded banks, very poor riparian habitat and moderate in stream habitat quality. The degraded riparian vegetation is dominated by blue gum (*Eucalyptus tereticornis)* (occasional) and Moreton Bay ash (*Casuarina tessellaris)* and contains widespread weeds species including castor oil plant (*Ricinus communis)*, elephant grass (*Pennisetum purpureum*), morning glory (*Ipomoea indica*), and exotic pasture grasses. Some weeping bottlebrush (*Melaleuca Viminalis*), crows ash *(Flindersia australis*), river she-oak *(Casuarina cunninghamiana)* were also observed. This waterway was assessed as likely to provide some limited habitat for fish.

The aquatic habitat assessment undertaken at the existing crossing of Laidley Creek described the creek as a heavily degraded modified creek surrounded by agricultural land. Heavy weed infestation are present including lantana (*lantana camara),* castor oil plant (*Ricinus communis), Paspalidium sp.*, while native plants include weeping bottlebrush (*Melaleuca viminalis)* (juvenile), weeping myall *(Acacia pendula)*, and the common reed *(Phragmites australis).*

The aquatic habitat assessment conducted at Lagoon Creek characterised the creek as a shallow creek, with muddy banks, riparian vegetation present but mostly weed species, including Chinese celtis (*Celtis sinensis*). It has no rocks or boulders and riparian habitat is mostly grasses or exposed banks and the water was observed to have high turbidity.

Some mat-rush (Lomandra longifolia) was noted on banks, along with weeping bottlebrush, (*Melaleuca viminalis*), Celtis (*Celtis sinensis*), broadleaved pepper berry tree, sorghum and cogon grass (*Imperata cylindrical*). Observed fauna included water dragon (*Intellagama lesueurii*) and white necked heron (*Ardea pacifica*). The creek was assessed as having a low probability of providing habitat for platypus and frogs. It has no rocks or boulders and is mostly grasses or exposed banks.

5.1.4.6. Threatened Ecological Communities

The Protected Matters Search Tool (PMST) identified four Threatened Ecological Communities (TECs) potentially occurring within 5 km of the Study Area. These TECS were not considered likely to occur, based on a review of DNRM regional ecosystem mapping and were not identified during subsequent field investigations.

TECs are a MNES and are discussed in **Section 6.6.**

5.1.5. Flora and Fauna

Whilst traversing a predominantly agricultural and modified environment, there are areas of significant habitat and fauna corridors throughout the Study Area.

A PMST search, a search of the Queensland WildNet database and targeted fieldwork were used to identify the likelihood of species occurring in the Study Area. The species likelihood assessment is summarised in **Table 5-5**.

Flora and fauna protected under the EPBC Act are MNES and are described further in **Section 6.6**.

5.1.5.1. Threatened Fauna - Queensland

The Endangered, Vulnerable, Near- threatened or Threatened species (EVNT) protected under the NC Act and listed in **Table 5-5** were identified in searches of the Queensland Government Wildlife online database. These are in addition to the EPBC Act listed species identified in **Section 6.6**.

Table 5-5 EVNT Species Protected Under the Queensland *Nature Conservation Act 1992*

SCIENTIFIC NAME	COMMON NAME	Q	HABITAT AND DISTRIBUTION	LIKELIHOOD OF OCCURRENCE
Calyptorhynchus lathami lathami	glossy black-cockatoo (eastern)	V	Forests and woodlands with she-oaks (*Allocasuarina* spp.); nests in large tree hollow	Moderate, but no feeding evidence was detected during preliminary surveys
Falco hypoleucos	Grey Falcon	V	Range covers eastern Australia in arid and semi-arid areas.	Low, lack of suitable habitat
Ornithorhynchus anatinus	Platypus	SL	Dependant on rivers, streams and bodies of freshwater, ideal habitat consists of earth banks and coarser bottom substrates.	High, previous records in area
Tachyglossus aculeatus	Short-beaked Echidna	SL	Common in dry open country on eastern Australia, open heathlands and in forests.	High, previous records in area
Acanthophis	Common	V	Habitats associated with deep	Possible, possible suitable

SCIENTIFIC NAME	COMMON NAME	Q	HABITAT AND DISTRIBUTION	LIKELIHOOD OF OCCURRENCE
antarcticus	Death Adder		leaf litter	habitat
Hemiaspis damelii	Grey Snake	E	Favours woodlands with cracking clay soils in areas with small gullies and water bodies.	Low to None, no suitable habitat
Ninox strenua	Powerful Owl	V	Open forests and woodlands along watercourses	Recorded in studies for Toowoomba Second Range Crossing

Migratory species were also identified in the PMST and are described in **Section 6.6**.

Further detailed field studies will be conducted in future project stages to update and confirm the likelihood of species occurrence in the Study Area and Preferred Alignment.

5.1.5.2. Essential Habitat

The Preferred Alignment will intersect areas of regulated vegetation and mapped essential habitat. A review of Queensland Government Essential Habitat Mapping available identified areas of essential habitat in the Study Area and surrounds as listed in **Table 5-6**.

Table 5-6 Mapped Essential Habitat in the Study Area and surrounds.

AREA	DESCRIPTION
Lockyer National Park, north of Helidon	Large expanse of essential habitat mapped, attributed as core habitat for koala
Lockyer Creek	Essential habitat attributed as habitat for koala
Land north east of Placid Hills	Smaller areas of essential habitat attributed as core habitat for koala
Gatton National Park, south east of Gatton	National Park and adjacent lots mapped as essential habitat attributed as core habitat for koala. A smaller patch is located south of Forest Hill
Little Liverpool Range	Essential habitat mapped on the eastern slopes, attributed as core habitat for koala. A separate area is located to the north of Grandchester.

5.1.5.3. Threatened Flora – *Nature Conservation Act 1992*

A search of the Queensland Wildlife Online database identified further flora records in the area. The western extent of the Study Area north of Postmans Ridge/Helidon is partially located within the DEHP Protected Plants High Risk Flora Survey Trigger map area, as is an area at Lawes, Grandchester and Calvert, indicating records of NC Act listed flora in the vicinity.

Table 5-7 lists the Wildlife Online search results for threatened flora for the Study Area, which should be read in conjunction with **Section 6.6**.

Table 5-7 Threatened Flora – Wildlife Online Results

SCIENTIFIC NAME	COMMON NAME	NC ACT STATUS
Callitris baileyi	Bailey's cypress	NT
Sophora fraseri	Brush sophora	V*
Melaleuca irbyana	Swamp Tea Tree	E
Eucalyptus taurina	Helidon Ironbark	V
Melaleuca groveana	Grove's Paperbark	NT
Notelaea lloydii	Lloyd's native olive	V*
Grevillea quadricauda	Four-tailed Grevillia	V*
Phebalium distans	Mt Berryman Phebalium	E*
Leionema obtusifolium	-	V*
Thesium australe	Austral Toadflax, Toadflax	V*
Caustis blakei subsp. macrantha	Koala Fern	V
Paspalidium grandispiculatum	-	V*

* Also listed under the EPBC Act.

Whilst the initial field survey did not include protected plant surveys, the potential presence of threatened flora including both State and Commonwealth listed species will need to be considered in future survey effort and impact assessment.

5.1.5.4. Pests

The PMST identified a number of Weeds of National Significance as potentially occurring in the Study Area including but not limited to *Lantana camara* (lantana), *Asparagus asparagoides* (bridal creeper), *Chrysanthemoides monilifera* (bitou bush), *Cryptostegia grandiflora* (rubber vine) and *Dolichandra unguis-cati* (cat's claw creeper). A number of weeds that potentially occur in the Study Area are also identified under the *Biosecurity Act 2014* as Category-2 through to Category-5 restricted matter.

During surveys of aquatic habitats, pest species associated with the waterways were observed as discussed above.

Pest fauna species likely to occur in the area include *Rhinella marina* (cane toad), *Canis familiaris* (wild dogs) and *Felis catus* (feral cats), feral deer, *Lepus capensis* (hares), *Oryctolagus cuniculus* (rabbits), *Rattus rattus* and *Rattus norvegicus* (black and brown rats), *Mus musculus* (house mouse), *Sus scrofa* (pigs) and *Vulpes vulpes* (foxes). Other introduced species including *Columba livia* (pigeons), ducks and *Hemidactylus frenatus* (common house gecko).

5.2. Social and Economic Environment

The region in which the Helidon to Calvert Project is located is undergoing significant growth, largely driven by external factors, i.e. urban development, as well as proactive measures by the local government areas of Lockyer Valley and Ipswich City to develop economic potential and capitalise on its strategic location. This is considered to be important context for understanding the existing socio-economic environment, as this is likely to influence the social fabric of the region over next decade.

A desktop review of the following documents was undertaken to prepare this overview:

- Lockyer Valley Regional Development Framework – 2013 to 2023
- Economic Development Plan for Ipswich City 2009 – 2031.

Within the Lockyer Valley Council there are number of key initiatives planned or underway over the short to medium term that are intended to capitalise on the intensive agricultural focus of the area and also position complementary activities (e.g. tourism) to benefit from regional growth. The Lockyer Valley Regional Council is working with Regional Development Australia in Ipswich and West Moreton on the Sustainable Food Bowl project. It is intended to position Lockyer Valley as a major agricultural production area in Australia.

Additionally, the transportation and logistics industry has been identified as one of Lockyer Valley Regional Council's top priorities for economic development. The Council has identified a number of key infrastructure priorities including access to the newly developed Gatton West industrial area and continued upgrade of the high capacity Warrego Highway and road networks connecting centres in the Lockyer Valley. Plainland is a Local Development Area identified in the South East Queensland Regional Plan 2009-2031. Gatton has been designated as a Principal Rural Activity Centre. The development of a new regional airport in or near the Lockyer Valley is identified as the most significant infrastructure opportunity in the future which will support agricultural and food industry growth. The airport will support the growth to Brisbane's west expanding the capacity of both regions. The Lockyer Valley is currently supported by two hospitals including the Gatton Public Hospital. To service the future strong population growth for the region the Lockyer Valley Regional Council has prioritised the development of a regional health facility to provide increased capacity in day surgery and specialist medical care.

While the Study Area overlays only a small area located in Ipswich Council local government area, it is important to recognise the strategic significance of Ipswich City's economy and its relationship to this proposal. The Ipswich City Economic Development Plan is targeting a growth in new jobs of approximately 120 000 and these are planned to be created in the next 22 years to 2031. Accordingly, this area will experience significant growth compared to the rest of South East Queensland. This will be driven by an influx of population targeted for Ipswich and the Western Corridor. This will require a significant investment in infrastructure, in particular to address more efficient travel times needed to ensure industry competitiveness.

A key development that relates to the proposal of Inland Rail will be the Ebenezer/Willowbank Major Development Area, intended to accommodate large footprint industrial development.

Community Profile

The community profile is intended to provide an understanding of the key demographic characteristics of the area in which the is to be located which is predominantly in the local government area of Lockyer Valley, with a small proportion within the Ipswich City Council local government area.

Population

The Lockyer Valley Estimated Resident Population for 2015 is 38,798. From 2005 to 2015, and there has been an increase in population annually in the range of 2 to 3% per year.

Age Profiles

For Lockyer Valley, the age structure between 2001 and 2011 was characterised by a large proportion of the population in the 0 to 19 year old age brackets. This period also saw a significant increase in the proportion of the population in the 45 to 74 year old age bracket.

Education

For Lockyer Valley local government area, there has been a strong increase in all forms of tertiary education, and vocational training. As a percentage, this change has been greatest in the number of people receiving vocational training (trades, Technical and Further Education etc.), with the Lockyer Valley lying above the South East Queensland average. Despite a growth across all education types, strong growth in vocational training as well as an increase in the number of individuals without tertiary or vocational qualifications is likely to be indicative of the labour intensive agrarian nature of the Lockyer Valley.

Income

In the Lockyer Valley, low income earners (those earning less than $400 per week in total) comprised 35.9% of the population, whilst high income earners (those who earn $1500 or more per week), comprised 9% of the population.

Industry and Labour force profile

As at 2011, 93.5% of the Lockyer Valley labour force was employed. The Lockyer valley also experienced increase in the rate of employment from 2001 to 2011 of close to 2% as well as an increase in the labour force. All occupational areas saw an increase in their workforce with the largest increases occurred in the Professionals and Community service workers occupations. Managers and Labourers saw shrinkage in their workforce.

5.2.1. Accommodation and Housing

The capacity of the existing accommodation to house the Helidon to Calvert Project's construction and operational workforce is dependent on the size and timing of the workforce to be accommodated relative to other construction projects in the region, including the timing of adjacent Inland Rail Projects (Gowrie to Helidon, Calvert to Kagaru). The TSRC motorway is currently under construction and is due to be completed in late 2018. The TSRC motorway construction workforce has been accommodated locally. The TSRC project also implemented a local participation policy, and has also provided a construction day camp for workers. The construction of the Helidon to Calvert Project is anticipated to have similar requirements, with workforce also being able to be sourced from the wider Brisbane area.

5.2.2. Cultural Heritage (Indigenous and Non-indigenous)

5.2.2.1. Indigenous Heritage

The Study Area is within the country of the Jagera people.

The initial cultural heritage assessment was primarily undertaken by desktop review of existing information (database searches and previous studies) and supplemented with preliminary workshops with the Jagera Daran.

Archaeological research indicates that Aboriginal occupation goes back at least 22 000 years in this region of Queensland. There is a substantial body of cultural material present throughout the Study Area and all items are considered to be of very high social significance to the Aboriginal groups.

The *Aboriginal Cultural Heritage Act 2003* defines Aboriginal cultural heritage as a significant Aboriginal object or, evidence of archaeological or historic significance of Aboriginal occupation of an area of Queensland, or Aboriginal human remains. Aboriginal cultural heritage can therefore be tangible (i.e. physical evidence in the landscape) or intangible (e.g. story places, ceremonial sites, other special associations etc.)

The most likely Aboriginal cultural heritage within the soils and across the geological formations of the Study Area would be surface stone artefacts, and rock shelters used as living spaces and as art surfaces.

The most likely evidence of past Aboriginal utilisation of vegetation communities in the Study Area would be the presence of scarring on trees, particularly on gums. The presence of mature Bunya Pines may also be indicative of past use of the landscape through anthropogenic plantings. Where water features exist, there is a higher likelihood for the presence of Aboriginal cultural heritage material.

Sections of the Study Area have been heavily disturbed through the construction of infrastructure and vegetation clearing and the potential to identify Aboriginal cultural heritage items in those areas is diminished.

Database search results identified 1 site (artefact scatters) within the Preferred Alignment and over 90 sites within 5 km of the Preferred Alignment.

Despite some sections of the Study Area being cleared, through early vegetation clearance and followed by sustained agricultural practices, there remains a risk to Aboriginal cultural heritage, especially adjacent to creeks and tributaries, which although cleared, may contain evidence of prior Aboriginal use. It is likely that further Aboriginal cultural heritage values exist, as yet unidentified, within the Study Area.

The results of initial consultation meetings with the Aboriginal parties for the Study Area indicate the likely presence of additional Aboriginal cultural heritage object, items and values.

5.2.2.2. Non-Indigenous Heritage

The earliest recorded visits of non-Aboriginal people to the region were in the late 1820s and early 1830s following the establishment of the Moreton Bay Penal Settlement in 1824-5. Pastoral interests dominated the region into the 1860's and agricultural activity grew from 1859. The Main Line Railway, part of the West Moreton Rail Network, was constructed between 1865 and 1867 and resulted in the establishment of railway towns in the region including Gatton and Helidon. The turn of the twentieth century saw the establishment of Lockyer Valley farming practices, included dairying, cattle grazing, small cropping and orchards. World War Two had a physical impact on the region, with occupation of some of the town buildings, schools, and hospitals by the military and the construction of air raid shelters in the city. Townships expanded post-war due to returning service people and urban expansion was the result. Massive subdivision, particularly around major towns, occurred from the 1950s onwards.

There are multiple listed places of historical heritage significance within the Study Area or in close proximity to the Study Area, including five places on the Queensland heritage register, 15 places listed in local planning schemes and 2 places on the Queensland Rail Heritage Register, as shown in **Table 5-8** and **Figure 5-5**.

Table 5-8 Results of historical database and register searches

SOURCE	RESULT	NOTES
Australian Heritage Database (NHL, CHL, RNE)	1 place	William and Victoria Streets Group (File No. 4/01/088/0005) Indicative Place (RNE).
Queensland Heritage Register	5 places	Grandchester Railway Station Complex (two locations within preferred alignment). Boer War Memorial, Gatton (within preferred alignment). Lockyer Valley Hotel, Gatton. Forest Hill Hotel, Forest Hill. Weeping Mother Memorial, Gatton.
Local planning schemes (Toowoomba, Lockyer Valley, Ipswich)	15 places	These places are located within the Ipswich and former Gatton Shire areas (note some of these places are also listed in the QHR).
Queensland Rail Heritage Register	2 places	These are places listed in Buchanan (2002) which formed the basis for the Queensland Rail Heritage Register.

Any works that may impact on known heritage-listed places may require approvals from Commonwealth, State or local authorities and therefore represent a potential constraint to the Helidon to Calvert Project. Field investigations and consultation with relevant stakeholders such as local heritage societies will serve to confirm the heritage values in the Study Area.

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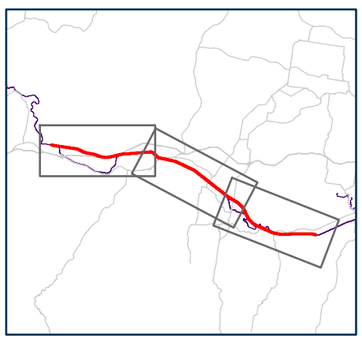
Cultural Heritage
Indigenous and Historical

Figure 5.5

- Historic cultural heritage sites
- Aboriginal cultural heritage (DATSIP)
- Preferred alignment (surface)
- Preferred alignment (tunnel)
- Adjacent Inland Rail project alignments
- Gowrie to Grandchester Protected Corridor
- Study Area
- West Moreton Rail Line
- Highway



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Author: IR

Scale: 1:65,000

Data Sources: Aboriginal Cultural Heritage: DATSIP; Cultural Heritage: DEHP; All other data: ARTC IR.

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ARTC InlandRail

3300 Helidon to Calvert

Cultural Heritage
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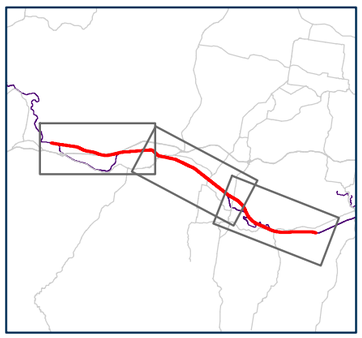

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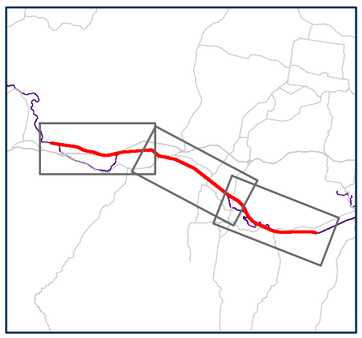

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5.3. Built Environment

Key existing regional infrastructure in the Study Area includes major transport networks such as the Warrego Highway and existing railway line (these are described further in **Section 5.4**), which will be crossed by the Preferred Alignment. The Preferred Alignment is adjacent to the existing rail line for a large portion of its length. There are also a number of local and sub-arterial roads in the Study Area, particularly in proximity to local centres such as Gatton, Forest Hill, Laidley and Grandchester.

The Preferred Alignment is likely to interact with numerous existing services, in particular near townships (Gatton, Forest Hill, Laidley and Grandchester) and when constructing adjacent to the existing rail corridor.

The Preferred Alignment largely follows the Gowrie to Grandchester future public passenger transport corridor, with vertical lowering in some locations, and also includes an alternative alignment for a section of the corridor north east of Helidon, to align the rail corridor between the existing gas pipeline and power easements in this location. This removes the need for multiple crossings of the Roma to Brisbane gas pipeline.

Powerlink has high voltage transmission lines in the area while Ergon and Energex also have smaller distribution networks that interact nearby. Numerous high voltage transmission lines cross the Preferred Alignment. Additional study to identify all service crossings is required. This needs to include an understanding of all municipal services and other miscellaneous services such as farm irrigation.

5.4. Traffic and Transport

The Warrego Highway is the key road transport route in the Study Area. The Warrego Highway is Queensland's principal east-west freight route, extending 714 km from Brisbane to Charleville. The Highway connects Brisbane to Toowoomba and southern Queensland, central and western New South Wales and Victoria and the Northern Territory. The highway provides for major freight movements interstate, and regionally between Toowoomba, Dalby and Roma, the agriculture sectors in the Lockyer Valley, Darling Downs and the south-west, and the energy and resource developments of the Surat Basin.

The Warrego Highway has existing capacity and safety issues and is experiencing rapid growth in traffic. The construction of the TSRC motorway is underway to the west of the Study Area to address a key bottleneck on the Warrego Highway.

Other key roads in the Study Area include the Gatton-Esk Road, Gatton-Laidley Road and Gatton-Helidon Road near Gatton. Near Laidley, the Old Laidley-Forest Hill Road and Laidley-Plainlands Road are key roads that would be crossed by the Preferred Alignment. Near Grandchester the Preferred Alignment interacts with Stokes Road and the Grandchester-Mt-Mort Road.

The West Moreton Railway Line extends from Rosewood to Miles. Heading east from Helidon, the Preferred Alignment is north of the existing rail corridor until Placid Hills when it runs parallel with the existing corridor through Gatton and Forest Hill and then deviates from the existing corridor in a southeast direction just north of Laidley Township crossing Laidley Plainlands Road. The Preferred Alignment then continues and crosses the existing rail corridor at grade near Yarongmulu until traversing eastbound reaching a 1.1 km tunnel section through Little Liverpool Range. There are two more crossing points over the existing rail line until running parallel once again with the existing rail corridor to Calvert.

There are a number of transport infrastructure crossings along the Preferred Alignment including arterial and local roads and the existing rail line. The potential impacts to transport infrastructure arising from the Helidon to Calvert Project are described further in **Section 6.5**.

5.5. Land Use and Tenures

Under the land categories of the SEQ Regional Plan 2009-2031 the Study Area is largely within Regional Landscape and Rural Production area. The exception of this is within Lockyer Valley Regional Council around the Helidon, Gatton, Forest Hill and Laidley localities where it is predominantly Urban Footprint land use designation. There is some Rural Living land use designation in Helidon, Gatton and Laidley.

Tenure within the Preferred Alignment is described in **Section 4.2**.

5.5.1. Key Local and Regional Land Uses

5.5.1.1. Land Use

The Helidon area is dominated by rural and rural-residential uses, and includes the small township of Helidon. The Helidon area is historically associated with natural springs and sandstone, which is quarried for building materials across Queensland.

Grantham and Ringwood are dominated by grazing and agricultural uses with some residential areas. The northern reaches of both townships slope up into the ranges associated with the Lockyer National Park and Lockyer Regional Park. The township of Grantham was previously located south of the existing rail line and characterised by large-lot rural-residential properties. Following the floods of 2011, a new housing initiative adjoining the township called the "Strengthening Grantham Project" was designed to relocate residents to a master planned community out of the flood zone.

Placid Hills is predominantly large-lot residential on the elevated areas with some grazing and irrigated seasonal horticulture to the south and southeast on the floodplain of Lockyer Creek. Placid Hills borders Gatton, with the Lockyer Creek forming the boundary between the two.

Adare is predominantly agricultural country located north of the existing rail line. Areas of residential purpose follow a man-made water channel connecting in the north with Lake Clarendon.

Gatton is the largest town in the Lockyer Valley and is the main hub of the region. Designated as an Urban Footprint in the SEQ Regional Plan, Gatton is home to the Lockyer Valley Regional Council, Lockyer Valley Cultural Centre, and Gatton industrial area. It is located close to the Warrego Highway and the existing rail line, contributing to its development as an agricultural and transportation hub. The Gatton Racecourse is located in a bend of Lockyer Creek, close to the existing railway. Lake Apex and a fauna sanctuary are located south west of the town environs. Gatton National Park is located south east of the town area.

The University of Queensland Gatton campus is located at Lawes north of the existing railway line. South of the existing rail line, the area is dominated by grazing country.

Forest Hill Township is within the Urban Footprint in the SEQ Regional Plan, and is the locale of a little town built up around two rail sidings adjoining the existing rail line near the confluence of Sandy Creek and Laidley Creek. To the north east, an area of large-lot residential has established, adjoining the community in Plainland. The rest of the area in Forest Hill is dominated by irrigated seasonal horticulture and grazing country.

Laidley and Laidley North are located near the eastern edge of the Lockyer Valley. The community of Laidley forms the second largest town within the Lockyer Valley, behind its close neighbour, Gatton. It is also within the Urban Footprint in the SEQ Regional Plan. Laidley is a significant heritage town whilst also being one of the main agricultural towns within the region. Along with its strong agricultural base, the area is home to the Laidley Cultural Centre and RSL Sub-branch, providing recreational facilities.

Grandchester roughly follows the catchment of Western Creek with the town of Grandchester located along the existing rail line and Western Creek. The region is predominantly grazing country with pockets of residential zoning surrounding the town, associated with the historic rail station.

Calvert is located on the existing rail line and is a small community on Western Creek surrounded by grazing country.

The relevant planning schemes do not provide a standardised locality classification for the relevant areas. Therefore, a more standardised approach to the classification was required. The Australian Government - Rural, Remote and Metropolitan Areas (RRMA) classification was utilised as this approach in this instance. The structure of the RRMA classification is shown in **Table 5-9**. The majority of localities in the vicinity of the Preferred Alignment are classified as remote zone- other remote areas in accordance with **Table 5-9**. Gatton and Laidley are classified as remote zone- remote centres.

Table 5-9 Rural, Remote and Metropolitan Areas Classification

ZONE	CATEGORY
Metropolitan Zone	Capital cities
	Other metropolitan centres (urban centre population > 100,000)
Rural Zone	Large rural centres (urban centre population 25,000 - 99,999)
	Small rural centres (urban centre population 10,000 - 24,999)
	Other rural areas (urban centre population < 10,000)
Remote Zone	Remote centres (urban centre population > 4,999)
	Other remote areas (urban centre population < 5,000)

Source: Rural, Remote and Metropolitan Areas (RRMA) classification http://www.aihw.gov.au/rural-health-rrma-classification/

5.5.1.2. Key Resource Areas

There are a number of Key Resource Areas (KRAs) in the Study Area.

The Gatton Shire Extractive Industries overlay map shows an additional large resource area to the north of the existing railway line, with significant extents of land identified as KRAs or mining leases. The overlay maps note that the Helidon KRA contains 'sandstone building stone materials, extractive materials, explosives manufacturing and buffer areas. The Helidon KRA is not identified in the State Planning Policy Mapping.

The Laidley Shire Extractive Industries overlay map show a small extractive industry site to the east of Laidley, and the south west of Grandchester. These are not mapped as KRAs under the State Planning Policy.

5.5.1.3. Agricultural Uses

A review of mapping associated with the Queensland Government Agricultural Land Audit dataset shows agricultural uses are predominantly high pasture production, with some medium pasture production from Helidon to Calvert within the Study Area. This includes irrigated cropping and seasonal irrigated cropping, particularly near Gatton, Forest Hill and Laidley.

Under the Queensland Government SPP and Regional Interests Mapping, Important Agricultural Areas and Agricultural land Class-A is mapped along the plains associated with Lockyer Creek, Sandy Creek, Laidley Creek and Western Creeks.

5.5.2. Key Local and Regional Land Tenures

The majority of land within the Study Area is held in freehold title as described in **Section 4.2**. Other tenure arrangements within the Preferred Alignment include lands lease (e.g. the rail corridor) and reserve. The tenure of properties within the Preferred Alignment is included in **Appendix A.**

5.5.3. Native Title

The predominant tenure across the Study Area is freehold, with reserves and state owned land in discrete pockets. Native Title interests may exist over non-freehold land, including road reserves dedicated after 1996 and waterways.

The Study Area is located within the country of the Jagera People, who have resided in the area since time immemorial. The Jagera Daran #2 People (QC2003/015 PRC/ QUD6014/03) are the 'Previously Registered Claimants'. Under the *Aboriginal Cultural Heritage Act 2003*, previously registered native title claimants continue to be the native title party for that area providing there is no other registered native title claim for the area and there is not, and has never been, a native title holder for the area. Jagera Daran Pty Ltd is the registered Cultural Heritage Body for the Jagera Daran #2 People.

5.6. Planning Instruments, Government Policies

5.6.1. Regional Plans

A desktop assessment of the Preferred Alignment was undertaken in reference to the South East Queensland Regional Plan 2009-2031. The Planning Schemes relevant to the Lockyer Valley Regional Council local government area (Gatton and Laidley Shires) are generally in accordance with the regional plan land use categories.

The subject regional land use categories are described as follows and shown in **Figure 5-6**:

- Regional Landscape and Rural Production Area (RLRPA) (Light Green) – Identifies land with regional landscape, rural production or other non-urban values.
- Urban Footprint (Pink) – Identifies land that can meet the region's urban development needs to 2031 in a more compact form.
- Rural Living (Orange) – Comprises locations currently designated for rural residential development in local government planning schemes, and where further rural residential development through infill and consolidation is permitted under the SEQ Regional Plan.

Within the Helidon to Calvert area the main land use category is Regional Landscape and Rural Production. The exception of this is within Lockyer Valley Regional Council around the Helidon, Gatton, Forest Hill and Laidley localities where it is predominantly Urban Footprint land use designation. There is some Rural Living land use designation in Helidon, Gatton and Laidley.

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3300 Helidon to Calvert

Land Use

Figure 5.6

LOCKYER VALLEY REGIONAL COUNCIL

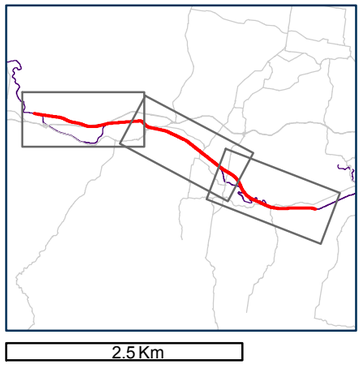
HELIDON

GRANTHAM

- Preferred corridor (surface)
- Preferred corridor (tunnel)
- Adjacent Inland Rail project alignments
- LGA boundary
- Study Area
- Gowrie to Grandchester Protected Corridor
- Coordinated projects
- Key Resource Area (resource processing area)
- Key Resource Area (separation area)

SEQRP land use categories:

- Urban Footprint
- Rural Living Area
- Regional Landscape and Rural Production Area
- West Moreton Rail Line
- Highway
- Secondary road
- Waterways



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ARTC InlandRail

3300 Helidon to Calvert

Land Use

Figure 5.6

GATTON

LOCKYER VALLEY REGIONAL COUNCIL

FOREST HILL

LAIDLEY

IPSWICH CITY COUNCIL

- Preferred corridor (surface)
- Preferred corridor (tunnel)
- Adjacent Inland Rail project alignments
- LGA boundary
- Study Area
- Gowrie to Grandchester Protected Corridor
- Coordinated projects
- Key Resource Area (resource processing area)
- Key Resource Area (separation area)

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- Urban Footprint
- Rural Living Area
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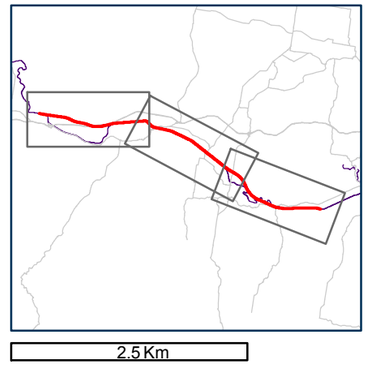

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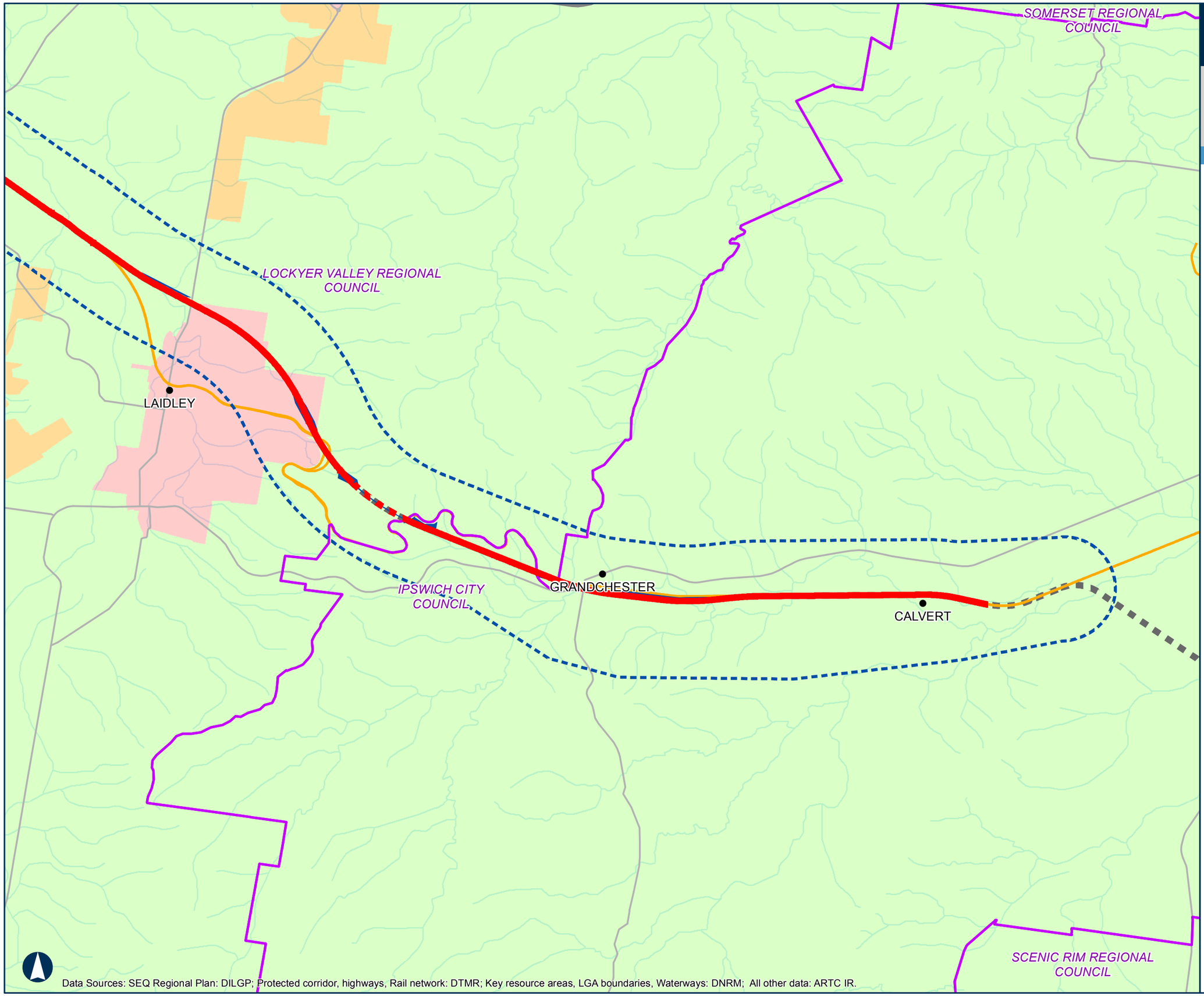

ARTC InlandRail

3300 Helidon to Calvert

Land Use

Figure 5.6

- Preferred corridor (surface)
- Preferred corridor (tunnel)
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- LGA boundary
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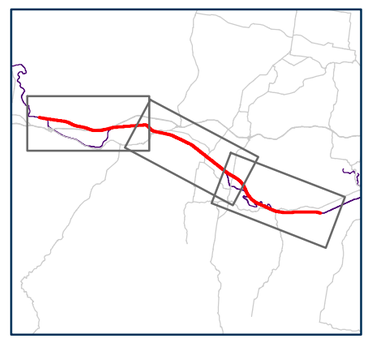

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5.6.2. Local Planning Schemes – Land Use Designations

Available planning scheme mapping from the Lockyer Valley Regional Council and Ipswich City Council was reviewed to identify land uses within the Study Area. The Lockyer Valley Draft Planning Scheme is yet to be finalised, therefore Planning Scheme information from the former Gatton and Laidley Shires is still in force in the Study Area. Local government planning scheme mapping generally allows for the future transport corridors.

Table 5-10 Planning Scheme Designations

LAND USE DESIGNATION	LOCATION / AREA
Lockyer Valley Regional Council (Gatton & Laidley Planning Scheme)	
Rural General	The Rural General designation is spread in areas throughout the Preferred Alignment, but with more of presence within the Grantham area.
Rural Agriculture	Several pockets of this land use designation are spread throughout the Preferred Alignment.
Industrial	A concentration of industrial lots are located just near the Helidon township
Rural Residential (Homestead Residential Precinct)	Several Rural Residential lots adjoin the Preferred Alignment within the Placid Hills area.
Urban Residential	The Preferred Alignment traverses a concentration of urban residential lots within the Gatton Township.
Open Space Zone	The Preferred Alignment traverses pockets of open space lots within the Gatton Township.
Commercial Zone	The Preferred Alignment traverses a concentration of commercial lots within the Gatton Township.
Ipswich City Council Planning Scheme	
Rural B (Pastoral)	The Preferred Alignment adjoins the Rural B (Pastoral) between Grandchester to Calvert to the south.
Rural A (Agricultural)	The Preferred Alignment predominantly adjoins this land use within the Ipswich City Council Region,
Township Residential	The alignment adjoins this land use within the Grandchester and Calvert townships.
Special Uses	The subject alignment is generally contained within this land use designation throughout the Ipswich City Council region.
Rural E (Special Land Management) Zone	The Rural E (Special land Management) designation is within close proximity to the alignment to the north between Grandchester to Calvert.

6. POTENTIAL IMPACTS

6.1. Natural environment

6.1.1. Land Use

Though the majority of the Preferred Alignment is located within the existing rail corridor, several areas of agricultural activity and residential uses will be directly affected by the Helidon to Calvert Project.

The Preferred Alignment impacts at least three agricultural water storages and further analysis would be required to evaluate the impact of changes to overland flow and water storages as a result of the corridor.

The Preferred Alignment passes through parts of the Urban Footprint however Councils have accommodated the current protected corridor in their strategic planning and development assessment processes.

Near Helidon the Preferred Alignment deviates from the Gowrie to Grandchester future public passenger transport corridor to align between two easements, potentially affecting two properties outside of the existing corridor , and one additional property may be impacted as a result of earthworks at the western tunnel portal at the Little Liverpool Range.

In general, land use impacts potentially arising from the Helidon to Calvert Project include the following:

- Potential air quality, noise and visual impacts to rural residential and residential land uses during construction and operation
- Direct impacts to existing land uses such as loss of rural agricultural land, impacts to existing businesses
- Severance and access impacts arising from the construction and operation of a linear corridor

No nature conservation reserves were identified in the Preferred Alignment, although the Lockyer National Park is located to the north of the Preferred Alignment at Helidon. Whilst these areas are not likely to be impacted by the Helidon to Calvert Project, habitat connectivity values will be investigated further in future stages of the Helidon to Calvert Project.

6.1.2. Geology and Soils

The variable geology along the Preferred Alignment from Helidon to Calvert generates a number of potential impacts to the design, construction and operational stages of the Helidon to Calvert Project. Potential impacts relating to soils and geology include, but are not limited to, the following:

- Cracking and/or settlement of structures due to the high potential for shrinkage and swelling of the black soils and cracking clays. Cracking may also result from the removal of vegetation with roots in these soils
- Limitations to construction programme due to black soils and cracking clays being non-trafficable during wet conditions
- Slope instability requiring stabilisation of cut faces
- Gully erosion due to the dispersive nature of cracking clays and black soils
- Rock fall onto track due to colluvial loose scree on existing slopes or weathering
- Less opportunities to reduce environmental footprint as the poor engineering qualities of black earth and cracking clays reduces their potential for re-use and increases the quantity of imported materials required
- Risks of landslip due to erodibility of the Marburg Formation, loose colluvial material, unstable scree slopes and an unknown water table

- Large quantities of material import and export- due to the poor founding characteristics of alluvial soils
- Due to the nature of the bedrock that will be encountered and the relatively short length of tunnel, it is envisaged that the Little Liverpool Tunnel will be excavated using mined tunnel techniques (road header/drill and blast).

There are land uses within and adjacent to the Preferred Alignment that pose a known or possible risk of contamination. This includes sections of the existing rail corridor which are likely contaminated. Other potential contaminated areas identified from desktop review include quarries, rural grazing and agricultural properties, and other rural uses. UXO may also be present adjacent to the Preferred Alignment however current mapped UXO do not occur within the preferred alignment therefore are unlikely to be impacted.

If not remediated or managed appropriately during construction, disturbance of contaminated land has the potential to result in human health and environmental impacts including impacts to soils, groundwater, vegetation and habitats.

6.1.3. Water

6.1.3.1. Surface Water

As described in **Section 5.1.2** the Preferred Alignment and the wider Study Area span two catchments, with the boundary following the Little Liverpool Range between Grandchester and Laidley**.** The western section is located within the Lockyer Creek Catchment and the eastern section of the corridor is located within the Bremer River Catchment. The Preferred Alignment crosses a number of waterways and tributaries.

Several water storages (dams) are located in the vicinity of the Preferred Alignment and may be directly or indirectly affected during the construction or operation of the Helidon to Calvert Project and will be further assessed during subsequent Project stages.

Potential impact associated with a new railway from a water resources perspective primarily occur during construction and decommissioning and to a lesser extent during operations. Direct impacts from construction can include:

- The removal of riparian vegetation which may lead to indirect impacts like the deterioration in water quality due to the increased sediment runoff or wind borne erosion of exposed soils
- Disturbance in the waterway including both water quality modifications and alterations to surface water flows
- The introduction or spread of exotic vegetation that could undermine the quality of riparian vegetation communities
- Spills and accidents which may affect water quality.

Impacts to water quality and surface water flows can have indirect impacts both at the construction site and downstream. These impacts can be both biological, where the health of the stream ecology degrades, and on water users where the water quality may no longer be suitable for previous uses (e.g. recreational or agricultural purposes).

Impacts to surface water resources during the operational phase are likely to be minimal, where water quality treatment measures and spill containment devices are implemented as part of design and construction. Some maintenance activities would be required that may affect riparian vegetation communities, introduce the risk of spills and accidents, and introduce the risk of spread of exotic vegetation.

6.1.3.2. Flooding

The Preferred Alignment follows the existing rail line for approximately 16 km (from Laidley to Gatton) crossing approximately 18 km of Lockyer Valley floodplain. Near Grantham, the Preferred Alignment deviates further north to

minimize the interaction with the Lockyer Creek floodplain. The Preferred Alignment has considered available flood extent and flood level information in order to increase its flood resilience.

The Preferred Alignment requires numerous drainage structures, varying from culverts, bridges and larger multi-span viaducts.

Design development of the crossing of the Lockyer Creek floodplain will address potential impacts to the flood regime and risks within the Lockyer Valley (Grantham, Gatton, Forest Hill, Laidley and surrounding inhabited areas). In addition, design development will include an assessment of the potential impacts to the flood regime and risks associated with Western Creek (Calvert). Design shall ensure that the proposed project does not increase the likelihood or intensity of damaging flooding events in the local area.

6.1.3.3. Groundwater

Fifty-five registered private groundwater bores were identified within the Preferred Alignment using the DNRM Australian Groundwater Explorer. Ten were for the purposes of irrigation, and one for the purpose of water supply.

It is likely that the groundwater is of good quality given the groundwater recharge nature of the area and the use of bores for irrigation and water supply. However, given the significant development in the area in recent years, further study will be required to determine the existing groundwater quality.

Key potential threats of a railway from a groundwater resources perspective are as follows:

- Activities which cause a decrease in water level such as dewatering activities and earthworks, particularly cuttings and tunnels, with potential impacts to water users and groundwater dependant ecosystems
- Activities which cause the spill or leaching of contaminants potentially impacting groundwater quality
- Impact to registered bore users, either through loss of access or bores within the Preferred Alignment, or changes to bore levels or water quality.

6.1.4. Air Quality

6.1.4.1. Rail Corridor Constraints

Published monitoring and modelling studies of rail freight projects were reviewed in order to identify the likely air quality impacts from the operation of the proposed rail alignment.

Based on review of these documents, and in consideration of the projected freight train movements per day for the Inland Rail Programme, the following conclusions can be made with respect to potential air quality impacts:

- Beyond 25 m of the rail alignment, it is expected that there will be negligible influence from particulate emissions (diesel engine, emissions from load, and recirculated dust)
- Beyond 50 m of alignment, the gaseous criteria (as defined in Environmental Protection (Air) Policy 2008 (EPP Air) for human health and impacts on agriculture and sensitive ecological areas and in the National Environmental Protection Measure for human health protection) are expected to be met. This includes consideration of existing background concentrations.

Analysis of cadastral data and aerial photography was completed to identify residential and commercial receptors at a range of setback distances from the Preferred Alignment.

The majority of sensitive receptors identified along the Preferred Alignment were found to be residential. Residential receptors were largely found in urban areas along the Preferred Alignment, primarily Gatton. Other localities that contributed significant numbers of residential receptors include - Forest Hill, Laidley, and Placid Hills. The majority of other residential receptors along the corridor consist mainly of rural residential and rural properties. Commercial receptors were also identified and generally concentrated in urbanised areas along the alignment such as Gatton. There are a number of agricultural properties in the Study Area which, depending on the crop type, may be sensitive to changes in air quality.

Thirty-eight receptors were identified to be within 50 m of the Preferred Alignment. Based on the screening buffer of 50 m from the corridor that was determined on the basis of review of previous studies, this indicates that a more detailed assessment including air quality modelling is appropriate for these receptors to determine predicted impacts and whether mitigation measures are required.

6.1.4.2. Tunnel

The initial air quality modelling results for the concept tunnel design suggest that based on modelled emissions from the tunnel portals only, there is potential for non-compliance with the EPP Air for nitrogen dioxide (1 hour average) for the Little Liverpool eastern and western portals at sensitive receptors. Therefore detailed modelling is recommended to determine the potential impacts on air quality and requirements for mitigations such as stack dispersion / ventilation in the tunnel design.

6.1.4.3. Construction Air Quality Impacts

Potential construction air quality impacts primarily relate to particulate emissions which are greatest during any clearing or earthworks. Earthworks and truck movements over unpaved surfaces result in the disturbance of surface material, which may be dispersed towards sensitive receptors during downwind conditions. The key air quality indicators for these types of activity are particulates.

Other aerosol emissions from construction activities include combustion products from the operation of diesel engines. These pollutants include carbon monoxide, nitrogen dioxide and PM_{10}.

Construction of new sections of line will progress in a linear fashion along the alignment with impacts considered to be relatively short term (i.e. months). Where longer-term construction is being undertaken, for example tunnel works or embankments, then the activities will be concentrated in a specific location for a longer period of time, and there may be a greater risk of air quality impacts.

It is recommended that the potential construction emissions should be further considered at the detailed assessment stage of the Helidon to Calvert Project, when the construction stages and work locations have been identified.

6.1.5. Ecosystems

The Preferred Alignment will intersect areas of regulated vegetation and mapped essential habitat particularly in the vicinity of the Little Liverpool Range.

A number of Eucalypt dominated “of concern” regional ecosystems will be intersected by the Preferred Alignment. Regional Ecosystems likely to be affected are listed as follows in **Table 6-1**.

Table 6-1 Potentially Impacted REs

SECTION	RE	VM ACT CLASS	BIODIVERSITY STATUS	COMMENT
Helidon	No REs	NA	NA	-
Easement Options- both	12.3.7 12.9-10.2	Least Concern Least Concern	NC NC	-
Between Easement Options and Gatton Bypass Options	12.9-10.2	Least Concern	NC	-
Gatton Bypass Option- North	12.3.3* 12.9-10.2*	Endangered Least Concern	Endangered NC	-
Gatton Bypass Option- South	12.3.3* 12.9-10.2	Endangered Least Concern	Endangered NC	-
Between Gatton Bypass Options and Laidley	No REs			-
Laidley to Grandchester	12.9-10.2 12.9-10.2/12.9-10.7* 12.9-10.7	Least Concern Least Concern /Of Concern Of Concern	NC NC/OC OC	10.9-10.2/12.9-10.7 unlikely to be impacted as the alignment would tunnel underneath this RE.
Grandchester Option- North	12.3.7*	Least Concern	NC	-
Grandchester Option- South	12.9-10.2/12.9-10.7	Least Concern /Of Concern	NC/OC	-
Note- * denotes where an RE is also mapped as essential habitat				

6.1.6. Flora and Fauna

The Study Area provides potential habitat and movement opportunities for a large number of fauna species listed under the NC Act as well as species listed under the EPBC Act. Loss of habitat, habitat fragmentation and mortality during construction and operation are the key potential impacts to fauna as a result of the Helidon to Calvert Project.

A rail corridor may form a linear barrier to fauna movement, particularly if exclusion fencing is installed. Habitat fragmentation may isolate populations, which if confined to sufficiently small patches of habitat, may have a high chance of local extinction. Movement barriers may also restrict gene flow across the landscape. Project design elements such as viaduct and bridge structures and the retention of existing ridgeline vegetation through tunnelling under the Little Liverpool Range, will facilitate fauna linkages to otherwise potentially fragmented habitat at these locations. Further development of the design during future project stages will identify additional fauna crossing locations and mitigation measures for fauna sensitive design.

The current investigations have not identified any significant ecological issues which are likely to impact long term operation of the completed Helidon to Calvert Project. The Helidon to Calvert Project will be referred under the EPBC Act for a determination as to whether it is a "controlled action" based on its potential to impact on matters of national environmental significance (described below in **Section 6.6**).

Indicative mitigation measures to be investigated for the Helidon to Calvert Project are described in **Section 7**.

6.2. Amenity, including noise, vibration, lighting, urban design and visual aesthetics

6.2.1. Noise and Vibration

The preliminary noise and vibration assessment for the Helidon to Calvert Project included unattended noise monitoring at four locations in the Study Area to characterise typical noise environments that may be expected along the Preferred Alignment:

- Rural - close to existing railway
- Remote rural – no major infrastructure
- Outer suburban - some rail and local roads in the vicinity
- Major infrastructure – Warrego Highway and existing rail.

The likely noise and vibration impacts associated with the operation of the Helidon to Calvert Project were predicted using an airborne noise propagation model implemented in SoundPlan. Groundborne noise and vibration will be modelled as part of the EIS.

Noise modelling will occur during the EIS phase that will determine the required location and nature of mitigation measures for airborne noise.

6.2.2. Landscape and Visual

A qualitative appraisal of potential landscape and visual impacts has been prepared with reference to the key prominent design features, including tunnel portals, proposed elevated structures and area of extensive excavation and cutting to accommodate the Preferred Alignment.

A summary of the anticipated impacts have been described in **Table 6-2.**

Table 6-2 Summary of Anticipated Impacts

LOCALITY	DESCRIPTION
1. Helidon	• The alignment is anticipated to be visible from the northern edge of Helidon Spa, Helidon and properties situated on Conner Road • At this location the alignment is anticipated to be close to ground level with localised

	areas of cutting and embankment.
2. Placid Hills	• Proposed alignment ties in with existing rail alignment. Potential for properties situated to the north of Placid Hills to experience views towards the proposed rail alignment • It is anticipated the landscape character has a degree of capacity to absorb this proposed change in the context of the existing rail alignment.
3. Gatton and Forest Hill	• The proposed alignment would tie in with existing rail alignment. Potential for properties within Gatton and Forest Hill to experience views towards the proposed rail alignment • It is anticipated the flat open pastoral landscape character has a degree of capacity to absorb this proposed change in the context of the existing rail alignment.
4. Laidley	• Severance of existing agricultural parcels of land and potential impact on agricultural character • Potential impact on existing farmsteads and residential buildings • Excavation at the tunnel portal resulting in the removal of mature vegetation in portal vicinity • Potential impact on local properties and farmsteads • Potential impact on Laidley Forested Mountains (Little Liverpool Range) character area.
5. Tunnel portals	• Excavation at the tunnel portals resulting in the removal of mature vegetation • Potential visual impact on properties and views from distant elevated scenic viewpoints.
6. Elevated structures	• Elevated structure are anticipated to result in potential visual impact on residential properties • Potential for impact on the forested hills character as a result of the introduction of rail infrastructure and structures.
7. Grandchester	• The proposed alignment would tie in with existing West Moreton Railway Line. Potential for properties situated to the south of Grandchester to experience views towards the proposed rail alignment • Potential impact on Pastoral Valley Floor character area.
8. Calvert	• Proposed alignment ties in with existing West Moreton Railway Line alignment. Potential for properties situated to the north of Calvert to experience views towards the proposed rail alignment • Potential impact on Pastoral Valley Floor character area • At this location the alignment is anticipated to be close to ground level with localised areas of cutting and embankment.

6.3. Social Environment

A review of previous studies for similar proposals and information from stakeholder engagement for the Helidon to Calvert Project has been used to identify likely social impacts. Potential social impacts during planning, construction and operation are identified hereafter. It should be noted that not all impacts listed below are adverse, neither is this list definitive.

6.3.1. Amenity and Social Cohesion

Public perception about the Helidon to Calvert Project and concerns about impacts during different phases of planning and construction may lead to social stress and confusion in affected communities.

During construction there may be reduced connectivity between key locations along the Preferred Alignment as a result of road network disruptions.

Land take for the Helidon to Calvert Project may result in severance of properties and a reduction in available land for agricultural holdings, potentially affecting the viability of operations. The presence of the Helidon to Calvert Project may result in long term changes to land use patterns around it.

During construction and operation there are likely to be amenity impacts to residential, rural residential and rural land uses near the Helidon to Calvert Project. This includes noise, air quality and visual impacts which are described in **Section 6.2**.

6.3.2. Community Health and Safety

Potential community health and safety concerns that will require detailed assessment includes impacts arising from locomotive exhaust, coal and grain dust and the potential risk of rail accidents.

The Helidon to Calvert Project will cross a number of existing roads. The proposed crossing design at each location (i.e. signalised, level crossing, grade-separated crossing etc.) will be informed by a safety risk assessment to determine the potential risk to road and rail infrastructure users and the community.

Increased road traffic particularly heavy vehicles during construction may also increase the risk of traffic incidents and generate increased noise and dust.

6.3.3. Access

The construction of the Helidon to Calvert Project may result in temporarily reduced or changed access to some open spaces, retail, community or educational services in the Study Area. The construction of the Helidon to Calvert Project may also cause temporary disruption to the availability of rail services and accessibility of stations.

6.3.4. Housing and Workforce

During construction there is the potential for temporary and localised inflation in property prices and reduction in the availability of rental properties to the influx of additional workers to the area. There is an opportunity to utilise local workforce and enhance economic development opportunities through local supply chains.

A social impact assessment process will analyse potential social impacts in further detail, with input from the community through consultation. This will identify how positive social impacts can be enhanced and negative impacts mitigated and/ or managed. A Social Impact Management Plan will address management measures through all project phases (planning/design, construction and operation).

6.3.5. Cultural Heritage

6.3.5.1. Aboriginal Cultural Heritage

In accordance with the *Aboriginal Cultural Heritage Act 2003*, all persons in Queensland have a Duty of Care to take all reasonable and practicable measures to ensure they do not harm Aboriginal cultural heritage whenever they undertake an activity. The ACHA provides a number of processes that allow a person undertaking an activity to meet

their Duty of Care, including an assessment of the proposed activity against the Duty of Care Guidelines (undertaking a cultural heritage risk assessment).

Despite some sections of the Study Area being cleared there remains a risk to Aboriginal cultural heritage, especially adjacent to creeks and tributaries, which although cleared, may contain evidence of prior Aboriginal use.

Based on the results of the desktop assessment, the proposed Helidon to Calvert Project activities would be carried out in a 'high risk landscape' and meets Category 5 of the Duty of Care Category. This means the proposed activity would traverse, or be in proximity to landscapes which have a higher risk of Aboriginal Cultural Heritage being present. High risk landscapes include those where natural landscape features are present, such as rock outcrops, caves, wetlands, permanent water holes, creeks, springs, hills and mound formations.

The existence of known Aboriginal cultural heritage sites and intangible sites within and in proximity to the Study Area, as well as high risk landscape features such as creeks, indicate that there is a high cultural heritage risk to the Helidon to Calvert Project. It is likely that further Aboriginal cultural heritage values exist as yet unidentified within the Study Area.

The results of initial consultation meetings with the Aboriginal parties for the Study Area also indicate the likely presence of additional Aboriginal cultural heritage objects, items and values.

6.3.5.2. Historical Cultural Heritage

A search of the Australian Heritage Database, Queensland Heritage Register, Local Planning Schemes (Lockyer Valley, Ipswich) and Queensland Rail Heritage Register identified multiple places recorded within the Study Area, as described in **Section 5.2.2.**

Any works that may impact on known heritage-listed places may require approvals from Commonwealth, State or local authorities.

6.4. Economic Effects

As a major infrastructure project, the Helidon to Calvert Project is likely to contribute significantly to the economy of Queensland; in particular the following positive economic impacts are expected:

- Creation of employment opportunities during the planning, design, construction and operation of the Helidon to Calvert Project
- Flow on economic effects in local communities due to employment opportunities and presence of the workforce within the Study Area
- Ongoing economic benefits arising from increased efficiency of freight transport
- Once operational, the Inland Rail Programme will result in a major transformation of the freight haulage network in eastern Australia.

Detailed socio-economic assessment will be conducted to identify and quantify the benefits and impacts of the Helidon to Calvert Project.

6.5. Built Environment

Major built infrastructure and transport infrastructure in the Study Area is described in **Section 5.3** and **5.4**.

6.5.1. Transport Infrastructure Impacts

There are a number of transport infrastructure crossings along the Preferred Alignment including arterial and local roads and the existing rail line.

Due to the vertical alignment of the Helidon to Calvert Project and the cuts and embankments required, a number of grade separations are required for existing roads. However level crossings will also be required. The strategy for road crossings for the Helidon to Calvert Project has considered a number of options including grade separation, active crossings (boom gates and lights), passive crossings (stop signs), road closures and road diversion. In general, highway and arterial road crossings are to be grade separated, and sub-arterial to local/undefined roads will be determined on a risk basis in accordance with national risk-based approaches. In future project stages consultation with TMR and local councils will be conducted to agree the specific treatment at each crossing.

During construction, the Helidon to Calvert Project will result in localised impacts to existing traffic and transport networks as construction progresses. Likely impacts include:

- Increased light and heavy vehicle traffic on the Warrego Highway and other roads in the local area for the transportation of construction personnel, materials and resources for construction
- removal and placement of spoil, with potentially significant haulage requirements
- Local access changes where local roads are required for construction access, this may include temporary road closures or detours.

Construction traffic management will be detailed in future project stages and will include a traffic management plan as part of the Construction Environmental Management Plan (CEMP) and consultation with stakeholders including local and state authorities.

6.5.2. Other Infrastructure Impacts

As identified in **Section 5.3** there are a number of utilities and services in the Study Area that will be crossed by or interact with the Helidon to Calvert Project, including a gas pipeline, transmission lines and other smaller services including sewer mains and trunk water mains.

Clearance to transmission lines and towers at each crossing must be confirmed through survey and field assessments to ensure adequate clearance. If there is insufficient clearance then raising or relocation of lines, or rail alignment variations might be required to increase the clearance.

Crossing of other services has not been considered in the concept design stage however this will need to be assessed in future stages of design.

Engagement with major utility providers and land owners will need to occur to ensure any planned modification or upgrades to this infrastructure can also be achieved.

6.6. Matters of National Environmental Significance under the EPBC Act

The Study Area provides potential habitat and movement opportunities for a large number of fauna species listed under the NC Act as well as species listed under the EPBC Act.

MNES potentially relevant to the Helidon to Calvert Project were identified through a search of the DoE's PMST, adopting a search buffer of 5 km from the Preferred Alignment. This identified four listed TECs, 43 listed threatened species (including 13 bird species, 9 mammal species, 4 reptile species, 2 fish species and 15 flora species), and 16 listed migratory species as potentially occurring in the Study Area. A further 25 marine species were identified in the search.

6.6.1. Threatened Ecological Communities

Four TECs were identified in the EPBC Act PMST as potentially occurring within 5km of the Preferred Alignment:

- Brigalow (*Acacia harpophylla* dominant and co dominant): Endangered
- Lowland Rainforest of Subtropical Australia: Critically Endangered
- Swamp Tea-tree (*Melaleuca irbyana*) Forest of South east Queensland: Critically Endangered
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland: Critically Endangered.

These TECs were not considered likely to occur in the Study Area, based on a review of DNRM regional ecosystem mapping. These were also not identified during initial targeted field investigations.

6.6.2. EPBC Act Listed Threatened Fauna

The EPBC listed threatened fauna species considered to have higher potential to occur in the area, based on a preliminary species likelihood assessment, observations during initial field investigations and species records documented for the nearby TSRC motorway include:

- Koala (*Phascolarctos cinereus*) – known
- Collared Delma (*Delma torquata*) – suitable habitat observed
- Spotted Quoll (*Dasyurus maculatus maculatus*) – high, particularly near the Little Liverpool Range
- Greater Glider (*Petauroides Volans*) – moderate, suitable habitat confined to trees with large hollows
- Grey-headed Flying Fox (*Pteropus poliocephalus*) – seasonal, pending nectar availability
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – high, suitable habitat present
- Regent Honeyeater (*Anthochaera Phrygia*) – seasonal, pending nectar availability)
- Painted Honeyeater(*Grantiella picta*) – moderate, paucity of mistletoes observed, but habitat otherwise suitable
- Red Goshawk (*Erythrotriorchis radiates*) – moderate, very large home-range suggests occasional use of Helidon to Calvert Project area possible
- Swift Parrot (*Lathamus discolour*) – seasonal, but even then rare
- Black-breasted Button-quail (*Turnix melanogaster*) – moderate, significance patches of lantana presence, but generally associated with Eucalypt forest. No potential feeding signs observed in initial surveys.

The Helidon to Calvert Project will likely have an impact on Koala habitat. Koala Spot Assessment Technique (KSAT) survey was undertaken across eight sites within the current investigation area. The data collected suggests low koala activity levels across the area which may indicate transitory individuals at some sites.

6.6.3. EPBC Act Listed Threatened Flora

The EPBC Act listed flora species considered to have higher potential to occur in the area, based on a preliminary species likelihood assessment and observations during initial field investigations includes:

- Hairy-joint Grass (*Arthraxon hispidus*)
- *Grevillea quadricauda*
- Wandering Pepper-cress (*Lepidium peregrinum*)
- Austral Toadflax (*Thesium australe*)

Further investigations will be required to determine the presence and/ or extent of presence of these flora species in the Study Area, and to determine the extent of impact as a result of vegetation clearing for the Helidon to Calvert Project.

6.6.4. Migratory Species

Sixteen migratory species were identified in the PMST search undertaken for the area within 5 km of the Preferred Alignment. Additional migratory species were also identified in the WildNet search. The following migratory species were considered to have higher potential to occur in the area, based on a preliminary species likelihood assessment include:

- Fork-tailed Swift (*Apus pacificus*) - High likelihood – Migratory, Marine
- White-throated Needletail (*Hirundapus caudacutus*) - High likelihood – Migratory, Marine
- Cattle Egret (*Ardea ibis*) - High likelihood – Migratory, Marine
- Marsh Sandpiper (*Tringa stagnatilis*) - Moderate likelihood – Migratory, Marine
- Painted Snipe (*Rostratula benghalensis*) - Moderate likelihood – Marine
- Swift Parrot (*Lathamus discolour*) -Seasonal – Marine.

6.6.5. Wetlands of International Importance

There were no Wetlands of International Importance (Ramsar) identified on the PMST.

The Helidon to Calvert Project is located in the headwaters of the Brisbane River catchment which discharges to the ocean in Moreton Bay. The Moreton Bay Ramsar site is approximately 70 km east of the Helidon to Calvert Project. Due to the significant distances between the Helidon to Calvert Project and any of the Ramsar sites, and the extensive urban development between the Helidon to Calvert Project site and the Ramsar site, neither direct or indirect impacts are expected.

7. ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

7.1. Natural environment

7.1.1. Land

Land use impacts (direct and indirect) are likely to result from the Helidon to Calvert Project. Further consideration of potential land impacts (severance, access, direct impact, and amenity) will be undertaken during subsequent project phases. Further design refinements will aim to minimise impacts on property owners particularly outside of the previously protected corridor, where reasonable and practicable. Construction planning will be required to determine the laydown requirements and optimally locate construction workspaces to minimise property impact.

Geological and soils impacts will influence the design and also require mitigation during construction. Future design stages as part of the EIS process will include geotechnical testing to confirm ground conditions and progress the design accordingly. Design mitigation will include measures to minimise the effect of shrink/swell in soils, minimise slope instability, drainage design to reduce the inflow of water into dispersive soils.

During construction, environmental impacts will be managed through a construction environmental management plan which will detail environmental outcomes, performance criteria and mitigation measures.

Further contaminated land investigation will be required in future project stages, including field investigations and testing where risk of contamination is likely. Similarly, further review of UXO risk in the Study Area is warranted given the history of previous defence uses in the vicinity. This includes works within proximity to the existing rail corridor.

7.1.2. Water

Due to the linear nature of a railway, it is often not possible to avoid crossing and impacting waterways. The following principles and mitigation measures will be investigated during the design phase to minimise impacts.

- Reduce in-stream disturbance impacts through the widening of existing bridges and/or culverts, rather than establishing new structures
- Minimise the number of crossings on each waterway where possible, however multiple perpendicular crossings are preferred to crossing of long sections
- Minimise the need for in-stream works, i.e. bridges are preferable to culverts at major waterway crossings
- Where possible, avoid realignment of waterways
- Design bridges such that works are avoided within riparian, littoral and in-stream environments as much as possible
- Design drainage systems to provide stormwater quality treatment prior to discharge to sensitive receptors
- Provide spill containment devices using a risk based approach taking into account sensitive receptor locations
- Design tunnels to prevent inflow and consequent draw down of the water table
- Identify areas that may require additional scour protection during construction
- Undertake geological investigations to inform the management of erosion prone and alluvium aquifer areas, and determine the risk of soils being impacted by the lowering of groundwater causing the soils to change properties and release contaminants

- Undertake hydrological investigations to determine the size and location of stormwater management devices to collect any excess water and treat stormwater run-off and determine the location of high risk areas in terms of impacts to groundwater quality and draw down.

Management of impacts during the construction phase will be documented in a CEMP prior to the commencement of construction and will likely include:

- Design and implementation of erosion and sediment control measures to minimise erosion occurring and sedimentation impacting surface waters
- Avoidance of high risk construction activity / earthworks during wet weather
- Minimise disturbance to stream banks and beds
- Rehabilitate and revegetate the worksite after the completion of works (or as areas are no longer required for construction activities)
- Exclude from the construction zone as far as practicable sensitive areas where groundwater is close to the surface
- Where it is determined that groundwater will be extracted and used during construction, minimise the groundwater use and cease groundwater extraction once the amount specified/permitted is reached.

7.1.3. Air Quality

7.1.3.1. Preferred Alignment

38 receptors have been identified in the 50 m screening buffer separation distance from the Preferred Alignment adopted for the initial review of potential air quality impacts. To assess whether there is an actual risk of non-compliance with the air quality goals, air quality modelling will be completed for the EIS of the Helidon to Calvert Project to refine impact predictions and determine appropriate mitigation measures.

7.1.3.2. Tunnel

Based on the preliminary dispersion modelling, it is likely that mechanical ventilation will be necessary for effective dispersion of emissions from the Little Liverpool Tunnel. Further detailed modelling and analysis will be necessary to confirm the detailed design requirements of the tunnel ventilation system to ensure air quality standards are met within the tunnel and for tunnel emissions.

7.1.3.3. Construction

Management of potential air quality impacts during the construction phase will be documented in a CEMP prior to the commencement of construction, including measures to minimise dust generation, minimise exposed earth, implementation of erosion and sediment controls, measures for rehabilitation of works areas after completion, and traffic management to reduce dust generation and impacts to sensitive receptors.

Many of these requirements will require further documentation and or approval as part of the EIS or post-EIS approvals.

7.1.4. Noise and Vibration

Construction noise and vibration will be managed in accordance with the state legislation and policy.

Noise impact mitigation measures for the operational phase will be employed where modelling indicates that it is required. The type and extent of mitigation measures will be contingent on the results of future noise modelling that will be undertaken during future design phases and throughout the EIS process.

7.1.5. Ecosystems and Flora and Fauna

The Helidon to Calvert Project has been referred under the EPBC Act for a determination as to whether it is a controlled action.

There are opportunities to incorporate ecological outcomes into the project design for example through the provision of fauna passage at key locations in the Preferred Alignment and to minimise ecological impacts in key areas through reduced earthworks footprints and alignment refinement. Design will need to incorporate fauna movement considerations.

A Construction EMP will be developed to ensure management and mitigation measures and conditions of approval are clearly documented, and are implemented during the construction phase of the Helidon to Calvert Project. This will include definition of no-go zones, requirements for post-works rehabilitation, and scheduling of works where necessary to minimise impacts during breeding periods or times of heightened environmental sensitivity.

More detailed targeted surveys for EPBC Act and NC Act listed threatened species including Koala (*Phascolarctos cinereus*), Collared Delma (*Delma torquata*) and Black Breasted Button Quail (*Turnix melanogaster*) will be required to determine potential impacts, and mitigation measures.

An offsets strategy is currently under development.

7.1.6. Landscape and Visual

A number of potential landscape and visual mitigation measures have been identified for consideration in future project stages to avoid, minimise and manage the potential impacts that may arise. These may include the development of site specific earthworks design solutions to reduce impact where possible, such as steeper earthworks profiles to reduce extent of physical impact where required, or shallower earthworks to respond to surrounding terrain with opportunities to return larger extent of acquired land to current use, and profiling of earthworks to reduce engineered appearance and reflect the surrounding natural landform.

Landscape and visual treatments will also be defined in future stages of design.

Landscape and visual treatments can be delivered as part of a coordinated response, integrated with provision of noise, fauna sensitive design and water quality provisions.

7.2. Built Environment

Built infrastructure and traffic and transport within the Study Area are described in **Sections 5.3** and **5.4** and potential impacts identified in **Section 6.5**. The Helidon to Calvert Project will interact with existing infrastructure including road, rail, pipelines and utilities in the Study Area. Key mitigation for these impacts will be detailed in future design stages but will include:

- Consultation with stakeholders including State and local authorities and utility providers to discuss potential Helidon to Calvert Project impacts and design options to avoid or mitigate impacts
- Design development to determine options for minimising impacts

- Additional survey to identify all utilities and services (including minor utilities etc.) so that they can be considered in design development.

Construction traffic management will be detailed in future project stages and will include a traffic management plan as part of the CEMP and consultation with stakeholders including local and state authorities.

7.3. Native Title and Cultural Heritage (Indigenous)

The existence of known Aboriginal cultural heritage sites and intangible sites within, and in proximity to, the Study Area, as well as high risk landscape features such as creeks, indicate that there is a high cultural heritage risk to the Helidon to Calvert Project. It is likely that further Aboriginal cultural heritage values exist within the Study Area.

Further assessment and consultation is proposed in future project stages to determine the management measures required for Aboriginal Cultural Heritage. This includes:

- A Cultural Heritage Field Assessment of the entire route by a suitably qualified archaeologist with the relevant Aboriginal parties to identify Aboriginal and/or historical cultural heritage objects, items and places
- Development of a Cultural Heritage Management Plan under Part 7 of the *Aboriginal Cultural Heritage Act 2003* or a voluntary Cultural Heritage Management Agreement in order to manage Aboriginal cultural heritage.

Native Title may still exist in areas of the Preferred Alignment. Whilst Native Title has been extinguished over freehold land under the NT Act, Native Title interests and rights may exist over other land. The Helidon to Calvert Project will require an assessment of Native Title within the Preferred Alignment, consultation with registered Native Title parties and authorisation under the Native Title Act.

The CEMP for the Helidon to Calvert Project will include measures for the management of cultural heritage impacts, including a protocol for the 'Accidental discovery of Aboriginal cultural heritage'

7.4. Non-Indigenous Cultural Heritage Management

There are multiple historic heritage places within the Study Area and the potential for other unlisted places of heritage significance in the Preferred Alignment and wider Study Area. Further heritage assessment and consultation with local heritage groups and regulatory authorities will be undertaken to determine heritage values and required management measures. This would include design refinement to minimise impacts to listed heritage places (the Main Line Railway) and unlisted heritage places (such as pre-war housing stock and rail infrastructure which have potential heritage value) and obtaining relevant heritage permits and approvals for impacts to listed heritage places. The CEMP would include management measures for the construction phase to describe the measures to minimise impacts to heritage values.

7.5. Greenhouse Gas

Construction of the Helidon to Calvert Project will generate greenhouse gases through the transport of materials, embodied energy of materials used for construction and the consumption of electricity and other fuels during construction (earthworks, tunnel boring etc.). Construction of large-scale infrastructure projects is GHG intensive, with tunnelling and bridging known to be more GHG intensive construction activities (Hill et al 2011).

During operation the key contribution to greenhouse gas emissions include diesel consumption from locomotives and electricity consumption required for tunnel operation. The Helidon to Calvert Project will also have a significant beneficial impact in greenhouse gas generation due to the transfer of freight transport from road to rail. On average, road transport has significantly greater greenhouse gas emissions that rail transport – approximately 62g Co_2/tonne-km compared to 22g CO_2/tonne-km (Cefic 2011).

There are a number of best practice opportunities for the reduction of greenhouse gas generation during construction and operation of the Helidon to Calvert Project, including:

- Optimise tunnel ventilation to reduce energy requirements during operation
- Selection of construction materials with low embodied energy
- Optimising the cut/fill balance for earthworks to minimise material transport requirements
- Driver assistance systems and speed management.

7.6. Waste Management

The ARTC Environmental Policy (2014) commits to 'preventing or minimising pollution and the generation of waste' in all of their activities'. This policy is broadly consistent with the waste and resource management hierarchy's of the National Waste Policy (DotEE, 2009) and the Queensland Waste Management Strategy (DEHP, 2014) which set an order of preference for options for managing waste—from avoiding/reducing, to reusing, recovering, treating and disposing of waste.

The further development of the Helidon to Calvert Project design and construction will be required to manage waste and materials in accordance with ARTC's Environmental Policy and industry standards through procurement requirements. Furthermore economic incentives to balance earthworks materials to minimise material moved within and into/out of the project area during the construction phase are expected to drive design development and construction approaches.

7.7. Hazard and Risk, and Health and Safety

All ARTC's operations and activities, including activities undertaken by their contractors, are required to be undertaken in accordance with ARTC's Safety Policy and Standards which are available on the ARTC website (www.artc.com.au).

The Helidon to Calvert Project will be procured, designed, constructed and operated with regard to ARTC's policies and systems and relevant legislation, guidelines and standards.

7.8. Environmental Management

All ARTC's operations and activities, including those undertaken by their contractors, are required to be undertaken in accordance with ARTC's Environmental Policy (2014) which is available on the ARTC website (www.artc.com.au) and Environmental Management System. The ARTC Environmental Policy provides a framework for continual improvement of an Environmental Management System and sets our commitments for managing potential environmental risks.

This EMS outlines processes that are designed to guide compliance with environmental laws, statutes, regulations and corporate policies while managing ARTC's environmental impacts.

The principal benefits of operating the ARTC EMS include:

- A clear definition of the corporate environmental goals;
- Documented policies and procedures that aim to prevent and / or minimise environmental damage and achieve legal compliance;
- Improved management of environmental risks;
- Documented roles and responsibilities in the decision making process; and

- Improved community relationships.
- The EMS also provides a structure for staff training, measuring environmental performance, environmental auditing and managing non-conformances.

The Helidon to Calvert Project, will be procured, designed, constructed and operated with regard to ARTC's policies and systems and relevant legislation, guidelines and standards.

Avoidance and minimisation or environmental impacts has been a key factor in the route selection processes for the Helidon to Calvert Project. As the Helidon to Calvert Project progresses, impact avoidance and reduction will remain key drivers in design development.

Key aspects to be addressed include:

- Further definition of habitat and vegetation impacts, through iterative design and environmental assessment
- Confirmation of the location of MNES and MSES habitat and species presence, and significance of populations, through targeted ecological investigations, in accordance with relevant State and Commonwealth survey guidance
- Confirmation of other environmental values in the Study Area
- Design development to avoid, reduce or manage impacts to identified environmental values
- Determination of environmental offset requirements for MNES and MSES impacts. A Programme-wide approach to biodiversity offset management is currently being considered.

The Helidon to Calvert Project's environmental outcomes should also be considered in the context of the overall intent and outcomes of the Melbourne to Brisbane Inland Rail Programme. The establishment of a freight rail route that provides a comparable level of service to road freight is expected to negate or delay the need for progressive upgrades of the National Highway and associated environmental impacts.

An environmental management approach including the development of an Environmental Management Plan for the Construction and Commissioning phases of the Helidon to Calvert Project will be developed based on the potential environmental impacts of the Helidon to Calvert Project. These have initially been identified in this IAS and will be further developed and understood during the environmental assessment phase.

7.9. Temporary Infrastructure Decommissioning and Rehabilitation

7.9.1. Laydown Areas, Offices, Stockpiles, Topsoil and Cleared Vegetation

The project will incorporate numerous laydown areas along the preferred alignment. The location and extent of these will be determined during future design phases during the EIS.

During construction the laydown areas will be progressively decommissioned and rehabilitated.

Demountable buildings will be removed progressively and concrete slabs broken up. The surface of all rehabilitated areas will be relieved of compaction prior to rehabilitation. De-compaction (ripping) or aeration will be done in accordance with management plans developed during the EIS. Previously excavated material stockpiled on site will be used to reinstate and the ground form to ensure that it is returned to its pre-existing profile and contour.

Some sediment and erosion control measures will be left in place until completion of the rehabilitation of the area. Upon removal of offices, laydowns, stockpiles, topsoil and cleared vegetation will be spread over the area and seeding undertaken according to a Rehabilitation Plan that shall be developed in later phases of the project.

Permanent erosion and sediment control measures (drainage and berms) may be installed as appropriate prior to re-spreading of topsoils and maintained until rehabilitation goals are achieved.

Some office facilities may be left for the Commissioning phase within the railway corridor.

7.9.2. Access Tracks and Roads

Access roads and tracks that will no longer be used will be decommissioned. Decommissioning of the temporary road/accesses shall achieve complete stabilisation and restoration to a condition generally consistent with the pre-existing area characteristics.

Treatments will be designed and implemented to completely eliminate the road/access track by restoring natural contours, hydrology, and vegetation through mechanical and/or natural means.

8. APPROVALS REQUIRED FOR THE PROJECT

If the Helidon to Calvert Project is declared a coordinated project and is also determined to be a controlled action under the EPBC Act it is anticipated that assessment will be progressed under the Bilateral Assessment Agreement between the Australian and Queensland Governments.

Further approvals are likely to be required under separate approvals processes. By the time this point is reached, the Queensland *Sustainable Planning Act 2009* is anticipated to be replaced by the *Planning Act 2016* (and subsequent regulations). This new legislation will establish the requirements for development permits including waterway barrier works and vegetation clearing. Other permits may be required under the NC Act (Protected Plant clearing permits, Species Management Programs). Furthermore other post-approval management plans may be required to progress implementation of the Helidon to Calvert Project.

Table 8.1 summarises the approval and permit requirements likely to be applicable to the Helidon to Calvert Project. Approval and permit requirements may vary depending on the final design and construction methodology, and future changes in statutory requirements prior to project implementation. Further detailed review of legislative requirements should be conducted in future project phases.

Table 8-1 Anticipated Approvals

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)	Federal Department of the Environment and Energy	EPBC Act referral to the Federal Department of the Environment and Energy for determination on whether the proposal is a 'controlled action'	Undertaking an action which has or is likely to have a significant impact to Matters of National Environmental Significance	Potential project impacts to Matters of National Environmental Significance including threatened species and threatened ecological communities	Coordinated and assessed under the provision of the assessment bilateral between the Queensland and Commonwealth governments.
State Development and Public Works Organisation Act 1971 (Qld) (SDPWO Act)	Coordinator General	Coordinated Project decision and subsequent Environmental Impact Statement or Impact Assessment Report	Declaration by the Coordinator-General	The proposed approval pathway for the Helidon to Calvert Project currently assumes 'coordinated project for which an EIS is required' under the SDPWO Act.	Coordinated
Native Title Act 1993 (Cth)	National Native Title Tribunal	Where an interest is required on land where native title has not been extinguished, the requirements of the	Works within areas where Native Title exists.	Native Title may still exist in areas of the Preferred Alignment. The Helidon to Calvert Project will require an assessment of Native Title	Independent

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
		NT Act must be met before tenure can be granted.		within the Preferred Alignment, consultation with registered Native Title parties and authorisation under the Native Title Act.	
Aboriginal Cultural Heritage Act 2003 (Qld)	Queensland Department of Aboriginal Torres Strait Islander Partnerships (DATSIP)	Duty of care to take all reasonable and practical measures not to harm Aboriginal cultural heritage Cultural Heritage Assessment/ Cultural Heritage Management Plan	Construction works with the potential for impact to Aboriginal Cultural Heritage	The Helidon to Calvert Project will require further detailed cultural heritage assessment and the Cultural Heritage Management Plan/Agreement for the works.	Coordinated
Sustainable Planning Act 2009 (Qld)	Department of Infrastructure, Local Government and Planning (DILGP)	Development Permit for Material Change of Use, Operational Work, Reconfiguring a Lot and/or Building Work (as defined under Section 10 of the SPA) Development assessed against	Development that is assessable development requires a development permit. Development that cannot be declared to be development of a particular type (e.g. exempt	Will be determined by the overall approvals pathway. It is likely that the Helidon to Calvert Project will be determined 'development that cannot be declared to be development of a particular type'.	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
		applicable instruments, which may include applicable State Planning Regulatory Provisions, State planning policy, relevant State Development Assessment Provisions (SDAP) codes	development) is outlined in Schedule 4 of the SP Regulation).		
Environmental Protection Act 1994 (Qld)	Department of Environment and Heritage Protection (DEHP)	Section 424 Disposal Permit	Disposal of contaminated material from a site listed on the Environment Management Register (EMR) or Contaminated Land Register (CLR) and/or making a material change of use of premises if all or part of the premises is on the EMR or CLR	The likelihood of an approval being required will be dependent on the nature of contaminants present within the material to be disposed. Subject to EMR/CLR search and further contaminated land investigations.	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
		Environmental Authority	Undertaking an Environmentally Relevant Activity (ERA) listed under Schedule 2 of the Environmental Protection Regulation 2008 (EP Regulation)	Potential ERAs associated with construction to be confirmed in future project phases and may include: Chemical storage Extractive and screening activities Crushing, milling, grinding or screening material Regulated waste storage/transport	Coordinated
Fisheries Act 1994 (Qld)	DAF and DILGP	Operational works permit for works within a declared Fish Habitat Area	Development in a declared fish habitat area	Not applicable as no Declared Fish Habitat Areas in the vicinity of the Preferred Alignment	Coordinated
		Development permit for Operational Works that is raising or constructing a waterway barrier	Constructing or raising waterway barrier works in fish habitats	There are a number of waterways in the Preferred Alignment that are mapped as low, medium or high risk under the Fisheries Act. Requirement for permit to be confirmed in future project phases, depends on the design and nature of creek crossings and whether	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
				crossings can comply with self-assessable codes for permanent or temporary works.	
Vegetation Management Act 1999 (Qld) (VM Act)	Department of Natural Resources and Mines (DNRM) and DILGP	Operational works permit for clearing remnant native vegetation (and possibly regrowth vegetation pending changes to the VM Act)	Removal of native vegetation	The Helidon to Calvert Project will require the clearing of mapped remnant native vegetation. Potential exemptions may be applicable to the Helidon to Calvert Project under Schedule 24 of the SP Regulation Extent of native vegetation clearing and applicability of exemptions to be confirmed in future project phases.	Coordinated
Nature Conservation Act 1992 (Qld) (NC Act)	DEHP	Protected Plant Clearing Permit Protected Plant Exemption Notification	Clearing of protected plants under the NC Act, or within 100m of protected plants Clearing of	Parts of the Preferred Alignment are within the High Risk Flora Survey Trigger Area, requiring flora survey and identification of protected plants, and if	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
			vegetation within the high risk flora trigger area	applicable a clearing permit or exemption will be required.	
		Approval to tamper with an animal breeding place.	If an animal breeding place used by an endangered, vulnerable or least concern fauna species requires removal a species-specific Species Management Program (SMP) will require approval by DEHP.	There is the potential for animal breeding places to be present within the Preferred Alignment. This is to be confirmed in future project phases through detailed fauna survey, and if necessary a SMP will be required.	Coordinated
Queensland Heritage Act 1992 (Qld)	DEHP and Queensland Heritage Council	Exemption certificate (for a low impact activity which will not significantly detract from the heritage values of the place) or Development Application for impacts to a	Impacts to a Queensland Heritage Place / Local government heritage place	There are Queensland Heritage places and local heritage places within the Study Area. The extent of impact to these places should be determined in future project phases to determine if an exemption certificate or approval is required.	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
		Queensland Heritage Place / Local government heritage place			
Water Act 2000 (Qld)	DNRM and DILGP	Riverine Protection Permit unless the Riverine protection permit exemption requirements (DNRM 2013) can be complied with.	Destroying of vegetation, excavating or placing fill in watercourse, lake or spring	Exemptions from the requirement for a Riverine Protection Permit may apply if the excavation or placing of fill is a necessary part of another permitted activity, or if the project is "prescribed assessable development" under the definition in Section 814 of the *Water Act 2000*. If this is not the case, a Riverine Protection Permit should be obtained for the Helidon to Calvert Project.	Coordinated
		Water licence/allocation associated with the taking or interfering with water for construction	Taking or interfering with water	Taking or interfering with water for construction purposes is likely to be required for the Helidon to Calvert Project. Construction entities may take water without an	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
				allocation, subject to conditions prescribed under a regulation. Creek diversions may also require licences under the Water Act and development permits.	
Transport Infrastructure Act 1994 (Qld) (TIA)	Queensland Rail	Approval to interfere with a railway (s255)	Crossing of existing rail line or works within existing rail corridor	Subject to detailed design and consultation with Queensland Rail	Coordinated
	Department of Transport and Main Roads (DTMR)	Road corridor permit for works within a State Controlled Road (s50) Access to State Controlled Road (s62/66)	Works within the Warrego Highway or other State Controlled Road Access to the Warrego Highway or other State Controlled Road (e.g. during construction)	Subject to detailed design and consultation with DTMR	Coordinated

ACT/ PROVISIONS	RESPONSIBLE/ADMINISTERING AUTHORITY	APPROVAL/PERMIT	TRIGGER	APPLICABILITY	COORDINATED / INDEPENDENT
Environmental Offsets Act 2014 (Qld) and Policy	DEHP	Offsets Management Plan	An environmental offset may be required as a condition of approval where—following consideration of avoidance and mitigation measures—the activity is likely to result in a significant residual impact on prescribed environmental matters.	The Helidon to Calvert Project is likely to have an impact on matters of state environmental significance (MSES). The significance of the residual impact would need to be confirmed in future project phases to determine offset requirements.	Coordinated
Local Government Act 2009	Local Government	Work on a local government controlled road permit	Construction works within a local government controlled road.	The Preferred Alignment intersects a number of local roads. Construction works are likely to occur within local roads.	Independent

9. COSTS AND BENEFIT SUMMARY

9.1. Local, State and National Economies

As described in **Section 3.3** and **Section 3.9**, the ARTC Business Case outlines the significant economic benefits of the Inland Rail Programme, which contributes to the efficient movement of freight in Australia and supports economic growth. The Inland Rail Programme is expected to increase Australia's GDP by an estimated $16 billion by 2050.

The Helidon to Calvert Project is a key component of the Inland Rail Programme and will bring economic benefits to the region and State by providing a critical element of the State and national freight network. In future project stages the economic costs and benefits will be subject to further detailed study.

In summary the benefits expected to arise from the Helidon to Calvert Project include:

- During the construction phase it is anticipated that the workforce will primarily be derived from local and regional sources depending on the nature of the skills required, creating local and regional job opportunities. Workforce numbers and their source will be determined once a construction methodology has been finalised and would be quantified as far as possible in the EIS.
- Job creation has the potential to create flow-on economic benefits in regional centres in the Study Area.
- Regional communities along and adjacent to the Inland Rail Corridor would benefit through more efficient and effective freight rail access to metropolitan and international markets. Subject to the location of freight terminals, Inland Rail will enable farmers to move grain and cotton more efficiently for export to port.
- Provision of rail transport for freight potentially delays the need for road infrastructure investment and reduces the congestion and safety issues on existing transport routes such as the Warrego Highway.
- The Helidon to Calvert Project will make provision for future possible passenger transport along the corridor between Toowoomba and Calvert would increase access between regional and metropolitan centres and potentially contribute to economic growth in regional towns.

The Helidon to Calvert Project cost is expected to be in the order of $1 billion and will require substantial public funding, however the business case demonstrates that operating revenues would cover operating costs (including maintenance), meaning that once delivered, Inland Rail would not require on-going taxpayer support.

Economic costs to the local and state economy may include:

- Local and temporary access disruption during construction with potentially negative effects on businesses in the region
- Land acquisition and property impacts
- The scale of the Helidon to Calvert Project may affect availability of resources and personnel for other significant construction projects in the region
- Influx of workers during construction may result in increased rents and property prices
- Workforce accommodation requirements may result in temporary accommodation shortages.

9.2. Natural and Social Environments

Without Inland Rail, consideration of other freight solutions would be required. This could include upgrades to the National Highway network, or the existing coast railway corridor. The establishment of a freight rail route that provides a comparable level of service to road freight is expected to negate or delay the need for progressive upgrades of the National Highway and associated environmental impacts. Furthermore it provides opportunities for regional development, supports regional agricultural business by providing improved access to freight services.

The Helidon to Calvert Project will have both temporary and longer term environmental and social impacts requiring management, including:

- Clearing of regulated vegetation and fauna habitat for species listed under State and National legislation
- The rail corridor will potentially form a barrier to fauna movement (when not in tunnel or on viaduct)
- Air quality and noise impacts
- Potential flooding impacts and impacts to watercourses due to crossing of floodplains and watercourses
- Landscape and visual impacts particularly at significant embankments, cuttings and viaducts
- Potential impacts to known and unknown Indigenous and historical heritage places.

Social benefits are expected to arise from the economic benefits and opportunities of the Helidon to Calvert Project that is described above.

Environmental and social impacts will be subject to further assessment in and the EIS with the development of mitigation and management measures where required. There is also an opportunity for design refinement in future phases to minimise or remove some of the impacts identified. A programme-wide biodiversity offset strategy is currently being investigated in the event that significant residual impacts are identified.

10. COMMUNITY AND STAKEHOLDER CONSULTATION

Extensive community consultation was undertaken by the Queensland Government for the studies to inform the protection of the Gowrie to Grandchester future public passenger transport corridor in 2003. ARTC have commenced consultation with key government and industry stakeholders and the outcomes of these initial consultations have informed the concept assessment phase. ARTC will implement an extensive public consultation program for the Helidon to Calvert Project and more broadly for the Inland Rail Programme.

10.1. Peak Body Consultation

Specific issues raised during preliminary consultation are outlined in Table 10-1

Table 10-1 Issues across the Helidon to Calvert Project

STAKEHOLDER	ISSUES and OPPORTUNITIES	2015	2016	STATUS
Lockyer Valley Regional Council	**Local road connectivity** Keen for discussions around technical solutions to maintain connections	✔	✔	While some level of severance is expected, grade separated and at grade crossing locations have been identified and discussions will be held with relevant stakeholders
	Flooding Long-standing concerns about contribution of rail infrastructure to flooding impacts	✔	✔	LVRC flooding data and modelling obtained through data sharing agreement. Flooding a key consideration of alignment refinement. Detailed modelling to be undertaken in future planning.
	Cumulative environmental impacts Concerns about the environmental impact that will be caused by both TSRC and IR	✔	✔	To be addressed in more detail during future environmental assessments.
	Operational Impacts of operations with alignment through townships such as Gatton	✔	✔	Alignment selection based on robust MCA and concept assessment process, taking into account various concerns and potential mitigation of risk and operational impacts.
Ipswich City Council	**Environmental impacts** Grandchester is a hub for conservation and Council was planning on tourism around this. Offsets and fauna movement		✔	To be addressed in more detail during future environmental assessments.

	were key area for consideration.			
	Visual impacts Height of proposed embankment near Grandchester a key concern		✔	Visual impacts have been considered during the concept design and alignment refinement process.
	Flooding Impacts on low lying properties and existing flood plains	✔	✔	Flooding a key consideration of alignment refinement. Detailed modelling to be undertaken in future planning.
	Infrastructure interface Concerns about interface with existing rail and Council plans for future development to accommodate population growth	✔	✔	To be addressed in more detail during future design.

10.2. Landowner Consultation

Private landowners engaged to obtain agreement to access their properties for the purpose of conducting ecological studies. Key themes included:

- The majority of landowners were aware of the existence of the protected rail corridor within their properties, however a small number of private landowners were unaware of the protected rail corridor
- Land acquisition arrangements and timing
- Future operation of existing rail line
- Landowners asked about plans for a tunnel through the Toowoomba range
- Negative experiences with adjacent infrastructure projects, such as the Toowoomba Second Range Crossing, including field studies
- Ongoing consultation with the dedicated community engagement lead was a consistent request.

Table 10-2 Summary of issues raised by landowners

STAKEHOLDER	ISSUES and OPPORTUNITIES	2015	2016	STATUS
Landowners	**Awareness of the Gowrie to Grandchester 2003 future public passenger transport corridor** The majority of landowners were aware of the existence of the protected rail corridor within their properties, however small number of private landowners were unaware of the protected		✔	Release of detailed corridor information deferred until completion of concept assessment report and selection of alignment.

	rail corridor.			
	Land acquisition arrangements and timing Concerns about lack of information being provided about the corridor location and project timing		✔	Commitments were provided to provide further information when it became available.
	Future operation of existing rail line Several landowners queried the planned operation of the existing rail line.		✔	All were advised this information could not be provided at this time, given the early stage of planning for the Inland Rail alignment.
	Adjacent infrastructure Many property owners located in the region had recent experiences with adjacent infrastructure projects, such as the Toowoomba Second Range Crossing, including with field studies undertaken as part of design for those projects and during construction activities. A number of negative comments were expressed relating to property impacts caused by access and construction activities.		✔	Comments were noted.
	Operational impacts Townships and communities such as Gatton and associated operational impacts such as noise, visual amenity, disruption to lifestyle, level crossing operations		✔	To be addressed in more detail during future environmental assessments

10.3. Community Information Sessions

Advertised community information and feedback sessions were held 20 to 23 June 2016. Direct mail invitations were distributed to landowners in a 500 metre radius to the corridor. The following are general issues raised:

- Lack of awareness about the location of the 2003 Gowrie to Grandchester protected corridor
- Concern from landowners located adjacent to the protected corridor about operational impacts
- Investment in their properties, such as building new infrastructure were now in doubt
- Interest in Inland Rail, when it will be constructed and in operation.
- Volume of freight traffic likely to be using the new line and potential impacts

- Flooding issues, particularly from residents in Forest Hill and Laidley.
- Opportunities for corridor modifications considering farmland operations, valley, flood plain, and access.
- Access for farmers, movement of stock and machinery across the rail corridor.
- Land acquisition and compensation processes.
- Opportunities for intermodal and freight interfaces within local communities.

10.4. Stakeholder Workshops

Stakeholder workshops were held in to identify key issues to be addressed during the environmental assessment process; opportunities to create additional value for the project and project stakeholders; and an initial indication of the potential social license and risks. Attendance at the Gatton workshop included Gehrke Grains and Transport, Lockyer Better Business, Lockyer Valley Growers, Lockyer Valley Regional Council, Lockyer Valley Water Users Forum, Nolan's Transport, Regional Development Authority - Ipswich and West Moreton, SEQ Catchments Limited, UQ – Gatton and Withcott Seedlings (known as Peak Bodies in Table 10-3). Key issues raised included:

- The alignment options under consideration, including Gatton Bypass (height for bypass, impacts on cropping land), Helidon deviation
- There were significant concerns raised in relation to the potential flooding impacts associated with the height of embankments through Forest Hill.
- Future operation of existing rail line - e.g. through Laidley
- Level crossings- impacts on local roads and delays for traffic – community severance. Laidley-Plainlands
- The likelihood of stations or terminals for freight being constructed in the Lockyer Valley as few benefits

Table 10-3 Summary of issues raised by peak bodies

STAKEHOLDER	ISSUES and OPPORTUNITIES	2015	2016	STATUS
Peak bodies	**Flooding impacts** Flood mitigation is a big issue, residents question whether there should be a levee around Forest Hill. Previous impacts in Laidley, Grantham and Helidon		✔	Flooding a key consideration of alignment refinement. Detailed modelling to be undertaken in future planning. Opportunity to use catchment groups flood modelling data.
	Environmental impacts Helidon Hills is an important environmental area for SEQ (rock wallabies)		✔	To be addressed in more detail during future environmental assessments.
	Supply chain benefits Interested in having loading facilities in the Lockyer and how this could work with		✔	Relevant stakeholders, such as trucking companies and growers consulted

	climate-controlled containers and need to identify the value-add for the area.			
	Connectivity to industrial and infrastructure developments Impact of loss of connectivity across Gatton and to the Warrego Highway		✔	More information to be provided on staging and timing when available.
	Operational impacts Townships and communities such as Gatton and associated operational impacts such as noise, visual amenity, disruption to lifestyle, level crossing operations		✔	To be addressed in more detail during future environmental assessments

10.5. Emerging Themes

Emerging themes and issues captured for Helidon to Calvert through Council sessions, peak body workshops, impacted landowners and the broader community are summarised in Table 10-4.

Table 10-4 Helidon to Calvert emerging issues

ISSUE THEMES	ISSUE DESCRIPTION
Flooding and hydrology	• Flooding in Forest Hill, Laidley and Grantham is a major concern and there needs to be significant engagement to understand localised water flows and historical issues that need to be considered. • There were significant concerns raised in relation to the potential flooding impacts associated with the height of embankments through Forest Hill. • Residents question whether there should be a levee around Forest Hill. • Long-standing concerns about contribution of rail infrastructure to flooding impacts • Significant doubts raised regarding the accuracy of records and the adequacy of design associated with Queensland Rail bridges and rail line through Forest Hill. Residents maintain that the infrastructure is inadequate for the flood conditions they experience at that it contributes to local flooding. • Questions raised regarding long term liability in the event that flood modelling and resulting design is inadequate
Alignment options	• Community was advised the scope of the concept assessment included consideration of potential refinement to the G2G protected corridor within a study area either side of the corridor. • There is a delicate balance in determining the optimum alignment through Gatton, either through the centre of Gatton or a bypass option that goes through prime agricultural land. • Other options were considered near Laidley and Grandchester to improve constructability and operational safety, address flooding issues, reduce project cost

ISSUE THEMES	ISSUE DESCRIPTION
	and address community impacts.
Road and rail interface	• Maintaining local road connectivity by minimising level crossings is a major challenge - examples include Laidley Plainlands Road (Laidley). • Emergency access for the town of Forest Hill is a key concern as the town's emergency vehicle access may be blocked in the event of a train breakdown. Residents expressed a preference for an emergency vehicle underpass to address this issue.
Future passenger services	• Strong interest in passenger services connecting Toowoomba with Rosewood, through townships including Helidon, Gatton and Laidley.
Land acquisition and compensation	• Mixed levels of awareness about the existence or location of the G2G corridor and landowners expressing varying degrees of financial and emotional stress as a result. • Questions around timing, process, valuations and extent of required land acquisition • Questions from landowners located in the G2G corridor, as well as landowners located adjacent to the corridor regarding opportunity for acquisition or compensation for impacts
Farming impacts	• Impacts to fertile and prime farming lands and property • Implications of property severance on farming activity • Access to farmers to move stock and machinery • Land acquisition and impacts to farm viability • Visual impacts and changes to the landscape and vista • Impacts on property values
Corridor identification, protection and preservation	• Questions were raised about why the G2G protected corridor was chosen over other options • Interest in the scope for variation from the protected corridor and the process for informing landowners that may be impacted but are not located in the G2G protected corridor, due to refinement options selected • Long timeframes since protection of the corridor, and until construction caused concerns from landowners about potential for resale or value of investing in the property • Strong dissatisfaction expressed with the change report process followed by Toowoomba Second Range Crossing to follow a different design and alignment than the one that community was consulted on. Community stakeholders believe they should be consulted on the final alignment and design.
Operation of existing line	• Interest in understanding the future operation of existing freight rail lines through the region including the size, number, frequency and schedule of train operations • Interest in understanding likely coal volumes and the approach to managing dust and air quality issues • Existing rail infrastructure in some areas, such as Laidley, was seen as contributing to flooding and ideally would be removed for that reason
Operational noise impacts	• Landowners were interested in the frequency, volume, size and speed of freight rail traffic on the new line and the associated operational noise impacts.

ISSUE THEMES	ISSUE DESCRIPTION
	• This was particularly relevant to existing townships where the proposed alignment goes directly through, e.g. Gatton.
Economic benefits	• Stakeholders in the project region would like to see economic opportunities and benefits beyond construction of the project, such as intermodals, decrease in freight costs for local products, opportunities for local road freight transport providers to take freight to intermodals. • Significant interest in connections to existing industrial areas and infrastructure, as well as optimising the project to provide supply chain value in the Lockyer Valley. - Support for local involvement of suppliers and source for material, accommodation camps etc. • The strong feedback that 'local' opportunities means opportunities for the towns within the project area, not only a nearby regional centre such as Toowoomba. • Views expressed that allowing space for the Queensland Government to develop future passenger services will greatly enhance the value of Inland Rail to the Lockyer Valley.

Further opportunities for formal and informal public consultation will be undertaken to support the delivery of approvals, and to capture relevant information for consideration in project design and assessments.

10.6. Aboriginal Parties

The Study Area crosses the Jagera people's Native Title Claim areas. ARTC commenced initial consultations with representatives from the Jagera People in mid and late 2016, to introduce the Helidon to Calvert Project and the study process, and further engagement is envisaged during subsequent project stages. ARTC will be responsible for the development of a Cultural Heritage Management Plan and Agreement with the Jagera people, in accordance with the *Aboriginal Cultural Heritage Act 2003*.

11. REFERENCE AND DATA SOURCES

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12. GLOSSARY, ACRONYMS AND ABBREVIATIONS

TERM	DESCRIPTION
µg/m^3	Micrograms per cubic meter of air
A	Australia
ACHA	Aboriginal Cultural Heritage Act 2003
AEP	*Annual Exceedance Probability*
AHD	Australian Height Datum
ARTC	Australian Rail Track Corporation
AUD	Australian Dollar
CEMP	Construction Environmental Management Plan
CLR	Contaminated Land Register
CO	Carbon Monoxide
DAF	*Department of Agriculture and Fisheries*
DATSIP	Department of Aboriginal Torres Strait Islander Partnerships
dB(A)	A-weighted decibel
DEHP	Department of Environment and Heritage Protection
DILGP	Department of Infrastructure, Local Government and Planning
DNRM	Department of Natural Resources and Mines
DotEE	Department of the Environment and Energy
DSITIA	Department of Science, Information Technology, Innovation and the Arts
DTMR	Department of Transport and Main Roads

TERM	DESCRIPTION
E	Endangered
EIS	Environmental Impact Statement
EMR	Environment Management Register
EP Regulation	Environmental Protection Regulation 2008
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERA	Environmentally Relevant Activity
EVNT	Endangered, Vulnerable and Near Threatened
g Co_2/tonne-km	Grams of Carbon Dioxide per transport of one tonne over one kilometre
GAB	Great Artesian Basin
GBN	Groundborne Noise
GDE	*Groundwater Dependant Ecosystems*
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IAR	Impact Assessment Report
IAS	Initial Advice Statement
IRAS	Inland Rail Alignment Study
ISCA	Infrastructure Sustainability Council of Australia
km	kilometres
KRA	Key Resource Area
KSAT	Koala Spot Assessment Tool

TERM	DESCRIPTION
LAeq	A-weighted equivalent sound level
LAmax	Maximum Noise Level
LeastC	Least Concern
m	metres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NA	Not Applicable
NC	Not of Concern
NC Act	Nature Conservation Act 1992
NEPM	National Environmental Protection Measure
NO2	Nitrogen Dioxide
NRM	*Natural Resource Management*
NSW	New South Wales
NT	Near Threatened
OC	Of concern
PLA	Priority Living Areas
PM10	Particulate Matter less than 10 microns
PM2.5	Particulate Matter less than 2.5 microns
PMF	Probable Maximum Flood
PMST	Protected Matters Search Tool
Q	Queensland
QLD	Queensland

TERM	DESCRIPTION
QR	Queensland Rail
QT	Queensland Transport
REs	Regional Ecosystems
RLRPA	Regional Landscape and Rural Production Area
RRMA	Rural, Remote and Metropolitan Areas
SCA	Strategic Cropping Areas
SDAP	State Development Assessment Provisions
SDPWO Act	State Development and Public Works Organisation Act 1971
SEA	Strategic Environmental Areas
SEQ	Southeast Queensland
SL	Special Least Concern
SMP	Species Management Program
SP Regulation	*Sustainable Planning Regulation 2009*
SPA	Sustainable Planning Act 2009
SPP	State Planning Policy
TECs	Threatened Ecological Communities
TIA	Transport Infrastructure Act 1994
TPC Act	Transport Planning and Coordination Act 1994
TRC	Toowoomba Regional Council
TSP	Total Suspended Particulates
TSRC	Toowoomba Second Range Crossing motorway

TERM	DESCRIPTION
UXO	Unexploded Ordnance
V	Vulnerable
VIC	Victoria
VM Act	Vegetation Management Act 1999
WEBs	*Wider Economic Benefits*

APPENDIX A – PREFERRED ALIGNMENT TENURE

Lot/Plan	Zone Category	LGA	Suburb
251SP130171	Special Use Zone	IPSWICH	CALVERT
261SP130172	Special Use Zone	IPSWICH	CALVERT
251SP130171	Special Use Zone	IPSWICH	CALVERT
92CH31279	Rural	IPSWICH	GRANDCHESTER
86CH31279	Rural	IPSWICH	GRANDCHESTER
272CH31129	Rural	IPSWICH	GRANDCHESTER
272CH31129	Rural	IPSWICH	GRANDCHESTER
215CH31279	Rural	IPSWICH	GRANDCHESTER
215CH31279	Rural	IPSWICH	GRANDCHESTER
281SP130175	Special Use Zone	IPSWICH	GRANDCHESTER
80SP156728	Rural	IPSWICH	GRANDCHESTER
8CC3515	Rural	IPSWICH	GRANDCHESTER
250CC3515	Rural	IPSWICH	GRANDCHESTER
20CC3471	Rural	IPSWICH	GRANDCHESTER
19SP161916	Special Use Zone	IPSWICH	GRANDCHESTER
22CC3471	Rural	IPSWICH	GRANDCHESTER
30CC3471	Rural	IPSWICH	GRANDCHESTER
31CC3471	Rural	IPSWICH	GRANDCHESTER
217CC3466	Rural	IPSWICH	GRANDCHESTER
281SP130175	Special Use Zone	IPSWICH	GRANDCHESTER
205SP136979	Special Use Zone	IPSWICH	GRANDCHESTER
39CC3471	Rural	IPSWICH	GRANDCHESTER
44CC3471	Rural	IPSWICH	GRANDCHESTER
38CC3471	Rural	IPSWICH	GRANDCHESTER
272CH31129	Rural	IPSWICH	GRANDCHESTER
272CH31129	Rural	IPSWICH	GRANDCHESTER
98CH31284	Rural	IPSWICH	GRANDCHESTER
281SP130175	Special Use Zone	IPSWICH	LAIDLEY
352SP122026	Community Facilities	LOCKYER VALLEY	LAWES
362SP117133	Community Facilities	LOCKYER VALLEY	LAWES
2RP189445	Rural	LOCKYER VALLEY	GRANTHAM
1RP172842	Rural	LOCKYER VALLEY	GRANTHAM
3RP178224	Rural	LOCKYER VALLEY	GRANTHAM
1RP175514	Rural	LOCKYER VALLEY	GRANTHAM
2RP175537	Rural	LOCKYER VALLEY	GRANTHAM
1RP175535	Rural	LOCKYER VALLEY	GRANTHAM
1RP175534	Rural	LOCKYER VALLEY	GRANTHAM
1RP175538	Rural	LOCKYER VALLEY	GRANTHAM
2RP180489	Rural	LOCKYER VALLEY	GRANTHAM
117CA3121	Rural	LOCKYER VALLEY	GRANTHAM
281SP130175	Community Facilities	LOCKYER VALLEY	GRANDCHESTER
281SP130175	Community Facilities	LOCKYER VALLEY	GRANDCHESTER
22SP131010	Community Facilities	LOCKYER VALLEY	FOREST HILL
351SP122026	Community Facilities	LOCKYER VALLEY	FOREST HILL
352SP122026	Community Facilities	LOCKYER VALLEY	FOREST HILL
341SP122025	Community Facilities	LOCKYER VALLEY	FOREST HILL
341SP122025	Community Facilities	LOCKYER VALLEY	FOREST HILL
391SP117135	Community Facilities	LOCKYER VALLEY	GATTON
382SP117134	Community Facilities	LOCKYER VALLEY	GATTON

362SP117133	Community Facilities	LOCKYER VALLEY	GATTON
362SP117133	Community Facilities	LOCKYER VALLEY	GATTON
259AP6856	Rural	LOCKYER VALLEY	GATTON
362SP117133	Community Facilities	LOCKYER VALLEY	GATTON
381SP121744	Community Facilities	LOCKYER VALLEY	GATTON
386SP121744	Community Facilities	LOCKYER VALLEY	GATTON
361SP117133	Community Facilities	LOCKYER VALLEY	GATTON
2CSH2396	Rural	LOCKYER VALLEY	HELIDON
1RP196611	Rural	LOCKYER VALLEY	HELIDON
1RP180055	Rural	LOCKYER VALLEY	HELIDON
452SP117138	Community Facilities	LOCKYER VALLEY	HELIDON
4RP182760	Rural	LOCKYER VALLEY	HELIDON
75CA31495	Rural	LOCKYER VALLEY	HELIDON
11RP805706	Rural	LOCKYER VALLEY	HELIDON
10RP811728	Rural	LOCKYER VALLEY	HELIDON
11RP843414	Rural	LOCKYER VALLEY	HELIDON
82RP843414	Rural	LOCKYER VALLEY	HELIDON
9RP805706	Rural	LOCKYER VALLEY	HELIDON
10RP805706	Rural	LOCKYER VALLEY	HELIDON
164CH3161	Rural	LOCKYER VALLEY	LAIDLEY NORTH
165CH3161	Rural	LOCKYER VALLEY	LAIDLEY NORTH
1RP25635	Rural	LOCKYER VALLEY	LAIDLEY NORTH
334SP122024	Community Facilities	LOCKYER VALLEY	LAIDLEY NORTH
3RP206321	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP206321	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP209381	Rural	LOCKYER VALLEY	LAIDLEY NORTH
1RP188490	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP188490	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP25657	Rural	LOCKYER VALLEY	LAIDLEY NORTH
261CH311056	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP25655	Rural	LOCKYER VALLEY	LAIDLEY NORTH
2RP25669	Rural	LOCKYER VALLEY	LAIDLEY NORTH
5RP25670	Rural	LOCKYER VALLEY	LAIDLEY NORTH
12RP170604	Rural	LOCKYER VALLEY	LAIDLEY
1CC3348	Rural	LOCKYER VALLEY	LAIDLEY
301SP122021	Rural	LOCKYER VALLEY	LAIDLEY
57RP155052	Rural	LOCKYER VALLEY	LAIDLEY
7RP170601	Rural	LOCKYER VALLEY	LAIDLEY
58RP155052	Rural	LOCKYER VALLEY	LAIDLEY
6RP802591	Rural	LOCKYER VALLEY	LAIDLEY
72SP156727	Rural	LOCKYER VALLEY	LAIDLEY
301SP122021	Community Facilities	LOCKYER VALLEY	LAIDLEY
2RP22836	Rural	LOCKYER VALLEY	SUMMERHOLM