SPORTSMANS CREEK NEW BRIDGE

Review of environmental factors

FEBRUARY 2015

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Roads and Maritime Services

Sportsmans Creek new bridge

Review of environmental factors

February 2015

Prepared by Kellogg Brown & Root Pty Ltd

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Executive summary

The Proposal

Roads and Maritime Services (Roads and Maritime) is proposing to replace the existing bridge over Sportsmans Creek at Lawrence, with a new bridge approximately 100 metres upstream. The Proposal also includes rebuilding of Grafton Street, new intersections at the southern approach of the bridge and at the intersection of Grafton and Bridge Streets.

Need for the Proposal

The existing Sportsmans Creek bridge is identified in the NSW Government's "Bridges for the Bush" program as a timber truss bridge which requires replacement to avoid the requirement for ongoing costly maintenance and repairs. Roads and Maritime has developed and published the Timber Truss Bridge Heritage Conservation Strategy for the management of its remaining timber truss bridge stock, after conducting public consultation (Roads and Maritime 2012a). As part of this strategy, the Sportsmans Creek Bridge is proposed to be removed and replaced with a modern structure. The new bridge and associated road work would be handed over to Council for its ongoing ownership, control and maintenance.

Seasonal sugarcane haulage activities rely on the bridge for access. As there is no available alternative should the current bridge be load limited, there is a need for a new bridge to be built to ensure the ongoing viability of this industry.

Upgrading the existing bridge is not viable as geometry and design limitations of the existing structure are such that it is unable to be safely upgraded to cater for future haulage requirements of local surrounding agricultural industries, two-way traffic and pedestrian access. The existing bridge has no designated pedestrian path.

Options considered

A multi stage options development and assessment process was initiated with a workshop and site visit in Lawrence in June 2013. At the workshop a significant number of diverse options were identified and categorised into three corridors (Western, Grafton Street and Bridge Street). Six options were selected and further developed.

A subsequent internal technical workshop was held in August 2013 to assess the six preliminary options using a Multi Criteria Analysis (MCA) process. The options were assessed and ranked in order of preference and short-listed to three options. Following the internal technical workshop, the shortlisted options were reviewed by Roads and Maritime in conjunction with Transport for NSW.

This review concluded that Option 2 was the recommended option to be taken forward for community display and comment as it provided key benefits in comparison to Options 3 and 4. Option 2 proposes a new bridge west of the existing Sportsmans Creek bridge and boat ramp. This new bridge would connect the Grafton – Lawrence Road with Grafton Street and re-join Bridge Street near the Lawrence General and Liquor Store. Option 2 was announced as the preferred option for the new bridge in July 2014.

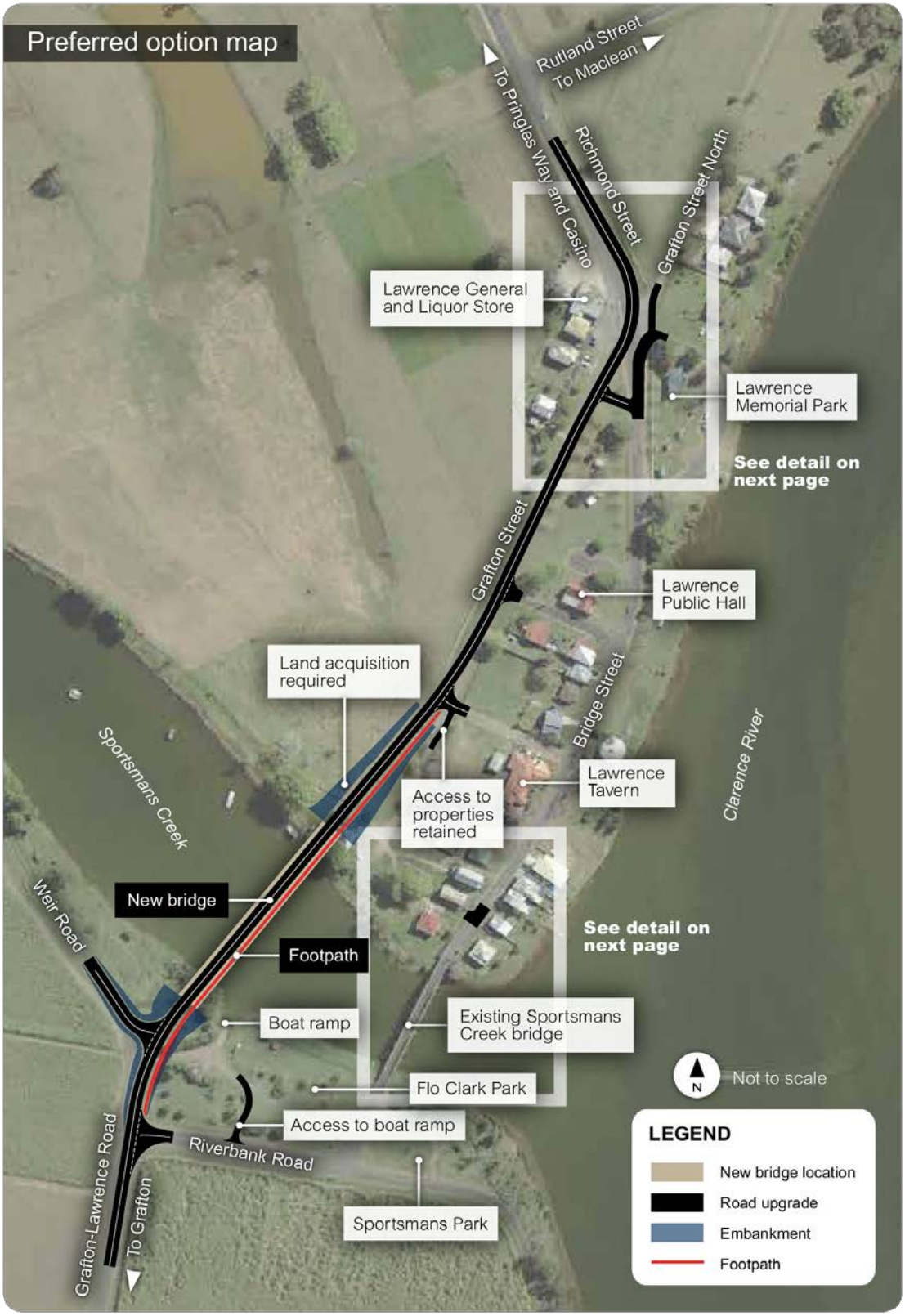

Figure E1 Preferred Option

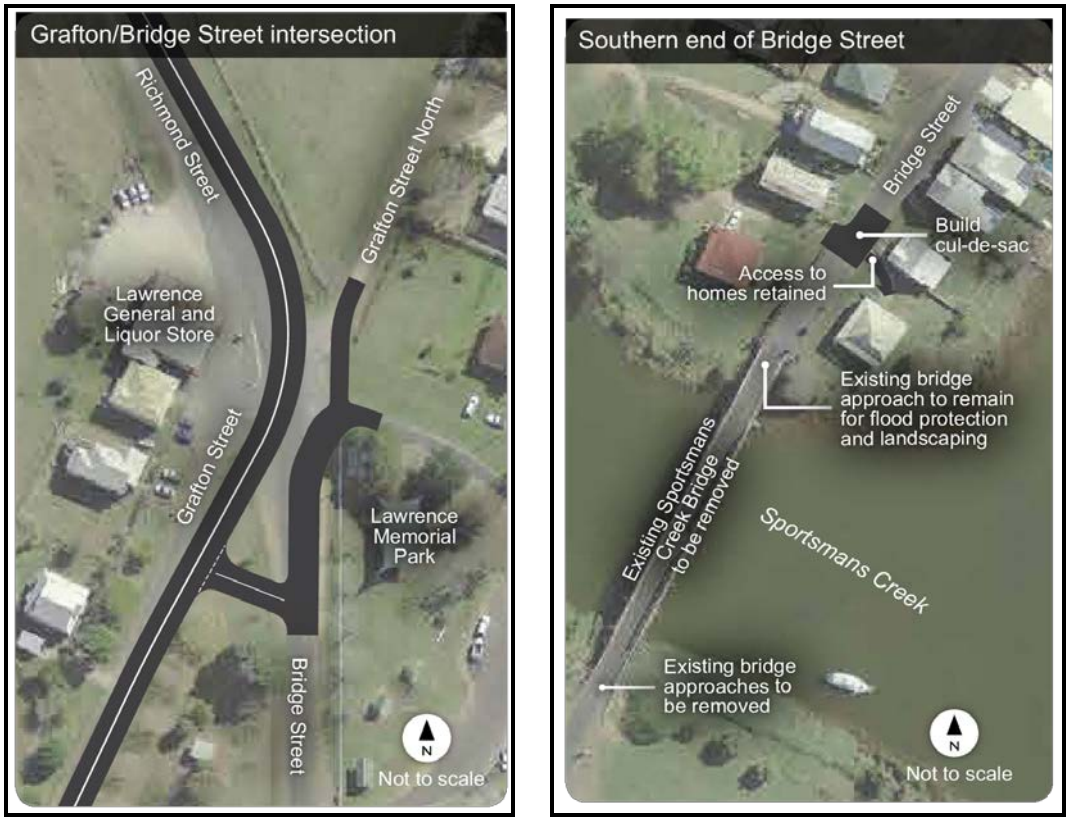

Figure E.2 Preferred intersection treatments

Statutory and planning framework

This review of environmental factors (REF) has reviewed the relevant legislation and determined that the Proposal is subject to assessment under Part 5 of the *Environmental Planning and Assessment Act 1979.* The Proposal would not require development consent as per the provisions of the *State Environmental Planning Policy (Infrastructure) 2007*. As such, Roads and Maritime is the proponent and determining authority for this Proposal.

The Proposal has also been assessed against relevant NSW legislation and other environmental planning instruments and no further statutory approvals are required. The matters of National Environmental Significance (NES) that are protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been considered for the Proposal and a referral to the Department of the Environment would not be required.

Community and stakeholder consultation

Community consultation was carried out with the residents and business owners of Lawrence and Clarence Valley Council through the options development process. Both residents and Council were supportive of the Proposal and comments provided have been incorporated into the early design and addressed in this REF.

Consultation with NSW Maritime, Office of Environment and Heritage (OEH) and Department of Primary Industries (DPI) (Fisheries) was also carried out during the REF. Relevant requirements are addressed in the assessments and safeguards proposed.

Ongoing consultation would be carried out with DPI (Fisheries), NSW Maritime, Council and the residents and business owners of Lawrence throughout the building of the project.

Environmental impacts

Hydrology, Flooding Soil and Water Quality

An assessment of hydrology, soil and water quality impacts was carried out to determine the potential impact of the Proposal on Sportsmans Creek. The assessment concluded that high risk impacts to the waterway health exist should potential impacts remain unmitigated. Key risks from impacts include:

- Erosion and sedimentation during works in the riparian zone
- Acid Sulphate Soils (ASS) and bottom sediments disturbance during works in the waterway
- Flooding during building work
- Accidental spillages affecting water quality.

A number of plans are proposed as part of the CEMP to address these impacts, including contingency plans to manage incidents. A further flood study has been carried out to ensure that the proposed design does not result in any additional flooding impacts upon the local environment.

Biodiversity

A biodiversity assessment was completed and included a desktop and field survey investigation of terrestrial and aquatic vegetation communities, flora and fauna. The

assessment concluded that while there is potential habitat for threatened species and migratory species within the survey area, there would be no long-term adverse impacts upon biodiversity as a result of the new bridge building work, provided the safeguards and management measures are implemented. The assessment also identified that there is a known roosting population of Large-footed Myotis (*Myotis macopus*) located in the existing Sportsmans Creek bridge.

Building the new bridge is not anticipated to disturb this population. However, it would provide an opportunity for alternative habitat for the population once the existing bridge is removed. The impact of removing the existing bridge on biodiversity would be subject to a separate assessment under a separate REF.

Noise and vibration

Specialist noise and vibration assessment was carried out by SLR Consulting which included noise modelling. This assessment determined that exceedances of noise and vibration criteria at the nearest sensitive residential receivers are predicted during a number of building work scenarios, in particular during piling works. Noise criteria exceedances at the nearest sensitive residential receivers are also predicted during the operation phase.

Reasonable and feasible mitigation measures have been considered and would be employed to minimise noise during building work. Noise mitigation in the form of architectural treatments would be required to reduce the impacts of operational road traffic noise and meet the criteria proposed in the EPA Road Noise Policy.

Traffic and access

The staging of building work of the new bridge followed by the removal of the existing bridge would minimise traffic impacts during the proposed works. Re-routing the roads into Lawrence including along Grafton-Lawrence Road and Grafton Street/Bridge Street would be required during intersection upgrades. Private property and business access would be temporarily disturbed on Grafton Street. The boat ramp in Flo Clark Park would also be closed during the building period of the new bridge and recreational users would be redirected to the boat ramp at Lawrence Memorial Park. A Traffic Management Plan would be developed to manage traffic issues during building work.

Disruption to waterway users may also occur, as the channel is partly obstructed during building work. Passage would be maintained on Sportsmans Creek for boats accessing the waterway. NSW Maritime would be consulted before any work causing disruptions the waterway access are proposed.

Justification and conclusion

Maintaining a quality transport link through Lawrence is an important issue for the prosperity of the local sugar cane industry. The Sportsmans Creek new bridge would address the needs of the industry and the local community well into the future. The new bridge would also provide significant savings in maintenance costs with the existing timber truss bridge constructed in 1911.

Key environmental impacts are identified in Section 6 of the REF. Impacts include vegetation disturbance, soils and waterway disturbance, noise and vibration, air quality, visual and landscape character, temporary loss of recreational open space and traffic and access. It is considered that the safeguards and management

measures identified in the REF would appropriately and sufficiently minimise adverse impacts of the Proposal during design, construction and operation.

In addition the Proposal would provide substantial benefits to the wider community and the regional economy through:

- Minimising the significant maintenance costs associated with the upkeep of the existing bridge
- Improved traffic efficiency for vehicles moving through the area and vehicles servicing the sugarcane and other industries into the future
- Enhanced road safety
- Improved accessibility for pedestrians
- Improvements in local amenity for residences in Bridge Street
- Enabling access to the boat ramp for sail boats
- Increased availability of open space in Flo Clark Park and Sportsmans Park
- Reinforcement of the original town plan and reduction in fragmentation of the Heritage Conservation Area of Lawrence.

On balance the Proposal to construct a new bridge on the alignment described in the REF is considered justified.

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1 Introduction

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) is proposing to replace the existing bridge at Sportsmans Creek at Lawrence, with a new bridge approximately 100 m upstream. The Proposal also includes upgrading Grafton Street and new intersections at the southern approaches of the bridge and at the intersection of Grafton and Bridge Streets.

The existing Sportsmans Creek bridge is located on the southern approach to Lawrence within the Clarence Valley Council Local Government Area (LGA). Lawrence is located 25 km north of Grafton on the Lawrence Road (MR152) which is managed and maintained by Council. The Proposal location is shown on Figure 2.1.

Roads and Maritime is responsible for the management of the existing bridge as an 'ex-national' bridge and in accordance with the NSW Government Gazette No 83, 1928. The existing bridge was built in 1885 and reconstructed in 1911. It is 91.7 m in length, consisting of three timber beam approach spans and two Timber Dare truss spans. The bridge has a 5.5 m wide carriageway. Geometry and design limitations of the existing bridge mean it is unable to be upgraded to cater for future haulage requirements of local surrounding agricultural industries, two-way traffic and pedestrian access.

The new bridge would be built before removing the existing bridge and would connect Grafton-Lawrence Road from the south and Grafton Street in the north.

A summary of the key features of the Proposal include:

- Building a new concrete bridge, consisting of two traffic lanes and a shared pedestrian and cycle path
- Establishment of pile foundations in the creek bed piers, with two columns each
- Intersection treatments at Grafton Street and Bridge Streets and Weir Road/Ensbey Road and Grafton-Lawrence Road
- Drainage works and road upgrades including accesses to properties on Grafton Street
- A new access into Flo Clark Park to facilitate boat ramp access
- Gateway treatment on the southern approach from Grafton-Lawrence Road
- Removal of buildings and structures located on Lot 1 Section 5 DP758604
- Adjustment of utilities as required.

The Proposal is expected to commence early to mid- 2016 for the duration of approximately 16 months, weather permitting.

Roads and Maritime has developed and published the Timber Truss Bridge Heritage Conservation Strategy for the management of its remaining timber truss bridge stock, after conducting public consultation (Roads and Maritime 2012a). As part of this strategy, the Sportsmans Creek Bridge is proposed to be removed and replaced with a modern structure. The new bridge and associated road work would be handed over to Council for its ongoing ownership, control and maintenance.

It is proposed that the removal of the existing bridge would be assessed separately by a further REF. The separation of this assessment is to allow for an accelerated

program for building the new bridge, which would otherwise be delayed by the assessment of the removal of the existing bridge. This is due to the Species Impact Statement (SIS) process required to assess the impact upon the threatened Large-footed Myotis (*Myotis macropus*) microbat population. The building of the new bridge would also facilitate the relocation of the threatened Large-footed Myotis (*Myotis macropus*) microbat population from the existing bridge into the habitat provided in the new bridge. Furthermore, as discussed in Section 6.3, the building of the new bridge would not result in any significant impacts upon the microbat population.

The two proposals are considered independent of each other as they would result in different impacts on the community and use different work methods. The new bridge can be built without the need to remove the existing bridge, which would be closed to traffic following the completion of building work. The activities are being assessed separately under the *Environmental Planning and Assessment Act 1979* (EP&A Act) as they are not reliant on each other and further investigation and assessment of the method and impact of the removal would be carried out in due course.

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by KBR on behalf of Roads and Maritime, Northern Region. For the purposes of this work, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the Proposal, document likely impacts of the Proposal on the environment, and detail protective measures to be implemented.

The description of the proposed works and associated environmental impacts have been carried out in context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Threatened Species Conservation Act 1995* (TSC Act), *the Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the Proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in Section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The potential for the Proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the Proposal

Two key documents provide the strategic need for the Proposal:

- The Bridges for the Bush Initiative
- Timber Truss Bridge Conservation Strategy.

2.1.1 Bridges for the Bush program

The 'Bridges for the Bush' initiative is a commitment from NSW Government to improve road freight productivity by replacing or upgrading bridges over the next five years at 17 key locations in regional NSW.

This program includes replacing or upgrading five key priority HML deficient bridges on State managed roads and 12 timber truss bridges on State, regional and local roads.

The Sportsmans Creek new bridge project is directly referenced by being an initiative of the 'Bridges for the Bush' initiative. It would replace a timber truss bridge and negate the requirement for ongoing costly repairs of the existing bridge.

2.1.2 Roads and Maritime Timber Truss Bridge Conservation Strategy

The Timber Truss Bridge Conservation Strategy (Roads and Maritime 2012a) was completed and endorsed by the Heritage Council of NSW in July 2012. The strategy was developed to address the long term management of timber truss bridges in NSW. The strategy, carried out in consultation with the Heritage Council of NSW aims to establish a balance between infrastructure provision and heritage conservation.

The strategy explains that timber truss bridges are expensive to maintain in terms of planning, approvals, materials, maintenance frequency and skilled resources. The strategy also recognises the road network plays a key role in the efficient transport of freight.

The existing Sportsmans Creek bridge at Lawrence was assessed as part of the strategy. The bridge comprises three timber beam approach spans and two timber Dare truss spans, which were built in 1911. The substructure and approaches are part of the original bridge which was constructed in 1895.

Due to geometry and design limitations of the existing bridge, it is unable to be safely upgraded to cater for future haulage requirements of local surrounding agricultural industries, two-way traffic and pedestrian access.

Seasonal sugarcane haulage activities rely on this bridge for access, and equate to about 3,720 trips per year (as provided by the Clarence Cane Growers) between July and December. As there is no available alternative route should the current bridge be load limited, there is a need for a new bridge to be built to ensure the ongoing viability of this industry.

As such, Roads and Maritime has identified that the existing bridge cannot be upgraded to meet future operational requirements with the existing bridge to be removed and replaced with a new bridge.

It should be noted that while both proposals to remove and build the new bridge are noted in the strategic need, the purpose of the assessment in this REF is to address the building of the new bridge.

2.2 Existing road and infrastructure

Figure 2.1 illustrates the road network between Grafton, Maclean and the Proposal site.

The Pacific Highway (Route A1) forms the key regional route in the Clarence Valley, and provides a high-capacity road link between Grafton and Maclean and further north to Brisbane.

The Summerland Way (Route B91) forms an inland route linking Grafton with Casino and Kyogle. Between Grafton and Maclean, the Grafton-Lawrence Regional Road (MR152) runs west of the Clarence River through Lawrence. A large section of this road is 100 km/hr speed limit, including on the southern approach into Lawrence.

Part of the MR152 route between Grafton and Maclean is a ferry crossing of the Clarence River between Bluff Point in Lawrence and Woodford Dale Road on Woodford Island, linking Lawrence to Maclean and beyond to Yamba. The existing Sportsmans Creek bridge at Lawrence forms part of the MR152 route.

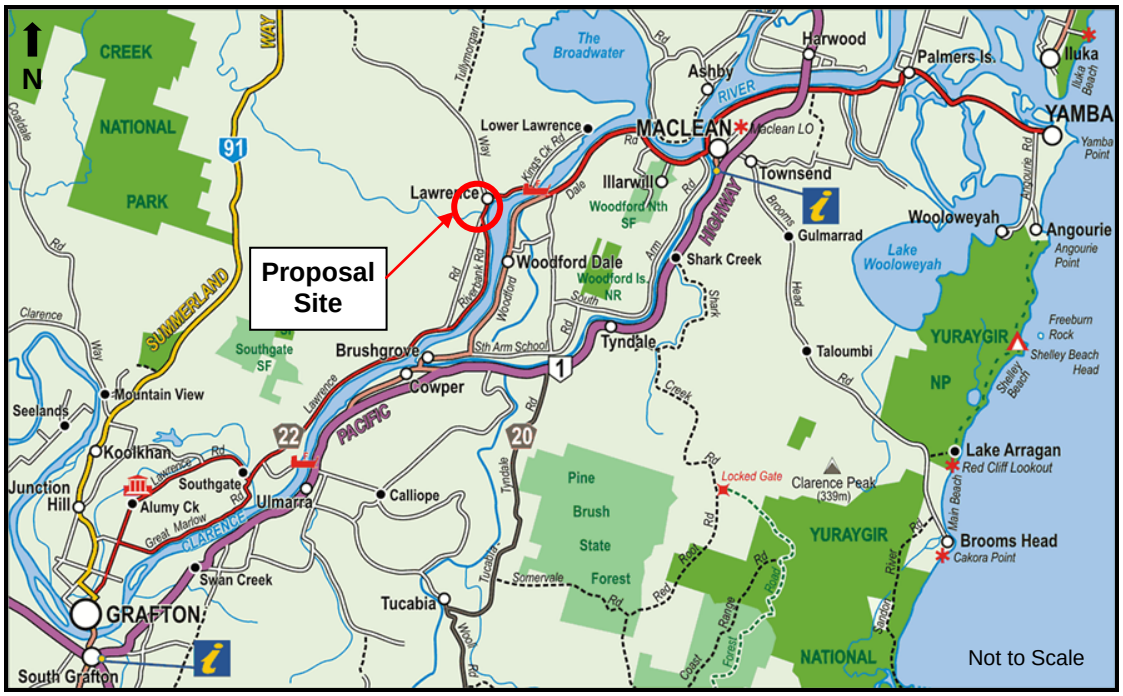

Figure 2.1 Road network (Source: Clarence Valley Tourism)

2.3 Proposal objectives

The key objectives for the Proposal have been established by Roads and Maritime in collaboration with key stakeholders. They are to:

- Build a new bridge over Sportsmans Creek, Lawrence
- Enhance road safety for motorists, residents, cyclists and pedestrians
- Improve traffic efficiency within Lawrence
- Improve road transport productivity, efficiency, maintainability and reliability
- Support local and regional economic development

- Allow for safe removal of the existing bridge, in support of the Timber Truss Bridge Conservation Strategy (Roads and Maritime 2012a)
- Minimise the impact on the natural, cultural, social and built environment
- Consider community views
- Deliver value for money
- Facilitate handover of the new bridge and associated road work to Council
- Remove the existing Sportsmans Creek bridge.

2.3.1 Supporting objectives

To assist in achieving these project objectives, the following four key supporting objectives have been developed and are listed below.

1. *Improve road safety*

- Minimise vehicle conflict points
- Manage building elements to reduce traffic/access impacts
- Provide a design which requires minimum ongoing operation/maintenance works and minimises the Work Health and Safety (WHS) risk for maintenance personnel.

2. *Improve local traffic efficiency/transport productivity and reliability*

- Reduced travel time
- Increase network capacity
- Business/services patronage
- Reduced road freight user costs
- Property access
- Pedestrian and cyclist safety.

3. *Minimise impact on the natural, cultural and built environment*

- Minimise visual impact
- Minimise ecological impact
- Minimise impact on heritage
- Minimise noise and air quality impact
- Minimise impact on drainage/water quality/flooding
- Minimise impact on property
- Minimise impact on the social environment.

4. *Provide value for money*

- Provide a design that is affordable and within the capital budget for the project.

2.4 Alternatives and options considered

This section of the REF is derived from the *Sportsmans Creek new bridge Preferred Option Report* (Roads and Maritime, 2014a), the Sportsmans Creek new bridge Recommended Option Report (Roads and Maritime, 2013) and summarises the process used to develop and assess the concept options and presents the findings of the assessment. The selected preferred option at the end of this process is the bridge and road design that are the subject of assessment in this REF.

2.4.1 Method for selection of preferred option

The process of assessing and determining a preferred option was based on the principles of a Multi Criteria Analysis (MCA). This allows preferences to be objectively established between options using criteria relevant to the needs of the project and ensuring transparency.

An overview of the process is presented below in Figure 2.2.

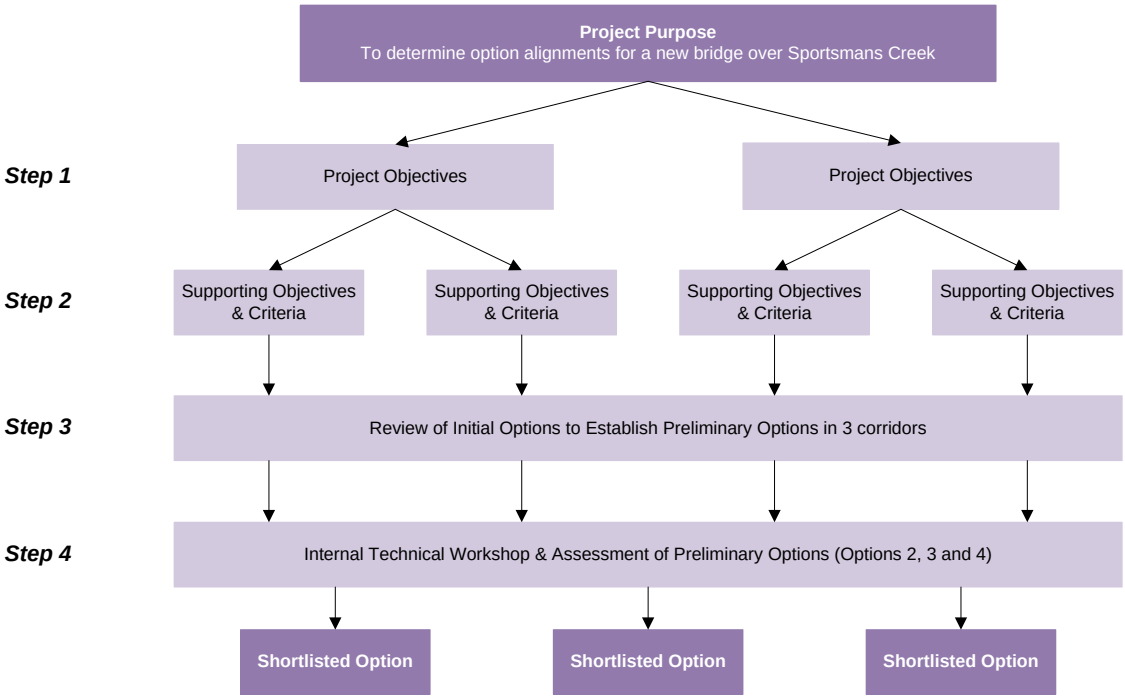

Figure 2.2 Assessment methodology

The supporting objectives proposed in Section 2.3.1 formed the basis for the MCA assessment and the general framework with which the preliminary options were reviewed and assessed.

2.4.2 Identified options

An initial workshop and site visit were carried out in Lawrence on 25 and 26 June 2013 as part of the project familiarisation and were attended by members of the project team. At the workshop a significant number of diverse options were identified and categorised into three corridors. The three corridors are described in Table 2.1.

Table 2.1 Identified Options

Corridor	Corridor Description
Western	This corridor consists of a new bridge to the west of Grafton Street.
Grafton Street	This corridor consists of a new bridge in the vicinity of Grafton Street.
Bridge Street	This corridor consists of a new bridge in the vicinity of existing Bridge Street location.

The workshop then examined the three corridors to identify issues associated with each corridor. As a result, six options were further developed. These preliminary options are illustrated in Figure 2.3.

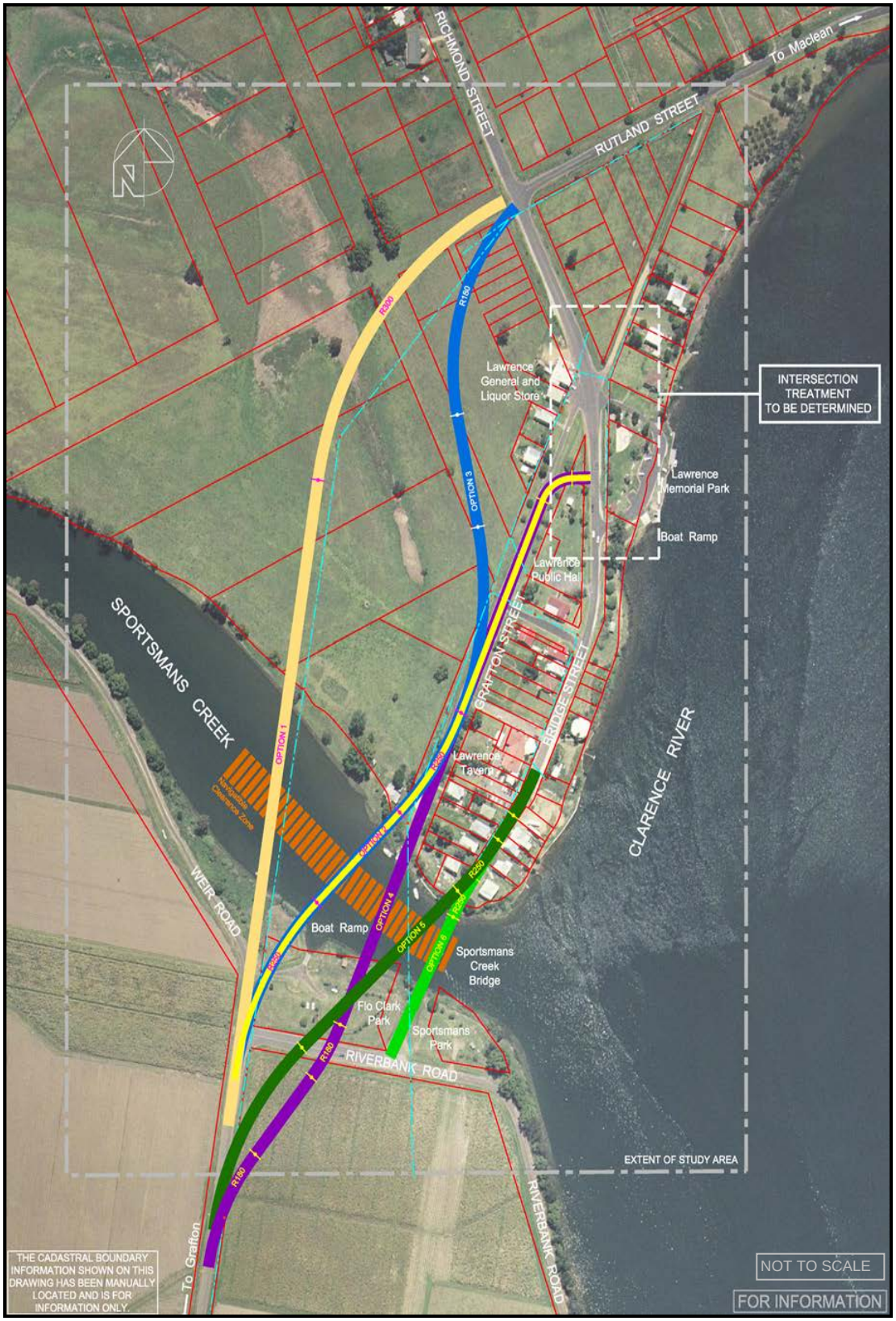

Figure 2.3 Preliminary alignment options

The six options were categorised into the following corridors within the study area:

- Western corridor – Option 1
- Grafton Street corridor – Options 2, 3 and 4
- Bridge Street corridor – Options 5 and 6.

Key features of each option are summarised in Table 2.2.

Table 2.2 Description of each initial option

Option	Description
Option 1	This option has a new bridge crossing to the west of Grafton Street and connects to the intersection of Richmond and Rutland Street. New intersections and local realignment of Weir Road and Ensbey Road would be required. Alternative access to the Boat Ramp would be required from Ensbey Road. This option had environmental constraints through disturbance to vegetation, soft soils, property acquisition, Aboriginal cultural heritage and ephemeral wetlands.
Option 2	This option has the same horizontal alignment starting point as option 1 with a different alignment crossing the creek to connect into the existing Grafton Street. New intersections and local realignment of Weir Road, Ensbey Road and Bridge Street would be required. Alternative access to the Boat Ramp would be required from Ensbey Road. Local adjustments for property accesses would be required along Grafton Street.
Option 3	This option has the same southern alignment as option 2. The alignment then diverges to the west of the Lawrence General and Liquor Store and connects to the intersection of Richmond and Rutland Street. New intersections and local realignment of Weir Road, Ensbey Road and Bridge Street would be required. Alternative access to the Boat Ramp would be required from Ensbey Road. Local adjustments for property accesses would be required along Grafton Street.
Option 4	This option follows the existing Grafton Street alignment with an intersection connecting to Ensbey Road and Bridge Street. New intersections on Ensbey Road and Bridge Street would be required. Local adjustments for property accesses would be required along Grafton Street. Acquisition of cane land on the southern approach is required.
Option 5	This option follows the existing Bridge Street alignment with the new bridge to the west of the existing structure. A new intersection with the Ensbey Road would be required. Local adjustments to heritage-listed properties and property accesses would be required along Bridge Street. Acquisition of cane land on the southern approach is required.
Option 6	This option follows the existing Bridge Street alignment with the new bridge in the same location of the existing structure. A temporary crossing structure or long term closure would be required to facilitate building work.

Do Nothing Option

The workshop participants also considered the “do nothing” option. It was concluded that the “do nothing” option would not meet the Proposal objectives and would not address future needs of the freight route for the existing bridge. Consequently it would not result in any improvement to road safety or traffic efficiency.

The “do nothing” option would also not address the need for ongoing expensive maintenance on the timber truss bridge and would not lead to safety improvements. For these reasons, the “do nothing” option was not progressed further.

2.4.3 Analysis of options

An internal technical workshop was held in August 2013 to assess the six preliminary options using the adopted MCA criteria. The objective of this workshop was to confirm and agree on a shortlist of options to take forward to the next stage of the project. The workshop was attended by 21 representatives including the project team and Roads and Maritime stakeholders. The assessment involved scoring each option against the four Proposal supporting objectives. ‘Pros and Cons sheets on the six preliminary options were created to allow participants to record their options of positive and negative aspects of their options. The rating sheets were discussed within the groups and reviewed by all participants, to agree an overall rating.

Following the assessment process, each option was scored and subsequently ranked to identify the best performing options to be carried forward for further assessment. These results are summarised in Table 2.3.

Table 2.3 Assessment rankings for initial options

Groups	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Group 1	13	17	15	15	6	5
Group 2	12	20	15	16	8	4
Group 3	12	15	13	18	11	9
Group 4	15	18	17	20	5	4
Total Score	52	70	60	69	30	22
Overall Rank	4	1	3	2		

Based on the assessment rankings above, the workshop agreed on the following shortlist of options:

- First preference Option 2 (Grafton Street corridor)
- Second preference Option 4 (Grafton Street corridor)
- Third preference Option 3 (Grafton Street corridor).

Option 1 (west of Grafton Street) was excluded on the basis of anticipated high project costs predicted to be beyond the financial scope of the Proposal and also on the basis of impacts on ephemeral wetlands.

2.5 Preferred option

Following the Internal Technical Workshop, the shortlisted options were reviewed by Roads and Maritime in conjunction with Transport for NSW.

This review concluded that Option 2 was the preferred option to be taken forward for community display and comment as it provided key benefits in comparison to

Options 3 and 4. Option 2, as the preferred option, is to build a new bridge west of the existing Sportsmans Creek bridge and boat ramp. This new bridge would connect the Grafton – Lawrence Road with Grafton Street and re-join Bridge Street at of the Lawrence General and Liquor Store. The preferred option as announced to the community is shown in Figure 2.4 .

The key benefits of the preferred option include:

- Makes use of existing roads and minimises development on greenfield sites
- Maintains passing trade for local businesses
- Connects Flo Clark Park and Sportsmans Park
- Enables access to the boat ramp for sail boats
- Delivers value for money
- Minimises impact on natural wetlands
- Reinforces the original town plan
- Reduces fragmentation of the Heritage Conservation Area of Lawrence
- Minimises property acquisition on the southern approach to the new bridge
- Does not impact prime agricultural land
- Does not fragment Flo Clark Park.

2.6 Design refinements

A number of investigations following the selection of the preferred option have been carried out. These activities and refinements included (refer Table 2.4):

- Field ecological survey and microbat investigation
- Flood modelling and investigation
- Noise and vibration modelling and assessment
- Field geotechnical investigations
- Aboriginal cultural heritage due diligence assessment
- Concept design road safety audit
- Further development of the strategic concept design to incorporate actions from the value engineering workshop and community consultation (refer to Table 2.5).

Table 2.4 Summary of investigations and design refinements

Work	Description and Issue addressed
Ecological investigation	A targeted field assessment of the existing bridge for the Large-footed Myotis (*Myotis macropus*) was carried out on 16 December 2013 and 3 February 2014 (which coincided with breeding periods) via direct inspection from a boat with scaffolding. The purpose of the survey was to identify species present, numbers, breeding status, roost habitat features and locations. The survey found around 300 Large-footed Myotis (*Myotis macropus*) were recorded roosting at the bridge during both surveys (308 and 301). The population comprised adults and young indicating a breeding population. It also noted that the existing bridge had a number of roosting sites. This information has led to the consideration of bat habitat in the new bridge design as discussed in Section 6.3.

Work	Description and Issue addressed
Flood investigation	A flood model was prepared and analysed to review the impacts of major flood events on the proposed bridge. The purpose of this investigation was to identify peak flow velocities in Sportsmans Creek to facilitate design of the proposed bridge to accommodate large storm events. It was determined that the proposed bridge would not increase flow velocities by more than 10 per cent from the base case and a negligible effect on the floodplain. No significant scour is anticipated, given the configuration of proposed bridge structure. Community consultation with Lawrence residents experienced with the flooding conditions revealed that the southern end of Bridge Street, including the stone wall, provides an effective local flood protection to adjacent properties and this would be retained as part of the Proposal. A further flood study has been completed for the Proposal which determined that the new bridge design would not result in any changes to flood patterns. The results of this study are discussed in Section 6.2 and Appendix I.
Noise and Vibration	Detailed investigation into operational and building noise and vibration impacts was carried out to better inform the Proposal team on any likely mitigation measures needed for the recommended option. These measures are discussed in Section 6.4.5.
Geotechnical	Geotechnical field investigations focusing on the preferred option 2 were carried out in late 2013 to facilitate further development of the design. A report discussing these investigations and more recent additional investigations within Sportsmans Creek was produced in March 2014 and is provided in Appendix B. The outcomes of these investigations were fed into the design refinements discussed in Table 2.5.
Archaeological due diligence assessment	An archaeological due diligence assessment including field investigation was carried out by McCardle Cultural Heritage on 10 March 2014. The assessment is included in Appendix C and summarised in Section 6.6 of this REF. The assessment identified that the investigation area has been subject to significant impacts including clearing, excavation works for tracks, roads, the current bridge, a boat ramp, housing and infrastructure, and picnic areas. Further that the alluvial plains may have provided resources for hunting and/or gathering, such landforms present in the investigation area were not suitable for occupation. As the investigation area is situated within the Sportsmans Creek alluvial plains and is highly disturbed, no sites or PADs were identified within the investigation area. No further archaeological works are required for the proposed development. The assessment did not result in any design refinements and confirmed the suitability of the location of the preferred option to avoid any impact upon known items of Aboriginal heritage significance.

Work	Description and Issue addressed
Concept design road safety audit	To identify potential deficiencies with the recommended option at an early stage and to allow improvements to the alignment to be carried out, an independent road safety audit was prepared for the strategic concept design of the preferred option. This safety audit examined the proposed bridge, with consideration of the surrounding road environment and the tie-in with the existing surrounds. Potential safety issues and deficiencies were identified and documented. Following the safety audit, a total of 22 deficiencies were identified either with the existing road network or the preferred option configuration. Three were identified as being high risk and mitigated as follows: • Implementing a gateway treatment on the approach to Lawrence to prevent vehicles travelling faster than the prescribed conditions and increasing risk of a crash • Inclusion of pedestrian footpaths to avoid trips and falls • Installing delineation of road alignment markers or guide posts on Grafton Street. Where appropriate, the remedies have been incorporated into the development of the strategic concept design for the preferred option. These would be further refined during the detailed design process.

Design refinement following the value engineering workshop, constructability, safety investigations and community consultation are summarised in Table 2.5.

Table 2.5 Post value engineering road and bridge design refinements

Project element	Design improvements
Northern intersection alignment	Alignment was adjusted to increase the clearance to the Lawrence General and Liquor Store fuel bowser and tank.
Bridge pile cap	Pile cap eliminated at water level. The pier columns/piles would extend through to the headstock level of the substructure and would minimise the need for working over water.
Bridge abutment height	Refined height of the abutment to improve aesthetics and minimise earthworks and settlement issues for the embankments.
Bridge five span structure	Bridge spans refined to a five span structure instead of four spans to improve aesthetics by providing shorter spans at the ends of the bridge.
Bridge shoulder width	The shoulder width across the bridge to be reduced to 1.0 m instead of Council standard 1.5 m , subject to consideration of real cost savings and the acknowledged need for a 2.5 m shared pedestrian and cycle path.
Bridge Columns	The central column on the piers removed so there are only two columns rather than three at each pier. This improves aesthetics and reduces the piling works in the creek.
Grafton Street/Bridge Street intersection	In response to community input and to improve road safety the connection to Grafton Street/Bridge Street was refined to keep the through main road priority.
Southern approach traffic calming	A gateway treatment incorporated on the southern approach as a traffic calming measure. This would be developed during the concept design as identified in the Concept Road Safety Audit.

Project element	Design improvements
Northern approach to the existing bridge	The approach, including the dry stone walls, would remain intact. The turnaround at the southern end of Bridge Street would be shifted further north increasing flood protection for the existing houses in the Bridge Street. The works associated with the removal of the existing Sportsmans Creek bridge would be assessed in a separate REF.
Southern end of Bridge Street	To be regarded and landscaped in consultation with the Council. This would unite Flo Clark Park and Sportsmans Park into one entity. The works associated with the removal of the existing Sportsmans Creek bridge would be assessed in a separate REF.

In addition to these improvements, the alignment of the bridge was moved slightly to the west (upstream) to increase the clearance to the Flo Clark Park boat ramp on the southern abutment. This also increases clearances to the properties on the eastern side of Grafton Street adjacent to the northern abutment and enables the existing access road to these properties to remain open. The final preferred option which was announced to the community in July 2014 is shown Figure 2.4 and Figure 2.5.

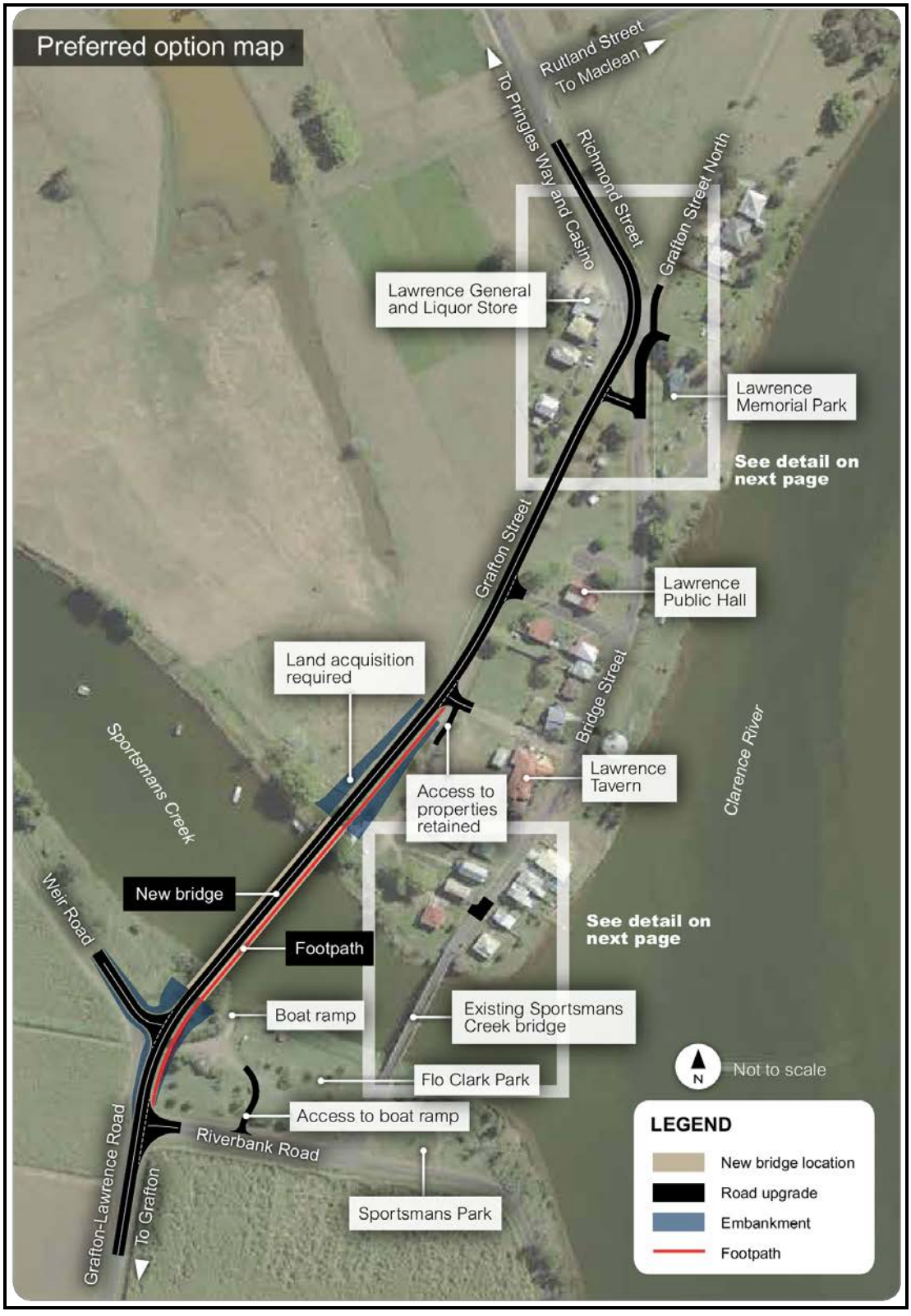

Figure 2.4 Preferred option for the Sportsmans Creek new bridge

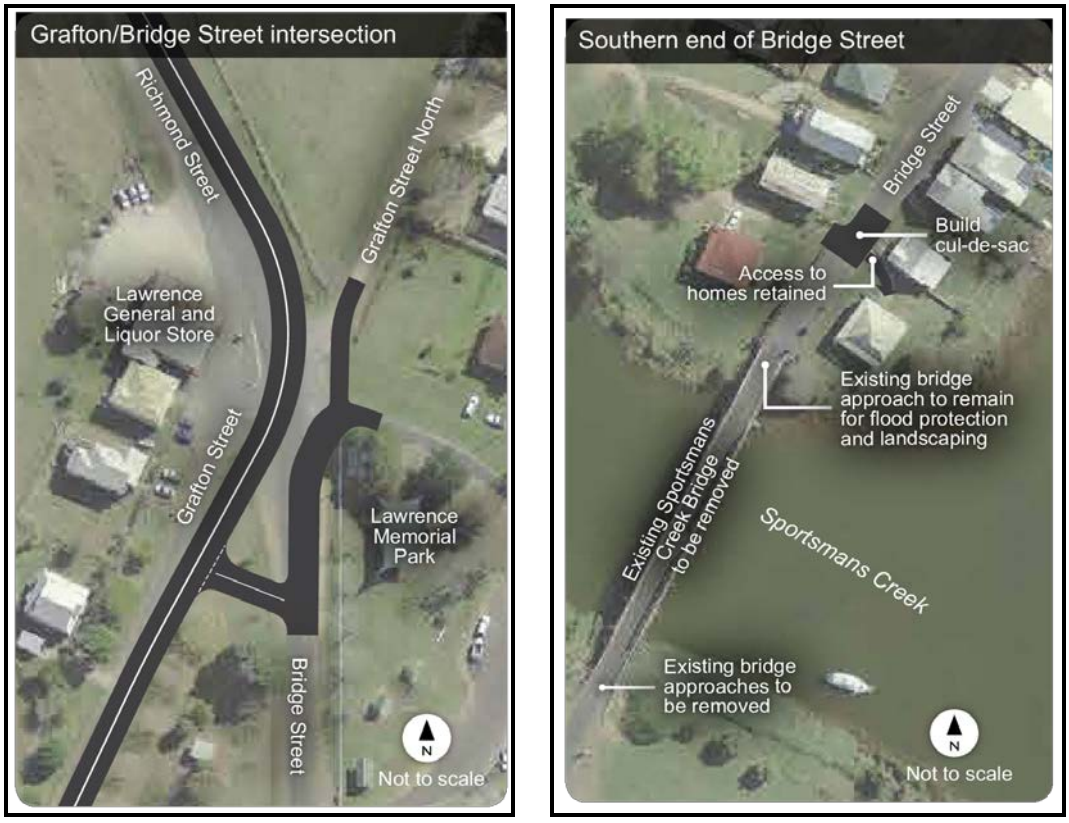

Figure 2.5 Preferred intersection treatments

3 Description of the Proposal

3.1 The Proposal

The Proposal is located about 100 m upstream of the existing Sportsmans Creek bridge in Lawrence. The Proposal involves building a new bridge to replace the existing timber truss bridge as well as road upgrades and intersection treatments as shown in Figure 3.1 and Figure 3.2. More detailed concept design drawings of the Proposal are provided in Appendix A and photographs of the location of the new bridge on Sportsmans Creek are shown in Plates 3.1 to 3.8.

The abutment works required near the existing Sportsmans Creek bridge and adjacent works on Bridge Street are not assessed by this REF and would be subject to a separate assessment as part of the bridge removal.

The key features of the Proposal are as follows:

- Building of a new two-lane bridge at Sportsmans Creek about 145 m long, 13.3 m wide and incorporating a 2.5 m shared path for pedestrians and cyclists
- Regular performance barrier along the length of the bridge
- A navigational vertical clearance equal to the existing bridge or minimum 4.4 m above the mean high water level
- Intersection treatment on Grafton/Bridge Street, upgraded to give priority to through traffic travelling on Grafton Street and Richmond Street (refer to Plate 3.1)
- Drainage works and road upgrade for the properties accessed from Grafton Street north (refer to Figure 3.1 and 3.2)
- Intersections for Ensbey Road and Weir Road (refer to Plate 3.3)
- Building of a gateway treatment on the southern approach as a traffic calming measure
- A new access from Ensbey Road into Flo Clark Park for boat ramp access
- Acquisition and removal of building structures on Lot 1 Section 5 DP758604 (This Lot has been acquired by Roads and Maritime)
- Adjustment of utilities, including the relocation of power poles for the 66 kV and 11 kV power lines in the vicinity of the new bridge in Flo Clark Park
- Provision of street lighting.

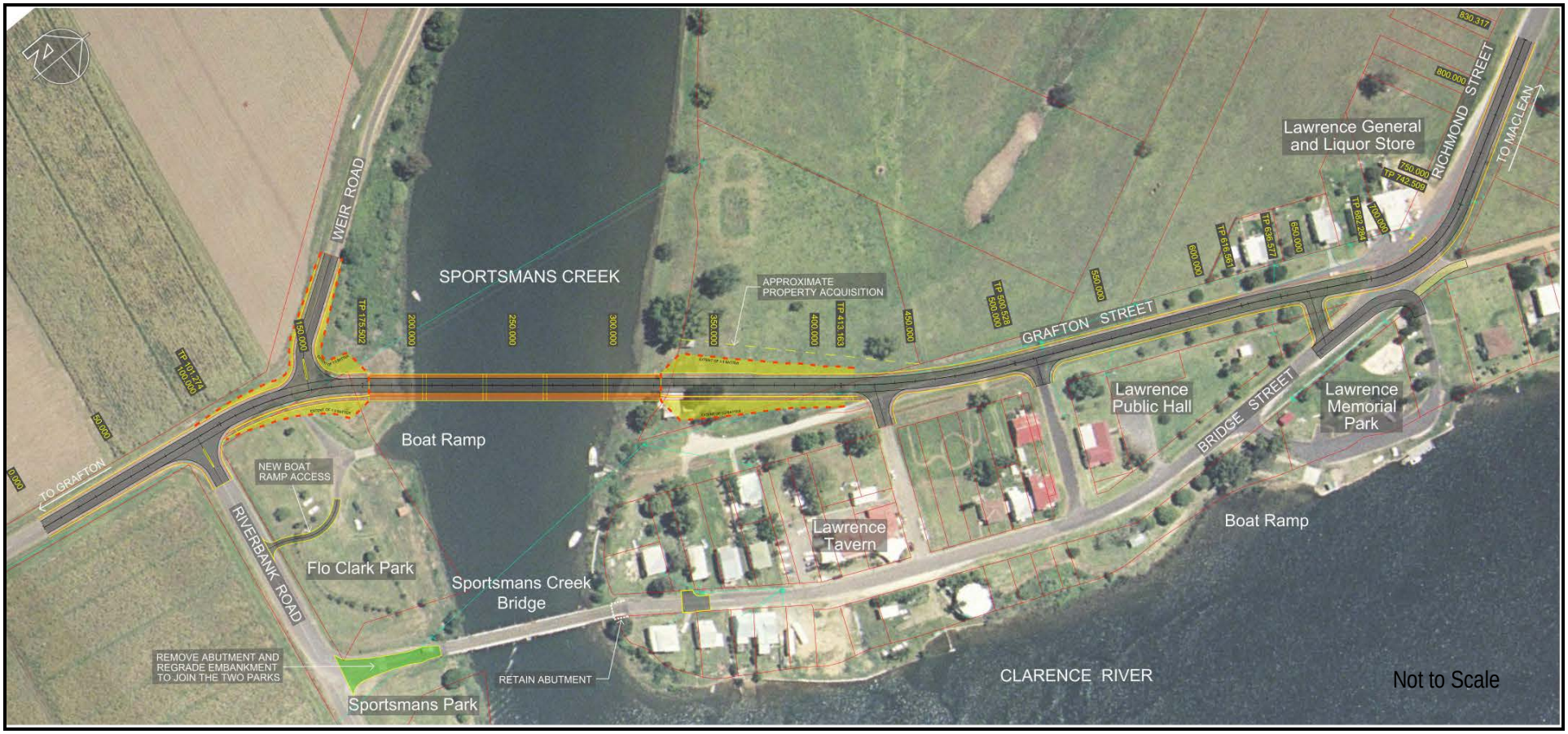

Figure 3.1 The proposed new bridge alignment over Sportsmans Creek (concept design)

Figure 3.2 Proposed intersection treatments for preferred option showing turning paths (concept design)

Plate 3.1 **Standing at the location of the southern abutment, looking towards the northern abutment**

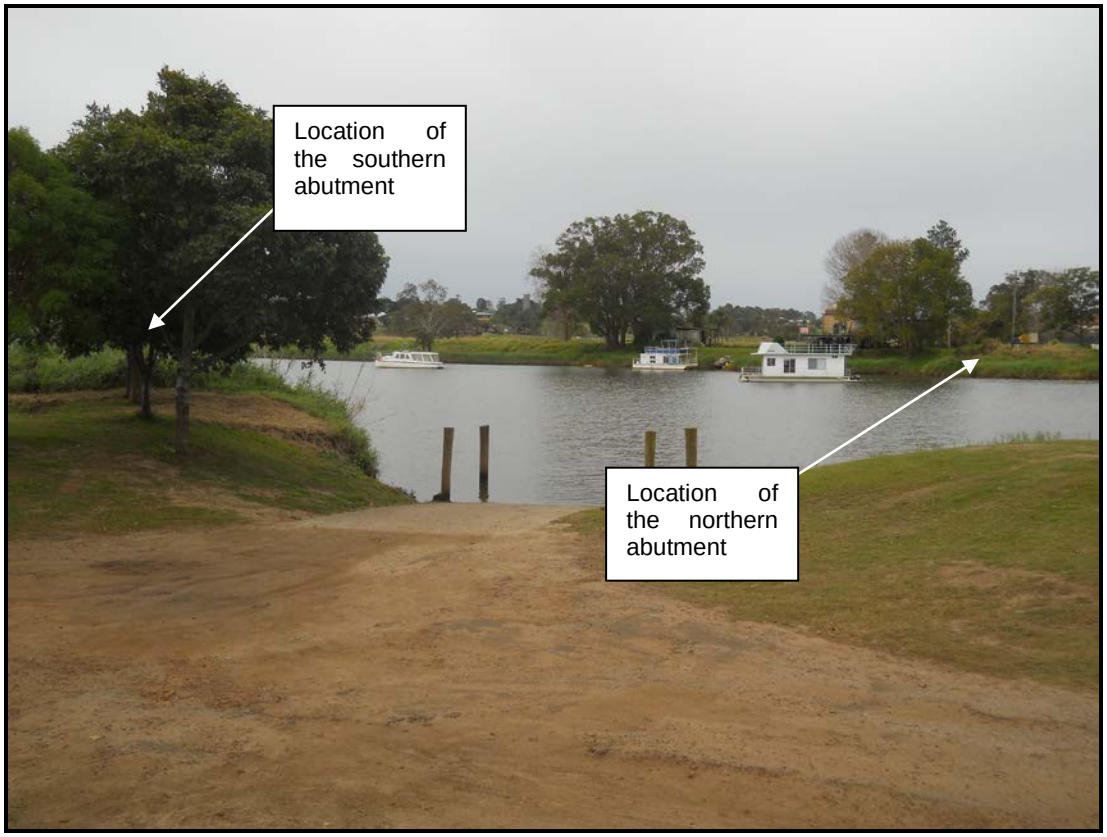

Plate 3.2 **Looking at the southern abutment across Sportsmans Creek from Flo Clark Park**

Plate 3.3 **Standing on the location of the northern abutment, looking towards the south over Sportmans Creek along the alignment**

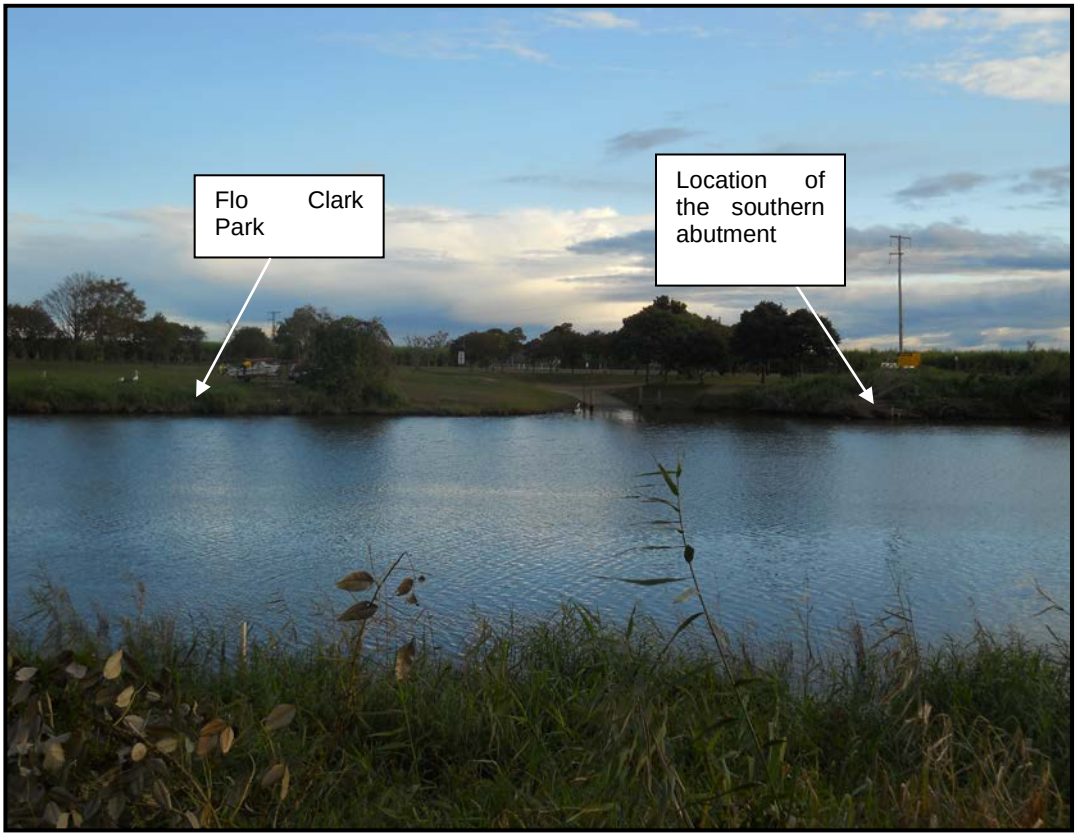

Plate 3.4 **End of Grafton Street towards Flo Clark Park**

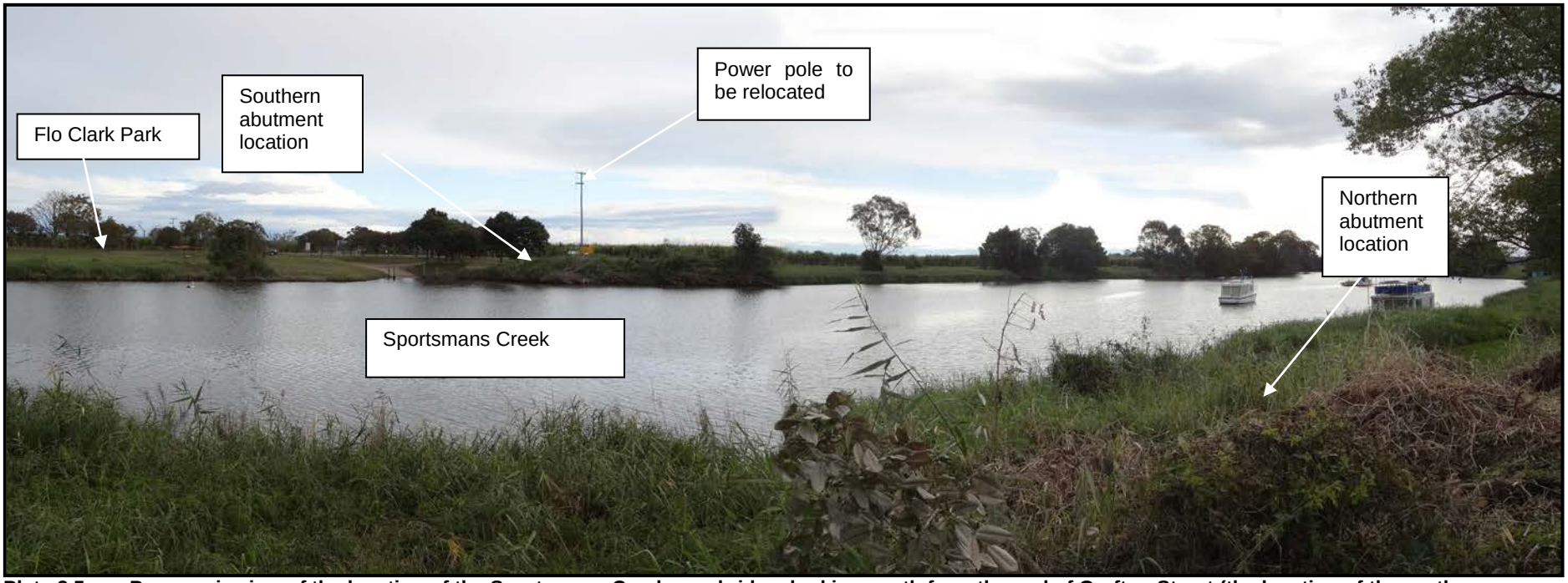

Plate 3.5 **Panoramic view of the location of the Sportsmans Creek new bridge, looking south from the end of Grafton Street (the location of the northern approach) towards the southern approach**

Plate 3.6 **Grafton Street/Bridge Street junction to be upgraded (looking north from Lawrence Memorial Park)**

Plate 3.7 **Drainage and property access to be upgraded on Grafton Street**

Plate 3.8 Ensbey Road/Weir Road to be upgraded (looking south from Flo Clark Park)

3.2 Design

3.2.1 Design criteria

The design of the Proposal has been prepared with reference to the following:

- Austroads Guide to Road Design (Austroads 2009)
- Roads and Maritime Supplements to Austroads Guides (Roads and Maritime 2009)
- New South Wales Development Design Specification D1, AUS-SPEC Geometric Road Design, Urban and Rural (AUS-SPEC 2006) as applying to Clarence Valley Council LGA.

Table 3.1 below provides a summary of the key design criteria used in developing the concept design.

Table 3.1 Key road design criteria

Design Criteria	Design Requirement
Horizontal Alignment – Design Speed	50 km/hr
Vertical Alignment – Design Speed	50 km/hr
Crest 'K' Parameter	5.2
Sag 'K' Parameter	4
Lane width	3.5 m
Shoulder width	

Design Criteria	Design Requirement
- Bridge - Road	1.0 m 1.5 m
Maximum Vertical Grade	5 %
Maintains existing Navigable Clearance	Minimum 4.4 m above the mean high water level

Further design aspects, including superelevation design, safety barrier design, earthworks, sight distance checks, pavement widening and aquaplaning checks would be considered during concept and detailed design.

Appendix A shows the strategic concept design drawings, including typical cross-sections for the Proposal.

3.2.2 Engineering constraints

Engineering constraints identified for the design and build phases include:

- Transport and installation of the bridge girders, due to their size and weight, as well as equipment in general
- Presence of soft soils, particularly on the southern approach foundations and in the waterway channel
- Presence of Acid Sulphate Soils requiring management during works in-stream and on the banks of Sportsmans Creek to avoid impacts upon water quality if oxidised
- Potential for contaminated soils located near the petrol bowser on Bridge Street
- Trafficability on compressible soils
- Designing for a navigable clearance consistent with existing bridge, minimum 4.4 m above the mean high water level
- Flooding in both Sportsmans Creek and the Clarence River
- Utilities within proximity of the Proposal (refer to Section 3.5)
- Maintaining access on the existing bridge during building of the new bridge.

3.2.3 Major design features

The new bridge includes a five-span bridge with a total length between the centrelines of the bridge abutments 145.9 m. The bridge has been designed with a minimum navigational vertical clearance of 4.4 m on the central span. Design criteria for the bridge is detailed in Section 3.2.1 and include:

- Set-back of bridge abutments from the Sportsmans Creek banks due to geotechnical considerations
- A straight bridge alignment and deck, with a width of about 13.3 m
- A vertical profile of the road along the structure to a maximum grade of about 4.3 per cent
- The bridge superstructure consisting of seven 1500 mm deep precast prestressed concrete girders (Super T), with a reinforced slab of 240 mm minimum thickness
- The first span at each end of the bridge would be of 27.5 m long. The three central spans would be 30 m long.
- Piers consisting of two piles per support.
- One metre shoulders and a 2.5 m wide shared pedestrian and cyclepath.

The general arrangement strategic concept drawings for the bridge are provided in Appendix A.

3.3 Construction activities

3.3.1 Work method

The indicative proposed work methodology is discussed below.

It should be noted that a broader scope of methodology is assessed in this REF as the final work methodology would be determined during detailed design, including the sequencing of construction steps.

Building of the Proposal would be carried out in four key activities:

1. Site establishment
2. Road treatments and Intersection upgrades
3. Building of the new bridge
4. Site disestablishment.

Site Establishment

- Consultation with Council and other agencies to announce the start date on site and temporary closure of the boat ramp
- Install site perimeter fencing
- Temporary traffic management arrangements
- Install environmental controls including temporary or permanent fencing and erosion, sedimentation and drainage controls
- Remove vegetation as required in Flo Clark Park
- Utility adjustment including the relocation of power poles within Flo Clark Park
- Import fill and carry out earthworks/surface compaction works to establish site compound and prepare for the building of the bridge approach
- Establish a southern site compound in Flo Clark Park
- Remove buildings on Lot 1 Section 5 DP758604 and clear vegetation as required
- Establish a northern site compound on Lot 1 Section 5 DP758604
- Establish stockpile sites and access tracks within the compound sites.

Road Treatments and Intersection upgrades

- Inform Council and local residents of works
- Obtain approvals from Council
- Install building signage
- Implement traffic control arrangements
- Install environmental controls including temporary or permanent fencing and erosion, sediment and drainage control measures
- Drainage work and structures
- Excavate existing surface using earthwork machinery and equipment
- Recycle suitable excavated material and incorporate suitable material in earthworks
- Truck any unsuitable materials off-site
- Place new road material
- Compact the resultant surface using compaction equipment
- Seal pavement using roadwork machinery and equipment

- Progressive landscaping and re-vegetate
- Install fencing
- Rehabilitate private access driveways
- Install line marking, street lighting, signs and guide posts.

Building of temporary working platforms for the new bridge

Subject to the building method chosen and construction contractor program of works, temporary working platforms may also be built. These platforms would be located within the building work zone and would extend from the existing banks into the river to enable stable and safe access to construction barges and platforms, and piling areas as required. Any temporary work platforms would be designed in accordance with the following principles:

- Built of hard, sound, durable rock free of fine particles and not contaminated with foreign materials
- Designed to allow for effective and regular clean-up of sediment and spill management
- Designed to prevent small rock or fine capping materials from being washed out of the platform
- Designed and operated in a manner that minimises the re-suspension of sediments or substrates
- Remain in the waterway for the minimum time possible
- Contained to ensure durability during a 1:10 year average rainfall interval flood event as a minimum
- Be protected by anti-pollution booms and heavy duty silt curtains which are designed, installed/anchored and maintained specific to the waterway
- Anti-pollution booms and heavy duty silt curtains would be installed before the start of any work that may generate sedimentation
- Facilitating appropriate water flow to safely convey water and reduce impacts in high flow events, including but not limited to downstream bank and bed scouring and associated deposition
- Including appropriate fish passage treatments, if required
- No greater than 3 m beyond the first pier from the southern bank and no greater than 3 m beyond the third pier from the northern embankment. This would leave approximately 52 m of open navigable channel.

In designing any temporary working platforms consideration would be given to:

- River flow velocity during non-flood events
- Flooding characteristics including but not limited to afflux constraints (eg proximity of sensitive receivers), catchment size, flow velocity during a 2-year, 10-year and 20-year average recurrence interval flood events, associated potential scour impacts and flood evacuation procedures
- River morphology including but not limited to bed shape, depth, major flow channels and substrate type
- Navigational requirements including but not limited to visibility, speeds and navigational channels
- Commercial and recreational uses of the waterway including but not limited to fishing, water skiing or other leisure activities
- Procurement and delivery of working platform materials and components including but not limited to mobilisation, proximity to existing river structures, transportation/access for barges, access to clean rock (ie hard, sound,

durable rock free of fine particles and not contaminated with foreign materials)
- Maintenance works and associated management (eg refuelling, routine maintenance and spill management)
- Rehabilitation requirements associated with decommissioning
- Applicability of industry innovations and/or sustainability initiatives (eg reuse of materials).

Any temporary working platforms would be developed and designed in consultation with the appropriate regulatory agencies to ensure that potential impacts from the installation, operation and decommissioning of the working platforms are managed to minimise impacts on the surrounding waterways.

Building the new bridge

- Inform Council and local residents of works
- Obtain necessary approvals
- Install construction signage
- Implement traffic control arrangements
- Install sediment controls to prevent material entering the waterway and dispersal of material in waterway (such as floating boom/turbidity curtain)
- Establish temporary access tracks and temporary working platforms (on land and in waterway)
- Build bridge foundations (driven or bored piles, pile caps and footings)
- Build abutments including scour protection and new approaches and backfill as required
- Install bridge superstructure and piers including deck, pavement works (cast in situ or pre-cast bridge elements) and girders either via the completed decks or via temporary bridge/jetty or rock platforms
- Place concrete to deck via completed decks using concrete pumps
- Complete earthworks at the approach slabs
- Install barriers and concrete on kerbs/parapets
- Place the wearing surface on the bridge deck.

Site Disestablishment

- Removal of temporary access tracks and working platforms (on land and in waterway)
- Removal of site compounds
- Complete progressive landscaping and re-vegetation
- Removal of traffic controls and signage
- Removal of environmental controls
- Disposal of acquired land, not dedicated as public road (that is, the remainder of Lot 1 section 5 DP758604).

3.3.2 Construction hours and duration

Building work is anticipated to take about 16 months, starting in January 2016. It is proposed that works would only be carried during daylight hours, as per standard construction hours stipulated in the *Interim Noise Construction Guideline* (DECC 2009).
The hours proposed are:

- Monday – Friday: 7am to 6pm
- Saturday – 8am to 1pm.

No work is proposed on Sunday or on public holidays.

With the exception of emergencies, building activities would not take place outside standard hours without prior notification to local residents, businesses and Council in accordance with the Roads and Maritime *Environmental Noise Management Manual Practice Note VII - Roadworks Outside of Normal Working Hours (RTA 2001).*

3.3.3 Plant and equipment

The following plant and equipment may be required:

- Trucks (for equipment and material transportation)
- Excavators
- Bulldozers, graders, loaders, backhoes
- Compactors, vibratory and drum rollers
- Cranes
- Compressors
- Generators
- Hand tools (such as jack hammers, grinding power tools, chainsaws, etc)
- Shoring
- Scaffolding
- Traffic control equipment
- Paints
- Pre-cast concrete and cement
- Concrete Trucks and Concrete pumps
- Piling rigs (bored or driven)
- Sheet piling
- Site compound equipment (portable toilets, crib room, lockup container)
- Environmental controls (sediment fences, turbidity curtain, sandbags)
- Barges, punts to access the waterway
- Water cart
- Welding equipment
- Bitumen sprayer and ancillary equipment
- Asphaltic concrete paver.

3.3.4 Earthworks

Earthworks would be required on both the southern and northern approaches to achieve the height required for the bridge.

Soil stabilisation work may be required on the southern approach due to the presence of soft soils. This may entail preloading of fill material with or without wick drains. The area adjacent to the southern approach would also be levelled for the installation of the new access to the boat ramp and for the temporary construction compound.

Earthworks would also be required as part of road re-building and intersection treatments associated with the Proposal. The approximate quantities for the Proposal are shown in Table 3.2.

Table 3.2 Approximate Earthworks Volumes

Earthworks	Amount (m^3)
Soil to be excavated (Cut)	4,900
Total fill required	5,600
Imported fill	700

Source and quantity of materials

It is anticipated the Proposal would not generate significant amounts of spoil. Building materials would need to be imported.

This would include materials for:

- Earthworks (general and select fill)
- Rock for temporary access tracks and construction platforms
- Aggregates and sand for drainage
- Road building work
- Concrete for drainage, road surfaces, bridge work and miscellaneous work
- Precast concrete elements for drainage and bridgework (piles, girders and parapets) and miscellaneous work
- Steel for bridge barrier railings and concrete reinforcement
- Bitumen for spray seals and asphalt.

A local water source would also be required for the water supply for the Proposal in the compound.

The sources and quantity of materials are yet to be determined and would most likely be locally sourced. There are a number of existing, approved or potential quarries near the Proposal area which are expected to provide sufficient resources to build the Proposal.

In general all materials and equipment would be brought to the works site via road. However, an assessment is being carried out by a specialist consultant with regard to the best method to bring the bridge girders to site. Due to their size and weight, options are being investigated for delivery by barge or truck transport.

3.3.5 Traffic management and access

Access to the Proposal would be via Grafton-Lawrence Road from the south, and Grafton Street and Bridge Street from the north. It is proposed that works to the intersection of Weir Road/Ensbey Road and Grafton-Lawrence Road as well as a new boat ramp access road would be carried out early to improve access into the compound area and enable works on the southern approach. A detour utilising Greens Lane and Ensbey Road would provide suitable alternative access to the bridge in the event that a full road closure is required for the intersection works. Local access to Weir Road would be maintained during intersection works for residents.

Properties with access on Grafton Street would also need to be consulted with regard to alternative access during the rebuilding of Grafton Street to ensure they are not adversely impacted. It is anticipated that access would be maintained to these properties throughout building of the project.

All traffic management required would be managed in accordance with a Traffic Management Plan (TMP) in the CEMP and the *Traffic Control at Work Sites Manual V4* (RTA 2010). The TMP is to be prepared in accordance with the requirements specified in Section 6.9.6 of this REF.

The waterway would be accessed for building purposes via barge and/or small boat, which could reach the waterway via built temporary platforms as noted in Section 3.3.1.

Public access to the boat ramp in Flo Clark Park would be blocked during building and the waterway may be required to be partially obstructed during this time (refer to Plate 3.9). It is proposed that the span between Pier 2 and Pier 3 would remain open for maritime access throughout the period of building work. However, the placement of the new bridge piles and piers would temporarily restrict transit route options. Also, barges used during piling would temporarily obstruct vessels. The NSW Maritime division of Roads and Maritime has reviewed the Proposal in accordance with clause 16(2)e of the *State Environmental Planning Policy (Infrastructure) 2007* (refer to Section 4.1). The community would need to be consulted before the start of works which would require temporary closure of the public boat ramp. The NSW Maritime division will also need to be informed of any temporary closures.

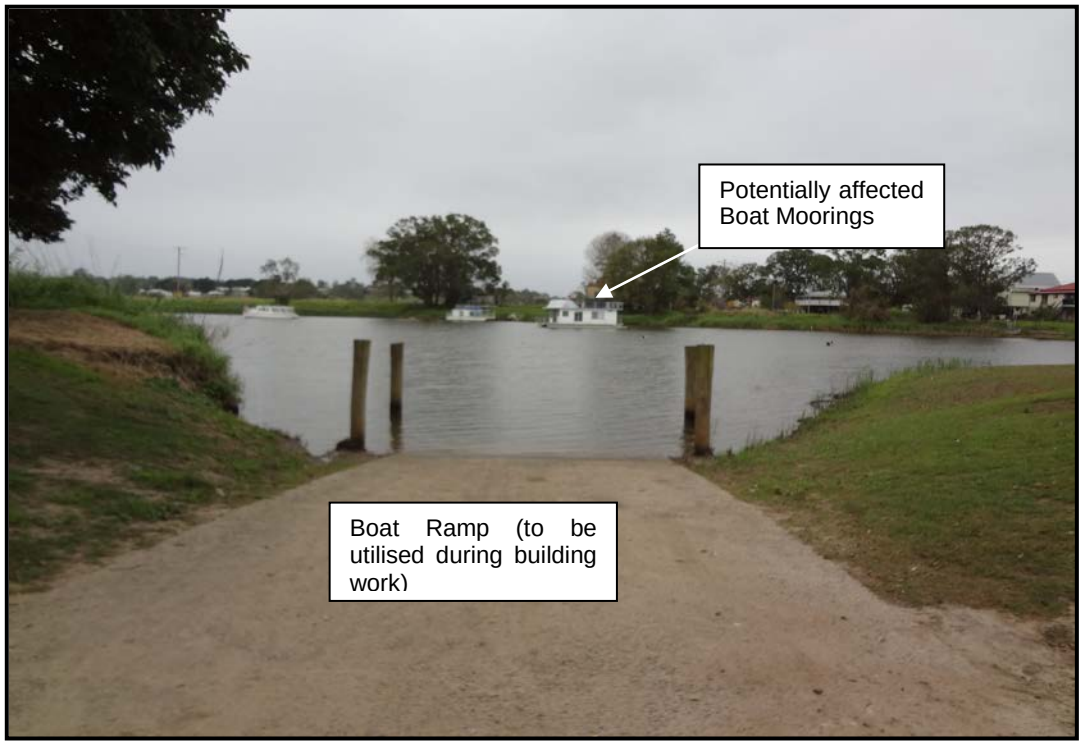

Plate 3.9 Boat ramp access via Flo Clark Park (looking north)

Maritime traffic generated during building of the platforms would be limited to construction barges, vessels used for installing and decommissioning the sediment control devices and vessels delivering materials.

There are existing boat moorings upstream of the proposed bridge. These moorings would need to be relocated during building. Roads and Maritime would consult with the owners of the moorings during the detailed design stage and before building work. Moorings would be reopened after completion of the bridge, although some may be relocated away from the bridge.

3.4 Ancillary facilities

Two site compounds/laydown areas would be required to build the new bridge; one located in Flo Clark Park, adjacent to the southern bridge approach, and the other located on Lot 1 Section 5 DP758604, at 1–9 Grafton Street, Lawrence next to the northern approach (refer to Plate 3.10 and 3.11).

Plate 3.10 Location of southern site compound in Flo Clark Park

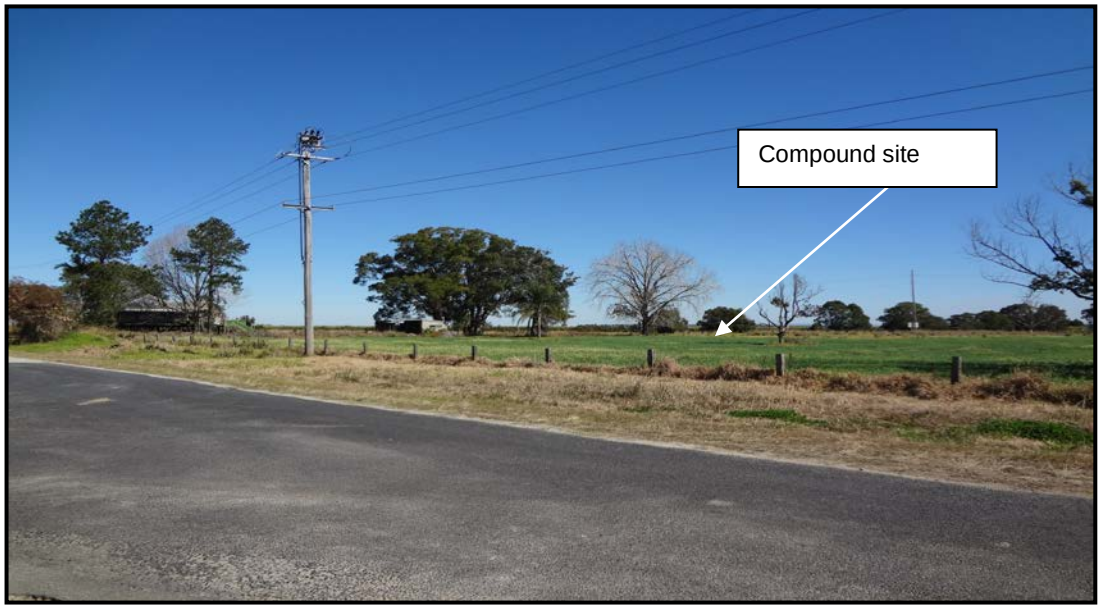

Plate 3.11 Location of compound in Lot 1 Section 5 DP758604

The compound sites would be used for the storage of machinery, site sheds (including site office and portable toilets), fuels and chemicals, waste storage, temporary stockpiles and laydown areas. All structures, storage and stockpiles in this area would need to ensure appropriate distances between the banks of the waterway with provisions implemented to secure the site and remove equipment and

dispersible material in flood events. Parking would also be provided at the compound sites for the small number of workers on site.

All fuels and chemicals would be stored in a double bunded area. It is likely that temporary stockpiles of soil which may be required at the compound sites would contain Acid Sulphate Soils (ASS). All stockpiles would be managed in accordance with Roads and maritime Stockpile Site Management Procedures and the QA Specification R44 – Earthworks. As far as practicable, the size of stockpiles and structures should be limited within the riparian zone to minimise the risk of potential erosion and sedimentation and of water pollution.

If required, a hardstand area would be situated within the compound sites. Minor clearing of vegetation, including weeds and mature trees would be required to establish the compounds sites as discussed in Section 6.3. At present, there is a house and a small shed on the northern compound site, which would require removal.

The compound sites would be securely fenced and signage would be erected to indicate the presence of building works. Signage would also be placed on the southern compound to inform the public that the boat ramp is closed for public access and to utilise the boat ramp at the Lawrence Memorial Park on the Clarence River as an alternative.

Plate 3.12 Access to the northern compound (south facing)

Plate 3.13 Access to the northern compound via Grafton Street (looking north)

Plate 3.14 Existing access into Flo Clark Park and Boat Ramp

Plate 3.15 House to be removed (northern site compound)

3.5 Public utility adjustment

Public utility adjustments would be required to be completed before the start of works. The locations of the existing power lines are shown on Figure 3.1 in blue. Above ground power lines and poles (66kV) are situated near Weir Road, at the location of the southern abutment which would need to be permanently relocated to the west to carry out works. (Refer to Plate 3.16). The final location of poles to be relocated is yet to be determined. However, it is likely that the pole would be shifted by a few metres to the south and would remain within the road reserve. It is also anticipated that one pole on the 11kV line in Flo Clark Park would also need to be relocated and the pole on the northern abutment would not be impacted.

An assessment of the potential impacts of the utility relocation is discussed in this REF in Section 6.10.

Plate 3.16 66kV pole to be relocated at the location of the southern approach

Low clearance telephone lines are situated on the western side of Grafton Street, which may impede access for works and would need to be considered during building work.

Council infrastructure (water supply and sewer) is likely to be situated on the eastern side of Grafton Street at the northern end of the Proposal. Should relocation of this infrastructure be required following detailed design, further advice would be sought from the Roads and Maritime environmental team before undertaking the works.

3.6 Property acquisition

No additional private property acquisition would be required for the Proposal. Roads and Maritime has previously acquired the land located at the northern approach to the bridge (Lot 1 Section 5 DP758604) as shown on Figure 2.4. The land required at the location of the southern abutment in Flo Clark Park (Lot 338, DP 751386) (refer to Figure 2.4) is owned by Council and the acquisition of this land (or a strip thereof for road easement) would be negotiated between Roads and Maritime and Council. A temporary lease arrangement would also be entered into for the use of Flo Clark Park for the compound.

Sportsmans Creek waterway is designated as crown reserve in NSW. A Section 34 'authority to occupy crown land' would be required to be arranged by Roads and Maritime with the Crown Lands Division and the Minister for the purposes of the new bridge building within the crown reserve as per Part 4 of the *Crown Lands Act 1989*. Works proposed on the small strip of reserve land located at the intersection of

Grafton and Bridge Streets (Lot 7014 DP 1126811), also considered crown reserve, would be subject to a section 34 ‘authority to occupy crown land’ approval.

All other works are located in the existing road easements on classified roads as defined under the *Roads Act 1993*.

4 Statutory and planning framework

The following section provides the statutory and planning framework for the Proposal and determines whether the assessment is subject to an environmental impact assessment under Part 5 of the EP&A Act.

4.1 State Environmental Planning Policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)

ISEPP aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent of local government.

As the Proposal is for road infrastructure facilities and is to be carried out by Roads and Maritime Services it can be assessed under Part 5 of the *Environmental Planning and Assessmen*t *Act 1979* (EP&A Act). Development consent from Council is not required.

It should be noted that the Proposal consists of two parts, the first to build the Sportsmans Creek new bridge and the second to remove the existing Sportsmans Creek bridge. Both parts are linked, however this REF assesses only the building of the new bridge and a separate assessment would be carried out for the removal of the existing bridge.

Both parts are able to be assessed separately under the EP&A Act as a lack of interdependence between both activities has been established, that is, the new bridge structure including all approaches could be built without the need to remove the existing bridge. Once the new bridge is completed, the existing Sportsmans Creek bridge would be closed to traffic before removal. Both activities are not reliant upon each other and would involve differing work methodologies and contractor engagements.

The separation of the Proposal into two environmental impact assessments facilitates the timing of building. It also assists in providing alternative habitat to relocate the threatened roosting population of Large-footed Myotis (*myotis macropus*) from the existing bridge before removal, if required. As the removal of the bridge would require the preparation of a Species Impact Statement (SIS), this could be undertaken separately and allow time for building activities to be completed on the new bridge. The removal works would not start until the contractors completing the works for the new bridge have finished, minimising impacts on the microbats and the community. Further investigation and assessment of the methodology and impact of the removal of the existing bridge would be undertaken at a later stage. Further information about the potential impacts during building of the new bridge on the microbat population is provided in Section 6.3.

The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 26 – Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Major Development) 2005.*

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities before the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in chapter 5 of this REF.

4.1.2 State Environmental Planning Policy (SEPP) 71 - Coastal Protection

The purpose of *State Environmental Planning Policy 71 – Coastal Protection* is to assist in regulating planning and development in the coastal zone of NSW. The policy stipulates that significant development in sensitive coastal areas must be referred to the Director-General for comment with development in the coastal zone taking into consideration the NSW Government's *Coastal Policy* (1997). Section 8 of the SEPP also lists a number of matters for consideration that Councils must consider when assessing development applications, such as access to coastal foreshore, scenic values, measures to conserve animals, fish and wildlife corridors, cultural places and items of heritage and water quality.

SEPP 71 applies to all land within the coastal zone, which is shown on the coastal zone mapping provided by the Department of Planning and Environment. The Coastal Zone includes a 1 km stretch of Sportsmans Creek covered by the Proposal. However, as the Proposal is not considered a significant coastal development (as defined under Part 3 clause 9 and Schedule 3 of SEPP71), a referral and an additional development approval is not required.

Although SEPP 71 does not apply to a project of this scale (insofar as significant coastal development provisions), mitigation measures relating to the key coastal themes for this Proposal. This included acid sulphate soils, protection of foreshores, public access, water quality and heritage which have been incorporated into the REF to ensure the protection of land and waterways in the coastal zone and consistency with this SEPP.

4.2 Local Environmental Plans

4.2.1 Clarence Valley Local Environmental Plan 2011

The *Clarence Valley Local Environmental Plan 2011* (Clarence Valley LEP 2011) is the relevant environmental planning instrument for the locality. However, the provisions of the ISEPP state *inter alia* that development for the purposes of roads can be carried out by a public authority without consent from local government, therefore the proposed development would not be assessed under the LEP. In any case, the land use zoning and relevant local policies are of interest to the proposed bridge's development but would not to be determined by Council under the local planning instrument. A review of Council's Geographic Information System (GIS) data for land use zoning is illustrated in Figure 4.1.

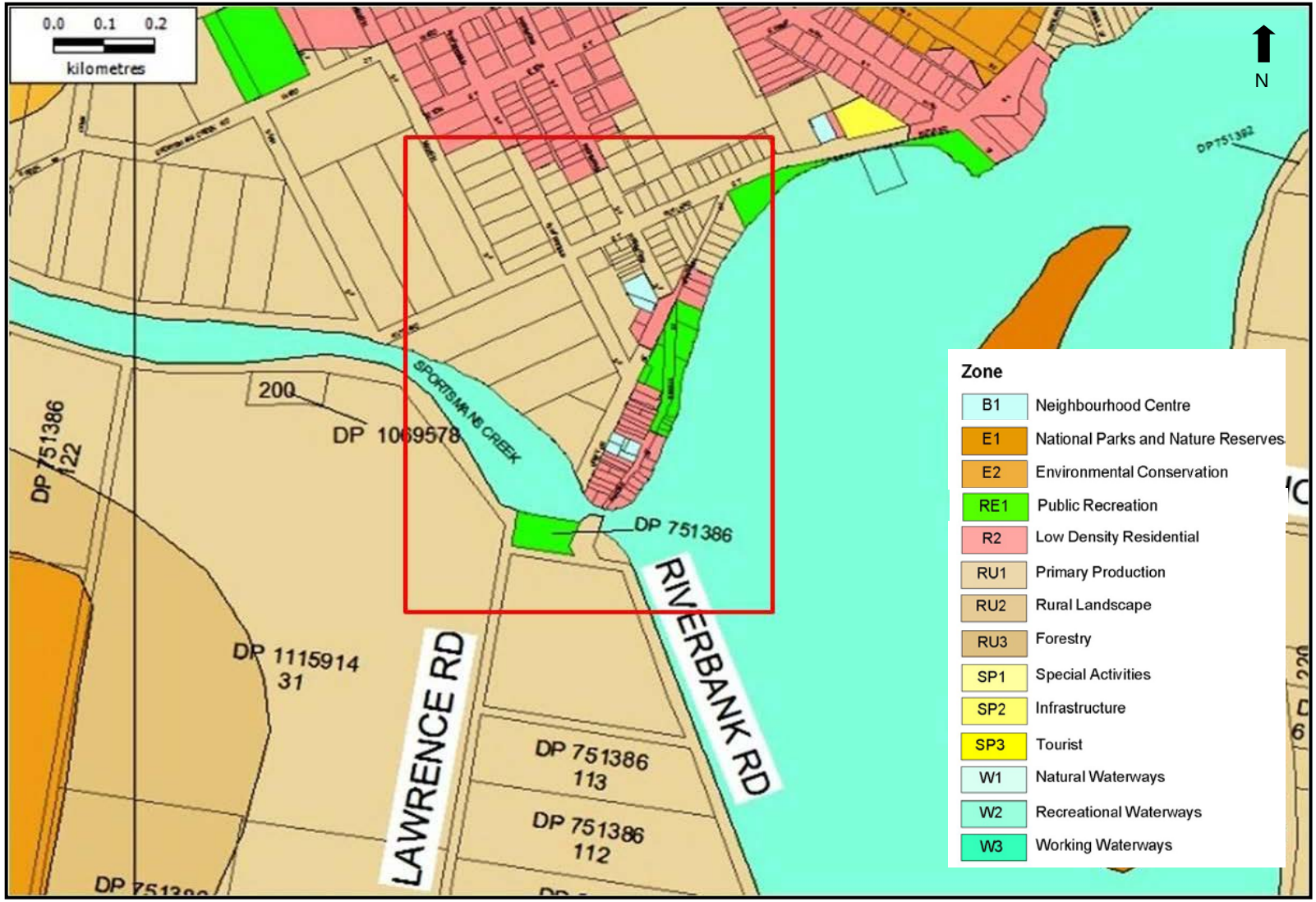

Figure 4.1 Clarence Valley LEP Zoning (Source: Clarence Valley LEP 2011, Land Zoning Map)

Land Use Zoning and Development

The land use zoning along the bridge route is comprised of the following land use zonings; RU1 – Primary Production, RE1 – Public Recreation, B1 – Neighbourhood Centre (pale blue) and R2 – Low Density Residential (pink). Table 4.1 details the objectives of the zones and the Proposal's consistency against them.

Table 4.1 Applicable Clarence Valley LEP2011 Zoning

Zone	Objectives	Consistency against objectives and permissibility
RU1 – Primary Production (light brown)	a) To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. b) To encourage diversity in primary industry enterprises and systems appropriate for the area. c) To minimise the fragmentation and alienation of resource lands. d) To minimise conflict between land uses within the zone and land uses within adjoining zones. e) To prevent dispersed rural settlement. f) To ensure that development does not unreasonably increase the demand for public services or public facilities. g) To ensure development is not adversely impacted by environmental hazards.	The Proposal would be considered as consistent with the zone's objectives and by improving the flow of traffic through Lawrence, the Proposal would be of general benefit to primary production and the town's rural amenity.
RE1 – Public Recreation (lime green)	a) To enable land to be used for public open space or recreational purposes. b) To provide a range of recreational settings and activities and compatible land uses. c) To protect and enhance the natural environment for recreational purposes.	The Proposal is consistent with the objectives of this zone and aims to expand the amount of area available for recreational use in the community by joining Sportsmans Creek and Flo Clark Park following the completion of building work.
R2 – Low Density Residential (pink):	a) To provide for the housing needs of the community within a low density residential environment. b) To enable other land uses, that provide facilities or services to meet the day to day needs of residents.	The Proposal is consistent with the objectives of the zone and does not modify the existing land uses that provide facilities or services to meet the needs of residents.

Zone	Objectives	Consistency against objectives and permissibility
B1 – Neighbourhood Centre (pale blue)	a) To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood. b) To reinforce the neighbourhood centres of Coutts Crossing, Glenreagh, Lawrence and Ulmarra as the locations for commercial premises. c) To minimise conflict between land uses within the zone and land uses within adjoining zones. d) To enable other land uses that are compatible with and do not detract from the viability of retail, business and community uses within the zone.	The proposal is consistent with this zone and will improve traffic flow through Lawrence, providing access to existing businesses and ensure their ongoing viability.

Acid Sulphate Soils

In addition, the Clarence Valley LEP 2011 includes a mapping layer which indicates the potential for Acid Sulphate Soils (ASS) classes in the Proposal area. The potential impacts and safeguards for ASS are discussed further in Section 6.1 of this REF.

Schedule 5 Environmental Heritage

A number of heritage items listed on the Clarence Valley LEP 2011 Schedule 5 heritage list, including the Lawrence Conservation Area, are present within the Proposal area. These are discussed further in Section 6.7 and as part of the *Historical Archaeology and Heritage Values of the Sportsmans Creek bridge Precinct, near Lawrence, NSW: Recommended Option Report* (Maxim Archaeology & Heritage 2013) provided in Appendix D.

4.3 Other relevant legislation

4.3.1 Crown Lands Act 1989

The *Crown Lands Act 1989* (CL Act) is administered by the NSW Department of Trade and Investment (Crown Lands Division). The broad purpose of the CL Act is to ensure that Crown Land is managed for the benefit of the people of NSW and to provide for the assessment, management, development, reservation and conservation of Crown Land in accordance with the Principles defined under Section 11 of the CL Act. Crown Land generally refers to land dedicated for a public purpose and includes reserves and submerged land.

As works are proposed on Crown Land near the intersection of Bridge and Grafton Streets (Lot 7014 DP1126811, refer to Figure 3.1) and in Sportsmans Creek, the Proposal has the potential to impact upon Crown Land. This is discussed further in Section 6.10 of this REF. A Section 34 ‘authority to occupy crown land’ would be required to be arranged by Roads and Maritime with the Crown Lands Division and the Minister for the purposes of the new bridge building works within the crown reserve as per Part 4 of the CL Act.

A search of the Register of Aboriginal Land Claims database was carried out on 21 November 2014 of Lot 7014 DP1126811, as the only affected crown land parcel in

the Proposal area. The search determined that Lot 7014 DP1126811 does not appear on the register as affected by an Aboriginal Land Claim pursuant to sections 36 or 37 of the *Aboriginal Land Rights Act 1983*.

4.3.2 Fisheries Management Act 1994

The object of *Fisheries Management Act (FM Act) 1994* is to conserve biological diversity of fish and marine vegetation and promote ecologically sustainable development and activities.

Under section 199 of the FM Act, a public authority (other than a local Government authority) is required to notify the Minister for Primary Industries (DPI) Fisheries if the proponent is to carry out any dredging or reclamation works.

The Act defines dredging as any work that involves excavating water land or any work that involves the removal of material from water land, including removal of woody debris, snags, gravel beds, cobbles, rocks, boulders, rock bars or aquatic vegetation from water land. Reclamation is defined as using any material to fill in or reclaim water land, or depositing any such material on water land for the purposes of its reclamation.

Further, section 219–220 of the FM Act requires that the Minister is notified whenever barriers to fish movement are to be built, altered or modified.

The FM Act also enables the Minister for Fisheries to make Habitat Protection Plans for the protection of any key fish habitat areas. Marine vegetation exists at the mouth of Sportsmans Creek where it enters the Clarence River, downstream of the existing Sportsmans Creek bridge. Under Section 205 of the FM Act, a notification and permit to harm marine vegetation is required. As the proposed works are at least 120 m upstream of the existing bridge and water quality mitigations would be in place it is not expected that marine vegetation would be harmed.

Sportsmans Creek is considered key fish habitat. However, as discussed in Section 6.3, threatened aquatic species and communities listed under Schedules 4, 4A, 5 & 6 of the FM Act are unlikely to be significantly impacted by the Proposal. Sportsmans Creek is not considered habitat for any listed threatened species or communities. The Proposal does not constitute a listed Key Threatening Process.

As the building of the bridge is likely to require minor earthworks and fill to be imported on water front land for the bridge approaches, as well as dredging depending on the selected building technique, notification is required to the Minister of DPI (Fisheries) as per section 199 of the FM Act. This is discussed in Section 5. A permit would be required under section 219 of the FM Act for any works that may result in the temporary or permanent obstruction of fish passage within a waterway. Such obstructions can include silt fencing across waterways for sediment and erosion control and bunding and dewatering works during the building and maintenance of crossings.

Further, waterway crossings would generally require approval or consultation to dredge and/or reclaim under Part 7 of the FM Act. The definition of dredging works includes works required as part of the Proposal to build the footings or foundations for the crossing. Reclamation works may include the building of the abutments for bridges, creation of in-stream construction pads or coffer dams if required to access the works, or the placement of material in a waterway to build temporary or permanent waterway crossings. Mitigation measures have been provided in Section 6.2.6 to minimise this disturbance.

4.3.3 Coastal Protection Act 1979

The *Coastal Protection Act 1979* (CP Act) regulates development and other activities carried out by public authorities in the coastal zone of NSW. As defined in the Objects of the Act (Section 3), the primary objective of the CP Act is to provide for the protection of the coastal environment of the State 'for the benefit of both present and future generations.' In particular the Act aims to protect, enhance, maintain and restore the environment of the coastal region and also to have regard for principles of Ecologically Sustainable Development (ESD). The CP Act defines the boundaries of the Coastal Zone, which are identified by the maps provided by the Department of Planning and Environment (DPE). The boundary is generally one kilometre landward of coastal waters, bays, coastal rivers, mangroves, coastal lakes or lagoons as described in words in section 4A of the CP Act. The Proposal is situated in the coastal zone as identified on the DPE mapping.

Section 38 of the CP Act requires a public authority to gain consent for carrying out developments in the coastal zone if the Minister is of the opinion that the development:

> *(b1) is inconsistent with principles of ESD;*
> *(c) adversely affects the behaviour of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse; or*
> *(d) adversely affects any beach or dune, the bed, bank, shoreline, foreshore or flood plain of the sea or an arm of the sea or any bay, inlet, lagoon margin, lake, body of water, river, stream or watercourse.*

This concurrence requirement is only enacted if the Minister advises the public authority that the development triggers the criteria above (section 38(1)) or issues a Gazette to public authorities (section 39(1)) about prohibited developments in the coastal zone. The Minister has not advised Roads and Maritime in this regard.

The CP Act also states under section 37B clause (c) that concurrence from the Minister is not required, if the development is consistent with the relevant Coastal Zone Management Plan (CZMP) under Part 4A of the CP Act. The current CZMP is the 'Clarence Estuary Management Plan' (Umwelt 2003) and was adopted by the former Councils' of the Clarence Valley in 2003. The main objectives relating to the Sportsmans Creek area are with regard to ASS management and the ecological values of the estuary, relating to connectivity of the river bank, wader habitats and riparian vegetation along the waterway. The Biodiversity Assessment (refer to Section 6.3) and visual and landscape assessment carried out of the Proposal in this REF determined that the Proposal would modify the riparian vegetation along the waterway and has the potential to leave permanent effects along the waterway. However, provided the mitigation measures and future landscaping treatments proposed along the river banks in Section 6.10 of this REF are implemented, the Proposal would be consistent with the Clarence Estuary Management Plan (Umwelt 2003) and the objectives of the CP Act.

Section 6.2 of this REF also documents the potential hydrological changes to the Creek and discusses the potential for flooding associated with the Proposal. The safeguards and management measures proposed in Section 6.2.6 of this REF would minimise any potential impacts associated with the works. As such, the Proposal would also be consistent with the principles of ESD and could be carried out in accordance with the relevant Council management plans and strategies, as well as with the NSW *Coastal Policy (1997).* Therefore, concurrence from the Minister would not be required under the CP Act.

4.3.4 Heritage Act 1977

Pursuant to section 57 of the *Heritage Act 1977* (Heritage Act), a proposed activity in relation to an item, which is subject to an interim heritage order or is listed on the State Heritage Register, requires approval of a relevant approval body (either the Heritage Branch, Department of Planning and Environment or Local Council). Under sections 139 and 140 of the Heritage Act, an excavation permit is required for the disturbance or excavation of any relic. Any deposit, object or material evidence relating to the settlement of the area that comprised NSW, not being Aboriginal settlement, and which holds state or local significance, is defined as a relic under the Act. It should be noted that formerly the Act protected any 'relic' that was more than 50 years old. The age determination has been removed from the Act and is now defined by the heritage significance assessment of the relic. An excavation permit is required for any works, excavations or activities, associated with an archaeological site.

A historical heritage assessment has been prepared as part of this REF as detailed in Section 6.7 and Appendix D. The assessment has identified a number of heritage items within the vicinity of the proposed works, including the Lawrence Conservation Area on Bridge Street (listed on the Clarence Valley LEP 2011) and the existing Sportsmans Creek bridge (listed on the Roads and Maritime s.170 Heritage Register and the Clarence Valley LEP 2011). The building of the new bridge is not anticipated to have any adverse impacts upon the existing heritage items and no excavation is proposed in the vicinity of these heritage items. Mitigation measures have been proposed in this REF to ensure that the heritage listed items in the area are protected during the works.

An endorsement was received in 2012 from the Heritage Branch of OEH of the Roads and Maritime Timber Truss Conservation Strategy including the removal of the Sportsmans Creek bridge. (Note: the removal of the old bridge is subject to a separate REF assessment process).

4.3.5 Contaminated Land Management Act 1997

The management of contaminated land is shared by the Environment Protection Authority (EPA), the Department of Planning and Environment and local Government authorities.

Under the *Contaminated Land Management Act 1997* (CLM Act), the EPA regulates contaminated sites where the contamination is significant enough to warrant regulation. Contaminated sites that are not regulated by the EPA are managed by local councils through land use planning processes.

As discussed in Section 6.1, the geotechnical investigation carried out for the Proposal identified that there are no items listed on the Contaminated Lands Register. However, it was identified that there is the potential for contaminated land to be located near the Lawrence General and Liquor store due to the presence of Petrol bowsers. Excavation is not proposed in this location, however, mitigation measures have been proposed in Section 6.1 to avoid any potential impacts.

4.3.6 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) lists threatened species, populations and ecological communities in NSW. If a threatened species, population or ecological community or its habitat is likely to occur in any area which may be affected by a development Proposal, then a '7 part test – Assessment of Significance' in accordance with Section 5A of the EP&A Act (as amended by the

TSC Act) must be conducted to determine whether the Proposal would have a significant impact.

If it is concluded that there would be a significant impact, then a Species Impact Statement (SIS) must be prepared. The Proposal would then be subject to approval from the Director-General of the Office of Environment and Heritage (OEH).

A biodiversity assessment completed for the Proposal (refer to Appendix E and Section 6.3) has identified that no threatened flora, fauna, endangered populations or Endangered Ecological Communities (EECs) would be adversely impacted by the Proposal. Although one threatened flora species, Durobby (*Syzygium moore*) was identified as potentially requiring removal, the tree was determined to be of low conservation significance as it is a landscape planting outside its natural range. As such, no '7-part test' would be required for the Proposal.

The removal of the existing bridge would potentially have a significant impact upon the Large-footed Myotis (*Myotis Macropus*) population which roosts in the existing bridge. A separate microbat impact assessment has been completed and a subsequent SIS and approval would be sought from OEH as part of a separate REF assessment for the bridge removal.

4.3.7 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is administered by the Office of Environment and Heritage. The purpose of the Act is the conservation of:

- Nature, including habitat, ecosystems, biological diversity, landscapes and landforms
- Objects, places or features of cultural value within the landscape including
  - places, objects and features of significance to Aboriginal people
  - places of social value to the people of NSW
  - places of historic, architectural or scientific significance.

The NPW Act also sets outs the responsibilities for the management of NSW National Parks. If development is to take place in the vicinity of an Aboriginal Place or identified historic site, the potential impacts of the development must be assessed.

A permit or approval under the NPW Act is required if any protected native flora or fauna, or Aboriginal sites or relics are to be affected or disturbed. It is considered an offence under the Act to remove or harm protected native flora and fauna or damage or destroy Aboriginal sites and relics.

Works may not require approvals or permits under the NPW Act for the following reasons:

- They are not located in areas that have been gazetted under the Act
- They comprise areas that have been previously disturbed for urban or rural development and are not located next to the banks of natural waterways
- In respect of points a) and b) above, the works are not likely to result in damage to or disturbance of any items of Aboriginal heritage significance as assessed in accordance with the DECCW (2010) Due Diligence Code of Practice; Under clause (80B) of the National Parks and Wildlife Regulation 2009, undertaking maintenance works on utilities on land that has been

disturbed previously by utility installation is a 'low impact activity'. This is considered under section 87(4) as a defence to prosecution under section 86(2) of the NPW Act
- In respect of points a) and b) above, the works are not likely to result in damage to or disturbance of threatened species, populations, ecological communities or their habitat, or critical habitat (as defined under the Act)
- The works are not expected to result in harm to any protected flora or fauna.

Part 6 of the Act provides protection for Aboriginal objects and declared Aboriginal places through the establishment of offences of 'harm' to these objects and places. Under section 86 the Act, it is an offence to knowingly harm or desecrate an Aboriginal object or Aboriginal place. If harm to an object or place is anticipated, an Aboriginal Heritage Impact Permit (AHIP) must be applied for and OEH may issue an AHIP under the section 90 of the Act.

Part 8A of the Act lists the offences in NSW relating to the harm or picking of threatened species, endangered populations or endangered ecological communities and buying selling or possessing threatened species or endangered population, damage to critical habitat and habitat of threatened species, endangered populations or endangered ecological communities. Clause 118A(3)(b) notes that it is a defence to prosecution for an offence against this section if the act constituting the alleged offence was essential for the carrying out of:

(ii) an activity by a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part,

As noted in Section 4.3.6, no known threatened species, endangered ecological communities or endangered populations would be impacted by the Proposal. Similar defence clauses apply under 118C(5)(b) and 118D(2)(b) for damage to critical habitat and habitat of threatened species.

No National Parks have been identified within the Proposal area. An Archaeological Due Diligence (Aboriginal) assessment has been carried out as part of this REF (refer Section 6.6 and Appendix C) and identified no Declared Aboriginal Place(s) or items of Aboriginal heritage significance within the Proposal footprint. It is noted that there is a low potential to find any items previously unidentified, however, an unexpected finds procedure is proposed as a mitigation measure as discussed in Section 6.6.6.

4.3.8 Noxious Weeds Act 1993

The purpose of the *Noxious Weeds Act 1993* is to identify noxious weeds in respect of which particular control measures need to be taken, to specify those control measures, and to specify the duties of both public and private landholders with respect to the control of noxious weeds. In this regard, the Act categorises noxious weeds into four divisions according to the requirements for their control.

Section 13 of the Act states that:

13 Public authorities' obligations to control noxious weeds on own land

(1) A public authority that is an occupier of land to which a weed control order applies must control noxious weeds on the land as required under the order, to the extent necessary to prevent the weeds from spreading to adjoining land.

2) A public authority must provide information as to the name and contact details of an occupier of land owned by the public authority, and a description of the land occupied, to the relevant local control authority, if the land is subject to a weed control order.

A number of woody weeds and exotic species were identified on site as discussed in the Biodiversity Assessment (Appendix E). Five listed 'Noxious weeds' were detected during the survey within the survey area (refer to Table 6.1). Two of these species, Lantana (*Lantana camara*) and Fireweed (*Senecio madagascariensis*) are also listed as Weeds of National Significance (WoNS). The invasion, establishment and spread of Lantana is also listed as a Key Threatening Process under the TSC Act.

Control measures for the management of weeds have been recommended in the safeguards of this REF as discussed in Section 6.

4.3.9 Water Management Act 2000/Water Act 1912

The *Water Management Act 2000* (WM Act) addresses the management of surface and ground water in NSW and is administered by the NSW Office of Water. Under the Act, approvals are required for controlled activities. The WM Act provides for the protection of waterfront land, including on the banks of rivers, creeks and lakeside land. In addition to protecting this land, the WM Act also aims to ensure the integrated and sustainable management of water resources for NSW. For certain activities, known as 'controlled activities' and 'aquifer interferences' as per Section 91 of the WM Act, an additional approval may be required from the Office of Water.

Exemptions exist under *Water Management (General) Regulation 2011* relating to controlled activities for public authorities. Clause 38 states that *interalia* public authorities are exempt from the requirement for obtaining controlled activity approvals under section 91E of the WM Act. This exemption also extends to third parties who are acting under contract on behalf of Roads and Maritime to carry out the building works, where Roads and Maritime retains control over works during and after building. Nevertheless, Roads and Maritime has a duty of care to ensure that works would not result in unprecedented harm to waterfront land and waterways under the WM Act, FM Act and the POEO Act.

Groundwater Licence / Aquifer Interference Approval

Section 91, clause (3) of the WM Act refers to an Aquifer Interference Approval. A draft NSW aquifer interference policy has been developed by NSW Office of Water. Under the policy it would be a requirement of the *Water Management Act 2000* to obtain a permit to carry out aquifer interference activities, such as the penetration of an aquifer, taking water from an aquifer and disposal of water taken from an aquifer. However, as a Water Sharing Plan has yet to start in the Clarence Valley area, the provisions of the *Water Act 1912* still apply. If extraction is required, a Part 5 Groundwater Licence may be required under the Water Act to carry out the works.

The initial Geotechnical assessment for the Proposal identified that water to be intercepted within the Proposal area is below the Mangrove limit is tidal and saline. Advice sought from the Senior Water Regulation Officer at the Office of Water indicated that any groundwater extracted is likely to be considered to be too saline for consumption by stock or for irrigation purposes. As such, a Part 5 licence would not be required for the Proposal.

4.3.10 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997 (*POEO Act) is administered by the Environment Protection Authority (EPA) and by the Environment Minister. It is the main law in NSW regulating water, air and noise pollution. Provisions for waste are also included.

The POEO Act:

- Empowers regulatory authorities to issue pollution licenses for scheduled activities, (eg Schedule 1 activities as EPLs)
- Creates a range of pollution offences and penalties
- Allows regulatory authorities to enforce the POEO Act
- Allows the public to take legal action to enforce the POEO Act.

Section 6 of the POEO Act indicates that the EPA is the appropriate regulatory authority for development by public authorities which would be Roads and Maritime for the Proposal. Roads and Maritime would be required to notify the EPA immediately of any 'pollution incident' that is likely to have an impact on the environment.

Offence to pollute waters

Section 120 of the POEO Act applies a general prohibition to water pollution, ie all water pollution is prohibited unless it is authorised in some way.

Air pollution

Unlike water pollution, there is no general prohibition on causing air pollution. However, the POEO Act contains a number of specific offences which regulate certain activities that result in air pollution.

Air pollution is defined as the emission into the air of any impurity, including dust, smoke, cinders, solid particles, gases, fumes, odours and radioactive substances.

Noise pollution

Unlike water pollution, there is no general prohibition on causing noise pollution. However, the POEO Act contains a number of specific offences which regulate certain activities that result in noise pollution. Appropriate noise criteria to be applied to avoid disturbance upon the surrounding environment are specified within the policies adopted by the EPA as discussed in Section 6.4.3 of this REF.

Mitigation measures have been proposed in this REF to ensure the potential risk of pollution of waters, foreign particle emissions and increases in noise resulting from the Proposal are minimised.

4.3.11 Waste Avoidance and Resource Recovery Act 2001

The waste hierarchy, established under the *Waste Avoidance and Resource Recovery Act 2001*, is one that ensures that resource management options are considered against the following priorities:

- **Avoidance** including action to reduce the amount of waste generated by households, industry and all levels of Government
- **Resource** recovery including reuse, recycling, reprocessing and energy

recovery, consistent with the most efficient use of the recovered resources
- **Disposal** including management of all disposal options in the most environmentally responsible manner.

The Proposal would need to consider these principles when preparing any waste management plans for inclusion in any environmental management planning and reporting in the building and operational stages of the Proposal. Section 6.12.5 discusses mitigation measures to ensure that waste is appropriately managed during the undertaking of the Proposal.

4.4 Commonwealth legislation

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'. These are considered in Appendix F and Section 6 of the REF.

The assessment of the Proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Accordingly, the Proposal has not been referred to the Australian Government Department of the Environment.

4.4.2 Native Title Act 1993

The *Native Title Act 1993* (NT Act) acknowledges native title rights and provides principles in relation to the management of native title in Australia.

A search of the federal Native Title Claims Search was carried out on 21 November 2014 and identified that there is one native title claim of the Yaegl People (Tribunal File no NC2011/001) which covers a large area to the east of the new bridge, including the nearby towns of Maclean and Harwood and continues beyond the coastline from Iluka to just beyond Wooli in the south. The boundary of the claim follows the existing bridge alignment up Grafton – Lawrence Road from north of Ulmarra through Lawrence along Bridge Street and Richmond Street.

Section 228 of the NT Act *interalia* states that development affects native title:

"…*if it extinguishes the native title rights and interests or if it is otherwise wholly or partly inconsistent with their continued existence enjoyment or exercise."*

Roads and Maritime address the legal obligations native title claims through their property division during the acquisition process. Property acquisition is not required for the Proposal within the area covered by the Native Title Claim as the Proposal is to the west of the boundary of the claim and as such the claim does not apply to the Proposal area.

4.4.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act) is to preserve and protect areas and objects in Australia and Australian waters that are of significance to the Aboriginal community.

Part II of the ATSIHP Act the federal Minister of Indigenous Affairs has powers to

protect items by means of ministerial declaration. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition. The Act can, in certain circumstances override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced.

The Aboriginal due diligence assessment carried out for the Proposal (refer to Appendix C) did not identify that items or areas of Aboriginal heritage significance would be impacted by the Proposal therefore this Act has not been triggered.

4.5 Confirmation of statutory position

This REF has reviewed the relevant legislation and determined that the Proposal would not require development consent from local government as per the provisions of the ISEPP and therefore is subject to assessment under Part 5 of the EP&A Act. As such, Roads and Maritime are the proponent and determining authority for this Proposal.

The review of legislation also determined that no further approvals or concurrence are required based on the current scope of works.

5 Stakeholder and community consultation

5.1 Consultation strategy

Roads and Maritime is committed to informing and consulting stakeholders in relation to the Sportsmans Creek new bridge. A Public Participation Plan was created for the development and assessment of concept options phase of the Proposal. The purpose of the plan was to inform and consult with stakeholders in accordance with the Roads and Maritime *Community Participation and Communications: A resource manual for staff* (Roads and Maritime 2012b).

Although consultation was carried out on the removal of the existing bridge, the focus of this REF relates to addressing the stakeholder and community concerns about the building of the new bridge. A separate REF assessment would address any issues raised about the removal of the Sportsmans Creek bridge.

5.1.1 Public Participation Plan

The objectives of the Public Participation Plan were to:

- Inform stakeholders of the Proposal scope and timeframes
- Manage stakeholder expectations in relation to delivery timeframes and their level of influence on the Proposal
- Provide stakeholders with appropriate opportunities to provide input to the options analysis.

The Plan was implemented between mid-2013 and late-2014, over three main stages:

- Stage 1: Study area announcement
- Stage 2: Recommended Option Report Display
- Stage 3: Announcement of preferred option.

A desktop analysis, as part of the development of the Public Participation Plan, was carried out to identify potential stakeholders affected or interested in the Proposal. This involved scanning the environment to identify stakeholders in proximity to the new bridge, relevant Government agencies that may have a stake in the Proposal and other potentially interested stakeholders such as environmental groups and community interest groups. This was carried out in close coordination with Roads and Maritime and Council.

Stakeholders considered under the Public Participation Plan were:

- Clarence Valley Council
- State and Federal Government (Roads and Maritime Services, State Member for Clarence and Federal Member for Page)
- Businesses within the study area (as shown on Figure 2.4)
- Residents and/or property owners within the study area
- Emergency services
- Lawrence Public School
- Traditional owners (in accordance with the Cultural Heritage Management Plan)
- Road users

- Environmental groups (Clarence Valley Conservation in Action, Clarence Valley Wires)
- Other interest groups (Lawrence Historical Society, Lawrence Fishing Club, Clarence Cane Growers, Clarence River Fisherman's Co-operative Ltd.)
- Local media.

Throughout the Proposal stakeholder feedback channels were maintained by phone, email and mail.

5.1.2 Steering Committee

A Steering Committee was also established for the Proposal. It was comprised of key executive representatives of Roads and Maritime and Council. Through their appointment to the Committee, members agreed to be available for the term of the Proposal and contribute by:

- Providing governance for the overall Proposal. This includes considering and making recommendations on matters as and when required
- Attending meetings to review the Proposal status, forecasts, risks and monitor the Proposal implementation to ensure it is properly carried out in accordance with agreed plans
- Overcoming any internal Roads and Maritime and Council barriers to success, through negotiation and discussion with colleagues at various levels
- Providing leadership to the team in implementing all Proposal outcomes
- Promoting the benefits of the Proposal throughout the wider community and stakeholders
- Acting as informed Proposal advocates, who speak on behalf of the Proposal without personal opinion or motivation
- Providing encouragement and celebrating success
- Overseeing the preparation of the Proposal's various implementation phases.

The Committee did not have specific decision-making responsibilities, but ensured that the relevant Council and Roads and Maritime bodies could act as informed Proposal advocates and assist in addressing any barriers to the Proposal's timely progress.

5.2 Community involvement

5.2.1 Stage 1: Study Area Announcement

The study area was identified by Roads and Maritime as the crossing of Sportsmans Creek in the lower part of Lawrence Village. The study area for the Proposal was publicly announced in June 2013 and residents of Lawrence were advised by letter. The correspondence included the background of the Proposal, its objectives and the opportunity for community comment.

During Stage 1, technical studies were completed and a wide range of possible bridge options were considered. While working to identify a shortlist of options, it became evident that one option delivered far greater benefits than the other options. Therefore, public participation during Stage 2 of the Proposal focused on gathering stakeholder and community feedback on the recommended option.

At Stage 1, opportunities to provide input were communicated through:

- Direct meeting requests

- Newspaper advertisement of community drop-in sessions held on Thursday 18 July 2013 (11am-2pm and 4pm-7pm) at the Lawrence Public Hall
- Distribution of a letter to the household (direct mail and letter box drop)
- Content on the Roads and Maritime website
- Media releases
- Holding two community drop-in sessions (mentioned above) where posters were displayed and the letter to the householder and feedback forms were available.

Thirty-eight community members signed in at the drop-in sessions including residents and business representatives from within and outside the study area. Twenty-two attended the morning session and sixteen attended the evening session. Attendees spoke with members of the Proposal team either one-on-one or in small groups to better understand the Proposal, ask questions and give feedback.

Individual meetings were held with the owners of the Lawrence General and Liquor Store (General Store) and Lawrence Tavern (Tavern) to discuss potential impacts on their businesses.

The Proposal team also presented to members of the Lawrence Historical Society on the Proposal's objectives, including the removal of the existing bridge.

Twenty-two formal feedback forms were returned, with some submitted on the day of the drop-in sessions and others sent by email or post.

The feedback received was compiled and presented in the *Sportsmans Creek new bridge Early Feedback Summary, August* (Roads and Maritime 2013b).

A number of suggestions from the community about the location of the new bridge were received. Table 5.1 summarises the community suggestions with relevant responses from Roads and Maritime identified during the development and assessment of concept options as well as the sections of the REF that can provide further detail.

Table 5.1 Bridge location suggestions and Roads and Maritime responses

Bridge location suggestions	Roads and Maritime responses as identified through the development of concept options and reference to relevant chapter of REF
Connect the Grafton-Lawrence Road with Rutland Street	This option is considered unsuitable as it would cost more than other options, directs traffic away from the Lawrence General Liquor Store and Lawrence Tavern, has higher environmental impacts than other options, also crosses ephemeral wetlands, has potential to restrict water flows across this area, has potential flooding impacts on residences and businesses in Grafton and Bridge Streets as a result of flood afflux and has potential to impact a Potential Archaeological Deposit (PAD).
Connect Grafton-Lawrence Road with Grafton Street but keep dog-leg intersection to slow traffic.	Traffic and safety has been considered in identification of the preferred option and this REF. Refer to Section 6.9 for further detail.
Do not use the most northern portion of Grafton Street (Bridge Street to Rutland Street)	The preferred option would use the most northern portion of Grafton Street as the through route. This option considered community feedback received during the recommended option consultation phase.

Bridge location suggestions	Roads and Maritime responses as identified through the development of concept options and reference to relevant chapter of REF
	When the recommended option for the new bridge was announced the community were invited to provide comment on two intersection treatments for the Grafton/Bridge Street connection. Option A involved a T- intersection from Grafton Street to Bridge Street (therefore not using the northern portion of Grafton Street) and Option B involved a minor realignment of Grafton Street to form a through route from Grafton Street to Richmond Street. The community preferred Option B with suggestions for refinement and safety. Option B was included as part of the preferred option for the following reasons: • Is strongly supported by the community • It maintains the through road hierarchy • Is compatible with the Lawrence Memorial Park vehicular movements, for school buses and boat trailer regular use • Is more appropriate for heavy vehicle movements • Reduced noise levels due to unimpeded through traffic flow.
Do not connect with Bridge Street as it is too narrow to accommodate two-way traffic and will reduce noise in the area.	The preferred option does not connect with Bridge Street, rather connecting Grafton-Lawrence Road with Grafton Street. The option of connecting with Bridge Street was considered during concept options development. However, this was not progressed because it would require widening the existing road reserve resulting in major land acquisitions, impact on heritage conservation area and have maximum building/noise/ vibration and operational noise due restricted site and close proximity of existing properties.
Do connect with Bridge Street because the residents already experience bridge traffic.	The option of connecting with Bridge Street was considered during concept options development. However, this was not progressed because it would require widening the existing road reserve resulting in major land acquisitions, impact on heritage conservation area and have maximum building/noise/ vibration and operational noise due restricted site and close proximity of existing properties.
The location of the new bridge should not impact on local businesses	Roads and Maritime considered community feedback on retaining passing trade for local businesses. The preferred option connects Grafton-Lawrence Road with Grafton Street.
Locate the bridge to the west of the existing boat ramp to increase access and usage.	The preferred option for the new bridge is west of the existing boat ramp, avoiding disruption to the boat ramp and allowing new access for sail boats.
If the bridge is built to the west of Grafton Street, ensure connecting roads are built to the General Store and Tavern.	The preferred option connects Grafton-Lawrence Road with Grafton Street maintaining passing trade for local businesses include the Lawrence General Store and Tavern.
Appropriate consideration needs to be made, if the bridge is located anywhere to the west of Grafton Street, to flooding.	The preferred option connects Grafton-Lawrence Road with Grafton Street minimising the impact on natural wetlands and the impact of flooding.

Table 5.2 lists the other top five topics raised by community feedback during study area announcement community consultation period. The relevant responses from

Roads and Maritime identified during the development and assessment of concept options are provided as well as the sections of the REF that can provide further detail.

Table 5.2 - Other topics raised by the community

Other topics raised by the community	Reference to relevant chapter of the REF
Flooding and drainage	Section 6.2 provides further details on how flooding and drainage of the preferred option were considered in the REF.
Technical specifications for bridge design (eg height of new bridge)	Section 3.2 details the technical specifications for the bridge.
Business and service patronage	The preferred option connects Grafton-Lawrence Road with Grafton Street maintaining passing trade for local businesses include the Lawrence General Store and Tavern. This is discussed in Section 6.9.
Community facilities and services	The preferred option for the new bridge is west of the existing boat ramp, would be temporarily closed during building work. Once the bridge is fully operational public access to the boat ramp would be restored. There would be no permanent loss or changes of community facilities and services as a result of the Proposal. This discussed in Section 6.10 and 6.11.

5.2.2 Stage 2: Recommended Option Report Display

While working to identify a shortlist of options, it became evident that one option delivered far greater benefits than the other options. Therefore, public participation during Stage 2 of the Proposal focused on gathering stakeholder and community feedback on the recommended option. However, the community update did outline the six options considered and why they were not progressed.

As well as being invited to comment of the recommended option, residents were asked to comment on the proposed intersection treatments for:

- Grafton/Bridge Street connection (option A and option B)
- Ensbey and Weir Roads connection
- Southern end of Bridge Street.

During Stage 2, opportunities to provide input were communicated through:

- Direct meeting requests
- Newspaper advertisement of community drop-in sessions held on Monday 9 December 2013 (4pm to 7pm) and Wednesday 11 December 2013 (11am to 2pm) in Lawrence at the Public Hall
- Distribution of a community update (direct mail and letter box drop)
- Email to the Proposal distribution list (stakeholder's invited to register during Stage 1)
- Content on the Roads and Maritime website
- Display of the *Sportsmans Creek new bridge Recommended Option Report, Roads and Maritime Services* (November 2013) (Roads and Maritime 2013a) along with posters and the community update including feedback form at Lawrence General and Liquor Store, Roads and Maritime office (Grafton) and Clarence Valley Council offices (Grafton and Maclean)

- Media releases
- Holding two community drop-in sessions (mentioned above) where posters were displayed and community updates and feedback forms were available.

Nineteen community members signed in at the drop-in sessions including residents and business representatives from within and outside the study area. Fifteen attended the session on 9 December and four on 11 December 2013.

Attendees spoke with members of the Proposal team either one-on-one or in small groups to better understand the Proposal, ask questions and give feedback.

Individual meetings outside the community drop-in session times were offered to property owners and businesses within the study area to discuss the recommended option and any potential impacts on their properties/businesses. Forty formal feedback forms were returned, with some submitted on the day of the drop-in sessions and others sent by email or post.

The feedback received was compiled and presented in the *Sportsmans Creek new bridge Early Feedback Summary*, February (Roads and Maritime 2014b). Generally, the recommended option announced in November 2013 was well received by those who attended the drop-in sessions and submitted feedback forms. Of the 40 feedback forms received:

- Twenty-three expressly preferred the recommended option
- Four preferred other options (namely Option 1 and 3) but were happy with the reasoning behind the selection of the recommended option
- Two preferred another option (Option 1 or 3).

The proposed intersection treatments that were put forward to the community for Grafton/Bridge Street connection, Ensbey and Weir Roads connection and southern end of Bridge Street as discussed in Section 3.2 and shown in Figure 3.2 were also well received.

Table 5.3 lists the other top five topics raised by community feedback during the recommended option consultation period. Relevant responses from Roads and Maritime identified during the development and assessment of concept options are provided as well as the sections of the REF that can provide further detail.

Table 5.3 - Other topics raised by the community

Other topics raised by the community	Reference to relevant chapter of the REF
Road safety	Section 6.9 discusses further details on how road safety has been considered by the REF.
Traffic flow and travel times	Section 6.9 discusses further details on how traffic flow has been considered by the REF.
Business and service patronage	The preferred option connects Grafton-Lawrence Road with Grafton Street maintaining passing trade for local businesses include the Lawrence General Store and Tavern. This is discussed in Section 6.11.
Flooding/ drainage	Section 6.2 discusses further details on how flooding / drainage for the new bridge has been considered by the REF.
Community facilities and services	Section 6.10 and 6.11 discuss how the Proposal would affect the community. No long-term permanent impacts would result from the Proposal upon the community.

5.2.3 Stage 3: Announcement of Preferred Option

In July 2014, the preferred option for the new bridge was announced. This stage of the development and assessment of concept options did not require further feedback from the community. Its aim was to announce the preferred option and explain the next steps for the Proposal.

At Stage 3, the preferred option was communicated via:

- On site media event attended by Roads and Maritime representatives, State Member for Clarence Mr Chris Gulaptis and Mayor Richie Williamson on 28 July 2014
- Distribution of a community update (direct mail and letter box drop)
- Email to the Proposal distribution list
- Content on the Roads and Maritime website
- Display of the *Sportsmans Creek new bridge Preferred Option Report, Roads and Maritime Services* (Roads and Maritime 2014a) along with the community update at Lawrence General and Liquor Store, Roads and Maritime office (Grafton), Council offices (Grafton and Maclean) and Lawrence Post Office
- Media releases.

5.3 Aboriginal community involvement

An investigation of the *Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime 2011a) into the potential for Aboriginal Heritage items to occur in the Proposal site was conducted by the Roads and Maritime Cultural Heritage Officer and McCardle Cultural Heritage (refer Appendix C).

The assessment concluded that no further investigation or Aboriginal Heritage Impact Permits would be required to carry out the works due to the low probability of discovery of items of Aboriginal significance. The Roads and Maritime Cultural Heritage Officer has confirmed that acceptance of the Archaeological Due Diligence Assessment report fulfils the Road and Maritime PACHCI requirements and no further consultation would be required with the Aboriginal community (G. Purcell pers. comm November 2014).

5.4 ISEPP consultation

The Infrastructure SEPP contains provisions for public authorities such as Roads and Maritime to consult with local councils and other public authorities before the commencement of certain types of development. Consultation has been carried out throughout the design development with Council. Additional consultation was carried out with council and a number of agencies with regards to the REF. A response was received from Council on 21 October 2014 (refer to Appendix H) indicating that they have no further comment with regard to the REF and they have discussed the Proposal in depth with Road and Maritime and their issues have been addressed. At the timing of writing this REF a final response from NSW Maritime was yet to be received. The outcomes of the consultation with NSW Maritime would be included in the CEMP for implementation before any activities within the waterways.

A summary of the consultation carried out with council and agencies, with the relevant applicable ISEPP clauses is shown in Table 5.4.

Table 5.4 ISEPP Consultation Summary

Infrastructure SEPP Clause	Assessment	REF Section
13 Consultation with councils—development with impacts on council-related infrastructure or services		
(1) This clause applies to development carried out by or on behalf of a public authority that this Policy provides may be carried out without consent if, in the opinion of the public authority, the development:		
(a) will have a substantial impact on stormwater management services provided by a council, or	Not Applicable	Not Applicable
(b) is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or	The Proposal has the potential impact upon traffic in the LGA.	Section 6.9 & Appendix G
(c) involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or	Not Applicable	Not applicable
(d) involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or	Not Applicable	Not applicable
(e) involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or	The Proposal would require the temporary closure of Flo Clark Park during building work and alterations to Flo Clark Park and 7014 DP11226811 (crown reserve managed by council) once works are completed.	Section 6.10
(f) involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).	The Proposal would involve works on local roads.	Section 6.9
(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies unless the authority or the person has: (a) given written notice of the intention to carry out the development to the council for the area in which the land is located, and	Correspondence was issued to Council on 17 July 2014 notifying of the REF assessment, the intention to carry out development and requesting any comment for inclusion.	Section 5. Appendix H
(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	A response was received 21 October 2014 indicating that Council have no further comment for inclusion in the REF and with regard to the Proposal.	

Infrastructure SEPP Clause	Assessment	REF Section
14 Consultation with councils-development with impacts on local heritage (1) This clause applies to development carried out by or on behalf of a public authority if the development: (a) is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area, and (b) is development that this Policy provides may be carried out without consent. (2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies unless the authority or the person has: (a) had an assessment of the impact prepared, and (b) given written notice of the intention to carry out the development, with a copy of the assessment, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and (c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given	The Proposal has been developed such that it may be carried out without consent. The building of the new bridge is not anticipated to have an impact that is minor or inconsequential upon any local heritage items or heritage conservation. Nevertheless, correspondence has been issued to Council and further consultation is recommended before works carried out within the Lawrence Conservation Area and immediately adjacent to the Lawrence Memorial Park.	Section 6.7 Appendix D, G
15 Consultation with councils-development with impacts on flood liable land (1) In this clause, "flood liable land" means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time. (2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Policy provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has: (a) given written notice of the intention to carry out the development to the council for the area in which the land is located, and (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	The Proposal study area is located within Flood liable land in accordance with Council flood mapping documents. Consultation has been carried out by Roads and Maritime with council with regard to the flood modelling carried out by Council. The outcome of the flood study prepared for the Proposal (refer to Section 6.2) determined the building of the new bridge would not adversely affect the flood patterns within the floodplain.	Section 6.2 Appendix I

Infrastructure SEPP Clause	Assessment	REF Section
16 Consultation with public authorities other than councils (1) A public authority, or a person acting on behalf of a public authority, must not carry out specified development that this Policy provides may be carried out without consent unless the authority or person has: (a) given written notice of the intention to carry out the development to the specified authority in relation to the development, and (b) taken into consideration any response to the notice that is received from that authority within 21 days after the notice is given. (2) For the purposes of subclause (1), the following development is "specified development" and the following authorities are "specified authorities" in relation to that development: (a) development adjacent to land reserved under the *National Parks and Wildlife Act 1974* -the Department of Environment and Climate Change, (b) development adjacent to a marine park declared under the *Marine Parks Act 1997* - the Marine Parks Authority, (c) development adjacent to an aquatic reserve declared under the *Fisheries Management Act 1994* -the Department of Environment and Climate Change, (d) development in the foreshore area within the meaning of the *Sydney Harbour Foreshore Authority Act 1998* -the Sydney Harbour Foreshore Authority, (e) development comprising a fixed or floating structure in or over navigable waters-the Maritime Authority of NSW, (f) development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act)-the NSW Rural Fire Service.	Clauses (a) - (d) and (f) do not apply to the Proposal development. NSW Maritime was consulted during the design development and a response provided on 30 July 2013. Further consultation with NSW Maritime was carried out on 17 July 2014 and follow up consultation 25 August 2014 seeking clarification on two items. A final response is yet to be received; however, the outcomes of consultation with NSW Maritime would be included in the CEMP for implementation before any activities within the waterways.	Section 5, 6.9 Appendix H

5.5 Government agency and stakeholder involvement

5.5.1 Department of Primary Industries (DPI) - Fisheries

In addition to the ISEPP consultation, Roads and Maritime has notified and consulted with DPI (Fisheries) under Section 199 of the FMA to obtain advice on REF requirements concerning proposed dredging and reclamation works. A response was received on 11 August 2014 and is contained in Appendix H.

A summary of the requirements which have been incorporated into Section 6.1.5, 6.2.6 and 6.3.5 includes:

- Use of the 'Blue Book' *Managing Urban Stormwater: Soils and Construction fourth edition* (Landcom 2004)
- Referral of a late draft of the REF to Fisheries NSW and consideration of the matters raised
- Address the REF requirements in Section 3.3 of *Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update)* (DPI 2013).

These requirements have been addressed in Sections 3, 6.1, 6.2 and 6.3.

5.5.2 Office of Environment and Heritage (OEH)

OEH was consulted with in regard to the Proposal and a response was received on 27 August 2014. The letter is contained in Appendix H and Attachment 1 of the correspondence lists the requirements for the REF. Table 5.5 shows the sections in which requirement are addressed.

Table 5.5 OEH Requirements

Issue	REF Section
General Information – including Proposal objectives	2.3
The Proposal – description	3
The Proposal Area – all processes and activities relating to the site	3 and 6
Aboriginal Cultural Heritage - assessment	6.6 and Appendix C
Biodiversity – flora and fauna characteristics, field survey, impacts and mitigations	6.3 and Appendix E
Historic Heritage	6.7 and Appendix D
Coast, Estuaries and Floodplains	6.2
National Parks and Wildlife Estate	6.3 and Appendix E

5.5.3 Office of Water

The Office of Water was consulted as part of REF for the geotechnical investigations with regard to requirements for permits for the extraction of groundwater during excavation.

A response provided on 30 July 2014 indicated that a permit under the *Water Act 1912* would not be required as the groundwater in the vicinity of the Proposal is too saline for the consumption by stock or for irrigation purposes. As such, no further consultation has been carried out with the Office of Water as part of this REF.

5.6 Ongoing or future consultation

The selection of the preferred route and this REF addresses the key issues raised during the consultation carried out to date with the community and stakeholders.

Ongoing or future consultation activities would be as stipulated by the safeguards and management measures in this REF and would be likely to involve:

- Affected residents and landholders
- Businesses and service providers (such as the Lawrence bus service, Lawrence General and Liquor store and Lawrence Tavern)
- Utility owners with regard to service relocations
- NSW Maritime
- Council as needed.

Further consultation with DPI (Fisheries) would be carried out following the preparation of the draft REF.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the building and operation of the Proposal. All aspects of the environment potentially impacted upon by the Proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities* (DUAP 1996) as required under clause 228(1)(b) of the *Environmental Planning and Assessment Regulation 2000*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in Appendix F. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Soils, Contamination and Water Quality

A geotechnical investigation report was completed for the Proposal by Golder Associates in March 2014 (Golder Associates 2014), which is provided in Appendix B and provides the basis for this Section of the REF.

The geotechnical study area referred to in this Section of the REF is shown on Figure 1 of Appendix B.

6.1.1 Existing environment

Topography

The topography of the study area is characterised by typically low elevation flood plain terrain associated with the Clarence River and Sportsmans Creek systems. The typical site elevation within the study area on the southern bank of Sportsmans Creek ranges between 3 m to 5 m Australian Height Datum (AHD). Elevations on the northern bank vary laterally and range from 1 m to 5 m AHD.

Geology and Soils

A review of the 1:250,000 scale NSW Department of Mineral Resources 1970 Geological Map 'Maclean' (series sheet SH56-7) shows that the study area is underlain by the geological rock units of the Bundamba Group. The majority of the area is underlain by rocks of the Late Jurassic Grafton Formation, consisting of interbedded, clayey siltstone, claystone, sandstone and minor coal seams.

The rock units shown on the 1:100,000 Grafton Area Coastal Quaternary Geology Map show that the majority of the Lawrence area are overlain by Holocene Alluvial Deposits, including levee and floodplain deposits of silts, clays, sands, organic mud and minor gravels. There is a small area of in-channel bar deposits near the mouth of Sportsmans Creek, consisting of fluvial sand, clay, gravel and silt. The geology of the study area is shown on Figure 2, Appendix B.

A number of geotechnical investigations including Standard Penetration Testing (SPT), test pits, and Cone Penetration Testing (CPT) were carried out at the locations along the preferred new bridge route as shown on Figure 1, Appendix B. The results of the most recent testing showed that the subsurface conditions consist of fill/topsoil to a depth of 0.3 m comprising variable clayey sand to silty clay. Beneath this, a layer of low strength alluvial deposits of silty to sandy clay, soft to firm on the south bank to depths of 31 m and depths of 4.0 m on the north bank. A sand, medium grained, loose to very loose, saturated layer was also interbedded with the above layer. Beneath these layers, fine grained sandstone and siltstone was

encountered at depths greater than 30 m on the southern bank and greater than 4 m on the northern bank. These results are consistent with the mapping reviewed.

Acid Sulphate Soils

A search of the Australian Soil Resource Information System (ASRIS) carried out as part of the Golder Associates (2013) desktop study indicates that the study area is located within an area recorded as high probability of the presence of potential acid sulphate soils (PASS). This is shown on Figure 6.1. A review of the Clarence Valley LEP mapping showed that the study area is located in soils mapped as either Class 2 or Class 3 ASS (high risk at greater than 1–2 m depth), with the sediments in Sportsmans Creek mapped as Class 1 ASS, meaning that the sediments are high risk.

Additional laboratory testing was carried out of the samples taken during geotechnical works to assess the presence of potential or actual ASS. The results showed that all samples exhibited some or all of characteristics of Potential Acid Sulphate Soils (PASS) to a depth from near the surface at 0.3 m to 5.95 m.

Three samples which showed a high reaction rate were tested further. The results of this testing showed that two samples indicated exceedance of Table 4.4 of the Acid Sulfate Soils Management Advisory Committee (ASSMAC) Guidelines.

Contamination

A desktop review was carried out by Golder Associates (2013) to identify any potential sources of contamination as follows:

- Review of publically available historical information, including aerial photography
- Regulatory databases and notices, including the EPA registers
- Publically available hydrological, geological and soils information relevant the study area.

A site inspection was also carried out to identify any potential contaminations in the area. The inspection showed that there are potential hydrocarbons and lead contamination in soils located near the General store, due to the storage of fuel in underground storage tanks. Other potential sources in the study area included agricultural land use impacts, namely pesticides/herbicides and local fill materials. A search of the Department of Primary Industries (DPI) cattle dip site locator completed on 21 November 2014 returned 10 sites located within the town of Lawrence. No records were located within the investigation area, with the closet record ‘McPhees’ located approximately 450 m south of the Proposal (E: 509250 and N: 6735640). No records were identified on the EPA Register of Contaminated Sites and one record on the POEO Public private property issued a clean-up notice 1.3 km north of the existing bridge next to the Lawrence water reservoir.

Following this review, contamination testing was carried out consistent with the current contamination guidelines. The results showed the contaminants were not present in the majority of testing locations. One sample in the investigation area (referred to as 137622029_tp03-004 in Appendix B) contained benzo(a) pyrene of 0.92 mg/kg which exceeded the trigger values set in the DECC, (2009) guidelines for disposal as general solid waste of 0.8 mg/kg and the National Environment Protection Council (NEPC), (2013) Ecological Screening Level (ESL) for coarse soils of 0.7 mg/kg. The assessment concluded that this was attributed to shallow fill and

this exceedance was considered minor. Laboratory test certifications and summary tables of these results are presented in Appendix F of Appendix B.

It was also identified that the house located at Lot 1 Section 5 DP758604 which is to be removed for the construction lay down area is likely to contain asbestos due to its age, which would require removal and disposal by an appropriately licenced contractor before its removal.

Water Quality and Stormwater Management

The nearest Water Quality station managed by the Office of Water is located at the Gurranang siding several kilometres upstream of the Proposal. At this location flow and velocities are monitored, however, no other parameters are monitored. The major influences to water quality generally within the Clarence River catchment are influenced by sediment transport, including acid sulphate soils and discharges from licensed industries, agricultural uses and wastewater and may be influenced time to time from recreational uses (Umwelt 2003).

At present there are no kerbs or gutters on local roads on the northern or southern approaches to the existing bridge and new bridge location and stormwater flows overland into drainage depressions alongside the roads.

6.1.2 Policy setting

The Proposal would be required to ensure that best practice soil and water quality management practices would be implemented as contained within the *Roads and Maritime QA Specifications G36 Environmental Protection* and *G38 Soil and Water Management* and in accordance with the Landcom (2004) *Managing Urban Stormwater, Soils and Construction Guidelines* (the Blue Book) to minimise impacts upon aquatic life, riparian vegetation, recreational use, food supply and environmental values of waterways.

Furthermore, public authorities are required to consider the impact of their activities on the environment in a number of subclauses of clause 228 of the *EP&A Regulation 2000,* including the potential for pollution of the environment.

6.1.3 Criteria

There is an absence of baseline water quality information to set criteria against the ANZECC Water Quality Guidelines. Given this, minimising impacts upon aquatic life, riparian vegetation, recreational use, food supply and environmental values of waterways has been adopted as the criteria for the Proposal to achieve through the implementation of best practice measures. This criterion would be achieved by adhering to best practice management with regards to implementing the Proposal.

Contamination laboratory testing was carried out by Envirolab Services as part of the Golder Associates investigation in accordance with the contaminant threshold values in the *Waste Classification Guidelines Part 1: Classifying Waste* (DECCW 2009) and the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013).

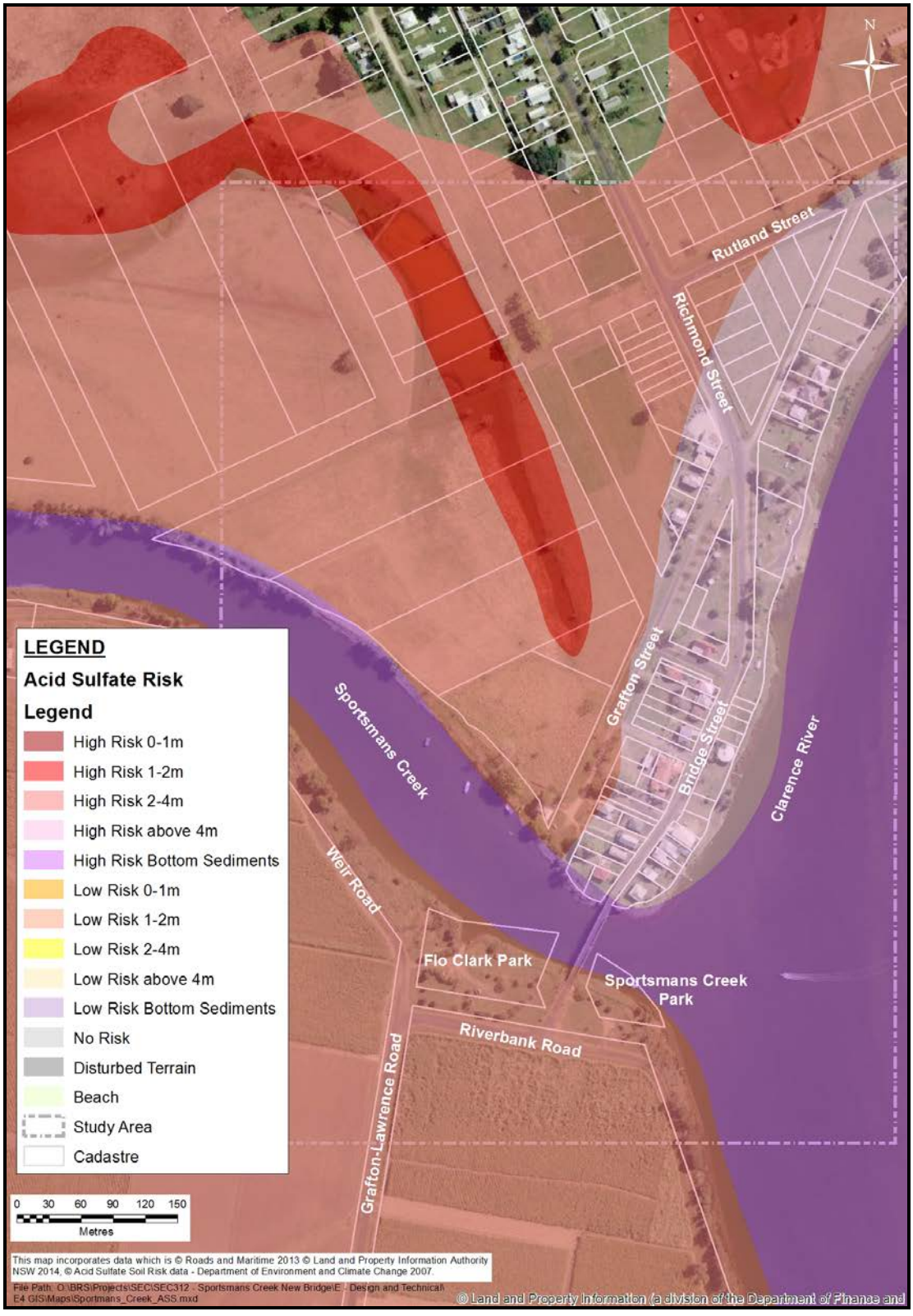

Figure 6.1 Acid Sulphate Soils Mapping

6.1.4 Potential impacts

Construction

Topography, Erosion and Sedimentation

The topography of the Proposal site is generally flat on the northern banks and has a gentle slope towards the boat ramp on the southern banks of Sportsmans Creek. Building activities which have the potential to impact upon soils in the local environment include:

- Building the bridge approaches
- Building temporary access tracks and working pads (land and water)
- Vegetation clearing and grubbing required for the road upgrade works and treatments and includes the site compound areas
- Excavation (including piling activities) within the bed or on the banks of Sportsmans Creek disturbing ASS and clay sediments
- Road upgrade and treatment works generally
- General vehicle movements, on unsealed surfaces, transporting sediment and compacting damp soils
- Stockpiling of soils
- Imported fill
- Landscaping treatments.

Initial works required for site establishment and the excavation works required for the bridge abutments would require vegetation to be cleared. Clearing would result in the exposure of topsoils to erosive forces from water and wind. These works, as well as the movement of vehicles and plant along banks of Sportsmans Creek, have the potential to result in sedimentation of exposed topsoils. Damp soils within these areas may also be impacted by soil compaction from heavy machinery.

Any temporary stockpiling works also have the potential to erode and cause sedimentation into the waterway. The short-term impacts upon soils is considered to be moderate to high, however, provided best practice erosion and sediment controls as per Section 6.1.5 are implemented, these impacts would be mitigated and not long-term.

The new bridge building work would require the building of piers within Sportsmans Creek. These works would require the b of temporary platforms which may include a jetty, bridge or rock fill platform into Sportsmans Creek. The existing boat ramp is likely to be utilised and may require some modification to allow barge entry. Both these activities have the potential to erode soils and cause sedimentation and disturb sediments within the waterway. These works are not anticipated to have long-term effects upon soils, however, would have a moderate disturbance in the short-term, which could be managed using the safeguards proposed in Section 6.1.5.

Acid Sulphate Soils

Excavation and piling works throughout the preferred route have the potential to expose or disturb PASS, as PASS have been identified in the investigations as located between 0.3 m to at least 5.95 m below the ground surface. The ASRIS desktop study (refer to Figure 6.1) also identified the high risk potential for PASS within the bottom sediments of Sportsmans Creek, which is likely to be disturbed during piling activities. Exposure of ASS may result in soil acidification and acid and

dissolved metal discharge into nearby surface water bodies via surface water runoff, drainage and groundwater flows.

The results of the laboratory testing indicate a high potential to encounter soils which exceed the trigger limits documented in the ASSMAC Guidelines (ASSMAC 1998). This triggers the requirement to prepare an ASS management plan for the building phase of the Proposal in accordance with the ASSMAC guidelines and the Roads and Maritime's *Guidance for the Management of Acid Sulfate Materials: Acid sulphate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze (RTA 2005).* In particular, the temporary stockpiling of PASS materials must be managed in accordance with Roads and Maritime's guidelines (RTA 2005) to minimise the potential for oxidisation and off-site impacts upon the environment.

Safeguards and management measures as per Section 6.1.5 should be implemented to mitigate the potential for adverse environmental impacts, which would be considered high risk if not managed.

Even where the disturbance of soils is neither minimal nor expected to occur, the effects of potentially acidic soils would also need to be considered on the materials used to build the road infrastructure (for example, acid sulphate attack of concrete, upstream discharges and loading of soils).

Contamination

Potential sources of contamination have been identified within proximity to the new bridge route. However, the current bridge design, road upgrades and intersection treatments avoid these potential sources, including in the vicinity of the underground storage tanks at the general store and the sample (137622029_tp03-004) in which benzo(a)pyrene exceeded the ESL for this substance.

As such, the geotechnical assessment determined that the exposure of contaminated soils is considered low risk and could be managed with the implementation of safeguards and management measures as shown in Section 6.1.5. Should the design of the upgrade to the Grafton Street intersection near the General store be modified, further assessment and investigation into the underground storage tanks and the potential for soil and groundwater contamination by hydrocarbons fuels may be required.

Water Quality

The building of the Proposal has the potential to introduce pollutants into the surrounding environment. If uncontrolled, these contaminates may result in a number of adverse impacts upon the water quality of Sportsmans Creek. Works associated with the building of the Proposal would have the following potential impacts:

- Activities carried out within the bed or on the banks of Sportsmans Creek resulting in increased sediment load and organic matter resulting in impacts upon aquatic flora and fauna found in the bed of creeks or within the riparian zone. This includes any activities which involve the generation of sediment, such as piling or earthworks, building temporary access tracks and working pads (land and water)
- Reduction in channel habitat due to sediment deposition and reduction in photosynthesis due to turbidity from works required in the waterway
- Accidental releases of contaminated wastewater from the building process such as concrete residues

- Contaminated stormwater runoff from the compound area and construction laydown areas, equipment and plant
- Spills of chemicals or other liquid waste (such as from the ablutions blocks) due to the proximity of chemical storage in the compound areas
- Accidental spills of materials into the waterway during the building of the bridge
- Flooding in the area transporting chemicals (such as stored fuels and oils), waste, materials and equipment into the Clarence River floodplain
- Aquifer cross-contamination due to penetrating works such as piling
- Dewatering of excavations due to the presence of a high water table.

The presence of ASS also has the potential to result in water quality impacts including acidification of waterways, fish kills and aquatic habitat loss. Particular activities which may disturb ASS and generally result in sediment in the waterway are those activities required on the banks of Sportsmans Creek, such as earthworks to establish access to the waterway and for the abutments and works carried out in-stream, such as during piling works or for building the temporary platforms. The disturbance of acid sulphate soils during excavation may also result in acidity in any water to be dewatered from excavations as well as in discharge via surface water bodies or runoff.

An increase in total suspended solid levels may also result from any barge movements or temporary jetty building in shallow water within the Creek. Vegetation removal along the banks of the water may result in sedimentation if controls are not in place.

Provided that the safeguards and management measures discussed in Section 6.1.5 and Section 6.2.6 are implemented, the potential for impacts upon water quality in Sportsmans Creek would be of low to moderate risk.

Operation

Topography, Erosion and Sedimentation

The Proposal is not anticipated to have any long-term or operational impacts upon topography, erosion or sedimentation, nor is it anticipated that ASS would be disturbed during maintenance.

Water Quality and Stormwater Management

The Proposal is not anticipated to have any adverse water quality impacts upon the surrounding environment once built. Although maintenance would be required which may result in the spill of chemicals and fuels, the result of contamination to the environment is low and would be managed.

There is the potential for stormwater run-off from the bridge and roads to impact on the surrounding environment. The Proposal would include operational water quality measures to manage stormwater run-off, which would be determined during detailed design.

6.1.5 Safeguards and management measures

The mitigation measures to prevent adverse impacts on Soils, Contamination and Water Quality would be in accordance with Section 4.1, 4.2, 4.3, 4.13 and 4.16 of the Roads and Maritime QA Specification G36, Roads and Maritime QA Specification G38 with the following additions/amendments.

Impact	Environmental safeguards	Responsibility	Timing
Polluting receiving waters downstream	• A Soil and Water Management Plan (SWMP) would be prepared as part of the CEMP for the Proposal before the commencement of building in accordance with the specification G38. The SWMP would address: o Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure. o The NSW *Soils and Construction - Managing Urban Stormwater Volume 1 'the blue book'* (Landcom 2004) *and Volume 2* (DECC 2008). o Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, (Roads and Maritime 2011b). • The plan would include (but not limited to): o Details of erosion and sediment controls to be implemented, including erosion and sediment control plans developed for the Proposal o Details of inspection frequency for control measures o Monitoring and maintenance of environmental control measures o Environmental work method statements for high risk activities such as dewatering and works within waterways o Procedures to manage stockpiles generated during building work o Tannin leachate management measures o Acid sulphate management measures o Detailed consideration of measures to prevent (where possible) or minimise any water quality impacts o Measures to manage known and unexpected contamination during the building stage o Appropriate controls to minimise risk of release of dirty water into drainage lines and/or waterways o Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be carried out on a regular basis to identify any potential spills or deficient erosion and sediment controls	Contractor	Pre-Construction

Impact	Environmental safeguards	Responsibility	Timing
	o Water quality control measures to prevent any materials (eg concrete, grout, sediment etc) entering waterways.		
Water Quality and surface water run-off	• Where practicable, stockpiles would be located away from areas subject to concentrated overland flow. Stockpiles located on a floodplain would be managed so as to minimise loss of material in flood or rainfall events. All stockpiles should be stabilised at the end of each work day, during wet weather and covered with geotextile or vegetative cover and managed in accordance with the Roads and Maritime procedure for *Stockpile Site Management Guideline* (RTA 2011a). • Topsoil, earthworks and other excess spoil material would be stockpiled in accordance with the principles outlined in *Stockpile Site Management Guidelines* (RTA 2011a). • Stockpiles containing potential ASS would be managed in accordance with the ASS Management Plan. • All wastewater should be treated to prevent the release of dirty water into the river or any waterways • Vehicle wash down and/or cement truck washout would be carried out off-site or in a designated bunded area lined with an impervious surface. • No works would be permitted if flooding is predicted and all excavations should be filled in and stockpiles removed or secured before enacting evacuation protocols.	Contractor	During construction
Water quality and the storage of chemicals	• All fuels, chemicals and liquids would be stored in an impervious bunded area (preferably at least 50 m) away from any waterways or drainage lines. For storage within 50 m, these would be, double-bunded or stored as approved by the Roads and Maritime Environment Officer. A Safety Data Sheet (SDS) for each item stored would be kept. • Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 m from drainage lines or waterways. Refuelling of plant and equipment on barges is to occur within a double-bunded area. • Daily checks of machinery and equipment for liquid leaks of any substance would be carried out.	Contractor	During construction

Impact	Environmental safeguards	Responsibility	Timing
	• All staff would be trained in incident and emergency response procedures. • Emergency dry and wet weather spill kits are to be kept on site at all times and staff made aware of their location and trained in their use. • The Roads and Maritime Environmental Incident Classification and Management Procedure is to be followed in the event of an incident and the Roads and Maritime Contract Manager notified as soon as practicable. • The EPA should be notified in the event of a significant spill in accordance with Part 5.7 of the POEO Act.		
Water Quality - Works in waterways	• No equipment cleaning would be carried out within the waterway. • All workers would remain vigilant to monitor for any signs of impacts to water quality (such as hydrocarbons spills, turbidity, discoloured water or unusual smells) on a daily basis.	Contractor	Pre-construction During construction
Dewatering of excavations	• A procedure would be developed for building site dewatering in accordance with Roads and Maritime QA Specification G38 and Roads and Maritime *Technical Guideline EMS-TG-011: Environmental Management of Construction Site Dewatering* (RTA 2011b). • No dewatering of excavations is to be discharged into Sportsmans Creek (or any other 'waters' as defined in the POEO Act 1997) without prior treatment. • Dewater must be treated using adequate sediment controls, such as geofabric wrapped gravel or sediment tanks, before discharge on a flat vegetated surface. Discharge must be carried out as far away as practicable from Sportsmans Creek. • Due the presence of ASS in the area, pH levels should be monitored before dewatering. • In the event that high pH levels are encountered indicating the presence of ASS leachate, additional water treatment and dosing would be required, in addition to sediment controls for dewatering. • The discharge water quality must be carried out in accordance with the POEO Act.	Contractor	During Construction

Impact	Environmental safeguards	Responsibility	Timing
	• Pumping associated with dewatering should be visually monitored for signs of contamination, such as odour or discoloration each time the pumping operation is started up. • Dewatering activities must halt in the event that water quality of discharge water would not meet POEO Act requirements or contamination is suspected. The Roads and Maritime Environmental Officer must be contacted immediately for further advice.		
Erosion and Sedimentation	• An Erosion and Sedimentation Control Plan (ESCP) would be prepared in accordance with the Roads and Maritime Specification G38 - Soil and Water Management (Soil and Water Management Plan) for inclusion in the SWMP. The ESCP would include: o Management measures for erosion and sedimentation controls are to be in accordance with the 'blue book', *Managing Urban Stormwater - Soils and Construction Volumes 1 and 2 (Landcom 2004, DECC 2008).* o Specific details of controls required for excavation activities, in-stream works (such as piling, temporary waterway access and earthworks for the bridge approaches. • The plan would include measures to : o Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets o Reduce water velocity and capture sediment on-site o Minimise the amount of material transported from site to surrounding pavement surfaces o Divert clean water around the site. o Erosion and sedimentation controls would be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request o Any additional measures listed under Section 6.1.5 for soil management in this REF. • Water from site would be used for building purposes, such as dust suppression, where feasible and reasonable.	Contractor	Before, during and post construction

Impact	Environmental safeguards	Responsibility	Timing
	• The CEMP would include specific measures to minimise tracking of material onto sealed areas and offsite and potential reuse of material on site or disposal in accordance with the mitigation measures in Section 6.12.5. • All erosion and sediment controls are to be installed before the commencement of works which would disturb soil and would be maintained until the works have been completed and areas are stabilised. • Topsoil would be stored separately for possible reuse. • The CEMP would include specific measures for rehabilitation of the site including: o Removal of traffic controls and signage o Removal of environmental controls • Progressive stabilisation and rehabilitation.		
Soil disturbance on the banks and in the waterway	• All surfaces disturbed should be stabilised and restored as soon as practicable and in a progressive manner as works are completed. • An Environmental Work Method Statement (EWMS) should be prepared in accordance with Section 4.13 of the Roads and Maritime QA Specification G36 for all works to be carried out within Sportsmans Creek and any access works on the banks of the waterway. • The EWMS should be prepared in accordance with the DPI (Fisheries) guidelines discussed in Section 6.2.6 and any requirements for dredging and reclamation activities. • All temporary access points installed for building access to the waterway (including constructed pads or temporary jetties) should be established in a manner such to minimise disturbance on the banks. • Any temporary working platforms would be managed in accordance with the principles detailed in Section 3.3.1 building of temporary working platforms for the new bridge of the REF and the outcomes of consultation with DPI (Fisheries).	Contractor	During construction

Impact	Environmental safeguards	Responsibility	Timing
	• For all works likely to generate sediment within the waterway or on the adjacent banks of Sportsmans Creek (including all temporary access works and piling), a sediment / silt curtain and hydrocarbon boom should be placed in Sportsmans Creek, weighted to the bed and secured to accommodate tidal flow. The hydrocarbon boom should be installed inside of the silt curtain when both are in operation. This should remain in place until the completion of drilling and removal of temporary access platforms.		
PASS / ASS Excavation / Disturbance	• For areas identified as PASS where excavation is required (including for piling construction), an ASS management plan should be prepared in accordance with the Roads and Maritime's *Guidance for the Management of Acid Sulfate Materials: Acid sulphate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze* (RTA 2005) and the soils and water management plan (acid sulfate soils section). The ASS management plan should be approved by Roads and Maritime before the commencement of any earthworks and at a minimum, the plan should include: o Management measures for the safe excavation, isolation and disposal of neutralisation of soils o Requirements for additional testing to determine predicted liming rates of excavated spoil once quantities are determined. • Specific controls to be implemented would include: o Capping exposed surfaces with clean fill to prevent oxidation o Placing excavated ASS separately in a lined, bunded and covered area o Neutralising ASS for reuse (where appropriate) by using additives such as lime.	Contractor	Pre-construction During construction
Contaminated soil	• A contingency plan for the management of contaminated soils should be developed. • Visual/olfactory assessment of excavated materials should be carried out immediately following exposure. • Soil disturbance should be minimised in the vicinity of the Underground Storage Tanks near the General Store. In the event that design changes require works at this location, the Roads and Maritime Environmental Officer should be contacted with regard to further	Contractor	Pre-construction During construction

Impact	Environmental safeguards	Responsibility	Timing
	environmental assessment.		
Imported Fill	• All fill brought on site should be classified as Virgin Excavated Natural Material (VENM) as per Schedule 1 of the POEO Act and be free of weeds and seeds.	Contractor	During construction
Trafficability	• If required, access tracks would be stabilised from gravel sourced locally, which is certified as pathogen-free.	Contractor	During construction

6.2 Groundwater, Hydrology and Flooding

6.2.1 Existing environment

Hydrology and drainage

The Proposal is located on Sportsmans Creek, approximately 3.2 km downstream of the Sportsmans Creek Weir and 100 m from the existing Sportsmans Creek bridge location, near where the Creek meets with the Clarence River. Sportsmans Creek is the dominant feature on the alluvial floodplain in which the lower parts of the township of Lawrence are located. The broader Clarence River, its estuary and the coastal floodplain which Sportsmans Creek forms part of, is the largest coastal river system in NSW (Umwelt 2003). The Clarence River Floodplain is also significant as it supports a commercial estuary fishing industry.

Sportsmans Creek is approximately 100 m in width and drains in a south-east direction under the existing bridge towards the Clarence River. During low flow conditions, Sportsmans Creek may be influenced by an afflux of water from the Clarence River, whereby the water from the Clarence flows upstream into Sportsmans Creek. Both the Clarence River and Sportsmans Creek are tidal. The weir is installed to prevent the incursion of saltwater into the wetlands further upstream (Golder Associates 2014). The weir also provides a freshwater pool for agricultural purposes for stock (Clarence Valley Council 2008).

Groundwater

The geotechnical assessment carried out by Golder Associates (2014) (refer to Appendix B) noted that groundwater seepage was observed in all surveyed boreholes at shallow depths, which indicates that the local groundwater level was at approximately RL 0 m Australian Height Datum (AHD) or within 2 to 3 m of the ground surface at the time of investigation. It was noted that the local water table is expected to fluctuate with tidal changes.

The inferred direction of surface and ground water flow in the area is to the east. It is constrained by the natural flood levies along the banks of Sportsmans Creek and through the sandy alluvium layers, which are charged by the flow from land at higher elevations north and east of the study area. Wet ground conditions are frequently noted behind the natural flood levies for Sportsmans Creek.

Flooding

The Lower Clarence River Flood Study Review (WBM 2004) shows that Sportsmans

Creek and the approach roads to Sportsmans Creek bridge are impacted by flooding. An update of the 2004 study was completed by BMT WBM (2013) and provides an assessment of the flood behaviour within the Lower Clarence Valley and the flood flow within Grafton and Maclean when the levee systems are overtopped.

A flooding assessment of the Sportsmans Creek new bridge proposal was completed by BMT WBM (2014) and is provided in Appendix I. The primary objective of the study was to determine the impact of the proposed bridge scenario on flood behaviour in the vicinity of Lawrence and carry out an assessment of potential scour at the abutments and piers of the proposed bridge. The study has utilised the existing hydraulic model which was developed for the Lower Clarence River Flood Model Update (BMT WBM 2013).

Lower Clarence River flood model

The Lower Clarence River flood model was updated to include multiple 2D domains, which increase the model resolution within and surrounding the urban areas of Grafton, South Grafton and Maclean and was updated to include newly available 1 m resolution Airborne Laser Survey (ALS) topography data. The model was developed using a software package called TUFLOW and data from a Digital Elevation Model (DEM) derived from ALS and topographic survey data for areas 'out of the bank' and bathymetry data based on the original hydro-survey from WBM (2004).

Land-use mapping is used by the hydraulic model to represent the associated hydraulic resistance or roughness within the floodplain. In total, nine areas of different land-use type based on aerial photography were used. These land-use values have been validated as part of the flood model calibration exercise.

The Lower Clarence flood model uses various input boundary conditions including:

- Flood inflows for the Clarence River at Mountain View
- Flood inflows for the Clarence River tributaries downstream of Mountain View
- Floodplain rainfall runoff
- Ocean water levels.

The model has also been used to assess the impact of climate change on flood behaviour through modelling increases in rainfall intensity and sea level rise.

Flooding behaviour

Flooding behaviour of the Lower Clarence River floodplain is dominated by the river flow originating from upstream in Grafton in terms of both peak flood levels (that is, the maximum level the flood waters reach during a flood event) and duration of inundation of the floodplain.

The flow typically contributes 80 to 90 per cent of the total volume of floodwaters that enters the lower floodplains, and flow can be sustained for several days to weeks as shown in Plate 6.1 ad 6.2. Clarence River floods typically occur from low rainfall intensity events that last several days to weeks. On the Clarence River floodplain, the flows from other smaller catchments downstream play only a minor role in flood behaviour.

As noted above, the river flows originating from upstream of Grafton dominate

flooding in the Lower Clarence Valley, so the flood behaviour downstream of Grafton is quite complex. For Sportsmans Creek, river flows and elevated river levels in the Clarence River result in flow back up Sportsmans Creek for all flood events in the existing environment. As the Clarence River floodplain flows peak, the flows travel in a reserve direction along Sportsmans Creek with flows discharging from Sportsmans Creek into the Clarence River.

Plate 6.1 and Plate 6.2 show the extent of the February 2013 flood event and the subsequent remaining impact after one week. The existing bridge can be seen in both photos and was not overtopped, although the approaches were inundated.

Plate 6.1 and Plate 6.2

Figures 6.2 and 6.3 are extracts from BMT WBM (2013) and show the extent of flooding in the study area for a 20 per cent Annual Exceedence Probability (AEP) event and the extreme (Maximum) flood event. The maps show that much of the Clarence River flood plain is inundated during both the 20 per cent AEP and 1 per cent AEP flood event.

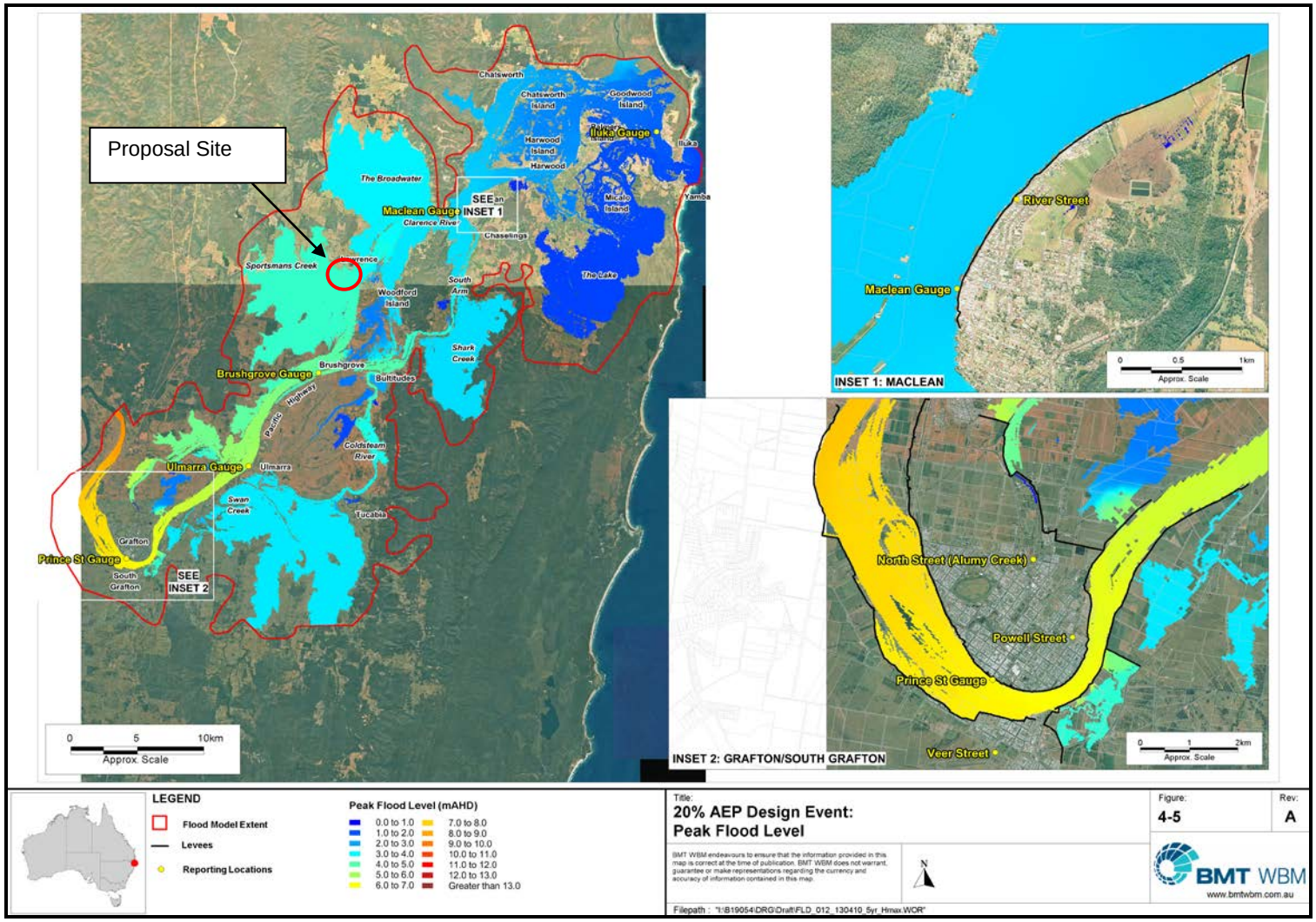

Figure 6.2 **20 per cent AEP flood levels (Source: BMT WBM 2013)**

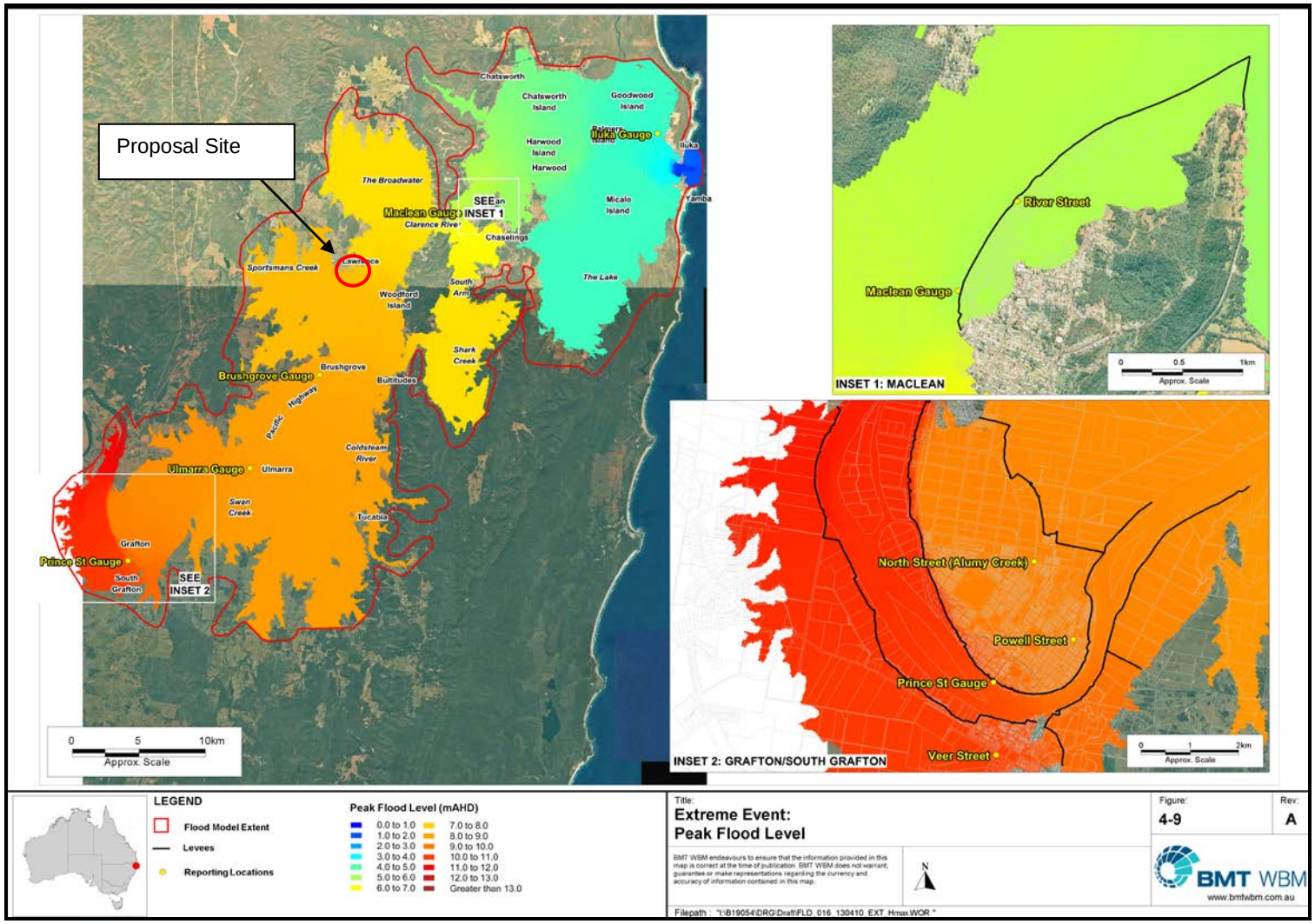

Figure 6.3 Extreme (maximum event) flood levels (Source: BMT WBM 2013)

6.2.2 History

The area has a history of flooding, with the Sportsmans Creek Weir installed in 1927 to prevent tidal flow upstream. Sportsmans Creek once formed part of diverse floodplain habitats, freshwater and estuarine wetlands, which have been removed and drained for agricultural lands (Umwelt 2003). This activity has resulted in the introduction of major challenges for sustainable management of water quality and water use in the catchment.

The flood model utilised by BMT WBM (2014) was calibrated based on the following historic flood events which have been recorded: 1967, 1968, 1980, 1988, 1996, 2001 and 2009.

6.2.3 Policy setting

The *Clarence Estuary Management Plan* (Umwelt 2003) is the Clarence Valley Council Coastal Management Plan which applies to Sportsmans Creek for the purposes of the *Coastal Protection Act 1979*.

The Office of Water issues a number of guidelines for the management of works on waterfront land. Although the Roads and Maritime are subject to exemptions from "controlled activity approvals" under the *Water Management Act 2000*, the guidelines are still relevant to works carried out within the riparian zone.

Furthermore, public authorities are required to consider the impact of their activities upon coastal processes and hazards under clause 228 2(p) and on the environment more broadly in a number of subclauses of clause 228 of the *EP&A Regulation 2000*.

6.2.4 Criteria

The criteria for assessing the impact of the Proposal would be set as minimising impacts upon groundwater, flooding and hydrology of the local environment to ensure it remains as similar as possible to the existing condition.

6.2.5 Potential impacts

Construction

Groundwater

As discussed in Section 6.1.5, in order to build the bridge approaches excavation is required which is likely to require groundwater dewatering. In order to minimise the amount of dewatering required, it is recommended to limit the depth of excavations as far as practicable. The presence of ASS has the potential to result in acidic groundwater which would require treatment before discharge. A number of safeguards and mitigation measures have been proposed for the management of groundwater issues in Section 6.2.6.

Flooding

The Proposal and associated work areas alongside the new bridge, in Flo Clark Park and on Lot 1 Section 5 DP758604 are located within the 1 in 5 year ARI (or 20 per cent AEP) as shown in Figure 6.2. The most recent flood in the area in 2013 (refer Plate 6.1 and 6.2) demonstrated that the Proposal area is prone to flooding and that once flooded, it is likely that it would take several days for the flood waters to recede. As such, the proposed building work and local access roads to the Proposal site are likely to be impacted by flood in the event of a significant rain event in the wettest summer months of the year. Building planning would need to consider the potential

impacts of flood upon works and a contingency plan developed, in accordance with the safeguards and management measures provided in Section 6.2.6.

Hydrology

The presence of temporary work platforms for the building of the new bridge has the potential to influence the local hydrology of Sportsmans Creek. The design of work platforms would need to consider the local hydrological conditions to ensure that this impact would be minimal.

Operation

Hydrology

The proposed location of the new bridge would require earthworks and imported fill along the banks of Sportsmans Creek which would result in modifications within the riparian zone of the Creek. Building the piers would also present a new obstruction within the waterway. The preparation of the bridge design would consider the potential for scour and other hydrological modifications upon the waterway flows to ensure there would not be any adverse impacts upon the local hydrology.

Flooding

Model Results and Conclusions

1. Design and climate change model runs

The proposed scenario model has been simulated for the 20 per cent AEP, 2 per cent AEP and 1 per cent AEP design flood events as per the Lower Clarence River Flood Model Update. Climate change model runs have been carried out for the 1 per cent AEP event for the following climate change scenarios:

- 10 per cent increase in rainfall intensity combined with a 0.4 m rise in sea levels; and
- 20 per cent increase in rainfall intensity combined with a 0.9 m rise in sea levels.

Peak water levels from the proposed scenario model have been compared to existing scenario model results to determine the impact of the proposed structure on water levels in the vicinity of the proposed bridge. Figure 6.4 to Figure 6.6 are a series of level difference maps showing both the differences in water levels across the 15 m model grid and at seven specific markers along Sportsmans Creek.

The results indicate that the peak flood levels are consistent in elevation across the seven flood markers and that the proposed works have a negligible impact on peak water levels for each of the design flood events assessed.

The updated model has been verified against model results from the Lower Clarence River Flood Model Update (BMT WBM 2013). The impact of the proposed scenario on peak water levels has been assessed for the 20 per cent, 2 per cent and 1 per cent AEP design flood events with the results indicating a negligible impact on peak water levels as shown in Figure 6.7 to Figure 6.9.

The climate changes analysis shows a peak water level of 5.7 m AHD at 10 per cent increase in rainfall intensity and 6.2 m at 20 per cent increase in rainfall intensity.

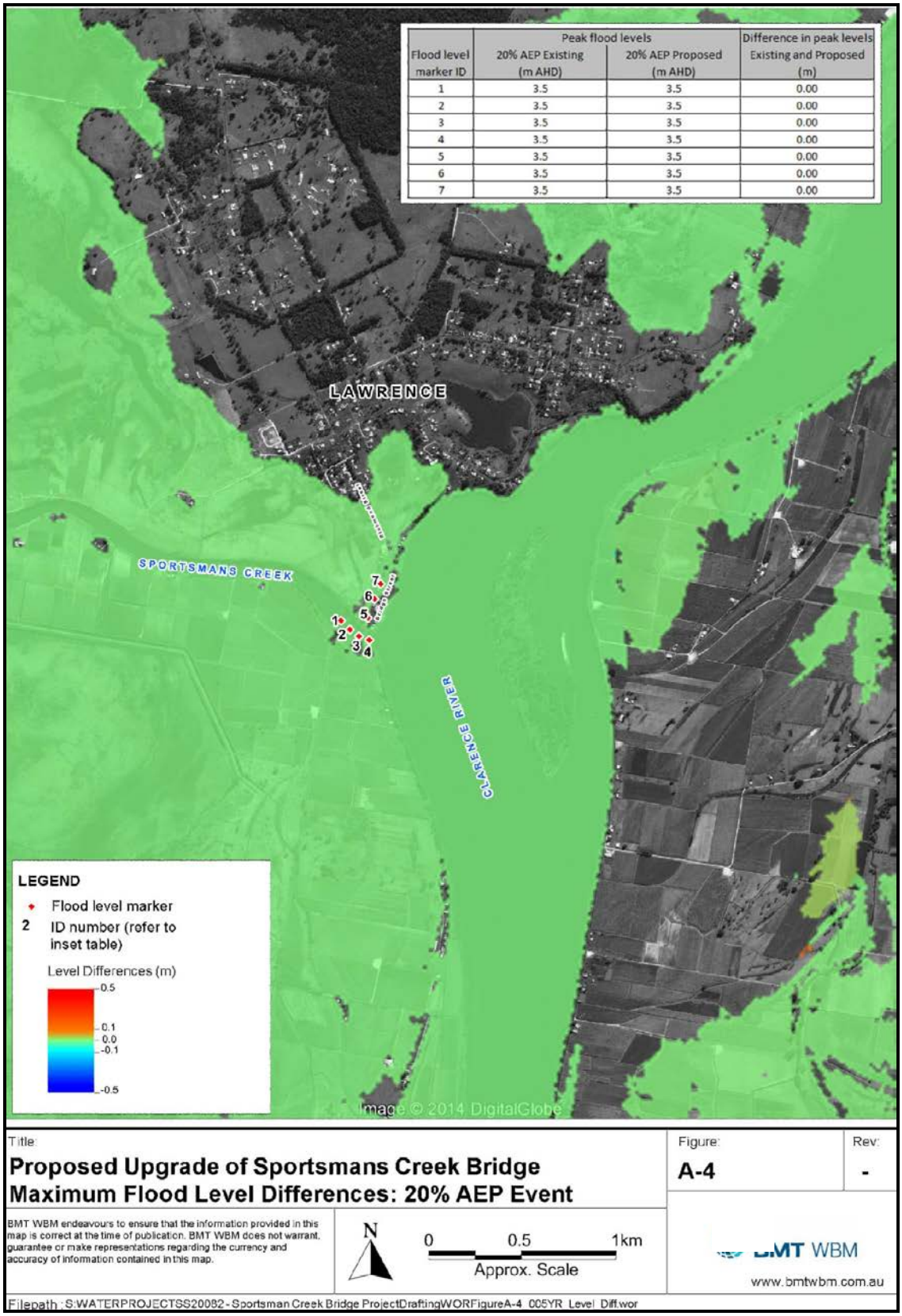

Figure 6.4 Proposed Upgrade of Sportsmans Creek Bridge maximum flood level differences: 20 per cent AEP Event (Source: BMT WBM 2014)

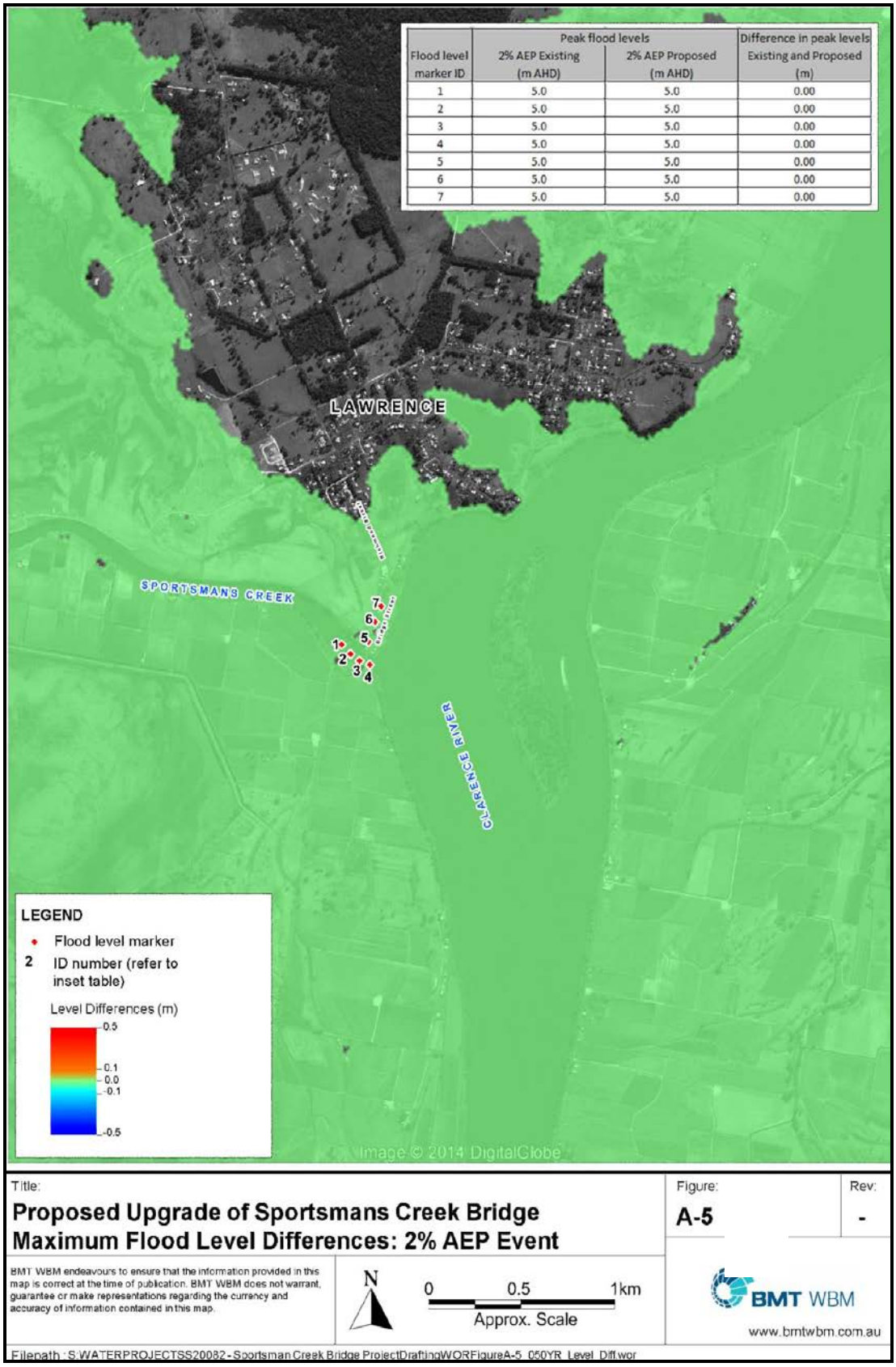

Figure 6.5 Proposed Upgrade of Sportsmans Creek Bridge maximum flood level differences: 2 per cent AEP Event

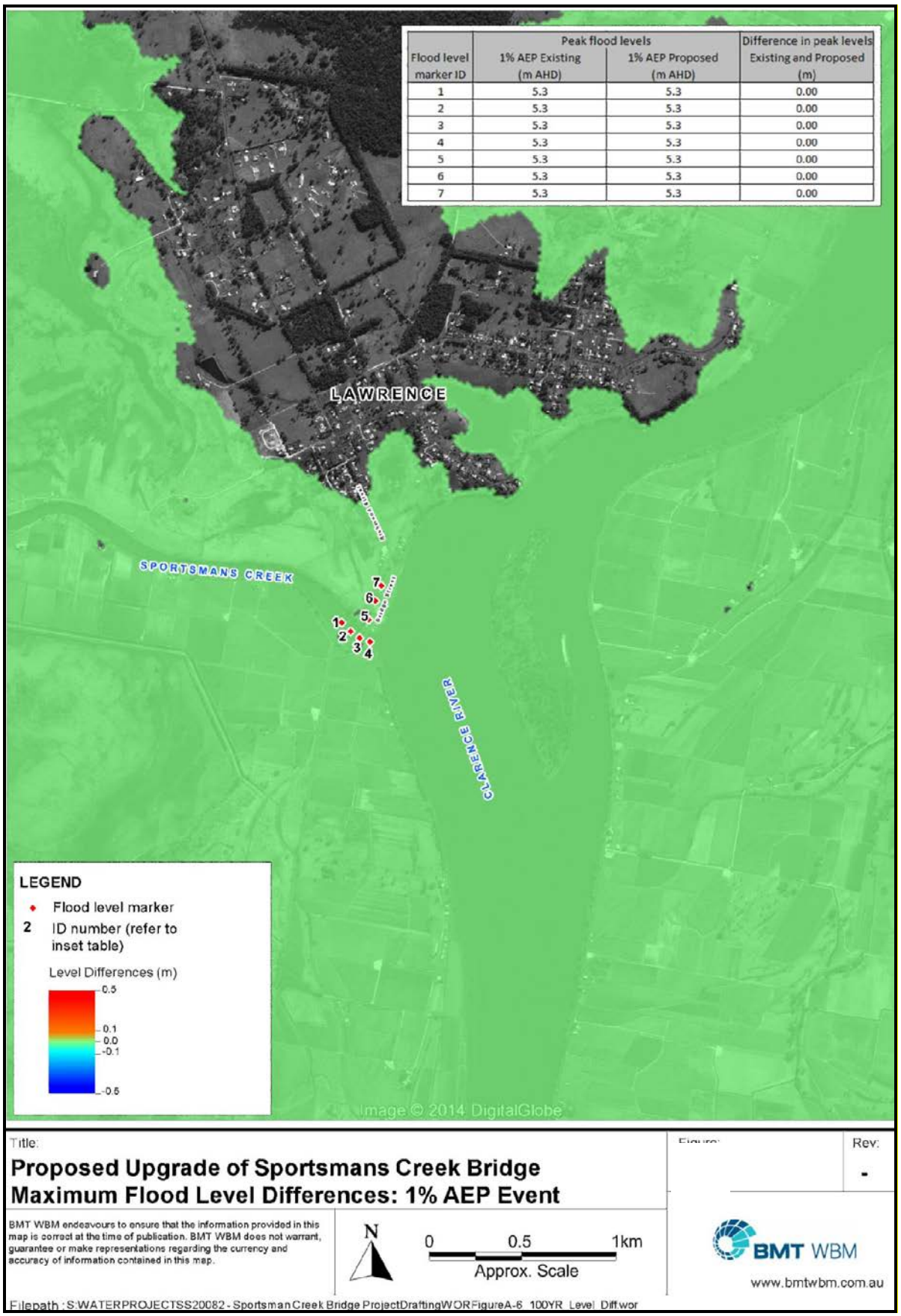

Figure 6.6 Proposed Upgrade of Sportsmans Creek Bridge maximum flood level differences: 1 per cent AEP Event

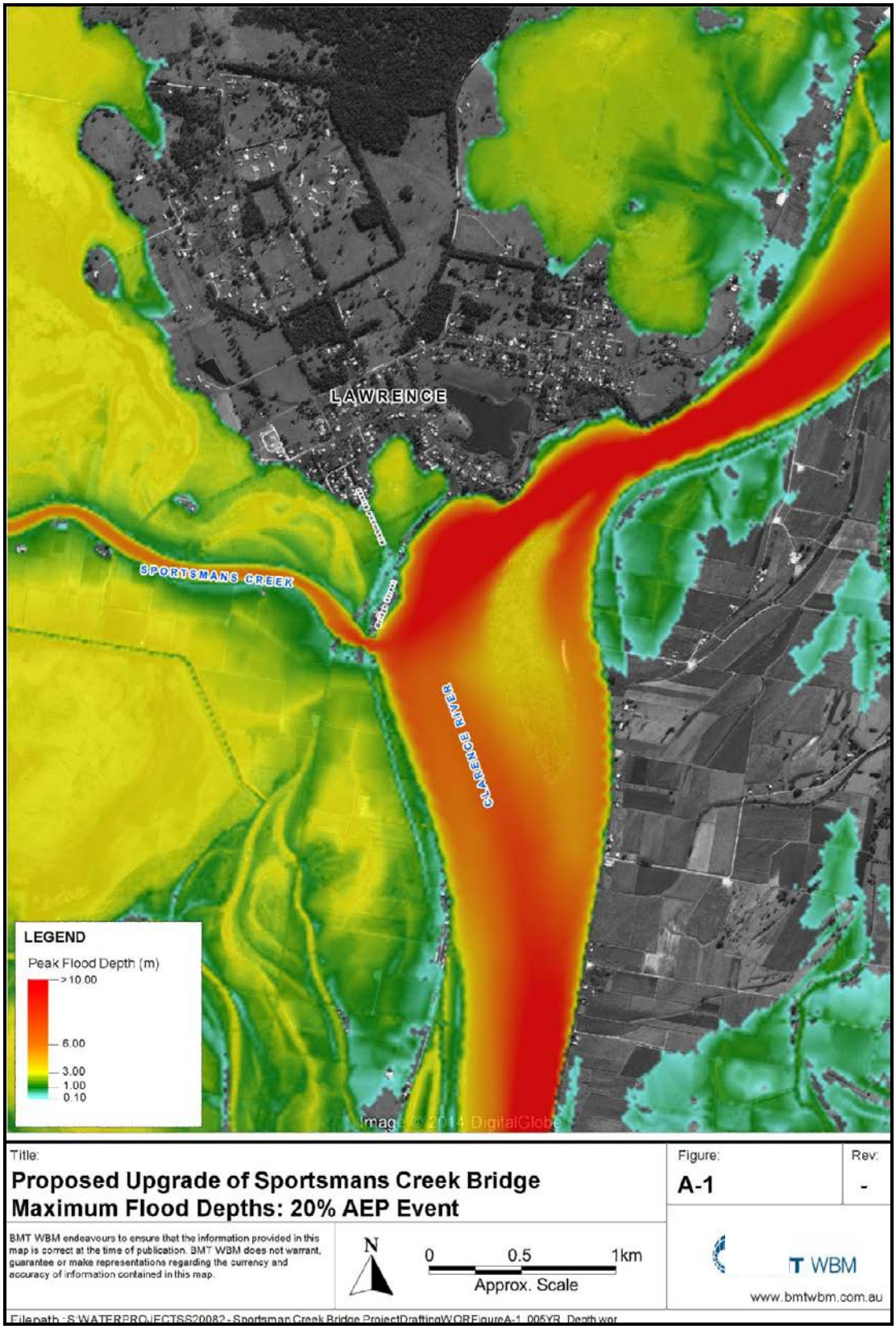

Figure 6.7 Proposed Upgrade of Sportsmans Creek Bridge maximum flood depths: 20 per cent AEP Event

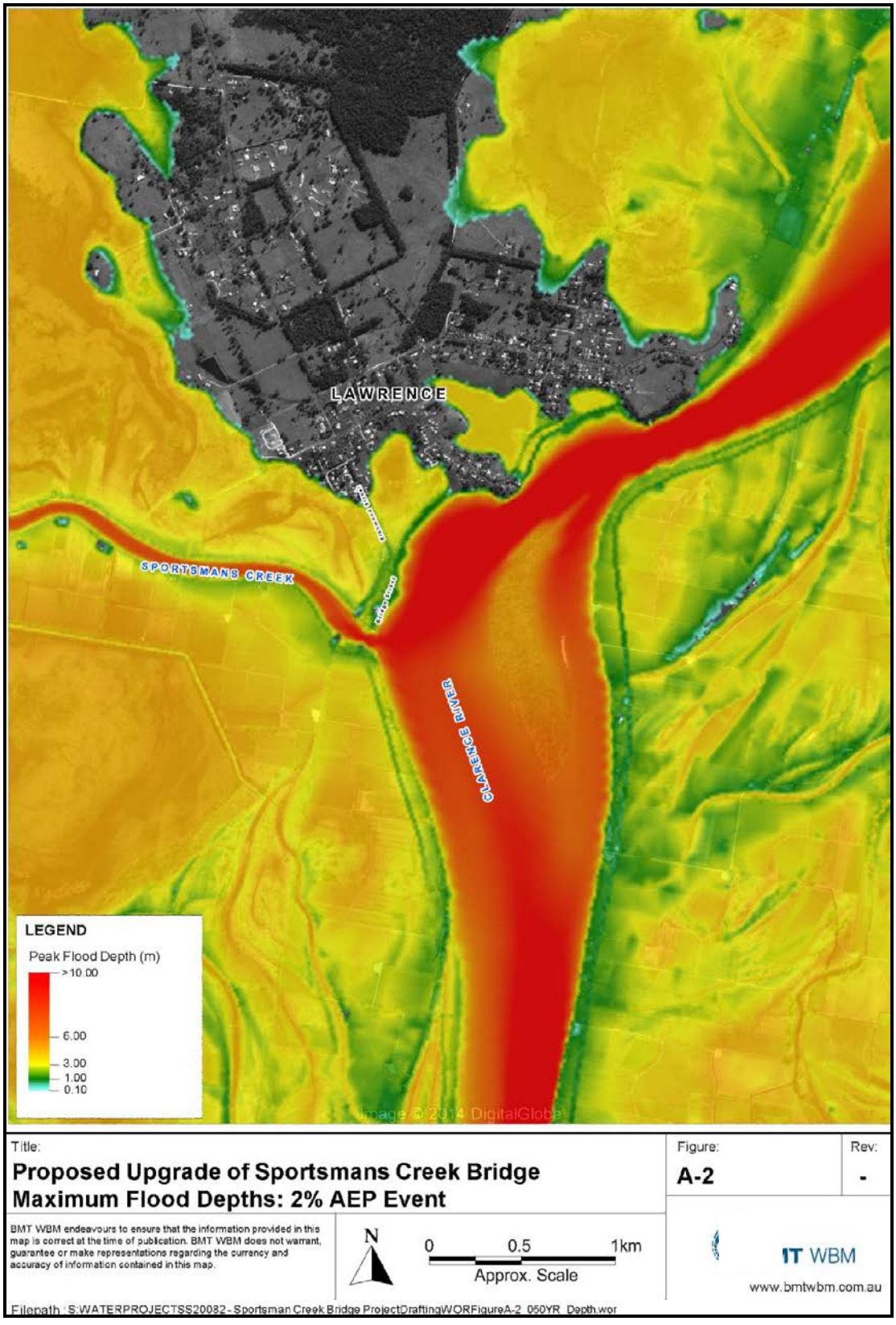

Figure 6.8 Proposed Upgrade of Sportsmans Creek Bridge maximum flood depths: 2 per cent AEP Event

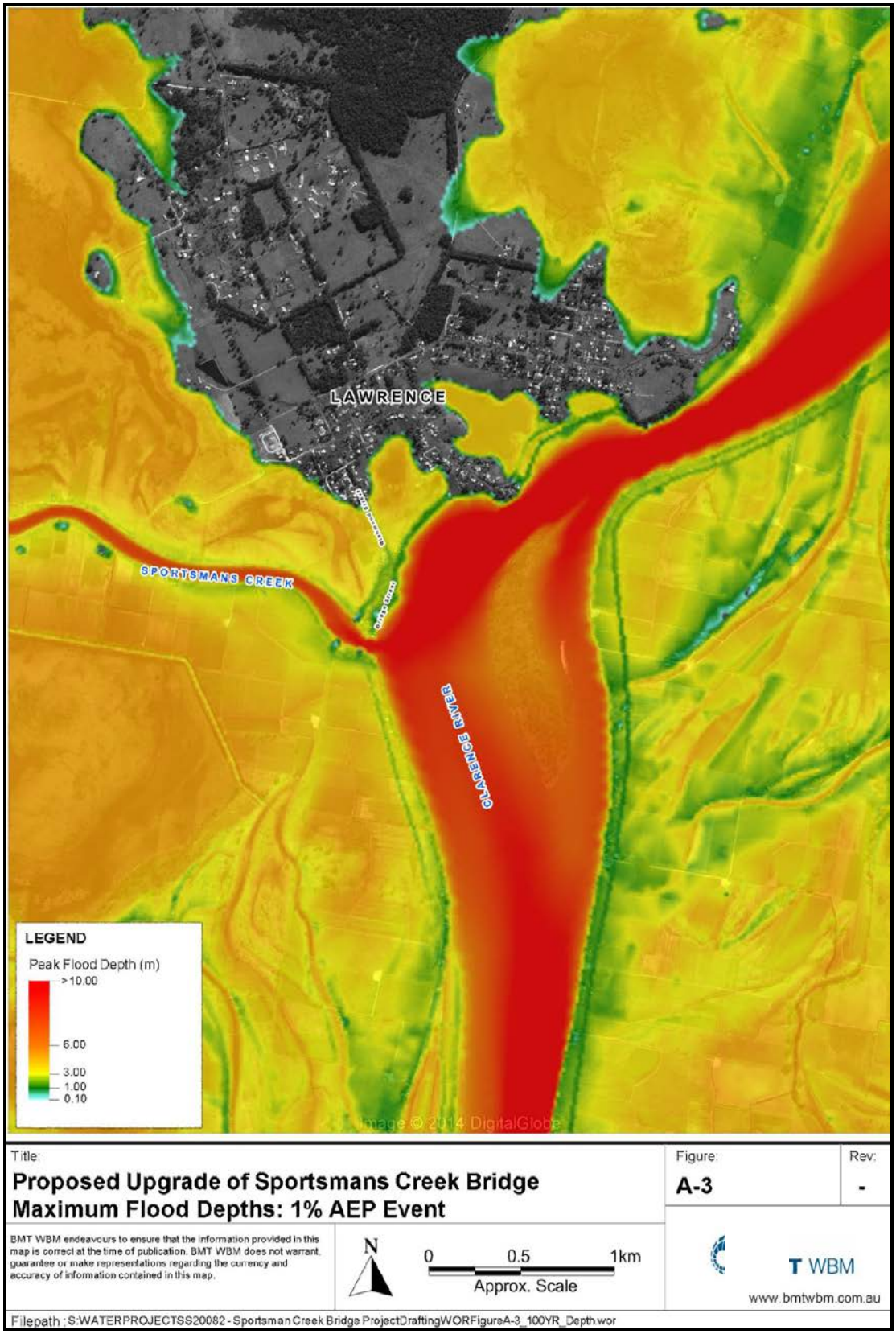

Figure 6.9 Proposed Upgrade of Sportsmans Creek Bridge maximum flood depths: 1 per cent AEP Event

Peak velocities

Assessments/modelling showing the peak velocities for each of the three design events assessed are provided in Figure A-7 to Figure A-9 in Appendix I. The peak channel velocities at the location of the proposed structure range from 1.5 m per second for the 20 per cent AEP event to 1.9 m per second for the 1 per cent AEP event (note that velocities represent depth averaged conditions from the 2D model).

Of the three design flood events assessed, the peak channel velocities at the location of the proposed structure occur for the 1 per cent AEP event. The peak velocities occur when flows in the Clarence River back up through Sportsmans Creek as indicated in Figure 4-1 in Appendix I. These peak velocities occur in advance of the peak in the Clarence River flood wave.

The peak channel velocities have been assessed for the design flood event (20 per cent AEP, 2 per cent AEP and 1 per cent AEP events) which produced the highest channel velocities at the location of the proposed bridge. Analysis of model results indicates that the 1 per cent AEP event produces the highest channel velocities at 2.1 m per second. These results are based on critical duration flooding on the Clarence River and occur as a result of flow travelling in a reserve direction up Sportsmans Creek.

The project strategic concept hydrology and hydraulic design results indicate that the proposed bridge (when compared to the existing state)would not increase average velocities by more than 10 per cent at the proposed bridge (5 per cent AEP). The increase in velocities would be greatest within the main channel of Sportsmans Creek. As such, this increase in average velocities is considered acceptable and would not require further mitigation. Further consideration of potential scour as result of the Proposal is outlined below.

Scour assessment

An estimation of scour at the abutments and piers of the Sportsmans Creek new bridge has been carried out for the 1 per cent AEP design flood event (ie the design flood event which produces the highest channel velocities at the location of the proposed bridge as noted above).

Scour occurs when the flow area of the watercourse is reduced by the bridge constricting flow. Accordingly, the scour calculations are limited to scour at the abutments and pier of the new bridge.

Given the configuration of the proposed bridge structure with piles founded at rock level and local approach flow conditions, no significant scour is anticipated. Local abutment and pier scour depths for the 1 per cent AEP design flood condition have been estimated to range from 1.8 m up to 7.5 m.

Potential Impacts

As the same navigable clearance of the existing bridge (refer to Section 3.2.1) is proposed for the bridge, the Proposal would not be impacted by flooding at the 20 per cent AEP flood event scenario as shown in Figure 6.7. However, at the 1 per cent and 2 per cent AEP flood event, the bridge would be subject to debris loading as the water level would overtop the bridge deck as shown in Figure 6.8 and Figure 6.9. This would be a consideration for the long-term management of the bridge, particularly during flood events. The new information provided by the BMT WBM (2014) study would be provided to Council to assist with flood planning.

Overall, as demonstrated by the BMT WBM (2014) study the operation of the new bridge is not anticipated to have any permanent long term impact upon the environment, property or community and would have a negligible effect upon the existing floodplain.

6.2.6 Safeguards and management measures

The mitigation measures to prevent adverse impacts on water quality would be in accordance with the Roads and Maritime QA Specification G36 *Environmental Protection* and *G38 Soil and Water Management* and in accordance with the Landcom (2004) *Managing Urban Stormwater, Soils and Construction Guidelines* (the Blue Book) with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Flooding during building work	• A Flood Management Plan should be prepared as part of the CEMP and implemented during building work. At minimum this plan should include: o Consideration of evacuation protocols from the *Clarence Valley Local Flood Plan* (SES 2012) for the Lawrence Sector o Project-specific emergency response and evacuation controls during flooding. o Measures to ensure that equipment, site-offices, ablution facilities, vehicles, materials, buoyant items and machinery are secured against flood or able to be removed off-site when a flood warning is issued. o Reporting requirements o A regular weather monitoring regime. • The State Emergency Service (SES) should be informed of the works, if they are occurring during flood season (November to March). • The SES should also be informed of any partial or full road closures during building work. • No works should be carried out during or immediately after periods of flood unless it is deemed safe to return to the area by the SES and the Roads and Maritime Project Manager.	Contractor	Pre-construction During construction
Hydrological impacts	• Any temporary structures such as silt curtains placed in-stream would be installed such that they would not impact flows and cause erosion.	Contractor	During construction
Groundwater contamination	• Temporary casing for bored piles would be employed. • Temporary sheet piling should be considered to minimise the impact of water inflow.	Roads and Maritime	Detailed design During construction

Impact	Environmental safeguards	Responsibility	Timing
Hydrological changes impacting Sportsmans Creek as a result of the bridge design and temporary building for waterway access	• As per the correspondence in Appendix H, the Proposal design should consider the *NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation and management* (DPI 2013) and mitigation measures to minimise potential impacts upon Sportsmans Creek. • The Proposal design should ensure that the hydrological flows of the waterways are not altered causing scouring of banks or obstruction of flows.	Roads and Maritime	Detailed Design

6.3 Biodiversity

A biodiversity assessment was completed by GeoLINK (2014) and is provided in Appendix E. The biodiversity assessment addressed both the building of the new bridge and removal of the existing bridge. This REF focusses upon the building of the new bridge only.

This section summarises the desktop and field investigations for flora and fauna in relation to the preferred option.

The Biodiversity Assessment has provided the following definitions for the purposes the assessment:

- 'the site' refers to the area directly affected by the proposed new bridge building and old bridge removal
- 'the study area' refers to the site and any additional areas that are likely to be affected by the Proposal, either directly or indirectly
- 'the locality' refers to land within a 10 km radius of the site.

6.3.1 Existing environment

Desktop assessment

A desktop assessment of the following databases was carried out to identify potential biodiversity constraints associated with the site as part of the preliminary investigations for the route options:

- A 10 km radius search of the Atlas of NSW Wildlife (OEH) to identify threatened flora/ fauna species and Endangered Ecological Communities (EECs) known to occur within the search area
- A 10 km radius search of the EPBC Protected Matters Search Tool for federally listed threatened flora/fauna species and ecological communities predicted to occur within the search area
- Searches of the NSW Department of Primary Industries (DPI) Fisheries Records Viewer for threatened aquatic fauna occurring within the Clarence Valley LGA.

A comprehensive literature review of information pertaining to the study area was carried out. Key sources of information reviewed include:

- OEH Critical Habitat Register
- Areas listed on the Register of National Estate (RNE)
- Directory of Important Wetlands in NSW (DIWA) Spatial Database

- Key Fish Habitat mapping for Clarence Valley LGA (NSW DPI)
- Mapped bird routes of the Clarence Valley (Clarence Valley Birdos 2006)
- DPE *SEPP 14 – Coastal Wetland* and *SEPP 26 – Littoral Rainforest mapping*
- Clarence Valley Estuary Management Plan (Umwelt 2003)
- Terrestrial and Aquatic Flora and Fauna Assessment: Proposed Replacement of the Sportsmans Creek Bridge, Lawrence (D and D Consultants 2002)
- Environmental Impact Statement for Demolition of Existing Bridge and Construction of New Bridge over Sportsmans Creek, Lawrence (Maclean Shire Council 2002)
- Bat Survey and Impact Assessment: Sportsmans Creek Bridge, Lawrence NSW (Ecotone 2007)
- Technical paper – A review of the Status of Breeding Osprey in 2006 (Ekert and Brady 2007)
- DPI Noxious Weeds Declarations search
- NSW DPI – Fishing and Aquaculture Record Reviewer.

In addition the desktop review, consultation was taken with the following individuals/ agencies:

- Mr Martin Swain, Council Ecologist
- Mr Greg Clancy, local ecologist and avifauna researcher.

A review of aerial photography of the study area was also carried out to identify vegetation extent, wetland areas and other ecological features of the site.

As preliminary investigations of the existing Sportsmans Creek bridge identified a breeding population of the Large-footed Myotis (*Myotis macropus*), a separate Microbat Survey and Impact Assessment Report has been prepared for the Proposal by GeoLINK (2014) which is included as an Appendix to this report (refer to Appendi A of Appendix E). The findings of this survey would form part of the REF for the assessment of the removal of the existing bridge, but have been included in Appendix E for information.

Threatened Flora

The OEH Atlas of NSW Wildlife search and Protected Matters Search Tool identified records of 14 flora species listed under the TSC Act and/or EPBC Act previously recorded or having habitat within the search area (10 km radius around the site) (refer to Appendix B of Appendix E).

Of the threatened flora species identified in the database searches, based on habitat requirements the following two species were considered to have potential to occur at the site:

- Hairy Jointgrass (*Arthraxon hispidus*): Considered to have a moderate potential to occur in cleared paddocks to the west of Lawrence.
- Maundia (*Maundia triglochinoides*): Considered to have a moderate potential to occur within areas of ephemeral wetland to the west of the study area.

Endangered/Threatened Ecological Communities

The OEH Atlas of NSW Wildlife search indicated nine EECs occurring within the search area (10 km radius around the site).

Based on a review of aerial photographs covering the site and previous vegetation mapping, the following TECs/ EECs were considered likely to occur at the site:

- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion.

The Protected Matters Search Tool also indicated that the TEC, Lowland Rainforest of Subtropical Australia as potentially occurring at the site. The assessment determined that this TEC is unlikely to occur at the site.

Threatened Fauna

The OEH Atlas of NSW Wildlife search and Protected Matters Search Tool identified records of 43 threatened fauna species listed under the TSC Act and/ or EPBC Act previously recorded or having habitat within the search area (10 km radius around the site).

Of the threatened fauna species identified by the database searches, the following 16 species were considered to have a moderate or high potential to occur in the study area (based on habitat requirements) on occasion:

- Magpie Goose (*Anseranas semipalmata*)
- Australasian Bittern (*Botaurus poiciloptilus*)
- Black-necked Stork (*Ephippiorhynchus asiaticus*)
- Brolga (*Grus rubicund*)
- Pied Oyster Catcher (*Haematopus longirostris*)
- Comb-crested Jacana (*Irediparra gallinacean*)
- Black-tailed Godwit (*Limosa limosa*)
- Eastern Osprey (*Pandion cristata*)
- Grey-crowned Babbler (*Pomatostomus temporalis*)
- Australian Painted Snipe (*Rostralula benghalensis australis*)
- Estuary Rock Cod (*Epinephelus coioides*)
- Little Bentwing-bat (*Miniopterus australis*)
- Eastern Bentwing-bat (*Miniopterus shreibersii*)
- Large-footed Myotis (*Myotis macropus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Migratory Species

A total of 31 migratory species listed under the EPBC Act were identified in the Protected Matters Search Tool for the search area. Eight are listed as ‘migratory terrestrial species’, 12 are listed as ‘migratory wetland species’ and 11 are listed as ‘migratory marine species’.

Although no listed migratory species were observed during field assessments, the following eight species are considered to have some potential to occur within the study area:

- Fork-tailed Swift (*Apus pacificus*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)

- Satin Flycatcher (*Myiagra cyanoleuca*)
- Great Egret (*Ardea alba*)
- Cattle Egret (*Ardea ibis*)
- Eastern Osprey (*Pandion cristata)*
- Latham's Snipe (*Gallinago hardwickii*).

Wildlife Corridors, Critical Habitat and Key Habitats
A review of NPWS wildlife corridor and key habitat mapping indicated no mapped wildlife corridors or areas of nominated key habitats associated with the study area. Field assessment of fauna habitat features supported these findings.

Sportsmans Creek would however act as a regional corridor for bird species moving between habitats associated with the upstream reaches of Sportsmans Creek and the Everlasting Swamps and habitats associated with the lower Clarence River.

A review of the OEH Critical habitat register (24 July 2013) found no areas of critical habitat relevant to the study area.

Endangered Populations

The following two endangered populations listed under the TSC Act were identified as occurring within 10 km of the study area:

- Emu Population in the NSW North Coast Bioregion and Port Stephens local government area.
- Allocasuarina *inophloia* (F.Muell. and F.M. Bailey) L.A.S. Johnson Population in the Clarence Valley Local Government Area.

The field survey confirmed there is no evidence of either populations in the study area.

Aquatic Species

A search of the NSW DPI (Fisheries) Records Viewer for threatened aquatic fauna did not find any records of threatened aquatic fauna in the vicinity of the study area. Previous studies for the existing Sportsmans Creek bridge identified that the bridge would be likely to provide habitat for the Estuary Rock Cod (*Epinephelus coioides*) which is listed as protected under the FM Act.

Additionally, Sportsmans Creek would provide habitat for a number of other fish species, including the Australian Bass (*Macquaria novemaculeata*) which would be likely to spawn within this estuary. The creek is a known breeding ground for crustaceans which were observed along with small fish in Sportsmans Creek during the fauna habitat assessment.

Sportsmans Creek is also included as part of an area of mapped Key Fish habitat within the Clarence Valley LGA. Sportsmans Creek is not considered habitat for the threatened Eastern freshwater Cod *Maccullochella ikei* (Eastern freshwater cod expert Dr Stuart Rowland pers. Comms.)

Wetlands

Four Important Wetlands were listed on the NSW Directory of Important Wetlands (DIWA) Spatial Database which were identified in the EPBC Act Protected matters search occurring within 10 km of the site.

Two wetlands were identified in proximity to the study area, Everlasting Swamp (occurring 500 m west of the Proposal study area) and the Clarence River Estuary, which occurs immediately east of the existing Sportsmans Creek bridge as shown on Figure 6.10.

No SEPP14 Coastal Wetlands occur within the study area.

A review of aerial photographs indicates that wetland areas occur in the western portion of the study area. These wetland areas largely consist of constructed ephemeral drainage lines which drain excess water from farm paddocks to Sportsmans Creek. They occur on the periphery of the Little Broadwater system of wetlands, located to the west of the study area. Although not formally listed as Important Wetlands, the Little Broadwater system of wetlands are likely to have significant habitat value to locally occurring wetland bird species such as the Black-necked Stork (*Ephippiorhynchus asiaticus*) and Brolga (*Grus rubicund*) and other threatened/ migratory wetland birds.

Field Survey

A field survey was carried out on 8 July 2014 to confirm the vegetation present on the site and provides an indicative list of flora species utilising the random meander method. The areas surveyed related to the potential areas to be cleared for the Proposal as shown on Figure 6.11.

A fauna assessment was carried out in additional to previous survey work carried out. The fauna assessment was based on a review of database records and habitat features and resources and suitability for threatened species recorded in the locality.

Figure 6.10 Ecological constraints within the study area (Source: GeoLINK)

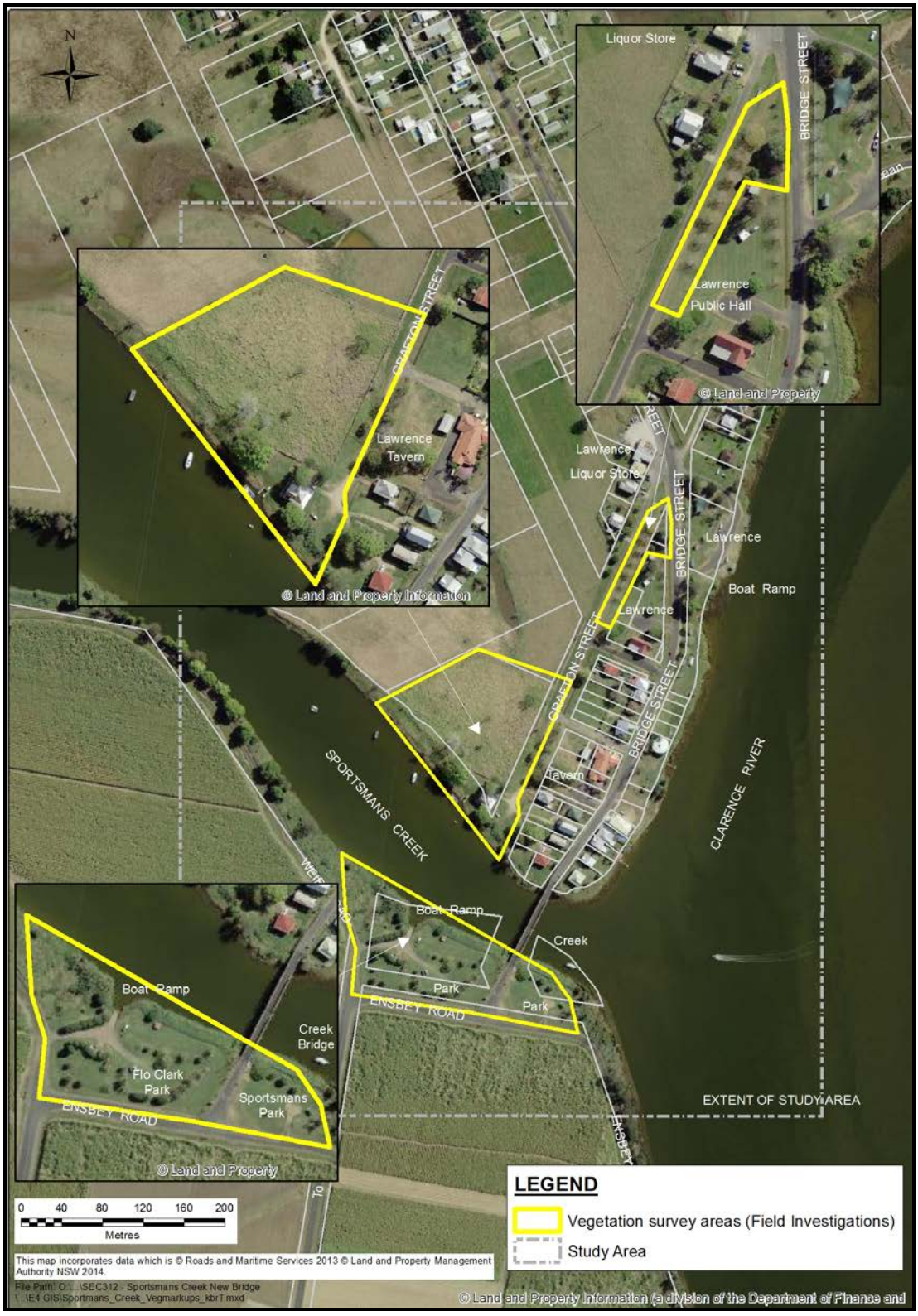

Figure 6.11 Vegetation surveyed during field investigation

Vegetation Communities

Vegetation communities present at the site are highly modified and have low conservation value, having been cleared of indigenous riparian vegetation which would have once covered the site and much of the locality. Four main communities are identified on site, as shown on Figure 6.10.

- Parkland
    - Flo Clark Park and Sportsmans Park (refer to Plate 6.3)
    - Vegetation of low conservation value including planted:
        - Bottlebrush (*Callistemon sp*), Cadagi (*Corymbia torreliana*), Jacaranda (*Jacaranda mimosifolia*), African Tulip Tree (*Spathodea companulata*) and Water Gum (*Tristaniopsis laurina*).

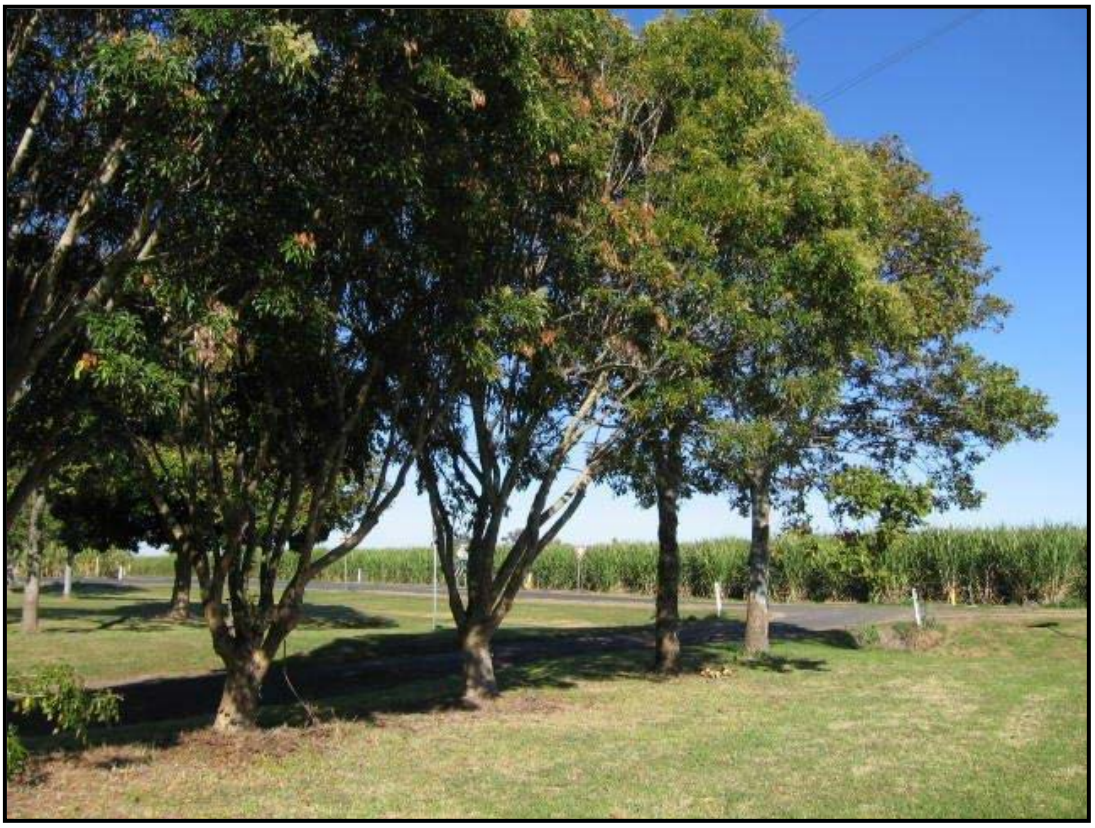

Plate 6.3 Non indigenous tree plantings in Flo Clark Park provide limited food resources and perching opportunities for birds.

- Riparian Zones
    - On the banks of Sportsmans Creek, largely cleared of native vegetation. The remaining vegetation is dominated by exotic grasses and weeds, particular Para Grass (*Urochloa mutica*) (refer Plate 6.4 and 6.5) and isolated patches of native Common Reed (*Phragmites australis*). Native Forest Red Gum (*Eucalyptus tereticornis*) on the southern banks is located within the study area, outside the immediate site.

Plate 6.4 **Alluvial riparian area of the southern bank featuring a dense matt of exotic Para Grass (*Urochloa mutica*) with emergent Castor Oil Plant (*Ricinus communis*) and a single juvenile Forest Red Gum (*Eucalyptus tereticornis*)**

Plate 6.5 **Exotic Para Grass (*Urochloa mutica*) dominates the steep southern bank. Woody debris (snags) add to aquatic and terrestrial fauna habitat diversity by providing shelter, breeding and ambush sites**

- Aquatic Zone and Seagrasses

  Mapped areas of seagrass and saltmarsh were identified within the Clarence River to the east of the site and aquatic vegetation was not identified at the time of survey within the proposal site. No saltmarsh or seagrass beds were identified within the site during the field surveys.

- Cleared Pasture Land
  - Located on the western side of Grafton Street. The vegetation mainly comprises:
    - Kikuyu (*Pennisetum clandestinum*), Common Couch (*Cynodon dactylon*) and Paspalum spp (refer Plate 6.6).

    - Mature trees such as Camphor Laurel (*Cinnamomum camphora*) trees and Silky Oak (*Grevillea robusta*) (refer Plate 6.7).
    - A regenerating Moreton Bay Fig (*Ficus macrophylla*) is present beneath one of the Camphor Laurels (refer to Plate 6.8).

Plate 6.6 Kikuyu and common couch grass located on cleared pasture lands on the western side of Grafton Street

Plate 6.7 Isolated trees in the middle, western portion of the study area. From left to right, Camphor Laurel (*Cinnamomum camphora*), Silky Oak (*Grevillea robusta*) a maple (Acer sp.) and a Cocos Palm (*Syagrus romanzoffiana*).

Plate 6.8 A sapling Moreton Bay Fig (*Ficus macrophylla*) covered in Coastal Morning Glory (Ipomoea cairica) growing under a mature Camphor Laurel (*Cinnamomum camphora*) on the residential house block.

- Avenue Tree Plantings
    - Consisting of streetscape trees Leopardwood (*Flindersia maculosa*), Jacaranda and Cadagi (*Corymbia torelliana*). (refer to Plate 6.9)

Plate 6.9 Avenue tree plantings along Grafton Street

Noxious Weeds

Five listed 'Noxious weeds' were detected during the survey (refer to Table 6.1). Two of these species, Lantana (*Lantana camara*) and Fireweed (*Senecio madagascariensis*) are also listed as Weeds of National Significance (WoNS). The invasion, establishment and spread of Lantana is also listed as a Key Threatening Process under the TSC Act.

Table 6.1 Listed Noxious Weeds identified on site

Scientific Name	Common Name	Listing	Extent / Location
Ambrosia artemisiifolia	Annual Ragweed	N5	Scattered occurrences along existing road reserve network.
Cinnamomum Camphora	Camphor Laurel	N4	A number of mature Camphor Laurels recorded on the site.
Erythrina sp	Coral Tree	N3	One mature tree occurring on the site.
Senecio madagascariensis	Fireweed	N4, WoNS	Common occurrence in cleared pasture areas associated with the site.
Lantana camara	Lantana	N4, WoNS	A small number of occurrences throughout the site.

Noxious weeds declared under the NW Act, are required by law to be controlled by all landholders within a given control area.

Threatened Flora

One threatened flora species, Durobby (*Syzygium moorei*) was recorded in Flo Clark Park which occurs on the southern bank of Sportsmans Creek. This tree has been planted and is of low conservation significance due to it occurring well outside its natural range (usually in lowland subtropical rainforest, north from the Richmond River). No other threatened flora species were recorded in the study area during the survey, including those predicted to occur.

Endangered/Threatened Ecological Communities

Vegetation communities within the study area were not considered to represent any NSW State or Commonwealth listed TEC or EECs. Flora present in the study area indicative of the Freshwater Wetlands EEC on drainage lines were deemed to be substantially modified and did not meet the criteria for the EEC.

Fauna

The existing Sportsmans Creek bridge was found to support a large and important Large-footed Myotis breeding colony. This species is listed as vulnerable under the TSC Act. Sportsmans Creek bridge also offers potential non-breeding roosting habitat for two other threatened species; the Little Bentwing-bat (*Miniopterus australis*) and Eastern Bentwing-bat (*Miniopterus schreibersii*). The existing bridge also represents a potential non-breeding roost habitat for the Eastern Osprey, which has been recorded on a number of timber truss bridges in NSW. There have been no known records at the Sportsmans Creek bridge.

No other threatened fauna species were recorded in the study area during the fauna habitat assessments. Based on the fauna habitat assessment of the study area it is considered unlikely that the study area represents a significant area of habitat for any of the predicted threatened fauna species with the exception of a number of microbat species. The fauna habitat assessment also identified one hollow-bearing tree in the vegetation survey area (refer to Figure 6.11), being a Camphor Laurel (*Cinnamomum camphora*) (refer to Plate 6.10) with a basal cavity near the northern end of the site, which did not appear to be occupied at the time of inspection.

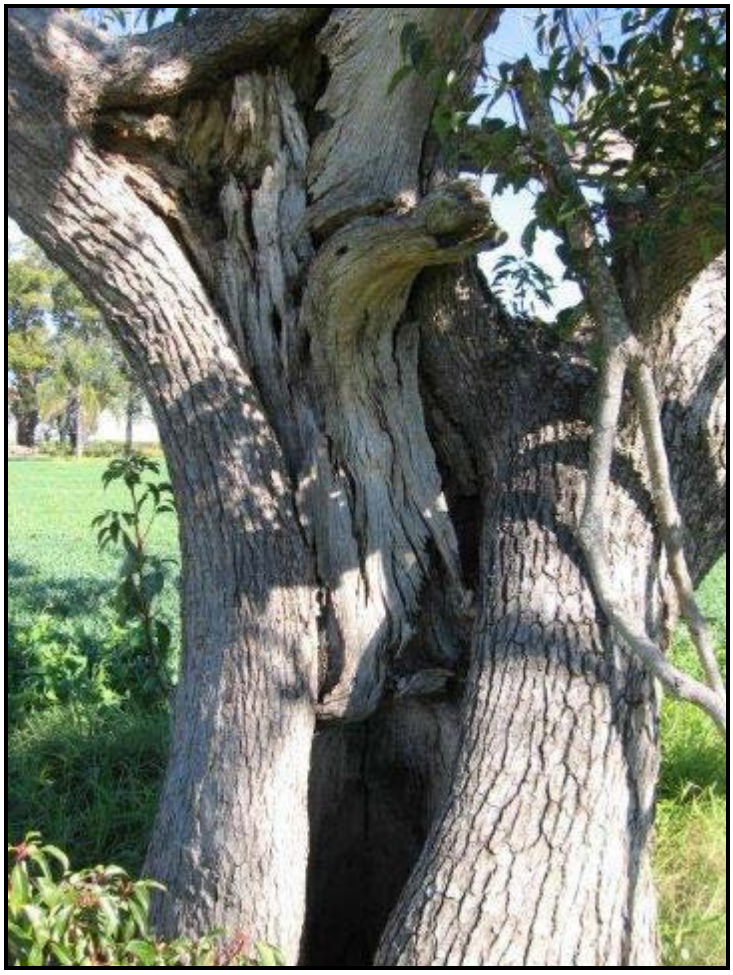

Plate 6.10 A basal cavity/tree hollow in an isolated Camphor Laurel (*Cinnamomum camphora*) towards the northern end of the site. A close examination of the hollow with the aid of a pointed metal probe and high-powered torchlight revealed no signs of fauna occupation.

A number of threatened wetland bird species are regularly observed around Sportsmans Creek and its surrounds including Black-necked Stork and Brolga. Neither species were observed during the field study, however, it is considered the species have potential to utilise the wetlands to the west for foraging.

6.3.2 Policy setting

A number of key acts relate to the to the protection of biodiversity and management of ecological impacts, including the federal EPBC Act and NSW NPWS Act, FM Act, TSC Act, NW Act, EP&A Act and the *Native Vegetation Act 2003*. These are discussed in Section 4 of this REF. Public authorities are required to consider the impact of their activities upon the local environment under Clause 228 of the *EP&A Regulation 2000.* More specifically, authorities must address any impacts on the habitat of protected fauna and whether the Proposal is likely to endanger any species of animal, plant or other form of life, whether living on land in water or in the air, as per clause 228(2)(f) and (g).

6.3.3 Criteria

The criteria adopted for assessing the impact of the Proposal would be to minimise impacts upon potential habitats of identified threatened species and minimise disturbance to native vegetation and the local terrestrial and aquatic environment as

result of the Proposal. The mitigation measures have been prepared in accordance with the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA 2011c).

6.3.4 Potential impacts

Construction

The study area represents a highly modified agricultural landscape cleared of indigenous vegetation. Remnant vegetation that remains is degraded and generally exhibits low diversity with significant weed cover. Fauna habitat values are generally low in terrestrial areas and medium in the aquatic environment associated with Sportsmans Creek.

As shown in Figure 6.12 clearing would be required to carry out the building of the proposed bridge, road and intersection upgrades. Clearing would also be required at Lot 1 Section 5 DP758604 and in Flo Clark Park for the proposed construction compounds and laydowns for the Proposal. Although all of the vegetation has been assessed at these locations, not all vegetation would need to be cleared as part of the works.

In general, the following biodiversity impacts in the local area would result from the building of the Proposal:

- Vegetation clearing of areas of planted landscape trees within Flo Clark Park and Sportsmans Park (refer to Plate 6.3)
- Potential removal of one threatened flora species, Durrobby (*Syzyigum moorei*), which is of low conservation significance
- Clearing of a number of avenue tree plantings including Jacaranda, Cadagi and Silky Oak (refer to Plate 6.9)
- Clearing / disturbance to an area of cleared pasture land to the west of Grafton Street on the northern side of Sportsmans Creek (refer to Plate 6.6 and 6.7)
- One hollow-bearing tree is proposed to be removed, a Camphor Laurel (*Cinnamomum camphora*) (refer to Plate 6.10)
- Fauna passage across the study area is not likely to be impacted
- The Proposal would not impact on areas of high conservation value wetland areas or ephemeral wetlands in the western portion of the study area
- There is not likely to be any significant impact on Key Threatening Processes listed in schedules of the FM Act or TSC Act
- Potential spread of noxious weeds
- No aquatic habitat and fauna species are likely to be significantly impacted by the Proposal.

Figure 6.12 shows the proposed clearing footprint for the Proposal. As noted above, the vegetation proposed to be cleared is of low conservation significance and would have minimal influence upon the local biodiversity within the local area.

The building of the Sportsmans Creek new bridge would have potential impacts to aquatic environments through potential water quality impacts and sedimentation, as discussed in Section 6.1 and 6.2. The building methodology selected would need to be sensitive to fish habitat and the aquatic environment, particularly for works required in-stream and minimise the disturbance of sediments and blockages in-stream to maintain fish passage.

However, provided effective implementation of safeguards and management measures listed in Section 6.1.5 and 6.2.6, these impacts would be minimised.

The building work also has the potential to spread noxious weeds through the movement of staff, plant, vehicles and equipment in works areas, as well as, surface water through the site. This is considered low risk as the occurrence and distribution of weed species is not likely to substantially increase and may be reduced as a result of weed control and landscaping works following building work. Best practice weed management protocols would be followed to minimise the spread of weeds and weed management would be carried out in accordance with Council requirements as specified in Section 6.3.5.

Operation

The Proposal is not anticipated to have any adverse impacts upon the local biodiversity during operation. Safeguards and mitigation measures to ensure that the design of the Proposal does not result in any adverse impacts upon the local hydrology are provided in Section 6.2.6.

Impacts upon microbat species during the removal of the old bridge as discussed in Appendix A of Appendix E, would be assessed in a separate REF process. However, it is proposed that the new bridge would be designed to provide roosting habitat for the microbat population. This would be investigated as part of the detailed design for the Proposal in consultation with a specialist experienced in microbat ecology and management

As discussed in Section 6.8, the landscaping and rehabilitation for the proposed would facilitate the protection of riparian vegetation and create opportunities for improvements to Flo Clark Park and Sportsmans Creek.

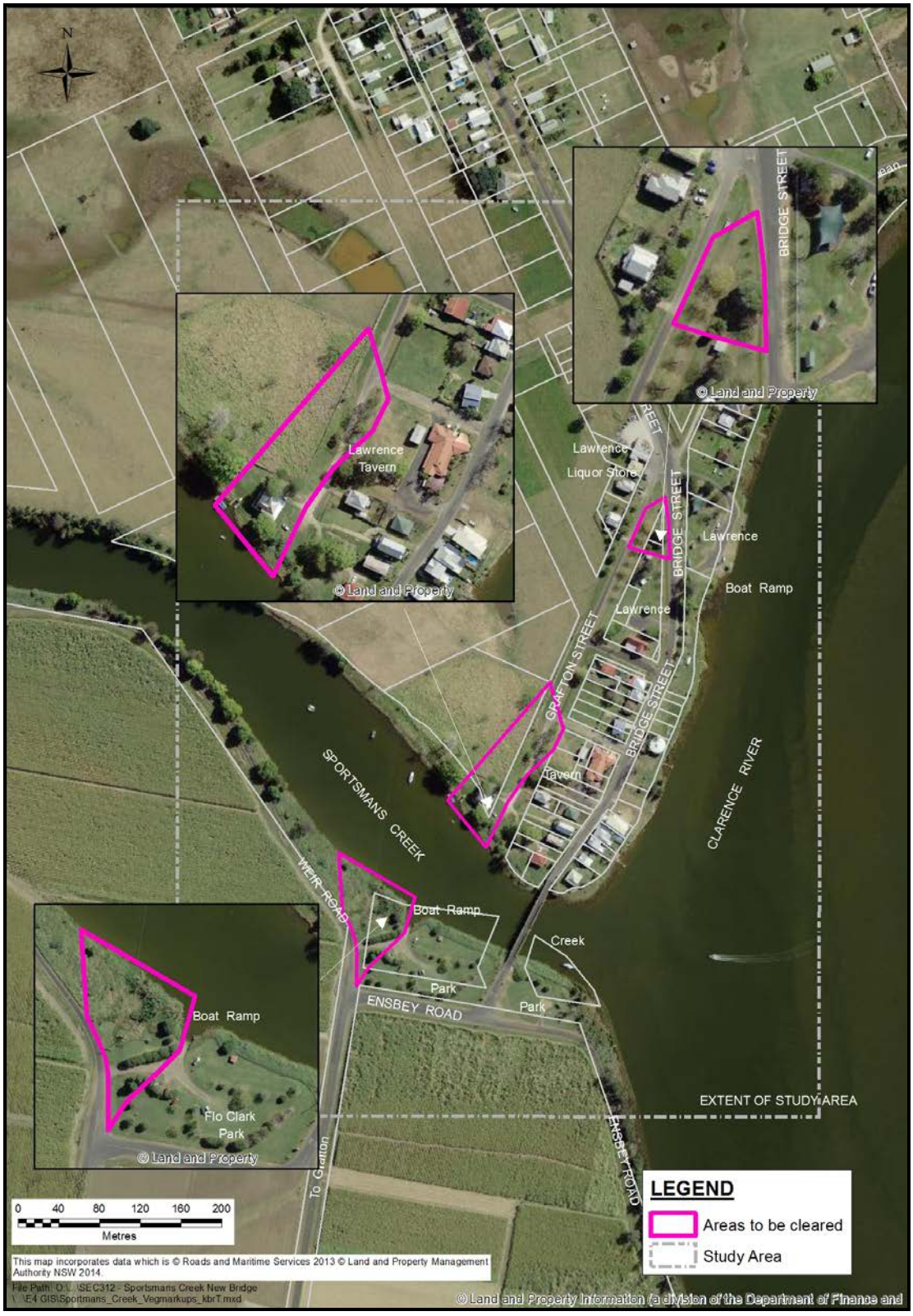

Figure 6.12 Proposed clearing footprint for the building of the new bridge

6.3.5 Safeguards and management measures

The mitigation measures to manage potential impacts upon biodiversity would be in accordance with Section 4.8 of the Roads and Maritime QA Specification G36 with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Disturbance/ Destruction of Vegetation	• All relevant staff would be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained • Clearing of vegetation would be carried out in accordance with *Guide 1 Pre-clearing Process of Biodiversity Guidelines* (RTA 2011c). These guidelines cover the felling of both non-habitat and habitat trees and the rescue and relocation of fauna. • The location of exclusion zones would be identified, with temporary fencing or flagging tape to indicate the limits of clearing (in accordance with *Guide 2 of the Biodiversity Guidelines* (RTA 2011c)) • Tree Protection Zones (TPZ) should be implemented around trees to be retained in proximity to the proposed works in accordance with the Australian Standard *AS 4970-2009 Protection of trees on development sites* to prevent machinery impacts to trees. • To minimise sedimentation impacts to waterways and wetlands, the safeguards listed in Section 6.1.5 and 6.2.6 of this REF would be implemented. • If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the RTA (2011c) *Unexpected Threatened Species Find Procedure in the RTA Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process*)' • Fauna handling would be carried out in accordance with the requirements the Roads and Maritime *Biodiversity Guidelines - Guide 9 (Fauna Handling) (*RTA 2011c).	Contractor	Pre-construction During construction
Aquatic biodiversity / protection of fish habitat	• During detailed design, the Proposal design team would comply with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013) in relation to requirements for maintaining fish passage via the design and building of in-stream structures. • Aquatic vegetation in areas other than in the vicinity of works area, are to be designated as 'no-go zones'. • Damage to any aquatic vegetation is to be recorded and reported to DPI (Fisheries).	Contractor and design team	Pre-construction during construction

Impact	Environmental safeguards	Responsibility	Timing
	• Visual inspection of Sportsmans Creek would be conducted for dead or distressed fish. Observations are to be reported immediately to the DPI (Fisheries). • Direct disturbance of aquatic fauna, habitat and riparian zones would be minimised in accordance with Roads and Maritime *Biodiversity Guidelines – Guide 10 Aquatic habitat and riparian zones (2011)*		
Impact to microbat population	• The detailed design of the Proposal would incorporate microbat habitat as designed by a specialist experienced in microbat ecology and management.	Roads and Maritime	Detailed Design
Spread of Weeds	• The Noxious weeds identified in Table 6.1 should be managed in accordance with the Council control requirements and for noxious weed classes as follows: o **N5** (Annual Ragweed): There are no requirements to control existing plants of Class N5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists. o **N4** (Camphor Laurel, Fireweed, Lantana): The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority, titled *Class 4 Weed Control Management Plan (CVC July 2012).* Champhor laurel (*Cinnamomum camphora*) must managed in accordance with the *Policy for management of Camphor laurel (Cinnamomum camphora)*. o **N3** (Coral Tree): The plant must be fully and continuously suppressed and destroyed. • Weeds would be controlled in accordance with the Roads and Maritime *Biodiversity Guidelines Guide 6: Weed Management* (RTA 2011c) • Declared noxious weeds would be managed in accordance with the requirements of the *Noxious Weeds Act 1993*. • Weed infested topsoil would be appropriately stockpiled with sediment fencing and as soon as practical, disposed of or treated appropriately to limit potential impacts on nearby areas of native vegetation.	Contractor	During construction

6.4 Noise and Vibration

A noise and vibration impact assessment of construction and operation of the new bridge was completed by SLR Consulting Australia in May 2014 (SLR 2014) and is provided in Appendix J. This section of this REF summarises the noise and vibration assessment carried out.

The noise and vibration assessment included a desktop review of the Proposal area as shown in Figure 6.13 below to identify sensitive receivers, followed by noise monitoring at three locations (as shown in Figure 6.13) during 9 December 2013 to 15 December 2013.

The assessment identified that exceedances of the *Road Noise Policy* (RNP) (DECCW 2011) have been predicted a five locations in the future design year during the operation of the Proposal with mitigation measures limited to architectural treatment have been identified at five individual receivers. During building work, the Proposal is predicted to exceed the noise goals at sensitive receivers during standard daytime construction hours for all scenarios. Specific mitigation measures have been proposed to address potential impacts.

6.4.1 Existing environment

A desktop review of the Proposal area identified residential, commercial, and other noise and vibration sensitive receivers within the Proposal area. The most potentially affected receivers are the residences located in the southern part of Lawrence village along Bridge Street and Grafton Street. The commercial receivers of the Lawrence Tavern and Lawrence General and Liquor store are also located within this area.

Other sensitive receivers are the community building at 33 Bridge Street, Lawrence and the passive recreation areas of Flo Clark Park, Sportsmans Creek and Lawrence Memorial Park. A map of the Proposal area showing the locations of different classification of noise sensitive receivers is shown in Figure 6.13.

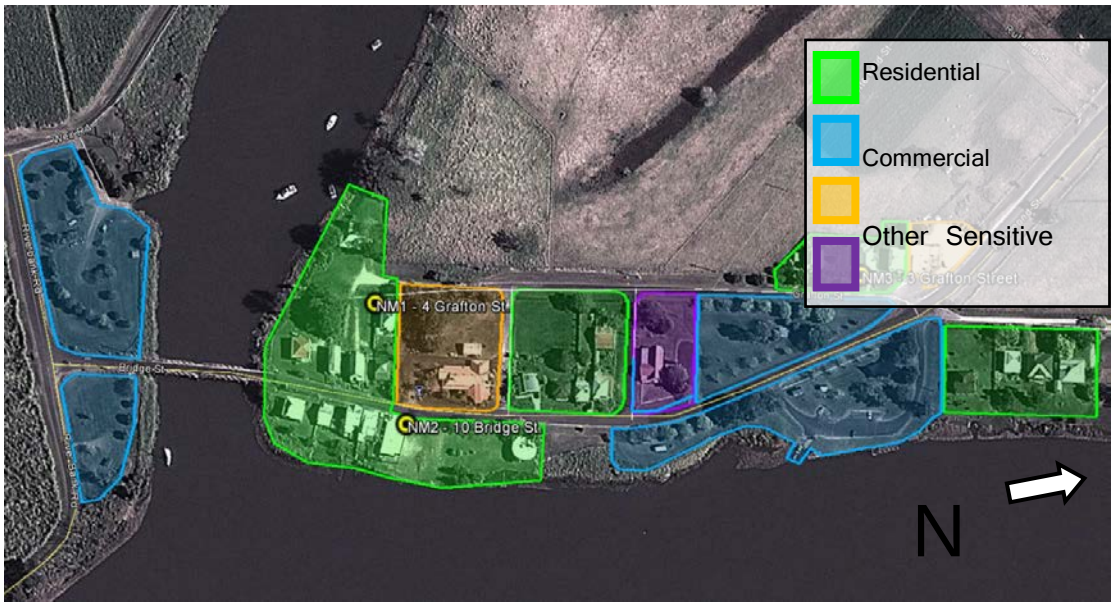

Figure 6.13 Ambient noise monitoring locations

A description of each noise monitoring location is provided in Table 6.2. The ambient noise monitoring locations NM1 to NM3 are indicated in Table 6.3.

Table 6.2 Ambient Noise Logging Locations

Location	Address	Logger Position	Distance to Proposal carriageway centreline
NM1	4 Grafton Street	Western side of the residence, 1 m away from the veranda awning, 60 m from nearest significant traffic source (Bridge Street). No line of sight to significant traffic source.	15 m
NM2	10 Bridge Street	Western side of the residence, 1 m away from the facade. Direct line of sight to the Bridge Street Carriageway. 8 m from nearest significant traffic source (Bridge Street).	90 m
NM3	3 Grafton Street	Eastern side of the residence, 1 m away from the facade, 40 m from nearest significant traffic source (Bridge Street).	20 m

In order to characterise the noise environment across the Proposal area (for the assessment of both building and operation) and to establish existing ambient noise levels upon which to base the noise emission targets, environmental noise monitoring was performed at representative locations within the Proposal area.

Both attended and unattended ambient noise measurements were taken at each monitoring locations. A summary of the unattended continuous noise monitoring during INP defined time periods is contained in Table 6.3. A full graphical representation of the noise levels recorded is provided in Appendix B of Appendix J.

Table 6.3 Unattended noise logger results

Location	Period	Noise Parameter (dbA)			
		LA90	LAeq	LA10	LA1
NM1	Daytime	33	47	47	55
	Evening	36	46	46	51
	Night	35	44	45	46
NM2	Daytime	31	56	58	67
	Evening	32	52	49	63
	Night	30	48	40	52
NM3	Daytime	32	51	53	60
	Evening	32	48	48	57
	Night	29	47	45	53

In accordance with the Roads and Maritime document *Preparing an Operational Traffic and Construction Noise and Vibration Assessment Report* (Roads and Maritime 2011c) traffic counting was carried out concurrently with the noise monitoring during the period 9 December to 15 December 2013. It was noted that traffic volumes and mix are not anticipated to change as a result of the Proposal. The “build” and “no build” traffic scenarios are therefore consistent.

The records reflect the intermittent nature of vehicle traffic in this area where there are also no major noise sources of a continuous nature (such as industrial plant or natural sources such as waves breaking on an ocean foreshore).

Further operator attended noise monitoring was carried out at noise monitoring locations NM1 to NM3. The daytime operator attended noise levels were slightly higher and at locations NM1 and NM3 were largely dominated by natural environmental noise from wind in trees, birds and/or insects, with some influence from nearby road traffic sources. Measured daytime ambient noise levels at location NM2 were dominated by road traffic from Bridge/Richmond Street.

6.4.2 Policy setting

The following noise and vibration guidelines for building and operations are based on the publications managed by the Environmental Protection Authority (EPA). The guidelines applicable to this REF assessment and noise and vibration assessment in NSW include:

- *Operational Noise – Road Noise Policy (RNP),* (DECCW 2011)
- *Construction Noise – Interim Construction Noise Guideline (ICNG),* (DECC 2009)
- *Construction Vibration (human comfort) – Assessing Vibration - a technical guideline*, (DEC 2006)

Roads and Maritime have also prepared a number of guidelines which set the policy framework and assessment for the noise and vibration associated with Roads and Maritime developments. These include:

- *Roads and Maritime assessment requirements – Preparing an Operational Noise and Vibration Assessment, Roads and Maritime July 2011* (Roads and Maritime 2011c).
- *Roads and Maritime noise management response – Environmental Noise Management Manual (ENMM),* (RTA 2001)

Public authorities are required to consider the impact of their activities upon the local environment under clause 228 of the EP&A Regulation 2000.

6.4.3 Criteria

Construction Noise Goals

The criteria adopted for assessing the impact of building the Proposal are the building goals set in the *Interim Construction Noise Guideline (ICNG)* (DECC 2009) as shown in Table 6.4.

In order to minimise the potential noise impacts upon nearby sensitive receivers, the majority of building work is proposed to be carried out during standard daytime periods (7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm on Saturdays).

There would be certain activities that would need to be carried out outside of these standard working hours. These ‘out of hours’ periods would be needed to reduce impacts on adjoining properties and reduce disruption for the travelling public including cane haulage.

With the exception of emergencies, building activities would not take place outside standard hours without prior notification to local residents, businesses and Council in accordance with the *Roads and Maritime Noise Management Manual Practice Note VII* (RTA 2001).

Table 6.4 ICNG Noise Management Levels (NML)

Receiver		Land Use	Management Level LAeq(15 min) (dBA) (applies when property is in use during daylight hours)
NCA3_RES NCA6_RES NCA1_RES	NM1 Residential NM2 Residential NM3 Residential	Residential	Rated Background Level (RBL) + 10 dB
NCA2_COM	Lawrence Tavern Lawrence General and Liquor Store	Offices, retail outlets (Commercial)	70
NCA5_PAS	Lawrence Memorial Park	Passive recreation area	60

The ICNG does not stipulate NML for all sensitive land use. As such, the recommended 'maximum' internal noise level for the Lawrence Public Hall (NCA4_SPC) has been derived from AS 107 and the LAeq is set at 50 dBA.

Operation Noise Goals

The criteria adopted for assessing the impact of the operation of the Proposal are the operational noise criteria set in the RNP for a project which is classified as a 'new arterial road corridor'. Noise criteria have been set for residential land use and non-residential land use, namely Lawrence Memorial Park, Flo Clark Park and Sportsmans Park. These criteria are discussed in Section 4.1.2 of Appendix J and shown in Table 6.5.

Table 6.5 Road Traffic Noise Assessment Criteria (Operation)

Road Category	Type of Project / Land Use	Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	LAeq(15hour) 55 dBA	LAeq(9hour) 50 dBA
N/A	Open space (passive use) Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, eg playing chess, reading.	LAeq(15hour) 55 dBA (external) when in use	N/A

Construction Vibration Noise goals

Goals have been set in accordance with the EPA's *Assessing Vibration: a technical guideline* (DEC 2006) and *Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives* and *British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2*.

The acceptable Vibration Dose Values (VDVs) for human comfort from vibration of an intermittent nature are set between 0.10 $m/s^{1.75}$ and 0.80 $m/s^{1.75}$ during both day and night times.

In addition to these guidelines, the German Standard is utilised for impact of

vibration on heritage buildings has been adopted and is discussed in Table 11 of Appendix J.

6.4.4 Potential impacts

Construction

Noise

The construction noise impact assessment is based on a preliminary scope of works for the major work scenarios and the worst-case sound power levels for equipment as discussed in Section 6.2 of Appendix J. It should be noted that the major work scenarios are based upon the worst case of activities, including rockbreaking, which may not be required due depth of bedrock (refer to Appendix B).

The Noise Management Levels (NML) were calculated based on the ICNG and noise catchment areas developed for the Proposal. These are shown in Table 6.6 and Figure 6.14.

Table 6.6 Noise Management Levels

NCA	Noise Monitoring Location	Receiver Types	RBL (dBA)			NML - LAeq(15 minute) (dBA)
			Day[1]	Eve.[2]	Night [3]	Std. Construction (RBL +10dB) Day[1]
NCA1_RES	NM1	Residential	33	36	35	43
NCA2_COM	n/a	Commercial	n/a	n/a	n/a	70
NCA3_RES	NM2	Residential	31	32	30	41
NCA4_SPC	n/a	Special Sensitive: Community Hall	n/a	n/a	n/a	60
NCA5_PAS	n/a	Passive Recreation	n/a	n/a	n/a	60
NCA6_RES	NM3	Residential Commercial[4]	3 2 n/a	32 n/a	29 n/a	70 42

Note 1: Standard daytime construction period: 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturday.
Note 2: Evening period: 6 pm to 10 pm.
Note 3: Night-time period: 10 pm to 7 am except on a Sunday/Public Holiday when night-time is extended to 8 am.
Note 4: One commercial receiver in NCA. Commercial receiver assessed against commercial NMLs

Figure 6.14 Proposal Area and Noise Catchment Areas

Noise prediction was calculated using the SoundPLAN V7.1 noise software.

The worse-case LAeq (15 minute) predicted noise levels for are presented in Table 21 of Appendix J for the various scenarios along with the relevant Noise Management Levels at the most potentially affected receiver. A complete list of results is provided in Appendix J.

The construction noise predictions indicate that exceedances of the NMLs are likely during the worst-case scenarios as assessed. Table 6.7 shows the scenarios where the modelling predicted these exceedances at the most potentially affected receiver.

It is noted that the worse-case scenarios assume works are being carried out in the closest work area to each receiver with rock breaking activities required. Given this noise levels are likely to be lower than predicted.

Table 6.7 Construction Noise Predictions

Works Ref	Scenario	Most Affected Receiver NCA	Address	Type	Worst-case Predicted LAeq(15 min) (dBA)	RBL (dBA)			NML (dBA)				NML Exceedance (dB)				Noise Level – LA1(60second) (dBA)		
						Day	Eve	Night	Day	Day OOH	Eve	Night	Day	Day OOH	Eve	Night	Worst-case Predicted (night-time)	Screening. Crit. (RBL+15 dBA)	Exceedance
1	Site Establishment and Installation of Environmental & Traffic Controls	NCA1_RES	4 Grafton	Residential	**87**	33	36	35	43	38	41	40	44	n/a	n/a	n/a	n/a	50	n/a
2	Site Preparation - Vegetation Removal	NCA1_RES	4 Grafton	Residential	**87**	33	36	35	43	38	41	40	44	n/a	n/a	n/a	n/a	50	n/a
9	Earthworks on Road Sections	NCA6_RES	19 Grafton	Residential	**88**	32	32	29	42	37	37	34	46	n/a	n/a	n/a	n/a	44	n/a
10	Construction of Road Slabs	NCA6_RES	19 Grafton	Residential	**77**	32	32	29	42	37	37	34	35	n/a	n/a	n/a	n/a	44	n/a
13	Site Dis-Establishment	NCA6_RES	19 Grafton	Residential	**80**	32	32	29	42	37	37	34	38	n/a	n/a	n/a	n/a	44	n/a
14	Landscaping	NCA6_RES	19 Grafton	Residential	**87**	32	32	29	42	37	37	34	45	n/a	n/a	n/a	n/a	44	n/a

A worst-case exceedance of the daytime (standard building hours) LAeq (15 minute) noise goal of up to 46 dB is predicted at the most affected sensitive receiver location within the Proposal area (NCA6_RES). This level of exceedance is common for infrastructure type building activities that are being completed in vicinity of nearby sensitive receivers.

Residential receivers are considered to be highly noise affected if noise levels exceed 75 dBA during standard building hours. The worst-case predicted levels indicate that there is the potential for this to occur during scenarios 1 2, 9, 10, 13 and 14 as indicated in Table 6.7, for residential receivers in Noise Catchment Areas NCA1_RES and NCA6_RES. Provided the safeguards and mitigation measures detailed in Section 6.4.5 are implemented, this impact would be minimised to a low to moderate risk.

Vibration

The major potential sources of vibration from the proposed construction equipment would be rock breaking (Scenarios 1, 3, 9 and 14) or during the use of a vibratory roller (Scenario 3). Lesser impacts may be apparent during the use of bored piling, jackhammers, and compactors.

Safe working distances

Safe working distances for typical items of vibration intensive plant are listed in Table 6.8. Distances are quoted for both “cosmetic” damage and human comfort. These distances must be complied with at all times, unless otherwise approved by the relevant authority.

Table 6.8 Recommended Safe Working Distances for Vibration Intensive Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	N/A
Jackhammer	-Hand held	1 m (nominal)	Avoid contact with structure
Impact Pilling*	< 10,000 kg/m	15 m	70 m

Note: More stringent conditions may apply to heritage or other sensitive structures.
Note*: Data sourced from published measurement results.

The safe working distances presented in Table 6.8 are indicative and would vary

depending on the particular item of plant and apply to typical buildings under typical geotechnical conditions. In order to monitor compliance with these distances, vibration monitoring is proposed in Section 6.4.5.

The above assessment assumes works are being conducted at the closest point of the works area to each receiver. Potential vibration impacts would need to be re-assessed during the detailed design stage and addressed in the CNVMP once equipment and building locations have been defined in more detail. The effective implementation of safeguards and management measures proposed in Section 6.4.5 would ensure that potential impacts are minimised.

Ground-borne Construction Noise

The nature of the works (surface works with minimal screening effects) means that ground-borne noise impacts are expected to be negligible. This is because the airborne noise emissions in most circumstances are much higher than ground-borne noise levels. For this reason ground-borne noise is not anticipated to be the controlling factor for this Proposal and further assessment was not required.

Heritage Buildings

Several of the buildings within the Proposal area are located within 100 m of the proposed building work as shown in Table 6.9

Table 6.9 Summary of Identified Listed Heritage Buildings with the Proposal Area

LEP Item Number	Address	Description
I169	Bridge Street	Sportsmans Creek bridge
I167	2 Street	Former Baptist manse
I164	9 Bridge Street	Baptist Church
I168	11 Bridge Street	Residence
I165	33 Bridge Street	School of Arts building
I166	Bridge Street	War memorial

The construction vibration impacts from works surrounding these buildings should be managed through the selection of low vibratory plant and equipment, as well as the vibration safeguards and management measures discussed in Section 6.4.5. This is due to the potential for significant levels of vibration from building works. Overall vibration impacts are of moderate risk impact provided the safeguards and management measures are implemented effectively.

<u>Impact (Driven) piling</u>

It should be noted that the noise assessment prepared assessed the impact of a building methodology utilising bored piles only. At the time of writing this REF, the building methodology for piling was yet to be determined and the possibility of driven piles was being considered. If driven (impact) piling were to be utilised, the construction noise impacts at the nearest potentially affected receiver would be up to 15 dB higher than the noise levels predicted for bored piling. Management measures have been proposed to address the potential for a change in building work methodology, which may require the addition of specialist input into management

measures before building.

It is not anticipated that the change in piling technique would generate vibration impacts upon nearby receivers as they would be within the safe working distances for human response. This includes residential receivers located on Grafton Street and on Bridge Street.

Operation

Predicted Operational Noise Levels

A three-dimensional noise model of the Proposal area was prepared using SoundPLAN V7.1 software, to assess the "build" and "no build" scenarios. The existing road features, at-opening and future 10 year scenario were used for the assessment of noise. It was assumed that the traffic volumes and mix would not change as a result of the Proposal and a standard growth rate was applied.

The predicted operational noise levels at the opening 'no build and 'build' scenarios are shown in Table 16, Appendix J, while the 10 year after Proposal opening levels are shown in Table 17, Appendix J. A summary of those locations at which exceedances of the operational noise criteria have been identified are shown in Table 6.10 and Table 6.11.

The predicted noise levels in Table 16, Appendix J show the change in noise levels between the at opening "build" and "no build" scenarios range for daytime and night time. For two receivers there is an increase is greater than +12dB between scenarios (as shown in Table 6.10) so the Proposal exceeds the RNP relative increase criteria at opening at these receivers (refer to Section 6.4.3 for the RNP criteria).

Predicted noise levels for the at-opening 'build' scenario exceed the RNP LAeq (15hour) daytime criteria by up to 2dB. Exceedances are predicted at two receivers for the daytime period as shown in Table 6.10.

The predicted noise levels in Table 17, Appendix J show that the change in noise levels between the design year "build" and "no build" scenarios. An increase greater than +12dB for two receivers (as shown in Table 6.11), therefore the Proposal also exceeds the RNP relative increase criteria in the design year at these receivers.

Predicted noise levels for the design year 'build' scenario exceed the RNP LAeq(15hour) daytime criteria by up to 2 dB. Exceedances are predicted at four receivers for the daytime period as shown in Table 6.11.

Therefore, a total of five receivers exceed either the relative increase or the LAeq (15hour) daytime noise criteria (refer to Table 6.10 and 6.11). Where exceedances of the noise criteria are identified, the RNP requires that all feasible and reasonable noise mitigation measures should be considered.

Maximum Noise Levels

A maximum noise level assessment was carried out in accordance with the Roads and Maritime Procedure *Preparing an Operational Noise and Vibration Assessment (July 2011)*, based on the data collected at the location of NM2, which is the closest to the monitoring location of the existing alignment, approximately 8 m away. The closest residential receiver to this location is 20 m away, with five potentially affected

residences located nearby.

The results of the maximum noise level assessment are shown in Table 18 of Appendix J. It was predicted that maximum noise level events at sensitive receivers in the Proposal area near NM2 are likely to exceed the guideline levels. Therefore, maximum noise level impacts should be considered when prioritising and ranking mitigation strategies. An assessment of feasible and reasonable mitigation measures was carried out in Appendix J and the resulting mitigation measures and safeguards are proposed in Section 6.4.5.

Table 6.10 At-Opening Predicted Operational Noise Levels

Receiver Address	Predicted Noise Levels (dBA) At-Opening – 'No Build' Scenario		At-Opening – 'Build' Scenario		Change in Noise Levels (dB)				RNP Criteria (dBA)		At-Opening 'Build' Scenario Level Above RNP Criteria (dB)	
	Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)		Night-time LAeq(9hr)		Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)	Night-time LAeq(9hr)
					Min	Max	Min	Max				
15 Richmond St	54	46	**56**	49	-0.3	1.9	-0.3	2.4	55	50	1	-
19 Grafton St	50	42	**57**	49	2.2	7.1	2.3	7.4	55	50	2	-
31b Bridge St	41	33	55	47	-5.7	**14.4**	-3.2	**14.4**	55	50	-	-
4 Grafton St	38	30	51	43	-9.3	**12.9**	-5.7	**12.9**	55	50	-	-

*NOTE: Results in **BOLD** indicate an exceedance of the operational noise criteria*

Table 6.11 Design Year Predicted Operational Noise Levels

Receiver Address	Predicted Noise Levels (dBA) Design Year – 'No Build' Scenario		Design Year – 'Build' Scenario		Change in Noise Levels (dB)				RNP Criteria (dBA)		Design Year 'Build' Scenario Level Above RNP Criteria (dB)	
	Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)		Night-time LAeq(9hr)		Daytime LAeq(15hr)	Night-time LAeq(9hr)	Daytime LAeq(15hr)	Night-time LAeq(9hr)
					Min	Max	Min	Max				
15 Richmond St	55	38	**57**	49	-0.3	1.9	-0.3	2.3	55	50	2	-
3 Grafton St	52	45	**56**	49	0.4	4.0	0.5	4.4	55	50	1	-
19 Grafton St	50	43	**57**	50	2.1	7.2	2.2	7.5	55	50	2	-
31b Bridge St	42	34	**56**	48	-6.0	**14.3**	-3.8	**14.4**	55	50	1	-
4 Grafton St	38	31	51	44	-9.8	**13.0**	-6.5	**12.9**	55	50	-	-

*NOTE: Results in **BOLD** indicate an exceedance of the operational noise criteria*

6.4.5 Safeguards and management measures

The mitigation measures to manage potential impacts upon Noise and Vibration would be in accordance with Section 4.6 of the Roads and Maritime QA Specification G36 with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Noise and vibration disturbance during building work	Before building work, when more specific information is available in relation to the proposed building work, a site specific Construction Noise and Vibration Management Plan (CNVMP) would be prepared. This CNVMP would address each major stage of the building work and identify the appropriate mitigation and management measures, consistent with the requirements of the ICNG. The objectives of the CNVMP are as follows: • Minimise exceedances of the Noise Management Levels and goals nominated in Section 6.4.4. • Provide detail of noise and vibration monitoring, reporting and response procedures. • Describe specific mitigation treatments, management methods and procedures to be implemented to control noise and vibration during building work. • Describe building timetabling to minimise noise impacts including time and duration restrictions, respite periods and frequency. • Describe procedures for notifying residents of building activities likely to affect their amenity through noise and vibration. • Define contingency plans to be implemented in the event of non-compliances and/or noise complaints. • Ensure management measures as detailed in this Section of this REF are documented. • Specify that the majority of works are to be carried out during normal work hours (ie 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts. • Prior notification to local residents, businesses and Council in accordance with the *Roads and Maritime Noise Management Manual Practice Note VII* would be provided for any work performed outside of normal works except in the case of emergencies.	Contractor	Pre Construction

Impact	Environmental safeguards	Responsibility	Timing
Noise disturbance during building work	Noise impacts would be minimised in accordance with Practice Note 7 in the Roads and Maritime *Environmental Noise Management Manual* (RTA 2011) and Roads and Maritime's *Environmental fact sheet No. 2- Noise management and Night Works*. As minimum, the following mitigation measures should be included in the CNVMP and all feasible and reasonable mitigation considered: • Utilising localised acoustic hoarding and/or earth bunds around significantly noise generating stationary items of plant (eg rock breaker), where practicable. • Planning of the higher Noise Management Level exceedance activities/locations should be carried out predominantly during less noise-sensitive periods, where available and possible. The adjacent residents should be consulted to assist in identifying less noise sensitive periods. • Workers and contractors would be inducted and trained to create awareness of the locality of sensitive receivers and the importance of minimising noise emissions. • Ensuring any spoil is placed and not dropped into awaiting trucks. • Locating noisy plant away from receivers where possible. • Turning noisy plant off when not in use. • Ensuring plant is regularly maintained and repair/replace equipment that becomes noisy • Establishing load points as far as practicable from sensitive receivers. • Utilising silenced or less noise-intensive equipment, where reasonable and feasible. • Where possible heavy vehicle movements should be limited to daytime hours. • Reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms. • Non-tonal reversing alarms should be considered to minimise nuisance caused by reversing alarms.	Contractor	Pre Construction During Construction
Vibration disturbance during building work	• Potential vibration impacts would be addressed in the CNVMP. • Mitigation measures, including allowing adequate distance that rollers can come to adjacent buildings and/or using non vibrating rollers, are to be used to minimise or prevent vibration impacts.	Contractor	Pre Construction

Impact	Environmental safeguards	Responsibility	Timing
	• Attended vibration monitoring should be carried out in the event that vibration intensive works are required within the cosmetic damage safe working distances, for example if rock breaking is required within 7 m of a receiver (medium rockbreaker), or if impact piling is required within 15 m of a receiver. o The aim of the attended vibration monitoring would be to ensure levels remain below the criteria for cosmetic damage at all receivers (heritage or otherwise) as listed in Section 6.4.3 and Table 6. • Measures for vibration management to be included in the CNVMP include: o Bored pilling and non-impact pilling where feasible should be utilised. o Consecutive works in the same locality should be minimised. • In the event that rockbreaking is required, the following additional measures should be considered in the CNVMP: o Dampened rockbreakers and/or "city" rockbreakers should be utilised to minimise the impacts associated with rockbreaking works (if required) and use a smaller capacity rockbreaker where feasible. o Rockbreaking should be sequenced operations so vibration intensive operations do not occur concurrently. o Rockbreaking works should be scheduled during the less sensitive times of the day. o Hydraulic rocksplitters should be utilised rather than use of a rockbreaker (if applicable).	Contractor	During Construction
Vibration impacts to heritage buildings during building work	• Building surveys of all nearby heritage structures as defined in Table 6.9 of this REF should be carried out in order to assess the potential for increased susceptibility to building damage from vibration. • In the event that these buildings are considered more susceptible to vibration than regular buildings, reduced vibration criteria levels may be applicable and subsequently adopted for the assessment process. These reduced criteria may influence the selection of appropriate building processes and equipment to be used in the vicinity of these buildings.	Roads and Maritime	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Noise impacts to residential receivers during operation.	• Noise architectural treatments at affected properties as defined in Table 6.10 and 6.11 in this REF would be developed in consultation with property owners. Further investigation to determine the extent of mitigation works should be carried out in consultation with owners.	Roads and Maritime	Detailed Design
Additional noise impacts due to change in building methodology	• In the event that a driven pilling technique is selected, the Roads and Maritime Environmental Officer must be contacted with regard to any additional requirements. Further mitigation measures or specialist input may be required to supplement the Noise and Vibration Management Plan (NVMP).	Roads and Maritime	Detailed Design

6.5 Air Quality and Climate

6.5.1 Existing environment

Air quality

The air quality in the area surrounding the Proposal site is typically that of a rural locality and as such is generally very good. The state of air quality in the Clarence Valley LGA area is not monitored and the nearest OEH Air Quality monitoring station is located in Tamworth a significant distance away. However, the air quality is generally influenced from a number of point sources of pollution, such as bush fires and controlled burns and industrial sites, both licenced and unlicensed and transport pollution (CVC 2009a).

Search results from *National Pollution Inventory* for the suburb of Lawrence show records from two industrial sources, which are located in Grafton. The commonly reported emissions are Arsenic and compounds, copper and compounds, chromium (VI) compounds, Ethylbenzene, Cyclohexane and total nitrogen and phosphorus. However, given the distance to Grafton, it is unlikely that these industries would impact upon the Proposal site or its environment.

Climate

The historical rainfall records for the closet Bureau of Meteorology (BOM) for the Lawrence Post office (Station Reference 058 033) were reviewed as the nearest station that collects rainfall to the Proposal site. The Lawrence climate is typically cool dry winters and warm wet summers.

The average monthly rainfall for the past century at the Lawrence Post office is shown in Figure 6.15. The wettest months of the year are the Summer months, with the highest rainfall received in February, a historical mean of over 140 mm. During the February 2013 floods, the Lawrence Post Office station recorded 323.4 mm and 242 mm in January, more than double the historical mean for the same months. The historical mean annual rainfall for the Lawrence area is 1070 mm per year. The driest months are August and September, with a historical mean of around 40 mm.

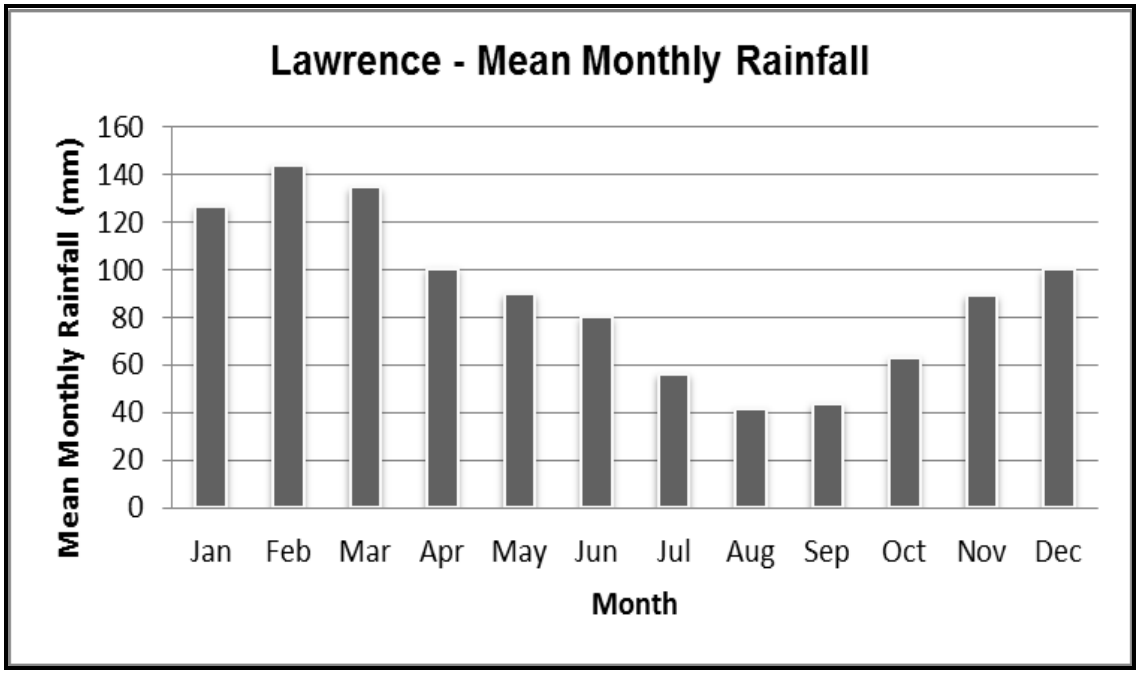

Figure 6.15 Historical mean rainfall at Lawrence Post Office

The nearest BoM weather station which monitors temperature is located at the Harwood Sugar Mill, Harwood Island (Station Number 058027) 17 km away to the north of the Proposal site. The historical mean monthly minimum temperature ranges between 7.8 degrees in July to 19.0 in February. The historical mean monthly maximum temperature ranges between 20.8 in July and 29.0 in January. Wind records and directions are not recorded at this location.

6.5.2 Policy setting

Air quality in NSW is regulated by the *Protection of the Environment Operations Act 1997 (POEO Act)* and the *POEO (Clean Air Regulation) 2010*. Both Acts are administered by the EPA and regulated by the EPA and local councils.

Public authorities are required to consider the impact of their activities upon the local environment under clause 228 of the *EP&A Regulation 2000.*

6.5.3 Criteria

The criteria adopted for assessing the impact of the Proposal would be to minimise emissions to air in the local environment as result of the Proposal.

6.5.4 Potential impacts

Construction

Air quality impacts may occur throughout all phases of building the Proposal from the following activities:

- Earthworks and general building activities on unsealed surfaces
- Vegetation clearing and stripping and stockpiling of soil
- Grading and surface levelling works for road preparation
- Any transport movements of soils and materials containing sediment
- Emissions generated by vehicle and plant movements from exhaust
- Removal of buildings and structures located on Lot 1 Section 5 DP758604.

Adverse impacts to upon the air quality of the local environment are most likely to be from the generation of dust on unsealed surfaces post clearing. Dust generation within the vicinity of residential receivers has the potential to cause health impacts and be a nuisance to residents upon surfaces. Dust generated may have an impact upon native vegetation with the area. However, due to the relatively small area required for clearing, the anticipated dust emissions are anticipated to be minor and could be controlled through best practice safeguards and management measures.

The removal of the buildings and structures on Lot 1 Section 5 DP758604 has the potential to generate dust and expose building fibres, which are potentially hazardous. The house is considered to be of 1920s era and may contain asbestos, which could cause fatal health impacts if exposed. Before the removal of these structures, a building inspection would be required to determine if any additional measures would be required to prevent human health impacts.

Vehicles, plant and equipment associated with the building works would generate exhaust emissions. The emissions would be considered short term and minimal, with the majority of heavy equipment required during early phases for earthworks. It is not anticipated that the presence of machinery would have an adverse long-term negative impact upon residential receivers or the local environment.

Operation

The Proposal is not anticipated to generate traffic nor create any new or additional influences upon the air quality of the local area once in operation. It is anticipated that the air quality of residents on Bridge Street would experience a minor improvement in air quality once the old bridge is removed, as traffic would no longer pass along Bridge Street with the shift in alignment.

6.5.5 Safeguards and management measures

The mitigation measures to prevent adverse impacts on air quality would be in accordance with Section 4.4 of the Roads and Maritime QA Specification G36, and safeguards specified in Section 6.13.5, with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Dust generation	• All construction vehicles would adhere to speed limits, particularly on unsealed surfaces. • Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation. • Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime's *Stockpile Site Management Guideline* (RTA 2011a). • Visual monitoring of air quality would be carried out on a daily basis to verify the effectiveness of dust controls. • Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	During Construction

Impact	Environmental safeguards	Responsibility	Timing
	• Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.		
Emissions to air	• Vegetation or other materials are not to be burnt on site. • Plant and vehicles must not be left idling when not in use for extended periods. • Regular maintenance of vehicles, plant and equipment should be carried out and fitted with emission control devices in accordance with Australian Design Standards. • Visual monitoring of air quality would be carried out on a daily basis to verify the effectiveness of emissions controls.	Contractor	During construction
Hazardous emissions to air during removal	• A full building inspection should be conducted of the house and structures to be removed by a qualified building asbestos inspector to determine if any asbestos materials are present before removal.	Roads and Maritime	Pre-construction
	• Water sprays or alternative dust suppression methods would be employed during removal in the event that significant dust is generated.	Contractor	During site establishment

6.6 Aboriginal Heritage

An archaeological due diligence assessment was completed by McCardle Cultural Heritage (McCardle Cultural Heritage 2014) and is provided in Appendix C. This section of the REF summarises the desktop and field investigations and assessment of potential items of Aboriginal heritage significance in the investigation area proposed and in relation to the preferred option.

A desktop assessment including a literature review was carried out to identify any potential items of Aboriginal heritage significance, followed by a field investigation on 14 February 2014. The assessment concluded that there were no sites of Aboriginal heritage significance or Potential Archaeological Deposits (PADs) identified and that the investigation area is highly disturbed with low to no potential for in situ archaeological evidence of past occupation. Standard best practice measures for the management of Aboriginal heritage during building would be applied.

6.6.1 Existing environment

Desktop assessment

Initially, a desktop assessment was carried out of the relevant literature and heritage databases covering the study area in order to identify any potential issues which may impact Proposal options.

The investigation area is situated within the Clarence Alluvial Plains along Sportsmans Creek, which is dominated by alluvial processes and is characterised by alluvial plains, levees, abandoned channels and back swamps. This location is considered to be very well resourced and would have provided valuable and reliable

resources that would allow sustained occupation of the local area. Due to waterlogging swamps were not favoured for actual camping (hunting and gathering occurs in the swamps), it was the elevated land above and overlooking swamps that were preferred by past Aboriginal societies, and this is typically where evidence of camping may be located. The specific investigation area has been cleared and primarily used for pastoral purposes (grazing), involving the wholesale clearance of native vegetation, the introduction of pasture grass, the building of dams, housing, fencing, tracks, roads, developments and associated infrastructure (water, electricity, telephone) as well as flooding on account of the low lying alluvial flats along Sportsmans Creek.

A search of the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) register revealed six known Aboriginal sites are currently recorded within five kilometres of the study area and include three modified trees, two artefacts and one burial site as shown in Table 6.12.

Table 6.12 Results of Aboriginal Heritage database searches

Database Name	Search Date	Search Type	Comment
OEH Aboriginal Heritage Information Management System (AHIMS)	02-07-2013	AGD, Zone : 56, Eastings : 504000 - 514000, Northings : 6731000 - 6741000 with a Buffer of 50 meters,	six AHIMS sites within the search area

Austral Archaeology (2002) undertook a Heritage Assessment and Statement of Heritage Impact (SoHI) for the new bridge route of the replacement of Sportsmans Creek bridge as part of a previous investigation by Clarence Valley Council. The survey was carried out was for a new concrete bridge on Grafton street by Austral Archaeology and the Yaegl Local Aboriginal Land Council.

The survey did not identify any Aboriginal archaeological or cultural sites. However, two Potential Archaeological Deposits (PADs), one on each side of the creek, were identified. PAD1 and PAD2 were both subject to past land use practices such as vegetation clearing and landscaping activities. It was argued that although this sort of activity is likely to have caused some disturbance to any sub surface archaeological remains, such remains, even though possibly disturbed, can still contribute information to the past Aboriginal occupation of the investigation area.

Predictive Model and Archaeological Model for the investigation area

Previous archaeological studies carried out throughout the Clarence Valley area are limited and provide limited information about site types, context, extents, locations and proximity to water. Research has shown that scarred trees and artefact sites are the most predominant site types likely in the area. The most common site locations are along watercourses and on elevated landforms, with artefact density being greatest in close proximity to water sources.

Within the specific investigation area, a low potential for evidence of past occupation is predicted due to the landform being an alluvial floodplain along Sportsmans Creek. Sites are expected to be located on elevated land, which the investigation area is lacking. Furthermore, based on archaeological sites registered in the region, the results of past archaeological studies, and the location of the study area within low lying flood plains, no sites are likely to occur in the study area.

Field investigations

Methodology

A field investigation was carried out on 14 February 2014 with the Roads and Maritime Aboriginal Cultural Heritage Officer as part of the McCardle Cultural Heritage (2014) Aboriginal due diligence assessment provided in Appendix C. The investigation was proposed to provide an assessment of the Proposal upon Aboriginal heritage as well as investigate the presence of the PADs identified in the Austral Archaeology (2002) report.

For ease of management, the study area was divided into four Survey Units (SUs) that were based on the proposed development impact areas (refer to Figure 6.16).

The survey units were surveyed on foot by the archaeologist and included transects at approximately four metres apart. Transects focused on areas of high ground surface visibility and exposures such as erosional features, creek bank, tracks, and cleared areas.

Consideration was given to the effective coverage, which is comprised of two components: the visibility of the bare ground and exposure, which is the likelihood of revealing subsurface cultural materials. The overall effective coverage of the study area was determined as 15.64 per cent, with grass being identified as the limiting factor, and erosion across the study area identified as minimal.

Results

The results of the McCardle Cultural Heritage (2014) field investigation were as follows.

No archaeological sites were identified as:

- The study area is situated on Sportsmans Creek alluvial plains and is subject to regular flooding
- The high level of land uses and impacts as well as natural factors (such as erosion and flooding) would have destroyed any evidence of past occupation.

No PADs were identified due to two main factors:

- The study area is situated on Sportsmans Creek alluvial plains and is subject to regular flooding
- The high level of land uses and impacts as well as natural factors (such as erosion and flooding) would have destroyed any evidence of past occupation
- In view of the survey results, the predictive model of site location was reassessed for the study area. The potential for artefacts to occur within the investigation is assessed as very low or negligible
- There remains a low to no potential for evidence to occur in the areas currently obscured by vegetation
- The study area is highly disturbed and is considered not to have been suitable for past occupation.

Figure 6.16 Survey units

6.6.2 History

The Clarence Valley area is dominated by lower valleys and rich coastal plains fed by the Clarence River and the Nymboida River. The Clarence River flows into the sea between Iluka and Yamba and was originally called Breimba or Berrinbah by the Aboriginal people indigenous to the area, who were traditionally part of the Gumbainggir language group. The full extent of Gumbainggir country stretched from Nambucca Heads in the south, to Yamba in the north and out to Glenn Innes in the west.

The Clarence River was located along the northern border of the Gumbainggir territory, with the traditional country of the Bundjalong language group located to the north of this.

6.6.3 Policy setting

The proposed works would be required to be consistent with the *Roads and Maritime Service Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) and the NSW *Due Diligence Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. The Roads and Maritime Cultural Heritage Officer has confirmed that acceptance of the Archaeological Due Diligence Assessment report fulfils the Road and Maritime PACHCI requirements (G. Purcell pers. comm).

Public authorities are required to consider the impact of their activities locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations under clause 228(2)(e) of the *EP&A Regulation 2000.*

6.6.4 Criteria

The criteria adopted for assessing the impact upon Aboriginal heritage in the locality, would be to ensure the Proposal avoids impact upon known or unidentified items of indigenous heritage significance.

6.6.5 Potential impacts

The archaeological due diligence assessment prepared by McCardle Cultural Heritage (2014) (refer to Appendix C) concluded that as no sites or PADs were identified within the study area, the Proposal would not result in adverse impacts upon the archaeological record within the study area and no further investigations are required.

Excavations and earthworks required for the building of the new bridge would require disturbance to the ground subsurface and have the potential uncover previously undiscovered items of Aboriginal heritage significance.

However, the assessment concluded that the potential to uncover undiscovered items is low to zero risk potential as the area is highly disturbed and is considered not to have been suitable for past occupation.

Nevertheless, during on-site works, all staff, contractors and others involved in building and maintenance related activities would be made aware of the statutory legislation protecting sites and places of significance. Safeguards and mitigation measures proposed in Section 6.6.6 below would ensure that any potential impacts to unidentified objects could be avoided.

6.6.6 Safeguards and management measures

The mitigation measures to manage potential impacts upon Aboriginal heritage would be in accordance with Section 4.9 of the Roads and Maritime QA Specification G36 and the Roads and Maritime standard safeguards, with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Damage to items of Aboriginal heritage significance	• The following measures should be included within the CEMP for the Proposal and implemented during building work: o All staff, contractors and others involved in building and maintenance related activities should be made aware of statutory legislation protecting sites and places of significance. Of particular importance is the *National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010*, under the *National Parks and Wildlife Act 1974*. o If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the RTA's Aboriginal cultural heritage advisor and the senior regional environmental officer contacted immediately. Steps in the Roads and Maritime (2012c) *Standard Management Procedure: Unexpected Archaeological Finds* must be followed.	Contractor	Pre-construction During construction

6.7 Non-Aboriginal Heritage

An assessment of the historical archaeology and heritage values of Sportsmans Creek bridge precinct was completed by Maxim Archaeology and Heritage Pty Ltd in August 2013 (Maxim 2013) and is provided in Appendix D. The assessment discussed both the building of the new bridge and the removal of the existing Sportsmans Creek bridge.

This section summarises the desktop and field investigations and assessment of potential items of Aboriginal heritage significance in the investigation area proposed and in relation to the Proposal.

The assessment identified a number of heritage items within the heritage study area through a desktop investigation. It was concluded that these items did not present a constraint to the building of the bridge and no further field inspection was carried out. The potential impact upon heritage items relating to the removal of the existing bridge would be the subject of a separate REF assessment.

6.7.1 Existing environment

A desktop assessment using heritage databases and available hard and soft copy resources was carried out to identify any items or places of potential historical heritage significance within the study area, as shown in Table 6.13. Further detail of the recorded items is provided in Appendix D.

Table 6.13 Results of the heritage database searches

Database Name	Search Date	Search Target	Outcome
Australian Heritage Database http://www.environment.gov.au/heritage/ahdb/	13.07.2013	The townships of Lawrence, Maclean and Copmanhurst in the Clarence Valley LGA, NSW	one resource was listed in the Lawrence town precinct
NSW Heritage Office State Heritage Register and State Heritage Inventory http://www.heritage.nsw.gov.au/	13.07.2013	The townships of Lawrence, Maclean and Copmanhurst in the Clarence Valley LGA, NSW	five listings within the Lawrence town precinct, of which 3 fell within the study area
The Clarence Valley Local Environmental Plan 2011 http://www.legislation.nsw.gov.au	13.07.2013	The localities of Lawrence, Maclean and Copmanhurst	15 listings within the Lawrence town precinct, of which 6 fell within the study area
Local Heritage Studies : The Maclean Community Based Heritage Study, 2006 http://www.clarence.nsw.gov.au	14.07.2013	The area of the former Maclean Shire LGA	15 listings within the Lawrence town precinct, of which five fell within the study area
The Copmanhurst Community Based Heritage Study, 2005 http://www.clarence.nsw.gov.au/	14.07.2013	The area of the former Copmanhurst Shire LGA	one listing within Lawrence town precinct, which fell within the study area
The Maclean Shire (former) Community Based Thematic History, 2006 http://www.clarence.nsw.gov.au/	14.07.2013	The area of the former Copmanhurst Shire LGA	one listing within Lawrence town precinct, which fell within the study area
Roads and Maritime Heritage and Conservation Register, under s170 Heritage Act, 1977 http://www.rta.nsw.gov.au	13.07.2013	The Northern Region	The detailed listing for the present Sportsmans Creek bridge

Review of databases and information supplied indicates the primary items of historical heritage significance relevant to the current Proposal are summarised below:

- The search of the Australian Heritage Database revealed the listing only of the present Sportsmans Creek bridge within the Lawrence area
- A search of the State Heritage Register and Inventory revealed no item listed as possessing State level heritage significance within the Lawrence area. A further five sites were listed on the State Heritage Inventory, four reflecting their listing on the former *Maclean Shire Local Environmental Plan 2001*, those within the study area (marked with an * below):
    - Lawrence Anglican Church
    - Former Lawrence Baptist Church*
    - C.S. Manton's residence
    - Lawrence School of Arts*
- The remaining listing (twice) was for the present Sportsmans Creek bridge reflecting listing in the former *Copmanhurst Shire Local Environmental Plan*

2008 and the Roads and Maritime Heritage and Conservation Register pursuant to s170, the *Heritage Act, 1977*.

- The Clarence Valley LEP 2011 lists 15 resources in the Lawrence precinct, six of which fall within the study area (marked with an * below):
    - Former Lawrence Baptist Church*
    - Lawrence School of Arts
    - Lawrence War Memorial and Park
    - Former Baptist Manse, Lawrence*
    - Residence, 11 Bridge Street, Lawrence*
    - Sportsmans Creek Bridge*
    - Lawrence Cemetery
    - Lawrence Anglican Church
    - Bluff Point ferry
    - Lawrence Museum
    - Lawrence Post Office/Residence
    - Lawrence Police Station
    - Remains of the former Lawrence Baths
    - Residence, 6 Stuart Lane, Lawrence
    - Lawrence Cricket Canteen.

Figure 6.17 shows the locations of the conservation area as listed in the Clarence Valley LEP 2011 and individual items of Non-aboriginal heritage significance within proximity to the Proposal site.

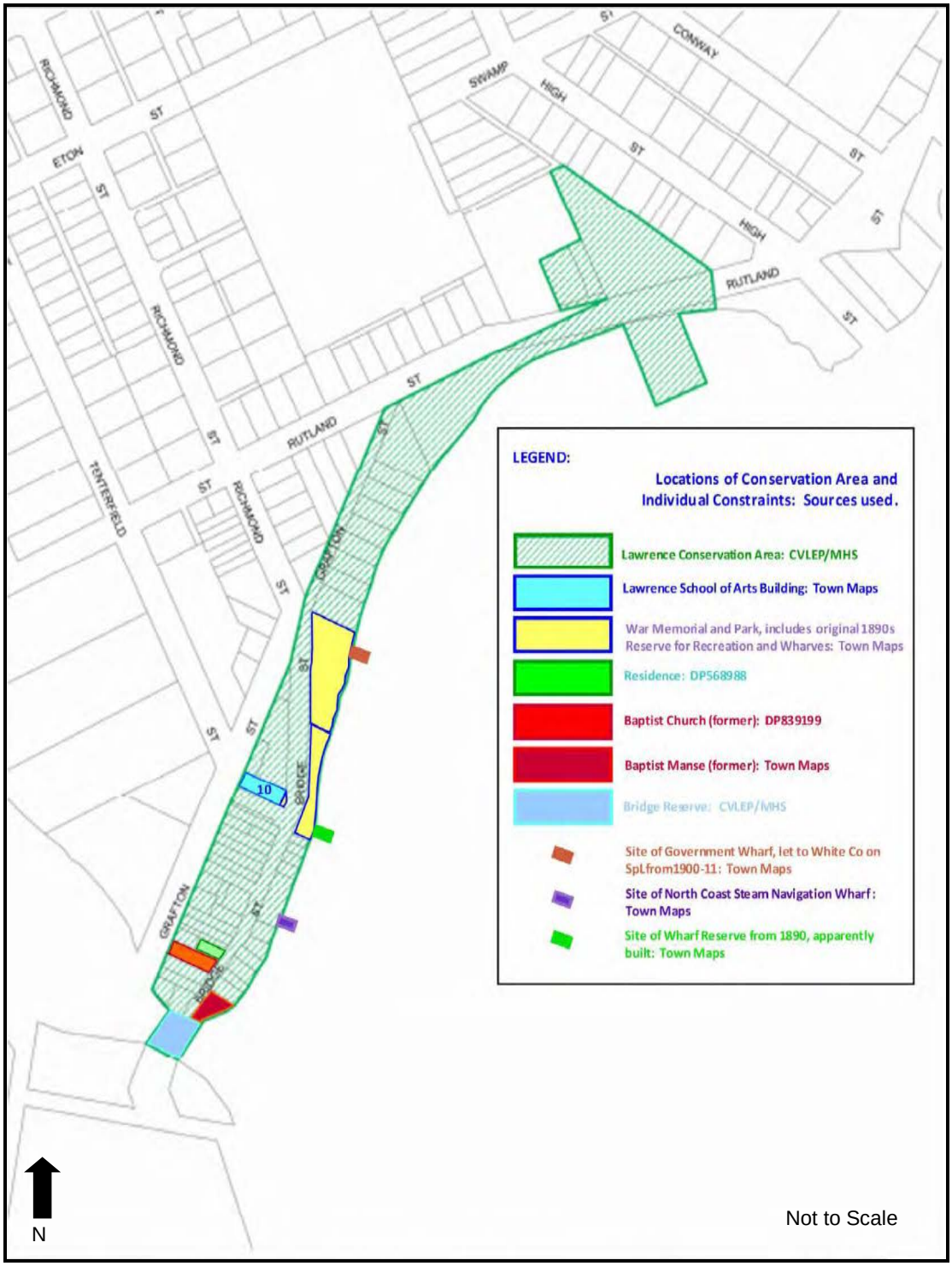

Figure 6.17 Heritage Conservation Area and Non-Aboriginal items of heritage significance

Roads and Maritime lists the Sportsmans Creek bridge in its Heritage and Conservation Register, maintained pursuant to section 170 of the *Heritage Act, 1977*.

6.7.2 History

William Robertson established his Lanark Lodge run of 15,000 acres in 1838. This run was bounded on the east by the western bank of the Clarence River, on the south by Sportsmans Creek and north by The Broadwater and Broadwater Creek.

The Station Homestead was established in the area that would eventually become the heart of Lawrence, the house, home farm and services in the Richmond-Eton-Tenterfield Streets enclave, with an orchard and gardens fenced off between the home farm and the river bank. In due course, a population area was resumed from Lanark Lodge station to provide for the establishment of Lawrence and the final footprint of the property.

The layout of the town had been well and truly established by 1889, when the Third Edition of the Town Map was prepared (refer to Appendix D). Also notable on this plan are the annotated locations of the Government wharf and that of the North Coast Steam Navigation Company. A further wharf was located next to the third lot north of the termination of High Street at the river bank. Subsequent town plans indicate the continuity of these wharves until 1942, although by that time another wharf was in operation next to the High Street wharf.

In general, the activity along the river bank gives emphasis to the history of the town of Lawrence as a long-standing transport hub, receiving and dispatching freight for the local district and from the New England. Lawrence played its part in the distribution process, in the first instance by fulfilling the role of principal port ('rather than a town' says the history), and as the terminal for bullock trains to and from the Tableland along 'the Old Line' connecting Tabulam. The population remained small because the town catered for itinerant teamsters rather than resident farmers, although had a Post office after 1859, Court House and Police Station since the 1860s, and as a tribute to the potential for interstate trade, had a Customs House after 1861.

The growth of Grafton as a transport hub regionally, resulted in the decline of Lawrence as a port. As such, much of what made Lawrence an important feature of Lower Clarence Valley life in the last half of the 19th Century, and to a declining degree in the first half of the 20th Century, is represented in surviving buildings and known locations of what must only be archaeological sites.

6.7.3 Policy setting

Public authorities are required to consider the impact of their activities locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations under clause 228(2)(e) of the *EP&A Regulation 2000.*

Heritage items in NSW are protected under the *Heritage Act 1977* and the relevant LEP as discussed in Section 4.3.4 and 4.2.1.

6.7.4 Criteria

The criteria adopted for assessing the impact upon Non-Aboriginal heritage in the locality, would be to ensure the Proposal avoids impact upon known or unidentified items of Non-Aboriginal heritage significance.

6.7.5 Potential impacts

The vast majority of items identified during the Non-Aboriginal heritage assessment were not identified in proximity to the new bridge construction footprint. As such, it is not anticipated that the building of the new bridge would result in any adverse impacts upon items of Non-Aboriginal heritage significance.

However, building work would have minor encroachments onto the Lawrence Heritage Conservation Area as works would be required on Grafton Street for

drainage and as part of the intersection upgrade near Grafton and Bridge Streets. As shown in Figure 6.17, the Lawrence Heritage Conservation Area covers Bridge Street to this section, as well as, the parcel of land on the corner at Lot 7014 DP 1126811 where works are proposed. The intersection works in particular would occur in close proximity to the Lawrence Memorial Park, in which a heritage War Memorial dedicated to war veterans is located (Plate 6.11). Access to the Clarence River may also be required via the boat ramp/wharf in the Lawrence Memorial Park in the event that alternative access is unavailable to access Sportsmans Creek during building work. Works in general within the conservation area would also need to consider the proximity of works to the fabric of heritage buildings and structures as shown on Figure 6.17. Overall the potential impact upon Non-Aboriginal heritage is anticipated low to negligible risk.

Nevertheless, during on-site works, all staff, contractors and others involved in building and maintenance related activities would be made aware of the statutory legislation protecting sites and places of significance. Safeguards and mitigation measures proposed in Section 6.7.6 below would ensure that any potential impacts to unidentified objects could be avoided.

Plate 6.11 War memorial to veterans in Lawrence Memorial Park

Although the subject of a separate REF assessment, it is relevant to note the relationship between the removal of the existing bridge and building of the new bridge. A Statement of Heritage Impact (SoHI) has been prepared by the GAO Heritage Group (2014) for the removal of the existing Sportsmans Creek bridge and would be discussed as part of the separate REF assessment of the removal of the bridge.

6.7.6 Safeguards and management measures

The mitigation measures to manage potential impacts upon Non-Aboriginal heritage would be in accordance with Section 4.10 of the Roads and Maritime QA Specification G36, with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Damage to items of Non-Aboriginal heritage significance	• All staff, contractors and others involved in building and maintenance related activities should be made aware of statutory legislation protecting sites and places of significance. Of particular importance are the *Heritage Act 1977,* the Clarence Valley LEP 2011 and items shown on Figure 6.17. • If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Roads and Maritime (2012c) Standard *Management Procedure: Unexpected Archaeological Finds* must be followed. Roads and Maritime Services Senior Regional Environmental Officer must be contacted immediately. • If any items defined as relics under the NSW *Heritage Act 1977* are uncovered during the works, all works must cease in the vicinity of the find and the Roads and Maritime Services Senior Regional Environmental Officer contacted immediately	Contractor	During Construction
Works in proximity to the Lawrence Memorial Park and Conservation Area.	• A notification should be issued to Council with regard to the works. • Consultation should be carried out with the Council Heritage Officer before the commencement of works which would involve disturbance to the War Memorial or any heritage structures located within the Lawrence Heritage Conservation Area. In addition the following applies: o Before works in proximity to the War Memorial, the boundary of the item should be clearly marked with flagging tape (or equivalent) and all site personnel should be made aware of its location and significance as a heritage item. o The War Memorial and Lawrence Memorial Park would be marked as a 'no-go' area for construction plant and machinery. o In the event that alternative access to Sportsmans Creek is unavailable, the boat ramp and wharf could be utilised subject to the approval of the Roads and Maritime Project Manager and Environment Officer in consultation with Council.	Contractor	During construction

6.8 Landscape and visual impacts

A Landscape character and visual impact assessment was completed by KI Studio in March 2014 (KI Studio 2014) and is provided in Appendix K.

This section summarises the landscape and visual constraints that apply to the selection of a preferred option for a new bridge over Sportsmans Creek.

The assessment concluded that the Proposal is of a limited scale considering the overall context and expanse of the setting. The Proposal has little effect on the longer term visual quality of the setting and provides future opportunities to enhance the urban structure and the use of the heritage village and improvements to accessibility of Flo Clark Park.

6.8.1 Existing environment

Methodology

The methodology used to carry out the landscape character and visual impact study is summarised as follows:

- Background review of the concept design and supporting material to gain an appreciation of the Proposal
- Detailed site visit to identify sensitivities, views, visual catchments, magnitude of change etc
- Contextual analysis evaluating the characteristics of the site including land uses, scenic values, character zones and landform
- Determination of sensitivity levels based on the contextual analysis
- Determination of visual exposure
- In collaboration with the project team, identification of strategies that would improve the outcome of the Proposal from an urban design, landscape character and visual impact point of view for the subsequent detail design phase
- Description of the design based on the urban design input and mitigation strategies
- Evaluation of the Proposal's impact on the landscape character
- Selection of viewpoints within the visual catchment that are representative of the varying site conditions and the Proposal
- Evaluation of the Proposal's visual impact by comparing the sensitivity of existing viewpoints and the magnitude of impact of the Proposal upon them.
- Identification of any further mitigating measures that could be incorporated into the design.

Landscape characteristics

Several key landscape characteristics have been identified within and around the study area based on preliminary information available and the site visit. These key characteristics include landscape and built form elements which contribute to the sense of place within the village of Lawrence as shown in Figure 6.18.

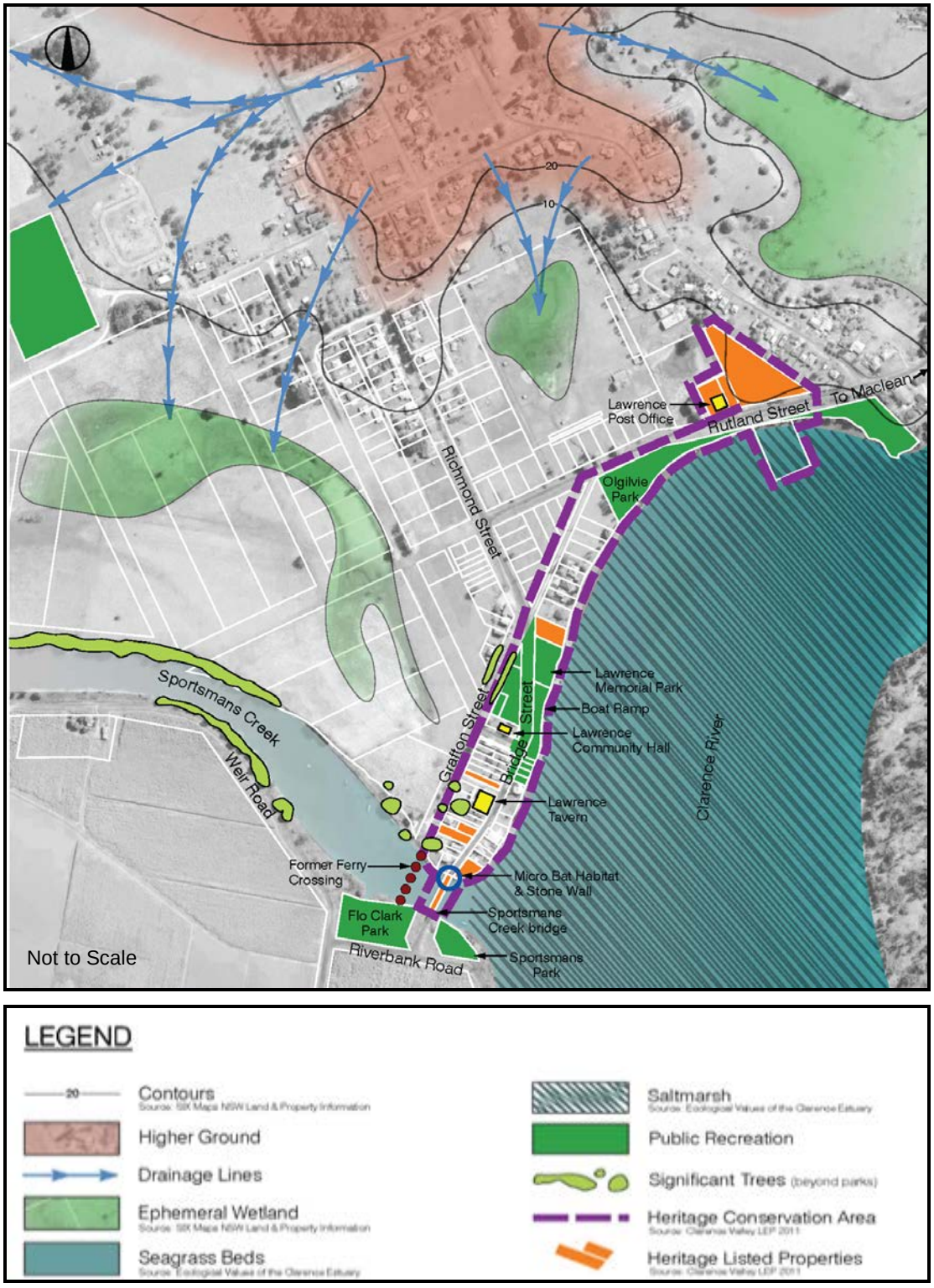

Figure 6.18 Landscape characteristics

Higher ground

The higher ground to the north of the village forms the skyline setting and commands views down onto the floodplain, waterways and heritage village below.

Drainage lines

There are many drainage lines, some defined, others broader and the general direction of fall is shown in Figure 6.. They run into the ephemeral wetlands which provide ecological and bird habitat to the west and north of the study area.

Salt Marsh, sea grass and wetlands

The study area is in the vicinity of seagrass beds, wetlands of national significance and saltmarsh areas. All three areas provide bird habitat and the location of a bridge should consider potential impacts upon these areas, or to nearby areas.

The *Clarence River Way Masterplan* highlights the need to improve public accessibility to the waterfront road reserves, and to provide bird habitat/interpretation of wetlands from road reserves (CVC 2009b).

Landscaped trees

There are mature Eucalypts and other trees/vegetation within and around the study area (beyond the salt marsh, and wetland vegetation and park areas) that provide high landscape value to the village and overall setting of the area. Key trees/vegetation from a landscape/visual point of view includes:

- Mature Eucalypts, Cadagi (*Corymbia torelliana*) in the vicinity of Grafton Street, which would form part of the riparian zone and original Parkland areas which have now been predominately cleared (refer to Plate 6.12).
- Avenue plantings to the northern end of Grafton Street (refer to Plate 6.13), which are noted as Jacaranda, Cadagi and Silky Oak in Section 6.3.
- Indigenous vegetation along Sportsmans Creek banks, noted as riparian zone in the Section 6.3 (refer to Plate 6.14).

Plate 6.12 Avenue plantings on the northern end of Grafton Street

Plate 6.13 The existing mature Eucalypts on the outer verge of Grafton Street provide excellent streetscape quality for any future potential widening.

Plate 6.14 Indigenous vegetation on Sportsmans Creek, looking from the southern end of Grafton Street

Open space/recreation areas

There are three main open space/recreation reserves in the village area, as per the Clarence Valley LEP 2011 including Ogilvie Park (outside of the study area), Lawrence Memorial Park and Flo Clark Park. In addition, there is Sportsmans Park, which whilst it is not allocated as “recreation” in the Clarence Valley LEP 2011, is situated at the mouth of Sportsmans Creek, and opposite bank to the village.

Ecological resource – bridge and wetlands

This area is the ecological value of the waterways surrounding the site, including the ephemeral wetlands to the west of the study area and the habitat provided by the existing bridge for the Large-footed myotis (*myotis macropus*). Sportsmans Creek is also a key fish habitat.

Heritage precinct

The small scale of the Heritage Conservation Area of the village, the 10 m wide road reserve of Bridge Street and relationship of the village to water are all elements that require a sensitive approach to planning and designing a new bridge and road infrastructure. The bridge provides an iconic gateway to the township.

Landscape character analysis

In order to determine the sensitivity of the landscape, the assessment identified eight landscape character zones in the general vicinity of the study area. These are shown on Figure 6.19 and form the basis of the assessment.

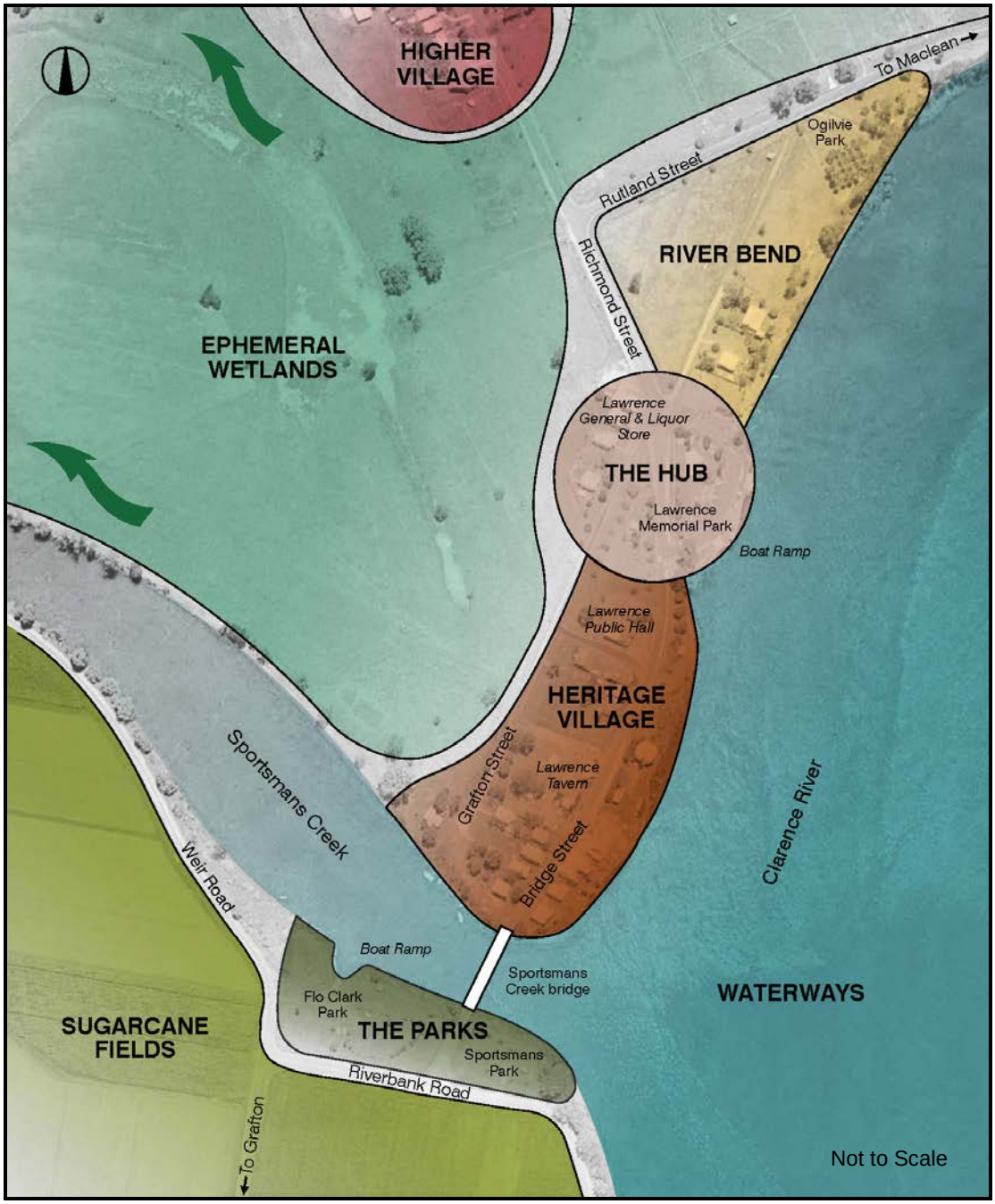

Figure 6.19 Landscape character zones map

Higher Village

This zone occupies the upper grounds of the township and comprises predominantly residential properties on an elevated position with views towards the floodplain below and beyond. This zone is considered high in sensitivity due to its general land use and contextual views from many residences.

Ephemeral Wetlands

Comprising of the low lying lands directly south and east of the Higher Village, this zone is characterised by pasture land and wetlands. Within this zone there are a few stands of trees, yet its character is open, providing extensive views beyond. Its sensitivity is considered moderate.

River Bend

This area includes a combination of open pasture land, a couple of residences flanking the Clarence River and Ogilvie Park. Due to the extensiveness of open space, this zone has a rather rural character. Due to its mixed use, a moderate sensitivity level has been assessed for this zone.

The Hub

The Hub is defined by the intersection of Richmond, Grafton and Bridge Streets.

Lawrence General Store strongly marks the intersection from where views towards the Clarence River are attainable.

This zone marks the northern entry point into the Heritage Village and provides a strong sense of context through the visual interrelationship between the waterways, the Heritage Village, the floodplains and the Higher Village. Hence, the Hub strongly contributes to the orientation of the traveller/viewer.

The Hub also includes Lawrence Memorial Park from which a boat ramp provides recreational access to the river. It also includes a playground, picnic facilities and a memorial in memory of local servicemen who served in both world wars, Borneo, Korea, Malaya and Vietnam. A high sensitivity level has been determined for this zone due to its strategic location and its interface of parks and water.

Heritage Village

The Heritage Village is an ensemble of residences with a number of them under heritage protection. This ensemble, including the former Baptist Church has a strong visual inter-relationship with the waterways of the Clarence River and creates a picturesque setting that defines its identity. Considering its significance to the township's identity and heritage value, a high sensitivity rating is considered appropriate.

The Parks

This zone comprises two parks, Flo Clark Park and Sportsmans Park. These two parks provide direct views towards the existing bridge and the Heritage Village beyond. Flo Clark Park has picnic facilities and a boat ramp, and Sportsmans Park has a picnic shelter and dilapidated BBQ. These parks consist of mown grass with stands of trees. Panoramic views are attainable from these parks towards the

Clarence River and Sportsmans Creek, as well as direct views across to the heritage village. This recreational area with contextual views is considered sensitive to change with a high sensitivity.

Sugarcane Fields

This zone, located to the south, is dominated by the green and homogeneous character of the sugarcane fields. Depending on the harvest time, these fields would either provide open views to the landscape beyond or create an enclosed feeling along the road. This zone strongly contributes to the general character of the landscape and is one of the most southern sugarcane production areas in NSW. In this case a low sensitivity level has been assessed due to its land use.

Waterways

Comprised of creek and river, this zone with its strong green demarcation in the form of a floodway, is visually and environmentally of high significance that defines the western edge of the central part of town. This zone is considered high in sensitivity due to its strategic position within Lawrence, its environmental values and aesthetic appeal. The recreational value of the waterways and visual appeal in context to its transient nature limits this zone sensitivity, however, an overall high sensitivity value is assessed for this study.

6.8.2 History

Lawrence flourished in the 1870s and 1880s through the trade from the tablelands and developed as a port facility along the Clarence River. Over time much of the historic fabric of the two town centres has vanished, however a number of old buildings along Bridge Street and Rutland Street still provide evidence of the 'old days'.

The heritage village of Lawrence hugs the western bank of the Clarence River at this location and is focussed on Bridge Street. This area with a number of heritage properties, combined with the bridge structure, creates a memorable gateway setting as the entry point into town from the south. This entry point is defined by the bridge, historic buildings as well as open space/parks that provide a strong visual and spatial relationship with the Clarence River.

This visual relationship is considered significant as it strongly contributes to the sense of place and character and provides a strong sense of arrival that partly defines the impression of the town.

6.8.3 Policy setting

Public authorities are required to consider the impact of their activities on *locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations, transformation of a locality and any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality* under clause 228(2)(b, d & e) of the EP&A Regulation 2000.

The visual assessment was prepared in accordance with Roads and Maritime guidelines as follows:

- *Guidelines for landscape character and visual impact assessment EIA-N04, Version 2.0* (Roads and Maritime 2013); and consideration of the Roads and Maritime latest revision to this document.
- Beyond the Pavement

- Bridge Aesthetics
- Landscape Design Guidelines.

The management measures proposed in Section 6.8.6 are also consistent with council plans, namely the *Clarence River Way Masterplan* (CVC 2009b). The focus on sustainability to increase water based access as a priority was a recommendation, and the need to provide a range of land/water interfaces access points along the river allied to the townships and tourist nodes.

6.8.4 Criteria

The criteria adopted for assessing the impact of the Proposal is broadly to minimise adverse impacts upon the visual amenity of the local environment as a result of the Proposal. The criteria utilised to assess the magnitude and sensitivity of impacts is derived from the landscape visual impacts rating table in the Guidelines for landscape character and visual impact assessment EIA-N04,Version 2.0 as shown in Table 6.14.

Table 6.14 Landscape visual impacts rating table (Roads and Maritime EIA-N04)

Magnitude

Sensitivity		**High**	**Moderate**	**Low**	**Negligible**
	High	High impact	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.8.5 Potential impacts

Construction

The Proposal is anticipated to generate a temporary visual impact upon the locality, through the presence of construction vehicles and equipment and the site compound in Flo Clark Park and along the banks of Sportsmans Creek.

The works would be visible along Weir Road, Ensbey Road, Grafton-Lawrence Road and to users travelling across the existing Sportsmans Creek bridge. The residential properties situated on the northern banks of Sportsmans Creek and along Grafton Street would be impacted by the temporary visual obstructions. Minor short-term disturbances would be experienced by the public and residents on Grafton and Bridge Street during the intersection treatments and road upgrades.

Provided the safeguards and management measures in Section 6.8.6 are implemented, it anticipated that these impacts would be of low to moderate risk.

Operation

The new bridge would result in a change in the visual amenity of the local area, through the introduction of a new feature on the landscape. Nevertheless, the new bridge would be a replacement for an existing feature and the design process to date

has endeavoured to minimise the introduction of the bridge. Figure 6.20 shows a photomontage of the new bridge looking south at the boat ramp in Flo Clark Park and Figure 6.21 shows a photomontage of the new bridge looking north at Lawrence.

Figure 6.20 Photomontage of the new bridge looking south

Figure 6.21 Photomontage of the new bridge looking north

Landscape Character Impact Assessment

The landscape character descriptions and sensitivity as described in Section 6.8.1 and summarised in Table 6.15.

Table 6.15 Summary of landscape character zones sensitivity ratings

Character Zones	Sensitivity
Higher Village	High
Ephemeral Wetlands	Moderate
River Bend	Moderate
The Hub	High
Heritage Village	High

Character Zones	Sensitivity
The Parks	High
Sugarcane Fields	Low
Waterways	High

The impact upon the landscape character is based on the aggregate of the area's built, natural and cultural character and sense of place. It is measured by a combination of the area's sensitivity and the magnitude. A summary of the overall impact assessment ratings is provided in Table 6.16 below and a full description of the impact upon each zone is discussed in Appendix K.

Table 6.16 Table Landscape Character impact - Summary Table

Character Zones	Sensitivity	Magnitude	Impact
Higher Village	High	Negligible	Negligible
Ephemeral Wetlands	Moderate	Low	Moderate-low
River Bend	Moderate	Negligible	Negligible
The Hub	High	Low	Moderate
Heritage Village	High	High	High
The Parks	High	Moderate	Moderate-high
Sugarcane Fields	Low	Negligible	Negligible
Waterways	High	Moderate	Moderate-high

It should be noted that the assessment of impact is based upon the cumulative impact from the removal of the old bridge as well as the building of the new bridge. The majority of impacts are anticipated to be negligible or moderate to low landscape impact as the majority of adverse impacts would not be significant. The following conclusions can be drawn from the assessment:

- The Ephemeral Wetlands zone rating is due to the redirection of movement along the floodplain's verge (Grafton Street), which would slightly increase the urbanity of the setting
- Parks and the Waterways zone rating is directly related to:
    - The removal of the old bridge and the individual identity it provides in the local setting
    - The reduction in environmental value due to the habitat provided for the Large-footed myotis (*Myotis macropus)*
    - This would be offset by the introduction of new open space and the introduction of habitat on the new bridge (to be assessed as part of the bridge removal REF process).
- The heritage village zone rating is a high positive character impact due to the increase in heritage value of the historic area and in environmental quality through the removal of traffic on Bridge Street.

In order to minimise the potential impacts upon the landscape character, a number of safeguards and mitigation measures were proposed in the assessment. The Proposal to combine Flo Clark Park and Sportsmans Creek has been adopted as part of the Proposal design and would be implemented once the existing bridge is

removed. Safe pedestrian access to Lawrence Memorial Park has also been accommodated in the intersection design of Bridge and Grafton Streets. The remaining safeguards and mitigation measures have been proposed in Section 6.8.6 of this REF for consideration during detailed design.

Visual Impact Analysis

The Proposal has a limited visual exposure due to a number of factors such as built form elements and vegetative screening or due to distant view corridors that limit the magnitude of impact for the viewer. The most exposed areas are those next to the Proposal and include Sportsmans Creek, Flo Clark Park and Sportsmans Park. Also the private properties within the heritage village and facing Sportsmans Creek would have a considerable exposure to the new bridge.

The visual impact assessment has been based by selecting representative viewpoints from the surrounding areas. Due to the limited accessibility into some private properties, the particular viewpoints are along the road's verge, local streets and parks. The viewpoints however discuss the likely visual effects these properties would experience as a result of the Proposal. In order to determine the visual impact, sensitivity values have been assigned to the various viewpoints. The various viewpoints are shown in Figure 6.23.

As shown in Table 6.17, from the nine viewpoints assessed, only one is considered to have a high impact as a consequence of the Proposal. Another three have been assessed with a moderate impact.

Table 6.17 Visual impact - Viewpoint Assessment Summary

Viewpoint	Sensitivity	Magnitude	Impact
1	Moderate	Moderate	Moderate
2	Low	Moderate	Moderate-low
3	High	High	High
4	High	Low	Moderate
5	Low	Moderate	Moderate-low
6	Moderate	Moderate	Moderate
7	Moderate	Low	Moderate-low
8	Low	Low	Low
9	High	Negligible	Negligible

Although three of the viewpoints have a high sensitivity as a result of the land use, nature of the viewer or direct interface with the waterway only one of these viewpoints results in a high impact. This particular view has been assessed looking directly towards the site of the proposed bridge.

Viewpoints five, six, and seven are assessed looking towards areas affected by the associated road widening works and have been assessed with a moderate to moderate-low impact. The impacts are considered positive as traffic would be relocated away from the heritage precinct, and an improvement to the legibility of the road network would enable enhancement of the overall setting.

The general impact of the Proposal would have minimal effect on the long term visual quality of the setting and provides future opportunities to further enhance the urban structure and use of the Heritage Village zone. Provided the safeguards and mitigation measures proposed in Section 6.8.8, visual impacts are anticipated to be low risk.

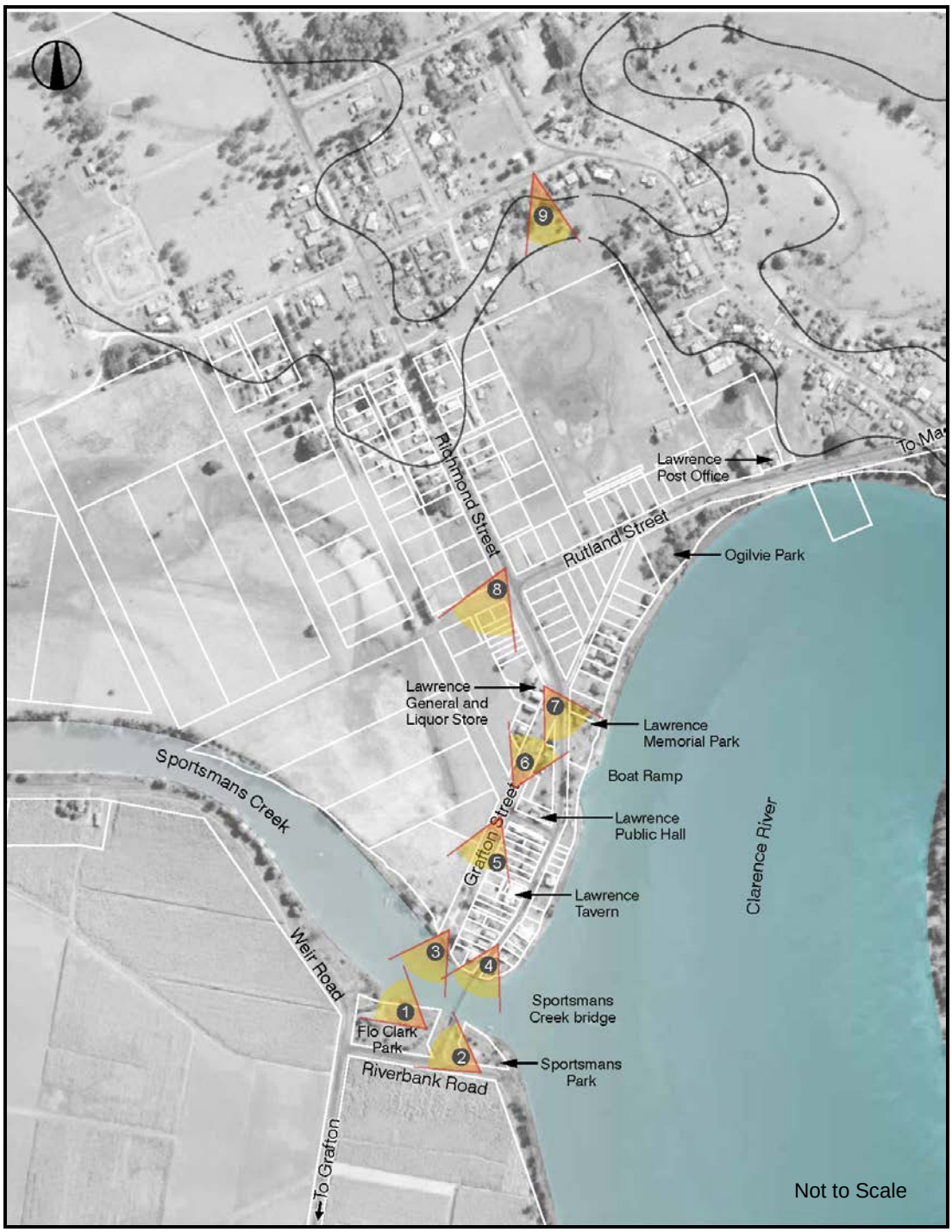

Figure 6.22 Visual Impact Assessment – Selected viewpoints

Light Spill

The new bridge location has the potential to impact upon the residents of Grafton Street with the introduction of a new light spill source, through the head lights of

vehicles utilising the bridge northbound. The north-east facing direction of the bridge is offset from the houses on Grafton Street and is unlikely to result in any light spill impacts upon the residences from vehicles. Nevertheless, the detailed design should consider the likelihood of any potential light spill impacts upon residences.

6.8.6 Safeguards and management measures

The mitigation measures to manage landscape character and visual impacts would be in accordance with the Roads and Maritime *QA Specification G36* with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Minimise long-term impacts upon the landscape character.	• Bridge works are to be managed in accordance with Roads and Maritime *Bridge aesthetics guidelines* (Roads and Maritime 2012d). • Landscaping is to be managed in accordance with Roads and Maritime's *Landscape guideline* (RTA 2008). • The following opportunities to minimise impacts upon the landscape character would be considered during detailed design in consultation with Council: o The recommendations in the Landscape Character and Visual Assessment (Appendix K) in consultation with Clarence Valley Council. o The trees to the east and west of the Grafton Street marked on Figure 6.18 that interface with the water should be retained as much as practical. o Near the Lawrence General and Liquor Store, the car parking design should enhance the legibility, quality and safety of this location.	Roads and Maritime	Detailed Design
Minimise short-term impacts upon the landscape character and visual amenity.	• The location of the compound and general site layout should be placed to minimise the visual impact on surrounding residences, including the siting of stockpiles, buildings, plant and equipment. • Works to be carried out in accordance with EIA-N04 *Guidelines for visual impact assessment and landscape character assessment*.	Contractor	Pre-construction During construction
Light spill from headlights on the bridge	• The detailed design would consider any potential for light spill impacts upon residences and would be avoided where possible.	Roads and Maritime	Detailed Design

6.9 Traffic and access

A transport and traffic assessment was carried out by GTA Consultants in March 2014 for the Proposal (GTA 2014). The report is provided in Appendix G and a summary is provided in this section.

The assessment included a desktop review of existing data and traffic volume counts which were carried out in a two-week period in February 2013 and a one-week period in December 2013. It was concluded that there would be a number of impacts, both positive and negative as a result of the operation of the Proposal, including safety considerations, intersection actions and access to bus services. During building work it is anticipated that there would be increased vehicle movements and travel delays on local roads and temporary property and access disturbances. Mitigation measures have been proposed to address these issues.

6.9.1 Existing environment

Regional Road Network

The regional road context for the Proposal is described in Section 2.2.

Local Roads

Key local roads in Lawrence include Bridge Street, Grafton Street and Rutland Street as shown on Figure 2.1. The Speed limits on local roads are generally 50 km/hr, with the exception of the existing bridge which is set at 20 km/hr. Bridge Street is a regional road which passes through the centre of Lawrence and also provides property access. It carries a high volume of through traffic, via Rutland Street to the Bluff Point Ferry.

Grafton Street runs parallel and to the west of Bridge Street Grafton Street provides access to properties fronting Grafton Street and rear access to properties with frontage to Bridge Street. Plate 6.15 shows a view of Grafton Street looking north towards the Lawrence General and Liquor Store.

Rutland Street provides the link to Bluff Point Ferry about 1 km north-east of the Lawrence village centre.

Traffic Counts

Traffic counts carried out by Roads and Maritime in February 2013 indicate that the Annual Average Daily Traffic (AADT) across Sportsmans Creek Bridge is 1,032 vehicles per day, of which about 7.4 per cent are heavy vehicles. The AM peak hour occurs between 8:00 and 9:00, with an average of 96 vehicles recorded over the survey period. The weekday AM peak volume was 116 vehicles for both directions. The recorded PM peak hour was between 4:00pm and 5:00pm, with an average of 91 vehicles.

Significant seasonal sugarcane haulage activities rely on this bridge for access between July and December each year. A total of 300ha of cane exists to the south of Sportsmans Creek with 40,000t (3,720 trips) of harvested cane transported across the bridge per year.

Plate 6.15 Street views

Recent traffic counts carried out in 2002 and 2013 indicated that traffic volume over the bridge is expected to increase at an annual growth rate of 2.5 per cent per annum for the next 25 years.

Bluff Point Ferry

The Bluff Point Ferry is a cable ferry linking Rutland Street and Bluff Point on the Lawrence side and the Woodford Dale Road – Lawrence Road junction on Woodford Island. It is part of the transport link between Lawrence and Maclean and is used by more than 800 vehicles daily which accounts for between 70 and 80 per cent of the volume on Sportsmans Creek bridge.

The ferry operates 24 hours a day, seven days a week. There is no interruption to service due to maintenance as an alternate ferry is available at the crossing. The capacity of the Bluff Point ferry has recently been upgraded from 35,000 to 46,800 vehicles a month.

Public Transport

Lawrence Bus Service operates two routes in Lawrence.

Route 384: Lawrence to Grafton:

- A daily weekday AM service to Grafton departing at 7:45am and arriving at 8:30am
- An additional Town Bus AM service to Grafton on Tuesdays and Fridays, departing 9:30am and arriving at 10:10am

- A daily weekday PM service from Grafton departing at 3:10pm and arriving at 4:10pm
- An additional Town Bus PM service from Grafton on Tuesdays and Fridays, departing at 2:00pm and arriving at 2:30pm
- No services operate on public holidays.

Route 385: Lawrence to Maclean:

- A daily weekday AM service to Maclean departing at 7:45am and arriving at 8:45am
- An additional Town Bus AM service to Maclean on Thursdays, departing 10:30am and arriving at 11:00am
- A weekday PM service from Maclean departing at 3:20pm and arriving at 4:10pm
- An additional Town Bus PM service from Maclean on Tuesdays and Fridays, departing at 2:00pm and arriving at 2:30pm
- No services operate on public holidays.

Site observations indicate that the main bus stop in Lawrence is outside the Lawrence General and Liquor Store, although no formal bus passenger facilities are provided.

Level of Service

The operational assessment demonstrated that the operation of Bridge Street during the peak periods can be considered within the acceptable levels of service, given that traffic volumes are well below the Austroads and Highway Capacity Manual (HCM) capacity limit, and that no significant platooning could be observed.

The other road sections in the study area experience lower volumes of traffic compared with Bridge Street, and by association, could be considered operating within acceptable levels as well.

Walking and cycling

There are no designated cycleways or footpaths in the vicinity of the Proposal. At presents pedestrians crossing the Sportsmans Creek bridge must cross with caution, sharing the road with vehicles.

Waterway usage

Sportsmans Creek has limited maritime traffic due to the obstruction of the weir upstream and the height restriction of the existing bridge. A small number of fishing boats utilise the waterway infrequently, however, the boat ramp at Flo Clark Park is frequently in use on weekends, particularly by small boats accessing the Clarence River.

6.9.2 History

Based on a review of previous traffic counts in Lawrence, future traffic growth over the period 1970 to 1990 was at an average of 1.1 per cent per annum. More recent traffic counts carried out in 2002 indicated that traffic volume over the bridge is expected to increase at an annual growth rate of up to 2.5 per cent per annum for the next 25 years.

Historical crash statistics collated by Roads and Maritime indicate that during the five-year period 1 July 2008 to 30 June 2013, there was a total of six crashes in the study area and vicinity, three of which are in the 50 km/hr zones north of Sportsmans Creek, and another three in the 100 km/hr section along the Grafton-Lawrence Road south of Sportsmans Creek.

The anticipated increase in traffic and history of crashes within the locality, therefore places emphasis on ensuring the ongoing safety and reliability of the bridge crossing in Lawrence is relevant into the future.

6.9.3 Policy setting

The Proposal forms part of the NSW Long Term Transport Master Plan (NSW Government 2012) and the 'Bridges for the Bush Initiative' as discussed in Section 2.1. The Proposal is also part of a commitment from the NSW Government to improve road freight productivity.

Roads and Maritime are required to assess the impact upon traffic when assessing their impact of their activities as per clause 228 of the EPA Regulation.

6.9.4 Criteria

The criteria adopted for assessing the impact upon traffic and access in the locality, would be to ensure the Proposal addresses the key traffic issues of road safety, traffic capacity, integration with user and community needs while maintaining constructability and achieves the objectives set in Section 2.3 of this REF.

6.9.5 Potential impacts

Construction

The building of the new bridge is anticipated to generate the following traffic and access impacts:

- Increased heavy vehicle movements for hauling of building materials, focusing on Grafton Street, Bridge Street, the Grafton-Lawrence Road and Pringles Way
- Heavy vehicle movements associated with building equipment
- Potential barge movements for delivery of larger structures
- Vehicle movements from construction staff and service vehicles
- Potential restricted vehicular access to the Lawrence General Store, including the petrol bowser
- Temporary partial or complete closures of the Weir Road/Grafton-Lawrence Road intersection, the Bridge Street/Grafton Street/Richmond Street intersection, and the intersections along Grafton Street (south)
- Access restrictions to the existing Sportsmans Creek boat ramp and Flo Clark Park
- Temporary partial or complete closure of roads and altered property and business accesses along Grafton Street.

These impacts have the potential to result in increased travel times due to reduced speed limits relating to road works and temporary detours, as well as potential safety issues relating to the increased heavy vehicle movements. However, detours such as utilising Ensbey Road, as an alternative to Grafton-Lawrence Road and the diversion of other roads (Weir Road and Grafton Street) and property access could be proposed to minimise impacts upon the local road network. Through traffic would

be maintained during the building of the new bridge and the resulting impacts of increased travel times and reduced speed limits would be minimal.

A discussion about access requirements to the work site is provided in Section 3.3.5. Residents, property owners and business owners (including the Lawrence Tavern) would need to be consulted about altered access arrangements before undertaking such changes. The Clarence Cane Growers and Harwood Mill would also need to be consulted with regards to the works during cane harvesting season, July and December.

As discussed in Section 5.4, NSW Maritime was consulted in regards to the Proposal. NSW Maritime has indicated that they would prefer to see that the waterway remains navigable during building work. As such, any waterway closures would need to be discussed prior with NSW Maritime, as well as with any residents with waterway access before obstructions to the waterway and moorings. Navigational marks and signage would need to be implemented to inform boat users of any changes resulting from the Proposal works. The navigation aids plan and on-water traffic management is to be development in consultation with and approved by NSW Maritime.

Furthermore, Council would need to be consulted with regard to utilising Flo Clark Park.

Operation

The Proposal is anticipated to result in a number of positive impacts, as it resolves a large number of transport, traffic and access issues relating to existing conditions. These include:

- Regional traffic flows, including heavy vehicle movements, would no longer run through the centre of the village
- Road safety and sight distance issues relating to the approach on the existing bridge would be addressed
- The potential for vehicle-pedestrian conflicts on Bridge Street is significantly reduced
- Vehicle access and egress to and from the Lawrence General and Liquor Store would be organised in a more efficient manner
- The new bridge facilitates safe pedestrian and cyclist access between north and south over Sportsmans Creek
- The closure of the existing bridge provides the opportunity to integrate Flo Clark Park and Sportsmans Park.

Although a number of positive impacts are anticipated for the Proposal, the Proposal does have the potential to generate a number of minor negative impacts. The more direct route through Grafton Street could encourage higher speeds, compared with the speed-limiting nature of the double 90-degree turns on the existing southern approach to Lawrence. This could potentially contribute to higher levels of road safety risk. However, the design has incorporated a gateway treatment, to encourage that motorists slow down from 100 km/hr to 50 km/hr.

It is also identified that a small number of changes to access would result due to the building of the new bridge on the Grafton Street alignment:

- Vehicles accessing the Lawrence General and Liquor Store would need to

enter a new driveway to the south of the petrol bowser, and egress via an exit driveway to the north, in order to maintain an organised internal circulation pattern. These manoeuvres could create delays on the new bridge route, particularly for the southbound direction, in which through-movements could potentially be delayed by vehicles turning right to access the Lawrence General and Liquor Store. Access to the petrol bowser would also be limited to a north-facing manoeuvre.

- Access to the northern end Bridge Street would be provided with a T-intersection. Access to Lawrence Memorial Park would remain unchanged. Access to the existing properties on Grafton Street north would be via bridge Street north.

Roads and Maritime would need to address these issues during detailed design in consultation with local property and business owners to ensure they are aware of the changes.

Signage would be required to indicate any new traffic and access arrangements, such as the new access to the boat ramp in Flo Clark Park from Ensbey Road.

6.9.6 Safeguards and management measures

In addition to the safeguards proposed in Section 3.7 of the Roads and Maritime QA Specification G36, the following safeguards are proposed to minimise adverse impacts upon traffic and access:

Impact	Environmental safeguards	Responsibility	Timing
Impact upon traffic and access	• A detailed Traffic Management Plan would be prepared in accordance with the RTA (2010) *Traffic Control and Work sites Manual* and RTA Specification G10-Control of Traffic. The plan must be approved by Roads and Maritime and reviewed by Council before implementation. • Where possible, current traffic movements and property accesses are to be maintained during the works. Any disturbance is to be minimised to prevent unnecessary traffic delays. • The Traffic Management Plan would include such measures to provide safe access points to work areas from the adjacent road network, safety barriers where necessary, temporary speed restrictions when necessary, adequate sight distances and prominent warning signage. • Consultation would be carried out with local residents and the Lawrence Tavern on Grafton St and on Weir Road with regard to any temporary access requirements to property to ensure access is maintained at all times. • Residents, businesses and Council would be notified of the proposed works and any changes in traffic arrangements in accordance with Roads and Maritime procedures before the works commencing.	Contractor	Pre-Construction

Impact	Environmental safeguards	Responsibility	Timing
	• The Clarence Cane Growers and the Harwood Mill would also be made aware of the proposed works and any changes in traffic arrangements, particularly for works during cane harvesting season, July to December. • Work areas would be bounded by fencing or barriers to prevent pedestrian access. Safe, alternative access should be provided for pedestrians where required.		
	• Construction traffic would access the site via designated access points to be defined in the Traffic Management Plan.	Contractor	Construction
	• Construction vehicles would be parked off-road as far as practicable or in a manner that minimises disruption to other road users, businesses and the public.	Contractor	Construction
Waterway access	• Signage should be placed at Flo Clark Park to indicate the temporary closure of the Boat Ramp and the park, and the location of alternative Ramp and facilities on the Clarence River near the Lawrence Memorial Park.	Contractor	Pre-Construction
On-water traffic and access	• NSW Maritime would be consulted with regard to the closure of the Boat Ramp, relocation of moorings and obstructions to the Sportsmans Creek channel as required during building work and before the commencement of works. • Consultation with NSW Maritime would be required throughout the duration of the works to develop forward plans for the on-water traffic management whilst the works are carried out and as plant and structures are deployed in different locations. • Appropriate navigational marks and signage should be implemented. A Navigational Aids plan to be prepared and approved by NSW Maritime. • Exclusion zones around critical areas of building activities and floating building plant would be clearly marked in accordance with Roads and Maritime advice and requirements.	Contractor	Pre-Construction, Construction
Faster speeds northbound from Grafton-Lawrence Road	• A gateway treatment should be provided along Grafton-Lawrence Road to the south of Ensbey Road.	Roads and Maritime	Detailed Design
Impact upon Public Transport Routes	• The Lawrence bus service should be notified and consulted with in regard to the relocation of the bus route. • The Proposal should allocate space for future provision of relocated bus stop facilities further to the south from the existing (de facto) bus stop outside Lawrence General Store, for both northbound and southbound directions.	Roads and Maritime Council	Operation

6.10 Land use, Property and Utilities

6.10.1 Existing environment

The land use in the area surrounding the Proposal site is predominately rural cane fields, open space and rural residential properties. A summary of the land zonings present and map is provided in Section 4.3.

On the northern side of Sportsmans Creek there are a small cluster of residences which form the lower Lawrence village. The majority of properties are accessed from Bridge Street, although access is via Grafton Street for at least two properties. There are two commercial uses within the locality. On Grafton Street, there is the Lawrence General and Liquor store and on Bridge Street is the Lawrence Tavern. A community hall is also situated on an unnamed laneway between Bridge and Grafton Streets, approximately 250 m north of the new bridge. To the north of this hall is a landscaped area of crown reserve (Lot 7014 DP 1126811 and Lot 280 DP751377) which is maintained by council. Lot 1 Section 5 DP758604, the proposed location of the northern abutment of the bridge, has been acquired by Roads and Maritime for the Proposal. At present there is a house and some structures on the land, but it is predominately a vacant lot.

On the southern side of Sportsmans Creek, the land use is open space, with Flo Clark Park to the west of the existing bridge abutment and Sportsmans Park on the east of the abutment. Flo Clark Park also provides boat ramp access into Sportsmans Creek and a grassed area for parking next to the waterway. The Weir Road reserve follows generally alongside the bank of Sportsmans Creek from the intersection of Grafton-Lawrence Road and Ensbey Road. The reserve is zoned as rural residential land on the Clarence Valley LEP 2011.

As discussed in Section 3.5, two electrical overhead lines traverse the Proposal site, a 66kV near Weir Road and 11kV near the northern abutment. Both lines are managed by Essential Energy and the 66kV is significant regionally as it supplies the Maclean Zone substation from Koolkhan. Low telephone lines are situated along Grafton Street.

6.10.2 Policy setting

Although development approval and assessment against the Clarence Valley LEP 2011 is not required, Roads and Maritime are required to consider the land zonings present as discussed in Section 4.3. Any acquisition required or modifications to freehold property would be carried out in accordance with the Roads and Maritime's Land Acquisition Information Guide (2011) and the *Land Acquisition (Just Terms Compensation) Act 1991.*

The policy setting which applies for works on Crown lands is discussed in Section 4.3.1.

6.10.3 Potential impacts

The Proposal is anticipated to cause minor temporary impacts upon land use during building work. The acquisition of Lot 1 Section 5 DP758604, which was for sale at the time of the Proposal development, has minimised the direct impact upon private property and available open space, as the land would be utilised for both lay down and the building of the bridge.

As discussed in Section 6.11.5, a road upgrade is planned for Grafton Street and accesses to private property and the Lawrence Tavern may be temporarily disturbed

during building work. However, once the road upgrades are completed, these properties would benefit from improved access. Intersection upgrades on Grafton-Lawrence Road and the building of the southern approach also have the potential to impact upon access to properties on Weir Road.

Flo Clark Park would be required as the area would be required for the building of the southern bridge abutment and for the laydown and compound area during building work. The compound area would be securely fenced and likely to be occupied for a period of at least 12 months. Part of the park would also need to be acquired for a permanent road easement for the location of the new bridge. This area is presently underutilised within the Park, due to the presence of the 66 kV power lines and poles and vegetation overgrowth.

The new bridge would require the relocation of power poles and minor adjustments to power line alignments to avoid the new route. The final location of the routes is yet to be determined but would keep as far as practicable to the existing alignment to minimise the need to relocate poles. Thus it is anticipated that only the relocation of one pole would be required on the 66kV line near the southern abutment and one pole on the 11kV line.

The pole for the 66kV line would likely be moved to the south-west and would remain within the general disturbance footprint for the Proposal and the road reserve. As noted in Section 6.3, the vegetation assessed in this area of Flo Clark Park is of low significance and as noted above, this area is currently underutilised. Any relocation of pole further west outside of the footprint assessed in Section 6.3, would need to be reassessed due to the presence of significant riparian vegetation. The pole for the 11kV line located in Flo Clark Park would remain within the Park and the disturbance footprint for building work, shifted slightly west of the existing bridge abutment. Overall, the utility adjustment works would be of low environmental impact due to the small footprint required to install the poles and could be managed utilising the standard mitigation measures and safeguards proposed in this REF for the broader Proposal.

The new bridge building work would remove of poor quality weedy vegetation and improve the topography within Flo Clark Park, resulting in a permanent positive benefit to land use in this area. Once works are completed access to the boat ramp and park for recreation would be improved. As such, once constructed the long-term operation of the bridge would not result in a reduction of available open space within the village. Any land which is not required following the completion of works at Lot 1 Section DP758604 would also be returned to freehold land. A permanent land use change would result from the intersection upgrade at Grafton and Bridge Streets on Lot 7014 DP 1126811, however, the overall significance of this would be negligible in the context of available open space in the village.

6.10.4 Safeguards and management measures

The mitigation measures to manage land use would be in accordance with those proposed in 6.11.6 and the Roads and Maritime QA Specification G36 with the following additions/amendments.

Impact	Environmental safeguards	Responsibility	Timing
Utility relocation	• Consultation should be continued with Essential Energy with regard to the relocation of services impacted. • Should the final location of relocated power poles be determined outside of the disturbance footprint for the Proposal, the Roads and Maritime Environmental Officer should be consulted to determine if further environmental assessment is required.	Roads and Maritime	Detailed Design
Unidentified services	• Before the commencement of building work, the location of all services within the building footprint should be confirmed and measures implemented to ensure that they would be avoided.	Contractor	Pre-construction
Reduction in available open space	• Council would be consulted with regard to the use of Flo Clark Park. • Rehabilitation and landscaping should ensure that Flo Clark Park is restored to as previous or better condition.	Roads and Maritime	Pre-construction

6.11 Socio-economic

The study area referred to in this section is adopted from the initial options assessment and is shown in Figure 2.3. However, the information presented and issues discussed in this section of the REF apply more broadly to the suburb of Lawrence and Council and the potential impact of the Proposal site more broadly.

6.11.1 Existing environment

Social

The profile of the existing social environment in Lawrence and the Clarence Valley is based on review and assessment of several data sources, including the following:

- Publically available Council reports and website information
- Desktop study of aerial photography, maps and other sources using a GIS
- Demographic data from the Australian Bureau of Statistics (ABS) 2011 Census
- Feedback from the consultation with community and businesses
- Field investigations.

Population characteristics

The following key elements of Lawrence's demographic profile are summarised below.

At the 2011 ABS Census, the Urban Centre and Locality (UCL) of Lawrence had a total population of 740 with the following age breakdown:

- 3.7 per cent aged less than 14 years
- 29.2 per cent aged over 65 years.

Compared with the Clarence Valley LGA which has the following features:

- 18.7 per cent aged less than 14 years
- 21.2 per cent aged over 65 years
- The median age of the population is 55 years, compared with 46 in the Clarence Valley LGA and 38 in NSW
- The Clarence Valley LGA has an indigenous population of 2.6 per cent which is lower than the Lawrence average of 5.7 per cent. A significantly lower portion of Lawrence residents are born overseas, 13.2 per cent than the NSW average of 31.4 per cent.

Population growth

According to the Social Plan, the Clarence Valley LGA population is growing, with the population reported at 48,425 at the 2006 census, which was an increase of 1026 (2.17 per cent) during 2001–2006 (CVC 2010). This growth is attributed to an increase in retirees and those looking for a sea change and/or tree change and moving to the area. At the 2011 census, the population of the LGA was reported as 49,665 and is projected to grow to 54,500 by 2021 and further to reach 57,300 by 2036 (CVC 2010, ABS 2011a).

Public transport usage

Public transport usage rates are very low in Lawrence. This is likely due to the limited public transport options (one bus company offers services between Lawrence and Grafton and Lawrence and Maclean).

The local school bus service utilises the Lawrence Memorial Park turning bay as a pick up and drop off point for school children.

Housing

Lawrence is generally characterised by low density, detached housing, which makes up 96.9 per cent of the total dwellings in the village (ABS 2011a). A very low portion of the population of Lawrence live in Group households (2.5 per cent) and the greatest portion live in family households (73.6 per cent). These figures are similar to Clarence Valley (2.7 per cent in group households, 69.6 per cent in family households) and NSW (3.8 per cent in group households and 71.9 per cent in family households).

In the village, 56.7 per cent of homes are fully owned, with only 10.9 per cent rented. This is significantly higher than the Clarence Valley LGA (37.5 per cent) and NSW (33.2 per cent).

Key community facilities, services and events

Few services and retail opportunities exist for the Lawrence community. Residents travel to Grafton or Maclean to access health, education and other related services, retail and employment. Services and businesses in the village are the post office, Lawrence Primary School, Lawrence Tavern (accommodation and restaurant/bar), Lawrence Nursery, Lawrence General and Liquor Store and Lawrence Museum. Figure 2.4 shows the location of key features in the area proximate to the Proposal.

The study area contains approximately 21 houses, two businesses and one cane farm, located in the south of the study area. Two houses were noted for sale during the field investigations and one has been acquired by Roads and Maritime and the other by a local resident.

There are also two reserves in the study area being Flo Clark Park, located on the southern side of Sportsmans Creek and the Lawrence Memorial Park on the banks of the Clarence River. Both of these parks have boat ramps which are frequently used. Two other recreation reserves exist in the village; Ogilvie Park (near the Lawrence Post Office) and Sportsmans Park (on the opposite bank to the village at the mouth of Sportsmans Creek).

The Lawrence Public Hall is also popular for hosting community events and clubs such as the over 50s Club and the Community Musical Fellowship.

Community values

The following key community values have been identified as part of previous consultation by Council:

- Scenic views, rural activities, community interactions with their surroundings
- Natural environment and flora and fauna within it and the recreational opportunities it provides
- Protection of natural environment in developing future economic benefits
- Healthy waterways and clean water
- Sense of place, cultural heritage, relationship to surrounding landscapes and human scale
- Community size is such that members can build relationships with others, feel connected and supported. The ability to 'pull together' in times of tragedy and natural disaster
- Safe and respectful communities (both safety and property security).

Economic

Business activity

The local economy of Lawrence is very small and is best viewed through an analysis of statistical data for the Clarence Valley LGA. Local economy is identified as a growth area with the Clarence River Way Masterplan, particularly in relation to encouraging investment from the tourism industry and improving infrastructure to facilitate industry transport (CVC 2010).

According to the Interim Valley Vision, there were approximately 4,090 businesses in the Clarence Valley in 2011, which has been in steady decline since 2007 (ABS 2011b, CVC 2013). Of the total businesses registered, the Agriculture, Forestry and Fishing industry has the highest number (26.3 per cent), followed by Construction (16.6 per cent), Rental, Hiring & Real Estate Services (7.8 per cent) and Retail Trade (7.6 per cent).

The estimated turnover for industry in the Clarence Valley was $1.3 billion in 2010/2011, which has also decreased by 0.4 per cent annually. However, the average turnover of all businesses has increased by 0.2 per cent. Overall the Gross Domestic Product (GDP) is growing for the Clarence Valley at around 8 per cent per annum and is presently worth approximately $1,703.9 Million (CVC 2013).

The core economic base is comprised of industries such as fishing, timber, agriculture and sugar, with emerging economics in tourism, regional food, arts and design, education, boat building and timber value adding (CVC 2013).

Investment within the region is increasing, in particular in aged care, tourism, timber and core infrastructure, encouraged by sea-change immigration, growing population, more affordable land and lower operational costs (CVC 2013).

Employment, labour force and income

Unemployment rates within Lawrence and Clarence Valley LGA are higher than those rates in NSW, with 13.4 per cent of the population in Lawrence unemployed and 8.9 per cent in the Clarence Valley compared with 5.9 per cent in NSW.

Economic values and trends

Key economic trends are identified at both the local and regional economy scale can be derived from the *Clarence River Way Masterplan, Clarence Valley Council Valley Vision 2024* and the *Mid North Coast Regional Strategy 2006 - 2031*.

The following trends and strategic directions are of note for the region in general (CVC 2009b, CVC 2013 and Department of Planning 2009):

- Encourage capital expenditure to improve infrastructure such as: recreational areas, site and landscaping improvements, road upgrades and environmental improvements
- Foster economic prosperity through environmentally sustainable activities
- Encourage economic growth and investment utilising federal funding support (through the Masterplan) to promote the rural coast area as a touring region
- Protection of high value natural environments to ensure that new urban development avoids key habitat corridors, threatened species, vegetation communities, coastal lakes, estuaries and aquifers
- Ensure development and growth does not impact upon the coast and character of local villages
- Increase housing stock to meet the demand of 59,600 by 2031 to meet the population growth, however, also ensure this meets the needs of smaller households and the elderly population
- Ensure the demand for land supports economic growth and capacity of the additional employment opportunities
- Support and value voluntary work and build opportunities for training and mentoring to retain expertise in communities (in particular for disadvantaged, youth and less skilled community members).

6.11.2 History

Sportsmans Creek was named in 1839 when the ship “King William” ran aground near Lawrence and encountered an abundance of wildlife. Lanark Lodge was the first settlement in the study area and the homestead was established in Lawrence was up on the high point above the Lawrence general store in 1842 (McSwan and Switzer 2006). The existing Sportsmans Creek bridge was built in 1911 and formed part of the original village gateway entry proposed by council.

6.11.3 Policy setting

Roads and Maritime are required to assess the social, economic and environmental

impacts, including any environmental impact on a community of their activities as per clause 228 of the EPA Regulation.

Roads and Maritime are also required to consider the principles of Ecologically Sustainable Development (ESD) under the objects of the EP&A Act, which require an assessment of inter and intra-generational equity and social impacts.

6.11.4 Criteria

The criteria for assessing the impact of the Proposal would be set as minimising impacts upon the local socio-economic environment, addressing community concern and ensuring potential impacts upon the locality are effectively managed.

6.11.5 Potential impacts

Community Consultation

As discussed in Section 3, the local residents of the Lawrence village were engaged during the options assessment process for the preferred route and subsequent intersection treatments. Issues raised by the community during consultation relating to the design included; road safety, traffic flow and travel times, business/service patronage, flooding and drainage and community facilities and services. The selection of the preferred route addressed these issues as discussed in Section 2.6. Residual concerns relating to traffic flow and travel times, flooding and drainage have been discussed and addressed through safeguards proposed in this REF in Section 6.2 and 6.9.

It was also noted that trees planted on Grafton Street near the Lawrence General and Liquor store are of significance to the community (refer to Plate 6.). As discussed in Section 6.3, these trees are not of conservation value, however, consultation would be required with the community to identify these trees and minimise any impacts.

Some residences in the Lawrence area are occupied by shift workers. As such, during building work there is potential to cause sleep disturbance during particularly noise-generating work scenarios (refer to Section 6.4.4). Residents who are shift workers should be identified within the community during the community consultation process and consulted in regards to reasonable feasible measures to avoid disturbance to daytime sleep.

Construction

The building stage of the Proposal is anticipated to generate the following impacts:

- Local amenity impacts relating to dust and air quality, noise and vibration visual amenity
- Property access changes, including access to businesses in the local area, namely the Lawrence Tavern and Lawrence General and Liquor store
- Reduction in available open space for recreation in Flo Clark Park and access to the boat ramp
- Restrictions on waterway access during key works requiring in-stream building work.

As discussed in Section 6.9, temporary impacts upon property access would be generated during the building of the new bridge, particularly to properties accessed in Grafton Street. Minor increases in travel time and temporary re-routing of school bus routes due to the diversions required to carry out the road and intersection

upgrades would also be experienced. However, provided the safeguards and management measures in Section 6.9.6 are implemented these impacts are anticipated to be low risk.

Emissions to air and noise and vibration impacts from building activities such as earthworks and piling are anticipated to be low to moderate risk and safeguards and management measures have been proposed in Section 6.4.5 and 6.5.5 to minimise these.

The temporary influences upon visual amenity and land use are considered low and measures discussed in Section 6.8.6 and 6.10.4 to address potential impacts. Consultation with the community during various stages of construction would be required to inform them of potential disturbances.

Maritime NSW was consulted with regard to the temporary disturbance upon access to the waterway and the boat ramp. Maritime NSW has stipulated that notices would be required in the local press and on the NSW Maritime website to inform residents and recreational boat users the Flo Clark Boat Ramp is closed due to the building work. The Lawrence Fishing club would also need to be informed of the changes in access to Sportsmans Creek. Any residents located further upstream with moorings would need to be consulted to minimise disruption. In addition, a number of permanent moorings are located within Proposal footprint on the waterway. These moorings would need to be relocated for the duration of works.

It is proposed that while the work are being carried out the boat ramp in Flo Clark Park would be closed and signage would be erected to direct recreational users the ramp in Lawrence Memorial Park, where sufficient recreational facilities are also provided.

During the work, the temporary construction compound located in Flo Clark Park would be securely fenced and signage would be erected to indicate the presence of building work.

The Proposal is not anticipated to generate any impacts upon local economy during building work, due to the small number of workers required to carry out the work. The local businesses in the area may experience increased patronage, however, this increase is anticipated to be a negligible impact.

Operation

Once operational, the new bridge would have a positive contribution long-term to the locality and would have flow-on effects to the local economy. An improved bridge crossing over Sportsmans Creek would facilitate the movement of cane through the region as larger HML vehicles could be utilised, potentially requiring fewer trips.

The design and alignment of the Sportsmans Creek new bridge has incorporated predicted increases in traffic through growth in normal economic activities, as well as growth opportunities identified in a number of strategies and policies that have an impact on Lawrence. These include the Clarence Valley Council's vision and the anticipated growth in tourism traffic as part of the *Clarence River Way Master Plan* (CVC 2009b). Furthermore, investigations carried out for the upgraded ferry at Bluff Point have been considered, as the traffic demand for the Sportsmans Creek new bridge and the upgraded Bluff Point Ferry are intertwined.

The preferred route would also result in a reduction of noise and air quality

emissions to the residents on Bridge Street and a reduction in noise overall in the study area as discussed in Section 6.4.4 and 6.5.4. The preferred route location would require the relocation of bus stops and bus routes located on the existing route. Safeguards and mitigation measures to address this would be required as noted in Section 6.9.6.

While there would temporary disturbance to the recreational use and visual amenity of Flo Clark Park, once the new bridge is built and the old bridge removed, landscaping proposed to join Sportsmans Park and Flo Clark Park would result in an improved larger recreational area. As noted in Section 6.8, this landscaping would enhance the original plan for the town entrance. The works proposed, would also improve access into Flo Clark Park for boats utilising the boat ramp. The new bridge design would also incorporate safe pedestrian access, such that the park would be more easily accessible by foot to the benefit of those who live locally.

6.11.6 Safeguards and management measures

The mitigation measures to manage socio-economic impacts would be in accordance with those proposed in 6.4.5, 6.5.5, 6.8.6, 6.9.6, 6.10.4 and the Roads and Maritime QA Specification G36 with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Disturbance to recreational users of Flo Clark Park	• Fencing and signage should be placed at the site compound location at Flo Clark Park. Signage should be placed to inform boat ramp users of the temporary closure of the boat ramp and the alternate waterway access in Lawrence Memorial Park.	Contractor	Pre-construction
Accessibility to the waterway	• Notices should be placed in the local press and NSW Maritime website as per NSW Maritime requirements and further consultation should be carried out with NSW Maritime with regards to timing of building work. • The Lawrence Fishing club should also be consulted with regard to the boat ramp closure. • Residents with moorings on Sportsmans Creek would be consulted before building in the waterway with regards to any obstructions of the waterway which may impact upon their access to the waterway downstream of the Proposal. • Any residents with permanent moorings at Sportsmans Creek within the building footprint would need to be consulted in cooperation with Maritime NSW in regards to the relocation of these moorings.	Contractor and Roads / Maritime	Pre-construction
Tree removal	• Council would be consulted in regards to the trees on Grafton Street near the Lawrence General and Liquor store to identify trees of community significance.	Roads and Maritime	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Local amenity disturbances	• Residents and businesses within the locality should be contacted at least five days before the commencement of work, in accordance with the Roads and Maritime *(2012b) Community Engagement and Communications Manual*. • Community consultation is to be carried out in accordance with the Roads and Maritime *(2012b) Community Engagement and Communications Manual*. • Complaints received are to be recorded and attended to promptly in accordance with the Roads and Maritime *(2012b) Community Engagement and Communications Manual*. • Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner. • Residents within the locality who are shift workers should be identified and consulted with in regards to noise-generating works that may result in sleep disturbance.	Roads and Maritime/ Contractor	Pre-construction

6.12 Waste management and demand on resources

6.12.1 History

The Proposal site contains imported fill of an unknown source which was brought on site for the building of the existing bridge and is likely to be clean.

6.12.2 Policy setting

Under clause 228 of the *EP&A Regulation 2000*, social, economic and environmental impacts (including the degradation and or pollution of the environment) must be taken into account when assessing the impact of an activity for the purposes of Part 5 of the EP&A Act.

The state's primary environment protection legislation, the *POEO Act 1997*, together with the *Waste Avoidance and Resource Recovery Act 2001* and the *Protection of the Environment Operations (Waste) Regulation 2005* contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste.

The management and disposal of potentially hazardous waste, in particular Asbestos, must address the NSW WorkCover codes of practice and regulations POEO Act 1997, Work Health and Safety Regulation 2011 and the *National Occupational Health and Safety Commission (2002) Code of Practice for Safe Removal of Asbestos (NOSHC 2005)*.

Roads and Maritime is committed to the principles embodied in the *Waste Avoidance and Resource Recovery Act 2001.* Roads and Maritime is also committed to ensuring responsible environmental management of waste that cannot be avoided and to providing opportunities for promoting the re-use of waste products as discussed in Section 4.3.11 of this REF.

6.12.3 Criteria

The criteria for assessing the impact of the Proposal would be set as minimising waste to landfill and resource use and ensuring reuse and recycling opportunities are maximised.

6.12.4 Potential impacts

Waste

The building of the new bridge and associated road upgrade and intersection treatment works would generate the following forms of waste:

- Packaging materials associated with the delivery of bridge components and other materials associated with building work
- Sediment captured in erosion and sediment controls installed
- Surplus excavated spoil and fill
- Vegetative matter from clearing works required for the establishment of site compounds, including noxious weeds
- General refuse from workers
- Wastewater from toilets, compound facilities, stockpiled materials and concrete washout, contaminated run-off form concrete bridge decks, water captured in excavations, dewatering
- Surplus materials, such as cement
- Potentially contaminated or hazardous soils, including ASS and any other unknown contaminates
- Waste from the removal of structures including buildings and road pavement and asbestos contaminated material.

In order to minimise waste to landfill, there is potential for waste reuse on site. Surplus excavated spoil or surplus fill and cleared weed free vegetation could be reused on site to facilitate landscaping and site rehabilitation. Any packaging materials could be separated for recycling, as well as general refuse which is collected by the workers. All other waste would be temporarily stored on site, classified and removed off-site by a licenced contractor to an EPA licenced facility. Liquid waste would be removed by tanker and disposed off-site in a similar manner. As discussed in Section 6.1, it is unlikely that contamination is present within soils to be disturbed, however, PASS are known to be situated close to the ground surface. Any soil which would be identified as potentially contaminated, would be classified as hazardous and require testing before removal. The removal of the house and associated structures on Lot 1 Section 5 DP758604 would potentially uncover hazardous asbestos waste due to their age. The management of asbestos during the removal process would be carried out by a specialist contractor.

Overall the Proposal is anticipated to generate minimal amounts of waste.

Resource use

The Proposal would require the use of resources as follows:

- Materials required for the building of the bridge and road upgrade and intersection works such as concrete, Super T structures, asphalt, road base and paints etc)
- Energy resources for the building of material and operation of machinery and plant
- Fill required to provide structural support for the approaches, to be imported from a local quarry

- Water for construction compounds, concrete works and dust suppression, which would be sourced locally.

The materials proposed for building work are readily available and can be sourced locally or cast in-situ. The only exception to this are the Super T structures, however, they are commonly utilised in building bridges. At present, the source or requirements for construction water is unknown and is likely to be sourced locally. Overall it is anticipated the Proposal would generate a minor demand on resources.

6.12.5 Safeguards and management measures

Waste management and the management of the demand on resources would be in accordance with Section 4.11 of the Roads and Maritime QA Specification G36 with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Waste Management	• Resource management hierarchy principles are to be followed: o Avoid unnecessary resource consumption as a priority. o Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery). o Disposal is carried out as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*). • Reuse opportunities for weed-free vegetation, including mulching for use on site in soil stabilisation and rehabilitation works should be investigated. • Bulk project waste (eg Fill, ENM, VENM, EPRM, recovered aggregate) sent to a site not owned by Roads and Maritime (excluding EPA licensed landfills) for land disposal would have prior formal written approval from the landowner, in accordance with the Roads and Maritime *Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project*. • Appropriate receptacles with lids for the collection of waste with separated bins for waste streams should be provided to encourage the recycling of materials. • Waste materials should be removed off-site by a licenced contractor to a facility authorised to take such waste. o There is to be no disposal or re-use of building waste on to other land. o Waste is not to be burnt on site. o Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed. o Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	During construction

Impact	Environmental safeguards	Responsibility	Timing
Wastewater disposal	• All liquid waste should be disposed off-site by tanker using a licenced contractor and disposed of a facility authorised to take such waste.	Contractor	During construction
Noxious weeds disposal	• All noxious weeds cleared should be disposed of in accordance with the requirements of Council as stipulated in Section 6.3.5 of this REF.	Contractor	During Construction
Material use	• Where practicable, procurement would buy materials manufactured with recycled content.	Roads and Maritime	Pre-construction
Removal of house and structures	• Lead paint materials are to be managed in accordance with the *Australian Standard AS4361.1 'Guide to Lead Paint Management – Part 1 Industrial Applications 1995'*. • Asbestos surveys would be conducted for structures to be removed as part of the Proposal. An asbestos certified disposal service would be engaged for properties identified as having asbestos materials. • The contractor carrying out the removal of asbestos would be required to hold a current ASA asbestos licence from WorkCover, NSW. The contractor must also make an application to WorkCover for the removal in accordance with their requirements.	Roads and Maritime/ Contractor	Pre-construction and during removal

6.13 Greenhouse gas and climate change

6.13.1 Existing Environment

According to the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5) prepared in 2013, human interference to the climate system is occurring which is resulting in changes in the state of the climate. These changes would have ongoing effects on natural and human systems, through extreme weather events and climate events and increases in temperature. The report noted that increases in temperature globally have occurred since the preparation of the AR4 report in 2007 and that further measures are require.

Existing sources of greenhouse gas emissions within proximity to the Proposal site are from vehicles utilising the road (in particular large cane trucks) and the equipment utilising within the surrounding agricultural land.

6.13.2 Policy setting

In NSW the Policy framework sits under the *NSW 2021: Plan to make NSW number one* plan (NSW Government 2014) which includes goals and targets supplemented by practical action to minimise impacts upon local community. The plan includes work to complete climate change assessments with the assistance of agencies and universities.

The NSW Climate Impact Profile prepared by OEH that assesses the potential impacts projected for NSW as a result of climate change. It outlines the risks NSW

faces in terms of climate change and assists decision makers in developing planning and response strategies under the NSW Policy.

Public authorities are required to consider the impact of coastal processes and coastal hazards, including those under projected climate change conditions under clause 228(p) of the *EP&A Regulation 2000*.

6.13.3 Criteria

The criteria for assessing the impact of the Proposal relates to ensuing minimising greenhouse gas emissions during the Proposal building work and ensuring that the Proposal has considered increases in temperature and extreme weather events in design.

6.13.4 Potential impacts

Construction

During building work the Proposal has the potential to generate greenhouse gas emissions, which are believed to be a major contributor global temperature increase and indicators of climate change. The Proposal may generate emissions through:

- The use of fuels in equipment and vehicles
- Material production
- Emissions associated with energy use

However, the overall amounts generated would not be a significant contributor to the atmosphere and would be considered minor.

As discussed in Section 6.2, the flood study by BMT WBM (2014) considered the effect of climate change on flooding. In detailed design, the necessary measures to ensure the Proposal is resilient against future changes in climate and extreme weather events would be considered.

Operation

The Proposal is not anticipated to generate traffic into the future and as such would not result in an increase in greenhouse gas emissions beyond current levels once the new bridge is operational.

6.13.5 Safeguards and management measures

The mitigation measures to minimise greenhouse gas emissions and account for climate change would be in accordance with Section 4.4 of the Roads and Maritime QA Specification G36, the safeguards specified in Section 6.5.5 with the following additions/amendments:

Impact	Environmental safeguards	Responsibility	Timing
Vulnerability to effects of climate change	• The effect of climate change should be factored into future designs, including the effects of flooding. • Further opportunities should be considered for reducing greenhouse emissions during building work and operation of the Proposal.	Roads and Maritime	Detailed design
Greenhouse gas emissions	• Alternative fuels and power sources for equipment should be considered, such as biodiesel generators.	Contractor	During Construction

6.14 Cumulative effects

6.14.1 Existing environment

A search of the Council register for development applications lodged recently and/or determined within the LGA was carried out in August 2014. The vast majority of these applications were applications for the sub-division of lots and minor structure modifications, located in the Upper Lawrence village. No Proposals were located nearby to the building of the new bridge.

A search of the NSW DPE major projects register was carried out in August 2014. The search did not return any results within close proximity to the site, with the nearest projects located in Grafton and Yamba.

Roads and Maritime's proposal to remove the existing bridge, which is planned to occur once the new bridge is operational, is the only significant proposal to be completed within close proximity to the Proposal.

6.14.2 Policy setting

Public authorities are required to consider the cumulative effect of their activities under clause 228(o) of the EP&A Regulation 2000.

6.14.3 Potential impacts

During building work, the Proposal is anticipated to generate a number of cumulative impacts from combined impacts within other activities in the local area, such as upon the local amenity (such as noise and air quality), visual amenity, recreational land use, waterway use and traffic and access. Continued consultation with the community, businesses and Council, combined with the safeguards proposed in Section 6 of this REF would ensure that the Proposal minimises any potential for cumulative impacts upon the local environment.

The Proposal is also anticipated to generate positive cumulative impacts with the removal of the existing bridge. In particular, land reclaimed in Flo Clark Park would be regained through the amalgamation of Sportsmans Park and Flo Clark Park. The building of the new bridge and removal of the bridge would also have positive cumulative effects on local amenity upon the residences in Bridge Street, the Lawrence Tavern and the Lawrence Heritage Conservation Area.

6.15 Summary of beneficial effects

The potential beneficial effects of the Proposal are discussed in Table 6.18.

Table 6.18 Summary of beneficial effects

Effect	Significance Rating
• Makes use of existing roads and minimises development on greenfield sites	High
• Maintains passing trade for local businesses	Moderate
• Connects Flo Clark Park and Sportsmans Park (once the existing bridge is removed)	Moderate
• Avoids the requirement to close or relocate the boat ramp and allows new access for sail boats, with a slightly higher navigable clearance (4.7 m RL)	Moderate
• Delivers value for money	High

Effect	Significance Rating
• Minimises impact on riparian vegetation in the locality	Moderate
• Reinforces original town plan	High
• Reduces fragmentation of the Heritage Conservation Area of Lawrence and the need for large trucks to move through the area.	High

6.16 Summary of adverse effects

While the Proposal is anticipated to have a number of beneficial effects, potential adverse effects are discussed in Table 6.19.

Table 6.19 Summary of adverse effects

Effect	Significance Rating
• New noise receivers would be impacted on Grafton Street (due to new traffic on Grafton Street)	Moderate
• Access would be limited to properties on Grafton Street during building work	Low
• Encroaches on heritage conservation area near the Lawrence Memorial Park and along the eastern property boundaries on Grafton Street.	Low
• Potential to direct headlights into homes as vehicles pass over the bridge towards Maclean	Low
• Temporary reduction in available open space and aesthetic impacts in Flo Clark Park	Low
• Temporary noise and air quality disturbances during building work	Low
• Erosion and sedimentation and subsequent water quality impacts due to exposure and disturbance of soils through clearing.	Moderate

7 Environmental management

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the Proposal. Should the Proposal proceed, these management measures would be incorporated into the detailed design and applied during the building and operation of the Proposal.

A Project Environmental Management Plan (PEMP) and a Construction Environmental Management Plan (CEMP) will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans will be prepared before building of the Proposal and must be reviewed and certified by the Roads and Maritime Services Environmental Officer, Northern Region, before the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System) and QA Specification G38 – Soil and Water Management (Soil and Water Plan).

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the Proposal and during building and operation of the Proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7.1.

Table 7.1 Summary of site specific environmental safeguards.

No.	Impact	Environmental safeguards	Responsibility	Timing
1	General	• All environmental safeguards must be incorporated within the following: o Project Environmental Management Plan o Detailed design stage o Contract specifications for the Proposal o Contractor's Environmental Management Plan	Project manager	Pre-construction
2	General	• A risk assessment must be carried out on the Proposal in accordance with the Roads and Maritime Services Project Pack and PMS risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented. • A review of the risk assessment must carried out after the initial audit or inspection to evaluate is the level of risk chosen for the project is appropriate. • Any works resulting from the Proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction After first audit
3	General	• An environmental contract specification must be forwarded to the Roads and Maritime Services Senior Environmental Officer for review at least 10 working days before the tender stage. • A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.	Project manager	Pre-construction
4	General	• The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environmental Officer Northern Region at least 5 days before work commencing.	Project manager	Pre-construction
5	General	• All businesses and residences likely to be affected by the proposed works must be notified at least 5 working days before the commencement of the proposed activities.	Project manager	Pre-construction
6	General	• Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required.

No.	Impact	Environmental safeguards	Responsibility	Timing
	Polluting receiving waters downstream	• A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP for the Proposal before the commencement of building work in accordance with the specification G38. The SWMP will address: o Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure. o The NSW *Soils and Construction - Managing Urban Stormwater Volume 1 'the blue book*' (Landcom 2004) *and Volume 2 (*DECC 2008). o Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, (Roads and Maritime 2011b). • The plan will include (but not limited to): o Details of erosion and sediment controls to be implemented, including erosion and sediment control plans developed for the project o Details of inspection frequency for control measures o Monitoring and maintenance of environmental control measures o Environmental work method statements for high risk activities such as dewatering and works within waterways o Procedures to manage stockpiles generated during building work o Tannin leachate management measures o Acid sulphate management measures o Detailed consideration of measures to prevent (where possible) or minimise any water quality impacts o Measures to manage known and unexpected contamination during the building stage o Appropriate controls to minimise risk of release of dirty water into drainage lines and/or waterways o Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be carried out on a regular basis to identify any potential spills or deficient erosion and sediment controls o Water quality control measures to prevent any materials (eg concrete, grout, sediment etc) entering waterways.	Contractor	Pre-Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
8	Water Quality and surface water run-off	• Where practicable, stockpiles will be located away from areas subject to concentrated overland flow. Stockpiles located on a floodplain will be managed so as to minimise loss of material in flood or rainfall events. All stockpiles will be stabilised at the end of each work day, during wet weather and covered with geotextile or vegetative cover and managed in accordance with the Roads and Maritime procedure for *Stockpile Site Management Guideline* (RTA 2011a). • Topsoil, earthworks and other excess spoil material will be stockpiled in accordance with the principles outlined in *Stockpile Site Management Guidelines* (RTA 2011a). • Stockpiles containing potential ASS will be managed in accordance with the ASS Management Plan. • All wastewater will be treated to prevent the release of dirty water into the river or any waterways • Vehicle wash down and/or cement truck washout will be carried out off-site or in a designated bunded area lined with an impervious surface. • No works will be permitted if flooding is predicted and all excavations will be filled in and stockpiles removed or secured before enacting evacuation protocols.	Contractor	During construction
9	Water quality and the storage of chemicals	• All fuels, chemicals and liquids will be stored in an impervious bunded area (preferably at least 50 m) away from any waterways or drainage lines. For storage within 50 m, these will be double-bunded or stored as approved by the Roads and Maritime Environment Officer. A Safety Data Sheet (SDS) for each item stored will be kept. • Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 m from drainage lines or waterways. Refuelling of plant and equipment on barges is to occur within a double-bunded area. • Daily checks of machinery and equipment for liquid leaks of any substance will be carried out. • All staff will be trained in incident and emergency response procedures. • Emergency dry and wet weather spill kits will be kept on site at all times and staff made aware of their location and trained in their use.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• The Roads and Maritime Environmental Incident Classification and Management Procedure will be followed in the event of an incident and the Roads and Maritime Contract Manager notified as soon as practicable. • The EPA will be notified in the event of a significant spill in accordance with Part 5.7 of the POEO Act.		
10	Water Quality - Works in waterways	• No equipment cleaning will be carried out within the waterway. • All workers will remain vigilant to monitor for any signs of impacts to water quality (such as hydrocarbons spills, turbidity, discoloured water or unusual smells) on a daily basis.	Contractor	Pre-Construction During construction
11	Dewatering of excavations	• A procedure will be developed for Construction site dewatering in accordance with RMS QA Specification G38 and Roads and Maritime *Technical Guideline EMS-TG-011: Environmental Management of Construction Site Dewatering* (RTA 2011b). • No dewatering of excavations will be discharged into Sportsmans Creek (or any other 'waters' as defined in the POEO Act 1997) without prior treatment. • Dewater must be treated using adequate sediment controls, such as geofabric wrapped gravel or sediment tanks, before discharge on a flat vegetated surface. Discharge must be carried out as far away as practicable from Sportsmans Creek. • Due the presence of ASS in the area, pH levels will be monitored before dewatering. • In the event that high pH levels are encountered indicating the presence of ASS leachate, additional water treatment and dosing will be required, in addition to sediment controls for dewatering. • The discharge water quality will be carried out in accordance with the POEO Act. • Pumping associated with dewatering will be visually monitored for signs of contamination, such as odour or discoloration each time the pumping operation is started up. • Dewatering activities must halt in the event that water quality of discharge water will not meet POEO Act requirements or contamination is suspected. The Roads and Maritime Environmental Officer will be contacted immediately	Contractor	During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		for further advice.		
12	Erosion and Sedimentation	• An Erosion and Sedimentation Control Plan (ESCP) will be prepared in accordance with the Roads and Maritime Specification G38 - Soil and Water Management (Soil and Water Management Plan) for inclusion in the SWMP. The ESCP will include: o Management measures for erosion and sedimentation controls are to be in accordance with the 'blue book', *Managing Urban Stormwater - Soils and Construction Volumes 1 and 2 (*Landcom 2004*,* DECC 2008*).* o Specific details of controls required for excavation activities, in-stream works (such as piling, temporary waterway access and earthworks for the bridge approaches. • The plan will include measures to : o Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets o Reduce water velocity and capture sediment on-site o Minimise the amount of material transported from site to surrounding pavement surfaces o Divert clean water around the site. o Erosion and sedimentation controls will be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request o Any additional measures listed under Section 6.1.5 for soil management in this REF. • Water from site will be used for building purposes, such as dust suppression, where feasible and reasonable. • The CEMP will include specific measures to minimise tracking of material onto sealed areas and offsite and potential reuse of material on site or disposal in accordance with the mitigation measures in Section 6.12.5. • All erosion and sediment controls are to be installed before the commencement of works which will disturb soil and will be maintained until the works have been completed and areas are stabilised. • Topsoil will be stored separately for possible reuse.	Contractor	Before, during and post construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• The CEMP will include specific measures for rehabilitation of the site including o Removal of traffic controls and signage o Removal of environmental controls • Progressive stabilisation and rehabilitation.		
13	Soil disturbance on the banks and in the waterway	• All surfaces disturbed will be stabilised and restored as soon as practicable and in a progressive manner as works are completed. • An Environmental Work Method Statement (EWMS) will be prepared in accordance with Section 4.13 of the *Roads and Maritime QA Specification G36* for all works to be carried out within Sportsmans Creek and any access works on the banks of the waterway. • The EWMS will be prepared in accordance with the DPI (Fisheries) guidelines discussed in Section 6.2.6 and any requirements for dredging and reclamation activities. • All temporary access points installed for building work access to the waterway (including constructed pads or temporary jetties) will be established in a manner such to minimise disturbance on the banks. • Any temporary working platforms will be managed in accordance with the principles detailed in Section 3.3.1 Construction of temporary working platforms for the new bridge of the REF and the outcomes of consultation with DPI (Fisheries). • For all works likely to generate sediment within the waterway or on the adjacent banks of Sportsmans Creek (including all temporary access works and piling), a sediment / silt curtain and hydrocarbon boom will be placed in Sportsmans Creek, weighted to the bed and secured to accommodate tidal flow. The hydrocarbon boom will be installed inside of the silt curtain when both are in operation. This will remain in place until the completion of drilling and removal of temporary access platforms.	Contractor	During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
14	PASS / ASS Excavation / Disturbance	• For areas identified as PASS where excavation is required (including for piling construction), an ASS management plan will be prepared in accordance with the Roads and Maritime's *Guidance for the Management of Acid Sulfate Materials: Acid sulphate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze* (RTA 2005) and the soils and water management plan (acid sulfate soils section). The ASS management plan will be approved by Roads and Maritime before the commencement of any earthworks and at a minimum, the plan will include: o Management measures for the safe excavation, isolation and disposal of neutralisation of soils o Requirements for additional testing to determine predicted liming rates of excavated spoil once quantities are determined. • Specific controls to be implemented will include: o Capping exposed surfaces with clean fill to prevent oxidation o Placing excavated ASS separately in a lined, bunded and covered area o Neutralising ASS for reuse (where appropriate) by using additives such as lime.	Contractor	Pre-construction During construction
15	Contaminated soil	• A contingency plan for the management of contaminated soils will be developed. • Visual/olfactory assessment of excavated materials will be carried out immediately following exposure. • Soil disturbance will be minimised in the vicinity of the Underground Storage Tanks near the General Store. In the event that design changes require works at this location, the Roads and Maritime Environmental Officer will be contacted with regard to further environmental assessment.	Contractor	Pre-construction During construction
16	Imported Fill	• All fill brought on site will be classified as Virgin Excavated Natural Material (VENM) as per Schedule 1 of the POEO Act and be free of weeds and seeds.	Contractor	During construction
17	Trafficability	• If required, access tracks will be stabilised from gravel sourced locally, which is certified as pathogen-free.		

No.	Impact	Environmental safeguards	Responsibility	Timing
18	Flooding during building work	• A Flood Management Plan will be prepared as part of the CEMP and implemented during building work. At minimum this plan will include: o Consideration of evacuation protocols from the *Clarence Valley Local Flood Plan* (SES 2012) for the Lawrence Sector o Project-specific emergency response and evacuation controls during flooding. o Measures to ensure that equipment, site-offices, ablution facilities, vehicles, materials, buoyant items and machinery are secured against flood or able to be removed off-site when a flood warning is issued. o Reporting requirements o A regular weather monitoring regime. • The State Emergency Service (SES) will be informed of the works, if they are occurring during flood season (November to March). • The SES will also be informed of any partial or full road closures during building work. • No works will be carried out during or immediately after periods of flood unless it is deemed safe to return to the area by the SES and the Roads and Maritime Project Manager.	Contractor	Pre-construction During construction
19	Hydrological impacts	• Any temporary structures such as silt curtains placed in-stream will be installed such that they will not impact flows and cause erosion.	Contractor	During construction
20	Groundwater contamination	• Temporary casing for bored piles will be employed. • Temporary sheet piling will be considered to minimise the impact of water inflow.	Roads and Maritime	Detailed Design During construction
21	Hydrological changes impacting Sportsmans Creek as a result of the bridge design and temporary building for waterway access	• As per the correspondence in Appendix H, the Proposal design will consider the *NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation and management* (DPI 2013) and mitigation measures to minimise potential impacts upon Sportsmans Creek. • The Proposal design will ensure that the hydrological flows of the waterways are not altered causing scouring of banks or obstruction of flows.	Roads and Maritime	Detailed Design

No.	Impact	Environmental safeguards	Responsibility	Timing
22	Disturbance / Destruction of Vegetation	• All relevant staff will be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained. • Clearing of vegetation will be carried out in accordance with *Guide 1 Pre-clearing Process of Biodiversity Guidelines* (RTA 2011c). These guidelines cover the felling of both non-habitat and habitat trees and the rescue and relocation of fauna. • The location of exclusion zones will be identified, with temporary fencing or flagging tape to indicate the limits of clearing (in accordance with *Guide 2 of the Biodiversity Guidelines* (RTA 2011c)) • Tree Protection Zones (TPZ) will be implemented around trees to be retained in proximity to the proposed works in accordance with the Australian Standard *AS 4970-2009 Protection of trees on development sites* to prevent machinery impacts to trees. • To minimise sedimentation impacts to waterways and wetlands, the safeguards listed in Section 6.1.5 and 6.2.6 of this REF will be implemented. • If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Roads and Maritime *Unexpected Threatened Species Find Procedure* in the *Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process*)'(RTA 2011c). • Fauna handling will be carried out in accordance with the requirements the Roads and Maritime *Biodiversity Guidelines - Guide 9 (Fauna Handling)* (RTA 2011c).	Contractor	Pre-construction During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
23	Aquatic biodiversity / protection of fish habitat	• During detailed design, the project design team will comply with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013) in relation to requirements for maintaining fish passage via the design and building of in-stream structures. • Aquatic vegetation in areas other than in the vicinity of works area, will be designated as 'no-go zones'. • Damage to any aquatic vegetation will be recorded and reported to DPI (Fisheries). • Visual inspection of Sportsmans Creek will be conducted for dead or distressed fish. Observations are to be reported immediately to the DPI (Fisheries). • Direct disturbance of aquatic fauna, habitat and riparian zones will be minimised in accordance with Roads and Maritime Biodiversity Guidelines – Guide 10 Aquatic habitat and riparian zones (RTA 2011c).	Contractor	Pre-construction During construction
24	Impact to microbat population	• The detailed design of the Proposal will incorporate microbat habitat as designed by a specialist experienced in microbat ecology and management.	Roads and Maritime	Detailed design
25	Spread of Weeds	• The Noxious weeds identified in Table 6.1 will be managed in accordance with the Council control requirements and for noxious weed classes as follows: o **N5** (Annual Ragweed): There are no requirements to control existing plants of Class N5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists. o **N4** (Camphor Laurel, Fireweed, Lantana): The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority, titled *Class 4 Weed Control Management Plan* (CVC July 2012). Camphor laurel (*Cinnamomum camphora*) must managed in accordance with the *Policy for management of Camphor laurel (Cinnamomum camphora)*. o **N3** (Coral Tree): The plant must be fully and continuously suppressed and destroyed. • Weeds will be controlled in accordance with the Roads and Maritime *Biodiversity Guidelines Guide 6: Weed Management* (RTA 2011c).	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• Declared noxious weeds will be managed in accordance with the requirements of the *Noxious Weeds Act 1993*. o Weed infested topsoil will be appropriately stockpiled with sediment fencing and as soon as practical, disposed of or treated appropriately to limit potential impacts on nearby areas of native vegetation.		
26	Noise and vibration disturbance during building work	Before building work, when more specific information is available in relation to the proposed building works, a site specific Construction Noise and Vibration Management Plan (CNVMP) will be prepared. This CNVMP will address each major stage of the building works and identify the appropriate mitigation and management measures, consistent with the requirements of the ICNG. The objectives of the CNVMP are as follows: • Minimise exceedances of the Noise Management Levels and goals nominated in Section 6.4.4. • Provide detail of noise and vibration monitoring, reporting and response procedures. • Describe specific mitigation treatments, management methods and procedures to be implemented to control noise and vibration during building work. • Describe construction timetabling to minimise noise impacts including time and duration restrictions, respite periods and frequency. • Describe procedures for notifying residents of building activities likely to affect their amenity through noise and vibration. • Define contingency plans to be implemented in the event of non-compliances and/or noise complaints. • Ensure management measures as detailed in Section 6.4.5 of this REF are documented. • Specify that the majority of works will be carried out during normal work hours (ie 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays will minimise noise impacts.	Contractor	Pre-Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• Prior notification to local residents, businesses and Council in accordance with the *Roads and Maritime Noise Management Manual Practice Note VII* will be provided for any work performed outside of normal works except in the case of emergencies.		
27	Noise disturbance during building work	Noise impacts will be minimised in accordance with Practice Note 7 in the Roads and Maritime *Environmental Noise Management Manual* (RTA 2001) and Roads and Maritime's *Environmental fact sheet No. 2- Noise management and Night Works*. As minimum, the following mitigation measures will be included in the CNVMP and all feasible and reasonable mitigation considered: • Utilising localised acoustic hoarding and/or earth bunds around significantly noise generating stationary items of plant (eg rock breaker), where practicable. • Planning of the higher Noise Management Level exceedance activities/locations will be carried out predominantly during less noise-sensitive periods, where available and possible. The adjacent residents will be consulted to assist in identifying less noise sensitive periods. • Workers and contractors will be inducted and trained to create awareness of the locality of sensitive receivers and the importance of minimising noise emissions. • Ensuring any spoil is placed and not dropped into awaiting trucks. • Locating noisy plant away from receivers where possible. • Turning noisy plant off when not in use. • Ensuring plant is regularly maintained and repair/replace equipment that becomes noisy • Establishing load points as far as practicable from sensitive receivers. • Utilising of silenced or less noise-intensive equipment, where reasonable and feasible. • Where possible heavy vehicle movements will be limited to daytime hours.	Contractor	Pre-Construction During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• Reversing of equipment will be minimised so as to prevent nuisance caused by reversing alarms. • Non-tonal reversing alarms will be considered to minimise nuisance caused by reversing alarms.		
28	Vibration disturbance during building work	• Potential vibration impacts will be addressed in the CNVMP. • Mitigation measures, including allowing adequate distance that rollers can come to adjacent buildings and/or using non vibrating rollers, will be used to minimise or prevent vibration impacts.	Contractor	Pre-Construction
		• Attended vibration monitoring will be carried out in the event that vibration intensive works are required within the cosmetic damage safe working distances, for example if rock breaking is required within 7 m of a receiver (medium rockbreaker), or if impact piling is required within 15 m of a receiver. o The aim of the attended vibration monitoring will be to ensure levels remain below the criteria for cosmetic damage at all receivers (heritage or otherwise) as listed in Section 6.4.3 and Table 6.. • Measures for vibration management to be included in the CNVMP include: o Bored pilling and not impact pilling where feasible will be utilised. o Consecutive works in the same locality will be minimised. • In the event that rockbreaking is required, the following additional measures will be considered in the CNVMP: o Dampened rockbreakers and/or “city” rockbreakers will be utilised to minimise the impacts associated with rockbreaking works (if required) and use a smaller capacity rockbreaker where feasible. o Rockbreaking will be sequenced operations so vibration intensive operations do not occur concurrently. o Rockbreaking works will be scheduled during the less sensitive times of the day. o Hydraulic rocksplitters will be utilised rather than use of a rockbreaker (if applicable).	Contractor	During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
29	Vibration impacts to heritage buildings during building work	• Building surveys of all nearby heritage structures as defined in Table 6.9 of this REF will be carried out in order to assess the potential for increased susceptibility to building damage from vibration. • In the event that these buildings are considered more susceptible to vibration than regular buildings, reduced vibration criteria levels may be applicable and subsequently adopted for the assessment process. These reduced criteria may influence the selection of appropriate building processes and equipment to be used in the vicinity of these buildings.	Roads and Maritime	Pre-construction
30	Noise impacts to residential receivers during operation.	• Noise architectural treatments at affected properties as defined in Table 6.10 and 6.11 in this REF will be developed in consultation with property owners. Further investigation to determine the extent of mitigation works will be carried out in consultation with owners.	Roads and Maritime	Detailed design
31	Additional noise impacts due to change in building work methodology	• In the event that a driven pilling technique is selected, the Roads and Maritime Environmental Officer will be contacted with regard to any additional requirements. Further mitigation measures or specialist input may be required to supplement the Noise and Vibration Management Plan (NVMP).	Roads and Maritime	Detailed design
32	Dust generation	• All construction vehicles will adhere to speed limits, particularly on unsealed surfaces. • Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation. • Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime's *Stockpile Site Management Guideline* (RTA 2011a). • Visual monitoring of air quality will be carried out on a daily basis to verify the effectiveness of dust controls. • Measures (including watering or covering exposed areas) will be used to minimise or prevent air pollution and dust. • Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
33	Emissions to air	• Vegetation or other materials will not be burnt on site. • Plant and vehicles must not be left idling when not in use for extended periods. • Regular maintenance of vehicles, plant and equipment will be carried out and fitted with emission control devices in accordance with Australian Design Standards. • Visual monitoring of air quality will be carried out on a daily basis to verify the effectiveness of emissions controls.	Contractor	During construction
34	Hazardous emissions to air during removal	• A full building inspection will be conducted of the house and structures to be removed by a qualified building asbestos inspector to determine if any asbestos materials are present before removal.	Roads and Maritime	Pre-construction
		• Water sprays or alternative dust suppression methods will be employed during removal in the event that significant dust is generated.	Contractor	During site establishment
35	Damage to items of Aboriginal heritage significance	• All staff, contractors and others involved in building and maintenance related activities will be made aware of statutory legislation protecting sites and places of significance. Of particular importance are the *Heritage Act 1977,* the Clarence Valley LEP 2011 and items shown on Figure 6.17. • If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Roads and Maritime (2012c) *Standard Management Procedure: Unexpected Archaeological Finds* will be followed. Roads and Maritime Services Senior Regional Environmental Officer must be contacted immediately. • If any items defined as relics under the NSW *Heritage Act 1977* are uncovered during the works, all works will cease in the vicinity of the find and the Roads and Maritime Services Senior Regional Environmental Officer contacted immediately	Contractor	Pre-construction During construction
36	Damage to items of Non-Aboriginal heritage significance	• All staff, contractors and others involved in building and maintenance related activities will be made aware of statutory legislation protecting sites and places of significance. Of particular importance are the *Heritage Act 1977*, the Clarence Valley LEP 2011 and items shown on Figure 6.17.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Roads and Maritime (2012c) Standard Management Procedure: Unexpected Archaeological Finds must be followed. Roads and Maritime Services Senior Regional Environmental Officer must be contacted immediately. • If any items defined as relics under the NSW *Heritage Act 1977* are uncovered during the works, all works must cease in the vicinity of the find and the Roads and Maritime Services Senior Regional Environmental Officer contacted immediately		
37	Works in proximity to the Lawrence Memorial Park and Conservation Area.	• A notification will be issued to Council with regard to the works. • Consultation will be carried out with the Council Heritage Officer before the commencement of works which will involve disturbance to the War Memorial or any heritage structures located within the Lawrence Heritage Conservation Area. In addition the following applies: o Before works in proximity to the War Memorial, the boundary of the item will be clearly marked with flagging tape (or equivalent) and all site personnel will be made aware of its location and significance as a heritage item. o The War Memorial and Lawrence Memorial Park will be marked as a 'no-go' area for construction plant and machinery. o In the event that alternative access to Sportsmans Creek is unavailable, the boat ramp and wharf can be utilised subject to the approval of the Roads and Maritime Project Manager and Environment Officer in consultation with Council.	Contractor	During Construction
38	Minimise long-term impacts upon the landscape character.	• Bridge works will be managed in accordance with the Roads and Maritime *Bridge aesthetics guidelines* (Roads and Maritime 2012d). • Landscaping will be managed in accordance with Roads and Maritime's *Landscape guideline* (RTA 2008). • The following opportunities to minimise impacts upon the landscape character will be considered during detailed design in consultation with Council: o The recommendations in the Landscape Character and Visual Assessment (Appendix K) in consultation with Council. o The trees to the east and west of the Grafton Street marked on Figure	Roads and Maritime	Detailed Design

No.	Impact	Environmental safeguards	Responsibility	Timing
		6.18 that interface with the water will be retained as much as practical. o Near the Lawrence General and Liquor Store, the car parking design will enhance the legibility, quality and safety of this location.		
39	Minimise short-term impacts upon the landscape character and visual amenity.	• The location of the compound and general site layout will be placed to minimise the visual impact on surrounding residences, including the siting of stockpiles, buildings, plant and equipment. • Works to be carried out in accordance with EIA-N04 *Guidelines for visual impact assessment and landscape character assessment*.	Contractor	Pre-construction During construction
40	Light spill from headlights on the bridge	• The detailed design will consider any potential for light spill impacts upon residences and will be avoided where possible.	Roads and Maritime	Detailed Design
41	Impact upon traffic and access	• A detailed Traffic Management Plan will be prepared in accordance with the RTA (2010) *Traffic Control and Work sites Manual* and RTA Specification G10-Control of Traffic. The plan will be approved by Roads and Maritime and reviewed by Council before implementation. • Where possible, current traffic movements and property accesses are to be maintained during the works. Any disturbance is to be minimised to prevent unnecessary traffic delays. • The Traffic Management Plan will include such measures to provide safe access points to work areas from the adjacent road network, safety barriers where necessary, temporary speed restrictions when necessary, adequate sight distances and prominent warning signage. • Consultation will be carried out with local residents and the Lawrence Tavern on Grafton St and on Weir Road with regard to any temporary access requirements to property to ensure access is maintained at all times. • Residents, businesses and Council will be notified of the proposed works and any changes in traffic arrangements in accordance with Roads and Maritime procedures before the works commencing. • The Clarence Cane Growers and the Harwood Mill will also be made aware of the proposed works and any changes in traffic arrangements, particularly for works during cane harvesting season, July to December.	Contractor	Pre-Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• Work areas will be bounded by fencing or barriers to prevent pedestrian access. Safe, alternative access will be provided for pedestrians where required.		
		• Construction traffic will access the site via designated access points to be defined in the Traffic Management Plan.	Contractor	Pre-construction
		• Construction vehicles will be parked off-road as far as practicable or in a manner that minimises disruption to other road users, businesses and the public.	Contractor	Pre-construction
42	Waterway access	• Signage will be placed at Flo Clark Park to indicate the temporary closure of the Boat Ramp and the park, and the location of alternative Ramp and facilities on the Clarence River near the Lawrence Memorial Park.	Contractor	Pre-construction
43	On-water traffic and access	• NSW Maritime will be consulted with regard to the closure of the Boat Ramp, relocation of moorings and obstructions to the Sportsmans Creek channel as required during building work and before the commencement of works. • Consultation with NSW Maritime will be required throughout the duration of the works to develop forward plans for the on-water traffic management whilst the works are carried out and as plant and structures are deployed in different locations. • Appropriate navigational marks and signage will be implemented. A Navigational Aids plan to be prepared and approved by NSW Maritime. • Exclusion zones around critical areas of building activities and floating construction plant will be clearly marked in accordance with Roads and Maritime advice and requirements.	Contractor	Pre-construction, construction
44	Faster speeds northbound from Grafton-Lawrence Road	• A gateway treatment will be provided along Grafton-Lawrence Road to the south of Ensbey Road.	Roads and Maritime	Pre-construction, construction
45	Impact upon Public Transport Routes	• The Lawrence bus service will be notified and consulted with in regard to the relocation of the bus route. • The Proposal will allocate space for future provision of relocated bus stop facilities further to the south from the existing (de facto) bus stop outside Lawrence General Store, for both northbound and southbound directions.	Roads and Maritime Council	Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
46	Utility relocation	• Consultation will be continued with Essential Energy with regard to the relocation of services impacted. • Should the final location of relocated power poles be determined outside of the disturbance footprint for the Proposal, the Roads and Maritime Environmental Officer will be consulted to determine if further environmental assessment is required.	Roads and Maritime	Detailed Design
47	Unidentified services	• Before the commencement of building work, the location of all services within the building footprint will be confirmed and measures implemented to ensure that they will be avoided.	Contractor	Pre-construction
48	Reduction in available open space	• Council will be consulted with regard to the use of Flo Clark Park. • Rehabilitation and landscaping will ensure that Flo Clark Park is restored to as previous or better condition.	Roads and Maritime	Pre-construction
49	Disturbance to recreational users of Flo Clark Park	• Fencing and signage will be placed at the site compound location at Flo Clark Park. Signage will be placed to inform boat ramp users of the temporary closure of the boat ramp and the alternate waterway access in Lawrence Memorial Park.	Contractor	Pre-construction
50	Accessibility to the waterway	• Notices will be placed in the local press and NSW Maritime website as per NSW Maritime requirements and further consultation will be carried out with NSW Maritime with regards to the timing of building work. • The Lawrence Fishing club will also be consulted with regard to the boat ramp closure. • Residents with moorings on Sportsmans Creek will be consulted before building in the waterway with regards to any obstructions of the waterway which may impact upon their access to the waterway downstream of the Proposal. • Any residents with permanent moorings at Sportsmans Creek within the building footprint will need to be consulted in cooperation with Maritime NSW in regards to the relocation of these moorings.	Contractor and Roads / Maritime	During construction
51	Tree removal	• Council will be consulted in regards to the trees on Grafton Street near the Lawrence General and Liquor store to identify trees of community significance.	Contractor / Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
52	Local amenity disturbances	• Residents and businesses within the locality will be contacted at least five days before the commencement of work, in accordance with the Roads and Maritime (2012b) *Community Engagement and Communications Manual*. • Community consultation is to be carried out in accordance with the Roads and Maritime (2012b) *Community Engagement and Communications Manual* Complaints received are to be recorded and attended to promptly in accordance with the Roads and Maritime (2012b) *Community Engagement and Communications Manual* • Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner. • Residents within the locality who are shift workers will be identified and consulted with in regards to noise-generating works that may result in sleep disturbance.	Roads and Maritime / Contractor	Pre-construction
53	Waste Management	• Resource management hierarchy principles are to be followed: o Avoid unnecessary resource consumption as a priority. o Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery). o Disposal is carried out as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*). • Reuse opportunities for weed-free vegetation, including mulching for use on site in soil stabilisation and rehabilitation works will be investigated. • Bulk project waste (eg Fill, ENM, VENM, EPRM, recovered aggregate) sent to a site not owned by the Roads and Maritime (excluding OEH licensed landfills) for land disposal will have prior formal written approval from the landowner, in accordance with the Roads and Maritime *Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project*. • Appropriate receptacles with lids for the collection of waste with separated bins for waste streams will be provided to encourage the recycling of materials.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• Waste materials will be removed off-site by a licenced contractor to a facility authorised to take such waste. o There is to be no disposal or re-use of building waste on to other land. o Waste is not to be burnt on site. o Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed. • Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.		
54	Wastewater disposal	• All liquid waste will be disposed off-site by tanker using a licenced contractor and disposed of a facility authorised to take such waste.	Contractor	During construction
55	Noxious weeds disposal	• All noxious weeds cleared will be disposed of in accordance with the requirements of Council as stipulated in Section 6.3.5 of this REF.	Contractor	During construction
56	Material use	• Where practicable, procurement will buy materials manufactured with recycled content.	Roads and Maritime	Pre-construction
57	Removal of house and structures	• Lead paint materials will be managed in accordance with the *Australian Standard AS4361.1 'Guide to Lead Paint Management – Part 1 Industrial Applications 1995'*. • Asbestos surveys will be conducted for structures to be removed as part of the Proposal. An asbestos certified disposal service will be engaged for properties identified as having asbestos materials. • The contractor carrying out the removal of asbestos will be required to hold a current ASA asbestos licence from WorkCover, NSW. The contractor will also make an application to WorkCover for the removal in accordance with their requirements.	Roads and Maritime	Pre-construction and during removal
58	Vulnerability to effects of climate change	• The effect of climate change will be factored into future designs, including the effects of flooding. • Further opportunities will be considered for reducing greenhouse emissions during building and operation of the Proposal.	Roads and Maritime	Detailed design
59	Greenhouse gas emissions	• Alternative fuels and power sources for equipment will be considered, such as biodiesel generators.	Contractor	During construction

7.3 Licensing and approvals

As discussed in Section 4, various approvals and permits are likely to be required for the Proposal, as summarised in Table 7.2.

Table 7.2 Summary of licensing and approvals required

Requirement	Timing
A late draft copy of the REF is required to be issued to DPI for review and consideration.	Following review of a late Draft of the REF and a minimum of 28 days before the commencement of dredging or reclamation works. Outcomes of this consultation must be addressed in the CEMP and relevant EWMS.
A commence works notification form as per the notification requirements under section 199 of the FM Act is required.	A minimum of three days before the commencement of works.
Council are to be notified of any road closures if required.	A Traffic Management Plan and notification is to be issued to Council about the closure.
Approval is to be sought in the event that property access is to be obstructed to properties on Grafton Street.	Consultation before building and then notification at least five days before the obstruction.
A notification is to be issued with regard to any works that would impact the Lawrence Memorial Park or the Lawrence Conservation area.	Consultation with the Council Heritage Officer before building work.
According to Maritime requirements, Marine Notices are to be placed in the local Press and on the NSW Maritime website.	During works and updated throughout the different building phases.
An 'authority to occupy crown land' is required in the form of a lease or licence from the Crown Lands Division for Lot 7014 DP 1126811 and the Sportsmans Creek waterway.	Before the commencement of works.

8 Conclusion

8.1 Justification

This REF has been prepared to assess the Proposal to construct a new bridge over Sportsmans Creek. The new bridge is required to replace the existing bridge, which is identified in the 'Bridges for the Bush' program to be removed as it cannot be safely upgraded and requires ongoing costly maintenance and repairs.

Furthermore, the route through Lawrence is important for cane haulage, which supports the economy of the region. The Sportsmans Creek new bridge would support the removal of the existing bridge, which is costly to maintain.

8.2 Objects of the EP&A Act

Table 8.1 Application of the objects of the EP&A Act to the proposal

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The strategic need for the Proposal, to facilitate the movement of agricultural product through the region, as well as, reduce the maintenance requirements of the existing bridge, both encourages the proper management, development and conservation of natural and artificial resources. Once the Proposal is complete, it would provide the community an improved area for recreation and remove the need for large trucks to move through the Heritage Conservation Area along Bridge Street.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The Proposal would promote the appropriate economic use and development of land through providing an improved route over Sportsmans Creek to facilitate agricultural and residential uses in the region.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The Proposal would require the relocation of two power lines and would ensure that these assets are protected and remain operational following the building of the bridge.
5(a)(iv) To encourage the provision of land for public purposes.	Although the Proposal would temporarily result in a reduction of beneficial of land for public purposes in Flo Clark Park, once operational, the bridge would provide improved access to public land and increase the area of public land available.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	Not relevant to the Proposal.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	A biodiversity assessment has been carried out for the Proposal and is provided in Appendix E. The design of the new bridge would consider the requirement for habitat for Large-footed Myotis (*Myotis Macropus)* which would be relocated from the old bridge once removed. The protection and conservation of the environment would be assured through the implementation of the safeguards presented in this REF in a CEMP to be prepared for building work.

Object	Comment
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the Proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of Government in the State.	Not relevant to the Proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	As discussed in Section 5.2, the community have been engaged throughout the options development phase of the Proposal and would be consulted through to operation.

8.2.1 The precautionary principle

To satisfy the principles of ESD, emphasis must be placed on anticipation and prevention of environmental damage, rather than reacting to it. The precautionary principle dictates that lack of scientific certainty should not be used as a reason for postponing measures to avoid environmental degradation, where there is a risk of 'serious or irreversible damage'.

The Proposal would lie largely within disturbed land and would only require a minor amount of clearing of vegetation and disturbance to open space. Works within the waterway could have the potential for serious or irreversible damage to the natural environment and although field investigations have been carried out, there remains still the potential to discover unidentified species or items of heritage significance. Nevertheless, the safeguards and management measures proposed in this REF would minimise the impacts of the Proposal. The Proposal is therefore considered to be consistent with the precautionary principle.

8.2.2 Inter and Intra-generational equity

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. The principle includes both intra-generational equity (within generations) and intergenerational equity (between generations).

The environmental impacts identified for the building phase of the Proposal, such as noise, disruptions to traffic and access, and loss of vegetation, would disadvantage current generations to a degree over a relatively short time frame.

However, the benefits of the road upgrade, as outlined in Section 6.15 of this REF, would be available not only to current generations, but future generations also. Moreover, there are no significant or important local natural resources that would be permanently removed, such that their loss would disadvantage future generations. The Proposal is therefore consistent with the principle of inter–- and intra–-generational equity.

8.2.3 Conservation of biological diversity and ecological integrity

Biological diversity (biodiversity) is defined as the variety of life forms, and is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. Ecosystem diversity describes the condition of an ecosystem that is relatively unaltered from its natural state.

The Proposal has avoided, where possible, disturbance to the local environment.

Where this has been possible, safeguards and mitigation measures have been provided in this REF to ensure that the Proposal would not compromise the biological diversity of the local environment or the ecological integrity of the surrounding area. As discussed in Section 6.3, the Proposal would have only minor effects on flora and fauna; clearing of vegetation required for building would be in a small area that it cannot be concluded that biological diversity, whether at a local or regional scale would be affected to any measureable or ecological extent.

Confidence in this conclusion is increased by the use of rigorous concept design process, the application of the precautionary principle, and the mitigation of impacts. The Proposal is therefore consistent with the principle of conservation of biological diversity and ecological integrity.

8.2.4 Improved valuation, pricing and incentive mechanisms

Improved valuation and pricing of environment resources is a component of the concept of inter-generational equity. The need to determine proper values for services provided by the natural environment, including waste assimilation, aesthetic and cultural values, and provision of materials, water, air and energy is central to ESD. Traditionally, pricing of resources has not reflected their true scarcity, replacement costs in the long-term nor future costs of irreversible and cumulative damage to natural systems.

Building of the Proposal would result in short term increases in resource use and in emissions of air pollutants and operation of construction plant and machinery. It would also require removal of a small area of vegetation, with an associated short term decrease in the local aesthetic value and visual quality. The economic and environmental value of these resources is difficult to quantify.

Although the cost of electricity, fuel, other utilities, raw materials and waste removal and management can be estimated for the building phase, these prices would not fully reflect the true environmental cost of their extraction, processing and ultimately, disposal of their waste bi-products. Whilst no detailed valuation or pricing of these environmental resources has been carried out, the resources to be expended or utilised during building of the Proposal would be minor within the context of the local economy, and negligible within the context of the regional or State economies. Moreover, the long term social and environmental benefits that would result from the Proposal would outweigh the relatively minor short-term negative impacts. Safeguards are provided in this REF to ensure that the Proposal would not compromise biological diversity, ecological integrity or result in a reduction of the value of the local environmental resources.

8.3 Conclusion

The proposed Sportsmans Creek new bridge at Lawrence is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

A number of potential environmental impacts from the Proposal have been avoided or reduced during the concept design development and options assessment. The Proposal as described in the REF best meets the Proposal objectives but would still

result in some impacts to:

- Soils through ground and waterway disturbance
- Local amenity due to noise and vibration and air quality disturbance during building and long-term disturbance from night-time noise
- Traffic and access to private property and in Lawrence village and waterway access to Sportsmans Creek during building
- Vegetation disturbance through clearing for site establishment vegetation
- Temporary reduction in open space at Flo Clark Park.

Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The Proposal would also provide opportunity for improvements to recreational accessibility in Flo Clark Park through eventual connectivity with Sportsmans Park, negate ongoing maintenance costs, improve pedestrian access across Sportsmans Creek via the new bridge and deliver a bridge which can sustain heavy vehicles into the future. On balance the Proposal is considered justified.

The environmental impacts of the Proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the Proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The Proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The Proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

9 Certification

This review of environmental factors provides a true and fair review of the Proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the Proposal.

Lara Mottee
Senior Environmental Scientist
Kellogg, Brown & Root Pty Ltd (KBR)
Date: 16 Feb 2015

I have examined this review of environmental factors and the certification by Lara Mottee from Kellogg Brown & Root Pty Ltd and accept the review of environmental factors on behalf of Roads and Maritime Services.

17 Feb 2015

David Andrews
Project Development Manager
Infrastructure Development Division (Northern Region)
Date:

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Terms and acronyms used in this REF

AADT	Annual Average Daily Traffic (AADT)
ABS	Australian Bureau of Statistics
AEP	Annual Exceedence Probability. The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year. It is utilised to measure the rarity of a rainfall event.
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALS	Airborne Laser Survey
AADT	Annual Average Daily Traffic
ARI	Average Recurrence Interval. The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration. It is implicit in this definition that the periods between exceedances are generally random. The term utilised to measure the rarity of a rainfall event prior to the use of the current term AEP.
ASS	Acid Sulphate Soils
ASRIS	Australian Soil Resource Information System
ASSMAC	Acid Sulfate Soils Management Advisory Committee
ATSIHP Act	Aboriginal and Torres Strait Islander Heritage Protection Act 1984
BOM	Bureau of Meteorology
CEMP	Construction environmental management plan
CLD	Crown Lands Division
CLM Act	Contaminated Land Management Act 1997
CL Act	Crown Lands Act 1989
CNVMP	Construction Noise and Vibration Management Plan
CPT	Cone Penetration Testing. A type of geotechnical investigation technique.
CP Act	Coastal Protection Act 1979 (NSW)
Council	Clarence Valley Council
Clarence Valley LEP 2011	Clarence Valley Council Local Environmental Plan 2011
CZMP	Coastal Zone Management Plan
DEC	Department of Environment and Conservation
DECCW	Department of Environment, Climate Change and Water
DEM	Digital Elevation Model
Db	Decibel
DIWA	Directory of Important Wetlands
DPE	Department of Planning and Environment
DP	Deposited Plan
DPI (Fisheries)	Department of Primary Industries - Fisheries
EEC	Endangered Ecological Community
EIA	Environmental impact assessment
ENMM	Environmental Noise Management Manual
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW). Provides the legislative framework for land use planning and development assessment in NSW

EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
ESL	Ecological Screening Level
EWMS	Environmental Work Method Statement
FM Act	Fisheries Management Act 1994 (NSW)
GDP	Gross Domestic Product
GIS	Geographic Information System
Heritage Act	Heritage Act 1977 (NSW)
HCM	Highway Capacity Manual
HML	Higher Mass Limit
ICNG	Interim Construction Noise Guideline
IPCC	Intergovernmental Panel on Climate Change
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
Kg	kilogram
kg/m	Kilograms per metre
Km	Kilometre
Km/hr	Kilometres per hour
kN	Kilo-newton
kV	kilovolts
LA1(60 second)	The typical 'maximum noise level for an event', used in the assessment of potential sleep disturbance during night-time periods. Alternatively, assessment may be conducted using the LAmax or maximum noise level
LALC	Local Aboriginal Land Council
LAeq	Equivalent continuous level. A term utilised to define the period of measurement of continuous noise or energy average noise level.
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
MCA	Multi-Criteria Analysis
mg/kg	Milligrams per kilogram
Mm	millimetre
M	metre
$m/s^{1.75}$	Unit of measurement for a Vibration Dose Value
NCA	Noise Catchment Area
NEPC	National Environment Protection Council
NES	Matters of national environmental significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
NM	Noise Monitoring location
NML	Noise Management Level
NT Act	Native Title Act 1993
NW Act	Noxious Weeds Act 1993 (NSW)
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
OEH	Office of Environment and Heritage

PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	The term 'Potential Archaeological Deposit (PAD)' is used to describe areas that are likely to contain sub-surface cultural deposits
PASS	Potential Acid Sulphate Soils
PEMP	Project Environmental Management Plan
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services
RBL	Rated Background Level
REF	Review of Environmental Factors
RNE	Register of National Estate
RNP	Road Noise Policy
Roads and Maritime	Roads and Maritime Service
RTA	Roads and Traffic Authority
SDS	Safety Data Sheet
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP 14	State Environmental Planning Policy No.14 – Coastal Wetlands
SEPP 71	State Environmental Planning Policy No.71 – Coastal Protection
SES	State Emergency Services
SIS	Species Impact Statement
SoHI	Statement of Heritage Impact
SPT	Standard Penetration Testing
SU	Survey Units
SWMP	Soil and Water Management Plan
TEC	Threatened Ecological Community
TMP	Traffic Management Plan
TPZ	Tree Protection Zone
TSC Act	Threatened Species Conservation Act 1995 (NSW)
UCL	Urban Centre and Locality
VDV	Vibration Dose Values
WHS	Work Health Safety
WM Act	Water Management Act 2000 (NSW)
WoNS	Weed of National Significance