BOYNE BURNETT INLAND

RAIL TRAIL

Concept Design Report

Boyne Burnett Inland Rail Trail

FOR

Gladstone Regional Council

BY

JFP Urban Consultants Pty Ltd

Issue F – 23.2.2022

Table of Contents

1.0 INTRODUCTION 3

2.0 SUPPORTING INFORMATION 3

2.1 TOPOGRAPHIC SURVEY 3

2.2 GEOTECHNICAL ASSESSMENT 3

2.3 STRUCTURAL ASSESSMENT 4

3.0 SAFETY 4

4.0 TRAIL ELEMENTS 7

4.1 SIGNAGE, FURNITURE & HARDWARE 7

4.2 TRAIL HEADS 7

4.3 TRAIL SURFACE 8

4.4 BRIDGES 12

4.4.1 Bridge condition summary - Taragoola to Ubobo – Section A1 13

4.4.2 Bridge condition summary - Builyan to Kalpowar – Section A2 16

4.4.3 Bridge condition summary - Mundubbera to Gayndah – Section A3 21

4.5 TUNNELS 26

4.6 ROAD CROSSINGS 26

5.0 COST OPTIONS 28

6.0 STAGING 30

7.0 OPTIONS, RISKS & OPPORTUNITIES 31

8.0 FUNCTIONAL DESIGN BRIEF 40

9.0 REFERENCE MATERIAL 43

10.0 APPENDICES 44

10.1 APPENDIX A – Typical Trail Surface Treatments 44

10.2 APPENDIX B – Safety In Design Registers 45

10.3 APPENDIX C – Staging Plans 46

10.4 APPENDIX D – Geo-technical Assessment 47

10.5 APPENDIX E – Structural Assessment 48

10.6 APPENDIX F – Cost Options 49

10.7 APPENDIX G – Concept Design Drawings 50

10.8 APPENDIX H – Project Masterplan 50

1.0 INTRODUCTION

Gladstone Regional Council has engaged JFP to prepare a Concept Design Report for the Boyne Burnett Inland Rail Trail project. It will look at various design considerations to explore options to convert the unused rail corridor into a safe, manageable and attractive recreation facility for walkers, cyclists and horse riders.

To assist with the exploration of design considerations, JFP assisted Gladstone Regional Council to undertake a community engagement and consultation process in which a survey was put forward to the general public and key stakeholders such as the G.A.W.B, B.B.I.R.T inc. and North Burnett Regional Council. A draft masterplan was produced by JFP to be used as communication tool for the community consultation process. The masterplan was made available to the public for comment between 19th July to 15th August 2021,both on the Gladstone Regional Council website, as well as at various local events and pop up stalls.

This report looks at various design considerations to provide a concept design for the implementation of the trail and identifies further design work needed to facilitate bringing the trail online. It deals primarily with the physical attributes of the trail; there are many behavioural, operational and management aspects of the trail outside the scope of this report that will need to be addressed by the future detailed design exercise and, more so, the future Trail Management Body.

This report is intended to be read in conjunction with the Boyne Burnett Inland Rail Trail Feasibility Study by Mike Halliburton Associates & Transplan, dated March 2019, which provides further background to the project.

2.0 SUPPORTING INFORMATION

2.1 TOPOGRAPHIC SURVEY

The project required topographical contour information to be sourced for the extent of the three sections of trail. Where available, State Government created LIDAR topographic data has been collated; these were available for:

- Approximately 50% of the Taragoola to Ubobo Section.
- Approximately 40% of the Builyan to Kalpowar Section.
- 100% of the Gayndah to Mundubbera Section.

The data has been digitised as 200mm contours in AutoCAD format.

Where State Government LIDAR was not available, JFP have undertaken new LIDAR survey with a drone-based survey platform. The additional survey has produced a point cloud of spatial and photographic imagery for the newly surveyed sections. This new data has been digitised as 200mm contours in AutoCAD format for the use of the concept design exercise. All data is to be provided to Council in digital format.

2.2 GEOTECHNICAL ASSESSMENT

Butler Partners have undertaken a preliminary geotechnical assessment, with the aim of identifying potential geotechnical hazards and risks on each trail. The results of the assessment were collated into three reports that

provide discussion on the following:

- observed site conditions;
- identification of geotechnical hazards and preliminary structure condition;
- proposed rectification/remediation solutions if relevant; and
- any other notable findings or recommendations, including recommendations for additional investigation, etc.

The inspection focused primarily on geotechnical aspects of the bridge structures and tunnels and looked at areas of erosion, landslip, and rockfall, mainly through rock cuttings. The project designers can review the condition analysis to find the most appropriate and cost-effective ways to deal with the issues presented and explore alternative outcomes.

It is noted that this assessment is preliminary only. Further detailed analysis and reporting is required to inform detailed design and remediation to ensure accurate analysis of risk and risk reduction measures.

Refer to **Appendix D** for the full Geotechnical Assessment.

2.3 STRUCTURAL ASSESSMENT

A preliminary structural assessment was undertaken to assess the current condition of the tunnel and bridge infrastructure found on the proposed rail trail. These initial condition assessments were used to identify potential structures which could be recycled and integrated into the proposed rail trail.

The scope of the assessment is as follows:

- Observation of current condition
- Identifying structural rectification works
- Identifying major structural damage and estimation of replacement if applicable
- Comment on the overall feasibility of each structure
- Further recommendations on monitoring and further investigation work

All comments are based on a visual inspection only as testing of members does not form part of this investigation. Judgment of structural integrity is based solely on visual inspection until further destructive testing is carried out. These assessments will inform the detailed design of the practicalities and risks of repairing each structure and give guidance as to further design and assessment.

Refer to **Appendix E** for the full Structural Assessment

3.0 SAFETY

Design risk matrices have been prepared for each of the trails to assess the safety risks associated with the use of the trail. The matrices identify the key hazards and offer solutions to reduce them to an acceptable level of risk. These hazards are based on data available at this, the Concept Design stage, and should be re-assessed when

more information become available through the preliminarily and detail design stages. This will ensure a high-quality public recreation asset that is safe for trail users, adjoining land holders and the general public.

Within the physical elements of the trail, the most critical risks that were identified in the concept design process were as follows:

- **Road Crossings**
  There are several road crossings present on each of the trails in a variety of different circumstances. Many of these crossings are across unsealed, 100km/hr roads, so the potential for a collision to be catastrophic is increased. Therefore, careful consideration needs to be given to the trail's design, operation, and management to ensure these road crossings are made as safe as possible.

- **Falling from heights**
  There is a serious risk of falling from heights at many different locations throughout the trail, in particular around bridge abutments and through the various locations of rock cuttings and earth embankments along each of the trail sections. Therefore, a balance needs to be struck between the competing interests of the trail in that:
    - Trails should be fundamentally safe to use, however, some element of risk (perceived or real) is a desirable aspect of trail riding.
    - It is impractical and prohibitively expensive to physically balustrade every single fall risk on the trail.
    - Excessive amounts of balustrading will detract from the visual amenity of the trail.

  Careful consideration needs to be given to the trail's design, operation, and management to ensure that falling from height risks are managed in a way that achieves these balances.

- **Rock fall or land slip**
  In the rock cuttings, particular through the tunnel section of the trail there are many instances where there is a potential risk of rock fall or land slip causing serious injury. The geotechnical assessment highlights some preliminary findings that support this being an item of risk and recommends further assessment and remediation of potential risk areas prior to the public use of the trail. The future design and the operational management of the trail must consider these risks.

Some other risks that were highlighted however aren't able to be adequately resolved by this report are as follows:

- Bushfire
- Biosecurity
- Interactions with farm and wild animals
- Flooding
- Remoteness

These issues require further detailed design, as well as operational and management input to be resolved or mitigated appropriately. These will need to be considered by the future detailed design consultant and by the Trail Management Body.

4.0 TRAIL ELEMENTS

4.1 SIGNAGE, FURNITURE & HARDWARE

Signage

Some of the old trail distance markers are still in place, in good condition and provide historical context. For the Taragoola to Ubobo and Builyan to Kalpowar sections, these markers count down the distance to Gladstone Station. For the Mundubbera to Gayndah section, it counts down the distance to Monto Station. It is proposed to reinstate these markers where they are missing and repair damaged ones and reuse the old chainages as a navigation tool on the trail and trail maps.

The existing distance markers can be supplemented with new distance markers that give more specific distance information, e.g. "5km to Barrimoon Siding", "1km to Four Mile Creek Bridge", and localised directional information, e.g.: "Stay Left".

As most users will start their journey at a trail head, code of conduct signage is to be provided at trail heads only at this stage. The future Trail Management Body may wish to consider installing more of this signage at road crossings or other places where users may access the trail, intended or not, to ensure that all users are aware of conduct requirements.

All road signs must be designed in accordance with the relevant design codes and manufactured from steel. This signage will need to be inspected and maintained regularly to ensure it is structurally sound and oriented correctly to serve its intended purpose.

Interpretive signage should be mounted on robust materials and be made so that they are visually appealing and in keeping with the visual character of the trail. Timber would be appropriate for this signage if built with careful detailing and maintained long term.

Furniture

Furniture is proposed to be made from steel framing, with timber or lookalike products to make up the slatting and tactile surfaces.

Hardware

Fencing is typically proposed to be post and wire cattle style fencing, with black painted star pickets or steel SHS posts in high use areas such as near grid and gates. This style of fencing is easy to maintain, cost efficient and suits the surrounding fencing character.

Cattle grids, gates, and horse yards are proposed to be constructed from galvanised steel for robustness and longevity. These could be powder coated or painted brown to give a timber look to maintain the trail's character.

4.2 TRAIL HEADS

A series of trail heads are proposed along the trail; these are predominantly proposed to be located within existing rail sidings, however in a few instances are on existing non-rail related recreational assets e.g. Futter

Creek Camping Reserve and Boynedale Bushcamp. Trail heads act as nodal points along the trail, as a start or finishing point, or a transition point on a more extensive journey. In addition, they may provide amenities to trail users such as:

- Carparking
- Access to drop off people and equipment such as bikes, horses, backpacks
- Camping
- Shade and seating
- Interpretive and authoritative signage
- Picnic and food preparation facilities
- Drinking and horse water
- Bike racks and horse yards

Where trail heads are proposed on sidings, it is proposed to install a contemporary shade structure that celebrates the distinct visual characteristics of heritage Queensland rail station buildings.
Having these structures repeated throughout creates a visual style that is distinct to the BBIRT and uniquely identifies it to visitors. This structure can provide shade, cooking and picnic facilities, non-potable water, lighting and other amenities. These structures should be detail designed, constructed of steel or similar robust materials to minimise maintenance requirements for the Trail Management Body. Timber is encouraged to be used to add to the character of the structures and trail, however it is recommended that it only be used decoratively and not as structural components.

Due to the remoteness of the proposed toilet locations, they will need to be composting, have water capture and storage, and photovoltaic lighting to be as self-sufficient as possible and minimise maintenance activities and ongoing costs. The relevant Trail Management Body will need to consider whether installing toilets is appropriate and the ongoing maintenance and management associated with owning and operating them. Appropriate assessments and designs will be required to ensure compliance with the relevant environmental and other statutory authority guidelines.

Car parking should be built from compacted gravel and formalised with bollards to ensure longevity and encourage good parking behaviour.

4.3 TRAIL SURFACE

The surface of a rail trail is a critical component of its success. A successful surface should exhibit the following properties:

- **Be fit for purpose**
  The surface needs to cater appropriately to all users. In this instance, it needs to suit walkers, cyclists and horse riders. Generally speaking, fine graded crushed stone is considered the most appropriate surface to cater to walkers, cyclists and horse riders without providing separate surfaces for each user type.

- **Be robust**
  The surface needs to be resistant to wear from use and damage and wear from natural processes such as wind and rain.

- **Be easy to maintain**
  The surface should require little maintenance and should be easy and low cost to repair.

- **It should complement the character of the trail**
  The aesthetics of the trail surface should not be at odds with its surroundings and should enhance the user experience.

Surface Condition

The existing trail surface through each of the three sections is predominantly in good condition in terms of scouring and erosion and is generally considered to be an appropriate trail surface for all three user types. Where the trail is not fit for purpose, it typically exhibits the following issues:

- Vegetation growing through the trail surface.
- Larger loose rocks > 20mm and detritus on the track making it hard to walk, cycle or ride on.
- Scour or erosion where uncontrolled surface water is running over the track.
- Soil, silt or fine aggregate size forming the track's surface, resulting in it being more susceptible to particle movement, erosion or muddy and slippery conditions when wet.
- Large aggregate size or ballast still in place, making the trail hard to walk, cycle or ride on.
- No track surface present. There are a few instances where the track surface has been removed or covered over completely, or the trail needs to be bypassed, such as around bridge crossings.

Detailed gravel pavement designs are subject to a future detailed design exercise, and it is recommended that in-situ subgrade testing be done to confirm these designs.

Where required, the track could be treated with one of the following typical treatments:

Trail Surface Treatment Type 1

It is recommended that Treatment Type 1 be the minimum treatment level for the entire trail. It assumes the trail surface is in good condition already.

This treatment involves:

- Mechanical removal of surface vegetation.
- Spraying out vegetation to stop it from growing back through the trail surface.
- Grading the surface to remove large rocks and detritus.
- Lightly rolling the surface to compact the existing gravel profile.

It is recommended that this treatment be carried out further as a maintenance process to the entire trail at required intervals. This will ensure the longevity of the trail and highlight any potential problem areas that arise.

Trail Surface Treatment Type 2

Treatment Type 2 is recommended to be used where the following issues arise:
Very heavy surface vegetation.

- Minor scour or erosion on the trail surface.
- Shallow, slightly oversized aggregate (~5-10mm) making up the trail surface.
- Shallow, finer material making up the trail surface.
- Where there is no trail surface present, however there is a robust, compact sub-grade in place.

This treatment involves:

- Mechanical removal of surface vegetation.
- Spraying out vegetation to stop it from growing back through the trail surface.
- Grading the surface to remove large rocks and detritus.
- Lightly rolling the surface to compact the existing gravel profile.
- Add 100mm depth of locally sourced, fine graded crushed stone to the surface, it would be ideal for the colour or type of stone to match what is existing to achieve the least impact on the visual amenity of the trail.
- Trim, shape and compact.

Trail Surface Treatment Type 3

Treatment Type 3 is recommended to be used where the following issues arise:
Very heavy vegetation on the surface.

- Major scour or erosion on the trail surface.
- Deep, very oversized aggregate (<10mm) or ballast making up the trail surface.
- Deep, large amounts of finer material making up the trail surface or soil over the surface.
- Where there is no trail surface present and the existing sub-grade is poor.

This treatment involves:

- Mechanical removal of surface vegetation.
- Spraying out vegetation to stop it from growing back through the trail surface.
- Grading the surface to remove large rocks and detritus, OR, grade and remove oversized aggregates or ballast off-site. Lightly rolling the surface to compact the resultant gravel profile.
- Add 200mm depth of locally sourced crushed stone to the surface, 100mm of finely graded stone, over 100mm of coarsely graded stone. It would be ideal for the colour or type of stone to match what is existing to achieve the least impact on the visual amenity of the trail.
- Trim, shape and compact.

Trail Surface Treatment Type 4

This level of treatment is thought to impact the character of being in a mostly natural landscape and is expensive to install, maintain, and repair. It is envisaged this treatment might be used in the future where particular problem areas are identified. As this treatment is not appropriate for use by horse riders, it is proposed that a 1m wide bridle trail be constructed as part of this treatment.

Treatment Type 4 is recommended to be used where the following issues arise:

- Continuous heavy wear on surface.
- Around heavy use areas such as sidings.
- Reoccurring very heavy vegetation on the surface despite removal.
- Very poor subgrade.

This treatment involves:

- Mechanical removal of surface vegetation to 3.5m width.
- Spraying out vegetation to stop it from growing back through the trail surface to 3.5m width.
- Grading the surface to remove large rocks and detritus to 3.5m width.
- Lightly rolling the surface to compact the existing gravel profile to 3.5m width.
- Add 200mm depth of locally sourced gravels to the surface, 3.5m wide followed by a 100mm deep layer, of finer gravels.
- A bridle trail is to be created by sealing only 2.5m of the completed surface by using a two coated **"seal"** and leaving a 1.0m wide strip unsealed.
- As the cost of this treatment could be substantial, the detail design of this treatment type is to be undertaken by a suitably qualified pavement professional to ensure value for money and an achievable design life.

4.4 BRIDGES

There are many bridges through the trail for which there is a community desire to retain, for both trail use and for historical preservation. Bridges are very much an attractor for rail trails as they are iconic and encapsulate the heritage and character of rail corridors. Repairing and converting these so that trail users can ride across as many bridges as possible further enhances the experience of the trail and will attract more users. Reusing heritage elements for a purpose similar to their original purpose (i.e. travel), enhances the heritage preservation and the user experience. Utilising the bridges will promote more frequent use of the trail, especially during periods of rain as it resolves the issue of traversing creeks and gullies when they are flowing.

Repairs and conversions to bridges to improve safety for trail users represent one of the largest single cost items associated with the rollout of a rail trail. With this in mind, bridge repairs and conversions will need to be prioritised based on their importance and the ease and cost of repair.

As a minimum, it is proposed that all bridges be retained and undergo basic maintenance and monitoring to ensure they can be preserved and don't pose any safety concerns to trail users or others. All bridges will require some intervention, whether maintenance for preservation or work to convert it for trail use.

Many of the bridges have suitable alternative routes already that require little or no work to make useable. This is, however, dry weather only option. Many of these bridges would be considered a lower priority to repair and could be considered for repair or conversation in future, for either conservation or trail use.

Several bridges have poor or no suitable alternative routes. These bridges should be prioritised for conversion, which will attract more users, provide better continuity, and better overall trail experience.

Many bridges are very damaged and will require costly repairs to be safe to traverse. These will need to be assessed carefully to ensure that project funds are being used as efficiently as possible.

It is proposed to install a lightweight, modular steel and aluminium board and handrail system to allow people to traverse the bridges safely. It is recommended that cyclists and horse riders dismount when crossing the bridges. It is recommended at a minimum to install balustrade and handrail height to a minimum height of 1.3m to be in keeping with the Bridge Design Australian Standard and Austroad guidelines. This will ensure cyclists are safe if they do not follow the instruction to dismount. Further assessment will be required to assess horse rider safety if they do not dismount to cross bridges.

It is further recommended to remove all of the timber sleepers on converted bridges. These sleepers represent a very high proportion of damaged or failed elements on all bridges, and the connection they have with their supporting girders also represented a consistent point of damage or failure. Replacing them would constitute a significant cost and create an ongoing maintenance burden for the trail.

Timber sleepers in general, particularly on bridges, are an iconic part of the visual character of a rail trail. The fact there are very few sleepers remaining on the trail, makes them highly desirable to keep, however it is proposed that this desirable outcome is outweighed by the need to keep maintenance costs and labour down. It is recommended that sleepers be kept on bridges that are not considered for repairs to keep as much of this character as possible.

Where conversion is to occur, fencing and a trail grid and gate is proposed at either end. This assists in isolating livestock from wandering onto bridges and acts as a point of dismount for cyclists and horse riders. Safety signage warning users to dismount will be provided at either end. It is proposed to have interpretive signage to highlight the history and intricacies of each individual bridge. It is further proposed to extend the balustrading from the bridge another 6-8m past the bridge abutments to ensure that any fall from height issues associated with the steepness of the embankments around bridge abutments are addressed. As alterations to any existing structures might alter the inherit structural integrity of these structures, it will be essential that detailed designs be undertaken by structural professionals to ensure safety and stability throughout the design life of these structures.

A summary of the bridges condition and its constraints for repair or alternative routes around them are as follows. Refer to Appendix D: Geotechnical Assessment and Appendix E : Structural Assessment for more detailed information.

4.4.1 Bridge condition summary - Taragoola to Ubobo – Section A1

Un-named Bridge
Approx. length: 26m
Approx. height: 5m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This short timber bridge crosses an unnamed gully line and is currently unpassable, in a state of disrepair. The upper structure is in reasonable condition however needs several components replaced. In addition, there is significant scour around some of the bridge piers, and the southern bridge abutment needs repair. Further investigation into the extent of rot damage is required to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the west of the bridge, through the invert of the gully the bridge crosses. Minor earthworks, trail surface upgrades and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the gully is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Portentia Creek Bridge
Approx. length: 75m
Approx. height: 7m
Effort of repair and conversion: Very Low
Effort of building alternative route: High
Priority to repair and convert: High

Condition: This steel and concrete bridge are relatively new (approximately 30 years old) and are in good condition. It crosses over the mouth of Portentia Creek, where it meets Awoonga Dam. It only needs minor repair and maintenance work to the structure and foundations and appropriate balustrading installation to be made suitable for traversing by trail users.

Alternative route: The alternative route to crossing this bridge is convoluted and would take trail users back to travel on Gladstone Monto Road, which has safety concerns and impacts the connectivity of the trail.

Recommendation: It is recommended this bridge be repaired and converted for trail use as a priority.

Marble Creek Bridge
Approx. length: 75m
Approx. height: 3m
Effort of repair and conversion: High
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: Marble Creek Bridge is a timber bridge that spans Marble Creek. It is currently unpassable and in need of extensive repair works to its upper structure. In addition, it has significant fire damage to the northern end and minor erosion and scour around the bridge piers.

Alternative route: There is currently a dry weather route to the west of the bridge, through invert Marble Creek. Minor earthworks, trail surface upgrades and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the gully is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Oaky Creek Bridge
Approx. length: 48m
Approx. height: 5m
Effort of repair and conversion: High
Effort of building alternative route: Medium
Priority to repair and convert: Medium

Condition: This timber bridge spans Oakey Creek. It is in an advanced state of disrepair with multiple issues with its upper structure, including a missing span. In addition, it has minor erosion and scour around the bridge piers.

Alternative route: This bridge needs further assessment and design to provide a dry weather alternative route which will be challenging to create given the steepness of localised terrain.

Recommendation: Pending further investigation, it is recommended this bridge be repaired and converted for trail use given the difficulty of creating an alternative route.

Four Mile Creek Bridge

Approx. length: 76m
Approx. height: 3m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This bridge timber bridge spans Four Mile Creek. It is in a state of disrepair with multiple issues in the upper structure and some components potentially requiring replacement. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the west of the bridge, through the invert of the Four Mile Creek. Minor earthworks, trail surface upgrades and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

De Galgil Creek Bridge
Approx. length: 112m
Approx. height: 7m
Effort of repair and conversion: High
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This timber and concrete bridge spans De Galgil Creek. It has extensive damage with many components of the upper structure needing replacement, and extensive scour and repair work required to the foundations. In addition, further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the west of the bridge, passing underneath it through the invert of the creek. Minor earthworks, trail surface upgrades, fencing, and signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is not recommended to repair and convert this bridge for trail use. Repair and maintenance work is required to protect the bridge for preservation purposes.

Railway Terrace Bridge
Approx. length: 51m
Approx. height: 3m
Effort of repair and conversion: Medium
Effort of building alternative route: Medium
Priority to repair and convert: High

Condition: This timber bridge spans a localised gully just south of Nagoorin township. It is in a state of disrepair and needs some components replaced. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: The alternate route is not ideal and requires users to travel along Gladstone Monto Road or through the gully to the west.

Recommendation: It is recommended this bridge be repaired and converted for trail use as a priority.

4.4.2 Bridge condition summary - Builyan to Kalpowar – Section A2

Deception Creek Bridge 2
Approx. length: 61m
Approx. height: 8m
Effort of repair and conversion: High
Effort of building alternative route: Low
Priority to repair and convert: Medium

Condition**:** This timber bridge spans Deception Creek within the Many Peaks township. It has significant damage with many components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative route around these two bridges along 'The Terrace' loop road. Minor earthworks, trail surface upgrades, fencing and some signage, are required to make this alternative a viable long-term solution.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Deception Creek Bridge 3
Approx. length: 52m
Approx. height: 10m
Effort of repair and conversion: High
Effort of building alternative route: Low
Priority to repair and convert: Medium

Condition**:** This curved timber bridge spans Deception Creek on the edge of Many Peaks township. It has significant damage, with many components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative route around these two bridges along 'The Terrace' loop road. Minor earthworks, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Glassford Creek Bridge 1
Approx. length: 36m
Approx. height: 8m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition**:** This curved timber bridge spans Glassford Creek. It has damage, with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently a dry weather route to the south of the bridge through the invert of Glassford Creek. Minor earthworks, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Coppermine Creek Bridge
Approx. length: 78m
Approx. height: 6m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This timber bridge spans Coppermine Creek. It has damage, with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently a dry weather route to the east of the bridge through the invert of Coppermine Creek. Minor earthworks, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Boggy Creek Bridge
Approx. length: 44m
Approx. height: 8m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This timber bridge spans Boggy Creek. It has some damage, with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the west of the bridge, passing underneath it through the invert of the creek. Minor earthworks, trail surface upgrades, fencing, and signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Glassford Creek Bridge 2
Approx. length: 125m
Approx. height: 10m
Effort of repair and conversion: Low
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This long steel and concrete bridge spans Glassford Creek. Its upper structure is in an acceptable condition and needs minor repair and maintenance works to be suitable for conversion. It has some scour and undermining of its foundations that need further investigation to determine rectification required.

Alternative route: There is currently a dry weather route to the west of the bridge through the creek invert. Minor earthworks, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Dawes Range Bridge 1
Approx. length: 50m
Approx. height: 8m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This timber bridge spans a localised gully. It is mostly in good condition, with some damage with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently a dry weather route to the east of the bridge through the creek invert. Minor earthworks, trail surface upgrades, fencing, and signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Dawes Range Bridge 2
Approx. length: 35m
Approx. height: 8m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This short timber bridge spans a localised gully. It has some damage, with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the east of the bridge, through the creek invert. Minor earthworks, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Cabbage Tree Creek Bridge
Approx. length: 52m
Approx. height: 8m
Effort of repair and conversion: Low
Effort of building alternative route: High
Priority to repair and convert: High

Condition: This is a steel and concrete bridge immediately north of the township of Kalpowar, spanning over Gladstone Monto Road and Cabbage Tree Creek. It is in an acceptable condition, and the upper structure requires little work to be suitable for conversion. However, it has some scour and erosion around its foundations that needs further assessment to ascertain its soundness fully.

Alternative route: The alternative route to crossing this bridge would require leaving the trail ~5km north at Barrimoon and travelling along local roads and Gladstone Monto road, which has safety concerns and impacts the connectivity of the trail.

Recommendation: It is recommended this bridge be repaired and converted for trail use as a priority.

4.4.3 Bridge condition summary - Mundubbera to Gayndah – Section A3

Red Gully Bridge
Approx. length: 55m
Approx. height: 5m
Effort of repair and conversion: Medium
Effort of building alternative route: High
Priority to repair and convert: High

Condition: This timber bridge spans over Stuart Russell Street. It is in a state of disrepair with multiple issues in the upper structure and some components potentially requiring replacement. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: The alternate route around the bridge would require trail users to ride along local roads, which makes repairing and upgrading this bridge a priority to give continuity to the trail and a seamless journey out of or into Mundubbera.

Recommendation: It is recommended this bridge be repaired and converted for trail use as a priority.

Philpott Creek Bridge
Approx. length: 75m
Approx. height: 20m
Effort of repair and conversion: Medium
Effort of building alternative route: High
Priority to repair and convert: High

Condition: Philpott Creek Bridge is a longer timber, steel and concrete bridge approximately 20m high over Philpott Creek. It is currently unpassable and needs extensive investigation and repair work to be safely traversable. There is significant erosion and scouring to the eastern abutment and creek bank and undermining of 3 eastern bridge piers, likely caused by large volumes of fast-moving water travelling through the creek. There is potentially further scouring and undermining under the bridge piers in the standing water of the creek.

Alternative route: The banks of Philpott Creek are too steep to traverse, and it currently has wide, deep standing water. The only practical alternative route is to loop back onto the track by heading north along Shallcross road and then west, a 7km detour, which has safety concerns and impacts the connectivity of the trail.

Recommendation: It is recommended this bridge be repaired and converted for trail use as a priority.

Philpott Curve Bridge
Approx. length: 28m
Approx. height: 5m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This curved timber bridge spans across the end of Shallcross road. It has some damage with some components of the upper structure needing replacement. In addition, it has minor erosion and scour around the bridge piers, and the northern abutment needs repair. Finally, further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently a dry weather route to the south of the bridge, across Shallcross Road. Minor earthworks, trail surface upgrades, fencing, and signage are required to make this alternative a viable long-term solution.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Slab Creek Bridge

Approx. length: 71m
Approx. height: 15m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: Slab Creek Bridge is a timber, steel and concrete bridge spanning over Slab Creek. The upper structure is in reasonable condition however needs several components replaced. In addition, it has widespread erosion and scour around the abutments and through the creek invert that requires repair and monitoring, however no observable damage to the abutment structures or bridge piers as a result.

Alternative route: There is currently an alternative, dry weather route to the south of the bridge, through the invert of Slab Creek. Minor earthworks, trail surface upgrades, fencing, and signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Anderson's Gully Bridge
Approx. length: 70m
Approx. height: 10m
Effort of repair and conversion: Medium
Effort of building alternative route:
Priority to repair and convert: Medium

Condition: Anderson's Gully Bridge is a timber, steel and concrete bridge spanning over Anderson's gully. The upper structure is in reasonable condition however needs several components replaced. In addition, there is some scour around some of the bridge piers.

Alternative route: There is currently an alternative, dry weather route to the south of the bridge, through the invert of the gully. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Castor Oil Creek Bridge
Approx. length: 76m
Approx. height: 10m
Effort of repair and conversion: High
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: Castor Oil Bridge is a longer timber, steel and concrete bridge Castor Oil Creek. It is currently unpassable and needs extensive repair works to its upper structure, with significant fire damage to the eastern end. In addition, it has significant erosion and scour around the bridge piers and eastern abutment.

Alternative route: There is currently a dry weather route to the south of the bridge through the adjacent road reserve. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is not recommended to repair and convert this bridge for trail use. Repair and maintenance work is required to protect the bridge for preservation purposes.

Baynton's Bridge
Approx. length: 74m
Approx. height: 15m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Medium

Condition: Baynton's Bridge is a timber, steel and concrete bridge spanning over a steep gully. It is in reasonable condition, with only minor repair and maintenance work needed to the upper structure. However, there are some areas of scour and erosion around the bridge piers that needs repair.

Alternative route: There is currently an alternative route to the south of the bridge by doubling back to the west and going south into the Beinke Road Reserve. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage is required to make this alternative a viable long-term solution. However, this route cuts out Humphrey Bridge 2 and erodes the connectivity of the trail.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Humphrey Bridge 2

Approx. length: 50m
Approx. height: 15m
Effort of repair and conversion: Medium
Effort of building alternative route: Medium
Priority to repair and convert: Medium

Condition: Humphrey Bridge 2 is a timber, steel and concrete bridge spanning over a steep gully. It is in reasonable condition, with only minor repair and maintenance work needed to the upper structure. However, it has significant erosion and scour around the abutments, bridge piers and through the creek invert. In addition, there is observable damage to the wing walls of the eastern abutments.

Alternative route: There is currently an alternative route to the south of the bridge by doubling back to the west and going south into the Beinke Road Reserve. However, this bypasses this bridge completely. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

Humphrey Bridge 1
Approx. length: 71m
Approx. height: 20m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Medium

Condition: This steel and concrete bridge spans over a steep gully. It is currently traversable, and the upper structure needs only minor repairs and maintenance to be suitable for traversing by trail users. However, it has scouring and erosion around the bridge abutments that needs repair and monitoring.

Alternative route: There is currently an alternative route to the south of the bridge by doubling back to the east and going south into the Beinke Road Reserve. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution.

Recommendation: Due to the ease of repair, it is recommended this bridge be repaired and converted for trail use as a priority.

Roth's Bridge
Approx. length: 41m
Approx. height: 7m
Effort of repair and conversion: Medium
Effort of building alternative route: Low
Priority to repair and convert: Low

Condition: This short timber bridge spans over a shallow localised gully. It has some damage to the upper structure, and some components need replacing. In addition, it has minor erosion and scour around the bridge piers. Further investigation into the extent of rot damage is necessary to ascertain its viability for conversion for trail use.

Alternative route: There is currently an alternative, dry weather route to the south of the bridge, through the invert of the gully. Minor earthworks and scour repair, trail surface upgrades, fencing and some signage are required to make this alternative a viable long-term solution. Some consideration should be given in the detailed design to installing low culverts or a low bridge to give access during wet weather and when the creek is flowing.

Recommendation: It is recommended this bridge be repaired and converted initially only if the project budget allows it. Repair and maintenance work is required to protect the bridge for preservation purposes.

4.5 TUNNELS

All six tunnels are currently passable and generally sound, with only minor defects prominent in each. It's recommended to monitor the minor defects for any further maintenance work that may be required.

Minor repair works are recommended, including removal of fallen debris from cut batters above entrances and repairs to the northern wing wall of Tunnel 4. It is recommended that some passive rockfall protection be installed in a few locations, including between the southern end of Tunnel 5 and the northern end of Tunnel 6. All protective measures should be detail designed by appropriately qualified geotechnical and structural professionals.

A small shelter is proposed at the southern portal of Tunnel 6 and at the northern portal of Tunnel 2.

4.6 ROAD CROSSINGS

There are a number of points on all three sections of trail, where users may be forced to cross roads. Many of these roads are 100km/hr speed limited and are dirt, so the potential for conflict causing death or injury is a risk that needs to be carefully considered and managed. It is proposed to provide appropriate signage according to the relevant design guidelines to provide advanced warning and location identification of the crossing points to minimise these potentials for conflict.

Road crossings are generally proposed to comprise the following treatments:

On trail:

- "Road Crossing" standard MUTCD signs with "Cyclists Dismount" custom extra signage approx. 20m from the point of conflict, on the trail, on each approach to the road crossing. This sign is to instruct trail users of the upcoming road crossing and for cyclists to dismount. It is generally considered safest for cyclists to dismount to crossroads, however that it is considered safer for horse riders to cross mounted as they have more control.
- "Give Way" standard MUTCD signs within 5m of the crossing point, on the trail, on each approach to the road crossing, to instruct trail users to give way to oncoming traffic at the point of conflict.
- As road crossings may end up being the entry point for authorised or unauthorised users, the trail management group may decide that installing "Code of Conduct" signage at these entry points if deemed appropriate.

On road:

- "Trail" standard MUTCD sign with "distance to crossing point" extra signage on the road, at an appropriate distance from the crossing point, on both sides, to instruct road users that there is a crossing point ahead and to approach with caution.
- "Trail" standard MUTCD sign with "distance to crossing point" and "on side road" extra signage at an appropriate distance from crossing point to instruct road users that there is a crossing point ahead on the side road and to approach with caution.

- "Trail Crossing" standard MUTCD signs as appropriate, on the road, on both sides of the crossing point to instruct road users of the location of the crossing point and to approach with caution.

Detailed design, more detailed risk analysis and negotiations with TMR, GRC or NBRC may highlight a preference for more instances of the "Trail" and "Distance" road signs to give multiple warnings of each crossing point to road users.

Some crossing points have poor visibility from the trail user or road user's perspective, giving insufficient time by either party for decision making if there is a potential conflict. More involved treatments may be required at these intersections, such as reduced speeds, vegetation clearance or more signage.

Chicanes are often used to force cyclists and pedestrians into giving way to vehicles and dismounting from their bicycles at a crossing point. Whilst chicanes are perceived to give a higher level of safety, they have not been proposed at crossing points on the trails for the following reasons:

- TMR Road Planning and Design Guidelines documentation suggest that chicanes are rarely effective at making cyclists dismount.
- It would be difficult to make a cost-effective and contextually appropriate chicane that works for horse riders and cyclists
- Due to the conflict point often being a significant distance from the road reserve boundary, it would put the chicane, which needs to be out of the road reserve, too far away, making the likelihood of trail users remounting their cycles higher.
- It creates a choke point that would encourage users to 'gather' on the danger side of the chicane to cross as a group, extending the period of time trail users are within the road reserve.

It should however, be noted that appropriate safety devices and/or speed settings are to be considered during detail design to prevent trail users from unknowingly entering roads in dangerous locations.

5.0 COST OPTIONS

It is part of the project scope to provide three options for implementing the trail in terms of design and cost. As there is currently no defined budget or funding arrangement in place, these options will help to guide Council on what level of service standards can be achieved with what budget to distribute funds better and to inform future funding applications.

Three cost estimates for the trails have been prepared on the basis of the below options; refer to **Appendix F**. These are a guide only, intended to assist in scoping the future detailed design and to inform funding applications.

Appendix F

Option 1: Gold standard trail design with all desirable features and elements to provide the highest level of user experience.

This option will provide the highest practical standard for the trail. It will provide maximum safety, robustness and user experience, however with higher capital and maintenance costs. This option may consider the following parameters:

- High-quality approach to trail surface works—typically Trail Surface Treatment Type 3.
- Conversion of all bridges.
- Upgrade and reinstate all sidings to the highest level of embellishment (Toilets, car parks, shelters, signage).
- Upgrade of all road crossings, subject to a risk assessment during detailed design.
- Repair of tunnels.
- Remediation of rock fall and landslide areas, subject to a risk assessment during detailed design.
- Fencing and gate work.

Option 2: Compromised trail design with some desirable features and elements to provide an enhanced user experience.

This option balances capital and maintenance costs against user experience to achieve a high level of user safety. This option may consider the following parameters:

- Conservative approach to trail surface works. Typically Trail Surface Treatment Type 1 and 2. Treatment Type 3 only when needed.
- Conversion of high priority bridges and some medium priority bridges only.
- Provision of appropriate alternate routes around non-traversable bridges.
- Upgrade and reinstatement of sidings to the level shown in this concept design.
- Upgrade of all road-crossings, subject to a risk assessment during detailed design.
- Repair of tunnels.
- Remediation of rock fall and landslide areas, subject to a risk assessment during detailed design.
- Fencing and gate works.

Option 3: Minimum trail design that will deliver a rail trail that is safe to operate however without any features or elements designed to add value to the user experience.

This option will look to provide the minimum safe standard for the use and operation of the trail. It will sacrifice user experience against cost. This option may consider the following parameters:

- A minimal approach to trail surface works. Generally, Trail Surface Treatment Type 1 with limited areas of Type 2 treatment.
- Conversion of high priority bridges only.
- Provision of appropriate alternate routes around non-traversable bridges.
- Upgrades and reinstatement of sidings at the start and end of each trail only.
- Upgrade of all road-crossings, subject to a risk assessment during detailed design.
- Repair of tunnels.
- Remediation of rock fall and landslide areas, subject to a risk assessment during detailed design.
- Fencing and gate works.
- Trail signage.

6.0 STAGING

The following project staging is suggested as it represents manageable portions of the trail that can be delivered and brought online as a single operating piece. The following staging is suggested only, and is subject to future detailed design, funding arrangements and input from the future Trail Management Body. Due to the separate nature of the trails, it is proposed that the staging of each section be independent of the others and that construction/funding activities could potentially occur in parallel.

Stage	Description of area	Comments / Major Works
Area 1 – Taragoola to Ubobo		
Stage A1 - 01	Nagoorin Siding to Ubobo Siding	• 1 Bridge • 1 Road Crossing • 2 Trail Heads / Sidings • Fencing
Stage A1 – 02	The southern end of GAWB lease to Nagoorin	• 4 Bridges • 4 Road Crossings
Stage A1 – 03	Futter Creek to the northern end of GAWB lease	• 2 Bridges • 3 Road Crossings
Area 2 – Builyan to Kalpowar		
Stage A2 - 01	Golimbel Siding to Barrimoon Siding	• 6 Tunnels • 1 Bridge • 2 Trail Heads / Sidings
Stage A2 – 02	Barrimoon Siding to Kalpowar Siding	• 3 Bridges • 1 Road Crossing • 1 Trail Head / Siding
Stage A2 – 03	Builyan Siding to Golimbel Siding	• 6 Bridges • 5 Road Crossings • 1 Trail Head / Siding • Safety related infrastructure. Eg Balustrading & rock catch fencing
Area 3 – Mundubbera to Gayndah		
Stage A3 - 01	Reid Creek to Humphrey Siding	• 1 Bridge • 3 Trail Heads / Sidings • 5 Road Crossings
Stage A3 – 02	Humphrey Siding to Philpott Siding	• 2 Trail Heads / Sidings • 7 Bridges
Stage A3 – 03	Philpott Siding to Mundubbera	• 2 Bridges • 3 Road Crossings • Safety related infrastructure. Eg Balustrading & rock catch fencing

Stage A1 – 01 - Nagoorin Siding to Ubobo Siding

This stage of the trail provides an opportunity to bring a well serviced ~6km stretch online with the least amount of further assessment and design, expense and intervention to bring it online with the baseline cost options.

Risks:

- There is a road crossing at Moran Street that needs further assessment and design and before being implemented to ensure the safety of trail and road users.

Constraints:

- Railway Terrace Bridge is a priority to be repaired and converted for this stage of the trail. The alternate route around the bridge is not ideal for trail users.
- The amenity of this trail is not as exciting as other parts of the A1 trail, primarily due to its straight nature and that it travels parallel to Gladstone Monto Road. It will need the northern stages of the trail implemented to provide sufficient amenity and length to be of long-lasting interest to tourists.
- Due to the removal of the fences between the road and the trail by TMR as part of decommissioning the rail line, grazing cannot be used as a vegetation control method along this stage of the trail, requiring more labour intensive burning or mechanical management. Having the fencing reinstated will provide more options for vegetation management.

Opportunities:

- Both Ubobo and Nagoorin townships already have existing facilities for accommodation, amenities and the purchase of food, fuel and supplies. These existing services can support the implementation of the trail.
- Repairing and converting the Railway Terrace Bridge will create a safe pedestrian link between the two townships for locals to use and tourists.
- This stage brings 6km of the trail online with minimal further design or implementation of expensive interventions.
- The trail surface in this stage is in reasonable condition and only needs minor works to make it serviceable.
- Implementation of trailheads in both these townships will potentially provide immediate tourism opportunities for local individuals and businesses.

Stage A1 – 02 - Southern end of GAWB lease to Nagoorin

This stretch connects the town of Nagoorin into the Southern Part of the GAWB managed area. This connects the existing services and facilities available at Nagoorin with the already existing facilities at Boynedale Bush Camp, providing a well-connected and well serviced portion of trail online for relatively

Risks:

- Four road crossings need to be addressed in this stage of the trail. Three of these are across minor local roads; one is across Gladstone Monto Road. These will need further assessment and design before being implemented to ensure the safety of trail and road users.
- Marble Creek Bridge and De Galgil Creek Bridge in particular, are in need of extensive repairs and could be costly to be converted.

Constraints:

- All four bridges in this stage need repair to be traversed. However, all except Oaky Creek Bridge have simple to implement dry weather alternative routes.
- This stage of the trail is not sufficient in its own right to provide enough amenity or distance to give broad range appeal and repeat visits. It needs to be implemented with the other stages of the A1 trail to provide the maximum potential for attracting tourists.

Opportunities:

- This trail stage needs comparatively little intervention to bring it online, adding 11km of trail to this section.
- The trail surface in this stage is in reasonable condition and only needs minor works to make it serviceable.
- The Boynedale Bush Camp facility and the associated recreation opportunities provide existing services and amenities to potential trail users.

Stage A1 – 03 - Futter Creek to Northern end of GAWB lease

This part of the trail will connect two already well serviced recreational facilities to each other and to the greater A1 trail. It requires a relatively low level of future design work and expense to bring the minimum standard of trail online.

Risks:

- The connection between where the trail ends and Futter Creek Camp Ground needs further assessment and design work. This will need to establish the most appropriate and safe way to take trail users along Gladstone Monto Road without forcing them to cross to the northern side of the road and back.

Constraints:

- This section has three road crossings, one of which is across Gladstone-Monto Road.
- The ballast is still in place from Boynedale Bush Camp until north of Portentia Creek Bridge; it is not an ideal surface for trail use and will need resurfacing.
- Un-named bridge needs repair, however it has an easily implemented alternate route.
- The trail surface is in mostly average condition in this stage.

Opportunities:

- This part of the trail will link two existing, well-serviced recreation spaces, providing existing services and amenities and linking them back to the townships of Nagoorin and Ubobo.
- This part of the trail needs comparatively little intervention and expense to bring it online.
- Where the trail meets Awoonga Dam provides one of the few places on the A1 trail where trail users can see mostly permanent standing water, adding a different landscape to many other areas of the trail, opening up additional recreation and amenity opportunities. In addition, Portentia Creek Bridge requires only minor intervention to be made appropriately safe to be used by trail users.

Stage A2 – 01 - Golimbel Siding to Barrimoon Siding

Golimbel Siding to Barrimoon Siding is seen as the preferred first stage to proceed with further development for this section of the A2 section of trail from Builyan to Kalpowar. Therefore, we recommend this as the first section of the A2 trail to bring online.

Risks:

- This section has a severe risk of injury due to rockfall and landslip where the trail passes through rock cuttings. Therefore, further geotechnical analysis, remediation work, monitoring, and management plans are strongly recommended before using the trail by the public.
- There is a serious risk of injury due to falling off steep embankments through the tunnel section and the Glassford Creek 2 Bridge abutments. Further risk analysis and recommendations for implementing any physical safety devices such as railings or edge markers must be undertaken, and proposed strategies for the operational management of the risks before use.
- This section of the trail is somewhat isolated. There are no major townships nearby, and mobile phone reception is limited. In case of an emergency, trail users will need to take other steps to ensure their safety; this is something the future Trail Management Body will need to consider in their Trail Management Plan.

Constraints:

- Barrimoon and Golimbel Siding are both accessed via gravel roads. They will only be accessible in dry weather by two-wheel drive, and larger vehicles such as busses may struggle to get to them.
- This stage of the trail is somewhat isolated. It is not close to any major townships, and fuel, food and supplies are not available nearby.
- This stage of the A2 trail is not sufficiently long to provide long term and repeat attraction as a trail. At approximately 11km long, it can be comfortably traversed on foot in two to three hours and by bike in one hour. The trail will need the connection to the north and south to appeal to different and repeat users long term.
- The alternate route around Glassford Creek Bridge is poor in wet conditions. The trail surface and possibly some culvert crossings or low bridges will need to be considered if the alternate access is used in extended periods of rain.

Opportunities:

- From an amenity perspective, this section of trail is one of the most exciting sections with all of six tunnels, amazing views and scenery, and one of the largest bridges on the trail.
- Both sidings are isolated from any residential setting
- It has very few immediate neighbours. This will require less engagement between the future rail trail management body and adjoining property owners.
- There is only one large bridge, which has an alternative route that is easily implemented.
- The trail surface is in predominantly good condition, and some sections have been recently graded.
- There are no road crossings through this section of trail.

Stage A2 – 02 – Barrimoon Siding to Kalpowar

This stage of the A2 trail will connect the township of Kalpowar and its existing services and facilities to the trail. Its addition to the trail will provide better connectivity to tourists travelling from the south.

Risks:

- Cabbage Tree Creek Bridge provides a barrier to the connectivity of this section of the trail. The alternate route across Gladstone Monto Road is long and not appropriate or safe in its current format. This bridge would need to be repaired.

Constraints:

- The road crossing across Pine Street needs to be designed and implemented to ensure trail and road users are safe in this area.
- This section is not long enough and does not provide sufficient amenity for a high-quality standalone trail. It needs to be partnered with the Golimbel Siding to Barrimoon stage to make it worthwhile.
- The trail runs through the Kalpowar township to Kalpowar Siding and therefore has several immediate neighbours. The Trail Management Body will need to engage with these property owners to ensure that potential conflicts are minimised and managed.

Opportunities:

- This stage of the trail would not require a large amount of work to bring it up to a detail design level.
- It brings trail access further south, making easier access for South East Queensland tourists to access.
- Kalpowar Siding provides two-wheel, all-weather access to the trail through Kalpowar Siding in Kalpowar township. There is sufficient room for larger vehicles to access the siding and drop off and pick up trail users.
- There is existing accommodation and amenities in and near Kalpowar Siding that can provide support and services to the trail.
- Both Dawes Bridge 1 and 2 need minor works to provide alternate routes around them for dry weather access.
- The trail surface is in reasonable condition and needs only minor works to be serviceable.
- This section adds ~6km in length and greater connectivity to the trail at relatively low comparative cost and effort.
- Implementation of a trailhead in Kalpowar will potentially provide tourism opportunities for local individuals and businesses.

Stage A2 – 03 – Builyan Siding to Golimbel Siding

This stage is the final component of the A2 trail, it requires the most amount of further design and assessment and represents potentially the most significant expense. It links the well-serviced township of Builyan with the rest of the A2 trail.

Risks:

- This stage has five separate road crossings, mainly in unsealed, 100km/hr conditions. These will all need more detailed design and implementation before use of the trail to ensure that trail and road users are safe.
- There are two sections of rock cuttings and earth embankments in this area as per the geotechnical reporting that are recommended to have further assessment and design to ensure they are safe prior to use of the trail in terms of rockfall and falling from heights.

Constraints:

- This stage of trail has six bridges that require further design and consideration. Deception Creek Bridge 2 and 3 should be repaired and converted to give the best connectivity for the trail.
- This stage has two smaller areas of rock cutting and potential fall from height concerns that need further investigation and intervention to be deemed safe for public use.

Opportunities:

- This stage of the trail has many stunning views and different terrain to much of the Boyne Valley. It also has extensive old railway hardware, bridges and other heritage items desirable to trail users.
- There is extensive existing facilities and infrastructure in Builyan already, combined with Kalpowar will create two vital bookends to the A2 trial.
- The trail surface in this stage is mostly in good condition.

Stage A3 – 01 – Reid Creek to Humphrey Siding

This stage represents a low effort way to create a large ~12km segment of the A3 trail without great effort in terms of design or expenditure.

Risks:

- There are no major risks associated with this stage.

Constraints:

- Five road crossings need to be addressed.
- Roth's Bridge needs repair to be traversed however has an easily implemented alternate route.
- This end of the trail is somewhat distanced from local services such as food and fuel.
- It doesn't really offer sufficient amenity to provide long term

Opportunities:

- There are relatively few neighbours that will be affected by the works and for the Trail Management Body to negotiate and work with.
- Provides a large part of trail with low design and cost inputs.
- Creates the strongest link towards the Gayndah end of the trail.
- The trail surface is in average to reasonable condition however is predominantly serviceable as is.

Stage A3 – 02 – Humphrey Siding to Philpott Siding

This stage is the core of the A3 trail in terms of its size and physical location and in terms of containing the most attractors for the A3 trail in terms of the bridges and rail history and access and views to the river. It also possibly represents the largest amount of effort in terms of design and expenditure however is key to the success of this section.

Risks:

- This stage has seven bridges, many of them requiring extensive repair and some of them being critical to trail connectivity. It will be an expensive and time-consuming exercise bringing these up to minimum safe standards to make the trail practical and usable by the public.

Constraints:

- There are a small number of areas through rock cuttings that will need further investigation and possible remediation work to ensure users are safe from rockfall or landslip.

Opportunities:

- There are no road crossings in this stage.
- Some of the bridges can be bypassed without great effort.
- This stage has most of the high-quality amenity and attractors of the A3 trail.
- This stage has seven unique bridges that will attract many visitors.
- The trail surface is in relatively good condition and is most serviceable as is.

Stage A3 – 03 – Philpott Siding to Mundubbera

This stage is potentially one of the most difficult to achieve in terms of its criticality to the connectivity of the trail, however the potential expense and design effort being high. It is key to the long-term success of the trail, and the services, facilities and amenities provided by the Mundubbera township being a large attractor to the trail.

Risks:

- Phillpot Creek and Red Gully Bridges need extensive repairs however are critical to the connectivity of the trail. Alternate routes are not practical or in keeping with the intent of the trail.

Constraints:

- There are three road crossings through this stage, two of these being comparatively busy urban roadways. These will need a higher level of interrogation than most of the other road crossings in the A3 section of the trail.
- This section of the trail will be expensive to design and construct for relatively low yield when compared to the other stages, yet it is still critical to the trail.

Opportunities:

- This will give vital connectivity from Mundubbera,, which has an abundance of existing services and amenities unlike any other section of this trail or the other two.
- Phillpot Creek Bridge is one of the most spectacular bridges in terms of views and scale on this section of the trail.
- The trail is in average condition however is serviceable primarily as is.

8.0 FUNCTIONAL DESIGN BRIEF

This section will look at providing a brief to the next phase of the design of the project, detailed design. One of the key aspects to the further design of the project will be to balance the competing outcomes of cost, safety and amenity.

Structures, furniture and hardware:

There are a number of structures, furniture and hardware associated with the trail that need further design:

- Detailed design of Shelter Structures, including any structural engineering, lighter/electrical engineering or certification required.
- Detailed design of Toilets, including any structural engineering, certification, hydraulic design or electrical / lighting design required.
- Detailed design of all trail related signage elements
- Graphic design of signage content
- Preparation of interpretive information for interpretive signage
- Detailed design of all hardware including fencing, gates, grid and gates, horse yards etc.
- Detailed design of all furniture items.
- RPEQ sign off where required.

Trail heads:

The Trail Heads will need further design,

- Detailed design of the layout of each trail head/ siding
- Detailed design of the placement of structures, furniture and hardware for each.
- Detailed design of car parking bays
- Detailed planting design for tree planting
- RPEQ sign off where required.

Trail Surface:

To enable the detailed design and construction of the Trail Surface, it is envisaged that the following tasks will need be undertaken, including however not limited to:

- Detailed visual inspection of the existing trail surface
- Proof roll with water truck to identify problem areas
- DCP, CBR or similar testing as required to further assess problem areas
- Review of proposed trail surface treatment types to create For Construction typical treatments.
- Proposed additional pavement design or gravel treatment to problem areas.
- Longitudinal nomination of different treatment types.

Bridges:

The detailed assessment and documentation to repair and/or convert the bridges is a large and expensive undertaking, it is likely that the project will not be able to afford designing all of this in a single instance, let alone

building it. As such, depending on likely project funding, only select bridges will need full documentation for repair and conversion. This can be determined at a later date, or explored by the detailed design consultant.

For bridges to be repaired and converted for use:

- Detailed in place structural assessment of relevant bridges
- Detailed in place geotechnical assessment
- Detailed design of structural repairs to the upper structure of each bridge to suit being converted and traversed by trail users.
- Detailed design of structural/geotechnical repairs to foundations and embankments to suit being converted and traversed by trail users.
- Detailed review of safety issues associated with bridge and bridge surrounds.
- Detailed design of conversion to add appropriate modular deck structure to bridge to allow traversing by trail users.
- Detailed design of hardware associated with bridges including grids, gates, fencing and trail and safety signage.
- Detailed recommendations on monitoring of bridge for safety and longevity.
- RPEQ design sign off
- Submission of proposed designs to the relevant authority for approval (E.g. OPW).

For bridges to be repaired and alternative access routes used:

- Detailed in place structural assessment of relevant bridges as recommended by
- Detailed in place geotechnical assessment.
- Detailed design of minimum structural repairs to ensure the preservation of upper bridge structure and allow safe proximity of trail users.
- Detailed design of minimum geotechnical/structural repairs to foundations and embankments ensures the preservation of the upper bridge structure and allows safe proximity of trail users.
- Detailed review of safety issues associated with alternate access, including flooding, falls from bridge abutments and unstable surrounding terrain.
- Detailed design of interventions required to allow alternative access, including trail surface design, earthworks, culverts, signage, fencing and gates.
- Detailed recommendations on monitoring of bridge for safety and longevity.
- RPEQ design sign off
- Submission of proposed designs to relevant authority for approval (E.g. OPW).

Tunnels:

- Detailed in place structural & geotechnical assessment of tunnels.
- Detailed design of geotechnical interventions to address rockfall and landslip issues over portals.
- Detailed design of repairs to tunnels and tunnel portals.
- Detailed recommendations on monitoring of tunnels for safety and longevity.

- RPEQ design sign off
- Submission of proposed designs to relevant authority for approval (E.g. OPW).

Rock Cuttings and steep embankments:

There are a number of cuttings in the Builyan to Kalpowar section and very limited amount in the Mundubbera to Gayndah section that pose potentially high risks to safety if not addressed. It is strongly recommended by the geotechnical reporting that the following be done in the areas highlighted.

- Detailed slope stability analysis.
- Detailed risk assessment for potential safety concerns caused by landslip or rockfall.
- Detailed risk assessment for potential safety concerns from falls from heights on steep embankments.
- Detailed design of remediation works to address landslip and rockfall issues.
- Detailed design of catch fences or balustrades.

Road Crossings:

- To enable the detailed design and construction of all road crossings, including however not limited to:
- Consideration of speed limits and vehicles per day
- Consideration of required stopping distances/times
- Consideration of trail user types and number of users per day
- Sign types, longitudinal sign placement
- Sight lines to crossing points for both vehicles and trail users
- Any additional road safety signage required.
- Any additional trail signage required.
- Negotiation with the relevant local authority and/or TMR
- Any physical crossing management tools such as bollards and chicanes.
- RPEQ design sign off
- Submission of proposed designs to relevant authority for approval (e.g. OPW).

9.0 REFERENCE MATERIAL

- Australian Standard AS 5100 – Bridge Design

- Transport and Main Roads - Manual of Uniform Traffic Control Devices - TMR MUTCD

- Road Planning & Design Manual – Edition 2: Volume 3, Transport and Main Roads, May 2020

- AustRoads Cycling Aspects

- Guide to Traffic Engineering Practice - Bicycles Part 14 Austroads

- AS 2156.1—2001 Walking Tracks

10.0 APPENDICES

10.1 APPENDIX A – Typical Trail Surface Treatments

10.2 APPENDIX B – Safety In Design Registers

10.3 APPENDIX C – Staging Plans

10.4 APPENDIX D – Geo-technical Assessment

10.5 APPENDIX E – Structural Assessment

10.6 APPENDIX F – Cost Options

10.7 APPENDIX G – Concept Design Drawings