Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

Coffs Harbour Bypass

Environmental Impact Statement

September 2019

VOLUME 1A

Project introduction and development

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Certification

Submission of environmental impact statement
Prepared under Part 5.1 of the *Environmental Planning and Assessment Act 1979*.

Environmental impact statement prepared by:

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Responsible person:

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Address:	20-44 Ennis Road,
	Milsons Point NSW 2061

Proposed development:

Coffs Harbour Bypass

Address of the land on which the infrastructure to which the statement relates:

Land between Boambee in the south through to Korora in the north, within the Coffs Harbour City Council local government area, as described within the environmental impact statement.

Description of the infrastructure to which the statement relates:

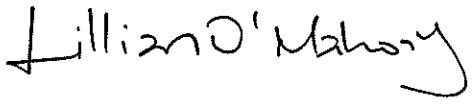
Construction and operation of the Coffs Harbour Bypass, which would comprise a 12 km bypass of Coffs Harbour from south of Englands Road intersection to Korora Hill in the north and a two-kilometre upgrade of the existing Pacific Highway between Korora Hill and Sapphire. The project would provide a four-lane divided highway that bypasses Coffs Harbour, passing through the North Boambee Valley, Roberts Hill and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

Environmental impact statement:

An environmental impact statement is attached addressing all matters in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979*.

Declaration: I certify that I have prepared the contents of this environmental impact statement in response to the Secretary's environmental assessment requirements dated 30 October 2017 and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. To the best of my knowledge the information contained in the environmental impact statement is not false or misleading.

Signature:



Name: Lillian O'Mahony

Date: 31 July 2019

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Glossary of terms and abbreviations

Term	Meaning
AADT	Average annual daily traffic. The total volume of traffic passing a roadside observation point over a period of a year, divided by the number of days per year. It is calculated from mechanically obtained axle counts.
Abutments	An end support of a bridge.
Access road	A road providing access to a property or another road.
AEP	Annual exceedance probability The probability of a rainfall or flood event exceeding a nominated level in a year. A 1% AEP is the probability of an event exceeding a nominated level in 100 years.
Afflux	An increase in water level resulting from a constriction in the flow path.
AHD	Australian Height Datum. The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level. Mean sea level is set at zero elevation.
Alignment	The geometric layout (of a road) in plan (horizontal) and elevation (vertical).
Ancillary work	Works that assist in the conduct of larger construction works such as the installation of scaffolding and compacting of soil.
Aquifer	Geologic formation, group or formations, or part of a formation capable of transmitting and yielding quantities of water.
ARI	Average recurrence interval. Used to describe the frequency or probability of floods occurring. (e.g. a 100-year ARI flood is a flood that occurs or is exceeded on average once every 100 years).
ARTC	Australian Rail Track Corporation.
Arterial road	The main or trunk roads of the State road network that mostly carry traffic between regions.
AS	Australian Standard.
AS/NZ	Australian/New Zealand Standard.
At grade	A road at ground level, not on an embankment or in a cutting.
BC Act	*Biodiversity Conservation Act 2016* (NSW).
Bioregion	A region defined by the characteristics of the natural environment rather than the man-made environment.
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes.
Catch drains	An open channel constructed along the high side of a road cutting or embankment outside the batter to intercept and redirect surface water.

Term	Meaning
CBD	Central business district.
CEMP	Construction Environmental Management Plan. A site-specific plan developed for the construction phase of a project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that environmental risks are properly managed.
CHCC	Coffs Harbour City Council.
Clearway	A section of a road where stopping and parking is not allowed during defined times.
CLM Act	*Contaminated Land Management Act 1997.*
Compound site	Facilities used to support the operation of a construction site including site offices, workshops, delivery areas, storage areas, crib sheds, staff vehicle parking, materials, plant and equipment.
Concept design	Initial functional layout design for a road or road system, to establish feasibility, to provide a basis for estimating, and to determine further investigations needed for detailed design.
Construction footprint	Defines the likely extent of the area required for construction of the project. This includes the area required for temporary work such as sedimentation basins, drainage channels, access roads, construction compounds and ancillary sites.
Corridor	The area investigated for environmental impact statement.
CSIRO	Commonwealth Scientific and Industrial Research Organisation.
CSSI	Critical State Significance Infrastructure; refers to a State significant infrastructure project which is essential for the State for economic, environmental or social reasons.
Culvert	One or more adjacent enclosed channels for conveying a stream below formation level.
Cut / cutting	Formation resulting from the construction of the road below existing ground level – the material is cut out or excavated.
dB	Decibel. An absolute indicator of sound power per unit in acoustics.
DEC	Department of Environment and Conservation (NSW) (former).
DECC	Department of Environment and Climate Change (NSW) (former).
DECCW	Department of Environment, Climate Change and Water (NSW) (former).
Design standards	Defined standards which are at a minimum, able to be enforced by regulatory bodies and are imposed by agencies.

Term	Meaning
Detailed design	The detailed design details the final project. It includes designs, plans and construction drawings for all elements, including: • Road alignment and geometry • Retaining wall, pavements and traffic signals • Urban design, landscaping and street lighting • Construction staging and traffic management • Drainage and utilities.
DIWA	Directory of Important Wetlands of Australia.
DoEE	Department of Environment and Energy (Australian Government).
DPC	Department of Premier and Cabinet (NSW).
DP&E	Department of Planning and Environment (former), now DPIE.
DPI	Department of Primary Industries – Agriculture (former) Department of Primary Industries – Fisheries (former) Now DPIE (Regions, Industry, Agriculture & Resources).
DPIE	Department of Planning, Industry and Environment.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
EIS	Environmental impact statement. An environmental impact assessment document prepared in accordance with the requirements of Part 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW), and written generally to comply with the requirements issued by the Secretary of the DPIE.
Embankment	An earthen structure where the road (or other infrastructure) subgrade level is above the natural surface.
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EP&A Regulation	Environmental Planning and Assessment Regulations 2000.
EPA	Environment Protection Authority
EPBC Act	*Environmental 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.
FBA	Framework for Biodiversity Assessment. The Framework for Biodiversity Assessment prepared by the NSW Office of Heritage and Environment underpins the Biodiversity Offsets Policy for Major Projects. It contains the assessment methodology that is adopted by the policy to quantify and describe the impact assessment requirements and offset guidance that apply to Major Projects.
Fill	The material placed in an embankment.

Term	Meaning
FM Act	*Fisheries Management Act 1994.*
FRNSW	Fire and Rescue NSW.
GDE	Groundwater Dependent Ecosystem. Ecosystems which have their species composition and natural ecological processes wholly or partially determined by groundwater.
Gross pollutant traps	Filters that catch stormwater pollutants (litter and silt) before they enter the waterway.
Heavy vehicles	A heavy vehicle is classed as a Class 3 vehicle (a two-axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
Interchange	A grade-separated junction between roads where a road passes over or under the highway via a bridge or underpass structure with one or more interconnecting roads.
ISCA	Infrastructure Sustainability Council of Australia.
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local government area.
Local road	A road or street used primarily for access to abutting properties.
LOS	Level of service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
Lot	A parcel of land defined by measurement as a lot in a deposited plan (DP) or as a Crown portion or allotment.
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction.
Microclimate	The climate of a small-scale area, such as valley or part of a city. The weather variables in a microclimate, such as temperature, rainfall, wind or humidity, may be subtly different from the conditions prevailing over the area as a whole.
Mined tunnel	A tunnel which is excavated without removing the overlaying rock or soil and open to the surface at one or both ends during construction (apart from shaft connections).
MNES	Matters of National Environmental Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
NCAs	Noise catchment areas. An area where receivers are likely to have similar noise exposure to traffic noise.
OEH	Office of Environment and Heritage (NSW) (former). Functions have been split between DPIE (Environment, Energy and Science) and DPC (Heritage).
PMF	Probable maximum flood. Largest flood that could theoretically occur at a particular location and defines the extent of flood prone land (the floodplain).
POEO Act	*Protection of the Environmental Operations Act 1997* (NSW).

Term	Meaning
Receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receptor is a home, work place, school or other place where people spend some time. An elevated receptor is a point above ground level.
RFS	NSW Rural Fire Service.
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.
Roads and Maritime	Roads and Maritime Services.
RTA	Roads and Traffic Authority.
Scour	The erosion of material by the action of flowing water.
SEARs	Secretary's Environmental Assessment Requirements. Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of Planning under section 5.16 of the *Environmental Planning & Assessment Act 1979*.
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SES	NSW State Emergency Service.
Sight distance	The distance measured along the carriageway over which objects of defined height are visible to a driver whose eyes are at a specified height above the pavement surface level.
Spoil	Surplus excavated material.
SSI	State significant infrastructure; refers to major infrastructure, in particular linear infrastructure such as roads, railway lines or pipes which often cross a number of council boundaries, or where development may have a significant environmental impact (in the meaning of the EP&A Act).
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil/waste.
Swale	A shallow, grass-lined drainage channel.
Table drain	The drain adjacent to the shoulders of a road, having an invert lower that the subgrade level and formed as part of the formation.
TfNSW	Transport for New South Wales.
TSC Act	*Threatened Species Conservation Act 1995* (NSW).
WARR Act	*Waste Avoidance and Resource Recovery Act 2001.*
Wetland	A swamp or marsh in which the soil is frequently or permanently saturated with water, or under water.
WM Act	*Water Management Act 2000.*
Zoning	Zoning regulates land use within an environmental planning instrument (usually by different colour codes on a map accompanying a local environmental plan). Land use tables set out the various purposes for which land may or may not be used or developed in each zone.

Executive Summary

Executive Summary

Roads and Maritime Services is seeking approval for the Coffs Harbour Bypass (the project). The approval is being sought under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as Critical State Significant Infrastructure (CSSI). The project is also a controlled action under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and would need separate approval from the Australian Minister for the Environment.

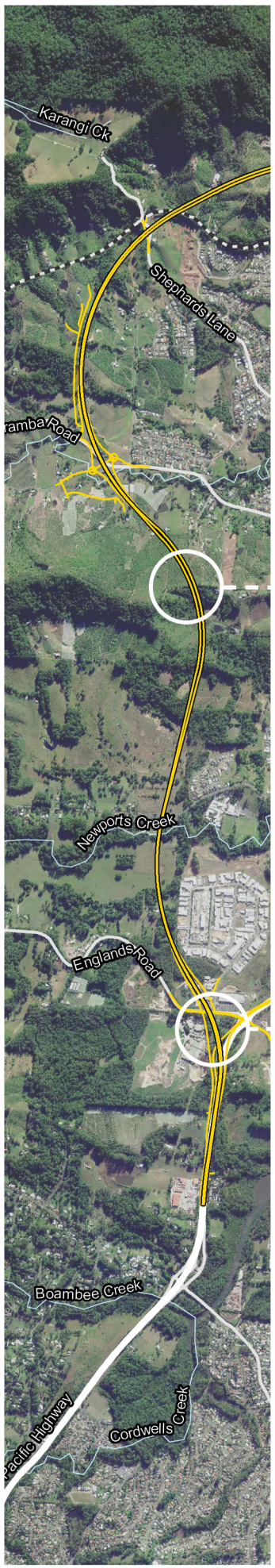
This environmental impact statement (EIS) has been prepared to describe the project and provide an assessment of all potential environmental impacts that could occur as a result of its construction and operation and identifies measures that would be implemented to avoid and minimise those impacts.

What is proposed?

The project includes a 12 kilometre bypass of Coffs Harbour from south of Englands Road to Korora Hill in the north and a two-kilometre upgrade of the existing highway between Korora Hill and Sapphire. The project would provide a four-lane divided highway with a posted speed limit of 110 km/h that bypasses Coffs Harbour, passing through the North Boambee Valley, Roberts Hill and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

The key features of the project are shown in **Figure 1-01** to **Figure 1-03** and include:

- Four-lane divided highway from south of Englands Road roundabout to the dual carriageway highway at Sapphire
- Bypass of the Coffs Harbour urban area from south of Englands Road intersection to Korora Hill
- Upgrade of the existing Pacific Highway between Korora Hill and the dual carriageway highway at Sapphire
- Grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- A one-way local access road along the western side of the project between the southern tie-in and Englands Road connecting properties to the road network via Englands Road
- A new service road, located east of the project, connecting Solitary Islands Way with James Small Drive and the existing Pacific Highway near Bruxner Park Road
- Three tunnels through ridges at Roberts Hill (around 190 metres long), Shephards Lane (around 360 metres long), and Gatelys Road (around 450 metres long)
- Structures to pass over local roads and creeks as well as a bridge over the North Coast Railway
- A series of cuttings and embankments along the alignment
- Tie-ins and modifications to the local road network to enable local road connections across and around the alignment
- Pedestrian and cycling facilities, including a shared path along the service road tying into the existing shared path on Solitary Islands Way, and a new pedestrian bridge to replace the existing Luke Bowen footbridge with the name being retained
- Relocation of the Kororo Public School bus interchange
- Noise attenuation, including noise barriers, low noise pavement and at-property treatments as required
- Fauna crossing structures including glider poles, underpasses and fencing
- Ancillary work to facilitate construction and operation of the project, including:
  - Adjustment, relocation and/or protection of utilities and services
  - New or adjusted property accesses as required
  - Operational water quality measures and retention basins
  - Temporary construction facilities and work including compound and stockpile sites, concrete/asphalt batching plant, sedimentation basins and access roads (if required).



ARTIST IMPRESSION OF ROBERTS HILL SOUTHERN TUNNEL PORTAL FACING NORTH

ARTIST IMPRESSION OF ENGLANDS ROAD INTERCHANGE FACING NORTH

Coffs Harbour Bypass
Key features of the project
Figure 1-01

Legend
- Alignment
- North Coast Railway
- Watercourse

0 0.4 0.8 1.2 km

Scale @A4: 1:40,000
GDA 1994 MGA Zone 56

Pine Brush Ck

Korora

Bucca Bucca Ck

Shephards Lane

Coramba Road

Newports Creek

Englands Road

Pacific Highway

ARTIST IMPRESSION OF SHEPHARDS LANE SOUTHERN TUNNEL PORTAL FACING NORTH

ARTIST IMPRESSION OF CORAMBA ROAD INTERCHANGE FACING NORTH WEST

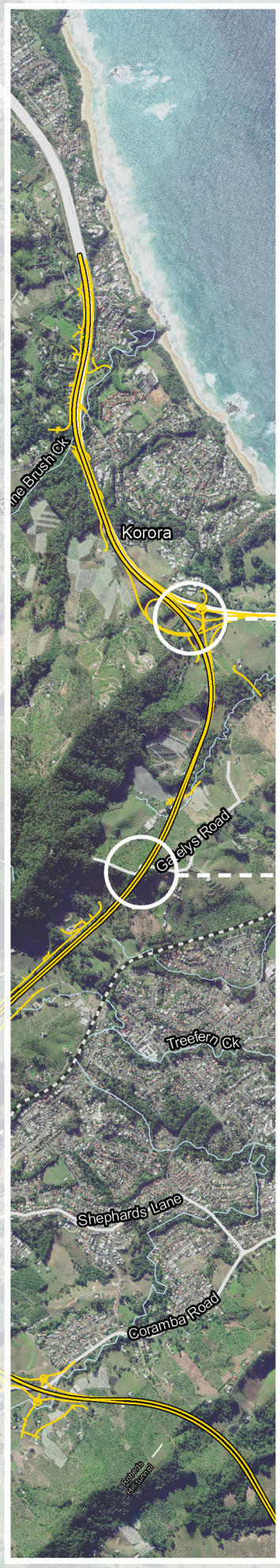
Coffs Harbour Bypass
Key features of the project
Figure 1-02

Legend

- Alignment
- North Coast Railway
- Watercourse

0 0.4 0.8 1.2 km

Scale @A4: 1:40,000
GDA 1994 MGA Zone 56



ARTIST IMPRESSION OF KORORA HILL INTERCHANGE FACING NORTH

ARTIST IMPRESSION OF GATELYS ROAD SOUTHERN TUNNEL PORTAL FACING NORTH

Coffs Harbour Bypass
Key features of the project
Figure 1-03

Legend

- Alignment
- North Coast Railway
- Watercourse

0 0.4 0.8 1.2 km

Scale @A4: 1:40,000
GDA 1994 MGA Zone 56

What are the project objectives?

The project supports the objectives and broader rationale of Pacific Highway upgrade program, which seeks to enhance the capacity and quality of the Pacific Highway by improving safety, travel times and reliability.

The Pacific Highway upgrade program is one of the largest road infrastructure projects in NSW. It connects Sydney and Brisbane and is a major contributor to Australia's economic activity. Since 1996, the Australian and NSW governments have been jointly upgrading the Pacific Highway to provide a four-lane divided road from Hexham to Queensland. The upgrade is planned to be completed in 2020. The objectives of the program are to:

- Significantly reduce road crashes and injuries
- Reduce travel times
- Reduce freight transport costs
- Develop a route involving the community and considering their interests
- Supporting the economic development in the region
- Manage the upgrading of the route in accordance with the principles of ecologically sustainable development (ESD)
- Provide the best value for money.

Subject to project approval and funding availability, construction of the project is proposed to start in 2020 and would take about four to five years to complete, weather permitting.

Specific objectives relating to the project are to provide:

- Travel time savings for through and local traffic, and business vehicles/freight
- A road that supports and integrates with the broader transport network
- Sufficient road capacity to meet traffic demand on the Pacific Highway
- Safer road conditions for all road users on the new and existing road.

Why is it needed?

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals.

The existing highway through Coffs Harbour forms part of the Sydney - Brisbane freight corridor and carries between 30,000 and 35,000 vehicles per day. Road users, including through and local traffic, pedestrians, cyclists and heavy vehicles, need to navigate 12 kilometres of low speed arterial road with 12 sets of traffic signals, a major roundabout and 26 other intersections. Additionally, conflict between pedestrian, passenger and freight traffic through the Coffs Harbour urban centre has resulted in a high crash rate and will continue to be a substantial safety issue as traffic volumes continue to increase with population growth.

This means the existing highway through Coffs Harbour experiences:

- A motorist, cyclist and pedestrian casualty rate more than three times higher than that expected of a road of this class
- Increased travel time and inefficient on-road freight operation
- Loss of economic development opportunities
- A decrease in the amenity of Coffs Harbour central business district (CBD).

Over the next 20 years, almost 77 per cent of population growth on the North Coast of NSW will be in regional cities, including Coffs Harbour (DP&E 2017a). The area is already experiencing high levels of congestion, and traffic volumes are expected to increase over time in line with population growth.

How would the project satisfy this need?

By providing a bypass of Coffs Harbour, the project would address declining transport efficiency, urban congestion and road safety issues caused by the interaction of local traffic and through traffic including freight. The project would provide an improvement to the operation of the road network by:

- Creating a decrease in traffic volumes on the existing Pacific Highway through the Coffs Harbour CBD and decrease daily traffic volumes on all local roads except for Coramba Road between the project and Shephards Lane, which would experience a minor increase. Some reduction in traffic counts for based on a 2024 opening year include:
  - Pacific Highway, south of Albany Street (reduction of 12,600 vehicles per day)
  - Hogbin Drive, north of Harbour Drive (reduction of 5200 vehicles per day)
  - Pacific Highway, north of Orlando Street (reduction of 10,000 vehicles per day)
  - Pacific Highway, south of Bruxner Park Road (reduction of 9200 vehicles per day).
- Reducing overall travel times, with travel time savings up to 20 minutes for those travelling southbound along the Pacific Highway by 2044, and up to 15 minutes for those travelling northbound
- An increase in network-wide average travel speeds by 7 km/h by 2044 for all vehicles, likely due to the posted 110 km/h speed limit and the reduction of traffic congestion along routes through Coffs Harbour
- A larger overall increase in average travel speed for heavy vehicles, increasing by 18 km/h to 26 km/h by 2044
- Road safety improvements due to:
  - Provision of a service road which would remove four unsignalised intersections with the Pacific Highway at James Small Drive, Korora School Road, Opal Boulevard and Seaview Close
  - Provision of grade-separated interchanges, reducing points of conflict between road users
  - Reduction in traffic along the existing Pacific Highway through the Coffs Harbour CBD, including a significant proportion of heavy vehicles
  - Relocation of the existing school bus interchange at Kororo Public School from the Pacific Highway to James Small Drive
  - Provision of a local access road at the southern end of the project which removes direct access to the Pacific Highway from private properties and other access points, therefore reducing points of conflict between road users
  - Upgrade of the Pacific Highway/Stadium Drive/Englands Road roundabout which would reduce the number of rollover incidents at this location.

Why is it a Division 5.2 project?

The project is declared to be CSSI under the EP&A Act, as it is considered essential for the State for economic, environmental or social reasons.

An application under Section 5.15 of the EP&A Act to carry out the project was submitted to the Department of Planning, Industry and Environment (DPIE) in May 2016. The report accompanying the application aimed to assist in the development of the Secretary's Environmental Assessment Requirements (SEARs). In June 2016, the Secretary of the DPIE issued the SEARs to Roads and Maritime.

The project was referred to the Australian Government Department of the Environment and Energy in August 2017 and was determined to be a controlled action due to the potential for the project to impact matters of national environmental significance under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The NSW Government confirmed the action will be assessed under the Assessment Bilateral Agreement (2015) between the Australian and NSW governments. This agreement accredits the assessment process under Division 5.2 of the EP&A Act. The SEARs issued for the project were revised in October 2017 to reflect this decision and to include additional environmental assessment requirements under the EPBC Act. This EIS has been prepared to address the specific matters raised in the revised SEARs.

What alternatives were considered?

The project has a detailed history of investigating and considering alternatives to achieve the objectives of the Coffs Harbour Highway Planning Strategy (CHHPS) and Pacific Highway upgrade program. There were several phases of investigation due to the variable and separate focus on the southern (Coffs Harbour) and northern (Sapphire to Woolgoolga) sections of the CHHPS as well as examination of additional corridor options proposed by Coffs Harbour City Council (CHCC) and community interests.

The corridor options investigated for the CHHPS fell within three broad strategic corridors:

- Far Western Bypass: A bypass of Coffs Harbour and Woolgoolga through the Orara Valley from Englands Road south of Coffs Harbour to Halfway Creek or Grafton
- CHCC Preferred Corridor: Options within a corridor that included the Coastal Ridge Way which was adopted by CHCC in late 2003 as its preferred option for a bypass of Coffs Harbour and Woolgoolga
- Coastal Corridor: Options along the coastal plain between Englands Road south of Coffs Harbour and Arrawarra Creek north of Woolgoolga, with an extension to Halfway Creek which included the Inner Corridor and upgrade of the existing Pacific Highway.

The assessment of the three broad strategic corridor options throughout 2001 to 2004 found the Coastal Corridor was the most feasible corridor option because of its good functional performance, manageable environmental impacts and value for money.

Route options within the Inner Corridor around the main Coffs Harbour urban area from Englands Road to Korora were identified and evaluated against the option of upgrading the existing Pacific Highway to urban motorway standards. The options were displayed in February 2004 and it was determined that the upgrade of the existing highway was not acceptable because of its potential social and economic impacts on Coffs Harbour.

The preferred option for the CHHPS was announced in November 2004 following community input, detailed investigations and discussions with a range of government agencies. The preferred option comprised route options from the Coastal Corridor and included Inner Corridor options for Coffs Harbour, upgrading of the existing highway from Korora to South Woolgoolga and a bypass of Woolgoolga.

The Inner Corridor options for the project consisted of a combination of route options Inner South 1 (IS1) and Inner North 2 (IN2). In combination, these options were found to provide better value for money, present lower engineering risks and minimise impact on existing and proposed development in the West Coffs Harbour area, resulting in less severance of existing and future communities. It was also found that IS1 and IN2 would provide for better use of the natural ridgelines and had the potential to be refined to reduce the potential noise, visual and other environmental impacts.

Following the announcement of the preferred option in November 2004, Roads and Maritime carried out further field investigations to allow development of a preliminary concept design for the project. Information collected from the investigations was used to further reduce potential impacts of the preferred option and better define the boundaries of the road corridor. In September 2008, the preliminary concept design was

displayed for community comment. In response to community submissions received during the display, the design was further refined. The road corridor based on the preliminary concept design was subsequently incorporated into the Coffs Harbour Local Environmental Plan (LEP) in 2013 to provide planning certainty for CHCC and the local community.

In 2016, Roads and Maritime recommenced design development and investigations. Key activities that have influenced refinement of the 2008 preliminary concept design since 2016 include:

- Display of the 2008 preliminary concept design in mid-late 2016 which re-introduced the project to the community after a period of inactivity and sought feedback on the design to identify current issues and opportunities
- Start of environmental studies and investigations to address the SEARs and identify opportunities to further avoid and minimise potential environmental impacts.
- Strategic review of the design and investigations to identify opportunities to improve value from both an economic and community perspective, and functionality while meeting functional requirements. This work was carried out against the following criteria:
  - Value for money
  - Ensuring all vehicles could use the bypass
  - Sustainability from an operating and maintenance perspective
  - Ensuring delivery in line with publicly stated timeframes
- Display of the 2018 concept design between September and November 2018 to seek feedback before finalising the EIS.

Following consideration of the community feedback from the display of the 2018 concept design between September and November 2018, the NSW Government announced in January 2019 further design investigations including:

- Use of tunnels
- Lowering the vertical alignment of the main carriageways
- Reducing the height of the bridge over North Coast Railway near Shephards Lane
- Use of low noise pavement and vegetated earth mounds to reduce potential noise impacts.

Design investigations have included a dangerous goods risk assessment, some elements of which are ongoing. Under current standards, vehicles carrying dangerous goods, particularly Classes 1 and 2.1 materials are not permitted to be carried in tunnels and therefore would not be able to travel on the project. Discussions with relevant authorities are ongoing to determine what classes of dangerous goods may be able to be carried on the bypass.

How did the community participate in selecting the preferred project?

Community and stakeholder engagement has been an important part of project planning since the early 2000s. Project planning started in 2001 with the announcement of the CHHPS to upgrade the Pacific Highway between Sapphire and Woolgoolga, while planning for future traffic needs within the Coffs Harbour urban area.

In 2004, after extensive consultation with stakeholder groups and the community, the preferred route was selected. The route was identified as the most suitable corridor to support economic development, ecologically sustainable development principles and value for money.

In 2008, Roads and Maritime produced a preliminary concept design to identify the project corridor. This information was used by CHCC to inform various planning activities for the Coffs Harbour area.

In early 2016, community and stakeholder groups were engaged in consultation on the preliminary concept design through activities such as local media advertisements, a community newsletter, webpage updates, drop-in sessions, pop-up displays, static displays, stakeholder briefings, site visits, community meetings, land owner engagement, agency site visits and business surveys. Further community consultation was carried out for the preferred concept design display between August and October 2016.

Between September and the end of November 2018, while the EIS was being prepared, further consultation was carried out which included community sessions and staffed displays to communicate the development of the design since 2016. This was to provide an update to the community regarding the project.

Issues raised by the community have been investigated and considered as part of the project, with design elements incorporated to address concerns raised and reduce potential environmental impacts where possible.

The January 2019 announcement by the NSW Government also included the establishment of a Community Consultative Committee (CCC) for the project. The purpose of the CCC is to provide a forum for discussion between Roads and Maritime and representatives of the Coffs Harbour community, stakeholder groups and CHCC on issues directly relating to the project.

Roads and Maritime will continue to provide opportunities for the community to participate in the design process. The EIS will be subject to public exhibition during which time submissions can be made.

What are the main beneficial outcomes expected?

The benefits of the project include:

- Complementing the Pacific Highway upgrade program by providing free flowing dual carriageway conditions between Hexham and the Queensland border
- Improving road safety by removing through traffic (light and heavy vehicles) and some local traffic from the existing road network which would reduce conflicts and improve safety for all road users. Total crash rate is estimated to reduce the number of crashes on the existing Pacific Highway by 15 crashes per year in 2044
- Reducing incidents associated with conflict between pedestrian, cyclist, passenger and freight traffic through the CBD with around 60 per cent of heavy vehicles predicted to divert from the existing highway to the project by 2044 (about a total 3000 fewer vehicles daily at the Pacific Highway north of Orlando Street)
- Improving travel time for through and local traffic, reducing travel times by up to 20 minutes for those travelling southbound by 2044
- Improving transport efficiency of the existing Pacific Highway through Coffs Harbour, relieving congestion on the wider Coffs Harbour road network and providing an alternative route for some local trips. This improved transport efficiency and the resulting improvements to accessibility and amenity to the Coffs Harbour CBD would likely result in wider economic benefits for the Coffs Harbour region
- Improving freight efficiency for heavy vehicles by providing a high standard dual carriageway road to complement the National Land Transport Network, Future Transport Strategy 2056 and the recently upgraded Pacific Highway
- Providing additional routes and connections above predicted flood levels resulting in potentially more effective flood evacuation procedures
- Improving safety outcomes through relocation of the existing school bus interchange at Kororo Public School from the Pacific Highway to James Small Drive.

- Improving safety for a number of local roads in the northern section of the project as well as the southern end (south of Englands Road interchange) through the provision of a service road and one-way local access road which would reduce the number of conflict points along the existing Pacific Highway by removing direct access to the Pacific Highway through unsignalised intersections.

What are the main adverse outcomes expected?

A number of potential environmental impacts from the project have been avoided or reduced during the assessment of alternative options, development of the refined strategic design and through further refinement and development of the concept design.

However, projects of the size and complexity of Coffs Harbour Bypass and its setting inherently have impacts on the environment and community during construction and operation. The project will require a range of mitigation measures to manage these impacts. Key adverse impacts would include:

- **Noise and vibration** – With low noise pavement along the full length of the project and extensive noise barriers in place, about 500 sensitive receivers still exceed the Roads and Maritime's Noise Criteria Guideline. These sensitive receivers qualify for consideration of at-property treatment. The final extent of treatment will be confirmed during detailed design. Where reasonable and feasible, at-property treatments will be implemented during the pre-construction phase of the project to assist in reducing noise impacts associated with construction (including out of hours work).
- **Biodiversity** – Construction of the project would result in around 43.37 ha of native vegetation being cleared. Removal of this vegetation would also result in a direct impact on the threatened flora species rusty plum and southern swamp orchid, as well as the loss of fauna habitat features which are known to support locally occurring threatened fauna species. The project would also potentially impact on matters of national environmental significance, including giant barred frog and koala.

  The design has been refined to avoid and reduce potential impacts to biodiversity, including areas of high priority, such as koala habitat corridors at Roberts Hill and Gatelys Road. Fauna connectivity measures have been identified and incorporated into the concept design, including three tunnels, to reduce the significance of impacts associated with habitat fragmentation, and to maintain landscape connectivity to the east and west of the project.

  A Biodiversity Offset Strategy has also been prepared, which identifies the mechanism for delivery of offsets in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014d), which has been endorsed by the Australian Government as part of the EPBC Act assessment bilateral agreement.
- **Landscape and visual amenity** – The character of the landscape and specific viewpoints within the area would experience a moderate to high visual impact due to the removal of existing mature vegetation and introduction of cuttings and embankments. Mitigation measures have been embedded within the design and include elements such as tunnels, revegetation using native species to strengthen and respond to the existing character, using vegetation to screen views on adjacent properties, noise wall design to relate to local landscape, and plans to integrate proposed earthworks to respond to the character of the area. The urban design elements of the project have been based on the natural landscape with the aim of integrating the project with the existing landscape.
- **Aboriginal cultural heritage** – The project traverses through four identified sites of Aboriginal cultural significance (Roberts Hill Pathway, Gumgali Storyline and Pathway, Sealy Point Pathways, and East Boambee Camp) and is also adjacent to the West Korora Living Place site. The project also passes through 24 Aboriginal archaeological sites. Mitigation measures have been identified, including salvage excavation and collection of surface artefacts. The inclusion of tunnels in the design further mitigates potential impacts to the culturally significant sites by maintaining connections along the Roberts Hill Pathway and Sealy Point Pathways.

- **Socio-economic, land use and property** – Construction of the project would result in impacts to around 285 ha of land that is currently used for a range of urban and rural land use. The project will result in direct impact on around 151 properties. Property acquisition will be carried out in accordance with Roads and Maritime policy and the *Land Acquisition (Just Terms Compensation) Act 1991*. There may also be a short-term reduction in passing trade for service stations, food outlets, accommodation providers and tourism operators along the existing Pacific Highway. However, it is expected that impacts would be neutral in the long-term. Coffs Harbour is a major destination regionally and it forms a logical stopping point being located halfway between Sydney and Brisbane. It is likely that many of these businesses would still experience high use as visitors seek out their services, particularly with the improved amenity of the Coffs Harbour CBD.
- **Agriculture** – There are 24 agricultural farms which would be directly impacted to varying degrees through loss of crop land, impacts to structures (eg packaging sheds) and impacts to irrigated water supply. There are currently 111 banana farms in the Coffs Harbour local government area (LGA), of which six would be critically impacted. No blueberry farms would be critically impacted.
- **Flooding and hydrology** – The project incorporates numerous waterway openings and crossing structures (such as bridges and culverts) as well as other flood mitigation design measures to minimise flooding impacts on the surrounding environment. These structures and measures have been designed with the aim of meeting flood impact objectives to the greatest extent practicable. However, the project would still result in residual flood impacts predominantly related to increases in water levels and flood extents downstream. The main areas of impact include Newports Creek floodplain upstream of the project, Coffs Creek downstream of Coramba Road interchange, Pacific Bay Eastern Lands development area and a few residential locations associated with Pine Brush Creek and Sapphire Beach catchments. Flood impacts to the majority of local and access roads would be unchanged and in a number of instances access would be improved with increased flood immunity. A number of mitigation options are proposed to address the residual flood impacts and will be confirmed in consultation with CHCC and other relevant stakeholders prior to construction.

How can I comment on the proposal and/or the environmental impact statement?

DPIE will make the EIS publicly available for a minimum period of 42 days. During this time, it will be available for inspection at the DPIE website: ***https://planningportal.nsw.gov.au/major-projects***, on the Roads and maritime project website ***www.pacifichighway.nsw.gov.au/coffsharbourbypass***, at selected Roads and Maritime offices, and at various staffed displays in Coffs Harbour. Advertisements will be placed in newspapers to advise of the public exhibition, to advise where the EIS can be viewed, and to provide details of community consultation activities and information sessions.

Roads and Maritime will also be holding community information sessions. A project information phone line will also be available throughout the exhibition period to answer questions from the community relating to the project – 1800 550 621 (toll free). Questions can also be sent by email to coffsharbourbypass@rms.nsw.gov.au

To provide feedback on the project, a person may make written submissions to the Secretary of the DPIE during the exhibition period. All submissions received will be placed on the DPIE website. Submissions should be made to ***https://www.planningportal.nsw.gov.au/major-projects***. Written submissions may also be directed to:

Director Transport Assessments
Planning and Services Division
Department of Planning, Industry and Environment
Application number – SSI 7666
GPO Box 39
Sydney NSW 2001

CHAPTER

1

Chapter 1

Introduction

1. Introduction

This chapter introduces the Coffs Harbour Bypass, providing a brief outline of the need for the project, its scope and location. It also outlines the structure of this environmental impact statement (EIS).

1.1 The proposed project

Roads and Maritime Services (Roads and Maritime) is seeking approval for the Coffs Harbour Bypass (the project). The approval is being sought under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as Critical State Significant Infrastructure (CSSI).

The project includes a 12 km bypass of Coffs Harbour from south of Englands Road intersection to Korora Hill in the north and a two-kilometre upgrade of the existing Pacific Highway between Korora Hill and Sapphire. The project would provide a four-lane divided highway with a posted speed limit of 110 km/h that bypasses Coffs Harbour, passing through the North Boambee Valley, Roberts Hill and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

The key features of the project include:

- Four-lane divided highway from south of Englands Road roundabout to the dual carriageway highway at Sapphire
- Bypass of the Coffs Harbour urban area from south of Englands Road intersection to Korora Hill
- Upgrade of the existing Pacific Highway between Korora Hill and the dual carriageway highway at Sapphire
- Grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- A one-way local access road along the western side of the project between the southern tie-in and Englands Road connecting properties to the road network via Englands Road
- A new service road, located east of the project, connecting Solitary Islands Way with James Small Drive and the existing Pacific Highway near Bruxner Park Road
- Three tunnels through ridges at Roberts Hill (around 190 m long), Shephards Lane (around 360 m long), and Gatelys Road (around 450 m long)
- Structures to pass over local roads and creeks as well as a bridge over the North Coast Railway
- A series of cuttings and embankments along the alignment
- Tie-ins and modifications to the local road network to enable local road connections across and around the alignment
- Pedestrian and cycling facilities, including a shared path along the service road tying into the existing shared path on Solitary Islands Way, and a new pedestrian bridge to replace the existing Luke Bowen footbridge with the name being retained
- Relocation of the Kororo Public School bus interchange
- Noise attenuation, including low noise pavement, noise barriers and at-property treatments as required
- Fauna crossing structures including glider poles, underpasses and fencing
- Ancillary work to facilitate construction and operation of the project, including:
  - Adjustment, relocation and/or protection of utilities and services
  - New or adjusted property accesses as required
  - Operational water quality measures and retention basins
  - Temporary construction facilities and work including compound and stockpile sites, concrete/ asphalt batching plant, sedimentation basins and access roads (if required).

The key features of the project are shown in **Figure 1-1.**

A detailed description of the project is provided in **Chapter 5, Project description** with construction methodology and potential staging of work detailed in **Chapter 6, Construction**. This EIS has been prepared based on the project concept design. A further detailed design process will follow. If approved, the project would be carried out generally in accordance with the description in this EIS and any conditions of approval.

The project complements the Pacific Highway upgrade program which, when complete, will provide free-flowing dual carriageway conditions for the Pacific Highway between Hexham and the Queensland border. The benefits of the project would include:

- Improved road safety by removing through traffic (light and heavy vehicles) and some local traffic from the existing road network which would reduce conflicts and improve safety for all road users. Total crashes on the Pacific Highway are expected to reduce by 11 crashes per year in 2024 and 15 crashes per year in 2044
- Improved travel time for through and local traffic, reducing through traffic travel times by up to 20 minutes for those travelling southbound by 2044
- Improved transport efficiency of the existing highway through Coffs Harbour, relieving congestion on the wider Coffs Harbour road network and providing an alternative route for some local trips. This improved transport efficiency and the resulting improvements to accessibility and amenity to the Coffs Harbour CBD would likely result in wider economic benefits for the Coffs Harbour area
- Improved freight efficiency for heavy vehicles by providing a high standard dual carriageway road to complement the National Land Transport Network, Future Transport Strategy 2056 and the recently upgraded Pacific Highway

The need for the project and project objectives are described in more detail in **Chapter 3, Strategic justification and project need**.

The project would be funded by the Australian and NSW governments. Subject to project approval and funding availability, construction of the project is proposed to start in 2020 and would take about four to five years to complete, weather permitting.

Legend

- Construction footprint
- Alignment
- North Coast Railway
- Sensitive receiver
- Watercourse

Coffs Harbour Bypass
Key features of the project
Figure 1-1

NOTE: Elements are indicative only for the purpose of project planning and may change prior to construction.

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

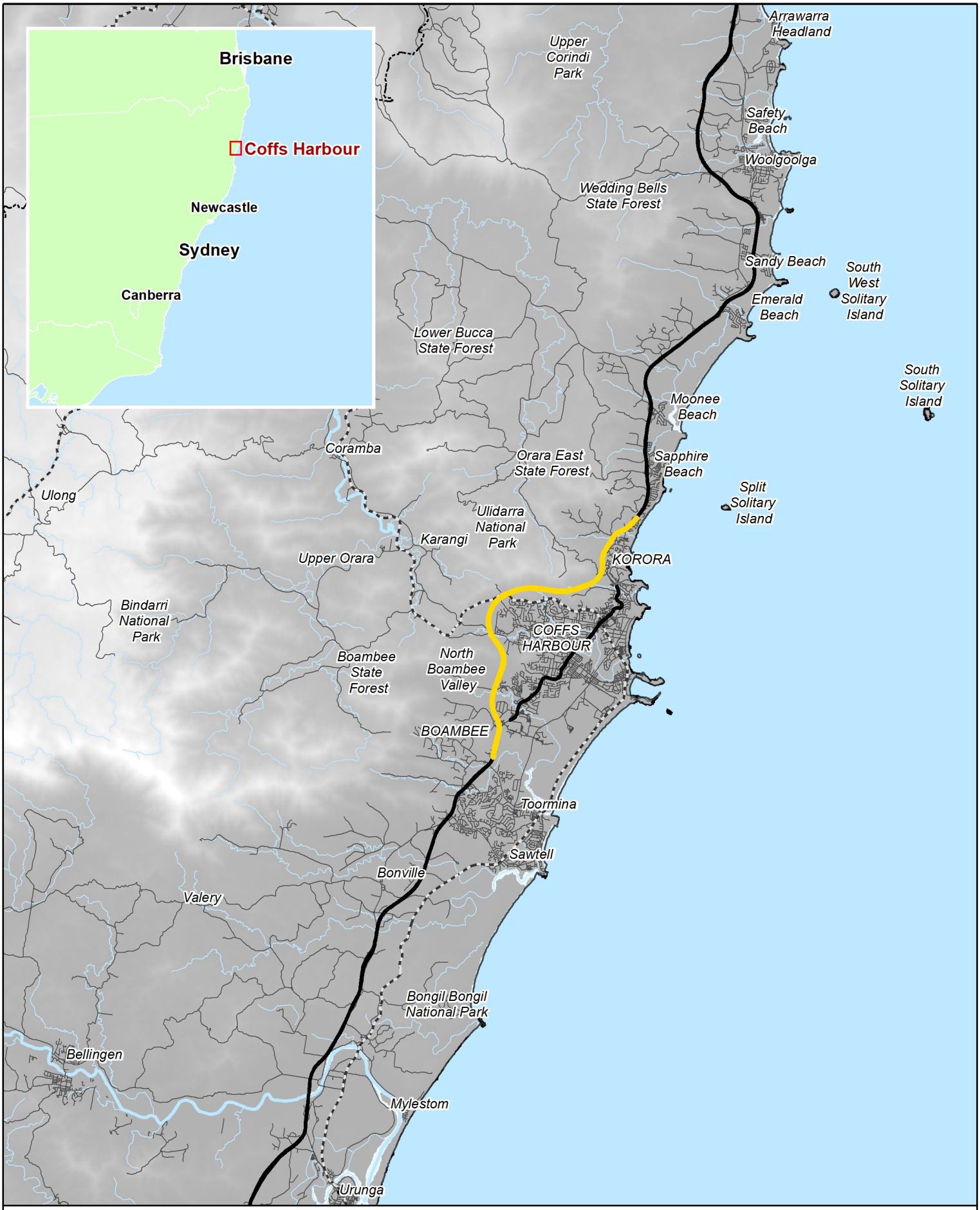
1.2 Project location

The project is located in the Coffs Harbour LGA about three kilometres west of the Coffs Harbour CBD, about 540 km north of Sydney and about 400 km south of Brisbane (refer to **Figure 1-2**).

The Coffs Harbour LGA is positioned midway between Brisbane and Sydney. The area has a growing and diverse economy, based on existing industry and services such as the Coffs Harbour Regional Airport, health and education campuses, and a growing digital innovation sector. Other adjoining LGAs have growing creative, manufacturing and transport industries that are likely to facilitate new employment opportunities in Coffs Harbour. The area also supports a productive agricultural hinterland. Recreation and tourism also contribute to the economy, due to sporting events such as the World Rally Championship and significant natural areas such as the Solitary Islands Marine Park.

There are many unique features within the project location, including the southern limits of Australia's banana plantations, nationally significant blueberry plantations, the proximity of the Great Dividing Range, the visual connection to the coastline and the proximity to a large regional city. The region also supports a diverse range of native vegetation communities and provides connectivity for important areas of flora and fauna habitat including Ulidarra National Park, Kororo Nature Reserve and the Boambee State Forest.

The project passes through or next to the localities of North Boambee Valley, West Coffs and Korora.



Legend

- Coffs Harbour Bypass
- Existing Pacific Highway
- North Coast Railway

Coffs Harbour Bypass
Location of project
Figure 1-2

NOTE: Elements are indicative only for the purpose of project planning and may change prior to construction.

0 2 4 6 km

Scale @A4: 1:18,000,000
GDA 1994 MGA Zone 56

N

1.3 Structure of this environmental impact statement

This EIS has been prepared to address the requirements issued by the Secretary of the NSW Department of Planning, Industry and Environment (DPIE) on 30 October 2017, the Secretary's Environmental Assessment Requirements (SEARs) and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

The EIS is divided into ten volumes.

Volume 1 (A-D) has the following structure:

- Introduction – provides a broad overview of the project and where it is located (**Chapter 1**)
- Assessment process – outlines the statutory requirements and explains the steps in the assessment and approval process (**Chapter 2**)
- Strategic justification and project need – provides the strategic context, explains the need for the project, identifies the project objectives and discusses the consequences of not proceeding (**Chapter 3**)
- Project development and alternatives – reviews the alternatives and options considered in developing the project and details the design investigations and development since 2016 (**Chapter 4**)
- Project description – provides a detailed description of the project including the route alignment, design standards and key design features (**Chapter 5**)
- Construction methodology – provides detailed description of construction methodology, construction footprint, ancillary facilities, work hours and staging (**Chapter 6**)
- Consultation – outlines the consultation activities carried out to date, issues raised and how these have been addressed (**Chapter 7**)
- Assessment of key issues – identifies the key environmental issues as identified in the SEARs, assesses the impacts and proposes environmental management measures including:
  - Traffic and transport (**Chapter 8**)
  - Noise and vibration (**Chapter 9**)
  - Biodiversity (**Chapter 10**)
  - Urban design, landscape and visual amenity (**Chapter 11**)
  - Land use and property (**Chapter 12**)
  - Agriculture (**Chapter 13**)
  - Socio-economic (**Chapter 14**)
  - Aboriginal cultural heritage (**Chapter 15**)
  - Non-Aboriginal cultural heritage (**Chapter 16**)
  - Flooding and hydrology (**Chapter 17**)
  - Soils and contamination (**Chapter 18**)
  - Surface water quality (**Chapter 19**)
  - Groundwater (**Chapter 20**)
  - Air quality (**Chapter 21**)
  - Waste (**Chapter 22**)
  - Sustainability (**Chapter 23**)
  - Hazard and risk (**Chapter 24**)

- Cumulative impacts – considers the interaction between various elements within the project and also the interaction between this project and others recently constructed or proposed in the area (**Chapter 25**)
- Summary of environmental management measures – collates all of the environmental management measures for the project identified through the impact assessment (**Chapter 26**)
- Environmental risk analysis – details the risk analysis process by which the potential environmental issues for assessment were identified (**Chapter 27**)
- Project justification and conclusion – presents the justification for the project, including consideration of the principles of ecologically sustainable development and the objectives of the EP&A Act (**Chapter 28**)
- Project synthesis – provides a description of the project, impacts not avoided, proposed mitigation measures, outcomes to be achieved and a justification of the project (**Chapter 29**)
- References (**Chapter 30**).

Volumes 2 to 10 contain the following appendices in support of the EIS:

- **Appendix A** – Secretary's environmental assessment requirements and checklist
- **Appendix B** – EPBC Act Assessment documentation requirements and checklist
- **Appendix C** – EP&A Regulation checklist
- **Appendix D** – Draft Community consultation framework
- **Appendix E** – Roads and Maritime Services environmental record
- **Appendix F** – Traffic and transport assessment
- **Appendix G** – Noise and vibration assessment
- **Appendix H** – Biodiversity assessment report
- **Appendix I –** Threatened Species Management Plan
- **Appendix J** – Urban design, landscape character and visual impact assessment
- **Appendix K** – Socio-economic appendices
  - **K1** Property impacts
  - **K2** Agricultural assessment
  - **K3** Business and community surveys
- **Appendix L** – Aboriginal cultural heritage assessment report
- **Appendix M** – Non-Aboriginal heritage assessment
- **Appendix N** – Groundwater assessment report
- **Appendix O** – Flooding and hydrology assessment
- **Appendix P** – Air quality assessment
- **Appendix Q** – Human health risk assessment.

CHAPTER 2

Chapter 2

Assessment process

2. Assessment process

This chapter describes the planning approval process for the project as well as other relevant environmental planning and statutory approval requirements. **Table 2-1** lists the SEARs relevant to the assessment process and where they are addressed in this chapter.

Table 2-1 SEARs relevant to the assessment process

Ref	General SEARs	Where addressed
1. Environmental Impact Assessment Process		
1.	The Environmental Impact Statement (EIS) must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulations 2000 (*the Regulation).	Section 2.1 **Appendix C, EP&A Regulation checklist**
2.	The project will impact on Matters of National Environmental Significance (MNES) protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed in accordance with the NSW Bilateral Agreement (2015). The Proponent must assess impacts to MNES protected under the EPBC Act. The assessment must be in accordance with the requirements listed in Attachment A to the SEARs.	Section 2.1 Section 2.2
3.	The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	Section 2.1 Section 2.2
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following	
	o) statutory context of the project as a whole, including: – How the project meets the provisions of the EP&A Act and EP&A Regulation; – A list of any approvals that must be obtained under any other Act or law before the project must lawfully be carried out.	Section 2.1 **Appendix C, EP&A Regulation checklist** Section 2.2

2.1 Approval framework

2.1.1 Environmental Planning and Assessment Act 1979

Roads and Maritime is seeking project approval for the project under Division 5.2 of the EP&A Act.

The project is SSI under Section 5.12 of the EP&A Act and does not require consent under Part 4 of the EP&A Act. The project is also declared to be CSSI under Section 5.13 of the EP&A Act, by virtue of clause 16 and Schedule 5, clause 1(b) of State Environmental Planning Policy (State and Regional Development) (SEPP) 2011, as it is considered to be essential for the State for economic, environmental or social reasons.

The project is therefore being assessed under Division 5.2 of the EP&A Act.

In May 2016, Roads and Maritime submitted an application under Section 5.15 of the EP&A Act to the Secretary of DPIE to carry out the project. The report accompanying the application described the project and aimed to help in the development of SEARs for the preparation of an EIS. In preparing the environmental assessment requirements, the Secretary is required to consult relevant public authorities and have regard to the need for the SEARs to assess any key issues raised by those public authorities.

On 16 June 2016, the Secretary of DPIE issued the SEARs to Roads and Maritime. The SEARs were then revised in October 2017 to reflect the decision that the project is a controlled action under the EPBC Act. This is further discussed in **Section 2.2.2.** A copy of the revised SEARs and an indication of where each element is addressed in the EIS is provided in **Appendix A, SEARs requirements and checklist** as well as being summarised in each key issue chapter.

This EIS has been prepared in accordance with Part 3 of Schedule 2 of the EP&A Regulation. In particular, the EIS complies with the General Provisions outlined in Part 3, including the project description, alternative options, likely environmental impacts and mitigation measures and relevant environmental planning approvals and permits. **Appendix C, EP&A Regulation checklist** outlines where each relevant environmental element is discussed within this EIS.

This EIS must be publicly exhibited for a minimum of 42 days, during which time any person (including a public authority) may make a written submission to the Secretary. Once the exhibition period has concluded, the Secretary is to provide copies of submissions received or a report of the issues raised in the submissions to Roads and Maritime and any other public authority the Secretary considers appropriate. The Secretary may then require Roads and Maritime to submit a response to the issues raised in the submissions and a preferred infrastructure report outlining any proposed changes to the project to further minimise its environmental impact or to deal with any other issues raised during the assessment of the project.

The approval process under Division 5.2 of the EP&A Act is illustrated in **Figure 2-1**. Further information on the assessment process is available on the DPIE (Planning and Assessment) website (planning.nsw.gov.au).

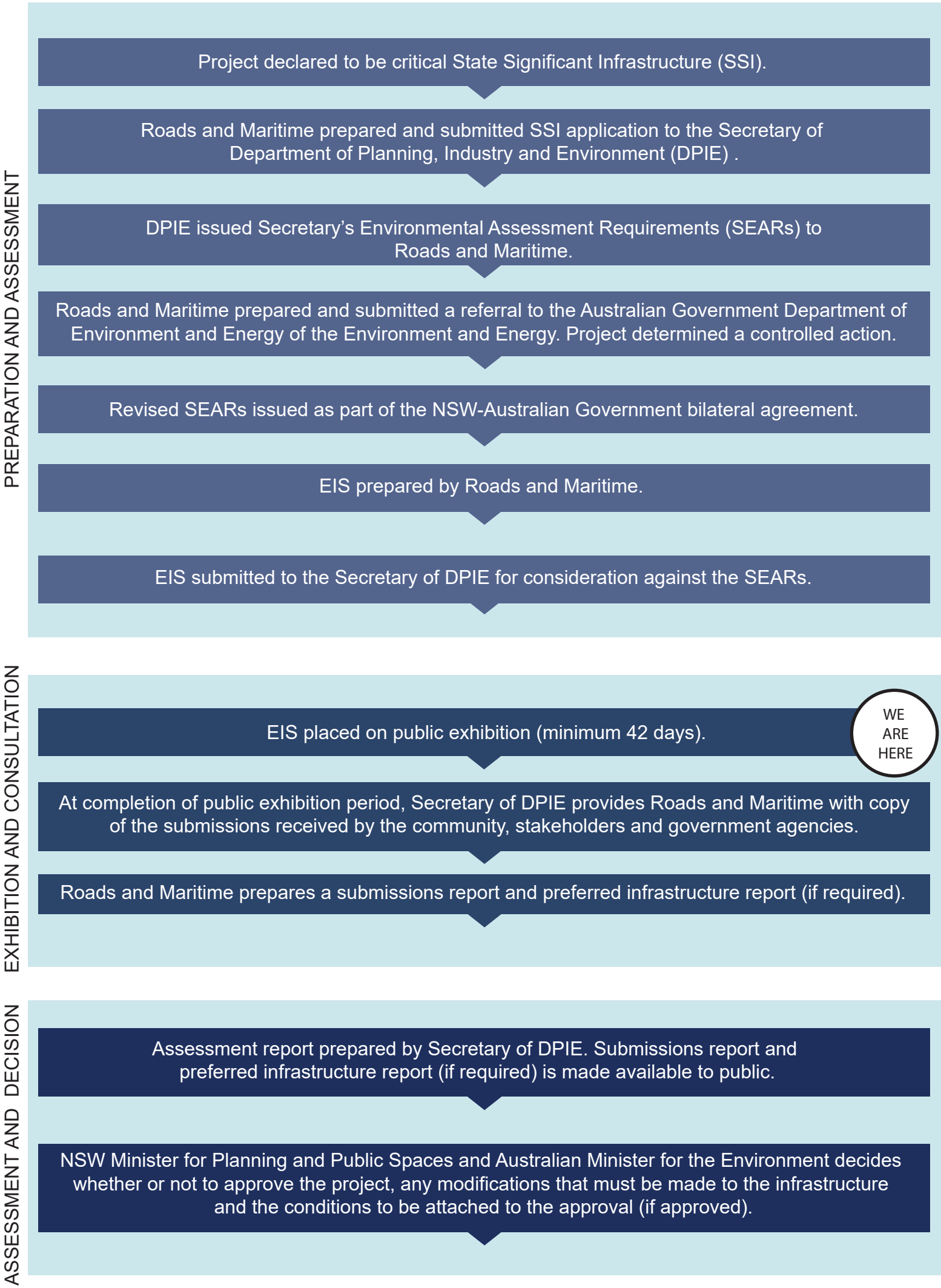


Figure 2-1 Approvals process under Division 5.2 of the EP&A Act and EPBC Act

2.2 Other legislation

2.2.1 NSW legislation

Before August 2017, the *Threatened Species Conservation Act 1995* (TSC Act) provided for the protection of biodiversity, including requirements for the protection of threatened species, populations and ecological communities. The TSC Act was repealed and replaced by the *Biodiversity Conservation Act 2016* (BC Act) on 25 August 2017; however, the NSW Government established transitional arrangements related to biodiversity assessment for the various categories of development consent or approval that are underway or have already been made. These transitional arrangements are defined in the Biodiversity Conservation (Savings and Transitional) Regulation 2017. In October 2017 and March 2019, DPIE confirmed the project is considered a "pending or interim planning application" and the TSC Act would still apply to the project under the transitional arrangements in accordance with clause 27(1) (a) of the Biodiversity Conservation (Savings and Transitional) Regulation 2017.

In addition to the above, a number of approvals are not required for a project approved under Division 5.2 of the EP&A Act (Section 5.23), including the following:

- Permits under sections 201, 205 and 219 of the *Fisheries Management Act 1994* to carry out dredging, reclamation works, to harm marine vegetation in protected areas or block fish passage
- Approvals or permits under the *Heritage Act 1997*, including under Part 4 (to demolish, disturb or excavate a place, building, work, relic, moveable object, precinct or land to which interim heritage order or listing on State Heritage Register applies), Section 139 (excavation permits) and Part 6, Division 8 (controlling and restricting harm to buildings, works, relics and places)
- Aboriginal heritage permits under section 90 of the *National Parks and Wildlife Act 1974* to harm an Aboriginal object or place
- Approvals under the *Water Management Act 2000*: water use approvals under section 89, water management work approvals under section 90, and activity approvals (other than aquifer interference approvals) under section 91.

Approvals, licences and/or notification requirements under NSW legislation that may apply to the project include:

- Consent under section 138 of the *Roads Act 1993* for any work or activities in the public reserve or in public road way
- Notification to the Minister if dredging or reclamation work are required under section 199 of the *Fisheries Management Act 1994*. Waterway realignments and adjustments which fall under the definition of dredging or reclamation are discussed further in **Chapter 5, Project description**
- Approval to grant relevant interests such as licences, permissions, easements or rights of way over land reserved under the *Crown Land Management Act 2016.* The Ulidarra National Park is located on the north-west outskirts of Coffs Harbour. A Crown reserve abuts part of the southern boundary of the park. However, the project would not impact this area
- Licence to carry out any prescribed activity with respect to an environmentally hazardous chemical or a declared chemical waste from the NSW Environment Protection Authority (EPA) under section 28 of the *Environmentally Hazardous Chemicals Act 1985*
- Aquifer interference approval under section 91F of the *Water Management Act 2000* if construction requires interference with a groundwater source. This is discussed further in **Chapter 20, Groundwater**.

Other NSW legislation that would apply to the project includes:

- An environmental protection licence for road construction under chapter 3 of the *Protection of the Environment Operations Act 1997* (POEO Act). In accordance with section 5.24 of Division 5.2 of the EP&A Act, such a licence cannot be refused for an approved project and is to be substantially consistent with the Division 5.2 approval
- Application of the *Land Acquisition (Just Terms Compensation) Act 1991* for the acquisition of land and property as described in **Chapter 12, Land use and property**
- Application of the *Contaminated Land Management Act 1997* about notification of the EPA in relation to the contamination of land. This is discussed further in **Chapter 18, Soils and contamination**
- The storage, transportation, handling and use of dangerous good and hazardous substances would be undertaken in accordance with the Dangerous Goods (Road and Rail Transport) Regulation 2014. This is further discussed in **Chapter 24, Hazard and risk**
- The expenditure of public funds and procurement of goods and services including infrastructure investment would be undertaken in accordance with *Public Finance and Audit Act 1983* to ensure that through the spending of public funds, Roads and Maritime and the project will ensure value for money in all respects.

Because the project is SSI, section 5.23(2) of Division 5.2 of the EP&A Act precludes the following being made to prevent or interfere with the carrying out of the project once approved:

- An order restricting harm to buildings, works, relics or places that are not the subject of an interim heritage order or listing under the State Heritage Register under Division 8 of Part 6 of the *Heritage Act 1977.*

In addition, as the project is CSSI, section 5.23(3) of Division 5.2 of the EP&A Act precludes the following being made to prevent or interfere with the carrying out of the project once approved:

- An interim protection order within the meaning of the *National Parks and Wildlife Act 1974*
- An order or direction under Part 11 of the *Biodiversity Conservation Act 2016*
- An order under Division 1 (Stop work orders) of Part 6A of the *National Parks and Wildlife Act 1974,* or Division 7 (Stop work orders) of Part 7A of the *Fisheries Management Act 1994*
- A remediation direction under Division 3 of Part 6A of the *National Parks and Wildlife Act 1974*
- An environmental protection notice under Chapter 4 of the POEO Act
- An order from a council to demolish or move a building, to repair or make structural alterations to a building, or to do or refrain from doing things under section 124 of the *Local Government Act 1993.*

2.2.2 Commonwealth legislation

Under the EPBC Act, proposed ‘actions’ that have the potential to significantly impact on Matters of National Environmental Significance (MNES); significantly impact the environment of Commonwealth land, or that are being carried out by a Commonwealth agency, must be referred to the Australian Government. If the Australian Minister for the Environment determines that a referred project is a ‘controlled action’, the approval of that Minister would be required for the project in addition to the NSW approval.

This project was referred to the Australian Government Department of the Environment and Energy (DoEE) on 14 August 2017 due to the potential for the project to impact on MNES listed under the EPBC Act.

On 22 September 2017, the Australian Minister for the Environment confirmed the project would be a controlled action. MNES of relevance to the project were listed as threatened species and communities (section 18 and 18A of the EPBC Act). As such, the project requires assessment and approval under the EPBC Act.

The NSW Government confirmed the action will be assessed under the Assessment Bilateral Agreement (2015) between the Australian Government and NSW. This agreement accredits the assessment process under Division 5.2 of the EP&A Act. The Australian Minister for the Environment would then need to issue a separate approval for the project as it is a controlled action.

In October 2017, the SEARs were revised to reflect the project being a controlled action (**Appendix A**). This EIS has been prepared to address the specific matters raised in the revised SEARs.

CHAPTER

3

Chapter 3

Strategic justification and project need

3. Strategic justification and project need

This chapter outlines the relationship of the project to the Pacific Highway upgrade program and the strategic planning framework. It also identifies the need for the project and the project objectives. A statement of strategic need concludes the chapter. **Table 3-1** sets out the SEARs that relate to the strategic context and need for the project and identifies where these SEARs have been addressed in this EIS.

Table 3-1 SEARs relevant to the strategic justification and project need

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following: c) a statement of the objective(s) of the project, including how it meets the objectives of the overall Pacific Highway upgrade program;	Section 3.2.1 Section 3.4
	d) a summary of the strategic need for the project with regard to its State significance and relevant State Government policy	Section 3.1 Section 3.2 Section 3.4

3.1 NSW and Australian strategic planning and policy framework

The following section describes the compatibility of the project with relevant Australian Government and NSW Government policies and plans. The documents relevant to the project are:

- NSW Government Premier's Priorities (NSW Government 2018b)
- NSW State Infrastructure Strategy (Infrastructure NSW 2018)
- Making it Happen in the Regions: Regional Development Framework (Department of Industry 2017)
- Future Transport Strategy 2056 (TfNSW 2018a)
- White Paper, AusLink: Building Our National Transport Future (Department of Transport and Regional Services 2004)
- National Road Safety Strategy 2011 – 2020 (Australian Transport Council 2011)
- Infrastructure Australia's Infrastructure Priority List (Infrastructure Australia 2018)
- North Coast Regional Plan 2036 (DP&E 2017a)
- Coffs Harbour 2030 Plan (CHCC 2009a)
- Our Living City Settlement Strategy (CHCC 2008)
- Coffs Harbour Local Growth Management Strategy (CHCC 2019)
- Coffs Harbour City Council Bike Plan 2014 – 2019 (CHCC 2014)
- NSW Climate Change Policy Framework (OEH 2016a).

3.1.1 NSW Government Priorities

The NSW Government has identified a number of priorities to enhance the quality of life for the people of NSW. These priorities have ambitious targets to deliver on the Government's key policy priorities including a strong economy and well connected communities with quality local environments.

Avoidable congestion costs NSW more than $5 billion a year. This will grow to $8 billion by 2020. Transport projects allow local communities across NSW to have access to better connected infrastructure and services including safer and better-quality roads and highways.

The project meets the overarching aims of these priorities by providing sufficient road capacity to meet traffic demand and by providing better road connections and safer conditions.

3.1.2 NSW State Infrastructure Strategy

The State Infrastructure Strategy 2018 – 2038 (Infrastructure NSW 2018) is a 20-year infrastructure investment plan for the NSW Government that places strategic fit and economic merit at the centre of investment decisions. The strategy assesses infrastructure problems and solutions and provides recommendations to best grow the State's economy, enhance productivity and improve living standards for our NSW community. The current strategy identifies policies and strategies needed to provide the infrastructure that meets the needs of a growing population and a growing economy.

The Strategy is underpinned by:

- State Infrastructure Strategy 2018 – 2038: Building Momentum (Infrastructure NSW 2018)
- Making it Happen in the Regions: Regional Development Framework (Department of Industry 2017) (refer to **Section 3.1.3**)
- Future Transport Strategy 2056 (TfNSW 2018a) (refer to **Section 3.1.4**)

The Strategy includes the NSW Infrastructure Pipeline, which outlines infrastructure proposals under development by the NSW Government. This includes the Coffs Harbour Bypass to provide improved traffic flow and travel times for freight as well as amenity for local traffic.

3.1.3 Regional Development Framework

Making it Happen in the Regions: Regional Development Framework (Department of Industry 2017) is a plan focused on providing quality services and infrastructure in regional NSW. The framework is based around a model of investment in regional NSW that:

- Provides quality services and infrastructure in regional NSW
- Aligns efforts to support growing regional centres, acknowledging the needs of areas with strong growth in population, jobs or both
- Identifies activities of economic potential by looking across regional NSW for opportunities to activate local economies.

The project aligns with the objective to provide quality infrastructure in NSW to support the Regional Road Freight Corridor Program, a Regional Growth Roads Program and regional tourism and environment. The project would provide travel time savings for traffic, including freight, and would provide safer road conditions to support future growth and tourism.

3.1.4 Future Transport Strategy 2056

The Future Transport Strategy 2056 (TfNSW 2018a) is an overarching strategy, supported by a suite of plans, to achieve a 40-year vision for the NSW transport system. The Strategy outlines a vision, strategic directions and customer outcomes, with infrastructure and services plans underpinning the delivery of these directions across the state. It has six outcomes to guide investment, policy, reform and service provision, and provides the framework for network planning and investment.

The Strategy is underpinned by several plans including:

- Regional NSW Services and Infrastructure Plan (NSW Government 2017b)

- NSW Freight and Ports Plan 2018-2023 (TfNSW 2018c)
- Tourism and Transport Plan (TfNSW 2018d)
- Road Safety Plan 2021 (Towards Zero NSW) (TfNSW 2018b)
- Connected and Automated Vehicles Plan (TfNSW 2019).

The project is recognised as a committed initiative for regional NSW under the Strategy.

Regional NSW Services and Infrastructure Plan

The Regional Services and Infrastructure Plan (NSW Government 2017b) provides a blueprint for transport in regional NSW until 2056. It outlines the vision and customer outcomes the government will use to go about detailed transport planning in each region and support its future decision-making.

The North Coast region is recognised as having a diverse economy, strong in tourism, manufacturing, services, technology industries and agribusiness. It is a significant exporter of manufactured products, with the manufacturing sector accounting for most of the region's exports. The area is regional NSW's most popular tourist destination, attracting over 12 million visitors a year. Upgrades to the Pacific Highway have increased accessibility across the region.

NSW Freight and Ports Plan 2018 – 2023

The aim of the NSW Freight and Ports Plan (TfNSW 2018c) is to provide a transport network in NSW that allows for the efficient flow of goods to market.

The Plan states freight volumes are expected to grow by a quarter in regional NSW over the next 40 years. With a growing population and increasing freight task, solutions are needed for the demands placed on the freight transport network to address issues such as congestion, journey and access times, and safety risks. The Plan aims to meet the needs of freight customers by:

- Continuing to invest in road and rail infrastructure to provide greater access on the networks
- Facilitating the introduction of new technologies to drive efficiencies on the network
- Utilising dynamic network management that prioritises vehicles depending on productivity, type of use and time of day
- Reforming road, rail and maritime regulations to harmonise cross-border regulatory regimes that will drive economic efficiencies.

The Plan notes the Pacific Highway upgrades have resulted in improvements that support regional development and provide safer travel, reduced travel times and improved transport efficiency, more consistent and reliable travel, and improved amenity for local communities. Completion of the dual carriageway construction along the Pacific Highway (including the project) is a committed regional NSW Initiative.

Tourism and Transport Plan

The Tourism and Transport Plan (NSW Government 2018c) is a supporting plan to the Future Transport Strategy 2056 (TfNSW 2018a). Transport infrastructure upgrades, including the Pacific Highway upgrades, are actions towards meeting the goal of doubling overnight visitor expenditure in NSW by 2020. The quality of roads and facilities along regional roads are known to affect the visitor experience when travelling to regional destinations. New corridor strategies, regional road upgrades and improved signage to visitor destinations can further enhance the visitor experience, drive more visitors to local destinations and create new economic development opportunities.

Regional NSW national parks have seen significant growth in visitor numbers where transport has been improved. For example, the Pacific Highway upgrades completed to date have contributed to a 70 per cent increase in visitation to national parks in the North Coast Region (NSW Government 2018c).

The project will continue to encourage growth in visitor numbers by improving road safety and transport efficiency, allowing easy access on and off the highway for through and local traffic and supporting economic development.

Road Safety Plan 2021

The Road Safety Plan 2021 (TfNSW 2018b) sets out priority areas to address recent increases in the road toll and move towards achieving the NSW Government's State Priority target to reduce fatalities by 30 per cent in 2021. The Plan will deliver on six priority areas:

- Saving lives on country roads
- Liveable and safe urban communities
- Using the roads safely
- Building a safer community culture
- New and proven vehicle technology
- Building a safe future.

The project would remove through traffic from Coffs Harbour CBD, reducing conflict between through and local traffic, cyclists and pedestrians, and improving road safety. The project would enable potential adjustments to the existing highway through Coffs Harbour to improve road safety for pedestrians and cyclists (subject to planning decisions by CHCC). This would result in the Coffs Harbour CBD becoming more liveable with a safer community culture.

Connected and Automated Vehicles Plan

The Connected and Automated Vehicles Plan (TfNSW 2019) outlines NSW's strategic directions and actions to progress connected and automated vehicles over the next five years and supports Future Transport 2056. The approach to connected and automated vehicles (CAVs) is framed around five priority areas, with goals and actions identified to achieve each priority. The priority areas included:

- Laws and safety
- Infrastructure and planning
- Transport and services
- Data
- Customer readiness.

The project has an opportunity to contribute to the infrastructure and planning priority and the goal of building infrastructure capability to support CAVs. With the project still in the development phase, there are opportunities to adopt flexible approaches that consider the future needs of CAVs, eg smart infrastructure and digital connectivity. This would potentially accelerate CAV use on the Pacific Highway road corridor providing safety, network efficiency and productivity benefits.

3.1.5 The AusLink White Paper

The White Paper, AusLink: Building Our National Transport Future (Department of Transport and Regional Services 2004), sets out a strategic framework for decision-making and investment in Australia's land transport network. The paper aims to link transport funding to priority needs and provide certainty for future investment. It also promotes the development of an integrated land transport network.

Components of the paper include:

- A defined National Land Transport Network of important road and rail links and their intermodal connections

- The National Land Transport Plan, which outlines the Australian Government's approach to improving and integrating the National Land Transport Network and associated investments.

The Pacific Highway is identified within the AusLink White Paper as a key component of the National Land Transport Network and one of the priority areas for transport funding.

3.1.6 National Land Freight Strategy

The National Land Freight Strategy (Standing Council on Transport and Infrastructure 2012) is a partnership between federal, state and territory, local governments and industry to drive efficient and sustainable freight logistics, balancing the needs of a growing Australian economy. The objectives of the Strategy are to improve the efficiency of freight movements across infrastructure networks, minimise the negative impacts associated with such freight movements and influence policy-making relevant to the movement of freight.

The Pacific Highway is identified as a key strategic corridor in the proposed national land freight network. A key objective of the project is to provide travel time savings for business vehicles and freight and to provide a road which supports and integrates with the broader transport network.

3.1.7 National Road Safety Strategy 2011 – 2020

The National Road Safety Strategy 2011 – 2020 (Australian Transport Council 2011) represents the commitment of federal, state and territory governments to an agreed set of national goals, objectives and action priorities. It sets out a path for action to reduce fatal and serious injury crashes on Australian roads.

Following a comprehensive review of progress in 2014, an Action Plan for the three years from 2015 to 2017 was developed cooperatively by federal, state and territory transport agencies, and was endorsed by the Transport and Infrastructure Council in November 2014. The National Road Safety Action Plan 2015 – 2017 details a range of priority national actions to be taken by governments including:

- Prioritising investment in infrastructure
- Improving the safety of vehicle fleets
- Encouraging safer road use
- Advancing the Safe System.

An objective of the Pacific Highway upgrade program is to significantly reduce road crashes and injuries, and a project objective is providing safer road conditions, thereby meeting the overarching objective of this Strategy to reduce fatal and serious injury crashes.

3.1.8 Infrastructure Australia's Infrastructure Priority List

Infrastructure Australia's Infrastructure Priority List (Infrastructure Australia 2019) sets out a number of projects and initiatives identified as priority infrastructure investments Australia needs over the next 15 years.

The Priority List is a reference point for Australia's most important infrastructure investments needs. The Priority List currently lists 121 major infrastructure proposals, including seven projects that are underpinned by a robust business case and have been positively assessed by Infrastructure Australia. The Priority List provides independent, evidence-based advice to governments and industry on the projects that would most benefit Australia's growing communities.

The Priority List identifies the Coffs Harbour Bypass as a priority initiative to improve Brisbane to Sydney connectivity.

3.1.9 North Coast Regional Plan 2036

The North Coast Regional Plan 2036 (DP&E 2017a) is a 20-year blueprint for the future of the North Coast. The NSW Government's vision for the North Coast is to create the best region in Australia to live, work and play. To achieve this vision the government has set four goals for the region:

- The most stunning environment in NSW
- A thriving, interconnected economy
- Vibrant and engaged communities
- Great housing choice and lifestyle options.

The Pacific Highway upgrades are seen as vital to unlocking the potential of the region. The Plan identifies the NSW Government investments on the North Coast including a share of $1.5 billion in funding towards the upgrade of the Pacific Highway in 2016 – 2017. The Plan identifies a focus for the future to harness new opportunities that arise from the improved travel safety, reduce travel times, improved transport efficiency and lower freight transport costs. It is noted that economic development will continue to be leveraged off the highway upgrade, and increased connectivity is building stronger partnerships and collaboration across communities.

The Plan notes the Pacific Highway is a critical link for Australia, NSW and the North Coast. It also notes ongoing upgrades to the Pacific Highway and access to a series of regional and international airports will drive economic growth and bring communities closer together. The preferred route for the Coffs Harbour Bypass is identified in this Plan.

Further discussion on the Plan as it relates to the project is provided in **Chapter 12, Land use and property**.

3.1.10 Coffs Harbour 2030 Plan

The Coffs Harbour 2030 Strategic Plan (CHCC 2009a) is a plan for the future of the Coffs Harbour community. The Plan is broken into the five key themes:

- Learning and prospering
- Looking after our community
- Looking after our environment
- Moving around
- Places for living.

Under each theme are several objectives providing goals and further strategies which specify how each of the objectives will be achieved. The project would contribute to four out of five of these themes, as outlined in **Table 3-2.**

Table 3-2 Strategies under the Coffs Harbour 2030 Strategic Plan relevant to the project

Objective	Relevant strategies
Looking after our community	
LC 1 Coffs Harbour is a strong, safe and adaptable community	LC 1.3 Promote a safe community
Looking after our environment	

Objective	Relevant strategies
LE 3 Our natural environment and wildlife are conserved for future generations	LE 3.1 Manage land use to conserve the region's unique environmental and biodiversity values LE 3.2 Enhance protection of our catchments, waterways and marine areas
Moving around	
MA1 We have an integrated, accessible and environmentally-friendly mixed mode transport system servicing the region	MA1.1 Plan for new transport infrastructure MA1.2 Improve the effectiveness of the existing transport system MA1.3 Promote increased public transport, pedestrian and cycle usage or reduced car usage
MA2 We have a system of well-maintained and safe roads for all users	MA2.1 Ensure adequate maintenance and renewal of roads, footpaths and cycleways MA2.2 Facilitate safe traffic, bicycle and pedestrian movement MA2.3 Reduce the impact of the highway on our community
Places for living	
PL 1 Our infrastructure and urban development is designed for sustainable living	PL 1.2 Provide infrastructure that supports sustainability living and is resilient to climatic events

The Coffs Harbour Delivery Program and Operational Plan sit under the Strategic Plan. These are the management documents to outline the services and projects that are being delivered as part of the objectives. As per the Coffs Harbour City Council 2017 – 2021 Delivery Program (CHCC 2017a), the project is identified as a key area of focus for both advocacy/stakeholder collaboration and for impact assessment up to 2021.

3.1.11 Local Growth Management Strategy

CHCC is in the process of reviewing and updating the Local Growth Management Strategy. The revised strategy will replace Council's existing Local Growth Management Strategy and will guide how and where growth will occur in Coffs Harbour LGA over the next 20 years. The revised strategy will outline the future growth of the Coffs Harbour LGA and builds on the strategic priorities of the North Coast Regional Plan. Early chapters of the Strategy are available for community comment.

Further discussion on the Strategy as it relates to the project is provided in **Chapter 12, Land use and property**.

3.1.12 Our Living City Settlement Strategy

The Coffs Harbour Our Living City Settlement Strategy (CHCC 2008) sets out a strategic approach to guide Council's land use decisions to 2031, including providing a series of policies to manage transport and urban growth issues. It is noted that this strategy is currently being revised, however the updated version was not available at the time of preparing this EIS.

The Strategy is broken into three parts: economic, environmental and social sustainability. The Strategy recognises that resolution of regional and local networks is required and recommends the development of innovative transport planning that increases cycling and walking opportunities.

Further discussion on the Strategy as it relates to the project is provided in **Chapter 12, Land use and property**.

3.1.13 Coffs Harbour City Council Bike Plan 2014 – 2019

The Coffs Harbour City Council Bike Plan 2014 – 2019 (CHCC 2014) was developed to outline cycling infrastructure and programs to 2019. The Plan was developed with the assistance of Roads and Maritime.

The objectives of the Plan are to:

- Plan and deliver a connected cycling network
- Improve cycling support facilities
- Make cycling safer
- Encourage greater participation.

The mapping associated with the Plan shows existing, proposed and future cycle paths, including the proposed cycle path along the existing Pacific Highway and Solitary Islands Way at Sapphire. The project would provide a 2.5 m shoulder to cater for cyclists. Further details on the provisions for pedestrians and cyclists are included in **Chapter 5, Project description** and discussed in **Chapter 8, Traffic and transport**.

3.1.14 NSW Climate Change Policy Framework

The NSW Climate Change Policy Framework (OEH 2016a) aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change. One of the aspirational long-term objectives is to ensure NSW is more resilient to a changing climate. The NSW Government aims to help NSW adjust to a changing climate by supporting local-adaptation actions, managing climate change risks to its own assets and services, and removing market, regulatory and governance barriers to the private sector and local government.

Climate change will lead to more extreme weather, heatwaves and a sea level rise which increases the risk of direct costs to public and private assets and services. The NSW Government manages the impact of climate change on its assets and services by embedding climate change consideration into asset and risk management.

An objective under the Roads and Maritime Environmental Sustainability Strategy 2019-2023 (Roads and Maritime Services 2019) is to plan and deliver transport infrastructure and operations that are resilient to the effects of climate change. A greenhouse gas emissions strategy would be prepared as part of the project's Sustainability Management Plan during detailed design. The impact from the project on flood behaviour, considering sea level rise and storm intensity due to climate change, has been assessed and discussed within **Chapter 17, Flooding and hydrology** and **Chapter 24, Hazard and risk**.

3.2 Project need

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals.

The existing highway through Coffs Harbour forms part of the Sydney - Brisbane freight corridor and carries between 30,000 and 35,000 vehicles per day (2016). Road users, including through and local traffic, pedestrians, cyclists and heavy vehicles, need to navigate a 12 km low speed arterial road with 12 sets of traffic signals, a major roundabout and 26 other intersections. This means the area experiences:

- A motorist, cyclist and pedestrian casualty rate more than three times higher than expected of a road of this class
- Increased travel time and inefficient on-road freight operation

- Loss of economic development opportunities
- A decrease in the amenity of Coffs Harbour CBD.

Over the next 20 years, almost 77 per cent of population growth on the North Coast of NSW will be in regional cities, including Coffs Harbour (DP&E 2017a). The area is already experiencing high levels of congestion, and traffic volumes are expected to increase over time in line with population growth.

By providing a bypass of Coffs Harbour consistent with the current standards of the Pacific Highway upgrade program, the project would address declining transport efficiency, urban congestion and road safety issues caused by the interaction of through and local traffic. These issues are discussed below.

3.2.1 Pacific Highway upgrade program

The upgrade of the Pacific Highway is one of the largest road infrastructure programs in NSW. It connects Sydney and Brisbane and is a major contributor to Australia's economic activity. The Australian and NSW governments have been jointly upgrading the Pacific Highway to provide a four-lane divided road from Hexham to Queensland. Upgrading started in 1996 and 2020 has been identified as the targeted completion date. By the end of 2020, 95 per cent of the Pacific Highway north and south of Coffs Harbour will be upgraded to 110 km/h design speed with a posted speed limit of 100 or 110 km/h.

The project supports the objectives and broader rationale of Pacific Highway upgrade program, which seeks to enhance the capacity and quality of the Pacific Highway by improving safety, travel times and reliability. Completion of the project will contribute to fully realising the objectives of the Pacific Highway upgrade program.

3.2.2 Population growth

The Coffs Harbour LGA population is projected to increase at an average annual rate of 0.9 per cent between 2011 and 2044, which is 35 per cent higher than the average rate of growth for regional NSW. This population growth is expected to continue over the next 20 years, as shown in **Table 3-3**. By 2036, Coffs Harbour LGA's population is projected to increase by more than 22 per cent from 2016 levels to 92,650 people. This is comparable to the population growth of 28 per cent in NSW by 2036 (DP&E 2016a).

Table 3-3 Population growth in Coffs Harbour 2011 to 2044

Region	Population growth					
	2011	2016	2024	2034	2044	Annual growth rate 2011–2044
Coffs Harbour	68,413	72,944	79,914	87,708	95,320	0.90%

3.2.3 Road demand

The Pacific Highway at Coffs Harbour has relatively high traffic volumes for a four-lane urban arterial road, with heavy vehicles accounting for a high proportion of total traffic. **Table 3-4** shows the current traffic volumes and classification of vehicles in the north, central and southern sections of the existing Pacific Highway from south of Englands Road to north of Korora Hill. The weekday average traffic counts show around 30,000 – 35,000 vehicles per day (2016) use the Pacific Highway in this section, with the highest volumes observed in the central Coffs Harbour area, near Coffs Creek and Coramba Road. The traffic counts indicate around 85 per cent of vehicles using the road are light vehicles, with the remainder heavy vehicles.

Table 3-4 Traffic counts along the southern, central and northern sections of the Pacific Highway including proportion of light vehicles (2016)

Segment of existing Pacific Highway	Weekday average traffic volumes				
	Combined	Northbound	Southbound	Combined classification of light vehicles	Proportion of through traffic
South of Coffs Harbour (South of Englands Road)	31,500	15,800	15,700	86.5%	14%
Central Coffs Harbour (Coffs Creek)	35,100	18,100	17,100	84.8%	n/a
Korora, north of Coffs Harbour (North of Korora Hill)	30,000	15,100	14,900	84.6%	15%

These high traffic volumes cause delays for local and regional road users entering and exiting properties and accessing the Pacific Highway. Traffic volumes are growing and are expected to continue to grow. Historic traffic count data on the Pacific Highway near Sapphire suggests growth over the last nine years has averaged three per cent per annum. In the northern sections of the existing Pacific Highway, traffic counts indicate large truck volumes have increased, up by 3.4 per cent per annum between 2011 and 2016 (refer to **Table 3-5**).

Table 3-5 Recent growth in vehicle movements on Pacific Highway at Sapphire

Year	Average daily traffic volume	ADT growth per annum	Heavy vehicle volume	HV growth per annum
2007	18,420	-	2153	-
2011	20,464	2.8%	2393	2.8%
2016	22,582	2.1%	3188	6.3%

3.2.4 Traffic delays

Increased traffic volumes in and around Coffs Harbour are creating pinch points which impact on the movement of people around the region and reduce the efficiency of freight movements. There are currently 12 sets of traffic signals on the Pacific Highway through Coffs Harbour, leading to localised congestion which impacts local, regional and interstate traffic. Delays can impact the cost of travel which in turn affects trip distribution (ie the route taken) and the number of trips that are made. Factors such as population and employment growth will impact further on the number of local trips made.

Traffic conditions of major roads and intersections can be quantified in terms of their operating level of service. Level of service is a qualitative measure of features that include speed, travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort, convenience and operating costs. Level of service ranges from A (generally free flow conditions) to F (vehicles moving at very slow speed). Traffic analysis demonstrates the current level of service experienced by traffic using the Pacific Highway at Coffs Harbour for local southbound and northbound trips is up to D to F at some locations, meaning traffic is held up and delayed at a number of intersections. It is expected that, without measures such as construction of the bypass, this level of service will continue to deteriorate with more turning movements and intersection approaches reaching LOS E and F under current traffic arrangements with continued growth in traffic

volumes. This level of service would result in each vehicle moving in lockstep with the vehicle in front of it, with frequent slowing required.

Signalised intersections in Coffs Harbour lead to a high level of stop-starting for freight vehicles on the national transport network and the main road freight corridor between Sydney and Brisbane. This adds to vehicle operating costs, particularly the running costs for significant speed fluctuations from cruise speed and the additional fuel costs due to queuing at traffic signals. Higher fuel consumption in congested conditions leads to higher greenhouse gas emissions; air pollution also increases in stop-start conditions.

3.2.5 Travel times

Travel time surveys conducted in June 2016 show travel times between Korora Hill and Englands Road ranges from 13.5 to 26.5 minutes in the morning peak hour. The current average and maximum travel times measured in the survey for the peak morning, midday and afternoon periods are shown in **Table 3-6.**

Table 3-6 2016 travel time survey results (minutes) between Korora Hill and Englands Road

Time	Southbound			Northbound		
	Max time	Avg time	Avg speed	Max time	Avg time	Avg speed
Morning (8am – 9am)	20.05	16.40	37.7 km/h	26.27	19.04	33.0 km/h
Midday peak (11am – 12pm)	22.42	19.00	33.1 km/h	32.55	23.23	26.9 km/h
Afternoon (4pm – 5pm)	26.54	18.38	33.7 km/h	24.32	18.48	33.5 km/h

Travel times for the future 2024 (project year of opening) and 2044 base case (project 20-year design horizon) have been modelled and are shown in **Table 3-7**. This demonstrates travel times are predicted to generally increase should the project not proceed (discussed further in **Chapter 8, Traffic and transport**).

Table 3-7 Future base case average travel time (minutes) for the existing highway between 1km south of Englands Road and Old Coast Road

2024 Predicted travel time (minutes)		
	Southbound	**Northbound**
Morning (8am – 9am)	21.0	19.6
Afternoon (4pm – 5pm)	19.3	19.6
2044 Predicted travel time (minutes)		
Morning (8am – 9am)	29.2	20.4
Afternoon (4pm – 5pm)	21.8	23.7

3.2.6 Safety record

There were 259 crashes for the period from January 2014 to December 2018 on the Pacific Highway at Coffs Harbour between south of the Englands Road roundabout and the dual carriageway highway at Sapphire (crash data provided by Roads and Maritime). This section of the existing highway between Englands Road and Korora Hill has a crash rate of 39 per 100 million vehicle kilometres travelled (100 mvkt) for all crashes. This is substantially higher than the expected crash rate on a bi-directional divided urban road within NSW which is 25.6 per 100 mvkt. The section of the existing highway between the northern tie-in at Sapphire and the proposed interchange at Korora Hill has a crash rate of 18.3 per 100 mvkt.

Of these crashes, 67 per cent were at intersections and 40 per cent were rear-end crashes, which are more likely to occur with unstable flow on high speed road. There were nine cyclist crashes and nine pedestrian crashes. Around 14 per cent of the crashes involved a heavy vehicle.

This higher than average crash rate demonstrates the safety issues caused by congestion and the conflict between pedestrian, passenger and freight traffic through the Coffs Harbour CBD. The stop-start nature of the Pacific Highway through Coffs Harbour results in significant safety risks for the transport industry and other road users due to the mix of through and local traffic. **Table 3-8** presents the most recent crash statistics for the existing Pacific Highway in Coffs Harbour and predicted number of crashes in 2024 and 2044 if the existing crash rate continues.

Table 3-8 Crash statistics

Segment of existing Pacific Highway	Existing			Base case (with project)	
	Number of crashes from January 2014 to December 2018	Average number of crashes per year	Crashes per 100 Mvkt	Predicted number of crashes in 2024	Predicted number of crashes in 2044
Sapphire to Korora Hill	26	5	18.3	6	7
Korora Hill to Englands Road	227	45	39.2	49	53
Englands Road to Boambee	6	1	8.1	2	2
Total	259	51	-	57	62

3.2.7 Travel time reliability

Travel time reliability refers to the level of predictability of journey times. Personal and business travellers value reliability because it allows them to make better use of their own time, while freight operators require predictable travel times to remain productive and competitive. Travel time reliability is also a major factor for bus service providers and bus users.

Travel time reliability is influenced by two factors:

- More congestion as measured by increasing volume to capacity ratios
- Variable congestion as measured by the variability in volume to capacity ratios.

As traffic volumes increase and approach the capacity of a road, there is an increase in the vulnerability of the traffic flow to breakdown because of relatively minor events. Given the existing level of service (level D to F on the Pacific Highway at some intersections) is resulting in traffic being held up and delayed at a number of intersections, additional external traffic will result in frequent delays and slowing of traffic.

The higher than average crash rates further increase the impact on travel time reliability for drivers. Minor changes in traffic have a disproportionate impact on the travel time along a congested road. As a result, travel times during peak periods vary significantly from day-to-day and it is difficult for travellers to predict the length of time they will be travelling.

3.2.8 Amenity

High traffic volumes, particularly of heavy vehicles, reduces the amenity of local centres such as the Coffs Harbour CBD. Land uses in central Coffs Harbour include commercial and retail which generates cross highway vehicle movements and pedestrian demand. As demand and congestion increase, amenity is further reduced because of noise impacts and severance. Reduced amenity from traffic congestion is considered to cause an indirect cost to business (Centre for International Economics 2006). Such impacts are understood to affect people and districts, reduce liveability or attractiveness of an area, and reduce business returns as a result.

With the project in place there would be a reduction in the total number and the proportion of heavy vehicles travelling through key intersections. This reduction in number and proportion of heavy vehicles will improve the overall capacity and efficiency of these intersections, reducing congestion and improving amenity.

3.3 Project objectives

The Pacific Highway upgrade program, which is complemented by the project, aims to support regional development. The objectives of the program are to:

- Significantly reduce road crashes and injuries
- Reduce travel times
- Reduce freight transport costs
- Develop a route involving the community and considering its interests
- Provide a route supporting economic development
- Manage the upgrading of the route in accordance with the principles of ecologically sustainable development
- Provide the best value for money.

Table 3-9 lists the project objectives and how they would be met.

Table 3-9 How the objectives of the Coffs Harbour Bypass project would be met

Objective	How the project meets the objectives
Provide travel time savings for through and local traffic, and business vehicles/freight	Travel time for daytime traffic using the proposed bypass to travel through Coffs Harbour is expected to be reduced by 10 to 12 minutes in 2024, and by 12 to 20 minutes in 2044 as a result of the project when compared to the future base case.
Provide a road which supports and integrates with the broader transport network	The project would provide a four-lane divided highway to complement the National Land Transport Network and recently upgraded Pacific Highway. The project would also result in improvement to transport efficiency of the existing highway through Coffs Harbour. It would relieve congestion on the wider Coffs Harbour road network and provide an alternative route for some local trips. This improved transport efficiency and the resulting improvements to accessibility to the Coffs Harbour CBD would likely result in wider economic benefits for the Coffs Harbour area.

Objective	How the project meets the objectives
Provide sufficient road capacity to meet traffic demand on the Pacific Highway	The project would result in additional highway capacity with the provision of four additional traffic lanes (two lanes northbound and two lanes southbound). Traffic congestion would be reduced with daytime through traffic travel times reduced by 10 to 12 minutes in 2024, and by 12 to 20 minutes in 2044 as a result of the project.
Provide safer road conditions for all road users on the new and existing road	The project would provide a high standard road, removing through traffic and some local traffic from the existing road network which would reduce conflicts and improve safety. It is expected that the project would result in 60% lower heavy vehicle volumes travelling through the Coffs Harbour CBD by 2044. Annual total crashes are expected to reduce by 11 crashes in 2024 and 15 crashes in 2044. Overall, it is expected that the project would have a crash rate of 12.5 per 100 mvkt, which is consistent with the expectations of new highways constructed to a 110 km/h design speed.

3.4 Statement of strategic need

3.4.1 Summary of the need for the project

The existing Pacific Highway through Coffs Harbour comprises two lanes in each direction with 12 sets of traffic signals and is between the CBD and other major commercial and industrial precincts.

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals. In addition, there is a small section of the Pacific Highway at Coolongolook, which is in an urban area with an 80km/h speed limit, but without traffic signals.

Roads and Maritime has been planning for the project since 2001 as part of the CHHPS (RTA 2001a). The preferred route for the strategy was announced in 2004 and included the Coffs Harbour Bypass in the south, and the Sapphire to Woolgoolga upgrade in the north. A preliminary concept design for the project was placed on community display in 2008 and the new road corridor was reserved in Coffs Harbour City Council (CHCC) Local Environment Plan (LEP) in 2013. The Sapphire to Woolgoolga upgrade opened to traffic in 2014.

The project would be funded by the Australian and NSW governments. Subject to project approval and funding availability, construction of the project is proposed to start in 2020 and would take about four to five years to complete, weather permitting.

Conflict between pedestrian, passenger and freight traffic through the Coffs Harbour urban centre has resulted in a high crash rate and will continue to be a substantial safety issue as traffic volumes continue to increase.

By providing a bypass of Coffs Harbour, the project would address declining transport efficiency, urban congestion and road safety issues caused by the interaction of through and local traffic. The completion of the project will also contribute to providing almost 2000 kilometres of high standard road between Melbourne and just south of Gympie in Queensland.

The rationale for the upgrade of the Coffs Harbour Bypass is consistent with the rationale for the broader Pacific Highway upgrade program, which seeks to improve the capacity and quality of the Pacific Highway, improving safety, travel times and reliability. Completion of the Coffs Harbour Bypass would complement the objectives of the Pacific Highway upgrade program and contribute to realising the full $4.4 – $4.7 billion

of program-wide benefits estimated in the Pacific Highway Upgrade Program Economic Appraisal 2011 Update.

3.4.2 Consequences of not building the project

The following consequences are anticipated if the project is deferred:

- Worsening traffic congestion within Coffs Harbour would lead to greater delays and further deterioration of travel time reliability for both local and longer distance trips, affecting passenger and freight transport tasks
- Forecast growth in freight traffic, particularly on the key Melbourne, Sydney and Brisbane freight network would lead to greater levels of congestion on the Pacific Highway at Coffs Harbour. The proportion of heavy vehicles and through traffic travelling through Coffs Harbour would likely to increase, adversely affecting road safety and amenity within the Coffs Harbour CBD
- The motorist, cyclist and pedestrian casualty rate would continue to be more than three times higher than expected of a road of this class and expected to worsen
- Not addressing the current situation would mean Coffs Harbour would remain as one of two locations on the east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where motorists would be interrupted by traffic signals and congestion bottlenecks at Coffs Harbour would continue
- Opportunities for economic growth and development within Coffs Harbour will continue to be constrained by the existing highway.

CHAPTER

4

Chapter 4

Project development and alternatives

4. Project development and alternatives

This chapter describes the various alternatives to the project that were considered as part of the project development process and explains how and why the project was selected as the preferred option.

Table 4-1 sets out the SEARs that relate to the consideration of alternatives and options within the project and identifies where these SEARs have been addressed in this EIS.

Table 4-1 SEARS relevant to the project development and alternatives

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following:	
(e)	An analysis of any feasible alternatives to the project;	Section 4.2
(f)	A description of feasible options within the project, including: – Alternative methods considered for the construction of the project, including the tunnels; and – Staging of the project;	Section 4.3 Section 4.5 Section 4.6 **Chapter 6, Construction**
(g)	A description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative/option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to, and options(s) within, the project were selected, including: – Details of the highway corridors and route options from the development of the Coffs Harbour Highway Planning Strategy, and the criteria that was considered in the selection of the preferred route;	Section 4.2 Section 4.3 Section 4.5 Section 4.6
(i)	A demonstration of how the project design has been developed to avoid or minimise likely adverse impacts;	Section 4.7

4.1 Overview

4.1.1 Early development

A bypass of the Coffs Harbour urban area has been in consideration since the 1970s with the then Department of Main Roads approving the Hogbin Drive arterial route in late 1973. This route was located east of the existing Pacific Highway and Coffs Harbour urban area. The alignment generally followed the existing Hogbin Drive and included a southern connection to the existing highway in the vicinity of the Coffs Harbour Airport and a northern connection to the existing highway near West Korora Road.

The Hogbin Drive arterial route was abandoned in 1989 because of strong opposition from the community and the Coffs Harbour and District Chamber of Commerce, with independent investigations commissioned by the Chamber of Commerce in 1983 and CHCC commissioning a study into a western arterial route in 1987. The land within the former route has since been developed with Coffs Harbour Health Campus occupying land in the south and residential and tourist development occupying land in the north.

4.1.2 Development associated with Pacific Highway upgrade program

The Australian and NSW governments have been jointly upgrading the Pacific Highway as part of the Pacific Highway upgrade program between Hexham and the Queensland border since 1996. Further detail on the Pacific Highway upgrade program is provided in **Chapter 3, Strategic justification and project need**.

Planning for the project began in 2001 as part of the Coffs Harbour Highway Planning Strategy (CHHPS) (RTA 2001a). The CHHPS was developed by Roads and Maritime in association with the DPIE and CHCC. It involved extensive consultation with a wide range of community groups and individuals. The purpose of the CHHPS was to:

- Address the need to upgrade the Pacific Highway between Sapphire and Woolgoolga
- Plan for future traffic needs within the Coffs Harbour urban area
- Provide planning certainty for CHCC and the community.

The original study area for the CHHPS identified in September 2001 covered an area from south of Sawtell to north of Woolgoolga and as far west as Coramba (refer to **Section 4.2.2**). The eastern extent of the study area was the existing Pacific Highway corridor. The study area was divided into two broad investigation areas to facilitate the CHHPS intent of addressing the need to upgrade the Pacific Highway between Sapphire and Woolgoolga while planning for future traffic needs within the Coffs Harbour urban area.

The study area was subsequently expanded westwards, in response to community feedback, to enable a review of potential options through the Bucca and Orara valleys and northwards to incorporate a section through the Clarence Valley local government area. The northern limit extended to the Pacific Highway at Halfway Creek.

A wide range of potential road corridors and route options were investigated within the CHHPS study area. These included options developed by Roads and Maritime and options put forward by CHCC and the community. The options investigated for the CHHPS would ultimately fall within three broad strategic corridors:

- Far Western Bypass: A bypass of Coffs Harbour and Woolgoolga through the Orara Valley from Englands Road south of Coffs Harbour to Halfway Creek or Grafton (refer to **Section 4.2.2**)
- Coffs Harbour City Council Preferred Corridor: Options within a corridor that included the Coastal Ridge Way and was adopted by CHCC in late 2003 as its preferred option for a bypass of Coffs Harbour and Woolgoolga (refer to **Section 4.2.3** and **Section 4.2.4**)
- Coastal Corridor: Options along the coastal plain between Englands Road south of Coffs Harbour and Arrawarra Creek north of Woolgoolga, with an extension to Halfway Creek which included the Inner Corridor and upgrade of the existing Pacific Highway (refer to **Section 4.2.2** and **Section 4.3**).

The assessment of the three broad strategic corridor options throughout 2001 to 2004 found that the Coastal Corridor was the most feasible corridor option due to its good functional performance, manageable environmental impacts and value for money.

Route options within the Inner Corridor (an option of the Coastal Corridor) around the main Coffs Harbour urban area from Englands Road to Korora were identified and evaluated against the option of upgrading along the existing Pacific Highway to urban motorway standards. The options were displayed in February 2004 and it was announced that the upgrade of the existing highway upgrade was not acceptable because of its potential social and economic impacts on Coffs Harbour.

The preferred option for the CHHPS was announced in November 2004 after community input, detailed investigations and discussions with a range of government agencies. The preferred option comprised route

options from the Coastal Corridor and included Inner Corridor options for Coffs Harbour, upgrading of the existing highway from Korora to South Woolgoolga and a bypass of Woolgoolga.

Further detail and the evaluation of the alternatives considered for the CHHPS section relevant to the project and route options considered for the Inner Corridor are provided below in **Section 4.2** and **4.3** respectively.

Roads and Maritime carried out further field investigations to allow development of a preliminary concept design for the project after the announcement of the preferred option. Information collected from the investigations was used to further reduce potential impacts of the preferred option and better define the boundaries of the road corridor.

In September 2008, the preliminary concept design for the project was announced and displayed for community comment. In response to community submissions received during the display, the concept design was further refined. This allowed CHCC to reserve the route in the local environmental plan (LEP) to provide planning certainty for CHCC and the local community. The road corridor based on this design was incorporated into the Coffs Harbour LEP 2013 (Coffs Harbour LEP) with a SP2 zoning for infrastructure.

A number of reviews, investigations and refinements have been carried out since the incorporation of the project into the Coffs Harbour LEP. This included optimisation of interchange designs and evaluation of a series of options and staging opportunities for key design features between 2016 and 2018. Refinements to the project since its incorporation in the Coffs Harbour LEP were made to improve traffic performance, reduce potential environmental impacts, address community and stakeholder feedback on the 2018 concept design and optimise overall value for money of the project. Further detail on the opportunities considered and their evaluation is provided in **Sections 4.5** and **4.6**.

Figure 4-1 shows the location of the three broad strategic corridors described above and outlines key decisions and milestones for the development of the project and CHHPS.

4.2 Project alternatives

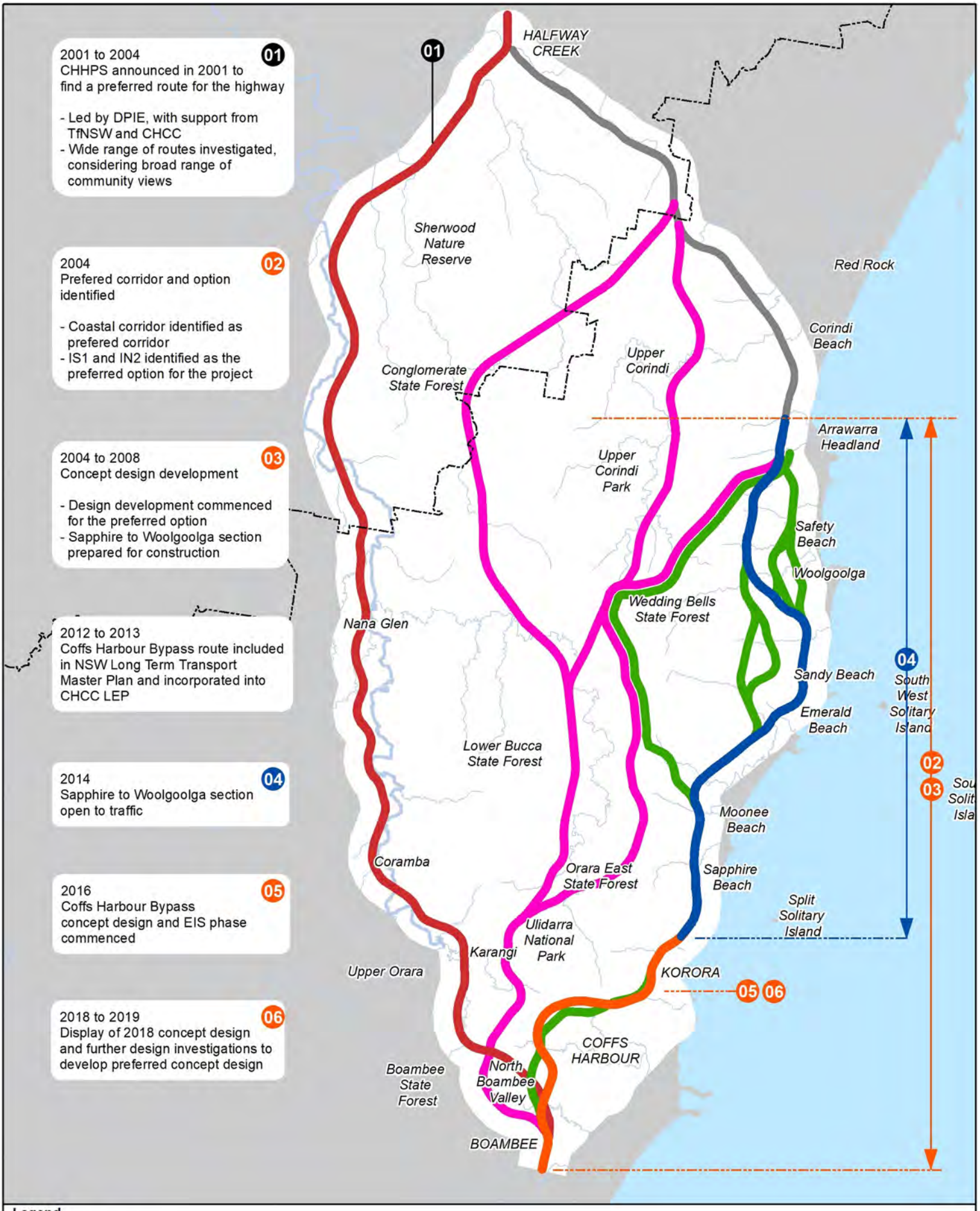
The project has a detailed history of investigating and considering alternatives to achieve the objectives of the CHHPS and Pacific Highway upgrade program. There were several phases of investigation because the CHHPS study area focused on two sections, the southern (Coffs Harbour) and northern (Sapphire to Woolgoolga) sections, and that Roads and Maritime examined additional corridor options proposed by CHCC and community interests.

Parts of some corridors were examined on more than one occasion as they were included in new or revised corridors during these investigations. An initial phase of investigations produced four diverse corridors and was followed by subsequent investigation phases. The corridors investigated and the potential route options were presented in different community update releases and detailed in technical investigation documents prepared by Roads and Maritime. The main reports included:

- Coffs Harbour Highway Planning Strategy – Preliminary Concept Design (RTA 2002a)
- Coffs Harbour Highway Planning: Coffs Harbour Section – Strategy Report (RTA 2004c)
- Coffs Harbour Highway Planning: Coffs Harbour Section – Review of the Coastal Ridge Way Proposal (RTA 2004b)
- Coffs Harbour Highway Planning: Southern and Northern Sections – Coffs Harbour City Council Preferred Corridor Feasibility Assessment (RTA 2004d)
- Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004f).

These documents and associated community update releases are located on Roads and Maritime's website (***https://www.pacifichighway.nsw.gov.au/coffsharbourbypass***).

A summary and evaluation of each of the alternative corridors considered for the project as part of the CHHPS is provided in the following sections.



Coffs Harbour Bypass
Project history overview with key decisions and milestones
Figure 4-1

4.2.1 Do nothing/do minimum

Do nothing

A ‘do nothing’ alternative was originally considered in the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004f). It involved retaining the existing Pacific Highway in its current configuration as the main south–north transport corridor through the Coffs Harbour urban area. This alternative would only involve maintenance work on the existing highway.

The main benefit of the ‘do nothing’ alternative is that no capital expenditure or resources would be required for implementation. However, the ‘do nothing’ alternative is not considered to be a viable alternative to carrying out the project as it would not accommodate the predicted growth in population and traffic at Coffs Harbour or the movement of people around the region.

A ‘do nothing’ alternative would result in the consequences described in **Section 3.4.2** and the predicted improvements to traffic capacity, safety, travel times, travel reliability, and the expected amenity and environmental benefits along the existing Pacific Highway would not be achieved. As such, the ‘do nothing’ is not a feasible alternative to the project.

Do minimum

In September 2016, Roads and Maritime investigated the implementation of clearways on the Pacific Highway through Coffs Harbour. Providing a clearway would add another lane to the existing highway potentially improving traffic flow, predominantly during holiday periods. This ‘do minimum’ alternative would retain the 12 sets of traffic lights on the existing highway through Coffs Harbour, but remove parking from the existing highway within the CBD and urban area. The investigations considered two clearway sections including between West High Street and Bray/Orlando Streets (1.8 km) and between Isles Drive and Coff Street (4.3 km).

There are limitations to widening the existing highway corridor at the southern and northern ends because of existing large retaining walls and cuttings. Widening these large retaining walls and cuttings was not considered as part of the clearway strategy. These areas would remain as pinch points under this alternative option and traffic would be required to form two lanes.

The estimated cost to implement the clearways in 2016 dollars was between $90 million and $300 million. This estimate included allowance for property acquisition needed to accommodate upgrades to the existing highway to establish the clearway, and upgrades to existing infrastructure at several locations (such as widening the existing bridge over Coffs Creek). It was estimated that travel time savings would only be two to three minutes with the clearway in place.

Overall, the ‘do minimum’ alternative of implementing clearways on the existing highway was not supported because of the low traffic relief benefits and the impact on parking and amenity within the Coffs Harbour CBD and urban area. As such, it was not considered a long-term solution to the issues described in the CHHPS or a feasible alternative.

4.2.2 Initial corridor identification

The initial phase of work for the CHHPS included identification and assessment of corridor options for the future upgrading of the Pacific Highway that were spread across the Coffs Harbour LGA. The primary objective of this phase of the study was to identify if and when a bypass of Coffs Harbour would be justified in the future and, if so, the most suitable corridor to take forward to the next planning and design stage.

Three initial corridors were identified by Roads and Maritime and released to the community in the September 2001 launch of the CHHPS. A fourth corridor (Far Western Corridor) was raised by the community following the launch of the CHHPS.

The four corridor options included:

- Inner Corridor – a bypass around 11 km long skirting the western edge of the existing Coffs Harbour urban area
- Central Corridor – a longer corridor option around 25 km long passing by the outskirts of Coffs Harbour, and providing a more westerly bypass of the town and surrounding area
- Outer Corridor – a bypass further west at its southern section and sharing the same northern section as the Central corridor, around 31 km long
- Far Western Corridor – a bypass that traverses the Orara Valley and re-joins the existing highway in the north, either at Halfway Creek or to the south of Grafton.

Figure 4-2 shows the general location of the initial corridor options.

Investigation of these corridors included design analysis, preliminary cost estimates, traffic modelling, road user cost benefit analysis and consideration of biodiversity and land-use planning issues. The results of the investigations were summarised in Information Sheet No. 2 and detailed in three technical working papers as part of the Coffs Harbour Highway Planning Strategy – Preliminary Concept Design (RTA 2002a). A summary of the key findings is provided in **Table 4-2.**

Table 4-2 Evaluation of initial corridor options

Aspect	Comment
Preliminary cost estimates	Strategic cost estimates were prepared for each of the three original bypass corridors and an indicative estimate was developed for the Far Western Corridor using average cost per kilometre rates for major highway construction. Given the variable lengths and alternative connection points for this corridor, a wide range of costs resulted.
Traffic modelling	The range of expected traffic volumes to the south and north of Coramba Road for each bypass corridor in 2021 indicated that generally the further west the corridor, the less traffic it would attract. This was consistent with surveys that confirmed a large proportion of highway traffic is locally generated. The Inner Corridor attracts significantly more traffic as it provides for more use by local traffic.
Road user cost benefit	The results indicated that the Inner Corridor was the only option likely to provide net benefits in the long-term planning horizon. By contrast, the relatively high costs and small traffic attraction of the Central, Outer and Far Western corridors made them undesirable economic proposals, even in the very long-term.
Biodiversity	The Far Western, Outer and Central corridors were severely constrained in terms of known and potential habitat for threatened species and severance of numerous wildlife corridors. By contrast, the Inner Corridor had a relatively low impact on biodiversity as it passed through largely cleared lands and any adverse effects on wildlife corridor were anticipated to be mitigated.
Land use	All options would involve significant property acquisition. The Inner Corridor would have a greater effect on urban release areas under consideration at the time by CHCC while the other options further west would have a greater effect on rural and agricultural areas.

It was concluded that the Inner Corridor was the only option that represented a feasible long-term investment in terms of relative costs and road user benefits. The comparative assessment showed that the Central, Outer and Far Western corridors could not be justified in the adopted planning horizon and, as such, they would not be investigated further. It was resolved that work on the CHHPS should proceed to develop routes within the Inner Corridor and compare the identified options with various upgrading scenarios for the existing highway through the Coffs Harbour CBD.

There was a high level of concern expressed in the community about the implications of dismissing all but the Inner Corridor and upgrade of the existing highway (ie the Coastal Corridor) following the release of findings in March 2002 in the Coffs Harbour Highway Planning Strategy – Preliminary Concept Design (March 2002) and summarised Information Sheet No. 2.

CHCC engaged an independent peer review of the CHHPS findings in response to the March 2002 release. The peer review is documented in the Coffs Harbour Planning Strategy Highway Upgrading Options – Peer Review (September 2002). The review concluded that, "the Inner Corridor is the preferred of the options for a bypass of Coffs Harbour and that the Planning process has provided for the delivery of the best option for the Coffs Harbour local community".

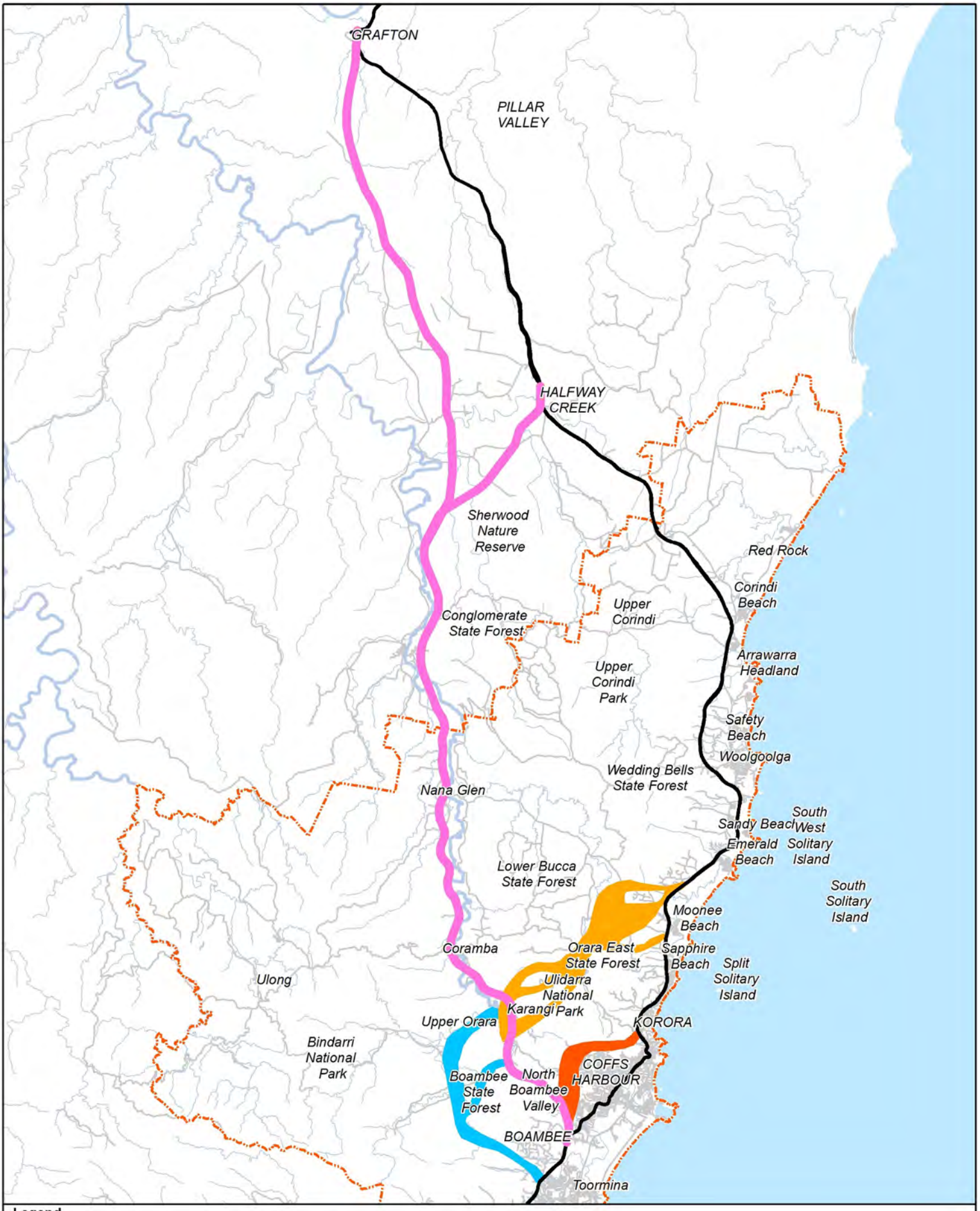
4.2.3 Coastal Ridge Way

The Coastal Ridge Way (CRW) corridor option was initially identified by members of the community and was progressively developed by Roads and Maritime in consultation with the CRW main community supporters. Development of the CRW was prompted by concerns about the potential social impacts (eg noise, air quality, safety, property acquisition and other environmental impacts) associated with an Inner Corridor option or an upgrade of the existing highway.

The CRW corridor traversed the rugged terrain to the west of the Coffs Harbour urban area and extended for about 38 km from Englands Road in the south to Arrawarra in the north (refer to **Figure 4-3**). The CRW corridor was also generally located in the same part of the study area as the previously investigated Central Corridor and had a similar transport and traffic function, including the opportunity to link with an option for the northern (Sapphire to Woolgoolga) section of the CHHPS. The main difference between the CRW corridor and Central Corridor was the different alignment in the southern part through the North Boambee – Karangi area and the consequently very different engineering, cost and socio-economic implications.

With the high-level support from part of the community for the CRW corridor and in response to a request from CHCC, it was agreed to conduct a review of the CRW corridor in parallel with investigations into the Inner Corridor and options to upgrade the existing highway. The investigations were detailed in the Coffs Harbour Highway Planning: Coffs Harbour Section – Review of the Coastal Ridge Way Proposal (RTA 2004b) and summarised in the Community Update No. 4. The investigations examined the key physical features, cost, traffic and economic performance of the CRW corridor and assessed its impacts across a range of social and environmental planning issues. The investigations concluded that the CRW corridor did not support the principles of ecologically sustainable development, and did not merit further consideration as an option for further development because of:

- The significant topographical constraints and engineering challenges associated with locating the CRW corridor outside the coastal plain and into the steep and hilly terrain associated with the coastal range
- The poor functional performance
- The high cost and poor economic viability
- The significant adverse impacts on biodiversity.



Legend

Initial corridor options
- Inner Corridor
- Central Corridor
- Outer Corridor
- Far Western Corridor

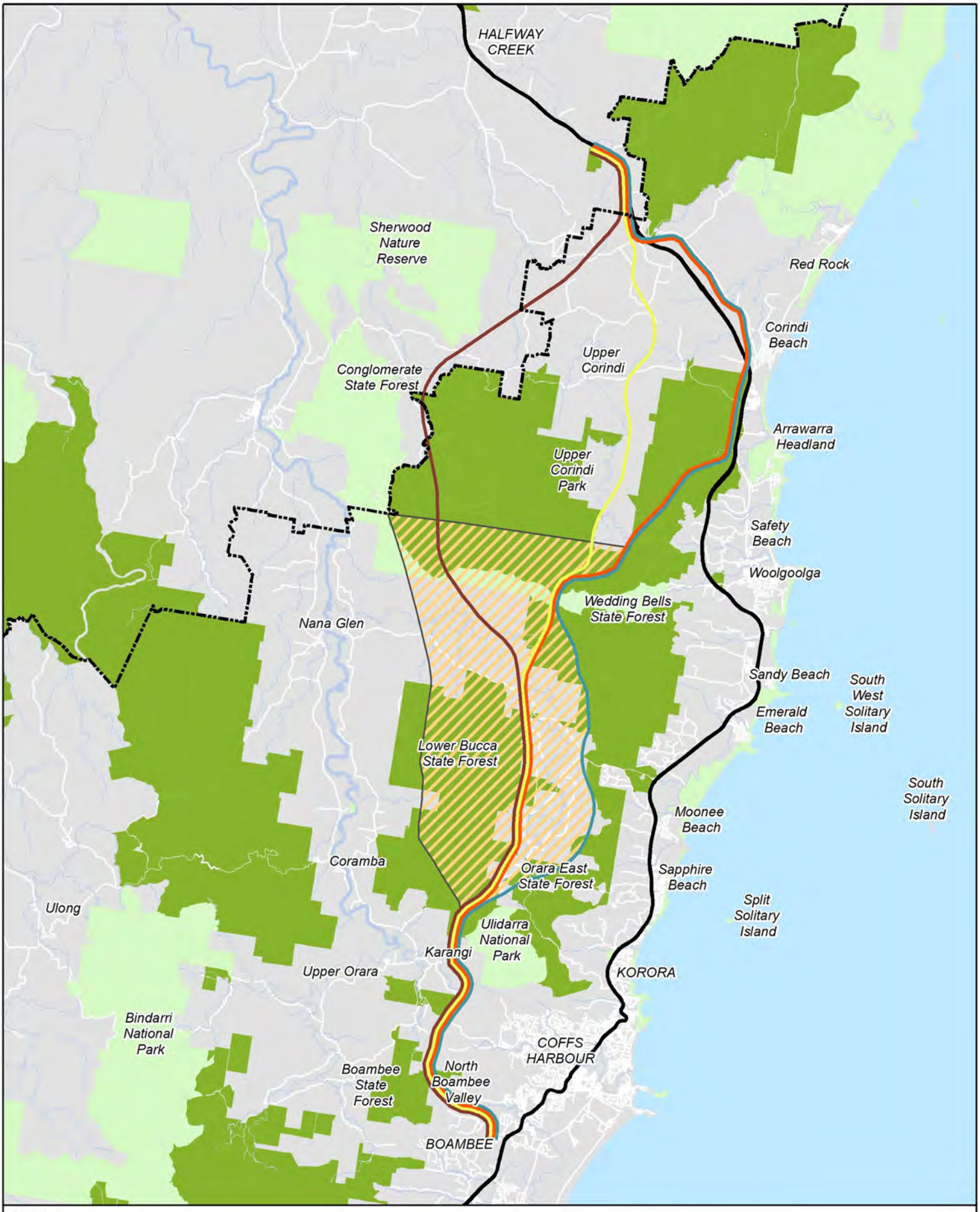
- Existing Pacific Highway
- Coffs Harbour City Council boundary

Coffs Harbour Bypass
Initial strategy corridor options
Figure 4-2

0 3 6 9 km

Scale @A4: 1:300,000
GDA 1994 MGA Zone 56

N



Legend

- Coastal Ridge Way / Option A
- Western Bucca Corrindi River / Option A
- Western Bucca Sherwood Creek / Option A
- Western Bucca Valey / Option A
- Existing Pacific Highway
- Coffs Harbour City Council Boundary
- ParksAndReserves
- StateForest
- CHCC Preferred Corridor (adopted at a special meeting on 29 October 2003)

Coffs Harbour Bypass
Coastal Ridge Way and CHCC preferred corridors
Figure 4-3

0 2 4 6 km

Scale @A4: 1:200,000
GDA 1994 MGA Zone 56

N

4.2.4 Coffs Harbour City Council Preferred Corridor

In late 2003, after a series of CHCC community forums on the highway planning, CHCC adopted a position of support for a western bypass of Coffs Harbour and Woolgoolga. CHCC concluded that the Inner Corridor option and an option to upgrade the existing highway did not address the objectives developed in the community forums. The (then) Minister for Roads agreed to CHCC's request to examine potential routes within the CHCC Preferred Corridor. An assessment was carried out to consider the feasibility of potential route options in terms of functional, socio-economic and biophysical parameters. Full details of the investigation were provided in the Coffs Harbour City Council Preferred Corridor Feasibility Study (June 2004) and summarised in Community Update No. 5.

The CHCC Preferred Corridor covered much of the Bucca Valley and would require construction of the section of the CRW corridor between Englands Road and the Ulidarra National Park. As the CHCC Preferred Corridor ends at the former northern boundary of the LGA, it was necessary to consider options through the Clarence Valley LGA to provide a connection to the existing highway.

The investigations identified four route options within the CHCC Preferred Corridor, the common end points being Englands Road in the south and Halfway Creek in the north (refer to **Figure 4-3**). The options considered within the CHCC Preferred Corridor as part of the feasibility investigation included:

- Coastal Ridge Way/Option A – around 55 km in length including up to five tunnels. The option would traverse State Forest for most of its length and go through the Sherwood Nature Reserve before re-joining the existing highway at Arrawarra Creek
- Western Bucca Valley/Option A – around 53 km in length including up to four tunnels. This option would pass through the western side of the Bucca Valley and the Sherwood Nature Reserve before re-joining the existing highway at Arrawarra Creek
- Western Bucca Valley/Corindi River – around 47 km in length and would pass through the western side of the Bucca Valley and the Sherwood Nature Reserve before re-joining the existing highway north of Corindi River
- Western Bucca Valley/Sherwood Creek – around 51 km in length including up to seven tunnels and would pass through the western side of the Bucca Valley. A series of tunnels up to one kilometre in length were required to provide passage through the western low point in Sherwood Road Ridge before re-joining the existing highway at Dirty Creek Range.

These options were assessed against functional (traffic), cost, socio-economic and biophysical parameters at a strategic level with only broad cost estimates to allow comparison between the options. Based on the assessment of potential alignments, it was concluded that none of the options within the CHCC Preferred Corridor were viable and did not merit further consideration because of:

- Significant topographical constraints and engineering challenges associated with locating the alignment outside the coastal plain and into the steep and hilly terrain associated with the coastal range
- Poor functional performance
- High cost and poor economic viability
- Significant adverse impacts on biodiversity
- Significant impacts upon a landscape of Aboriginal cultural heritage importance.

4.2.5 Upgrading the existing highway

As described in **Section 4.2.2**, the outcome of the initial corridor investigations for the CHHPS and the peer review was to carry out a comparative assessment of an existing highway upgrade with the Inner Corridor.

This required Roads and Maritime to develop routes within the Inner Corridor and compare the identified options with an upgrade of the existing highway through the Coffs Harbour CBD.

Both the Inner Corridor and the existing highway upgrade options were developed to satisfy the overall objectives of the Pacific Highway upgrade program and the objectives developed for the CHHPS. Design development, investigation and evaluation of the Inner Corridor and upgrade of the existing highway were reported in the Coffs Harbour Highway Planning: Coffs Harbour Section – Strategy Report (RTA 2004c) and summarised in Community Update No. 4.

The design for the upgrade of the existing highway through Coffs Harbour was based on contemporary urban motorway schemes and was developed to provide a dual-carriageway facility with grade-separated interchanges and overpasses at key locations for access to and from the highway and/or for local east-west traffic movements. These were complemented by the provision of local north-south service roads or adjustments to existing local roads for access to properties and businesses along the existing highway corridor.

A series of working papers were prepared to assess and compare the impacts of the Inner Corridor and the upgrade of the existing highway across a range of functional (traffic), socio-economic and environmental planning issues. This allowed detailed consideration of the operational characteristics and costs of each corridor option, as well as potential social, environmental and property impacts and available mitigation measures to offset these impacts. A summary of the key findings from the Strategy Report (RTA 2004c) is provided below in **Table 4-3**.

Table 4-3 Comparison of the Inner Corridor and upgrading of the existing highway

Aspect	Inner Corridor	Upgrading the existing highway
Function	• 16-39% reduction in the amount of the total traffic along the bypassed section of the existing Pacific Highway including a 34-51% reduction in the amount of heavy vehicle traffic in 2021.	• Retains the main road traffic flows in the existing corridor but would provide separation of local and through traffic next to service roads and motorway.
	• Heavy vehicle travel times would be reduced by 20% relative to the existing situation.	• Heavy vehicle travel times would be reduced by 15% relative to the existing situation.
Environment	• Corridor traverses several areas of high value native vegetation. However, the nature and scale of potential impacts are likely to be acceptable, with opportunities to effectively mitigate and or offset for these impacts.	• Minimal biodiversity effects.
Socio-economic	• Minimal direct impact on existing urban land use in Coffs Harbour CBD • Substantial adverse impacts on rural and rural residential areas in North Boambee, West Coffs Harbour and West Korora • Adverse impacts on the residential communities near the corridor, mostly from traffic noise and visual impact	• Very high adverse impacts anticipated in terms of urban land use and business activity • Adverse impact in terms of community cohesion due to access restrictions along and across the amplified highway corridor • Significant changes to the urban fabric of Coffs Harbour along the corridor including potentially severe impacts on the form and function of the CBD

Aspect	Inner Corridor	Upgrading the existing highway
	• Beneficial impacts are anticipated for local accessibility and amenity along the existing highway corridor, with the removal of through traffic including significantly reduced heavy vehicle movements. This would also provide potentially significant benefits for CBD land use and property, and overall business activity and tourism.	• No impacts on rural land use.
Cost (in 2004)	• 280 to $425 million	• $690 million

Despite the likely benefits to road users with the option to upgrade the existing highway, it was concluded that this option would likely have unacceptable community impacts (including community disruption), reduced amenity and severe land use and business impacts in the Coffs Harbour CBD. Additionally, when considered with how the Inner Corridor and upgrade of the existing highway performed against the objectives of the Pacific Highway upgrade program, the overall finding was that the Inner Corridor was the most suitable means of meeting future highway needs for Coffs Harbour.

4.2.6 Preferred corridor

The Inner Corridor was determined to be the preferred long-term corridor for the highway strategy in the southern (Coffs Harbour) section of the CHHPS after the investigations carried out between early 2001 and the June 2004 release of the Coffs Harbour City Council Preferred Corridor Feasibility Study.

This decision was reviewed by Roads and Maritime and DPIE in late 2004 as part of the process of identifying and confirming a preferred option for the CHHPS and was documented within the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004g). That review reaffirmed the Inner Corridor as the preferred long-term corridor and agreed that route options within the Inner Corridor were the only viable options for the CHHPS as:

- They would have good functional performance (provide substantial road safety improvements and travel time savings) while still providing opportunities to separate through and local traffic
- Although they have major socio-economic impacts, they would provide the best balance between functional, environmental, social and economic factors
- They would be lower in cost the other corridor options
- Their economic performance was better than the other corridor options in terms of ability to stage construction and benefit-cost ratios.

4.3 Route options development

Various route options were considered for the Inner Corridor as part of the design investigations carried out to compare the Inner Corridor and upgrading the existing highway. The route options were developed considering detailed analysis of technical constraints of the preferred corridor and feedback from the community consultation process. The process to develop options was documented in the Coffs Harbour Highway Planning: Coffs Harbour Section – Strategy Report (RTA 2004c) with the route options displayed to the community in Community Update No. 4 in February 2004.

4.3.1 Description of route options

Two alternative route options were identified in both the southern and northern sections of the Inner Corridor. The four component routes had a common crossover point close to Coramba Road, near its intersection with Bennetts Road. The northern and southern sections of the options were designed to be interchangeable and combined to form a total of four potential route options starting on the existing Pacific Highway just south of Englands Road, passing through the common crossover point, and re-joining the Pacific Highway north of Coffs Harbour at Korora Hill.

The four route options are described in **Table 4-4** and shown in **Figure 4-4**.

Table 4-4 Route options

Route option	Description
Inner South (IS1)	This option deviated from the existing Pacific Highway just south of Englands Road roundabout, crossed North Boambee Road around 300 m west of Bishop Druitt College and continued north toward the low saddle in the Roberts Hill ridge about 100 m west of Buchanans Road, before proceeding to Coramba Road.
Inner South 2 (IS2)	This option initially followed a similar route as IS1 but deviated to the west, south of North Boambee Road and continued to Roberts Hill ridge about 800 m west of IS1. A 560 m long tunnel would have been needed to cross Roberts Hill ridge because of the higher terrain in this area.
Inner North 1 (IN1)	This option passed north–east from Coramba Road crossing Spagnolos Road and Shephards Lane before heading east to Mackays Road following close and parallel to the North Coast Railway for about 1.6 km. From this point, the option deviated to pass through the valley between Sealy Lookout and Gatelys Road before crossing the West Korora basin to re-join the existing highway at Korora Hill.
Inner North 2 (IN2)	This option followed a more westerly alignment than IN1 and crossed Shephards Lane at its western extremity. This option passed through and then to the north of a major ridge near the end of Shephards Lane and crossed the Mackays Road valley to re-join IN1 opposite the western end of Gatelys Road.

4.3.2 Route option evaluation

Key inputs into the route option evaluation were:

- The findings of the technical investigations carried out during option development
- Feedback received from the community
- Outcomes of the value management workshop held in August 2004.

These inputs are further described below.

Coffs Harbour Bypass
Inner corridor options
Figure 4-4

Technical investigations

Technical investigations and assessments carried out during route option development included:

- Traffic assessment – Analysis of traffic and transport performance including consideration of traffic volumes, travel speeds, attraction for heavy vehicles and vehicle operating costs
- Cost and economic performance – Preparation of strategic cost estimates and broad economic analysis to determine road user costs and benefits
- Environmental and social assessment – Technical studies addressing a range of socio-economic, planning and environmental issues including Aboriginal and non-Aboriginal heritage, planning and land use, traffic noise, biodiversity, geotechnical, agricultural land, socio-economic issues, air quality and urban design and visual assessment.

Consideration of the factors raised in these studies and the influence of their findings on the design/development process were summarised in the Coffs Harbour Highway Planning: Coffs Harbour Section – Strategy Report (RTA 2004c). The findings of the investigations and assessments were used in the evaluation of the options during the value management workshop described below.

Community feedback

The route options were on public display from 23 February to 19 March 2004. Feedback from the community received during the staffed displays and from written submissions is documented in the Coffs Harbour Highway Planning Community Involvement Summary Report (Short-Listed Options) (RTA 2004h). A total of 170 submissions (including one petition) and 444 survey forms were received.

Key issues of concern for the community and stakeholders identified in the submissions include:

- Traffic and transport: travel time and efficiency, road safety
- Socio-economic: impacts on residential property and agricultural land use, impacts on business and tourism and forestry activities, access impacts
- Environmental: impacts on biodiversity, geology and soils, Aboriginal heritage and non-Aboriginal heritage, impacts on quality of waterways, noise and vibration, visual and urban design, air quality and community impacts
- Construction: construction costs and construction duration and related disruptions.

Submissions were received expressing support for and opposing each of the options. Submissions were also received around the feasibility of tunnels and whether these were viable for use by dangerous goods vehicles.

Value management workshop

A value management workshop was held on 2-3 August 2004 with participants from key government agencies, community stakeholders and the Roads and Maritime project team. The purpose of this workshop was to consider the four options from a wide range of perspectives and evaluate the options against project objectives and their functional, socio-economic and environmental performance. Full details on the value management study process and all the outcomes from the workshop, including the assessment criteria, weightings and rankings developed were documented in the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004g).

A summary of the outcomes of the option evaluation and ranking process against the performance criteria is included in **Table 4-5**.

Table 4-5 Key outcomes of the option evaluation and ranking process

Performance criteria	Comment
Function	IS1 was considered to perform better than IS2 in regard to long term functionality, safety and flexibility to cater for traffic growth. The difference was largely because of the long tunnel that would be needed through Roberts Hill ridge as part of IS2. This has the potential to restrict future upgrading of the route. IN2 was considered to perform better than IN1 because of its horizontal alignment, and because of the proximity of IN1 to residential areas (existing, released and proposed) and the existing rail corridor.
Environment	IS2 was considered to perform better than IS1 across all environmental assessment criteria, primarily because of the tunnel that would be required through Roberts Hill ridge as part of IS2. IN2 was considered to perform better than IN1 because of the potential impact of IN1 on fauna habitat/vegetation and threatened species.
Socio-economic	IS2 was considered to perform better than IS1 primarily because it would be further removed from residential development. IN2 was considered to perform better than IN1 across all socio-economic assessment criteria except in terms of impact on agricultural lands. The location of the route behind the ridge to the north of urban development would give some useful shielding of nearby residences from noise and visual impacts but would result in the loss of a significant area of banana and agricultural land associated with the ridge.

The workshop participants unanimously selected Option IS2 and IN2 as the preferred options for the project. The principal reasons for selection of these options were:

- These options would provide the most effective physical separation from existing residential communities
- They would have least impact on planned urban development areas
- They would have the least traffic noise implications
- They would have the lowest visual and landscape impacts and provide greatest opportunity to mitigate adverse effects.

In reaching these overall findings, the workshop recorded several key issues that would need to be addressed in any subsequent investigations to select the preferred option. These issues included:

- Concern that the cost of IS2 (about $65 million from 2004 estimates) which was attributable to the 560 m long tunnel through Roberts Hill ridge may not merit the benefits obtained
- The availability of funding for the construction of the preferred option
- The need for immediate action to secure the preferred option and replan the future development of the West Coffs Harbour and North Boambee areas
- The need to address the impacts on agricultural land
- Concerns about the feasibility of tunnels and the resolution of issues associated with the transportation of dangerous goods
- Concerns about community support of a preferred option located within the Inner Corridor.

4.3.3 Preferred option

After the value management workshop, representatives from Roads and Maritime and DPIE reviewed the work carried out between 2001 and 2004 as part of the process of identifying and confirming a preferred option for the CHHPS. This review is documented in the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004g) and involved consideration of the technical investigations, the outcome of the value management workshop and the results of the community consultation activities. The purpose of the review was to identify the recommended preferred option for consideration by the then NSW Minister for Roads.

The review focused on the likely extent of development expected in the North Boambee Valley and the West Coffs Harbour area before construction of the project. The review recommended IS1 over IS2, concluding that IS1 would have lower engineering risks and would provide better value for money as there would be additional ongoing operational costs associated with a 560 m long tunnel through the Roberts Hill ridge with IS2. It was also found that IS1 had the potential to be refined to further reduce potential noise, visual and other environmental impacts and that the overall potential impacts of IS1 on likely future land use were similar to IS2 and could be mitigated by replanning the development of the North Boambee Valley.

The review also recommended IN2 over IN1 despite the higher cost associated with IN2, as it was found that the IN2 option would have less impact on existing and proposed development in the West Coffs Harbour area and would result in less severance of existing and future communities. It was also found IN2 would provide for better use of the natural ridges and would reduce the potential noise and visual impact on properties and proposed urban areas near the project.

As such, the review concluded the preferred route option for the project was a combination of IS1 and IN2. The preferred option was announced to the community in Community Update No. 6 in November 2004 and the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004g).

The preferred route option, as announced, is presented in **Figure 4-5.**

The preliminary concept design and refinements made since the announcement of the preferred route option are discussed in the following sections.

4.4 Preliminary concept design

A total of 22 submissions were received in response to the public display of the preferred route in Community Update No. 6. Submissions included multiple submissions from some groups and individual residents. The majority of issues raised in the community feedback were in relation to the selection of the Inner Corridor as the preferred route, with a number of submissions calling for the adoption of alternative corridors and the removal of heavy vehicle traffic from the Coffs Harbour area.

After the announcement of the preferred route option in 2004, Roads and Maritime continued to refine the concept design in consultation with CHCC and directly affected property owners to a level where the boundaries of the road reserve corridor could be defined and incorporated into the Coffs Harbour LEP.

Refinements to the design included:

- Adjustments to the design of cut and fill batters
- Development of arrangements to provide access to nearby properties which included dedicated overpass or underpass structures in some locations
- Development of designs for grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- An upgrade of the existing highway between Korora Hill and the dual carriageway at Sapphire.

The design was documented in the Coffs Harbour Bypass – Concept Design Report (RTA 2008a) and placed on public display. The Concept Design Report also provided a comparison of the feasibility of tunnel structures, as an alternative to deep cuttings at the major ridges on the bypass route. A decision on whether to proceed with tunnels or cuttings through each of the major ridges would be carried out at the time of detailed planning and environmental assessment of the project. The road reserve corridor was based on cuttings with a cut-and-cover tunnel for Roberts Hill ridge.

A total of 232 submissions were received in response to display of the concept design. Issues raised included the need to retain the Luke Bowen footbridge and the bus stop/interchange arrangements at Korora. Other issues raised included the design of the bypass, including traffic and access, and impact of the project on biodiversity, flooding, water quality, the Solitary Islands Marine Park, noise, air quality, agriculture, business, tourism and the community. Issues raised were considered in the subsequent design investigations.

The road corridor based on this design was incorporated into the Coffs Harbour LEP 2013 with a SP2 zoning for infrastructure.

Legend

- Carriageway
- On/off ramp
- Proposed road boundary
- Interchange and service road

Coffs Harbour Bypass
Preferred option (Concept Design Report 2008)
Figure 4-5

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

4.5 Concept design development (2016–2018)

In 2016, Roads and Maritime recommenced design development and investigations. The main purpose of this phase of the project was to assess project features within the road reserve corridor documented in the Coffs Harbour Bypass – Concept Design Report (RTA 2008a).

Key activities that have influenced refinement of the 2008 preliminary concept design since 2016 include:

- Display of the 2008 preliminary concept design in mid-late 2016 which re-introduced the project to the community after a period of inactivity and sought feedback on the design to identify issues and opportunities (see **Chapter 7, Consultation** for further detail)
- Start of environmental studies and investigations to address the SEARs and identify opportunities to further minimise potential environmental impacts
- Strategic review and investigation of the design to identify opportunities to improve value from both an economic and community perspective, while meeting functional requirements.

The strategic review and investigation of the design resulted in a series of options and staging opportunities being developed in late 2017. These options and opportunities were assessed against the following key criteria that were adopted for this phase of the project:

- Value for money
- Ensuring all vehicles could use the bypass
- Sustainability from an operating and maintenance perspective
- Ensuring delivery in line with publicly stated timeframes.

For the purposes of the assessment, value for money considered both the capital cost of construction and operational and maintenance cost of the option. The evaluation categories used to identify the preferred options included function, environment, socio-economic and cost considerations which were based on the categories used to assess the route options for the project as part of the CHHPS.

A major outcome of the design development undertaken during this period was to display a refined concept design to the community before finalising and exhibiting the EIS. This occurred in late 2018.

Features of the design that were reviewed and investigated, including consideration of options, and development outcomes are provided in the following sections.

4.5.1 Interchange location

Community feedback from the display of the 2008 preliminary concept design in mid-late 2016 covered a range of issues including comments about the proposed interchanges at Coramba Road and Korora Hill. Concerns included:

- Noise associated with Coramba Road interchange with vehicles using on/off ramps and capacity of Coramba Road to facilitate traffic to and from the bypass
- Noise, scale of infrastructure and visual impact associated with the proposed Korora Hill interchange design.

A review of the need for and location of interchanges was carried out in February 2017 in response to these concerns. The purpose of the review was to confirm whether the connection strategy presented in the preliminary concept design (with interchanges at Englands Road, Coramba Road and Korora Hill) would provide the best outcomes for the project and for Coffs Harbour.

Alternative connection strategies were identified considering two primary functions of the Pacific Highway at Coffs Harbour:

- Facilitating the movement of freight and people as part of the National Land Transport Network
- Providing efficient access to and from Coffs Harbour.

The alternative connection strategies comprised different locations of interchanges and a reduced number of interchanges. These strategies were identified considering the land use context for Coffs Harbour, including travel patterns to access key locations and activity centres, and the existing road network within Coffs Harbour. The focus of the investigation was to identify the number of interchanges needed and where interchanges should be located to best provide access to and from Coffs Harbour, considering functional, environmental and socio-economic factors, while providing value for money.

Four connection strategy options were identified and these are described in **Table 4-6** and shown in **Figure 4-6**. Preliminary designs were developed for each option based on the 2008 preliminary concept design. The key differences between the options were the number of and locations for interchanges to connect the project to the existing road network in Coffs Harbour.

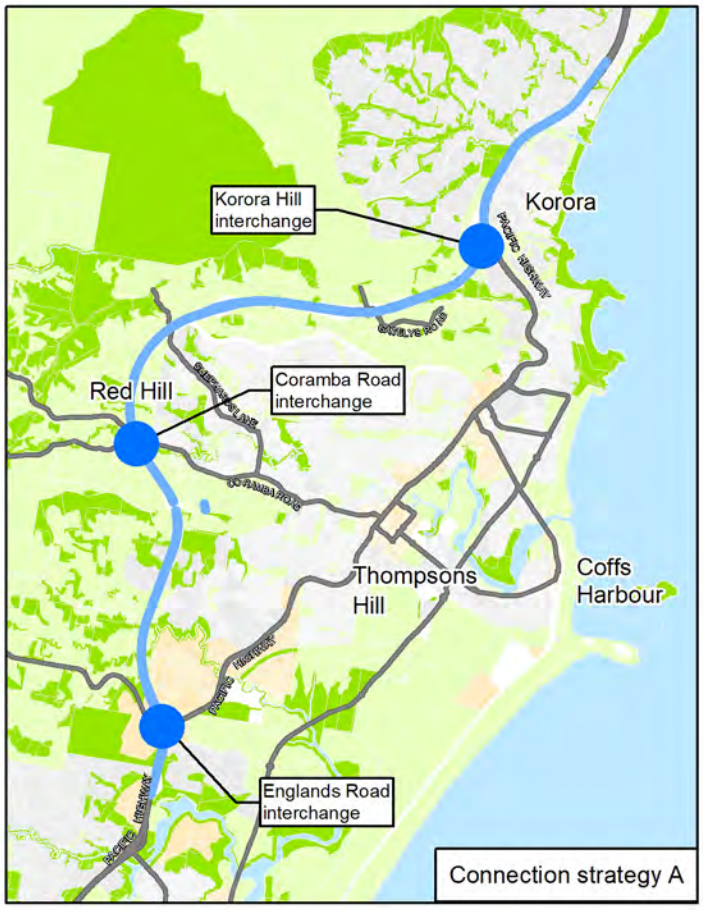
Table 4-6 Alternative connection strategies considered for the project

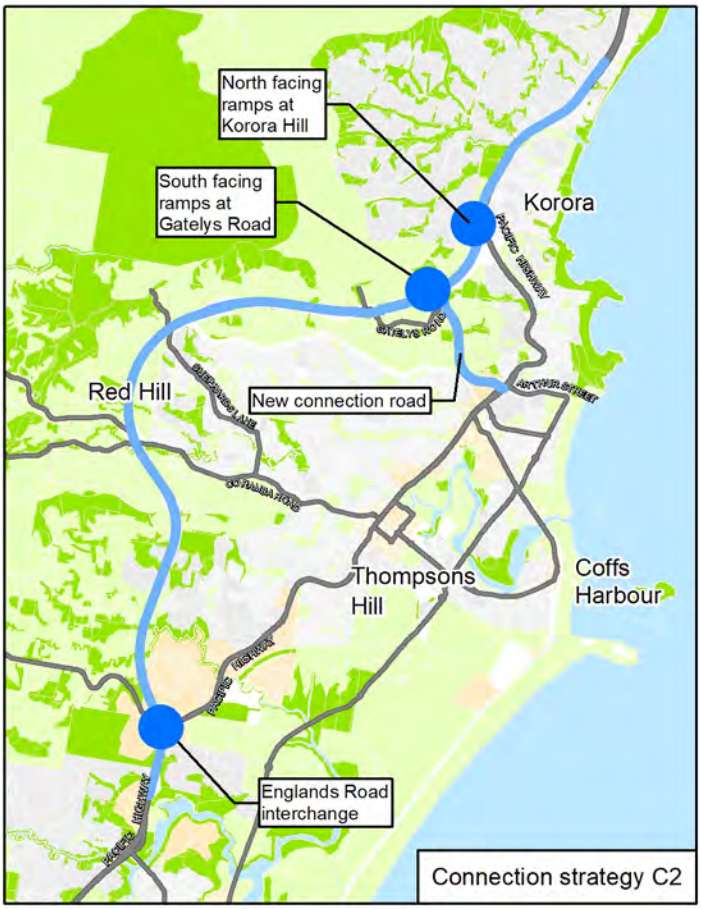
Connection strategy option	Description
Option A	Option A was consistent with the connection strategy presented in the 2008 preliminary concept design with interchanges at Englands Road, Coramba Road and Korora Hill.
Option B	Option B included two grade-separated interchanges, at Englands Road and Korora Hill, and no interchange at Coramba Road.
Option C1	Option C1 had two grade-separated interchanges at Englands Road and Gatelys Road, and no interchange at Coramba Road. It also includes a four-lane connection road linking the Gatelys Road interchange with the Arthur Street overpass on the existing Pacific Highway (at Park Beach Plaza).
Option C2	Option C2 had two grade-separated interchanges at Englands Road and Gatelys Road/Korora Hill, and no interchange at Coramba Road. The interchange at Gatelys Road/Korora Hill would be split with south facing ramps at Gatelys Road and north facing ramps at Korora Hill. It also included a two-lane connection road linking the south facing ramps at the Gatelys Road interchange with the Arthur Street overpass on the existing Pacific Highway (at Park Beach Plaza).

An options evaluation workshop was held to assess the alternative connection strategies in February 2017 and consisted of representatives from Roads and Maritime and CHCC. The evaluation process comprised an assessment of each option against function, environment, socio-economic and cost categories.

The evaluation criteria used for the assessment were based on the evaluation criteria developed to assess the route options for the project as part of the CHHPS, which are outlined the Coffs Harbour Highway Planning Strategy – Preferred Option Report (RTA 2004g).

The outcome of the assessment was Option A (the connection strategy presented in the 2008 preliminary concept design) would on balance, provide the best outcomes for the project. A summary of the outcomes from this assessment is provided in **Table 4-7**.





Legend

Alignment
Roads

Land use category

Commercial
Urban
Conservation
Rural open space
Waterways

Coffs Harbour Bypass
Connection strategies
Figure 4-6

0 1 2 3 km

Scale @A4: 1:100,000
GDA 1994 MGA Zone 56

N

Table 4-7 Summary of outcomes from the assessment of connection strategies

Evaluation category	Key outcomes
Function	• All options would provide traffic congestion relief to the existing Pacific Highway with similar levels of access to key activity centres in Coffs Harbour • Option A would have the highest traffic volumes on the bypass south of Coramba Road, providing the greatest relief to traffic congestion on the section of the existing Pacific Highway south of Albany Street and Option C1 would have the highest traffic volumes on the bypass north of Coramba Road, providing the greatest relief to traffic congestion on the northern end of the existing Pacific Highway • Option A would provide route flexibility, better opportunities for emergency management (as it would have three interchanges) and would have the largest decrease in vehicle hours travelled and largest increase in average travel speeds.
Environment	• All options would have a similar level of environmental impact • Option C1 and Option C2 could potentially have additional impacts on wildlife corridors because of the new connection road between Gatelys Road interchange and Mastracolas Road.
Socio-economic	• Option A would be consistent with current planning identified in the Coffs Harbour LEP, whereas Option C1 and Option C2 would be inconsistent • Potential impacts for Option A and Option B would be largely contained within road reserve corridors and would impact fewer residential, commercial and agricultural properties. However, Option C1 and Option C2, which introduce new potential impacts associated with the new connection road between Gatelys Road interchange and Mastracolas Road • Option A would allow improved accessibility to the bypass with the provision of an interchange at Coramba Road. It would also have the greatest reduction of traffic on the existing Pacific Highway south of Albany Street and provide additional access to the bypass at Coramba Road, potentially resulting in better outcomes in terms of community severance.
Cost	• Option B would provide the best overall performance for this category. However, it was noted that all options would have similar construction costs and operational and maintenance costs.

4.5.2 Crossing of major ridges

There are three major ridges being crossed by the project located at Roberts Hill, north of Shephards Lane and west of Gatelys Road. As described in **Section 4.4**, the Coffs Harbour Bypass – Concept Design Report (RTA 2008a) investigated the feasibility of tunnel structures as an alternative to deep cuttings at the major ridges. While the comparison did not provide a decision on whether to proceed with tunnels through Shephards Lane and Gatelys Road ridges, feasible tunnel solutions were developed. Roberts Hill ridge included a cut-and-cover tunnel solution for the preliminary concept design to reinstate the prominent ridge and assist with fauna connectivity.

Review and investigation of options for crossing the three major ridges was carried out in early 2018. The purpose was to determine the best value solution for crossing the major ridges based on evaluation of function, environment, socio-economic and cost considerations against the four key criteria of:

- Value for money (including factors associated with the project)
- Ensuring all vehicles could use the bypass
- Sustainability from an operating and maintenance perspective
- Ensuring delivery in line with publicly stated timeframes.

A range of options were developed for each major ridge crossing; comprising cuttings, tunnels or land bridges. An initial evaluation of the options was carried out and the better performing options at each location were combined to form a short list of options for the project. The short list of options involved:

- The best performing option for each location, on balance, from function and cost perspectives were combined (Option 1)
- The best performing option for each location, on balance, from a non-cost perspective considering function, environment and socio-economic criteria were combined (Option 2)
- The best performing option for each location, on balance, from a non-cost and cost perspective considering function, environment, socio-economic and cost criteria were combined (Option 3).

The initial evaluation of performance of the options used the 2008 preliminary concept design as the base case with a cut-and-cover tunnel for Roberts Hill ridge and mined tunnels for Shephards Lane and Gatelys Road ridges. The designs from which options were developed included cuttings (both steep and conventional 2H:1V batters), mined tunnels and land bridges. The short list of options is described in **Table 4-8.**

Table 4-8 Short list options for major ridge crossings

Ridge crossing option	Description
Base case	This option provided a cut-and-cover tunnel for Roberts Hill ridge and mined tunnels for Shephards Lane and Gatelys Road.
Option 1	This option included cuttings for all locations with 2H:1V batters.
Option 2	This option included mined tunnels for Shephards Lane and Gatelys Road. Roberts Hill ridge included a mined tunnel that acts as land bridge for fauna and flora connectivity.
Option 3	This option included a mined tunnel/land bridge (80 m long) for Roberts Hill ridge, a 2H:1V batter cutting at Shephards Lane, and a 2H:1V batter cutting and a land bridge at Gatelys Road.

An options evaluation workshop was held in February 2018 with representatives from Roads and Maritime, TfNSW and the Australian Government Department of Infrastructure, Regional Development and Cities.

The outcome of the options evaluation workshop was that Option 3 was the preferred solution for crossing the major ridges as it managed environmental risks associated with Roberts Hill and Gatelys Road ridges, generally performed better from a traffic and function perspective allowing all vehicles to use the bypass, and overall offered better value for money.

A summary of the outcomes from the workshop is provided below in **Table 4-9**.

Table 4-9 Summary of outcomes from the assessment of major ridge crossings

Evaluation category	Key outcomes
Function	• Option 1 and Option 3 generally performed better than Option 2 because of the difference in the number and length of tunnels. Cuttings or shorter tunnels/land bridges (ie 80 m) would have fewer operational restrictions, eg less scheduled maintenance requirements and potentially no travel restrictions on dangerous goods • Option 1 performed slightly better than Option 3 because of the mined tunnel/land bridge at Roberts Hill associated with Option 3. However, as the mined tunnel/land bridge would be shorter, it would have fewer operational risks than the longer tunnels of Option 2 (and the base case) and it was considered that there were opportunities to minimise or avoid the risks during detailed design, including the ability to design Option 3 to cater for all vehicles.
Environment	• Option 2 performed better than the other options as there would be less disturbance to the existing landscape. This would result in fewer biodiversity impacts including severance of wildlife corridors • Option 1 had the greatest impact on biodiversity because of the long-term severance with cuttings at Roberts Hill and Gatelys Road • Option 3 performed better than Option 1 but worse than Option 2. The land bridge at Gatelys Road would have a short-term impact on the wildlife corridor in this location when compared to Option 2.
Socio-economic	• Option 2 performed better than Option 1 and Option 3. The tunnels associated Option 2 were considered to provide better urban design and visual amenity benefits and would reduce/avoid potential impacts associated with the Aboriginal cultural significance • All options performed similar for operational noise with differences between options being negligible to minor • Option 1 was the poorest performing option and would result in increased impacts associated with Aboriginal cultural significance and poorer urban design outcomes.
Cost	• Option 1 performed best in this category. However, Option 3 also provided considerable cost savings when compared to the base case when considering both the cost to build and ongoing operation and maintenance of the bypass • Option 2 (and the base case) was the poorest performer in this category because of higher construction and ongoing operational costs.

Following the workshop in February 2018, a decision was made that the crossing of Roberts Hill ridge would be developed as an 80 m long land bridge. This allowed the assessments and investigations being carried out for the EIS and concept design to focus on one design solution only at this location. It was further noted that this would not preclude the development of a mined tunnel at this location at the detailed design stage.

4.5.3 Design standards

One of the opportunities to improve value for money for the project and sustainability from an operating and maintenance perspective was to reassess the proposed design standards. Reducing median widths was an area that provided these opportunities without unduly impacting the project function and objectives, ie a narrowed median width may result in less earthworks, reduce the construction footprint compared to a design with wider medians and reduce scale of ongoing maintenance requirements.

Options for median widths were developed in early 2018 and are presented in **Table 4-10**.

Table 4-10 Median width options

Options	Description
Option 1	This option included a 12 m wide median consistent with 2008 preliminary concept design to enable widening to six lanes in the median.
Option 2	This option included a narrow median (5 m wide) with no provision for widening to six lanes in the median.

The above design standards options were assessed as part of the options evaluation workshop held in February 2018. A summary of the key outcomes from the options evaluation workshop held in February 2018 is provided below in **Table 4-11**.

Table 4-11 Summary of outcomes from the assessment for median widths

Evaluation category	Key outcomes
Function	• Option 1 had a slightly better functional performance as it would likely have a lower risk of barrier strikes with consequent less disruption to traffic during maintenance.
Environment	• Option 2 had a slightly better environmental performance because of the smaller project footprint.
Socio-economic	• Option 1 had a slightly better socio-economic performance. No median barriers were preferred from a landscape/visual amenity perspective and median widths would be more consistent with adjoining sections of the Pacific Highway.
Cost	• Option 2 provided about $28 million in savings (which included additional maintenance costs) when compared against Option 1.

The outcome of the workshop was that Option 2 consisting of the narrow median was the preferred design standard as it demonstrated overall value for money of the project and better environmental performance.

While the narrow median did not include provision for widening to six lanes, a traffic analysis carried out to inform the options evaluation workshop indicated the following:

- A four-lane bypass would operate at a level of service C (ie stable traffic flow, at or near free flow with posted speed maintained) in 2044
- A four-lane bypass would operate at a level of service D (ie travel speeds slightly decrease as traffic volume slightly increases) in 2064

- A four-lane bypass would operate at a level of service E (ie traffic flow becomes irregular, speed varies frequently and posted speed is rarely reached) in 2079.

As such, allowing for widening to six lanes in the median was not deemed to be justified even with acknowledging potential costs and difficulties associated with widening. Additionally, it was considered that there would be further opportunities within the Coffs Harbour road network when the bypass reaches capacity and that overall the narrow median provided better ongoing value for money.

4.5.4 Staged delivery

In addition to reviewing the design standards for the project, a number of staging options were also investigated in early 2018. Potential staging options included:

- Staged delivery of the Coramba Road interchange with constructing the south facing ramps as the initial stage
- Deferring upgrade of the Pacific Highway north of Korora Hill interchange
- Staged development of the bypass with the initial stage consisting of a single two-lane carriageway, construction of Korora Hill and New Englands Road interchanges and only limited upgrade work for the existing Pacific Highway between Korora Hill interchange and Sapphire.

The potential staging options were initially evaluated against the 2008 preliminary concept design using the function, environment, socio-economic and cost categories consistent with what was developed to assess the route options for the project as part of the CHHPS.

Overall, the potential staging options did offer short-term program and cost savings; however, the evaluation identified some negative impacts associated with functionality and socio-economic considerations. Consequently, a staging option was not adopted for the project at the options evaluation workshop held in February 2018.

However, further design investigations after the options evaluation workshop in February 2018 have identified the potential that the section of the project north of Korora Hill interchange to Sapphire may be built in stages to maximise the use of the existing dual carriageway highway. Refer to **Chapter 6, Construction** for further information regarding potential staging of these works.

4.6 Refined concept design development (2019)

A concept design was developed following the above outcomes and was displayed for community and stakeholder feedback between September and November 2018. This was to enable the community an opportunity to comment on the refined design before finalising and exhibiting the EIS.

Following consideration of the feedback, the NSW Government announced in January 2019 further design refinements would be investigated including:

- Use of tunnels
- Lowering the vertical alignment of the main carriageways
- Reducing the height of the bridge over North Coast Railway near Shephards Lane
- Use of low noise pavement and vegetated earth mounds to reduce potential noise impacts.

The January 2019 announcement also included the establishment of a Community Consultative Committee (CCC) for the project. Refer to **Chapter 7, Consultation** for further information regarding the display of the 2018 concept design, associated consultation activities and feedback and the CCC.

A summary of the design investigations and comparative assessment is provided below.

4.6.1 Design investigations

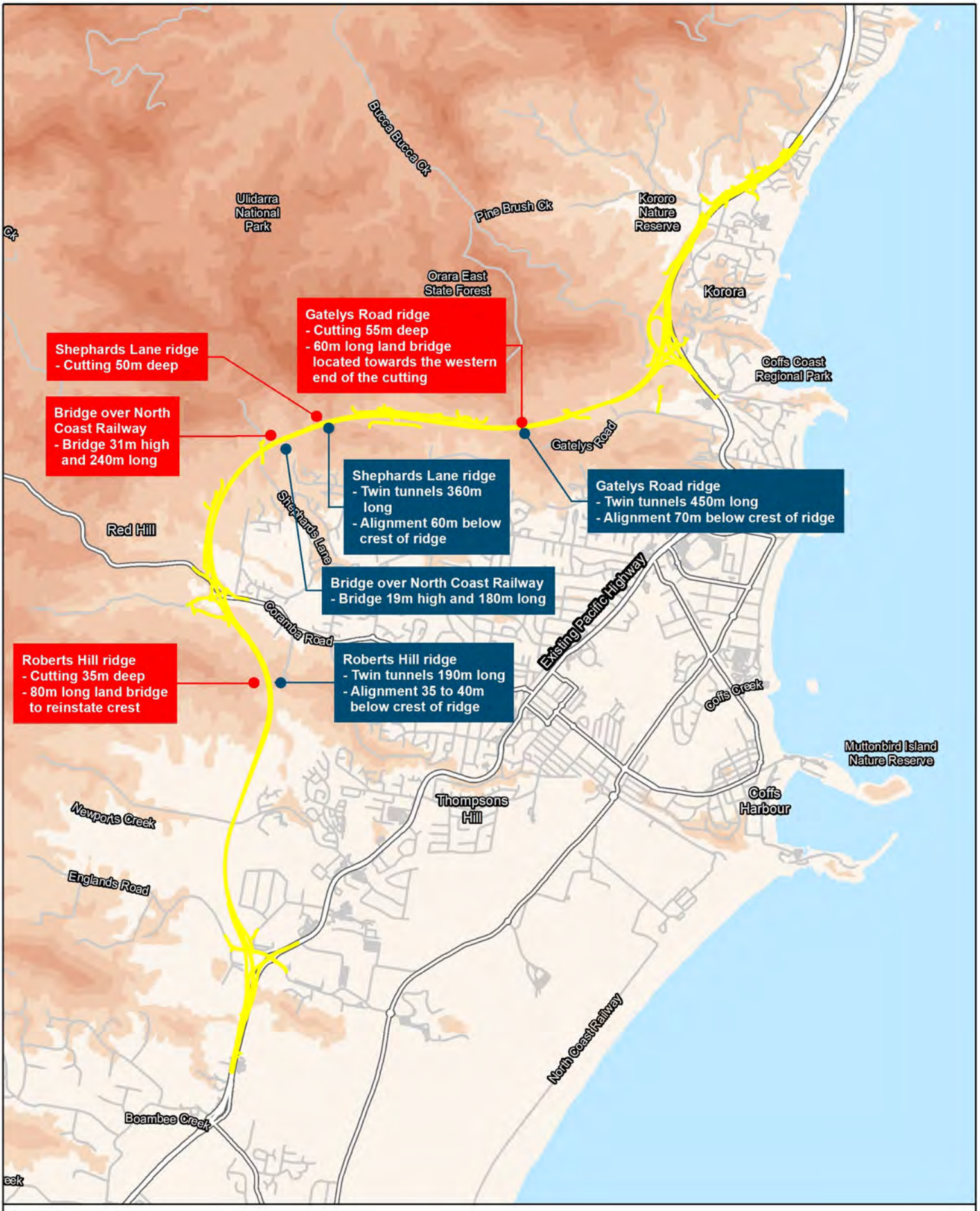
The design investigations largely focused on the design around the three major ridges at Roberts Hill, north of Shephards Lane and west of Gatelys Road. The investigations resulted in the development of an alternative concept design option (alternative option) to the 2018 concept design.

The 2018 concept design and alternative option are generally the same between the southern extent of the project and about 400 m north of North Boambee Road, and between south of Korora Hill interchange and the northern extent of the project. The exception to this is the consideration of low noise pavement for the full length of the alternative option. **Table 4-12** and **Figure 4-7** provide a summary of the key design differences between the 2018 concept design and alternative option.

Table 4-12 Key design differences between 2018 concept design and alternative option

Design feature	2018 concept design	Alternative option
Roberts Hill ridge	• A cutting, about 35 m deep, through the Roberts Hill ridge • An 80 m long vegetated land bridge with the existing ridge excavated during construction and reinstated with a minimum width of 40 m provided at the crest for fauna connectivity	• Twin tunnels about 190 m long • Alignment about 35 to 40 m below the crest of Roberts Hill ridge
Shephards Lane ridge	• A cutting, about 50 m deep through Shephards Lane ridge • Southern approach to the cutting would be on a climb of about 4.5% over 1700 m	• Twin tunnels about 360 m long • Alignment about 60 m below the crest of the ridge • Southern approach to the tunnel would be on a climb of about 3.5% over 1700 m
Gatelys Road ridge	• A cutting, about 55 m deep, through the Gatelys Road ridge • A vegetated land bridge, about 60 m long, would be provided within the cutting for fauna connectivity and to reduce potential visual impacts • The southern approach to Gatelys Road ridge would be on a climb of about 3.8% over 600 m • The northern approach to Gatelys Road ridge would be on a climb of about 4.6% over 1000 m	• Twin tunnels about 450 m long • Alignment about 70 m below the crest of Gatelys Road ridge • The southern approach to Gatelys Road tunnel would be on a climb of about 2% over 300 m • The northern approach to Gatelys Road ridge would be on a climb of about 3.4% over 700 m
Vertical alignment	• A vertical alignment that is higher in the landscape when compared to the alternative option • Through Mackays Road valley, the fill embankments would typically include an earth mound, generally about 4.5 m above the road level	• A vertical alignment that is lower in the landscape when compared to the 2018 concept design as described below: – About 3 m lower at Roberts Hill ridge – About 10 m lower at Shephards Lane ridge

Design feature	2018 concept design	Alternative option
		– About 15 m lower at Gatelys Road ridge • Through Mackays Road valley, the fill embankments would typically include an earth mound, about 4.5 m above the road level
Bridge over North Coast Railway	• The bridge over the North Coast Railway is about 31 m high above existing ground • Bridge length is about 240 m	• The bridge over the North Coast Railway is about 19 m high above existing ground • Bridge length is about 180 m
Pavements	• Quieter noise pavement (dense graded asphalt) along the existing Pacific Highway, south of Englands Road, from north of Newports Creek to Korora Hill interchange and along the existing Pacific Highway from Korora Hill interchange to Sapphire	• Low noise pavement (open grade asphalt) for full length



Legend

- Alignment
- 2018 concept design
- Alternative option

Coffs Harbour Bypass
Key design differences between 2018 concept design and alternative option
Figure 4-7

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

4.6.2 Comparative assessment

A comparative assessment of the 2018 concept design and alternative option was carried out in April 2019 to identify which design performed best overall and aligned with the Pacific Highway upgrade program objectives.

The evaluation categories used for the comparative assessment were based on the categories used to assess the route options for the project as part of the CHHPS and options considered during the design development undertaken between 2016 and 2018. The evaluation categories included function, environment, socio-economic and cost considerations.

A summary of the outcomes from the comparative assessment are provided in **Table 4-13**.

Table 4-13 Summary of outcomes from the comparative assessment of the 2018 concept design and alternative option

Evaluation category	Key outcomes
Function	• Impacts to traffic operations would be less for the 2018 concept design than the alternative option. This is due to the requirements for quarterly shutdowns of the bypass for routine maintenance of the tunnels • Travel time for heavy vehicles on the alternative option would be 19 to 31 seconds faster (one-way) when compared to the 2018 concept design • Fuel usage for the alternative option would be around 4.5% (or about 4600 litres/day) less than the 2018 concept design
Environment	• Biodiversity impacts for the alternative option would be less than the 2018 concept design. This includes fewer impacts on wildlife corridors during construction and operation and less direct impacts to koala habitat when compared to the 2018 concept design • The risk of erosion and sedimentation impacts and disturbing soil potentially contaminated with Panama disease and other contaminants such as pesticides (eg Aldrin, Dieldrin and DDT) is lower for the alternative option when compared to the 2018 concept design
Socio-economic	• Impacts on landscape character and visual amenity would be less for the alternative option. The lower vertical alignment, reduced height and width of fill embankments and use of tunnels rather than deep cuttings would substantially reduce the visual impact when compared to the 2018 concept design • Seven fewer properties and around 14% less agricultural land would be impacted by the alternative option. This would potentially allow for three farms to continue to operate when compared to the 2018 concept design • Impacts on items of Aboriginal cultural heritage significance including sites, areas of potential archaeological deposits and cultural pathways would be less for the alternative option when compared to the 2018 concept design • Noise impacts would be reduced with the alternative option compared to the 2018 concept design. The number of sensitive receivers requiring at-property noise treatments for the alternative option would be about 30% less than for 2018 concept design because of the lower gradients and use of low noise pavement.
Cost	• Construction, operational and maintenance costs would be higher for the alternative option compared to the 2018 concept design

4.7 Minimising environmental impacts

A number of environmental impacts have been avoided or minimised throughout the development of the project. The initial planning for the project saw several alternative routes and options abandoned because of potential environmental impacts or risks. These include the Far Western Corridor and CHCC Preferred Corridor because of the environmental impacts of these options and risks associated with Sherwood Nature Reserve, threatened species, wildlife corridors and significant impacts upon a landscape of Aboriginal cultural heritage importance.

A number of potential environmental impacts have been avoided or minimised as part of the more recent design development and investigation. These include:

- New bridge structure for Newports Creek to help in managing potential impacts on the giant barred frog and reconfiguration of culverts and bridges north of North Boambee Road to address flooding issues and minimise hydrological changes that may affect the coastal petaltail dragonfly
- Use of tunnels to cross the three major ridges to avoid and/or minimise impacts on wildlife corridors, reduce direct impacts on koala habitat, minimise impacts to landscape character and visual amenity, reduce impacts to agricultural properties, and reduce Aboriginal cultural heritage impacts
- Design of cut and fill batters to minimise the need for geotechnical treatments, eg shotcrete and rock bolting, and improve the visual amenity and landscaping potential of the project
- Inclusion of around 7.5 km of new noise barriers, low noise pavement for the full length of the project and lower carriageway gradients to minimise operational noise impacts
- Locating the proposed service road on the alignment of the existing south bound carriageway of the Pacific Highway as it crosses Pine Brush Creek to reduce potential environmental impacts at this location.

4.8 The project

The preferred option and concept design for the project was identified and refined through an extensive assessment and review process to ensure that it best meets the project objectives, is evaluated against the key performance criteria of function, environment and socio-economic considerations and ultimately provides value for money. The preferred option comprises:

- An alignment consisting of a combination of IS1 and IN2 corridor options
- A connection strategy that consists of grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- Tunnels to cross the major ridges of Roberts Hill (about 190 m in length), Shephards Lane (about 360 m in length) and Gatelys Road (about 450 m in length)
- Low noise pavement (open grade asphalt) for the full project length.

With the use tunnels to cross the major ridges, it has meant that the inclusion of a narrow median as the preferred design standard for the project (as described in **Section 4.5.3**) has required adjustment to accommodate a rock pillar of about 12 m in width between the twin tunnels.

The preferred option for the project is presented in detail in **Chapter 5, Project description**. **Chapter 29, Project synthesis** provides details of future design activities and areas of the project that could be subject to refinement.

CHAPTER

5

Chapter 5

Project description

5. Project description

This chapter describes the project, including the proposed concept design alignment, main project elements and design standards. A detailed description of the completed project and the key project elements are described in **Section 5.3.** Design criteria (refer to **Section 5.2**) are proposed to deliver a project that performs against the project objectives and to provide a clear basis for the detailed design stage.

Construction activities required to deliver the project including the proposed construction program and staging are described in **Chapter 6, Construction.**

Table 5-1 lists the SEARs relevant to describing the project and where they are addressed in this chapter.

Table 5-1 SEARs relevant to the project description

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following: b) a description of the project and all components and activities (including ancillary components and activities) required to construct and operate it, including:	
	- The proposed route	Section 5.1 Section 5.3
	- Design of the motorway and its components, including interchanges, tunnels and bridges, and road user, pedestrian and cyclist facilities, and lighting	Section 5.3
	- Local road upgrade works, including road widening, intersection treatment and grade separation works, property access, parking, pedestrian and cyclist and public transport facilities	Section 5.3
	- Ancillary infrastructure and operational facilities, such as operational and maintenance facilities, ventilation systems, fire and emergency systems and services, and infrastructure, for the project	Section 5.3.18 **Chapter 6, Construction**
	- The relationship and / or integration of the project with existing public and freight transport services.	**Chapter 8, Traffic and transport**
	q) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software	Figure 5-2
7. Socio-economic, Land Use and Property		
4.	The Proponent must assess potential impacts on utilities (including communications, electricity, gas and water and sewerage) and the relocation of these utilities	Section 5.3.16

5.1 Project scope

This section as well as **Section 5.2** and **Section 5.3** provide a detailed description of the project and design elements. The description of the project provided in this chapter is based on the concept design, community feedback (refer **Chapter 7, Consultation**) and describes the key elements of the project.

The concept design is intended to define a buildable concept that provides:

- A definition of property acquisition requirements sufficient to allow acquisition to proceed
- A clear description of the design principles, extent of impacts and impact management requirements
- Enabling a cost estimate for the project to be prepared
- A sound and clear basis for later development of the detailed design to a standard required to support project delivery.

5.1.1 The project

The project includes a 12 km bypass of Coffs Harbour from south of Englands Road to Korora Hill in the north and a two kilometre upgrade of the existing highway between Korora Hill and Sapphire. The project would provide a four-lane divided highway that bypasses Coffs Harbour, passing through the North Boambee Valley, Roberts Hill ridge and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

The key features of the project include:

- Four-lane divided highway from south of Englands Road roundabout to the dual carriageway highway at Sapphire
- Bypass of the Coffs Harbour urban area from south of Englands Road intersection to Korora Hill
- Upgrade of the existing Pacific Highway between Korora Hill and the dual carriageway highway at Sapphire
- Grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- A one-way local access road along the western side of the project between the southern tie-in and Englands Road, connecting properties to the road network via Englands Road
- A new service road, located east of the project, connecting Solitary Islands Way with James Small Drive and the existing Pacific Highway near Bruxner Park Road
- Three tunnels through ridges at Roberts Hill (around 190 m long), Shephards Lane (around 360 m long), and Gatelys Road (around 450 m long)
- Structures to pass over local roads and creeks as well as a bridge over the North Coast Railway
- A series of cuttings and embankments along the alignment
- Tie-ins and modifications to the local road network to enable local road connections across and around the alignment
- Pedestrian and cycling facilities, including a shared path along the service road tying into the existing shared path on Solitary Islands Way, and a new pedestrian bridge to replace the existing Luke Bowen footbridge with the name being retained
- Relocation of the Kororo Public School bus interchange
- Noise attenuation, including low noise pavement, noise barriers and at-property treatments as required
- Fauna crossing structures including glider poles, underpasses and fencing
- Ancillary work to facilitate construction and operation of the project, including:
  - Adjustment, relocation and/or protection of utilities and services
  - New or adjusted property accesses as required
  - Operational water quality measures and retention basins
  - Temporary construction facilities and work including compound and stockpile sites, concrete/asphalt batching plant, sedimentation basins and access roads (if required).

These features are described in more detail in the following sections.

The construction of the project may comprise staged delivery of components of the project. Further detail on possible staging options for the project is provided in **Chapter 6, Construction**.

5.2 Design criteria

5.2.1 Design standards

The project has been designed in general accordance with Upgrading the Pacific Highway - Design Guidelines (Roads and Maritime Services 2015f), Austroads guidelines, Australian Standards, and Roads and Maritime supplementary documents.

The key design criteria for the project are outlined in **Table 5-2**.

Table 5-2 Key design criteria

Design element	Design criteria	
	Bypass	
Design speed	110 km/h	
Posted speed limit	110 km/h for light vehicles	
Traffic lane width	3.5 m	
Nearside shoulder widths	2.5 m	
Offside shoulder widths	0.5 m	
Median width	Variable width Typically 12 m, minimum 5 m and maximum 20 m	
Minimum horizontal radius	750 m	
Maximum vertical grade	4.5% desirable maximum 6% absolute maximum	
Vertical clearance of bridges from highway surface	Pedestrian bridges: 5.5 m Other bridges: 5.4 m	
Vertical clearance of bridges over railways	7.1 m	
Minimum vertical clearances of tunnels from highway surface	5.5 m	
Design vehicle	B-double (25 m)	
Stopping sight distance (reaction time) on main carriageway	2.5 seconds	
Flood immunity	1% annual exceedance probability (AEP)	
	Access road	**Service road**
Design speed	40 km/h	60 km/h
Posted speed limit	40 km/h	60 km/h
Traffic lane width	3.5 m	3.5 m
Nearside shoulder widths	1 m	2 m

Design element	Design criteria	
Offside shoulder widths	N/A	N/A
Median width	N/A	N/A
Clear zone	N/A	5 m
Minimum horizontal radius	40 m	105 m
Maximum vertical grade	25 %	7 %
Vertical clearance of bridges from highway surface	5.4 m	5.4 m
Design vehicle	Service vehicle (8.8 m)	Semi-trailer (19 m)
Stopping sight distance (reaction time) on main carriageway	1.5 seconds	1.5 seconds
Flood immunity	5% AEP	5% AEP

5.2.2 Urban design principles and objectives

Details of the urban design principles and objectives, as well as landscape framework and plans are provided in **Chapter 11, Urban design, landscape and visual amenity** and summarised below.

Upgrading The Pacific Highway Urban Design Framework (Roads and Maritime Services 2013e) sets a vision for the Pacific Highway as follows:

The upgrade should be a sweeping, green highway providing panoramic views to the Great Dividing Range and the forests, farmlands and coastline of the Pacific Ocean; sensitively designed to fit into the landscape and be unobtrusive; and characterised by simple and refined road infrastructure.

Key urban design objectives for the Pacific Highway have been identified to support the vision:

- Provide a flowing road alignment that is responsive and integrated with the landscape
- Provide a well vegetated, natural road reserve
- Provide an enjoyable, interesting highway
- Value the communities and towns along the road
- Provide consistency with variety in road elements
- Provide a simplified and unobtrusive road design.

Urban design objectives and principles have been considered during the development of the concept design and will:

- Deliver a positive, functional and aesthetic experience to road users and to adjoining rural residents and visitors
- Integrate with, and be sensitive and responsive to, the landform and landscape character of the surrounding rural and natural areas
- Provide an enjoyable, interesting highway with varied view and vistas of the landscape
- Retain and enhance quality views from the highway over the existing landscape.

5.2.3 Detailed design requirements

This EIS seeks approval for the project elements and their functionality as described in this chapter; however, the concept design presented in this EIS may be refined as a consequence of the EIS exhibition process and during the detailed design, including as a consequence of future community consultation as part of the detailed design process.

The development of the detailed design would:

- Meet any conditions of approval arising for the project
- Be consistent with key design criteria, principles and functionality as described in this EIS and any subsequent response to submissions
- Avoid or minimise environmental impacts wherever possible
- Further develop and refine mitigation measures
- Appropriately develop and incorporate the urban design and landscape strategy presented in **Appendix J, Urban design, landscape character and visual impact assessment** and summarised in **Chapter 11, Urban design, landscape and visual amenity**
- Establish detailed plans for construction delivery method, addressing buildability, traffic capacity and safety during construction, geotechnical issues, all relevant specifications and design requirements, current guidelines and policies, and practicality/cost effectiveness
- Address risk management during construction and operation
- Allow for safe and cost-effective maintenance of the project during operation in accordance with work health and safety requirements and relevant specifications.

Further discussion on the development of the detailed design and areas where further work would be carried out to optimise the design outcomes and construction methodology is provided in **Chapter 29, Project synthesis**.

5.3 The completed project

5.3.1 Alignment

The main project alignment would generally provide:

- Two lanes in each direction, each lane being 3.5 m wide
- Typical median width of about 12 m between edge lines (minimum five metres and maximum 20 m) including a wire rope barrier to divide the carriageways
- Nearside shoulder width of 2.5 m
- Offside shoulder width of 0.5 m.

Indicative cross sections for the project are shown in **Figure 5-1** and the proposed concept design alignment is described below and shown in detail in **Figure 5-2-01** to **Figure 5-2-12**.

The description below has been divided into three sections based on geographical features of the project alignment, as follows:

- South of Englands Road to Roberts Hill
- Roberts Hill to Korora Hill
- Korora Hill to Sapphire.

Dimensions provided would be subject to refinement during detailed design.

South of Englands Road to Roberts Hill

The project would start about 1.1 km south of Englands Road, connecting to the existing four-lane divided highway north of Sawtell Road. The upgrade would generally be located west of the urban fringe between Englands Road and Roberts Hill ridge. The main features of the upgrade in this section are shown on **Figure 5-2-01** to **Figure 5-2-04** and include:

- Upgrade of the existing highway south of Englands Road
- An interchange at Englands Road providing access between the project and the existing road network at Englands Road, including the existing Pacific Highway, Englands Road and Stadium Drive (refer to **Section 5.3.3**)
- A new one-way local access road located on the west side of the highway to provide access between properties west of the existing highway, including Lindsay Transport, and the road network via Englands Road. The local access road has been included to improve road safety and separate through and local traffic at this location
- A new four-lane divided highway just west of the urban footprint to the north of Englands Road towards North Boambee Road, generally on fill embankment to keep the project above the floodplain. The fill embankments may include an earth mound to help with managing visual and noise impacts
- Bridges over Newports Creek, North Boambee Road and a tributary of Newports Creek to the north of North Boambee Road
- The project is located about 200 m west of Bishop Druitt College as it crosses North Boambee Road
- The project would be located to the west of Highlander Drive and The Lakes Estate, just to the north of North Boambee Road
- The project would cross Roberts Hill ridge via twin tunnels. The tunnels would retain the existing ridgeline and be about 190 m long and about 35 to 40 m below the crest of Roberts Hill ridge. One tunnel would be provided for each carriageway, separated by a rock pillar. The northbound tunnel would be about 17.9 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety. The southbound tunnel would be about 17.9 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety (refer to **Section 5.3.5**)
- The median between carriageways would be wider than the rest of alignment on approaches to the Roberts Hill tunnel. The additional median width would accommodate the rock pillar between the twin tunnels and an emergency cross over bay about 700 m south of the Roberts Hill tunnel.

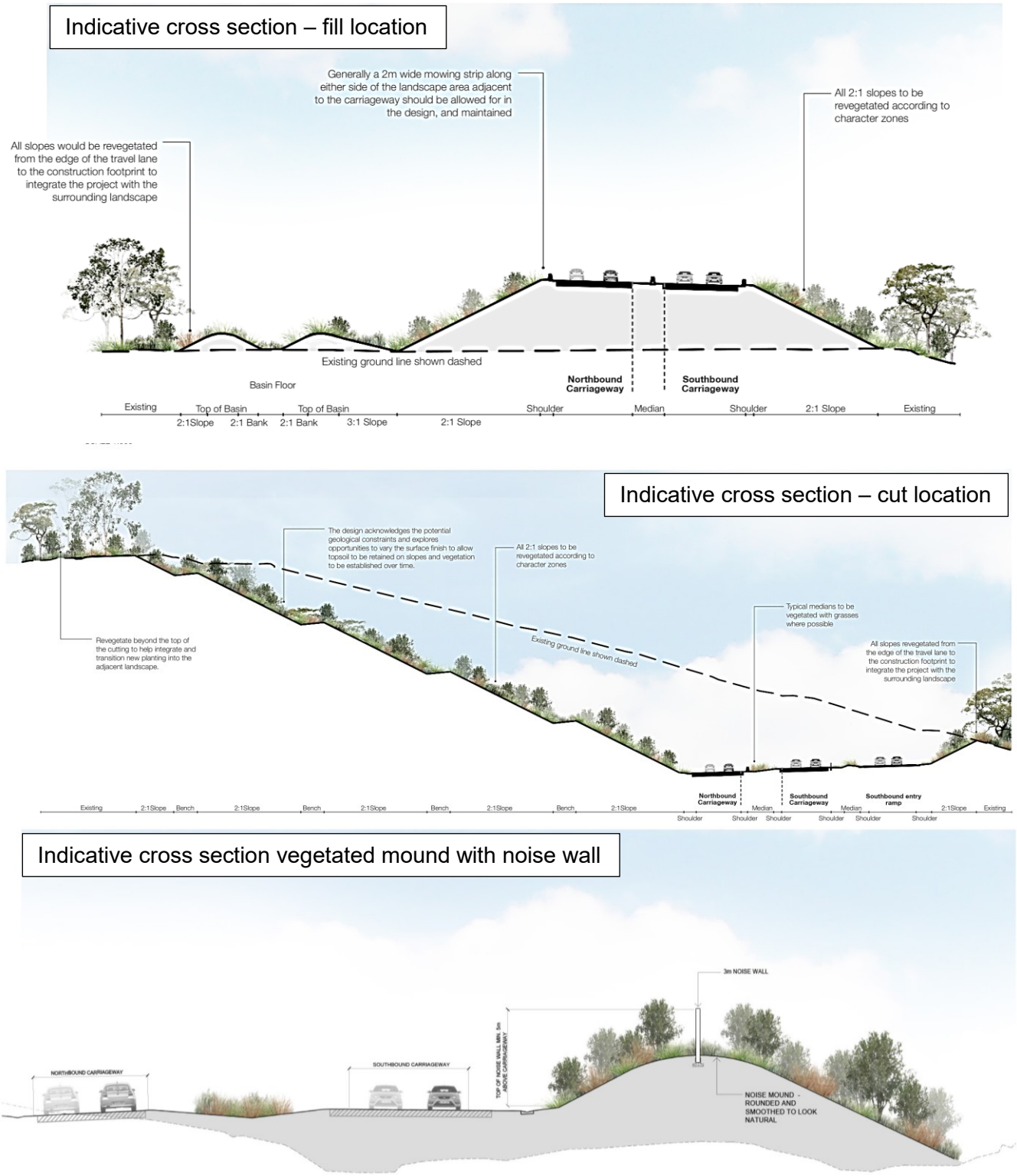


Figure 5-1 Typical cross sections of the project

Roberts Hill to Korora Hill

The project would generally be located at the base of the escarpment surrounding Coffs Harbour between Roberts Hill and Korora Hill. The project would cross two major ridges in this section, including Shephards Lane ridge and Gatelys Road ridge.

The main features of the project in this section are shown in **Figure 5-2-04** to **Figure 5-2-10** and include:

- An interchange at Coramba Road providing access between the proposed upgrade and the existing road network at Coramba Road (refer to **Section 5.3.3**)
- South of Coramba Road, the bypass would be located east of the existing flood detention basin which is next to Bennetts Road
- North of Coramba Road, the bypass would be located west of the existing flood detention basin which is next to Spagnolos Road and Roselands Estate
- Further north, the alignment would be located in a series of cut and fill embankments as it heads towards Shephards Lane and the North Coast Railway. This section of the project includes a northbound climb of about 3.5 per cent over around 1700 m. The fill embankments would typically include an earth mound to help with managing noise and visual impacts
- Shephards Lane would pass over the project
- A bridge would be provided over the North Coast Railway and local access road immediately north of the existing rail line
- The project would cross Shephards Lane ridge via twin tunnels. The tunnels would be about 360 m long and about 60 m below the crest of Shephards Lane ridge. One tunnel would be provided for each carriageway, separated by a rock pillar. The northbound tunnel would be about 16.8 m wide providing sufficient width for three traffic lanes (two general traffic lanes and an acceleration lane from the Coramba Road interchange) and sight distance widening for road safety. The southbound tunnel would be about 16.8 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety (refer to **Section 5.3.5**)
- The alignment would then pass through the Mackays Road valley and head towards the Gatelys Road ridge. The project would generally be in fill through this section. The fill embankments would typically include an earth mound on the eastern side of the main carriageway to help balance earthworks for the project and help with managing visual and noise impacts
- The project would include an underpass about 500 m north of the Shephards Lane tunnel to provide access to properties located to the west of the project. A new local access road would be provided west of the project to provide access between Mackays Road and the properties located west of the project. Mackays Road would be realigned for about 600 m parallel and east of the project to provide a connection to the underpass
- The project would cross Gatelys Road ridge via twin tunnels. The tunnels would be about 450 m long and about 70 m below the crest of Gatelys Road ridge. One tunnel would be provided for each carriageway, separated by a rock pillar. The northbound tunnel would be about 16.8 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety. The southbound tunnel would be about 16.8 m wide providing sufficient width for three traffic lanes (two general traffic lanes and an acceleration lane from the Coramba Road interchange) and sight distance widening for road safety (refer to **Section 5.3.5**)
- The southern approach to Gatelys Road tunnel would be on a climb of about two per cent over 300 m. The northern approach to Gatelys Road ridge would be on a climb of about 3.4 per cent over 700 m
- The median would be wider than the rest of alignment from south of the Shephards Lane tunnel to north of the Gatelys Road tunnel. The additional median width would accommodate the rock pillar between the twin tunnels at Shephards Lane ridge and at Gatelys Road ridge
- Emergency cross over bays would be provided on either side of the Shephards Lane and Gatelys Road tunnels
- The alignment would then pass through the West Korora Road valley, passing over West Korora Road, towards Korora Hill. The project would generally be in fill through this section
- A cutting, about 30 m deep, would be needed through Korora Hill, just south of Bruxner Park Road.

- Emergency cross over bays would be provided on either side of the Shephards Lane and Gatelys Road tunnels
- The alignment would then pass through the West Korora Road valley, passing over West Korora Road, towards Korora Hill. The project would generally be in fill through this section
- A cutting, about 30 m deep, would be needed through Korora Hill, just south of Bruxner Park Road.

Korora Hill to Sapphire

The project would generally comprise an upgrade of the existing Pacific Highway between Korora Hill and Sapphire. The upgrade would be located to the west of the existing highway and there would be a two-lane service road on the eastern side of the project. The main features of the project in this section are shown in **Figure 5-2-10** to **Figure 5-2-12** and include:

- An interchange at Korora Hill providing access between the project and the existing road network at Korora Hill, including the existing Pacific Highway, James Small Drive and Bruxner Park Road (refer to **Section 5.3.3**)
- An upgrade of the existing highway between Korora Hill and Sapphire
- New bridges over Pine Brush Creek
- A new service road, located east of the project, connecting Solitary Islands Way with James Small Drive and the existing Pacific Highway near Bruxner Park Road
- The existing school bus interchange located near Kororo Nature Reserve would be relocated to just south of Kororo Public School with access provided via James Small Drive
- Luke Bowen footbridge would be replaced with a new pedestrian bridge over the project around 200 m north of the existing bridge. The new bridge would retain the name Luke Bowen footbridge
- A new local access road would be provided west of the project between Old Coast Road and Seaview Close. An underpass below the project would be provided near Fernleigh Avenue to connect the new local access road to the new service road.

Boambee Equestrian Centre
Lindsays Road
BOAMBEE CREEK
CORDWELLS CREEK
Pacific Highway
Elizabeth Avenue
Lorrikeet Avenue
Koala Avenue
Palm Avenue
Sawtell Road
Shaws Close
Pepperman Road
Hamilton Drive
Dunlop Drive
9330.000
9600.000
9750.000
10000.000

Longitudinal section MCN1 Pacific Highway Northbound

Design level	7.950	7.600	7.100	6.600	6.266	8.170	16.844
Existing level	7.752	7.475	7.028	6.578	6.009	6.772	15.407
Chainage	9330	9400	9500	9600	9700	9800	10000

Coffs Harbour Bypass
Project features
Figure 5-2-01

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

Bridge 01
Bridge 02
Englands Road
Pacific Highway
9750.000
10000.000
10500.000
11000.000
11150.000
Bridge 02
Bridge 01
Industrial Drive
Isles Drive
Forge Drive
Englands Road interchange
Stadium Drive

Longitudinal section MCN1 Pacific Highway Northbound

Design level	6.861	8.170	12.432	16.844	20.727	24.023	26.727	28.460	28.854	26.601	23.628	19.710	16.113	13.457	12.483
Existing level	5.969	6.772	10.747	15.407	19.761	22.402	22.971	22.158	24.264	7.184	6.983	7.334	16.014	4.883	4.396
Chainage	9750	9800	9900	10000	10100	10200	10300	10400	10550	10700	10800	10900	11000	11100	11150

Coffs Harbour Bypass
Project features
Figure 5-2-02

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Bridge 03
Bridge 23
Bridge 04
Bridge 05
Bridge 23
Bridge 04
Bridge 05
England's Road
North Beambee Road
11500.000
12000.000
12500.000
12600.000
Industrial Drive
11150.000
11000.000
Engineering Drive
Isles Drive
Forge Drive
NEWPORTS CREEK
Bishop Druitt College
Highlander Drive
Jock Avenue
Close

Longitudinal section MCN1 Pacific Highway Northbound

Design level	13.457	11.744	10.975	11.149	12.082	13.082	14.082	15.082	16.082	17.082	17.999	17.968	16.798	15.298	13.798	12.695
Existing level	4.883	4.516	4.864	7.022	16.641	11.270	10.421	10.617	9.668	9.503	9.132	8.175	8.200	8.875	8.314	7.830
Chainage	11100	11200	11300	11400	11500	11600	11700	11800	11900	12000	12100	12200	12300	12400	12500	12600

Coffs Harbour Bypass
Project features
Figure 5-2-03

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

Bridge 05

Roberts Hill tunnel

12500.000

12600.000

Glengyle Close

13000.000

13500.000

13900.000

Buchanans Roa

Longitudinal section MCN1 Pacific Highway Northbound

Chainage	12500	12600	12700	12800	12900	13000	13100	13200	13300	13400	13500	13600	13700	13800	13900
Design level	13.798	12.695	13.179	15.314	18.064	20.912	24.304	27.804	31.304	34.804	38.134	40.655	42.307	43.089	43.001
Existing level	8.314	7.830	9.691	10.642	19.677	27.017	27.293	35.012	51.907	44.311	32.910	49.733	79.840	58.152	57.551

Coffs Harbour Bypass
Project features
Figure 5-2-04

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Coramba Road interchange
Roberts Hill tunnel
Bennetts Road
COFFS CREEK
Bridge 07
Bridge 09
Bridge 06
Coramba Road
Bridge 06
Bridge 08
14500.000
15000.000
15300.000
Spagnolos Road
Tiffany Close
Rosina Close
Tamora Close
Roselands Drive
14000.000

Longitudinal section MCN1 Pacific Highway Northbound

Design level	43.001	42.044	40.218	37.521	34.279	31.029	27.779	24.579	23.287	24.160	25.160	26.160	27.199	29.747	33.247
Existing level	57.551	59.399	43.433	36.093	46.725	35.484	27.942	21.752	23.264	34.339	24.864	23.615	24.264	23.702	28.715
Chainage	13900	14000	14100	14200	14300	14400	14500	14600	14695.115	14800	14900	15000	15100	15200	15300

Coffs Harbour Bypass
Project features
Figure 5-2-05

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Bridge 11

Bridge 12

Bridge over North Coast Railway

Shephards Lane

15300.000

15500.000

16000.000

16500.000

16600.000

Bridge 12

Roselands Drive

Mcentyre Street

Gillon Street

Longitudinal section MCN1 Pacific Highway Northbound

Design level	33.247	36.747	40.247	43.747	47.247	50.747	54.247	57.747	61.247	64.747	68.247	71.747	75.247	78.747
Existing level	28.715	41.564	37.005	53.374	55.609	58.373	54.588	66.160	74.539	62.738	56.195	82.779	67.499	60.789
Chainage	15300	15400	15500	15600	15700	15800	15900	16000	16100	16200	16300	16400	16500	16600

Coffs Harbour Bypass
Project features
Figure 5-2-06

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

Shephards Lane tunnel

Bridge over North Coast Railway

Bridge 12

Bridge 12

Bridge 13

Bridge 13

16600.000

17000.000

17500.000

18000.000

Brennan Court

Longitudinal section MCN1 Pacific Highway Northbound

Chainage	16600	16700	16800	16900	17000	17095.759	17200	17300	17400	17500	17600	17700	17800	17900	18000
Design level	78.747	82.219	85.126	87.263	88.632	89.221	89.061	88.121	86.413	83.935	80.942	77.937	74.931	71.925	69.223
Existing level	60.789	62.983	91.436	84.053	106.311	128.178	141.940	110.026	86.746	82.219	77.366	71.205	67.138	66.168	71.329

Coffs Harbour Bypass
Project features
Figure 5-2-07

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Gatelys Road tunnel

Gatelys Road

Mackays Road

18000.000

18500.000

19300.000

Longitudinal section MCN1 Pacific Highway Northbound

Chainage	18000	18100	18200	18300	18400	18500	18600	18700	18800	18900	19000	19100	19200	19300
Design level	69.223	67.146	65.694	64.867	64.665	65.088	66.136	67.809	69.809	71.606	72.578	72.680	71.913	70.276
Existing level	71.329	68.766	66.981	65.541	75.239	76.673	61.993	69.266	68.378	87.801	127.208	151.242	129.414	94.084

Coffs Harbour Bypass
Project features
Figure 5-2-08

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Longitudinal section MCN1 Pacific Highway Northbound

Design level	70.276	67.769	64.490	61.090	57.690	54.290	50.890	47.537	45.103	43.919	43.971	44.471	44.971	45.471
Existing level	94.084	61.966	57.995	52.544	49.790	46.084	44.596	40.433	38.201	41.114	50.327	72.447	72.532	52.461
Chainage	19300	19400	19500	19600	19700	19800	19900	20000	20100	20200	20300	20400	20500	20600

Coffs Harbour Bypass
Project features
Figure 5-2-09

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

Bridge 17

Bruxner Park Road

Bridge 17

Pacific Highway

20500.000

20600.000

21000.000

21500.000

Nautical Close

Fern Tree Place

Korora Hill interchange

Bridge 19

Ballantine Drive

Tranquility Drive

Seaside Close

Albert Chappell Drive

Lodge Place

James Small Drive

Lagoona Close

Backers Way

Malibu Drive

21900.000

22000.000

Longitudinal section MCN1 Pacific Highway Northbound

Design level	44.971	45.471	45.971	46.471	47.001	47.970	49.070	50.120	50.815	50.627	49.606	47.752	45.064	41.543	37.189
Existing level	72.532	52.461	36.458	36.285	37.202	32.624	32.321	40.083	55.652	49.759	52.197	46.580	38.353	40.524	36.936
Chainage	20500	20600	20700	20800	20900	21000	21100	21195.475	21300	21400	21500	21600	21700	21800	21900

Coffs Harbour Bypass
Project features
Figure 5-2-10

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

N

Luke Bowen footbridge
Kororo Public School bus interchange
Bridge 21
Bridge 21
Bridge 22
Korora Basin Road
Old Coast Road
Korora School Road
Pacific Highway
Kororo Public School
Coffs Harbour Montessori Preschool
PINE BRUSH CK
Service road
21900.000
22000.000
22500.000
23000.000
Fern Tree Place
Tropic Lodge Place
James Small Drive
Plantain Road
Norman Hill Drive
Herman Reick Avenue
Sheawater Place
Opal Boulevard
Pine Brush Crescent
Seaview Close
Coachmans Close
Albert Chappell Drive
Bruce Taylor Circuit
Ainslie Road
Malibu Drive
Gannet Place
Osprey Place
Daintree Drive
2300.000

Longitudinal section MCN1 Pacific Highway Northbound

Chainage	21900	22000	22100	22200	22300	22400	22500	22600	22700	22800	22900	23000	23100	23200	23300
Design level	37.189	32.087	26.862	21.637	17.326	15.228	14.504	13.797	13.090	13.123	15.340	19.429	23.339	26.093	27.669
Existing level	36.936	31.950	26.772	21.074	16.340	5.738	13.662	12.632	12.432	10.561	13.209	16.811	21.151	24.045	27.771

Coffs Harbour Bypass
Project features
Figure 5-2-11

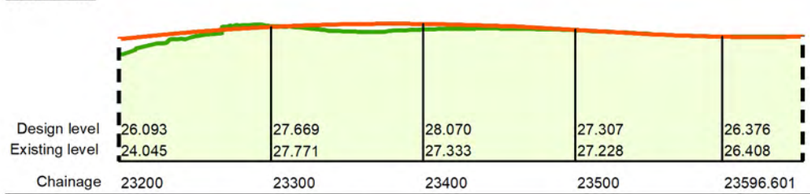
Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

Bridge 22
Campbell Close
Old Coast Road
Hunter Close
Warrawee Street
Elouera Drive
Seaview Close
Pacific Highway
Solitary Islands Way
Sapphire Crescent
Sapphire Place
Coachmans Close
Emerald Avenue
23200.000
23300.000
23500.000
23657.250
Daintree Drive
Beachfront Close
Oceanfront Drive

Longitudinal section MCN1 Pacific Highway Northbound



Coffs Harbour Bypass
Project features
Figure 5-2-12

Legend

- Indicitive road corridor
- Pavement
- Bridge
- Earthworks cut
- Earthworks Fill
- Permanent basin
- North Coast Railway
- Proposed footpath
- Watercourse
- Existing cycleway
- Existing Footpath
- Design levels
- Existing levels

0 40 80 120
Metres
Scale @A3: 1:4,000
GDA 1994 MGA Zone 56

5.3.2 Indicative road corridor

The indicative road corridor is shown in **Figure 5-2-01** to **Figure 5-2-12** and would accommodate operational water quality basins and finishing work (ie line marking, signage, road furniture, fencing, lighting, footpaths for pedestrians and cyclists, and landscaped areas).

The indicative road corridor width for the concept design generally allows for around 15 m between the edge of the earthworks and the project boundary. The width of the indicative road corridor is typically around 160 m wide where cut or fill embankments are relatively small. The width increases (up to about 430 m) with the scale of associated earthworks and where elements such as interchanges are needed.

5.3.3 Intersections and interchanges

The project includes interchanges at Englands Road, Coramba Road and Korora Hill. These interchanges would facilitate access between the project and the existing road network at Coffs Harbour. The interchanges are described in more detail in the following sections.

Englands Road interchange

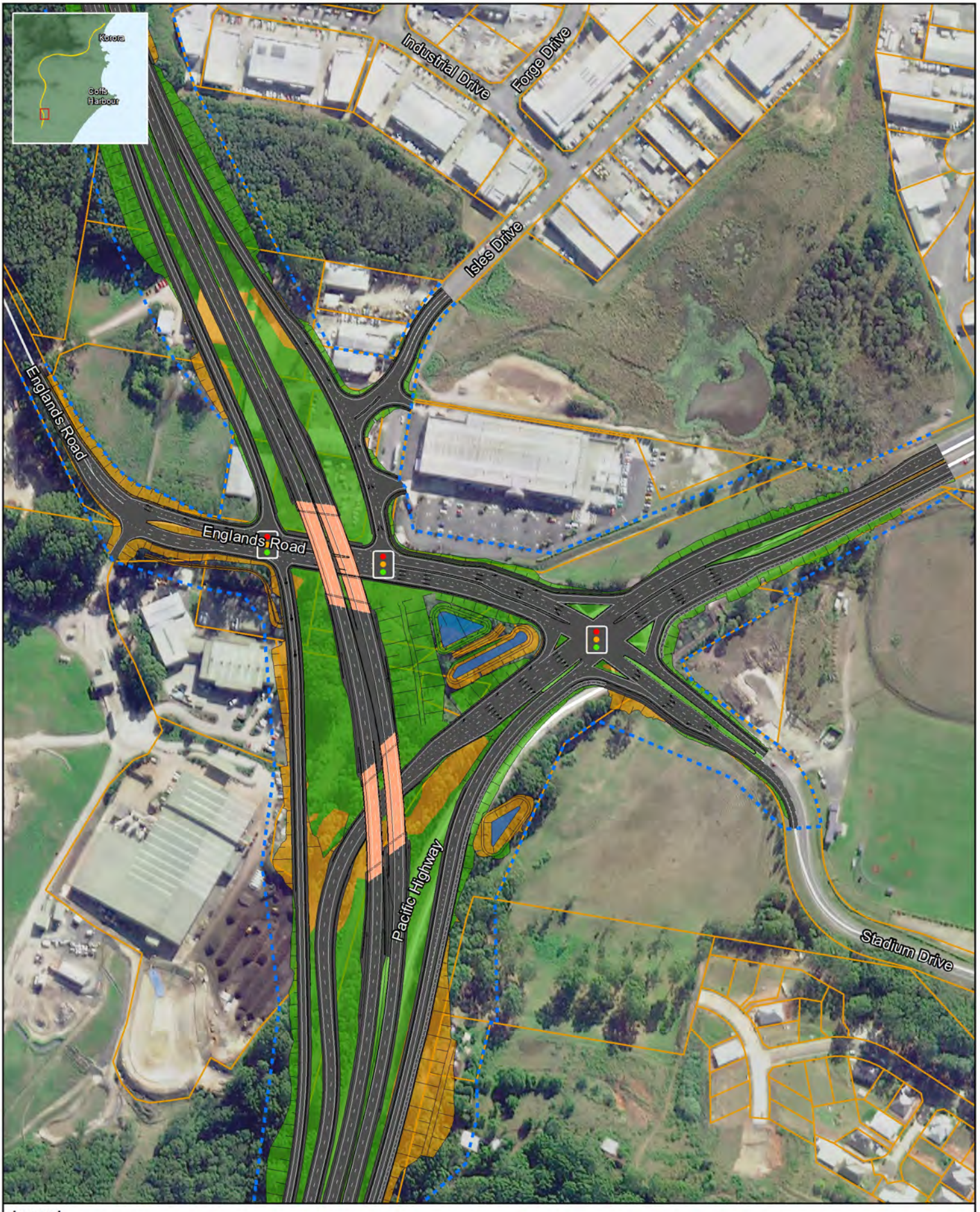
This is the southernmost interchange and would connect the project to the existing Pacific Highway (between Sawtell Road and Englands Road). The interchange would improve access to and from the Coffs Harbour CBD and various destinations either side of the existing Pacific Highway. The main features of the interchange would include:

- A northbound exit ramp that would pass under the project carriageways and connect to a new traffic light intersection with the existing Pacific Highway, Englands Road and Stadium Drive
- A southbound entry ramp connecting the existing Pacific Highway, Englands Road and Stadium Drive to the existing Lyons Road to Englands Road section of the highway
- A northbound entry ramp from Englands Road connecting with the project
- A southbound exit ramp to new traffic lights on Englands Road. The southbound exit ramp would include a left slip lane to Isles Drive, which would provide direct access to the Isles Drive industrial area from the southbound exit ramp
- Access between Isles Drive and Englands Road would be one-way towards Englands Road. Traffic bound for the Isles Drive industrial area would generally be via the intersection of Isles Drive and the existing Pacific Highway (opposite Coffs Harbour Health Campus). The exception would be for traffic from the southbound exit ramp which would have direct access to Isles Drive. An assessment of traffic and transport, including consideration of potential impacts on heavy vehicle movements, is discussed in **Chapter 8, Traffic and transport**
- A new one-way local access road, located on the west side of the project, to provide access between properties west of the existing highway and the road network via Englands Road.

The concept design for the interchange includes traffic lights along Englands Road on either side of the project to provide safe entry and exit points to the project while providing access to the existing road network at Englands Road and the existing Pacific Highway.

The concept design for the interchange impacts an area of the Coffs Coast Resource Recovery Park because of a need to separate the northbound exit ramp and access to properties west of the highway. The impact to the operation of Coffs Coast Resource Recovery Park is discussed in **Chapter 12, Land use and property** and **Chapter 14, Socio-economic**. Consultation with CHCC will be carried out before construction regarding impacts to the Coffs Coast Resource Recovery Park to identify opportunities to reduce the extent of property acquisition, temporary construction impacts and any other associated impacts to facilities which are important to the ongoing operations of the park.

The concept design for the Englands Road interchange is shown in **Figure 5-3**.



Legend

- Indicative road corridor
- Pavement
- Bridge
- Permanent Basin
- Earthworks cut
- Earthworks fill
- Cadastre
- Watercourse
- North Coast Railway
- Signalised intersection

Coffs Harbour Bypass
Englands Road interchange
Figure 5-3

0 0.04 0.08 0.12 km

Scale @A4: 1:4,000
GDA 1994 MGA Zone 56

N

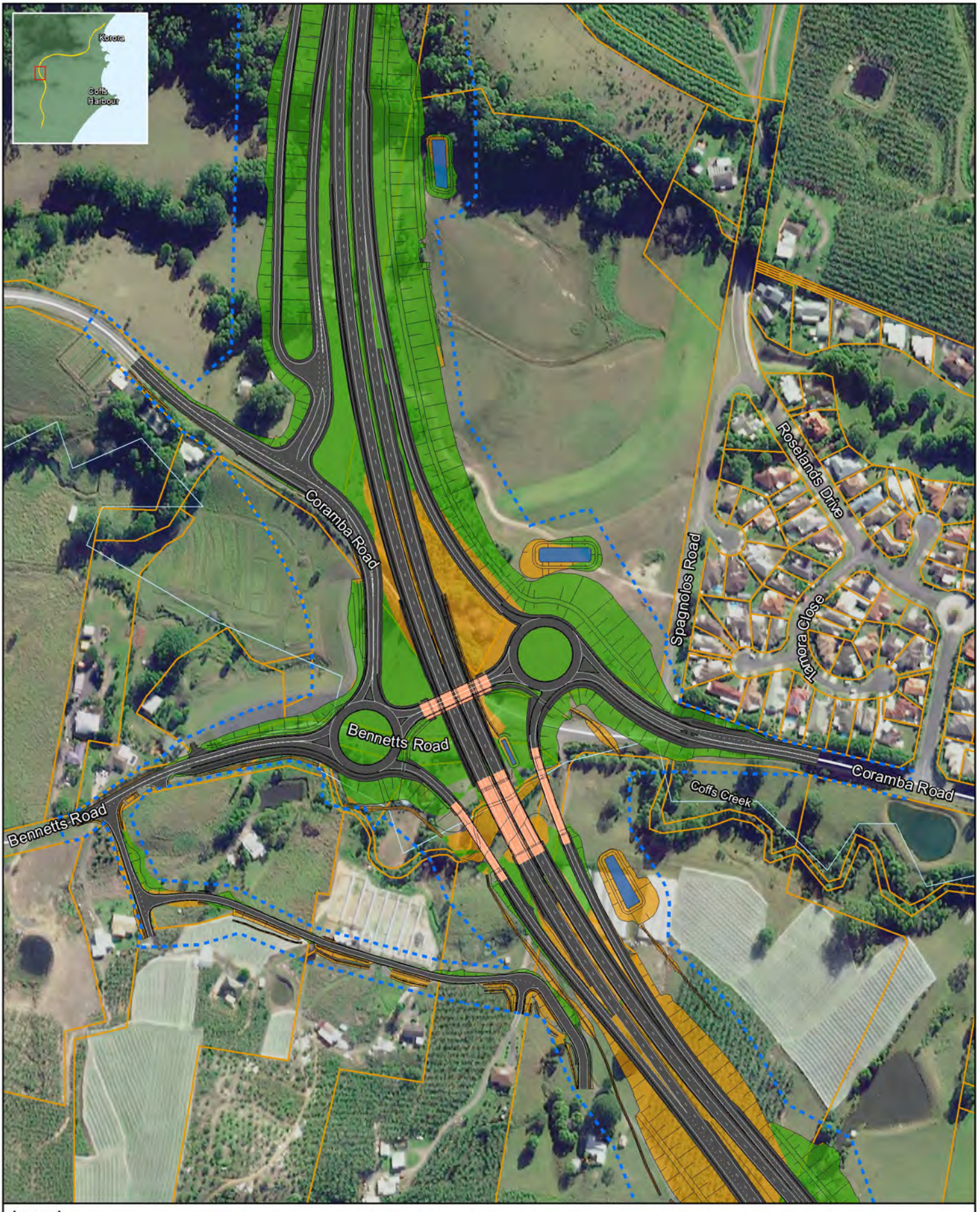
Coramba Road interchange

This interchange would be located about half way between the Englands Road interchange and the Korora Hill interchange. The interchange provides for all movements to and from the project. The main features of the interchange would include:

- A northbound exit ramp with a bridge over Coffs Creek (BR07) to a new roundabout at the intersection of Bennetts Road and Coramba Road
- A southbound entry ramp with a bridge over Coffs Creek (BR08) from a new roundabout on Coramba Road, east of the project
- A bridge carrying the main highway carriageways over Coffs Creek (BR06) which would then pass beneath a realigned Coramba Road
- A bridge carrying Coramba Road over the main highway carriageways (BR09) which would connect to the interchange entry and exit ramps and Bennetts Road
- A northbound entry ramp directly from Coramba Road. The northbound entry ramp would include a short two-lane section to provide access between a new local access road (refer to **Section 5.3.3**) and Coramba Road
- A southbound exit ramp.

The concept design for the interchange includes two roundabouts on the realigned Coramba Road on either side of the main highway carriageways, to provide safe entry and exit points to the project while maintaining through traffic on Coramba Road.

The proposed interchange design is shown in **Figure 5-4.**



Legend

- Indicative road corridor
- Pavement
- Bridge
- Permanent Basin
- Earthworks cut
- Earthworks fill
- Cadastre
- Watercourse
- North Coast Railway
- Signalised intersection

Coffs Harbour Bypass
Coramba Road interchange
Figure 5-4

0 0.04 0.08 0.12 km

Scale @A4: 1:4,000
GDA 1994 MGA Zone 56

N

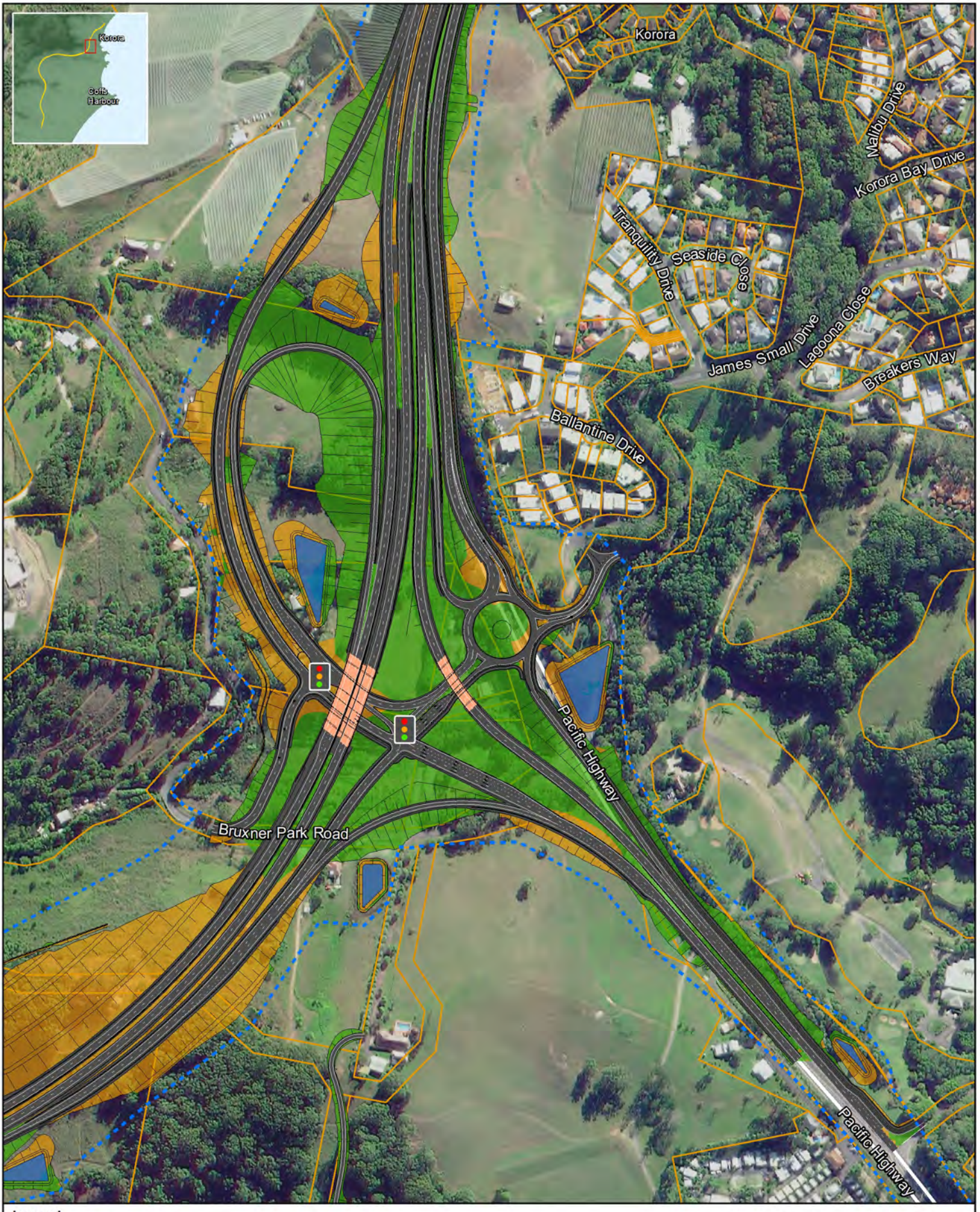
Korora Hill interchange

The Korora Hill interchange would be located towards the northern end of the project and provide a connection between the project and the existing Pacific Highway as well as access between the northern coastal suburban areas of Coffs Harbour and the Coffs Harbour CBD. The main features of the interchange would include:

- A southbound exit ramp from the project to the existing Pacific Highway via a bridge (BR19) providing access to the existing Pacific Highway. A left slip lane would be provided from the southbound exit ramp to provide access to James Small Drive, the service road and Bay Drive (via the James Small Drive roundabout and the existing Pacific Highway)
- A new connection road providing access from James Small Road to the existing Pacific Highway, the northbound and southbound entry ramps and Bruxner Park Road
- A bridge (BR17) carrying the project over the realigned existing Pacific Highway and the northbound entry ramp
- Realignment of the existing Pacific Highway to pass beneath the project and merge with the northbound entry ramp and the northbound exit ramp. Traffic lights with pedestrian crossings would be provided on either side of the project to facilitate access between the project, Bruxner Park Road, James Small Drive and the service road
- A northbound exit ramp from the project to the existing Pacific Highway via the James Small Drive roundabout
- A southbound entry ramp from the existing Pacific Highway, via the eastern traffic lights and pedestrian crossing, to the project
- Bruxner Park Road would be realigned to the west of the project to join the realigned existing Pacific Highway.

The concept design for the interchange includes traffic lights on the realigned existing Pacific Highway on either side of the project and a roundabout at the junction of James Small Drive and the service road. These intersections would provide safe entry and exit points to the project while providing access to the existing road network.

The proposed interchange design is shown in **Figure 5-5.**



Legend

- Indicative road corridor
- Pavement
- Bridge
- Permanent Basin
- Earthworks cut
- Earthworks fill
- Cadastre
- Watercourse
- North Coast Railway
- Signalised intersection

Coffs Harbour Bypass
Korora Hill interchange
Figure 5-5

0 0.05 0.1 0.15 km

Scale @A4: 1:5,000
GDA 1994 MGA Zone 56

N

5.3.4 Bridges

A total of 19 bridges would be required for the project. These include:

- 11 highway bridges, including a bridge over the North Coast Railway and other bridges over waterways
- Three highway overpasses (entry and exit ramps)
- Two local road overpasses
- Two local road underpasses
- A pedestrian bridge across the project alignment near Kororo Public School.

The concept design for the bridges are indicative and would be refined during detailed design to provide value for money, while considering the proposed urban design principles, fauna crossing requirements and other environmental constraints.

Five bridge structure design options were considered in developing the concept design for the project. These bridge options ensured the functional requirements could reasonably be achieved at each bridge location, and include:

- Precast concrete plank superstructures
- Precast super-T concrete superstructures
- Concrete box girder superstructures
- Post tensioned concrete girder superstructures
- Steel box girder superstructures.

Table 5-3 provides indicative details for each of the proposed bridges for the project. **Table 5-3** also identifies locations where fauna passage would be integrated with the proposed bridge designs. Further details on design criteria for fauna connectivity measures are provided in **Chapter 10, Biodiversity**.

The location of each of the proposed bridges is shown in **Figure 5-2-01** to **Figure 5-2-12**.

Bridge layouts have been developed to demonstrate that specific functional requirements can be achieved and to identify potential environmental impacts. Bridge lengths are subject to refinement during detailed design.

The concept design for bridges has considered:

- Relevant design standards in terms of sight lines, structural performance and maintenance
- Geometric requirements for each carriageway, including sight distance widening on curved bridges
- Constructability and construction sequencing
- The visual impact on the surrounding area by addressing the urban design strategy described in **Chapter 11, Urban design, landscape and visual amenity**
- Avoidance of piers in watercourses
- Provision of adequate waterway capacity, with minimal increase to water levels upstream of the structure and ensuring that the maximum flow velocity (in the one per cent AEP event) does not cause scour
- Provision for fauna access under bridges through consideration of abutment and pier locations
- The need to incorporate safety screens, hand rails and noise barriers, where required, as integral parts of the bridge balustrade
- Provision of appropriate horizontal and vertical clearances to roads and the North Coast Railway.

Table 5-3 Location of proposed bridge structures

Bridge number	Description	Fauna crossing	Indicative length (m)	Indicative number of spans	Indicative bridge type
Indicative highway bridges					
BR01	Bridge over northbound exit ramp at Englands Road interchange (4 km south-west of Coffs Harbour CBD)	No requirement for fauna passage	77	3	Super-T bridge with spill through abutments
BR02	Bridge over Englands Road (3.9 km south-west of Coffs Harbour CBD)	No requirement for fauna passage	80	3	Super-T bridge with spill through abutments
BR03	Bridge over Newports Creek (south) near Industrial Drive (3.7 km south-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, giant barred frog, pale-vented bush hen	81	3	Super-T bridge with spill through abutments
BR23	Bridge over Newports Creek north of B03 (3.5 km south-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, giant barred frog, pale-vented bush hen	90	3	Super-T bridge with spill through abutments
BR04	Bridge over North Boambee Road (3.4 km south-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll	95	3	Super-T bridge with spill through abutments
BR05	Bridge over creek near Highlander Drive (3.2 km south-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, giant barred frog, pale-vented bush hen	62	2	Super-T bridge with spill through abutments
BR06	Bridge over Coffs Creek at Coramba Road interchange (3.5 km north-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, pale-vented bush hen	64	4	Plank bridge with spill through abutment
BR12	Bridge over North Coast Railway near Shephards Lane (3.8 km north-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, pale-vented bush hen	180	3	Cast in situ concrete balanced cantilever
BR17	Bridge over northbound entry ramp (3.8 km north of Coffs Harbour CBD)	No requirement for fauna passage	70	2	Super-T bridge with spill through abutments

Bridge number	Description	Fauna crossing	Indicative length (m)	Indicative number of spans	Indicative bridge type
BR21	Bridge over Pine Brush Creek (5.4 km north of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, pale-vented bush hen, giant barred frog, green-thighed frog.	40	2	Super-T bridge with spill through abutments
Indicative local road underpasses					
BR13	Bridge at unnamed local road, south of Mackays Road (3.4 km north-west of Coffs Harbour CBD)	Fauna passage included with access road underpass Target species: koala, spotted-tail quoll	32	1	Super-T bridge with spill through abutments
BR16	Bridge over West Korora Road (2.9 km north of Coffs Harbour CBD)	Combined road bridge incorporating fauna underpass	33	1	Super-T bridge with spill through abutments
BR22	Bridge over new connection between Coachmans Close and Seaview Close (5.9 km north of Coffs Harbour CBD)	No requirement for fauna passage	37	1	Super-T bridge with spill through abutments
Indicative highway entry / exit ramps (overpasses)					
BR07	Northbound exit ramp bridge over Coffs Creek at Coramba Road interchange (3.5 km north-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, pale-vented bush hen, fish	64	3	Super-T bridge with spill through abutments
BR08	Southbound entry ramp bridge over Coffs Creek at Coramba Road interchange (3.4 km north-west of Coffs Harbour CBD)	Fauna underpasses Target species: koala, spotted-tail quoll, pale-vented bush hen	72	3	Super-T bridge with spill through abutments
BR19	Southbound exit ramp bridge over new connection road between existing Pacific Highway and James Small Drive (3.8 km north of Coffs Harbour CBD)	No requirement for fauna passage	50	2	Super-T bridge with spill through abutments

Bridge number	Description	Fauna crossing	Indicative length (m)	Indicative number of spans	Indicative bridge type
Indicative local road overpasses					
BR09	Bridge at Coramba Road interchange (3 km west of Coffs Harbour), includes shared user path	No requirement for fauna passage	50	3	Super-T bridge with spill through abutments
BR11	Shephards Land bridge over the project (3.9 km north-west of Coffs Harbour CBD), includes shared user path	No requirement for fauna passage	84	2	Post tensioned voided slab concrete girder
Pedestrian bridge					
BR24	Bridge providing pedestrian access over the project	No requirement for fauna passage	206	6	Steel box girder

5.3.5 Tunnels

Tunnel geometric design

Tunnels are proposed to cross the major ridges at Roberts Hill, Shephards Lane and at Gatelys Road. Twin tunnels are proposed at each location, with one tunnel for each carriageway, separated by a rock pillar. The locations of the tunnels are shown in **Figure 5-2-04** (Roberts Hill tunnel), **Figure 5-2-07** (Shephards Lane tunnel) and **Figure 5-2-08** (Gatelys Road tunnel).

The tunnels have been designed with reference to Austroad's Guide to Road Tunnels (Austroads 2018) and key design features are provided in **Table 5-4**, the typical cross section for the tunnels is shown in **Figure 5-6** and an artist's impression of the tunnels is shown in **Figure 5-7**. Dimensions provided would be subject to refinement during detailed design.

Design features common to all three tunnels include:

- Minimum vertical clearance of 5.5 m. Additional space would be available above the required 5.5 m vertical clearance at the centre of each tunnel for tunnel services (eg jet fans and wiring)
- Fire and life safety systems including deluge systems for fire suppression
- CCTV systems to enable continuous monitoring by tunnel operators
- Electronic signage and lighting
- Concrete barriers would be provided at the edge of the carriageways in each tunnel
- Maintenance access walkways, one metre wide and 2.1 m high, with a concrete barrier to separate the path from traffic lanes. Maintenance access walkways would provide safe access for maintenance activities to be carried out within the tunnels
- A 1.5 m wide pedestrian and cycle path with a concrete barrier to separate the path from the traffic lanes
- Portals would have a tubular/elliptical shape and would include a short section of cut and cover tunnel with a sloped finish (2H:1V) to tie into the existing terrain

- Ventilation of the tunnels would primarily occur through natural air flow and the piston effect of moving vehicles pushing air toward the respective exiting portals.

Table 5-4 Tunnel design features

Design element	Roberts Hill tunnel	Shephards Lane tunnel	Gatelys Road tunnel
Length	190 m	360 m	450 m
Portal width	17.9 m	16.8 m	16.8 m
Rock pillar width (between twin tunnels)	12 m	12 m	12 m
Number of lanes	2 northbound 2 southbound	3 northbound[1] 2 southbound	2 northbound 3 southbound[2]
Indicative approach grades	3.5 per cent up grade from the south with the crest of the alignment located just north of the northern portal	3.5 per cent up grade from the south and a 3 per cent up grade from the north. The crest of the alignment would be located within the tunnel	2 per cent up grade from the south and a 3.4 per cent up grade from the north. The crest of the alignment would be located within the tunnel
Cross passages	Two cross passage located near the centre of the tunnel	Three cross passages. Maximum spacing: 120 m between cross passages	Four cross passages. Maximum spacing: 120 m between cross passages
Jet fans	No	Yes	Yes

Tunnel safety

Jet fans would be provided below the ceiling of the Shephards Lane and Gatelys Road tunnels. Jet fans would be operated in the unlikely event of a fire to prevent smoke spreading to where traffic is likely to be stopped behind an incident and to prevent smoke from entering the adjacent tunnel.

Fire safety in Australian road tunnels follows a defined fire safety engineering process outlined in Australian Standard AS4825 – Tunnel fire safety. Fire suppression (deluge) along with linear heat sensors would be used to manage fires and ensure occupant safety, operational continuity and asset protection. A deluge suppression system operated in a timely manner would minimise the fire size, reduce fire spread and heat generation. A deluge fire suppression system and the tunnel operator would assist Fire and Rescue NSW (FRNSW) in managing and clearing a fire incident. These factors allow for efficient incident management and would minimise the time it takes for the tunnels to reopen.

Further detail regarding tunnel safety is provided in **Section 5.3.18**.

Refer to **Chapter 24, Hazard and risk** for further discussion.

[1] The additional lane in the northbound carriageway of the Shephards Lane tunnel is an acceleration lane for slow moving vehicles entering from Coramba Road interchange
[2] The additional lane in the southbound carriageway of the Gatelys Road tunnel is an acceleration lane for slow moving vehicles entering from Korora Hill interchange

Figure 5-6 Tunnel typical cross section

Figure 5-7 Artist's impression of twin tunnels

Tunnel structure and portals

Tunnel support measures for each tunnel were determined by assessment and evaluation of rock quality based on available geotechnical information. Six support classes were developed. Class 1 to 4 would comprise shotcrete and rock bolts of different configurations. Classes 5 and 6 would be likely to require additional support measures such as spiling bars, or canopy tubes, and lattice girders or combinations of these measures.

The main support measures included for the concept design consist of Class 1 to 4. Final support measures will be confirmed during detailed design.

The tunnel support measures above would be supplemented by additional concrete lining for long term tunnel support.

Tunnel portals would have a tubular/elliptical shape and would include a short section of cut and cover tunnel with a sloped finish (2H:1V) to tie into the existing terrain at Roberts Hill, Shephards Lane and Gatelys Road (refer to **Figure 5-7**).

All three tunnels would be drained tunnels. Waterproofing membrane and other water resisting treatments would be required within the tunnels from the road level to the crown. The waterproofing treatment would be determined during detailed design and following further geotechnical investigation.

The tubular/elliptical portal design is proposed for all three tunnels to optimise the urban design outcomes by helping to blend the tunnel portals into the existing terrain, and for consistency with other tunnels along the Pacific Highway. The final treatment would consider structural and urban design considerations and would be in accordance with the Tunnel Urban Design Guideline (Roads and Maritime Services 2017f).

5.3.6 Cuttings and fill embankments

Cuttings would generally be at a slope of 2H:1V, equating to one metre vertical rise for every two metre horizontal run. There are three locations where 0.5H:1V cut slope profiles are proposed to reduce potential property and environmental impacts (refer to **Figure 5-8**). These steeper cuttings are located:

- About midway between Coramba Road and Shephards Lane and would likely require rock bolts and shotcrete to ensure the batter slope is stable
- Between the North Coast Railway and the southern portal of the Shephards Lane tunnel to reduce impacts on adjoining properties. This steep cutting would likely require rock bolts and shotcrete to ensure the batter slope is stable
- About 400 metres south of the Gatelys Road tunnel to reduce impacts on adjoining properties. This steep cutting would likely require rock bolts and shotcrete to ensure the batter slope is stable.

Fill embankments are generally proposed to be at a slope of 2H:1V (refer to **Figure 5-1**). The slope may be flattened during detailed design where space permits and where there are maintenance advantages. If batter slopes are steepened, they would need be consistent with the objectives of **Appendix J, Urban design, landscape character and visual impact assessment** and environmental outcomes of this EIS.

All slopes would be revegetated to the edge of the indicative road corridor or existing landforms, where reasonable and feasible, to integrate the project with the surrounding landscape.

The design of the project has attempted to integrate cutting and embankment slopes with the surrounding topography where possible. Where cut batters are in hard rock or where 2H:1V slopes are not feasible, and it is not reasonable and feasible to revegetate the cut batter, these would be left as natural stone where stable. If shotcrete is required for batter stability, the colour, consistency and texture would be sensitive to the existing landform and character. Further details of the urban design measures are provided in **Appendix J, Urban design, landscape character and visual impact assessment**.

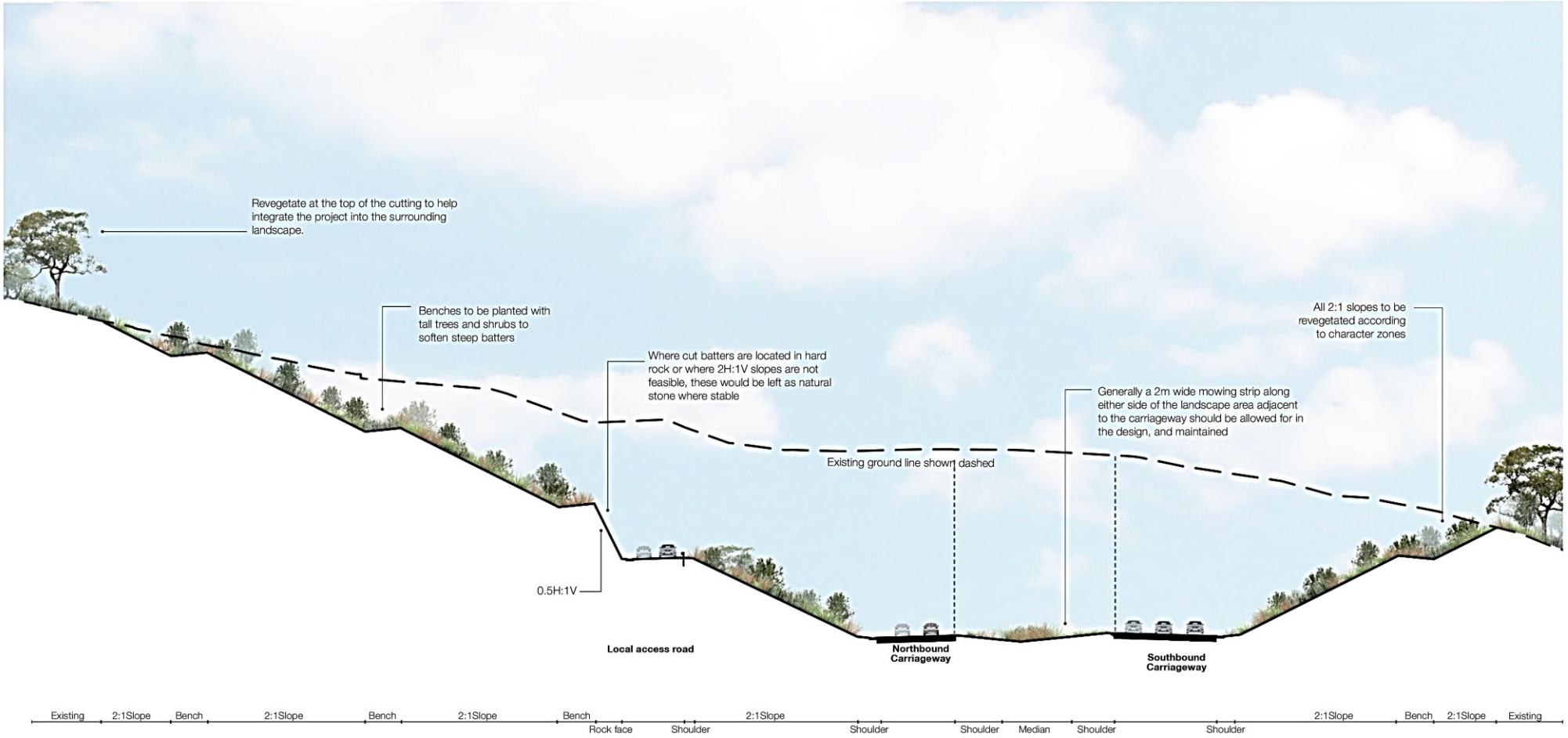


Figure 5-8 Typical cross section with 0.5H:1V cutting

5.3.7 Drainage and flood protection

The project would cross Newports Creek, Coffs Creek, Jordans Creek, Treefern Creek, Pine Brush Creek and smaller tributaries of these creeks. The concept design has been developed to meet the requirements in **Section 5.2.1** and to minimise potential impacts on water quality and flows into the nearby creeks. The design requirements are summarised in **Table 5-5.**

A range of drainage infrastructure would be installed for the project and may include:

- Road surface drains – consisting of stormwater inlets and pits that connect to reinforced concrete pipes which would cater for run-off from the road surface, cut batters and the median
- Longitudinal catch drains – would be located at the top of cuttings or at the bottom of the batter to catch runoff from the project and prevent water from flowing into nearby areas
- Cross drains – would convey surface water under the project.

The design of the project would generally allow the natural flow regimes to be maintained. Cross culverts and bridges would be provided beneath the project to convey surface water runoff and would be designed with sufficient capacity to convey the one per cent AEP peak flow with no impact on highway function. Indicative locations of bridge structures are shown in **Figure 5-2-01** to **Figure 5-2-12** and proposed bridge structures are described in **Section 5.3.4**.

Culverts would be designed to generally follow the existing waterway alignment to minimise potential for bank erosion, which in some cases results in the culverts being set on a skewed alignment to the project. Bridge abutments would generally be located to minimise scour velocities, impacts on flood behaviour and other key performance criteria listed in **Section 5.2.1**. Appropriate scour protection would be provided on both upstream and downstream ends of all structures where increased velocities have the potential to cause scour. The impacts of the project on hydrology are discussed in detail in **Chapter 17, Flooding and hydrology**.

All bridges would require drainage systems to be developed to discharge to the road surface drainage system and avoid direct discharge into the waterway. Bridge deck drainage systems would be developed during detailed design and piped drainage in the bridge superstructure would provide adequate drainage of surface water from the bridges

Table 5-5 Typical drainage details

Drainage feature	Design details
AEP limits • Channels and open drains • Piped system (including pits) • Culvert and structures • Road surface wearing course • Gross pollutant traps • Cross drainage • Impacts to properties during major storm • Impact to project structures • Temporary drainage	Minimum AEP • 20% AEP • 10% AEP • 1% AEP • 10% AEP • 100% AEP • 1% AEP • 1% AEP • 0.05% AEP • 50% AEP.
Stormwater pipes	• Pipe sizes range from 375 mm to 3000 mm in diameter for cross drainage • Type – reinforced concrete (minimum Class 3).
Culverts	• Box culvert sizes range from 600 mm (h) x 1200 mm (w) to 3000 mm (h) x 4800 mm (w) for cross drainage • Type – reinforced concrete (minimum Class 3).

Tunnel drainage

All three tunnels would be drained tunnels and there would be separate drainage systems to capture and recharge groundwater, and to manage stormwater ingress and water from the fire suppression (deluge) system.

Captured groundwater in the Roberts Hill tunnel would drain through a longitudinal pit and pipe network to the southern portals before being recharged via infiltration pits or basins. Captured groundwater in the Shephards Lane and Gatelys Road tunnels would drain through a longitudinal pit and pipe network to both the southern and northern portals before being recharged via infiltration pits or basins.

A separate drainage system would be provided to manage fire suppression (deluge) water (as part of the fire and life safety system) in the event of an emergency in the tunnels, spills and/or any stormwater ingress at the portals. Tunnel incident water/spills would be captured in holding tanks at the portals and would be discharged either by pumping out by a licensed waste receiver or discharged if water quality parameters have been met as defined in **Chapter 19, Surface water quality**.

Surface water runoff at Roberts Hill tunnel would drain towards the southern portals where it would be captured in an operational water quality basin adjacent the tunnel portal.

Both Shephards Lane and Gatelys Road tunnels are designed with crests to allow surface water runoff to drain to both the southern and northern portals where it would be captured in an operational water quality basin adjacent the tunnel portals.

5.3.8 Fauna crossing structures

A fauna connectivity strategy has been developed to reduce impacts on fauna associated with habitat fragmentation.

A range of fauna passage and connectivity structures have been proposed based on the requirements of the target species, the alignment and condition of fauna corridors and the design and topographic constraints of the project. A detailed summary of fauna connectivity structures is provided in **Chapter 10, Biodiversity**.

5.3.9 Waterway realignments and adjustments

The project has been designed to minimise impacts on waterways. However, there is the potential that several waterways may be subject to realignment or adjustment as part of the project. Typically, waterway realignment and adjustment is needed when a project crosses an existing waterway and the cross drainage requirements and nature of existing channels result in the need to realign or adjust the waterway to maintain drainage and flow characteristics. In addition to the realignment or adjustment, scour protection may extend into the waterway channels to ensure bridges and banks are protected from potential stability and scour risks. **Figure 5-9** provides a typical waterway alignment design. All waterway realignment and/or adjustments would be subject to site-specific design in futures phases of the project.

The below descriptions of proposed waterway realignments and adjustments are based on the concept design for the project and detailed design investigations would aim to reduce or avoid waterway realignments where reasonable and feasible.

Proposed waterway realignments and adjustments for the project include:

- Minor realignment of the meandering Newports Creek as it passes beneath the project. About 50 m of Newports Creek would be realigned around the piers of the bridge BR23
- Realignment of a northern tributary of Newports Creek as it passes beneath the project north of North Boambee Road. About 130 m of Newports Creek would be realigned around the piers of the bridge over the tributary (BR05). The realignment would involve shallow excavation of the floodplain

beneath the bridge and would include a low flow channel so that natural flow conditions could be maintained, which would be designed in accordance with the requirements of the DPIE guidelines for fish conservation and management (Fairfull & Witheridge 2003)

- Minor realignment of the northern tributary of Newports Creek (about 400 m north of North Boambee Road and about 150 m north of BR05) as it passes beneath the project. A cross-drainage culvert is proposed in this location to convey flood water beneath the project. The alignment of the culvert would generally follow the alignment of the existing creek and would include a low flow channel to provide for fish passage
- Extension of the existing culvert under Bennetts Road and realignment of Coffs Creek where the project crosses the creek south of Coramba Road. About 90 m of Coffs Creek may require realignment and/or adjustment because of the extensive meander of Coffs Creek main channel at this location and the need for three bridge crossings (BR06, BR07 and BR08)
- The upper reaches of Treefern Creek would be replaced with longitudinal catch drains and cross drains where the creek is impacted by the project. This includes about 120 m of the main creek channel. Fish passage requirements are not needed at this location because the existing creek is considered a Class 4 waterway, and drainage work would be managed through typical drainage design principles
- Realignment and temporary work within Pine Brush Creek would be required between the new bridge over Pine Brush Creek (BR21) and the existing bridge over Old Coast Road. Works would be limited to the riparian corridor (bank to bank) where feasible. In addition to the realignment of the main channel, minor realignment of the northern tributary of Pine Brush Creek immediately upstream the new bridge would also be required. About 35 m of the northern tributary would be realigned to optimise drainage and flow at this location and to provide a new confluence with the realigned tributary and main channel.

During detailed design, any required realigned drainage line or watercourse will be designed to behave in a similar hydrologic and geomorphic manner as existing conditions and will consider the requirements of the Policy and Guidelines for Fish Habitat Conservation and Management (Department of Primary Industries (DPI) 2013) and Guidelines for Instream Works on Waterfront Land (DPI 2012a). Detailed design of waterway realignments and adjustments would be developed in consultation with DPIE (Regions, Industry, Agriculture and Resources) and will consider:

- Investigation of opportunities to reduce or avoid waterway realignments to maintain existing creek alignments including locating piers outside of the waterway
- Retention of existing riparian vegetation where possible, including retention of tree stumps where trees are removed
- Maintaining existing waterway lengths, velocities and hydraulic grades
- Use of soft engineering approaches to scour protection where landscaping is provided over the rock scour
- Maintaining fish passage in accordance with the waterway classification and DPIE (Regions, Industry, Agriculture and Resources) guideline Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings *(*Fairfull & Witheridge 2003).

The impacts of the proposed waterway realignments are discussed in detail in **Chapter 10, Biodiversity**. **Chapter 17, Flooding and hydrology** and **Chapter 19, Surface water quality**.

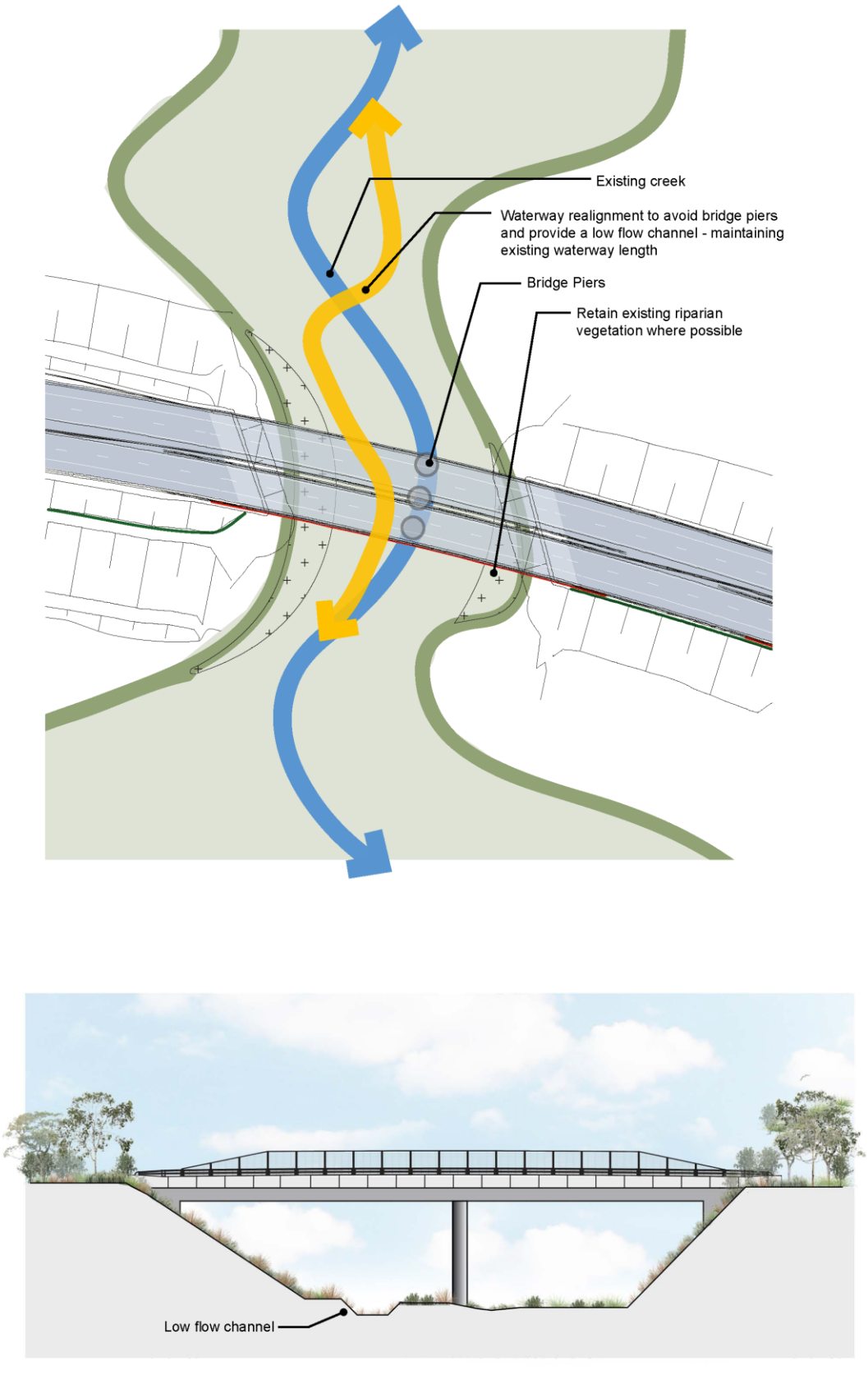


Figure 5-9 Waterway realignments

5.3.10 Provisions for pedestrians and cyclists

Provision has been made for cyclists on the project which includes a dedicated cycle path within the proposed tunnels (refer to **Section 5.3.5**) and a 2.5 m wide shoulder for the remainder of the project. However, cyclists can exit the bypass at Englands Road interchange and Korora Hill interchange to avoid crossing the two-lane exit ramps and two-lane on ramps.

The service road (refer to **Section 5.3.11**) would also include a 2.5 m wide shared user path for cyclists and pedestrians on the eastern side of the service road. The shared user path would be provided between Solitary Islands Way at Sapphire (near Coachmans Close) to the proposed new roundabout at the intersection of the service road and James Small Drive near the Korora Hill interchange.

The existing Luke Bowen footbridge would be replaced with a new pedestrian bridge over the project about 200 m north of the existing bridge and would retain its name. This new bridge would provide a pedestrian and cyclist connection between Old Coast Road and the proposed service road next to Kororo Public School.

The existing shared user path located east of the existing Pacific Highway between north of Stadium Drive and the southern extent of the project would be reinstated on the east side of the project. Signalised pedestrian crossings would be provided at the proposed traffic lights at the intersection of Stadium Drive, Englands Road and the existing Pacific Highway. These crossings would enable pedestrians to safely traverse the intersection.

Traffic lights with pedestrian crossings would be provided on either side of the project at the Korora Hill interchange to facilitate access between the project, Bruxner Park Road, James Small Drive and the service road.

All local road underpasses would be wide enough to include provision for pedestrians and cyclists, separated from the local road.

The Coramba Road and Shephards Lane overpasses would include a footpath on one side of the bridges for pedestrian access across the project.

5.3.11 Service and access roads

The project would comprise a service road on the east side of the project in the Korora Hill to Sapphire section, and various access roads to maintain access to local roads and properties. The service road would run parallel to the project and provide an alternative route to the project, typically for local movements, and extend to the Korora Hill interchange. Local access roads provide access between private properties and the surrounding road network. The location of the service road and local and access road upgrades are shown on **Figure 5-2-01** to **Figure 5-2-12.**

Service road

The service road connects the Korora Hill interchange to Solitary Islands Way to tie into the dual carriageway highway at Sapphire. This service road would continue the service road network from Sapphire through to the existing Pacific Highway at Korora and would provide alternative access to the Coffs Harbour road network for local traffic.

The service road would include:

- Two 3.5 m wide lanes, one lane in each direction
- Sealed near side shoulder about two metres wide
- Posted speed limit of 60 km/h or less
- A shared user path to be located on the eastern side of the service road.

Refer to **Section 5.3.10** for information about the provisions for pedestrians and cyclists.

Local and access roads

The proposed local and access road upgrades for the project are listed below. These upgrades are needed to accommodate the project and maintain connections on the existing road network that would be directly affected by the project. Local road network upgrades would be subject to further refinement during the detailed design stage.

- A new one-way local access road, located on the west side of the highway, to provide access between properties west of the existing highway and the road network via Englands Road
- Englands Road would be widened to accommodate the proposed Englands Road interchange, between the access to the Coffs Coast Resource Recovery Park and Stadium Drive
- Isles Drive would terminate at the southbound exit ramp of the Englands Road interchange. There would be one-way access (southbound) between the end of Isles Drive and Englands Road
- Stadium Drive would be widened to four lanes on the approach to the existing Pacific Highway
- North Boambee Road would not be upgraded, but sufficient vertical clearance would be provided to not preclude it being raised in the future by CHCC
- Coramba Road would be realigned as it crosses the project (refer to **Section 5.3.3**)
- Bennetts Road would be realigned to join the western roundabout of the Coramba Road interchange
- A new local access road would be provided from the northbound entry ramp of the Coramba Road interchange to provide access to properties located north of Coramba Road and between the project and the North Coast Railway
- Direct access to Coramba Road from Spagnolos Road would be closed
- The existing school bus stop at the intersection of Coramba Road and Spagnolos Road would likely be reinstated further east along Coramba Road near its existing location. Consultation would be carried out with CHCC and the school bus operator to confirm the final location and requirements
- Shephards Lane would be realigned as it crosses the project
- Mackays Road would be realigned to run parallel to the project and then pass under the project just north of the Shephards Lane tunnel. A new local access road would be provided north of the project to provide access to properties to the north of the project between the Shephards Lane tunnel and the Gatelys Road tunnel
- West Korora Road would be realigned as it passes beneath the project
- A new local access road would be provided from West Korora Road to the hill overlooking Korora Hill interchange. This local access road would replace access to a property which currently gains access to the road network via Bruxner Park Road. The new local access road would be located about 140 m east of the project
- Bruxner Park Road would be realigned to join the realigned Pacific Highway to the west of the project next to the Korora Hill interchange (refer to **Section 5.3.3**)
- A new connection road would be provided between the proposed roundabout at James Small Drive and the realigned Pacific Highway to the east of the project next to the Korora Hill interchange
- James Small Drive (south) would be realigned to join the proposed roundabout at the intersection of the service road and the new connection road
- The eastern end of Old Coast Road would be a cul-de-sac with access to properties being provided via an access road between the project and Kororo Nature Reserve
- Korora School Road would be closed. Properties which currently have access via Korora School Road would be provided access from the service road. Parking and drop off/pick up areas will be provided on the eastern side of the service road adjacent to Kororo Public School

- A new local access road would be provided west of the project between Old Coast Road (near Korora Basin Road) and Seaview Close to provide access to properties west of the project in this area. This new local access road would be connected to the service road via an underpass near Fernleigh Avenue
- Opal Boulevard would be realigned between the service road and Pine Brush Creek, east of the project
- Coachmans Close would be realigned to connect to the realigned Opal Boulevard. Realigning Coachmans Close and providing the service road adjacent to Coachmans Close would result in vegetation clearing during construction. Where possible, vegetation would be replanted between the service road and Coachmans Close.

Kororo Public School bus interchange

The existing bus interchange facility located on the existing Pacific Highway between Kororo Nature Reserve and Kororo Public School would be replaced with a new bus interchange facility to the south of Kororo Public School. Access to the new Kororo Public School bus interchange would be provided via James Small Drive rather than the new service road (refer to **Figure 5-10**). This is because of the significant height difference between the interchange and service road at this location not making a connection possible. Formalised on-street parking would be increased from 14 to 37 bays on Korora School Road as a staff car park. The bus interchange would be subject to further refinement during the detailed design stage.

Figure 5-10 Proposed Kororo Public School bus interchange

5.3.12 Connections to existing roads and tie-ins

The project ties into the existing Pacific Highway to the south at the Englands Road interchange and to the existing dual carriageway highway at Sapphire. The project would also include several connections to the local road network as described in **Section 5.3.11**. The extent of the tie-ins and connections includes line marking, signposting and minor pavement work.

5.3.13 Operational water quality measures

A water quality management strategy has been developed for the project with the aim of maintaining or improving water quality running off the project before it enters the local creek system.

The strategy comprises a system of catch drains, piped drainage, swales, sediment basins and gross pollutant traps in tightly constrained environmentally sensitive locations. The swales, sediment basins and proprietary spill capture units would treat day-to-day runoff from the road. The sediment basins and proprietary spill capture units would be designed to accommodate a spill volume of up to 40,000 L which would contain a major accidental spill from a traffic accident. The proposed sediment basins are shown in **Figure 5-2-01** to **Figure 5-2-12**.

The following mean annual pollutant load reduction targets from the Pacific Highway design guidelines (Roads and Maritime Services 2015f) have been adopted as part of the water quality treatment design for the project. This guideline recommends load-based reduction targets as follows:

- 80 per cent reduction in total suspended solids (TSS)
- 45 per cent reduction in total phosphorus (TP).

The percentage reduction is measured by comparing the unmitigated design scenario with the mitigated design scenario. The Pacific Highway design guidelines do not include a reduction target for total nitrogen (TN).

Proprietary spill capture units are proposed at the following locations:

- At the southern end of the project near the tie-in with the existing Pacific Highway
- Four are proposed at the Englands Road interchange
- South of Coramba Road interchange
- About mid-way between the Coramba Road interchange and Shephards Lane
- Just south of the project crossing of Pine Brush Creek
- At the portals of each tunnel, except for the northern portal of Roberts Hill tunnel (alignment crest is just north of the northern portal and all fluid in the Roberts Hill tunnel would drain to the southern portal).

The proposed operational water quality measures would be subject to further refinement during the detailed design stage. Further consideration of the proposed water quality measures is provided in **Chapter 19, Surface water quality**.

5.3.14 Roadside furniture, fencing and lighting

Safety barriers would be provided along the length of the project in line with the Pacific Highway design guidelines (Roads and Maritime Services 2015f).

Fencing would be installed where needed to prevent unauthorised access to the main project alignment and other operational areas next to the bypass. Fauna fencing would also be used to prevent animals from entering the road and to guide animals to the proposed fauna crossing structures (refer to **Section 5.3.8**). Fauna fencing is anticipated to be about 1.8 m high and chain mesh (or similar). The type of fencing would be finalised during detailed design.

A lighting scheme would be developed consistent with the Pacific Highway design guidelines (Roads and Maritime Services 2015f). Lighting at the interchanges would be designed based on luminance criteria in accordance with Category V3 in with AS/NZ 1158 – Lighting for roads and public spaces. This would typically involve fitting the lighting with aeroscreen visors and positioning lights to avoid light spill outside of the road corridor and upwards into the night sky.

Lighting for the project would be provided at the following locations:

- The northbound exit and the southbound entry ramps at the Englands Road interchange
- Along Englands Road between the northbound entry ramp and Stadium Drive, including the approaches to intersections along Englands Road, for the existing Pacific Highway, Isles Drive and the northbound entry ramp
- The western roundabout of the Coramba Road interchange
- The northbound exit ramp approach, the Bennetts Road approach and the Coramba Road approaches to the western roundabout of the Coramba Road interchange
- The southbound exit ramp approach and the Coramba Road approaches to the eastern roundabout of the Coramba Road interchange
- The intersection of Coramba Road and the northbound entry ramp at the Coramba Road interchange
- Along the realigned existing Pacific Highway at the Korora Hill interchange, between the realigned Bruxner Park Road, the southbound entry ramp, the new connection road to James Small Drive and the James Small Drive roundabout at the intersection of James Small Drive and the service road
- The northbound entry and the southbound exit ramps at the Korora Hill interchange.

The proposed lighting for the project would be subject to refinement during detailed design.

Tunnel lighting

Lighting within and directly adjacent to the tunnels would be based on road geometry and would be designed to comply with the Australian/New Zealand Standard AS/NZS 1158.5:2007: Lighting for roads and public spaces, and the International Standard CIE 88-2004: International Commission of Illumination Publication Guide for the Lighting of Road Tunnels and Underpasses.

Impacts associated with light spill have been assessed in **Chapter 11, Urban design, landscape and visual amenity**.

5.3.15 Noise mitigation

Preliminary noise mitigation measures have been developed based on the concept design and a preliminary feasible and reasonable assessment. These include:

- Low noise pavement, consisting of open graded asphalt, from the southern tie in to the northern extent of the project, excluding the extent of the tunnels as shown in **Figure 5-2-01** to **Figure 5-2-12**
- Earth mounds incorporated into the project design to help balance earthworks for the project and help with managing visual and noise impacts (refer to **Section 5.3.1** for locations and heights of the earth mounds)
- Noise walls (refer to **Chapter 9, Noise and vibration** for locations and heights of noise walls)
- At-property treatments for sensitive receivers.

The potential road traffic noise impacts and the proposed noise mitigation measures are discussed in **Chapter 9, Noise and vibration**. The design of noise barriers (including earth mounds and walls) is discussed further in described in **Chapter 11, Urban design, landscape and visual amenity**.

The noise mitigation measures (including barrier heights and locations) would be reviewed at the detailed design stage. This assessment may result in more or less receivers qualifying for consideration of noise mitigation and would consider any changes to the design and, where required, feedback from consultation with affected residents.

5.3.16 Utility services

Several utilities are in or next to the construction footprint including electrical, sewer, water and telecommunications. Preliminary discussions with utility service providers and investigations during the concept design stage has provided an overview of existing public utilities and development of relocation strategies. **Table 5-6** provides a description of utilities that potentially require relocation or protection during construction, relevant utility service providers and general locations in relation to the project.

Table 5-6 Utilities potentially requiring relocation or protection

Utility	Service provider	Utility type	General locations for relocations or protection
Water	CHCC	Water main	Pacific Highway south of Englands Road, Englands Road, Stadium Drive, Isles Drive, Industrial Drive, North Boambee Road, Coramba Road, Bruxner Park Road, James Small Drive and Pacific Highway between Bruxner Park Road and Solitary Islands Way.
Sewer	CHCC	Sewer main Sewer rising main	Stadium Drive, Englands Road, Isles Drive and Opal Boulevard.
Electrical	Essential Energy	Low voltage cable 11 kV 66 kV	Pacific Highway south of Englands Road, Englands Road, Stadium Drive, Isles Drive, Industrial Drive, North Boambee Road, Buchanans Road, Coramba Road, Bennetts Road, Shephards Lane, West Korora Road, Bruxner Park Road, James Small Drive, Old Coast Road, Coachmans Close, Pacific Highway between Bruxner Park Road and Solitary Islands Way and various local access roads intersected by the project.
Communications	Telstra NBN Optus Next Gen AARNet	Aerial cables Underground conduits Local optic fibre cables Nationally significant optic fibre cable (Optus)	Pacific Highway south of Englands Road, Englands Road, Stadium Drive, Isles Drive, Industrial Drive, North Boambee Road, Buchanans Road, Coramba Road, Bennetts Road, Shephards Lane, West Korora Road, Bruxner Park Road, James Small Drive, Old Coast Road, Coachmans Close, Seaview Close, Pacific Highway between Bruxner Park Road and Solitary Islands Way and various local access roads intersected by the project.

In addition to the services above, existing street lighting may need to be relocated or improved in certain areas for the project.

Depending on the utility service being relocated, work may be required to occur outside the construction footprint to meet the utility service provider requirements. For example, telecommunication service providers typically require that any optic fibre adjustment be from ‘node to node’ in nominated pits with splicing not preferred and/or feasible.

Details of existing utility services and requirements for their potential relocation or protection will be finalised during detailed design in consultation with the utility service providers. Given the scope of work potentially required, it is likely that any relocation or protection would occur as a pre-construction activity (refer **Chapter 6, Construction**) and would also require work outside of the standard working hours to minimise disruption to traffic and disturbance to surrounding residences and businesses (refer **Chapter 6, Construction**).

Specifically, the strategy for managing utilities would include:

- Further detailed utility investigations (revised 'Dial before you Dig' queries and/or potholing to confirm location of buried services)
- Ongoing consultation with utility service providers
- Detailed utility design
- Carrying out relocation or protection work in accordance with environmental management measures detailed in **Chapter 26, Summary of environmental management measures** and utility service providers requirements and construction methods.

The project would require connection to existing electricity, telecommunication and water utilities. This would be required for the operation of street lighting and the traffic signals as well as the operation of the three tunnels. For the tunnels, connections would include:

- Water for tunnel maintenance activities, deluge systems and fire testing. A connection to the mains water supply is proposed
- Electricity supply infrastructure would be installed to supply power to the tunnels during construction and would be retained for associated mechanical and electrical equipment, fire and life safety systems and operational control systems needed during operation. Uninterrupted electrical power is essential for lighting, the various traffic operational devices and other safety reasons within the tunnels.

Chapter 12, Land use and property and **Chapter 14, Socio-economic** assesses the potential impact of carrying out the utility relocation or protection work.

5.3.17 Property access and acquisition

The project would involve rationalising local property access connections and incorporating new local access roads which would provide for safer access into properties and onto the bypass.

The project would change existing access arrangements for several properties. Property access would be reinstated where existing access is affected by the project, either be via an overpass or underpass structure and/or new property access road built next to the project alignment. Proposed local and access roads are shown on **Figure 5-2-01** to **Figure 5-2-12** and described in **Section 5.3.11**.

Land within this corridor would be acquired in accordance with the Land Acquisition Information Guide (Roads and Maritime Services 2014b) and the *Land Acquisition (Just Terms) Compensation Act 1991* and the land acquisition reforms announced by the NSW Government in 2016, which can be viewed online at:

https://www.finance.nsw.gov.au/sites/default/files/NSW_Government_Response.pdf

The extent of property acquisitions is outlined in **Chapter 12, Land use and property**. Residual land treatment opportunities have been identified for land acquired for the construction of the project that would not be needed for the operation of the project (refer to **Appendix J, Urban design, landscape character and visual impact assessment**).

5.3.18 Traffic management and emergency and incident facilities

Emergency crossover access has been nominated at five locations on the project. The facilities proposed would be a combination median crossover, stopping bays and U-turn facilities. The indicative locations proposed are as follows and would be refined during detailed design:

- About 700 m north of North Boambee Road and about 700 m south of the Roberts Hill tunnel
- About 200 m south of the southern portal of the Shephards Lane tunnel
- About 200 m north of the northern portal of the Shephards Lane tunnel
- About 400 m south of the southern portal of the Gatelys Road tunnel
- About 200 m north of the northern portal of the Gatelys Road tunnel.

The facilities would provide for the turning of emergency vehicles and/or blocked highway traffic in the event of a crash or the management of traffic flows onto the alternate carriageway in the event of a major incident on the Pacific Highway.

Tunnel emergency and incident facilities

The proposed road tunnel fire safety systems were developed by following the process outlined in Australian Standard AS4825 – Tunnel fire safety and Dangerous Goods in Tunnels Application and Methodology (Austroads 2019). The final road tunnel fire safety systems would be determined during detailed design in consultation with relevant stakeholders.

The Regional Traffic Operations Centre (RTOC) at Ewingsdale would likely be used to coordinate tunnel operation systems during normal operation and during emergency conditions for all three tunnels. The RTOC will be supported by local resources to manage incidents or respond to emergency events as required.

Key objectives of the fire and life safety design would be to protect life and assets, control the incident and facilitate intervention by the emergency services.

Cross passages would be located within the tunnels (refer to **Table 5-4**) for maintenance and emergency access only. Cross passages would connect to the adjoining tunnel, providing access to a non-incident zone during an emergency. Connections between the tunnels would cater for people with disabilities by minimising ramps with steep grades and by providing alternative safe holding zones in an incident.

Shoulders and a 1.5 m wide maintenance and emergency access pedestrian path would be provided within the tunnels to enable safe passage to the cross passages.

Jet fans would be provided below the ceiling of the Shephards Lane and Gatelys Road tunnels. Jet fans would be operated in the event of a fire to prevent smoke spreading to where traffic is likely to be stopped behind an incident and to prevent smoke from entering the adjacent tunnel.

Fire suppression (deluge) along with linear heat sensors would be used to manage fires and ensure occupant safety, operational continuity and asset protection. A deluge suppression system operated in a timely manner would minimise the fire size, reduce fire spread and heat generation. A deluge suppression system and the tunnel operator would assist FRNSW in managing a fire incident and in performing their search and rescue duties. These factors allow for efficient incident management and would minimise the time it takes for the tunnels to reopen.

Mains water supply would be required during operations for the deluge suppression system. The tunnel deluge and fire suppression system, including number, location and capacity of water storage facilities, would be designed and sized to meet the requirements of FRNSW and the water supply authority, CHCC.

Roads and Maritime will develop controls and operating procedures to respond to all tunnel incidents in consultation with FRNSW, SES, Rural Fire Service and CHCC. These would include clearly defined

responsibilities with respect to access, traffic management and tunnel equipment, to ensure a rapid and coordinated response to emergencies. These procedures, including trial incident response/simulated rescue activities with all key stakeholders responding would be tested during both desk and field commissioning trials prior to opening the tunnels and at regular intervals post opening to ensure operational readiness in the rare event of in incident.

Tunnel traffic management

Traffic management and communication systems are included in the tunnel design for the safety of tunnel users and personnel employed in tunnel maintenance and operations. A range of electronic equipment would be deployed to monitor and control traffic flows, transmit alarms, alert emergency and breakdown services and maintain contact between the RTOC, Transport for NSW's Transport Management Centre, the relevant emergency services and local Roads and Maritime resources as required.

Monitoring of traffic and other activities would be achieved by combinations of closed-circuit television (CCTV), CCTV alert and automatic incident detection systems, and emergency telephones. Traffic would be controlled by fixed signs, variable message signs, variable speed limit signs, matrix signals, traffic signals, in tunnel lane control signs and moveable medians according to specific needs. Portal physical barriers (boom gates), traffic signals, moveable medians and median crossovers would also be provided to allow for tunnel closures and diversions. When hazards arise, variable messages/signals and variable speed limits would display appropriate advance warnings to slow or redirect traffic or warn of lane or tunnel closures ahead.

In the event of a tunnel closure, the existing highway would form an alternative route. Contra flow arrangements in conjunction with on-site manual traffic control, could also be used via the median crossovers.

CHAPTER

6

Chapter 6

Construction

6. Construction

This chapter summarises the proposed approach to the construction of the project. It outlines the proposed construction footprint, program and staging, activities, ancillary facilities and work hours. A detailed description of construction resources and materials are outlined in **Section 6.7**. Construction management, including traffic management and access, spoil and waste, erosion and sediment control is discussed in **Section 6.8**.

Table 6-1 sets out the SEARs relating to construction and where these SEARs have been addressed in this EIS.

Table 6-1 SEARs related to construction of the project

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following: b) a description of the project and all components and activities (including ancillary components and activities) required to construct and operate it, including:	
	- The proposed route	Section 6.3 **Chapter 5, Project description**
	- Design of the motorway and its components, including interchanges, tunnels and bridges, and road user, pedestrian and cyclist facilities, and lighting	Section 6.4 **Chapter 5, Project description**
	- Local road upgrade works, including road widening, intersection treatment and grade separation works, property access, parking, pedestrian and cyclist and public transport facilities	**Chapter 5, Project description**
	- Ancillary infrastructure and operational facilities, such as operational and maintenance facilities, ventilation systems, fire and emergency systems and services, and infrastructure, for the project	Section 6.5
	- Location and operational requirements of construction ancillary facilities and access	Section 6.1 to Section 6.5 Section 6.8
	- The relationship and / or integration of the project with existing public and freight transport services.	**Chapter 8, Traffic and transport**
	f) a description of feasible alternatives to the project, including: - Alternative methods considered for the construction of the project, including the tunnels; and	Section 6.2 Section 6.4
	- Staging of the project	Section 6.2
	q) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software	**Chapter 5, Project description**

6.1 Construction footprint

The construction footprint (shown in **Figure 6-1**) defines the likely extent of the area required for construction and operation of the project. This includes the area required for all work such as temporary and permanent drainage structures, permanent waterway realignments, ancillary facilities and access roads.

The construction footprint has been established to minimise vegetation clearing while providing sufficient room to allow the project to be constructed in a safe and efficient manner. The construction footprint would be subject to refinement during detailed design and construction. Some factors that could affect the final construction footprint include the location and size of sedimentation basins, the construction methodology and arrangements made with directly affected landowners.

6.2 Construction delivery, staging and timing

6.2.1 Construction delivery

Subject to project approval, Roads and Maritime would consider and select the most suitable procurement method for project construction delivery. This may include:

- A detailed design contract(s) followed by a separate construction contract(s), each awarded through a competitive tendering process
- A combined detailed design and construction contract awarded through a competitive tendering process.

The preferred procurement method would be selected and implemented in compliance with this EIS, the project's approval and any licences or permits.

Roads and Maritime would be responsible for overseeing the construction, including inspections, monitoring and auditing work performed by the construction contractor(s).

6.2.2 Construction staging

As described in **Chapter 4, Project development and alternatives**, staged delivery of the project was reviewed during concept design development. While that review focused on staging options that deferred delivery of features of the project, there is also potential for the construction phase of the project to be staged to allow certain construction activities to start as soon as possible after project approval (ie enabling work) and before the main construction work.

Enabling work for major infrastructure is typically carried out before the start of main construction work to 'make ready' the key construction sites and/or minimise disruptions to traffic and the community and/or to remove conflicts and bring about road user safety benefits as early as possible. Enabling work could be carried out by one or more construction contractors who could also be independent of the main construction work contractor.

Enabling work is considered different to pre-construction activities which are typically of low impact to the community and environment. Pre-construction activities are described in **Section 6.4.1**.

Potential activities that could be carried out as enabling work for the project are identified in **Table 6-2** and the locations are shown in **Figure 6-1.**

Table 6-2 Potential enabling work activities

Enabling work activity	Description	Benefit
Coramba Road bridge (BR09)	Coramba Road bridge is a local road overpass forming part of the Coramba Road interchange. Starting construction of the overbridge and its approaches before starting the main construction work would allow local traffic to be diverted to the new bridge and onto its final configuration earlier in the main construction program.	Reduces duration of impacts on the community and minimises disruption to local traffic. Also improves construction efficiencies associated with being able to establish a haul road under the new bridge earlier in the construction program and would avoid a potential safety conflict between local traffic and construction traffic.
Bridge over North Coast Railway near Shephards Lane (BR12)	Based on consultation with ARTC, opportunities to establish a temporary level crossing of the North Coast Railway within the construction footprint are limited due to the alignment of the railway and potential safety requirements likely not being able to be achieved. Other constraints at this location include surrounding topography and the design alignment being about 11 m above the rail alignment. Starting construction of the bridge over the railway before starting the main construction work would allow the use of the bridge for construction traffic earlier in the main construction program and would allow for haulage of earthworks and construction materials within the project corridor rather than the local road network.	Minimises the duration of impacts on local traffic and the community from construction vehicles and haulage equipment needing to use local roads before being able to use the construction footprint for access and hauling.
Shephards Lane overpass (BR11)	Construction of this bridge (in conjunction with BR12) before starting the main construction work would allow the use of the bridge for construction traffic earlier in the main construction program and improve access to the construction site.	This would assist in providing suitable early access to the construction site and would reduce impacts to residents who gain access to the existing road network via Shephards Lane. Also improves construction efficiencies associated with being able to commence earthworks earlier in the construction program at this location and establish the haul road under the new bridge.
Tunnel preparatory work and extractive activities	Preparatory work for tunnels including establishing the portal sites, associated ancillary sites and preparation of the tunnelling face.	The portal sites would provide support services for the tunnelling activity including temporary ventilation plant, water supply, construction water treatment plants and workforce facilities. Excavating a heading through one or more of the tunnels early (particularly at Shephards Lane) would also allow access/haulage along the route early and reduce the need for site access from local roads.

Enabling work activity	Description	Benefit
	Earthworks associated with the cuttings south of the Roberts Hill and south of Korora Hill interchange and processing of the material.	Improves construction efficiencies with high quality fill material being available earlier in the main construction program. Also minimises potential for overreliance of imported materials which could result in the use of limited local quarry resources and an unexpected amount of surplus material to manage later in the construction program.
Bridge over North Boambee Road (BR04)	Construction of the overbridge and its approaches before starting the main construction.	Improves construction access along the corridor for the main construction program and reduces traffic management requirements on North Boambee Road. Reduces impacts for road users on North Boambee Road. Also improves construction efficiencies associated with being able to establish a haul road under the new bridge earlier in the construction program and would avoid a potential safety conflict between local traffic and construction traffic.
Waterway crossings	Construction of bridges over waterways associated with the Coffs Creek (BR06, BR07 and BR08), North Boambee Valley floodplain, including Newports Creek (BR23) and its tributaries (BR03 and BR05). This would include any required realignment and/or adjustment of the waterways.	Construction of the bridges over waterways associated with Coffs Creek and the North Boambee Valley floodplain, including Newports Creek and its tributaries would assist in managing environmental risks at these locations. Based on consultation with DPIE (Regions, Industry, Agriculture and Resources), establishing the permanent crossings early in the construction program would reduce the need for temporary crossing structures and reduce the duration of potential impacts to these waterways. In addition, undertaking any necessary realignment and/or adjustment of the waterway early in the construction program would allow for associated landscaping and soft engineering to be fully established prior to the end of construction.
Korora Hill to Sapphire	The Korora Hill to Sapphire section of the project would involve coordinating work with the existing Pacific Highway traffic for the duration of the construction program. There are several activities within this section of the project that could be started as enabling work before main construction starts, including: • Construction of the new Luke Bowen footbridge (BR24)	Would provide significant safety improvement to remove school buses and children from the existing Pacific Highway and the construction zone as early as possible, eliminating potential conflicts. Also provides significant time savings for the main construction program if these activities are started as enabling works. This is due to the ability to use the new service road as part of managing the

Enabling work activity	Description	Benefit
	• Relocation of the Kororo Public School bus interchange and parking • Construction of the bridges over Pine Brush Creek (BR21) and new service road • Relocation of 66 kV power line and other adjacent utility services.	existing Pacific Highway traffic and allowing school buses and pedestrians to utilise the new facilities in their final configuration either before or as early as possible in the main construction program.

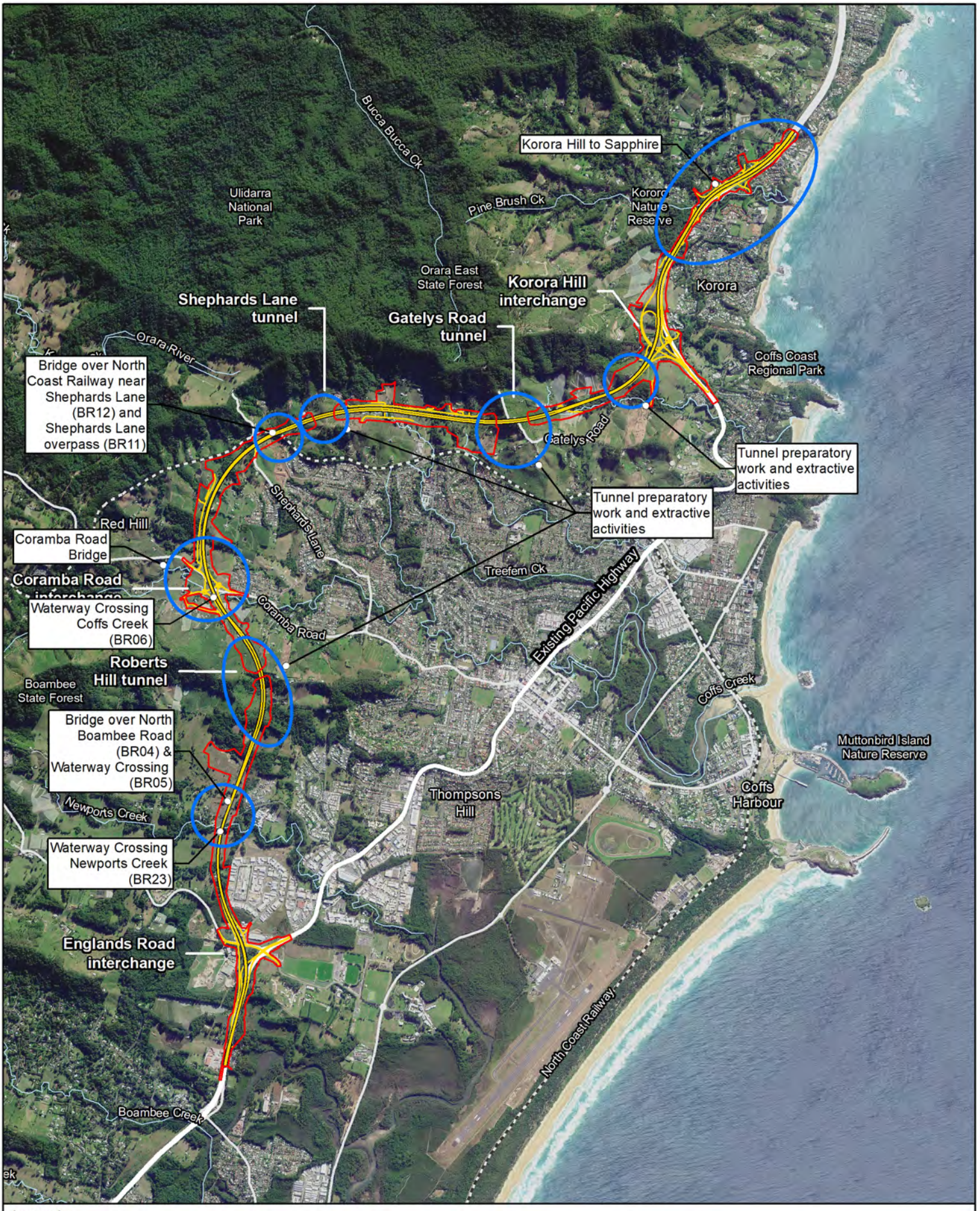
In addition to the enabling works described above in **Table 6-2**, there remains the potential that the section of the project between Korora Hill and Sapphire may be built in stages to maximise the use of the existing dual carriageway highway. An initial stage may include rationalising individual property accesses to the existing highway and closing median breaks.

The decision on possible staging of the project enabling work described above in **Table 6-2** and the Korora Hill and Sapphire section would be made after project approval and during the pre-construction stage. The decision would be made with reference to project conditions of approval, funding availability and other engineering considerations.

If a decision is made to stage the relevant work, a staging report would be prepared and would include but not be limited to:

- A description of the proposed staging requirements
- Identification of how the project conditions of approval would be addressed across and between the proposed construction stages of the project
- Identification of any additional environmental management measures that would be implemented (if required) because of the staging of the project's enabling works and the Korora Hill and Sapphire works.

The construction footprint described in **Section 6.1** and associated environmental impacts considers the proposed enabling work options as part of the whole project and environmental management measures proposed in the EIS would address all likely impacts. Similarly, potential environmental impacts from building the Korora Hill and Sapphire section in stages are anticipated to be negligible with impacts associated with rationalising individual property accesses and closing median breaks being balanced by road user safety benefits. Notwithstanding, following the decision of possible staging of the project, if there is potential for environmental impacts that have not been addressed as part of the EIS, consideration of these will be included within the staging report described above.



Legend

- Construction footprint
- Alignment
- North Coast Railway
- Watercourse

Coffs Harbour Bypass
Potential enabling works
Figure 6-1

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

6.2.3 Construction timing

Subject to project approval and funding availability, construction of the project is proposed to start in 2020 and would take about four to five years to complete, weather permitting.

The construction program shown in **Table 6-3** is indicative only and may change based on further work during detailed design and changes to construction methods and/or materials as well as wet weather periods. The community would be kept informed of timing as the construction program is refined after project approval.

Table 6-3 Indicative construction timeline based on a four year construction program

Principal activities	Year 1	Year 2	Year 3	Year 4
Preliminary activities and site establishment				
Site preparation and bulk earthworks				
Drainage and structures				
Bridges				
Tunnels				
Road work and road surfacing				
Finishing work				

6.3 Construction zones

Three construction zones have been defined for the project during concept design development. These zones are based on separating the project into sections where construction issues or differences in construction methods are likely. This approach has mainly been developed as a planning tool and may be altered during construction. The locations and features of the three proposed construction zones are provided in **Figure 6-2** to **Figure 6-7** and described in the following sections.

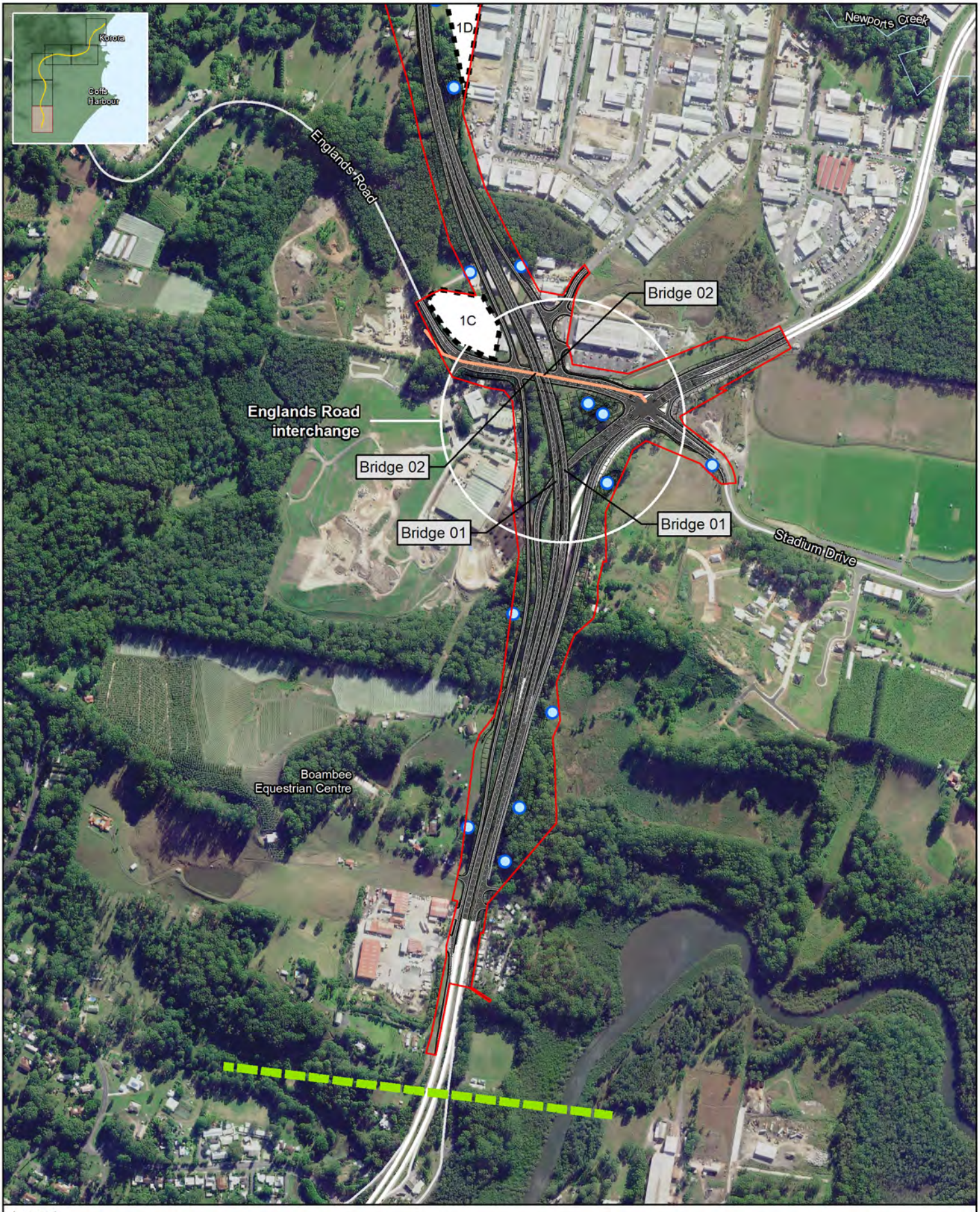
6.3.1 Zone 1 – Englands Road to Roberts Hill

This construction zone covers the area of the project from the southern tie-in to the existing Pacific Highway, south of Englands Road, to the north of Roberts Hill. Most of this construction zone would be constructed away from the existing Pacific Highway and across the North Boambee Valley floodplain. It includes the Englands Road interchange and the Roberts Hill tunnel.

Key features of this construction zone are discussed in **Table 6-4** and shown in **Figure 6-2** to **Figure 6-3**.

Table 6-4 Zone 1 construction features

Key features	Comments
Zone length	• Around 4.4 km
Construction access	• Via the existing Pacific Highway and Englands Road • Via North Boambee Road.
Earthworks	• Potential excess of material when comparing cut and fill volumes • Zone largely in fill across the North Boambee Valley floodplain.
Tie in to existing Pacific Highway south of Englands Road	• Connects to the existing dual carriageway highway about 1.1 km south of Englands Road • Includes extension to existing koala underpass south of Englands Road • Includes converting Englands Road roundabout to a traffic light intersection • Bridge over the proposed northbound exit ramp (BR01) • Bridge over Englands Road (BR02).
Newports Creek bridge (BR23)	• Bridge to minimise impacts on Newports Creek, which would require minor realignment to reduce potential impacts on habitat.
North Boambee Road bridge (BR04)	• Sufficient vertical clearance to North Boambee Road would be provided to not preclude it being raised in the future by CHCC.
Roberts Hill tunnel	• Twin tunnels about 190 m long and about 35 to 40 m below the crest of Roberts Hill ridge • Would require drill and blast to excavate material.



Legend

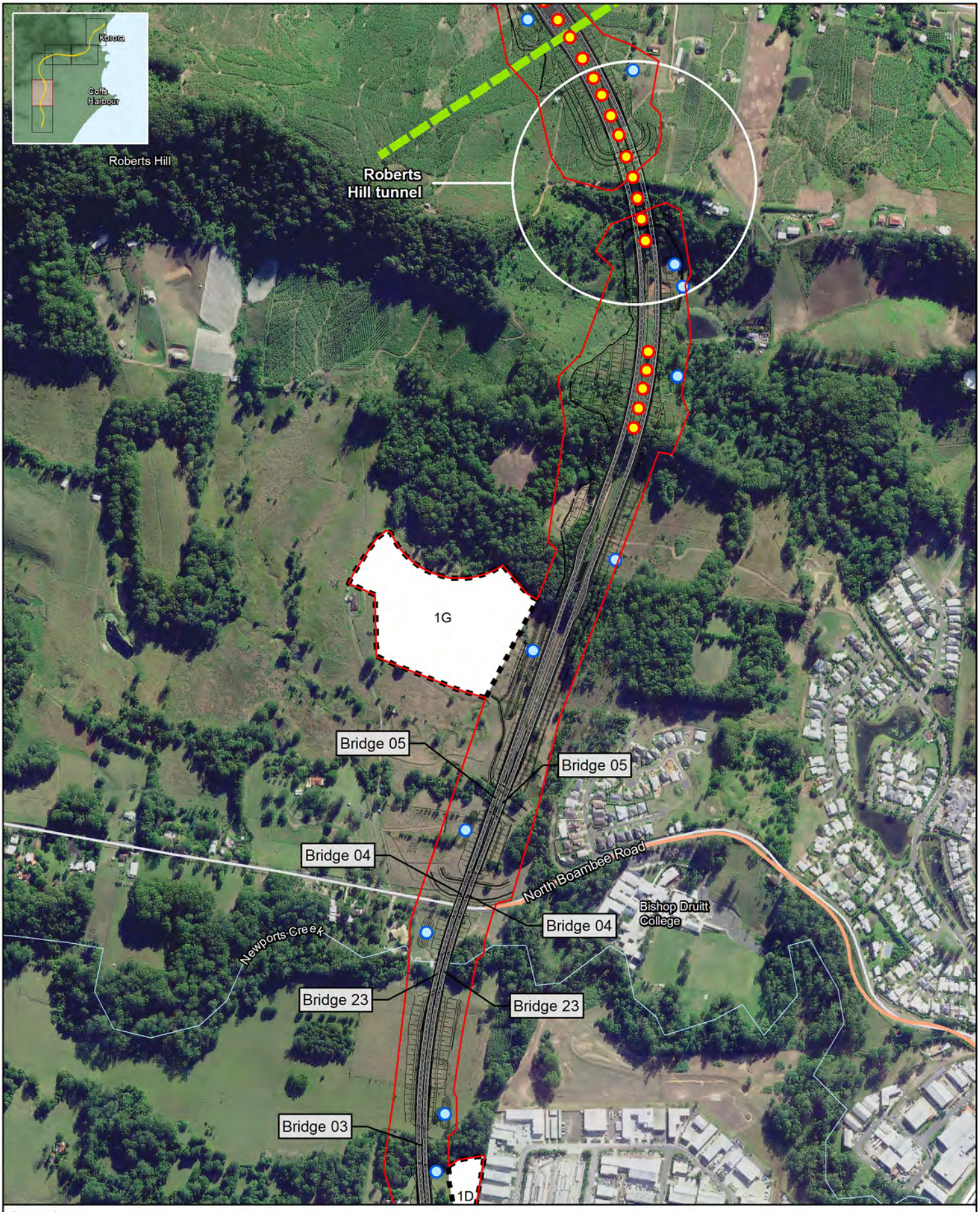
- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential anciliary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 1 (Map 1)
Figure 6-2

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential ancillary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 1 (Map 2)
Figure 6-3

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

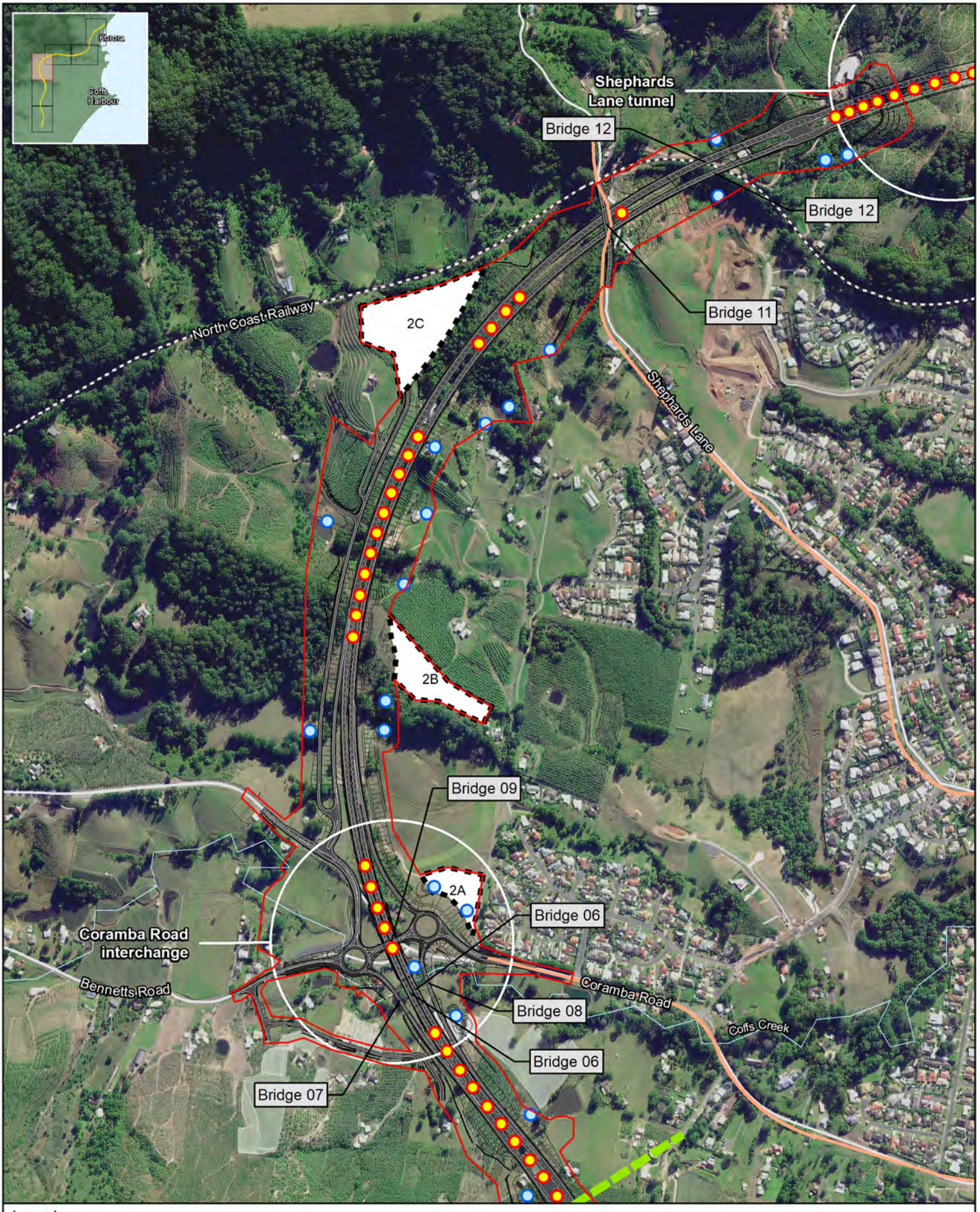
6.3.2 Zone 2 – Roberts Hill to Korora Hill

This construction zone covers the area of the project north of Roberts Hill to south of the Korora Hill interchange. It traverses a number of minor ridges, with a series of cuts and fills along the project and includes the Shephards Lane and Gatelys Road tunnels. This construction zone also includes the Coramba Road interchange and a crossing of the North Coast Railway.

Key features of this construction zone are discussed in **Table 6-5** and shown in **Figure 6-4** to **Figure 6-6**.

Table 6-5 Zone 2 construction features

Key features	Comments
Zone length	• Around 6.2 km
Construction access	• Via Coramba Road • Via Shephards Lane • Via Bray Street and Mackays Road • Via West Korora Road.
Earthworks	• Potential shortfall of material when comparing cut and fill volumes • Series of cuts and fills along the zone length.
Coramba Road interchange	• Includes diversion of Coramba Road to pass over the project alignment and ramps to provide access to and from the project.
Shephards Lane bridge (BR11)	• Bridge over the project to reconnect Shephards Lane • Bridge would be constructed next to the existing North Coast Railway tunnel currently below Shephards Lane and west of the project.
Bridge over North Coast Rail Line (BR12)	• Bridge spanning the North Coast Railway and a local access road.
Shephards Lane tunnel	• Twin tunnels about 360 m long and about 80 m below the crest of Shephards Lane ridge • Would require drill and blast to excavate material.
Mackays Road underpass (BR13)	• Underpass south of Mackays Road to provide access to properties west of the project. This would require realignment of Mackays Road
Gatelys Road tunnel	• Twin tunnels about 460 m long and about 60 m below the crest of Shephards Lane ridge • Would require drill and blast to excavate material.
West Korora Road underpass (BR16)	• Underpass along the existing alignment of West Korora Road to provide access to properties west of the project.



Legend

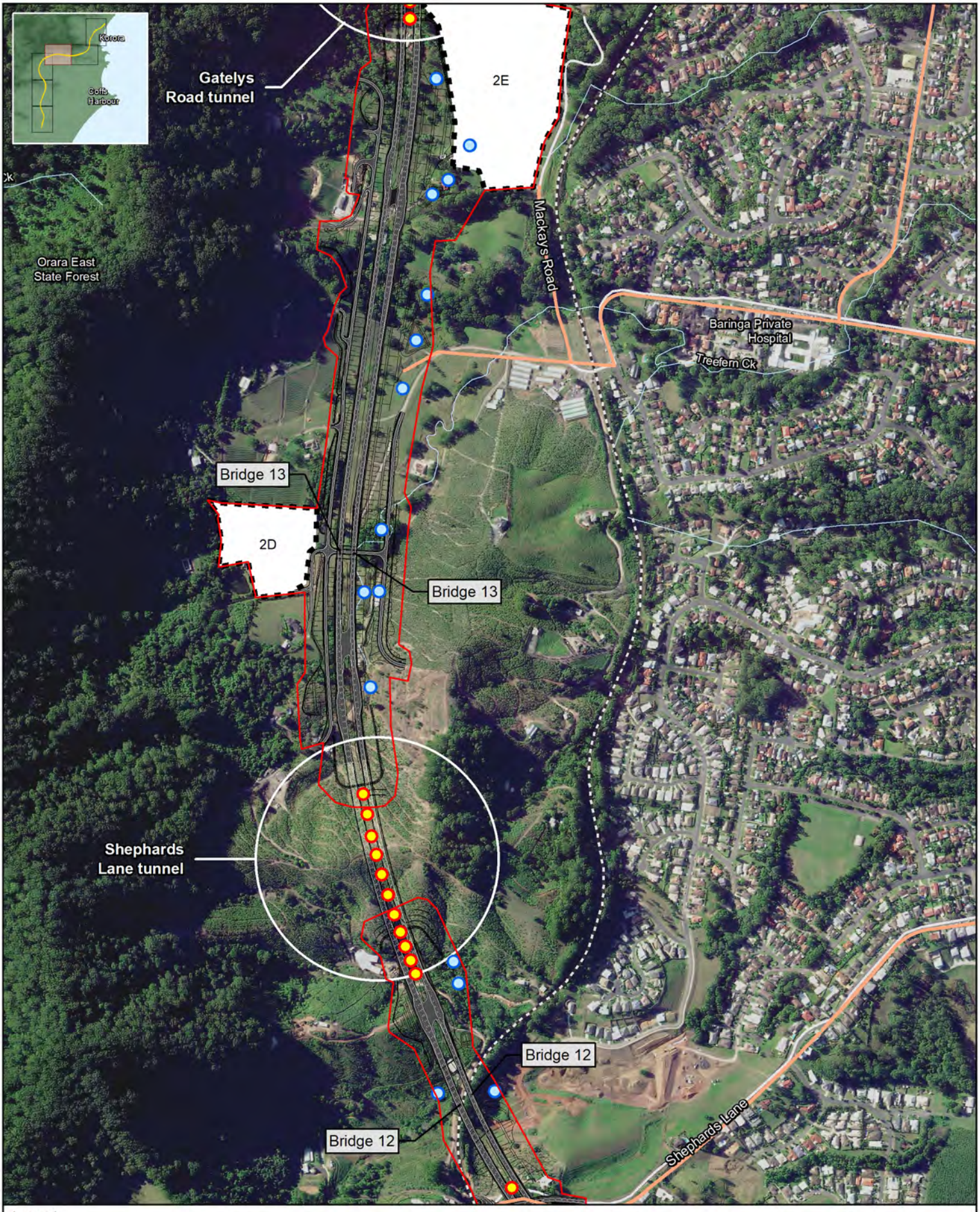
- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential anciliary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 2 (Map 1)
Figure 6-4

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential ancillary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 2 (Map 2)
Figure 6-5

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

6.3.3 Zone 3 – Korora Hill to Sapphire

This construction zone covers the area of the project from south of Korora Hill interchange to the northern tie-in to the existing Pacific Highway at Sapphire. This construction zone is largely located along the existing Pacific Highway between Bruxner Park Road and the northern tie-in. It is located in a very tightly constrained corridor, with key pinch points at the Kororo Nature Reserve and Kororo Public School. It comprises a continuation of the existing service road to the east (built as part of the Sapphire to Woolgoolga upgrade) from south of Sapphire to James Small Drive, and a local access road proposed to the west of the project to provide access to Old Coast Road and Seaview Close.

Key features of this construction zone are discussed in **Table 6-6** and shown in **Figure 6-6** to **Figure 6-7.**

Table 6-6 construction features

Key features	Comments
Zone length	• Around 3.4 km
Construction access	• Via the existing Pacific Highway and Bruxner Park Road • Via Old Coast Road • Via James Small Drive.
Earthworks	• Potential excess of material when comparing cut and fill volumes. Any excess material will be used in other zones on the project.
Korora Hill interchange	• Interchange located west of the existing Pacific Highway and provides a connection between the project and the existing Pacific Highway to the south (towards Coffs Harbour), Bruxner Park Road, James Small Drive and the proposed service road • Bridge over a realignment of the existing Pacific Highway (BR17) • Bridge over a connection to James Small Drive (BR19).
Upgrade along existing Pacific Highway corridor	• Tightly constrained corridor between Kororo Nature Reserve and Kororo Public School • Existing Pacific Highway traffic to be managed during construction • Bridge over Pine Brush Creek (BR20).
Proximity to Kororo Public School	• Construction activities are likely to occur in Zone 3 for the full construction program, including in areas next to the school.
Luke Bowen footbridge relocation (BR24)	• Existing pedestrian bridge to be replaced with a new pedestrian bridge to be built about 200 m north of the existing bridge, near Old Coast Road.
Kororo Public School bus interchange	• Existing bus interchange to be relocated, near Kororo Public School. Access to the bus interchange to be from James Small Drive.
Local access underpass (BR22)	• Local access underpass, near Fernleigh Avenue, to provide access to Old Coast Road and Seaview Close.
Tie-in to existing dual carriageway at Sapphire	• Connects to the existing dual carriageway highway at Sapphire. • Service road east of the project connects directly to Solitary Islands Way.

Legend

- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential ancillary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 2 (Map 3) / Construction Zone 3 (Map 1)
Figure 6-6

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Construction footprint
- Alignment
- Construction zone
- Potential construction access
- Potential ancillary sites
- Potential controlled blasting sites
- North Coast Railway
- Watercourse
- Indicative construction sediment basin location

Coffs Harbour Bypass
Construction Zone 3 (Map 2)
Figure 6-7

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

6.4 Construction activities

The project would likely be built using conventional methods used on most highway projects. These methods may be modified during the detailed design or construction stages to address site-specific environmental or engineering constraints. The typical pre-construction and construction activities are shown in **Table 6-7.**

The activities and typical construction plant and equipment listed in **Table 6-7** provide sufficient detail to allow an assessment of the likely nature and extent of environmental impacts during construction. These activities are indicative and would be refined by the construction contractor based on the site constraints and in accordance with any conditions of approval. The type of plant and equipment would be determined by the construction contractor and may vary to **Table 6-7**.

The activities listed in **Table 6-7** are described in more detail in the following sections.

Table 6-7 Typical construction activities and plant

Component	Typical activities	Typical plant and equipment
Pre-construction and site establishment	• Property acquisition and adjustments, including property access changes • Detailed investigations and survey work including investigative drilling, contamination investigations and excavations • Condition surveys • Site establishment work, fencing and signage • Establishment of temporary ancillary facilities and compound sites including the site office • Temporary traffic management arrangements including construction of minor access roads • Progressive installation of environmental controls including temporary or permanent fencing, and erosion and sediment control measures • Construction of temporary drainage controls including temporary creek crossings • Minor clearing and removal of vegetation (non-threatened species) • Relocation and/or protection of utilities.	• Trucks • Generators • Light vehicles • Excavators • Chainsaws • Mulchers • Water carts • Cranes • Drilling rigs.
Site preparation and bulk earthworks	• Clearing and grubbing of vegetation • Mulching of vegetation for re-use in landscaping activities, where possible • Stripping topsoil and stockpiling it for reuse in landscaping • Excavation of cuttings, including processing, stockpiling or haulage of material, and stabilisation of batters • Drilling of blast holes • Establishment of crushing plant • Crushing and screening excavated material	• Trucks • Bulldozers • Excavators • Compactors • Graders • Scrapers • Loaders • Water carts • Compactors • Vibratory rollers

Component	Typical activities	Typical plant and equipment
	• Hauling materials from excavated cuttings, borrow sites and external sources to fill embankment locations • Construction of fill embankments and earth mounds, including foundation drainage • Benching and stabilising cut and fill batter slopes.	• Rock breakers/ hammers • Drilling and blasting equipment for hard rock cuttings.
Drainage and structures	• Construction of drainage, including kerb and gutter (where required) • Installation of cross-drainage, including culverts and inlet and outlet work, such as channel diversions and scour protection • Installation of longitudinal and vertical drainage in cuttings and embankments • Construction of diversion and catch drains along the formation and sedimentation control basins or swales (where required) • Construction of subsurface drainage • Construction of any retaining walls • Installation of fauna connectivity structures.	• Trucks • Bulldozers • Excavators • Concrete pumps • Concrete trucks • Cranes.
Bridge work	• Preparation of bridge work areas including temporary piling pads, access platforms • Installation of rock caissons or cofferdams or temporary access roads across waterways • Installation of bridge foundations (driven or bored piles, pile caps and footings) • Construction of new bridge abutments and piers • Construction of bridge superstructure including deck and road surface work (cast in situ or precast bridge elements) • Construction of scour protection (where required) • Construction of noise walls (where required).	• Piling rigs • Concrete pumps • Concrete trucks • Cranes • Excavators • Trucks • Cherry pickers • Welding equipment.
Tunnel work	• Establishment of portal sites in preparation for tunnel excavation, including provision of temporary tunnel services • Excavation and installation of temporary and permanent support measures (including lattice girders, spiling bars, reinforcement as appropriate and sprayed shotcrete) of tunnel portals • Excavation of tunnels using drilling and blasting equipment for hard rock and the installation of temporary and permanent support measures (including rock bolts, lattice girders, spiling bars, reinforcement as appropriate and sprayed shotcrete) • Excavation of cross passages and the installation of temporary and permanent support measures (including	• Drilling jumbos and blasting equipment for hard rock • Trucks • Excavators • Bulldozers • Graders • Paving machines • Light vehicles • Small cranes • Elevated working platform • Generators

Component	Typical activities	Typical plant and equipment
	rock bolts, lattice girders, spiling bars, reinforcement as appropriate and sprayed shotcrete) • Finishing works in tunnel and provision of permanent tunnel services • Commissioning tunnel plant and equipment.	
Demolition	• Demolition of bridges (Luke Bowen footbridge and northbound carriageway bridge over Pine Brush Creek) • Demolition of buildings (structures and sheds).	• Trucks • Bulldozers • Excavators • Light vehicles • Concrete saws • Jack hammers.
Road work and road surfacing	• Construction of temporary local traffic management diversions • Construction of base and select layers of materials • Construction of road surface layers • Construction of road surface drainage, including kerb and gutter (where required) • Construction of concrete barriers, wire rope fencing and guardrails • Installation of traffic lights, road markings, signposting, roadside furniture and lighting • Progressive landscaping and tree planting.	• Graders • Backhoes • Trucks • Water carts • Vibratory compactors • Bitumen sprayers • Rollers • Concrete trucks • Concrete pumps • Concrete saws • Compressors • Bitumen sprayers • Generators • Milling machines • Paving machines • Asphalt trucks • Curing machines.
Finishing work	• Remove temporary work • Restoration and landscaping of temporary sites • General site clean-up • Restoration of topsoil and revegetation of batters • Removal of temporary environmental controls • Site clean-up and demobilisation, including restoration of ancillary sites and construction access roads (where required).	• Trucks • Generators • Light vehicles • Cranes.

6.4.1 Pre-construction and site establishment

There would be some mobilisation and site establishment activities as listed in **Table 6-7**, before the main construction activities begins as these are activities considered to be low impact and can be undertaken before the Construction Environmental Management Plan (CEMP) is approved. The purpose of these activities would be to prepare the site, gather additional survey and geotechnical information, and install any environmental controls required during construction.

These activities would be managed by a separate activity-specific environmental management plan or work method statement. Preliminary and site establishment activities would include:

- Survey work including carrying out general alignment survey, installing survey controls (including installation of global positioning system), installing repeater stations, carrying out surveys of existing and future utilities and building and road condition surveys
- Geotechnical and site investigations including investigative drilling, contamination investigations and excavation
- Treatment of contaminated sites subject to the recommendations of a remediation action plan
- Establishment of construction ancillary facilities described in **Section 6.5** including constructing ancillary facility access roads and providing utilities to the facility. Operation of the ancillary facilities; however, would be limited to supporting other pre-construction activities or enabling work described in **Section 6.5**
- Minor clearing of native vegetation
- Installation of environmental management measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas
- At-property noise treatments to mitigate anticipated construction noise impacts before commencement of construction
- Consultation with CHCC and property owners potentially affected by flooding impacts and, if required, commencement of at-property flood mitigation measures as detailed in **Chapter 17, Flooding and hydrology**
- Archaeological testing under the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b) and salvage of archaeological objects in accordance with an approved salvage strategy
- Translocation of native vegetation and threatened species detailed in **Chapter 10, Biodiversity**
- Property acquisition adjustment works including installation of property fencing, demolition and removal of buildings and relocation and adjustments of property utility connections including water supply, sewer, telecommunications and electricity
- Relocation and connection of utilities described in **Chapter 5, Project description**
- Existing road network adjustments including minor upgrades to existing local roads and the existing Pacific Highway network, upgrade of existing intersections to cater for construction traffic and the installation of temporary project signage
- Construction of minor access roads, temporary relocation of pedestrian and cycle paths and the provision of property access including access and egress to construction ancillary facilities
- Establishment of construction water treatment plants and explosive storage magazines to support tunnelling activities
- Maintenance of existing buildings and structures required to facilitate the carrying out of the project.

6.4.2 Site preparation and bulk earthworks

Site preparation and bulk earthworks would be required to achieve a stable formation suitable for drainage and structures work, bridge work, tunnel work and road work. These activities would be carried out using conventional cut and fill techniques in which material is carted from each cut using excavators and trucks to fill areas requiring additional material.

Site preparation and bulk earthwork activities would include:

- Clearing and grubbing of vegetation
- Mulching of vegetation for re-use in landscaping activities, where possible
- Stripping topsoil and stockpiling for reuse in landscaping
- Excavating cuttings using excavators, graders, scrapers, bulldozers and blasting (where required)
- Drilling blast holes
- Use of rock hammers and rock breakers
- Crushing and screening excavated material
- Hauling materials from excavated cuttings and external sources to fill embankment locations
- Constructing fill embankments
- Stockpiling material for use on the project
- Benching and stabilising cut and fill batter slopes
- Installing transverse drainage and longitudinal and vertical drainage alongside embankments.

Road cuttings are likely to be excavated through a combination of controlled rock blasting and mechanically by bulldozers. Controlled rock blasting would be required to remove hard rock material where mechanical excavation would not be economical. Controlled blasting may occur in about 15 cuttings, with indicative locations shown in **Figure 6-2** to **Figure 6-7**.

Blasting may not occur for the entire cut formation at these locations, but for the portion of hard rock only. Rock breaking alternatives such as penetrating cone fracture and hydraulic rock breakers may also be used. No blasting within waterways is proposed for this project.

A Blast Management Strategy would be prepared before the start of blasting to identify exact blasting locations. Where a blast location is predicted to have an impact on a sensitive receiver, a series of trials would be carried out at a reduced scale to determine site specific blast response characteristics, to define allowable blasts sizes. Safety measures for the travelling and general public, including safe blast distances and exclusion zones, would be identified within the Blast Management Strategy. Refer to **Chapter 9, Noise and vibration** for further consideration of blasting.

6.4.3 Drainage

Drainage structures (including pits, pipes, culverts and open drains/swales) may be built progressively in conjunction with bulk earthworks and road work (refer to **Chapter 5, Project description**). Construction activities would vary depending on the type of drainage facility and would be installed to enable continuity of natural watercourses and hydrological processes.

A number of temporary diversion and watercourse crossings may be needed to enable ground work (such as placement of a drainage rock blanket) and for installation of culverts or bridge piers. The watercourse would then be re-routed along its natural course. Temporary diversions and watercourse crossings would be managed to avoid impact on any sensitive receiving environments, including any hydrological changes. Scour protection measures would be installed upstream and downstream of culverts and disturbed stream/creek banks to avoid erosion of the watercourse.

Catch drains and table drains would be constructed to collect water crossing the road formation. These are generally constructed with earth and lined with fibrous material such as jute or are seeded with a grass cover. However, given the steepness of the construction footprint in some sections, it is likely many catch drains and table drains would require concrete or rock lining. Kerb and guttering may also be constructed at deep cuts, interchange roundabouts and some local roads, service roads, and access roads.

Subsurface drainage would be constructed to capture any water that may seep under the road formation.

Depending on local site conditions, scour protection and/or drainage work may be required to extend outside the construction footprint to ensure appropriate connection to existing waterways and/or drainage lines and ensure hydrologic conditions are maintained or impacts minimised where possible.

Indicative construction activities are provided in **Table 6-7**.

6.4.4 Bridge work

The project is expected to include 19 bridges including waterway crossings, overpasses, underpasses and viaducts. Bridge foundations and substructures (including piles, abutments and piers) would be constructed using standard techniques and would typically involve:

- Construction of bridge foundations and substructures including piles, pile caps, piers and abutments
- Installation of bridge deck (super structure).

Abutments would be constructed directly from the approach embankments at either end of the proposed bridges. The construction activities and sequence would be determined by the construction contractor and informed by the EIS, approval conditions and detailed design.

The bridge superstructures would vary and would include:

- Concrete plank bridges
- Super-T bridges
- Concrete cast-in-situ reinforced concrete balanced cantilever box girder bridges (proposed bridge over North Coast Railway [BR12])
- Post tensioned cast-in-situ reinforced concrete voided slab concrete girder bridges (proposed Shephards Lane bridge over the bypass [BR11])
- Steel box girder bridge (proposed pedestrian bridge over the existing Pacific Highway near Kororo Public School [BR24]).

Some bridge superstructures would be constructed using the precast construction techniques. A crane would be used to lift in the bridge girders directly onto the abutments and pier headstocks once the bridge bearings have been constructed.

The cast-in-situ reinforced concrete box girder bridge proposed over the North Coast Railway (BR12) would likely be built using a balanced cantilever method due to the long central span (about 90 m). Balanced cantilever construction would likely involve:

- Installing the deck segments (typically three to five metres long) on either side of the pier. Each segment wold be stressed back to the adjoining bridge element (either the pier or adjoining deck segment). Bridge deck segments would be progressively added to each side of the pier outwards, generally maintaining a balanced load, cantilevering from each side of the pier
- Closing the spans with an in-situ deck ‘stitch’ once the cantilevers from nearby piers are completed
- Post-tensioning the box girders to make the bridge continuous.

Potential impacts to the operation of the North Coast Railway during construction are detailed in **Chapter 8, Traffic and transport**.

Overpasses and underpasses

A number of local access roads would be reconstructed either as overpasses or underpasses to maintain access across the project.

Construction of the Coramba Road overpass (BR09) would require temporary diversion of Coramba Road and Bennetts Road to maintain traffic operation during construction of the bridge and interchange ramps. The temporary diversion road would be constructed to a standard similar to the existing road and could be in service from six to 18 months weather dependant.

The alignment of the Shephards Lane overpass (BR11) allows for construction to be carried out with minimal impact to local traffic movements. Traffic management controls would be needed during construction of the bridge and the tie-ins to existing Shephards Lane to maintain local traffic movements.

Local roads that would be reconstructed as overpasses are described in **Section 5.3.4**.

Most of the underpasses would occur due to the construction of highway bridges over the local road. This may require minor realignments of the local road, which would be carried out before the underpass is constructed. These underpasses include BR13 and BR16 and would require temporary traffic restrictions and controls during the placement of the superstructure.

Creek realignments

Proposed creek realignments for the project are described in **Section 5.3.9**.

Creek realignments would be constructed so that natural flow conditions are maintained and would be carried out in accordance with the requirements of the DPIE guidelines for fish conservation and management (Fairfull & Witheridge 2003). Construction of creek realignments would begin by installing erosion and sediment control measures (including scour protection) around the existing watercourses to avoid erosion impacts. The new channel would then be constructed (including bulk earthworks) offline from the existing creek alignments. Once constructed, the new creek alignment would remain free of water flow to allow early establishment of native vegetation of the surrounds and creek bed. Planting would occur during this stage to help with early establishment of native vegetation before the creek is diverted to the new channel. Once the integrity of the riparian corridor is established, the creek would be diverted to the new channel.

Any realignment or adjustment of small unnamed drainage lines and watercourses would generally follow the above construction methodology where relevant. Depending on local site conditions, realignments or adjustments may be required to extend outside the construction footprint to ensure appropriate connection to existing waterways and/or drainage lines and ensure hydrologic conditions are maintained or impacts minimised where possible.

In addition to waterway realignments, temporary crossing structures may be required to cross Newports Creek, Coffs Creek, Treefern Creek, Pine Brush Creek and other small unnamed drainage lines and watercourses to enable materials to be hauled within the construction footprint (as opposed to using the existing road network) while the nearby culvert or bridge is being built.

Where required, the temporary crossing structure would be designed, constructed and maintained in accordance with the following requirements:

- Low-flow conditions would be maintained
- Fish passage would be maintained in accordance with the waterway classification and DPIE (Regions, Industry, Agriculture and Resources) guideline Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings *(*Fairfull & Witheridge 2003)
- Material used in temporary crossings would be selected to minimise risk of fine sediment material entering the waterway

- Include erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)
- Any material used in the temporary creek crossing would be removed following construction and the site rehabilitated to its existing condition.

6.4.5 Tunnel work

Tunnels are proposed to cross the major ridgelines at Roberts Hill, Shephards Lane and at Gatelys Road. Twin tunnels are proposed at each location, with one tunnel for each carriageway, separated by a rock pillar.

The tunnel excavation methods would be confirmed by the contractors engaged to construct the project. However, it is anticipated the tunnels would be excavated using controlled drill and blast methods and managed through the implementation of the Blast Management Plan discussed in **Section 6.4.2**.

Tunnel excavation works would involve:

- Establishment of critical services to the portal site such as high voltage electricity and water
- Preparation of the tunnelling face and establishing the portal sites including temporary ventilation plant, water supply, construction water treatment plants including sedimentation basins, acoustic sheds and workforce facilities
- Phased excavation by controlled blasting method including drilling holes and charging with explosive, blasting and removal of loosened material (mucking out) for external processing
- Ground support depending on geotechnical conditions would be installed as the tunnelling face is advanced. This would include temporary and permanent support measures (including rock bolts, lattice girders, spiling bars, reinforcement as appropriate and shotcrete

Another technique that may be used for tunnel excavation is to use a roadheader. A roadheader is an excavation machine consisting of a boom-mounted, rotating cutter head fitted on bulldozer style tracks (for moving the roadheader around).

Tunnel finishing works

Tunnel finishing works would be carried out following completion of the tunnel excavation works, and would involve:

- Installation of stormwater and groundwater drainage systems, including sumps
- Installation of water resisting treatments (where required)
- Finishing of cross-passages
- Installation of cut and cover tunnel section foundations
- Installation of cut and cover tunnel superstructure and back filling above the cut and cover tunnel sections
- Pavement construction and line marking
- Installation of electrical and communication conduits and cable trays, deluge and hydrant fire mains, road furniture, architectural panels/painting.

Tunnel fit out, testing and commissioning

The tunnel would be fitted out with operational infrastructure including power, fire and life safety systems, communications, traffic control device and systems, tunnel lighting, and other operation management and control systems following completion of the tunnel finishing works.

This would be followed by a commissioning process to validate the operation and integration of tunnel systems before and after the tunnels are opened to traffic.

6.4.6 Demolition

The following existing structures would require demolition during construction of the project:

- The Luke Bowen footbridge would need to be demolished to accommodate the project and the proposed realignment of Korora School Road. A new Luke Bowen footbridge (BR24) would be provided 200 m north of the existing footbridge, near Old Coast Road
- The existing northbound bridge over Pine Brush Creek would be demolished while the southbound bridge would be retained for the service road
- Around 110 buildings would need to be demolished for the construction of the project. This would include around 74 residential buildings, around 32 sheds and other structures, eg utilities and redundant services.

Waste from demolition activities would be managed in accordance with a project specific resource and waste management plan. Further detail is provided in **Chapter 22, Waste**.

6.4.7 Road work and road surfacing

Road work and road surfacing would involve:

- Constructing the road formation by excavating existing materials or by placing fill embankments
- Placing and compacting road base, sub-base and select material layers over the road formation
- Placing and compacting the road surface layer (concrete, or concrete and asphalt) over the road base, sub-base and select material layers. This would include placing a seal between the base layer and the road surface layer
- Constructing concrete kerb and gutter (where required)
- Constructing concrete medians and roundabouts (where required)
- Constructing footpaths and cycle paths
- Installing traffic lights and road lighting.

Depending upon the location, the road surface would be either an asphalt, plain concrete, continuously reinforced concrete or any other suitable material to be confirmed during detailed design.

6.4.8 Finishing work

Finishing works are tasks required before the opening of the project.

Finishing work tasks include:

- Installation of lighting, street furniture, traffic barriers, noise wall, pedestrian balustrades, etc
- Remove temporary work structures, ancillary facilities and general site clean up
- Restoration of temporary sites including ancillary sites
- Landscaping works including the restoration of topsoil and revegetation of batters
- Removal of erosion and sediment control measures.

6.5 Construction ancillary facilities

A range of construction related facilities would be required to build the project. These ancillary facilities would include some or all of the following:

- Site compounds including workshops and maintenance sheds
- Concrete batching plant

- Asphalt batching plant
- Crushing plant
- Stockpile areas
- Precast facilities.

Potential ancillary facilities are described in **Table 6-8** below and potential locations are shown in **Figure 6-2** to **Figure 6-7**.

Initial site work in these areas would involve site clearing, installing appropriate environmental controls and providing hardstand areas for storage, parking and access roads. The final use, locations and layout of ancillary facilities will be determined by the construction contractor.

Table 6-8 Potential sites for ancillary facilities and proposed uses

Site no.	Proposed use					
	Main site compound	Secondary site compound	Concrete batch plant	Asphalt batch plant	Crushing plant	Stockpile site
1C	✓	✓	✓	✓	✓	✓
1D	✓	✓		✓		✓
1G	✓	✓	✓	✓	✓	✓
2A	✓	✓				✓
2B					✓	✓
2C		✓			✓	✓
2D		✓			✓	✓
2E		✓			✓	✓
2G		✓				✓
3B	✓	✓			✓	✓
3C		✓				✓
3D						✓
3E		✓				✓
3G						✓

6.5.1 Site compounds

Site compounds are located within ancillary sites (refer to **Figure 6-2** to **Figure 6-7** for ancillary site locations and **Table 6-8**) which includes offices, workforce facilities (such as parking, lunchrooms and toilets), workshops and storage areas for plant and construction materials.

A main ancillary site is likely to be located at the southern (eg Site 1C near Englands Road, 1D near Industrial Drive or 1G north of North Boambee Road) and northern (eg Site 3B near Bruxner Park Road) ends of the project, in construction Zone 1 and Zone 3, as a minimum. Secondary site compounds are likely to be needed throughout the project extent with key areas being south of Roberts Hill (eg Site 1H), near Coramba Road (eg Site 2A), Shephards Lane (eg Site 2C), Mackays Road (eg Site 2E) and the northern extent of the project (eg Site 3C or 3E).

These site compounds may be co-located with batch plants and are proposed to be sited near major construction activities to minimise construction traffic. All site compounds would be fenced for security and safety purposes.

Secondary site compounds near the proposed tunnels (eg Sites 2C, 2D, 2E and 2G) would include activities that support tunnelling, including but not limited to, temporary ventilation plant, water supply, construction water treatment plants and explosive storage magazines.

Additional secondary site compounds may also be established within the construction footprint near key construction activities, eg major bridge work and tunnel portals. These sites would only be in operation for the duration of the associated construction activity and would likely only include offices, toilets and storage areas.

6.5.2 Concrete batching plants

Construction of bridge structures (depending on design) may require concrete to be placed in situ. Concrete for tunnels and road pavements would also be required. Concrete batching plants would supply concrete for constructing drainage and structures where ready-mixed concrete is not available from external sources.

The project is likely to require one or more concrete batching plants to be constructed on or near the project. Preliminary locations for batching plants have been identified and are shown in **Figure 6-2** to **Figure 6-7** and indicated in **Table 6-8** and include:

- North of Englands Road on the western side of the project (Site 1C)
- South of Roberts Hill on the western side of the project (Site 1G).

The final location for batching plants would be confirmed during detailed design and would be influenced by the specific approach of the construction contractor(s), informed by the EIS and approval conditions for the project. This may include investigation of the need for a concrete batching plant for construction zone 3.

It is highly desirable that crushing plants (refer **Section 6.5.4**) be located in the vicinity of concrete batching plants, and this would be taken into consideration when choosing the relevant locations for the facilities.

Temporary buildings for staff amenities, offices and quality assurance control would also be required.

6.5.3 Asphalt batching plants

Adoption of a flexible road surface with deep asphalt, or low noise asphalt surfacing for the project would require asphaltic concrete to be placed. Asphalt may be obtained from local suppliers as far as practicable; however, existing suppliers may be unable to meet the production rates required where large quantities of asphalt at high production rates are needed for constructing flexible pavement. As such, it is likely that one or more on-site asphalt batching plants could be constructed for the project. The potential asphalt batching plant sites are listed in **Section 6.5.2** and shown in **Figure 6-2** to **Figure 6-7.**

It is highly desirable that crushing plants (refer **Section 6.5.4**) be located in the vicinity of asphalt batching plants (particularly if a flexible surface is adopted), and this would be taken into consideration when choosing the relevant locations for the facilities.

Temporary buildings for staff amenities, offices and quality assurance control would also be required.

6.5.4 Crushing plants

Crushing plants would primarily be required to process rock material from cuttings to make suitable material for use in fill. Production of aggregates for concrete and/or asphalt in addition to materials for drainage

would also be undertaken where possible. The crushing plants would be located within the construction footprint near cuttings where possible to reduce traffic movements to the crushing and processing area.

The crushing plant area would also be expected to include areas for the stockpiling of material. The stockpiling requirements would depend on the construction staging and contractor's work methods but assuming conservatively that all rock would be crushed, storage would be required either in the crushing plant area or in the project corridor before it is placed in fill embankments.

The crushing plant could also potentially produce aggregates for concrete and/or asphalt. Should the construction contractor adopt this option, the crushing plants would be located near or as near as possible to concrete or asphalt batch plants to reduce truck traffic on public roads.

The location of the crushing plant would be determined by the construction staging (if any) and the associated mass haul balance, access, environmental and amenity issues.

6.5.5 Stockpile areas

Stockpile areas would be required to temporarily store:

- **General fill material** – Temporary storage of select material, rock or other material at various locations along the project
- **Spoil** – The excavation of existing ground and road surfaces could create excess spoil material that may need to be stockpiled. Some of it would be re-used as general fill for other parts of the project; the rest would be unsuitable spoil material and would be disposed (unsuitable spoil material may consist of soil, sand, clay, and asphalt). The spoil stockpile areas would be located within the ancillary facilities shown in **Figure 6-2** to **Figure 6-7** as well as other areas within the construction footprint. See **Section 6.8.2** for further discussion on spoil stockpiles.
- **Mulch and topsoil** – Stockpiling of topsoil and mulch created from clearing and chipping of vegetation would be needed before this material is re-used on the project.

The earthworks balance would be revised during detailed design to reduce the potential for unsuitable material where possible. In general, it would be preferable that unsuitable material be used for flattening batters or for mounding along the formation, to help balance earthworks for the project and/or help with managing visual and noise impacts, rather than it being stockpiled. Temporary stockpiling may be required to suit the sequence of construction activities within each project section.

Possible stockpile areas are shown in **Figure 6-2** to **Figure 6-7** and **Table 6-8** lists the stockpile areas required for mulch, topsoil and unsuitable spoil. The potential stockpile areas would also be suitable for the temporary storage of other materials such as unsuitable material, cleared vegetation mulch, rock and excess concrete.

The estimated area of each stockpile site is based on:

- A three metre clearance around each earthworks stockpile for access and environmental controls
- A five metre clearance around each mulch stockpile for access and environmental controls (due to the need to control leachates, such as tannins, and to periodically turn the mulch where required).

6.5.6 Precast facilities

Precast facilities may be required to produce the precast concrete products to build the bridge deck segments and girders ready for assembly. There is an existing precast facility located in the industrial estate at Isles Drive north of Englands Road interchange. It is possible that this facility could be used for the project; however, this would be determined by the construction contractor. If the facility is unable to meet the production rates required for the project and is deemed to be unsuitable, alternative precast facilities may need to be constructed. A precast facility would require an area of about 400 m by 100 m and

would likely be located near Englands Road. The need for precast facilities would be determined by the construction contractor and would depend on the bridge construction method adopted, value for money and the availability and proximity of alternative precast facilities.

6.5.7 Assessment of ancillary facilities

For the purposes of the EIS, assessment of proposed ancillary sites has been undertaken against the following criteria:

a Be located more than 50 m from a waterway
b Be located within or next to land where the project is being carried out
c Have ready access to the road network
d Be located to minimise the need for heavy vehicles to travel through residential areas
e Be sited on relatively level land
f Be separated from nearest residences by at least 200 m (or at least 300 m for a temporary batching plant)
g Not require vegetation clearing beyond that already required by the project
h Not impact on heritage items (including areas of archaeological sensitivity) beyond those already impacted by the project
i Not unreasonably affect the land use of nearby properties
j Be above the 20-year average recurrence interval (ARI) flood level unless a contingency plan to manage flooding is prepared and implemented
k Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

Table 6-9, **Table 6-10** and **Table 6-11** provide an assessment of currently proposed sites for each construction zone against the above criteria.

Potential impacts from the ancillary facilities in relation to nearby residences (noise and vibration), heritage, biodiversity, flooding and traffic are discussed in **Chapter 8, Traffic and transport** to **Chapter 24, Hazard and risk** of this EIS. Measures to mitigate and/or manage adverse impacts from ancillary facilities are summarised in **Chapter 26, Summary of environmental management measures.**

Table 6-9 Assessment of ancillary facilities for construction zone 1 – based on standard condition criteria

Criteria	Ancillary site		
	1C	1D	1G
A	Yes	Northern extent within 50 m of waterway (southern tributary of Newports Creek)	Yes
B	Yes	Yes	Yes
C	Yes, via Englands Road	Access via the corridor, about 600 m north of Englands Road	Access via the corridor, about 400 m north of North Boambee Road
D	Yes	Yes	Yes
E	Yes	Yes	Sloping land
F	Yes	Yes	No one residence nearby on western side. Note parts of the site are more than 300 m from this residence
G	Yes, no additional clearing	Yes, no additional clearing	Yes, no additional clearing

Criteria	Ancillary site		
	1C	1D	1G
H	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items
I	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties
J	Yes	No. Part of the site would be within the 20-year ARI flood level (northern portion)	No. Part of the site would be within the 20-year ARI flood level (existing drainage channel)
K	Yes	Yes	Yes

Table 6-10 Assessment of ancillary facilities for construction zone 2 – based on standard condition criteria

Criteria	Ancillary site					
	2A	2B	2C	2D	2E	2G
A	Yes	No, within 50 m of northern tributary of Coffs Creek	Yes	Yes	Yes	Yes
B	Yes	Yes	Yes	Yes	Yes	Yes
C	Yes, via Coramba Road	Yes, via Spagnolos Road	No, access would be via the corridor, about 1 km north of Coramba Road	Yes, via Mackays Road (unsealed)	Yes, via Mackays Road (unsealed)	Yes, via West Korora Road
D	Yes	In part, heavy vehicles would travel past residential properties along Spagnolos Road	Yes	No	No	Yes
E	Yes	Yes	No	Yes	Yes	Yes
F	No, residences about 20 m from eastern boundary	No, nearest residence less than 30 m from eastern boundary. Note parts of the site are more than 200 m from	No, nearest residence about 50 m from the site	No, nearest residence about 60m from the site	Existing residence next to eastern boundary of the site	Yes, however only 120 m in south western corner

Criteria	Ancillary site					
	2A	2B	2C	2D	2E	2G
		the nearest residence				
G	Yes, no additional clearing	Yes, no additional clearing	Yes, no additional clearing	Yes, no additional clearing	Yes, no additional clearing	Yes, no additional clearing
H	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items
I	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties
J	Yes	Yes	Yes	Yes	No. Less than 10% of the site would be subject to flooding	Yes
K	Yes	Yes	Yes	Yes	Yes	Yes

Table 6-11 Assessment of ancillary facilities for construction zone 3 – based on standard condition criteria

Criteria	Ancillary site				
	3B	3C	3D	3E	3G
A	Yes	Yes	Yes	Yes	Yes
B	Yes	Yes	Yes	Yes	Yes
C	Yes, via Bruxner Park Road	Yes, via Bruxner Park Road	Yes, via Bruxner Park Road	Yes, via Pacific Highway	Yes, via Seaview Close
D	Yes	Yes	Located next to the site but also the nearby residencies	Yes	Yes
E	Sloping land	Sloping land	Sloping land	Yes	Sloping land
F	No, nearest residence less than 20 m from eastern boundary	No, nearest residence about 20 m from the western boundary	No, nearest residence about 30 m from the western boundary	No, nearest residence about 40 m from the western boundary	No, nearest residence about 30 m from the northern boundary
G	Yes, no known additional clearing	No, exotic vegetation within the site	No, some clearing required depending on extents of site used	No, some native remnant and exotic vegetation on the site	No, will require further vegetation clearing – exotic vegetation on this property

Criteria	Ancillary site				
	3B	3C	3D	3E	3G
H	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items	Yes, no additional impacts on heritage items
I	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties	Yes, not unreasonably affect land use of nearby properties
J	Yes	No. Part of the site would be within the 20-year ARI flood level (existing drainage channel)	Yes	No. Part of the site would be within the 20-year ARI flood level	No. Part of the site would be within the 20-year ARI flood level
K	Yes	Yes	Yes	Yes	Yes

6.6 Workforce and construction work hours

The size and composition of the construction workforce would vary throughout the construction period depending on the activities being carried out.

An estimated peak workforce of about 450 to 520 people is anticipated. The average size of the construction workforce on site would be about 270 people including management staff and subcontractors.

6.6.1 Standard construction hours

The recommended standard hours for construction (including blasting) from the NSW Interim Construction Noise Guideline (DECC 2009) are shown in **Table 6-12.**

Table 6-12 Standard construction hours

Work type	NSW Interim Construction Noise Guideline Recommended standard hours of work
Normal construction	• Monday to Friday: 7am to 6pm • Saturday: 8am to 1pm • Sunday and public holidays: no work
Blasting	• Monday to Friday: 9am to 5pm • Saturday: 9am to 1pm • Sunday and public holidays: no blasting

The potential construction noise and vibration impacts during the recommended standard hours of construction are detailed in **Chapter 9, Noise and vibration**. All work carried out during the recommended standard hours of construction would be managed through implementation of a construction noise and vibration management plan.

6.6.2 Out of hours work

The NSW Interim Construction Noise Guideline (DECC 2009) also recognises there are some situations where specific construction work may need to be carried out outside of the recommended standard construction hours.

The following are the categories of work that may be carried out outside the recommended standard hours:

- Delivery of oversized plant or structures that the police or other authorities determine require special arrangement to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- Public infrastructure works that shorten the duration of construction and are supported by the affected community
- Work where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours.

Potential activities associated with the last category of work are detailed in **Table 6-13** including likely locations in regard to the construction zones identified in **Section 6.3** and justification for the work. The majority of these activities would be carried out in the Korora Hill to Sapphire section (Zone 3) due to the need to coordinate work with existing Pacific Highway traffic (about 30,000 vehicles per day at this location), Road Occupancy Licence (ROL) restrictions necessary to minimise road user delays and traffic queuing and the need to consider safety of construction personnel and road users.

Table 6-13 Proposed out of hours work

Activity	Location	Justification
Bridge construction	All zones	A number of bridges would require construction in close proximity to or over the existing Pacific Highway between Korora Hill and Sapphire. Activities would include lifting and setting bridge spans and girders. Due to the potential safety risks to road users and construction personnel associated with working near the existing heavily trafficked highway, this work would need to be carried out outside peak traffic hours or at night when there are significantly lower traffic volumes. Avoiding peak periods would also significantly minimise the disruption to traffic. In addition, it is likely that bridges over Englands Road (BR02) and North Boambee Road (BR04) would also require lifting and setting bridge spans and girders during out of hours to reduce the potential safety risks to road users and construction personnel. During construction of the bridge over the North Coast Railway (BR12), there may also be a need to undertake pier construction or lifting and setting bridge segments and girders outside of the recommended standard construction hours to minimise disturbance to railway operations. This work would also need to be in accordance with fixed Track Possession periods issued by Australian Rail Track Corporation when only certain works are permitted to occur with the rail corridor. This may include working over public holidays/long weekends, eg Easter when the tracks are officially closed to rail traffic across the broader rail network for a defined window so as to minimise impacts on rail freight and passenger services as well as the associated safety risks.
Bridge demolition	Zone 3	The existing Luke Bowen footbridge would be rebuilt, and the existing bridge would be removed as part of the project. It is expected the main bridge span would be required to be lifted out in a single piece,

Activity	Location	Justification
		necessitating a full stoppage of the Pacific Highway and or a detour of traffic. To avoid potential safety risks to road users and construction personnel associated with demolishing the existing bridge over live traffic, this work would need to be carried out at night when there are lower traffic flows. Avoiding peak periods would also minimise the disruption/delays to traffic.
Concrete paving and saw-cutting	All zones	Roads and Maritime has specifications for concrete paving that relate to temperature and rainfall. For continuously reinforced concrete base, the specifications prohibit the placement of concrete during rain or when the ambient air temperatures are below 5ºC or above 32ºC. As hot weather affects the quality of the concrete surface, paving in the early evening and into the night is preferred as it takes advantage of cool night-time temperatures. Concrete pavement would be used for the project, either continuously reinforced concrete pavement or plain concrete pavement, which is an unreinforced pavement. To manage cracking associated with drying and shrinkage, saw cutters are used to cut the pavement. The timing of concrete cutting is governed by the hydration rate of the concrete and may require cutting at any time within four and 24 hours after paving, with a 'cutting window' as short as 30 minutes. As the timing of the cutting is critical to the quality of the pavement and acceptance of the finished product, concrete saw-cutting may be needed at any time including outside standard construction hours. Concrete saw-cutting is a construction activity that is transient in nature, and each saw cut would be of a short duration.
Structural concrete work	All zones	Roads and Maritime has specifications for structural concrete work that relate to temperature and rainfall. For structures, the specifications prohibit the placement of concrete during rain or when the ambient air temperatures are below 5ºC or above 32ºC. During hydration of the concrete, significant temperatures can be generated. Additionally, for large size members (minimum dimension of 1 m), the maximum allowable internal temperature of the concrete must not exceed 70ºC. The temperature differential between the centre of the element and the surface must not exceed 25ºC. As hot weather affects the temperature of the concrete constituents and hence the mix, as well as the ambient conditions under which the work is exposed and ultimately the quality of the concrete, placing concrete at night and in the early morning is preferred as it takes advantage of the coolest part of the day. These would generally be concrete pours for specific, large sized critical elements of the project. Additionally, some bridge construction techniques, concrete work and stressing operations need to occur at times of the day when the temperature effects are relatively stable or minimised to achieve the required design intent.
Traffic management, tie-ins, line marking and traffic switches	All zones	Road surface work, including milling and re-sheeting with asphalt and the removal and replacement of concrete carried out on the existing Pacific Highway associated with traffic management, tie-ins, line marking and traffic switches would need to be coordinated with live traffic. While this work would be completed in stages, it may require lane closures to safely carry out the work. This work would need to occur during evening and night-time periods during periods of lower traffic volumes. Carrying out this work outside the recommended standard construction hours would reduce inconvenience to road users, avoid traffic delays during daytime or peak

Activity	Location	Justification
		traffic periods and better manage the safety of construction personnel working on the existing highway. Similarly, traffic switches associated with the new alignment of Coramba Road would also need to be undertaken outside of the recommended standard construction hours to reduce inconvenience to road users, avoid traffic delays during daytime or peak traffic periods and better manage the safety of construction personnel. Intersection works including the installation and commissioning of traffic lights would also be programmed to occur outside peak traffic hours or at night when there are significantly lower traffic flows. Avoiding peak periods would also significantly minimise the disruption to traffic.
Utility relocations and protection	All zones	Public utility providers typically require 'cut over' work to be carried out outside of peak demand periods to avoid or minimise potential disruptions for utility customers. This is also the case for utility supply to critical infrastructure. This would result in some utility work needing to be carried out outside of the recommended standard construction hours. In addition, carrying out utility relocations or protection near the existing Pacific Highway would require construction close to live traffic. Due to the potential safety risks to road users and construction personnel associated with working near the existing highway and to minimise the duration, this work would need to be carried out outside peak traffic hours or at night when there are lower traffic flows.
General construction on or near the existing highway	Zone 1 Zone 3	A ROL would be required for all work on the existing Pacific Highway between Korora Hill and Sapphire and between the southern tie-in and Englands Road interchange. An ROL is required for any activity that would or is likely to cause delay including obstruct, restrict, close, interfere with, slow or stop the free flow of traffic on any lane or shoulder of the existing highway. Due to the importance of the existing Pacific Highway in the State road network and traffic volumes experienced (between 30,000 to 32,000 vehicles per day for the above locations), ROL requirements would likely restrict the majority of work outside peak traffic hours or at night when there are lower traffic flows. As such, a number of general construction activities would be required to be carried out outside of the standard construction hours for the Korora Hill to Sapphire section and southern tie-in to Englands Road interchange section of the project. This would include earthworks, drainage and structures, road work and finishing work (eg installation of road furniture). Additionally, some general construction activities directly next to the Kororo Public School may be also be best carried out outside of school hours to minimise impacts on the operations of the school including the safe drop off and pick up of children.
Operation of construction ancillary facilities	All zones (ancillary sites only)	Operation of some construction ancillary facilities would be required to support proposed out of hours work.
Deliveries to batching plants	All zones (batching plants only)	A number of batch plants are proposed as part of the project (see Section 6.5.2). In addition to normal daytime operation, the batch plants would need to operate in conjunction with paving work during the evening and night-time. There may also be a need to cast some bridges in situ, which may require the plant to operate continuously for up to 24 hours. To keep up with the materials demand during these peak periods of concrete

Activity	Location	Justification
		production, the batch plant would also require material deliveries outside normal working hours.
Refuelling operations and maintenance	All zones	To maximise plant and machinery operations and therefore reduce the overall duration of the project.
Tunnel excavation	Zone 1 and Zone 2	Out of hours tunnel excavation would include but not be limited to drill and blast preparation and underground construction (mucking out, ground support such as drilling/bolting/shotcrete and tunnel mechanical and electrical fit out and testing/commissioning). No out of hours blasting is proposed. This work would allow a construction contractor to maximise program efficiency and reduce the overall duration of the project. Reducing the overall duration of the project would provide a benefit to the affected community by reducing the overall time exposure to potential construction related impacts such as noise and vibration.

Table 6-14 provides an estimated duration for out of hours work for each construction zone and is based on the construction timing and methodology developed as part of the concept design. For simplicity, durations for out of hours work are based on an eight-hour shift. However, in some instances the eight-hour shift could be two four-hour shifts. In addition, out of hours tunnel excavation shifts will likely be 12-hour shifts but for the purposes of calculating duration, these are based on eight-hour shifts. Tunnel excavation would be undertaken based on 24-hour work cycle eg 6 am to 6 pm and 6 pm to 6 am.

Table 6-14 Estimated duration of out of hours work

Zone	Duration	Comment
Zone 1 – Englands Road to Roberts Hill	1808 shifts	The activities listed in **Table 6-13** would require out of hours work throughout Zone 1. However, the main locations would likely be the southern tie-in to Englands Road interchange section, around North Boambee Road and at the Roberts Hill tunnel.
Zone 2 – Roberts Hill to Korora Hill	2052 shifts	Similar for Zone 1, out of hours work would be required throughout Zone 2. The main locations would likely be the Shephards Lane and Gatelys Road tunnels.
Zone 3 – Korora Hill to Sapphire	744 shifts	Out of hours work would occur for the full length of Zone 3 due to the need to coordinate work with existing Pacific Highway traffic, ROL restrictions and the need to consider safety of construction personnel and road users.

Chapter 9, Noise and vibration includes an assessment of the above activities and provides noise management level exceedances outside the recommended standard construction hours for day, evening and night-time periods.

Additional activities and/or locations for out of hours work may be required, and estimated durations revised up or down as further construction staging, and methodologies are developed during detailed design. Out of hours work would occur in accordance with the project approval and notification requirements of any Environment Protection Licence for construction of the project. Specifically, this would be managed through an out of hours work procedure which would be included as part of the Noise and Vibration Management Plan.

In acknowledgment of the extent of out of hours work proposed, at-property operational noise mitigation measures would be implemented during the pre-construction phase of the project before the main construction activities begin, where reasonable and feasible. This would include at-property treatments to reduce potential noise impacts associated with construction (including out of hours work). In addition, the out of hours work procedure would include specific management measures to minimise or mitigate potential noise impacts. This would include:

- Scheduling of noise intensive or high noise impact work to evening periods where feasible
- Use of alternative plant and equipment and/or construction techniques to minimise noise
- Notification and consultation requirements including preparation of a six-month 'look ahead' program for likely out of hours work
- Use of temporary noise barriers
- Acoustic sheds will be included around tunnel portals to shield noise from within the tunnel during evening and night periods
- Construction personnel working within the tunnel will be bused in and out to limit noise and vehicle movements
- Respite periods
- Representative noise monitoring
- Offers of reasonable and temporary alternative accommodation or an act of good will
- Use of negotiated agreements.

6.7 Construction resources

Typical materials that would be used for the construction of the project include:

- Earthwork materials, such as topsoil, general fill and select fill
- Aggregates for drainage and producing concrete and asphalt and spray seals
- Sand for drainage and concrete, and producing asphalt
- Cement and fly ash for producing concrete
- Concrete for drainage, road surfaces, bridge work, tunnel work and miscellaneous work such as barrier kerbs, kerbs and gutters, paving and signpost footings
- Road base for constructing flexible road surfaces
- Bitumen for spray seals and producing asphalt
- Precast concrete elements for drainage (culverts, pits and headwalls), bridge work (piles, girders and parapets), tunnel work (cut and cover tunnel collar) and miscellaneous work
- Steel for bridge girders, barrier railings, tunnel support including rock bolts, spiling and lattice girders.

Indicative quantities of the main materials are listed in **Table 6-15.** The possible material source locations are discussed in **Section 6.7.1**.

Table 6-15 Indicative quantities of materials needed for construction

Material	Estimated quantity
Road work	
Earthwork (cut to fill) (m^3)	3,477,000 4,224,000[1] (bulked volume)
Earthwork (dispose of excess material) (m^3)	174,000
Earthwork (select fill material) (m^3)	378,000
Concrete (m^3)	100,000
Asphalt (m^3)	53,000
Dense graded base and sub base (DGB and DGS) (m^3)	55,000
Steel reinforcement (tonnes)	1000
Bridge work	
Concrete (m^3)	60,000
Steel reinforcement (tonnes)	14,000
Bridge deck wearing surface (m^3)	3000
Tunnel work	
Concrete (m^3)	42,000
Steel reinforcement (tonnes)	20,600
Drainage and structures	
Concrete (m^3) (pipes, culverts and headwalls)	9000
Concrete (^{m3}) (retaining walls and noise walls)	7000
Steel reinforcement (tonnes)	600

6.7.1 Source of materials

There are several existing, approved quarries near the project, and it is expected that sufficient material resources are available in the local area to build the project. These sites are listed in **Table 6-16**. The identified quarries have been limited to the CHCC area; however, there are many other quarries further afield in the Clarence Valley local government area and the greater Northern Rivers region, if local resources prove insufficient and an earthworks balance is not achieved during detailed design of the project.

[1] Value includes bulking factor of 21.5% (factor determined based on geotechnical data for the project). Bulking factors are applied to the volume of excavated material to allow for a greater volume of material that would result from the excavation process.

Table 6-16 Source of materials within the CHCC area

Name of quarry	Location	Proximity to project
Coffs Harbour Quarry	Bennetts Road, Karangi, NSW	5.5 km west of project
Karangi Mine	Karangi, NSW,	6 km west of the project
T.G. Jung Quarries	530 Coramba Road, Coffs Harbour	8 km west of project
Flintstone Quarry	130 Taylors Creek Road, Central Bucca, NSW	12 km west of project
Woolgoolga Quarry	66A Morgans Road, Woolgoolga, NSW	20 km north of project
Illabo Mine	Cat Trail, Lowanna, NSW	35 km north-west of the project
Corindi Quarry	Corindi Beach, NSW	About 35 km north of the project

Earthworks material

The project would require both general fill (for use in embankment construction) and select fill (for use in the selected material zone below the road pavement). The preliminary estimates indicate that around 4.2 million cubic metres of general fill and around 0.6 million cubic metres of select fill would be required.

The project would generate about 4.2 million cubic metres of earthworks material from project cuttings. Indicative volumes of cut material generated and general and select fill requirements for each construction zone are listed in **Table 6-17**. These quantities would be refined during detailed design and before construction.

Table 6-17 Indicative general and select fill requirements, and cut material generated

Construction zone	Cut material[2] (m^3)	General fill (m^3)	Select fill (m^3)	Cut surplus (m^3)	Fill deficit (m^3)
1	1,202,000	1,082,000	138,000	120,000	-
2	1,758,000	1,939,000	268,000	-	-181,000
3	1,266,000	1,031,000	146,000	235,000	-
Total	**4,226,000**	**4,052,000**	**552,000**	**174,000**	-

There would be an overall surplus of earthworks material in some construction zones and a shortfall in others. Earthworks requirements would be managed across the entire project as far as practicable, with surplus material from one construction zone transferred to construction zones that have a shortfall. Material would be hauled along the project corridor.

The priority for the project would be to reuse material from the cuttings and tunnels on the project. There may be a need to import material from external sources, depending on the preferred method of construction for the construction contractor(s). Where possible, and only if required, imported material would be sourced from existing, approved or potential quarries near the project. Quarry status and potential materials to be gained are summarised in **Table 6-16.**

Further investigations would be completed during detailed design to determine the source of each material. The haulage of materials would follow construction access routes as outlined in **Figure 6-8.**

[2] Value includes bulking factor of 21.5% (factor determined based on geotechnical data for the project).

Concrete material

Around 218,000 m³ of concrete would be required for pavement, bridge structures, drainage structures and retaining walls, and tunnel structures. This would require concrete aggregates (including gravel and crushed stone) and sand for concrete batching.

On-site concrete batching plants would be established for the construction of the project. Cement and fly ash for concrete production and surface stabilisation would be imported by road or rail from Newcastle, Sydney or Brisbane. It is expected that storage silos would be established on site, next to the concrete batching plants.

Asphalt material

Around 53,000 m³ of asphalt would be required for flexible pavement on the project (refer to **Table 6-15**). On-site asphalt batching plants would be established, or existing large commercial plants located in Coffs Harbour would be used to supply asphalt for the project.

Bitumen for asphalt production and spray sealing work would be sourced from refineries in either Sydney or Brisbane and brought to site by tankers.

Steel material

Structural steel elements, such as bridge girders, bridge barrier railings and handrails and tunnel support, would be supplied from Roads and Maritime accredited steel fabricators in either Wollongong, Sydney or Brisbane, and brought to site by truck.

Steel reinforcement would be sourced from Roads and Maritime accredited suppliers and would typically comprise steel bars and mesh. Some reinforcement (such as cast in situ piles) may be fabricated off-site and transported to site by truck.

All steel supplied would be Australian made and fabricated.

6.7.2 Water usage

Water would be required for:

- Compacting and stabilising earthwork
- Dust suppression
- Watering landscaped areas
- Drilling (eg geotechnical boreholes, drill holes for drill and blast activities)
- On-site concrete batching
- Washing plant and machinery
- Site amenities (eg wash basins).

Water quality requirements vary for different activities:

- High quality water is needed for mass concrete production and is required to meet Australian Standard 1379 (AS1379) Specification and Supply of Concrete. High quality water could be sourced from CHCC's town water supply system or any other suitable source
- Lower quality water is needed for compaction control, landscape watering and dust suppression; this water could be sourced from local rivers, streams, recycled water construction sediment basins and farm dams.

Indicative water requirements are listed in **Table 6-18**. The actual daily water usage would vary with the weather conditions and the type of activities in progress.

Table 6-18 Indicative water requirements for construction

Construction activity	Estimated water consumption during construction	
	Non-potable water	Potable water
Dust control	2000 kL per day	Not used
Drilling	60 kL per day	Not used
Earthworks	18 L/m^3 for compaction 70 L/m^3 for stabilisation	Not used
Landscape watering	120 kL per day	Not used
Road surface construction	Not used	200 kL per day per batching plant
On-site concrete production	Not used	200 kL per day per batching plant

6.8 Construction management

6.8.1 Traffic management and access

The construction of the project would require construction traffic to use various local and regional roads to access the project. **Table 6-19** and **Figure 6-8** identifies the local roads that could be used during construction.

Table 6-19 Local roads potentially required for construction

Construction zone	Construction access
Zone 1 – Englands Road to Roberts Hill	• Englands Road • North Boambee Road.
Zone 2 – Roberts Hill to Korora Hill	• Coramba Road/West High Street • Shephards Lane • Bray Street • Mackays Road.
Zone 3 Korora Hill to Sapphire	• West Korora Road • Bruxner Park Road • James Small Drive • Old Coast Road.

The haulage of earthwork would take place along the project corridor. The construction program will prioritise the excavation of one tunnel tube at each ridge (starting at both portals) to establish the haul road for the project.

Transport of construction materials would avoid peak periods to minimise impacts on traffic and access and would follow construction access routes.

A Traffic Management Plan would be prepared for the construction of the project including traffic management measures to be employed to manage short-term traffic impacts expected during construction. These measures would be developed in accordance with the Traffic Control at Work Sites Technical Manual (Roads and Maritime Services 2018c). The Traffic Management Plan would also confirm the local roads to be used during construction. Impacts on traffic and access because of the project are outlined in **Chapter 8, Traffic and transport**.

Changes to traffic and access conditions

There are no appropriate alternative temporary routes to the existing Pacific Highway that could be used during construction. Provision for traffic would be included in the construction sequencing and construction methodology for all sections of the project, consistent with the Traffic Control at Work Sites Technical Manual (Roads and Maritime Services 2018c).

Much of the project would be able to be constructed with minimal disruption to existing Pacific Highway traffic (ie between Englands Road and Korora Hill); however, there are a few locations where construction activities would interact with the existing Pacific Highway traffic, including:

- At the tie-ins at the southern limit of the project to the north of the Englands Road interchange
- At the Korora Hill interchange where the project joins the alignment of the existing Pacific Highway
- Between Korora Hill interchange and the tie-in to the existing Pacific Highway at Sapphire.

Speed restrictions and traffic controls would be required to manage traffic during construction of the above sections of the project. Night work would be required at the above locations to allow smooth transitions to occur and traffic diversions to be installed while minimising traffic impacts. Detailed arrangements for works in these areas would be developed during detail design.

There are several locations where construction activities would be required close to existing local roads and property access roads, including:

- North Boambee Road
- Coramba Road
- Bennetts Road
- Shephards Lane
- Mackays Road
- West Korora Road
- Bruxner Park Road
- James Small Drive
- Korora School Road
- Old Coast Road
- Opal Boulevard
- Coachmans Close
- Seaview Close.

Speed restrictions and traffic controls would be required to manage traffic during construction of the project when construction activities are being carried out near the above listed roads. Construction of the project would have impacts on road users of the above roads.

Haulage may also have an impact on local roads as it would include the transfer of fill material within and beyond the construction corridor. Haulage would also consider peak travel hours and times, particularly during school and public holiday periods, to minimise the potential for delays on the existing Pacific Highway to the travelling public and to minimise impacts to local roads. Haulage of excavated material would be carried out along the project corridor.

Legend

- Construction footprint
- Construction zone
- Construction site access
- Alignment
- North Coast Railway
- Watercourse

Coffs Harbour Bypass
Construction access routes
Figure 6-8

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

6.8.2 Spoil and waste

Construction of the project would produce a number of waste streams including:

- Excavation material
- Demolition wastes
- Vegetation wastes
- Construction materials
- Hazardous building materials such as asbestos, lead paint or other sources of hazardous contamination
- General waste from construction sites, including office and construction compound wastes
- Liquid wastes, including spills and oils and fuels produced from the maintenance of construction vehicles and plant.

Any temporary spoil stockpiles will be included within the proposed ancillary sites (shown in **Figure 6-2** to **Figure 6-7**) or assessed against the following criteria:

- Be located within an active construction zone within the construction footprint described in **Section 6.1**
- Have minimal amenity impacts to surrounding sensitive receivers, with consideration of noise and vibration impacts, traffic and access impacts, dust and odour impacts, and visual impacts
- Have minimal impact in respect to waste management and no impacts on flora and fauna, soil and water, and heritage beyond those assessed in the EIS
- Have environmental and amenity impacts that can be managed through the implementation of environmental management measures detailed in **Chapter 26, Summary of environmental management measures**.

Spoil and waste disposal would be carried out in accordance with the management measures for waste disposal in construction outlined in **Chapter 22, Waste**.

6.8.3 Erosion and sediment control

An Erosion and Sediment Management Report has been prepared for the project (SEEC 2019) in accordance with Managing Urban Stormwater: Soils and Construction (Landcom 2004). This report details the methods that would be implemented to mitigate and manage potential erosion and sedimentation impacts from the project, including impacts to water quality.

During construction, there is a risk of offsite (clean) and onsite (dirty) water mixing at various locations because of the undulating and extremely steep topography. This will limit the ability to install cross drainage as early works and divert offsite (clean) water catchments in some locations. The risk of clean and dirty water mixing is also high at tie-in locations because of the proximity of the existing highway to the proposed works, and the need to maintain live traffic through the work area. This is most relevant south of the proposed Englands Road interchange and north of the proposed Korora Hill interchange.

Sediment basins will be needed for most catchments disturbed during construction (indicative basin locations are shown in **Figure 6-2** to **Figure 6-7**). The final location and size of all sediment basins would be determined during detailed design. Sediment basins would be designed to contain the five-day 90th percentile rainfall event within all sub-catchments that drain into the Solitary Islands Marine Park. All other sub-catchments would include sediment basins designed for five-day 85th percentile rainfall event.

Alternative erosion and sediment control measures will be implemented in locations where designed sediment basins are needed but cannot be provided because of site, soil and drainage constraints to constructing large scale sediment basins. For these catchments, undersized sediment basins, sediment

sumps, mulch bunds, sediment fences or similar combinations of thereof would be used. However, to manage potential associated risks, these catchments would also be subject to enhanced erosion control measures and best management practice, such as limiting the size of disturbed land at any one time. The enhanced erosion and sediment control measures will be mainly in the form of temporary ground cover and/or soil binders over high-risk areas (ie steep (>30 per cent) batters and concentrated flowpaths) whenever significant rainfall is imminent.

Secondary erosion and sediment control measures will be designed and implemented in accordance with the Blue Book to achieve the relevant design average recurrence interval (ARI) criteria.

The concept design for the project includes drainage to divert offsite (clean) water away from completed cut and fill batters. Where feasible, these drains will be installed early to minimise the risk of erosion. Temporary drainage will be needed in some locations to bypass clean water around work areas and divert dirty water to sediment control structures. Temporary drainage will be designed and installed in accordance with the principles detailed in Roads and Maritime's Technical Guideline: Temporary stormwater drainage for road construction (Roads and Maritime 2011b).

Typical sediment and erosion control measures and practices would include, but not be limited to, the following:

- Temporary diversions until permanent stormwater devices can be used
- Temporary controls such as large mulch bunds or sediment traps with enhanced erosion control measures (eg slope breaks at decreased intervals, temporary stabilisation of exposed soils with biodegradable soil binders) until permanent sediment basins can be installed
- Sedimentation basins to capture sediment from construction runoff
- Sediment fences and filters
- Batters and exposed slopes to be covered with temporary vegetative cover and / or biodegradable soil binder
- Large mulch bunds secured down with biodegradable matting / mesh, rock filter bunds / dams, sediment sumps and online sediment basins / traps within cuts
- Linear sediment traps at the toe of works as a mulch bund (or similar) or sediment fencing
- Shallow, linear swale type infiltration basins
- Irrigation to land rather than traditional basin discharges (subject to any landowner permissions (if undertaken outside of construction), any Environment Protection Licence requirement and consideration of other environmental risks, eg waterlogging).

The proposed ancillary facilities would also include appropriate controls to divert clean water around the site as far as possible and to manage sediment laden waters.

Tunnelling will require use of construction water treatment plants to manage groundwater inflow into the tunnelling sites. The captured groundwater will be treated and discharged in accordance with criteria established in consultation with EPA and DPIE Water. It is likely processes would be established to allow for groundwater recharge.

CHAPTER

7

Chapter 7

Consultation

7. Consultation

Roads and Maritime has been investigating the project since 2001 as part of the overall Pacific Highway upgrade program. This chapter summarises the stakeholder and community engagement activities that have been, and will continue to be, carried out for the project.

Table 7-1 sets out the SEARs relating to stakeholder and community engagement and where these SEARs have been addressed in this EIS. The NSW Sustainable Design Guidelines Version 4.0 (TfNSW 2017) have guided the project's engagement program.

Table 7-1 Engagement requirements within the SEARs

Ref	General SEARs	Where addressed
4. Consultation		
1.	The project must be informed by consultation, including with relevant local, State and Commonwealth government agencies, infrastructure and service providers, special interest groups (including Local Aboriginal Land Councils, Aboriginal stakeholders, and pedestrian and bicycle user groups), affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines.	Section 7.2 Section 7.3
2.	The Proponent must document the consultation process, and demonstrate how the project has responded to the inputs received.	Section 7.2 Section 7.3
Ref	**Key Issue SEARs**	**Where addressed**
7. Socio-economic, land use and property		
5.	A draft Community Consultation Framework must be prepared identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder and community complaints during the design, construction and operation of the project. Key issues that must be addressed in the draft Framework include, but are not limited to: a) Traffic management (including property access, pedestrian access) b) Landscaping /urban design matters, c) Construction activities including out of hours work, and d) Noise and vibration mitigation and management, e) Soil erosion and water quality management, and f) Interaction with existing land uses.	**Appendix D, Draft Community Consultation Framework**

7.1 Consultation objectives and strategy

Roads and Maritime prepared and implemented a Community and Stakeholder Engagement Plan (CSEP) for the EIS and the concept design phase of the project. The CSEP describes the communication and consultation approach and activities for the concept design and environmental assessment of the project and keeping stakeholder groups and the community informed and involved during the work.

The CSEP includes:

- Engagement approach
- Engagement objectives
- Stakeholder identification.

An overview of the CSEP and outcomes of consultation activities is provided in the following sections.

To guide ongoing communication and consultation during construction of the project, a draft community consultation framework has been prepared and is provided in **Appendix D**.

7.1.1 Engagement approach

Engaging with stakeholder groups and the community during the preparation of the EIS and concept design provides an opportunity for all parties to understand the issues that need to be addressed during this phase of work.

The approach to date includes:

- Working with stakeholder groups to discuss the project and identify issues and opportunities
- Working with landowners to enable technical studies to be carried out (ie biodiversity surveys)
- Communicating broadly with the Coffs Harbour community to raise awareness of the project and its progress
- Providing opportunities for community members to identify themselves as interested stakeholders and participate in engagement activities
- Helping people to understand the EIS process and the technical studies being prepared to inform the process
- Providing information about the project using clear and concise language and relevant imagery to aid understanding
- Using a variety of digital, print and face-to-face methods to provide and seek information (such as the website, visualisations, newspaper advertisements, newsletters, drop-in sessions, social media, dedicated project information centre, and stakeholder briefings and meetings)
- Providing answers to stakeholder questions in a timely manner, or advising when information would be available to answer questions
- Being proactive when issues arise to ensure stakeholder groups and the community have correct information and the opportunity to voice their concerns
- Providing feedback to stakeholder groups and the community about the outcomes of engagement activities.
- Establishing a Community Consultative Committee (CCC) for the project which provides a forum for discussion between Roads and Maritime and representatives of the Coffs Harbour community, stakeholder groups and the local council on issues directly relating to the project.

7.1.2 Engagement objectives

Engagement objectives for the project are to:

- Provide information about the EIS and concept design process to stakeholder groups and community members
- Provide opportunities for Roads and Maritime to engage with people and groups to better understand the real and perceived impacts and benefits of the project

- Provide opportunities for interested people and groups to learn about the EIS as it progresses so they can make informed submissions during the EIS public comment period
- Address the consultation requirement of the SEARs
- Seek feedback from the community and gather information that would be useful when developing the detailed design.

7.2 Engagement process and activities

Planning for the project started in 2001 with the announcement of the CHHPS. This planning addressed the need to upgrade the Pacific Highway between Sapphire and Woolgoolga, while planning for future traffic needs within the Coffs Harbour urban area.

During this time, community and stakeholder engagement has been carried out by various parties which has helped in the development of route options and the selection of the preferred route as well as informing investigations and studies carried out for the EIS.

Engagement activities for project stages has included stakeholder and landowner meetings, community drop-in sessions, community update newsletters, advertisements, project email and phone calls, letters and email updates and regular updates to the Roads and Maritime project website.

Further details of key engagement activities and issued raised by stakeholders and community members are provided in the following sections.

7.2.1 Aboriginal cultural heritage consultation

Consultation with Aboriginal stakeholders has been carried out in accordance with the SEARs and the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010a). This involved consultation with Aboriginal stakeholders, including Coffs Harbour and District Local Aboriginal Land Council (CH&D LALC), other Registered Aboriginal Parties (RAPs) and Aboriginal cultural knowledge holders) for the project, to assess impacts and develop mitigation measures. Key activities included:

- Advertising for registered stakeholders in the Koori Mail (27 July 2016), National Indigenous Times (28 July 2016) and Coffs Advocate (27 July 2016)
- Government agency notification letters
- Notification of closing date for registration
- Initial field surveys (June, August and September 2016) with Aboriginal stakeholders
- An Aboriginal Focus Group (AFG) meeting held on 28 June 2017 to discuss archaeological assessment methodology and cultural assessment
- Provision of proposed archaeological assessment methodology, outlining the methodology to prepare the Cultural Heritage Assessment Report (CHAR) and undertake the test excavation
- Follow-up meeting on 8 February 2018 to further discuss the test excavation methodology and additional matters relating to the incorporation of Aboriginal cultural knowledge in the assessment
- Archaeological test excavation with Aboriginal stakeholders (February – March 2018)
- Interviews with Aboriginal cultural knowledge holders
- Provision of the draft CHAR for review in September 2018
- A second formal AFG meeting to discuss investigation results, draft CHAR and detailed mitigation strategies review on 13 September 2018
- A meeting with RAPs on 11 February 2019 to discuss their comments on the draft CHAR

- Further field surveys and archaeological test excavation of proposed ancillary facility areas with RAPs in April – May 2019.

Roads and Maritime will continue to consult with the local Aboriginal community throughout subsequent phases of the project. For more information about Aboriginal cultural heritage consultation, see **Chapter 15, Aboriginal cultural heritage** and **Appendix L, Aboriginal cultural heritage assessment report**.

7.2.2 Engagement before preparation of the EIS

Engagement activities began when the CHHPS was announced in 2001. The preferred route for the project was selected in 2004 after extensive consultation with stakeholder groups and the community. The preferred route was identified as the most suitable corridor to support economic development, ecologically sustainable development principles and value for money. The outcomes of the 2004 investigations recommended specific planning action to reserve land for the bypass corridor within the Coffs Harbour LEP.

In 2008, Roads and Maritime produced a preliminary concept design to identify the project corridor. This information was used by CHCC to inform various planning activities for the Coffs Harbour area.

These activities are summarised in **Table 7-2** and more detail is provided in **Chapter 4, Project development and alternatives**. Project documentation that details the engagement carried out before the start of the EIS in 2016 is available at ***www.pacifichighway.nsw.gov.au/coffsharbourbypass***.

Table 7-2 Engagement activities carried out since 2001

Engagement activity	Target stakeholder groups/community	Purpose	Outcomes
2001 to 2004 – Community information and consultation for CHHPS			
Public notices Information sheets Free call project line Website	Community and stakeholders	Provide information about project planning	The outcomes of this consultation were considered in developing the short list of route options.
Community Focus Groups Public displays Written submissions Survey forms	Community and stakeholders	Seek feedback to inform project planning	
Community Focus Groups Public displays Written submissions Survey forms	Community and stakeholders	Seek feedback to inform project planning	
February to March 2004 – Consultation on shortlist of route options			
Project letter Phone calls Meetings	Potentially affected property owners	Inform potentially affected property owners and gather feedback on shortlist of route options	Feedback informed the preferred route announced in November 2004 as part of the CHHPS
Newsletter Public notices and advertisements Free call project line	Community and stakeholders	Inform community of the shortlist of route options	

Engagement activity	Target stakeholder groups/community	Purpose	Outcomes
Website			
Community Focus Groups Public displays Written submissions Survey forms	Community and stakeholders	Seek feedback on the shortlist of route options	
Meetings and presentations with authorities and interest groups	• CHCC • Coffs Harbour Chamber of Commerce • Rotary Club of Coffs Harbour • Coffs Harbour and District Banana Growers Association • Coffs Harbour Advocate • Woolgoolga Advertiser	Seek feedback on the shortlist of route options	
November 2004 – Preferred route option			
Public displays Written submissions Community Focus Groups	Community and stakeholders	Inform community and seek feedback on the preferred route option	Submissions considered, and design refined
September 2008 – Consultation on preliminary concept design			
Newsletter Public notices and advertisements Free call project line Website	Community and stakeholders	Inform community of the concept design	
Comment form Public displays	Community and stakeholders	Seek feedback on the concept design	

7.2.3 Engagement during preparation of the EIS

The EIS and concept design process began in early 2016. The engagement activities carried out are detailed in the following sections.

Landowner engagement

In early 2016, Roads and Maritime recommenced discussions with landowners who would be directly impacted by the project. This involved a series of meetings and phone calls to discuss the project, seeking permission to access their land for design and EIS related investigations, and notify landowners of upcoming investigations and related access requirements.

In August 2018, interviews and site visits with a number of agricultural property owners directly impacted by the project were conducted as part of the agricultural assessment (refer to **Chapter 13, Agriculture**). The purpose of the interviews and site visits was to gather information on agricultural land use and perceptions

of business owners and managers about potential benefits and impacts of construction and operation of the project.

From September to November 2018, Roads and Maritime displayed the 2018 concept design to the community for feedback. During this time directly impacted property owners were again contacted via letter or phone calls and given an update on the project and the acquisition process. Discussions with directly impacted property owners have continued since then.

Agency engagement

Roads and Maritime recommenced engagement with Australian Government, State and local government agency representatives in early 2016 to discuss the project and associated EIS process. This involved meetings, site visits, phone calls and email correspondence between the parties during the past three years. Agency stakeholders have included:

- DoEE
- DPIE (Planning and Assessment)
- DPIE (Environment, Energy and Science)
- DPIE (Regions, Industry, Agriculture & Resources)
- Department of Premier and Cabinet (Heritage)
- EPA
- CHCC.

Consultation for 2008 preliminary concept design in 2016

The 2008 preliminary concept design for the project was made available for the community to view and provide feedback between Wednesday 24 August and Monday 19 September 2016. The closing date for the feedback period was extended to 31 October 2016 in response to community requests.

The purpose of this engagement phase was to:

- Re-introduce the project to the community given the long period between September 2008 and the expected change in community since this time
- Seek feedback on the design to identify issues and opportunities
- Provide information about the current phase of work which included field investigations, development of the EIS and design development.

Feedback received from the community during the preliminary concept design display included:

- Seventy-seven items of written feedback
- One petition
- Six letters received through the local Federal Member of Parliament’s office.

During this engagement phase, the project team also received and responded to 45 emails and 53 calls to the 1800 project information line.

Table 7-3 provides details of the community engagement activities carried out during preliminary concept design display.

Table 7-3 Engagement activities for the 2008 preliminary concept design

Tool	Date(s)	Details
Local media Newspaper advertisements	24, 27 and 31 August 2016	Media release was issued to local media outlets. Advertisements were placed in the Coffs Harbour Advocate advertising the community drop-in sessions.
Community update newsletter	27 August 2016	A community update was distributed widely within the Coffs Harbour area via an insert in the Coffs Harbour Advocate (31,000 copies of the newsletter). The update was also emailed and posted directly to project stakeholders, published online, handed out at community information sessions, provided at static displays and posted to 2500 properties located within 500 m of the project corridor.
Webpage	August to September 2016 and ongoing	Information about the preliminary concept design and engagement activities was published at ***www.pacifichighway.nsw.gov.au/coffsharbourbypass*** .
Drop-in sessions	31 August 2016 3 September 2016	Drop-in sessions were held at the Cavanbah Centre in Coffs Harbour. The sessions were staffed by the project team and people were invited to drop in at a time that suited them. Detailed mapping was used at the sessions to discuss the project with attendees. A set of display posters also provided information about the EIS and concept design refinement activities. About 400 people attended the two sessions.
Pop-up display	28 August 2016 (Harbourside Markets) 1 September 2016 (Park Beach Plaza)	Pop up display sessions were staffed by the project team and provided an opportunity to speak to people about the project and the upcoming community drop in sessions.
Static poster display	August to September 2016	Information about the project was placed on display at CHCC, Service NSW (Coffs Harbour) and Roads and Maritime's office in Grafton.
Stakeholder briefings, site visits and meetings	August to September 2016	A series of meetings and briefings were held by Roads and Maritime during this engagement phase to discuss the project with relevant stakeholders including: • Local members of parliament (MPs) • CHCC • Coffs Harbour Chamber of Commerce • Affected landowners • Businesses • Local schools.
Meeting with Kororo Public School	12 September 2016	The project team met with Kororo Public School's management to receive feedback. The school parents and citizens and broader school community were encouraged to provide their feedback.

Tool	Date(s)	Details
Meeting with Bishop Druitt College school executive	21 September 2016	The project team met with school executives and agreed to present to the wider school community.
Community meeting at Highlands Estate	13 October 2016	A community meeting was held after a petition from residents of Highlands Estate requesting the preferred route be moved. The meeting was attended by 30 residents.
Information evening at Bishop Druitt College	19 October 2016	The project team presented at an information evening for parents and teachers, attended by around 50 people.
Landowner engagement	August to September 2016	The project team met with affected landowners to discuss the project. Community update newsletter posted to 2500 properties within 500 m of the project corridor. Discussions with landowners at drop-in sessions.
Project email and 1800 number	Ongoing	Project email address and dedicated 1800 number were active and available throughout the consultation period.

Business and community survey and feedback from preliminary concept design display

In November 2016, Roads and Maritime carried out detailed local business and community surveys to help further understand the community's expectations, knowledge and concerns related to the project. The information has been used to:

- Inform the EIS investigations
- Refine the preliminary concept design
- Develop further targeted community consultation
- Help Roads and Maritime understand what topics are key to the community
- Inform the transport model and social impact investigations which feed into the understanding of how the bypass influences the road network.

Table 7-4 provides details of the engagement activities carried out during this engagement phase.

Table 7-4 Engagement activities for the business and community survey and feedback from preliminary concept design display

Tool	Date(s)	Details
Community update newsletter	November - December 2016	• Inserted in the Coffs Harbour Advocate on 17 December 2016 (31,000 copies) • Emailed to 508 stakeholders from the project database • Posted to 54 stakeholders from the project database • Posted to 1710 stakeholders who live within 500 m of the corridor • Posted to 238 businesses within 500 m of the corridor
Local media	November 2016	• Media release was issued to local media including newspapers and radio

Tool	Date(s)	Details
Community Feedback Summary	November - December 2016	• The Community Feedback Summary for the August 2016 consultation was made available on the project webpage
Interactive map	November - December 2016	• An interactive map was set up to show the boundaries of the project corridor, interchange locations and the proposed tunnels or cuttings giving the community the option to provide feedback on these further design options • 1583 users viewed the interactive map between 23 November 2016 and 31 December 2016 • 83 comments were placed in the map by users
Webpage	November 2016	• Information about the preliminary concept design and engagement activities was published at ***www.pacifichighway.nsw.gov.au/coffsharbourbypass***.
Business phone survey	November 2016	Coffs Harbour businesses were engaged via a phone survey to gather information to help with the traffic model, with 418 businesses participating in the survey. Response rates per area were as follows: • Central business district – 298 businesses identified, 122 responded to the survey (41 %) • Englands Road area – 199 businesses identified, 102 responded to the survey (51 %) • Hogbin Drive area – 150 businesses identified, 67 responded to the survey (45 %) • Coffs Harbour Jetty area – 68 businesses identified, 33 responded to the survey (49 %) • Park Beach area – 174 businesses identified, 89 responded to the survey (51 %) • Other – 15 businesses identified, 5 responded to the survey (33 %)
Business and community survey (online survey)	November - December 2016	An online survey was made available for businesses and the community to answer a number of questions about the preliminary concept design and potential impacts on the business and wider community, with 103 responses received during November and December 2016.
Project email, letters and 1800 number	Ongoing	Project email address and dedicated 1800 number were active and available throughout the engagement period. • 67 emails were received and responded to • Eight individual letters were received and responded to • 68 phone calls to the 1800 were received and responded to
Meetings with stakeholder groups and community	November - December 2016	• Project team members were available throughout this period to meet with stakeholder groups and community • 29 meetings with stakeholders including the Highlands Estate community meeting and a Bishop Druitt College community meeting

In addition to the above engagement activities, online business surveys were also carried out again during May and June 2018. Businesses located along the existing Pacific Highway were contacted by phone and email and invited to participate in a survey that focused on understanding their reliance on passing trade from the existing Pacific Highway. Ninety-six businesses were contacted and 22 provided a response (refer **Appendix K3, Business and community surveys**).

Consultation for the 2018 concept design display

The 2018 concept design for the bypass was made available for the community to view and provide feedback between 24 September 2018 and 26 October 2018. As a result of the community interest the feedback period was then extended to 30 November 2018. The purpose of this engagement phase was to seek feedback on the 2018 concept design prior to finalising the EIS. There were 813 submissions received from the community during the 2018 concept design display. This included:

- 244 submissions received via email or mail
- 512 submissions received via survey (both paper and online)
- 57 submissions received via the interactive map.

Table 7-5 provides details of the community engagement activities carried out during the 2018 concept design display.

Table 7-5 Engagement activities for the 2018 concept design

Tool	Date(s)	Details
Community update newsletter	September - November 2018	• Emailed to 3088 stakeholders from the project database • Posted to 120 stakeholders from the project database • Posted to 1720 stakeholders who live within 500 m of the corridor • Posted to 14,322 residences in the Coffs Harbour area • Posted to 1802 businesses in the Coffs Harbour area
Project summary report	September - November 2018	• 1000 copies printed and made available at displays
Local media	September 2018	• Media release was issued to local media including newspapers and radio • Media event held with local media invited to attend
Interactive map	September - November 2018	• An interactive map was set up to show the proposed boundaries of the project corridor, interchange locations and design giving the community the opportunity to provide feedback • The interactive map was viewed 2900 times between 24 September and 30 November 2018 • 57 comments were placed in the interactive map by users
Webpage	September 2018	• Information about the design display and engagement activities was published at ***www.pacifichighway.nsw.gov.au/coffsharbourbypass***.
Project email, letters and 1800 number	Ongoing	Project email address and dedicated 1800 number were active and available throughout the engagement period.

Tool	Date(s)	Details
		• More than 300 emails and letters were received and responded to • More than 100 phone calls to the 1800 number were received and responded to
Meetings with stakeholder groups and community	September – November 2018	• Project team members were available throughout this period to meet with CHCC, stakeholder groups and community • 44 individual meetings with stakeholders were held
Community information displays	September – October 2018	• Three community information displays were held at the Coffs Harbour Golf Club on 27 September, 13 October and 18 October 2018 • More than 500 people attended the community information displays
Pop-up displays	November 2018	• Three pop-up stalls were staffed at Coffs Central and Park Beach Plaza shopping centres on 21, 26 and 29 November • More than 150 people spoke to staff at these displays
Static displays	September – November 2018	• Project information was made available the following locations: – Coffs Harbour City Council offices – Park Beach Plaza – The office of the former State Member for Coffs Harbour, Andrew Fraser MP – The office of the former Federal Member for Cowper, Luke Hartsuyker – The Big Banana
Online and paper feedback survey	October – November 2018	• A feedback survey was created to allow people to provide comments on the design • The feedback survey was available online at surveymonkey.com or via the project webpage and also in hardcopy at the community and pop-up displays • 512 completed surveys were submitted during the display period
Community display office	November 2018	• A community display office at 11a Park Avenue, Coffs Harbour was opened on 19 November 2018 • 272 people visited the office from 19 November 2018 to the end of the display period (30 November 2018)

Community Consultative Committee

In January 2019, the NSW Government announced it would establish a Community Consultative Committee (CCC) for the project. The purpose of the CCC is to provide a forum for discussion between Roads and Maritime and representatives of the Coffs Harbour community, stakeholder groups and CHCC on issues directly relating to the project.

The CCC has an independent chairperson and includes representatives from the community, CHCC and Roads and Maritime. Further information about the CCC can be found at the project's website: ***www.pacifichighway.nsw.gov.au/coffsharbourbypass***.

The CCC had its first meeting on 29 April 2019. A summary of issues discussed at the meeting is included in **Table 7-11**. The next meeting of the CCC is proposed for the EIS exhibition period.

7.3 Summary of issues raised during EIS preparation

Key issues raised by stakeholders and the community included:

- Route selection
- Property impacts
- Agriculture impacts
- Environmental impacts, including noise, visual, air quality, Aboriginal heritage and biodiversity impacts
- Community value
- Preference for tunnels over cuttings and land bridges
- Movement of vehicles carrying dangerous goods
- Impacts on community facilities, including impacts on Bishop Druitt College
- Reducing highway traffic through Coffs Harbour CBD
- Traffic arrangements around Kororo Public School
- Local road arrangements and increased traffic on Coramba Road and James Small Drive
- Interchange designs.

These issues were investigated and considered as part of the development of the project, with design elements incorporated to address concerns raised and reduce potential environmental impacts where reasonable and feasible.

7.3.1 Issues raised by Australian Government and State government agencies

A summary of issues raised by Australian Government and State government agencies during the preparation of the EIS is provided in **Table 7-6**.

Table 7-6 Summary of issues raised by government agencies

Agency/stakeholder group	Comments	Where addressed
DoEE	• Confirmation of the bilateral assessment process • Confirmation of the proposed approach to biodiversity offsets	**Chapter 2, Assessment process** **Chapter 10, Biodiversity**
DPIE (Environment, Energy and Science)	• Providing adequate fauna connectivity across the project including incorporation of arboreal connectivity structures into design • Importance of Roberts Hill ridge as a koala corridor	**Chapter 7, Consultation** **Chapter 10, Biodiversity**

Agency/stakeholder group	Comments	Where addressed
DPIE (Regions, Industry, Agriculture & Resources	• Protection of Pine Brush Creek during construction and operation • Use of five day 90th percentile rainfall event to design construction sediment basins within creek catchments that flow into the Solitary Islands Marine Park • Design should avoid direct impacts from bridge piers and minimise need for realigning waterways where possible • Retain existing riparian vegetation where possible • Ensure adequate planning and space for erosion and sediment control measures • Mitigation measures for dust management during construction • Implementation of Panama disease management measures	**Chapter 6, Construction** **Chapter 19, Surface water quality** **Chapter 10, Biodiversity** **Chapter 17, Flooding and hydrology** **Chapter 18, Soils and contamination** **Chapter 21, Air quality**
Department of Premier and Cabinet (Heritage)	• Ensuring adequate consultation on Aboriginal cultural heritage	**Chapter 7, Consultation** **Chapter 15, Aboriginal cultural heritage**
EPA	• Ensure adequate planning and space for erosion and sediment control measures • Early consultation with EPA on requirements for enabling works and out of hours work • Adequately resourcing for community liaison during construction, particularly in relation to noise impacts • Consideration of potential locations for re-use of construction site water • The need for ongoing consultation on the use of tunnels by all classes of vehicles carrying dangerous goods	**Chapter 5, Project description** **Chapter 6, Construction** **Chapter 9, Noise and vibration** **Chapter 18, Soils and contamination** **Chapter 19, Surface water quality** **Appendix D, Draft Community consultation framework** **Chapter 24, Hazard and risk**
Fire and Rescue NSW	• The need for ongoing consultation on the use of tunnels by all classes of vehicles carrying dangerous goods	**Chapter 24, Hazard and risk**
NSW State Emergency Service	• The need for unimpeded access to emergencies during construction • North Boambee Valley and Newports Creek flooding issues	**Chapter 17, Flooding and hydrology**
SafeWork NSW	• The need for ongoing consultation on the use of tunnels by all classes of vehicles carrying dangerous goods	**Chapter 24, Hazard and risk**

Agency/stakeholder group	Comments	Where addressed
Australian Rail Track Corporation	• Ensure the bridge over the railway provides adequate clearance for the railway • Ensure the bridge over the railway allows for future rail upgrades • Requirement to provide anti-throw screens on bridge over railway	**Chapter 5, Project description**

7.3.2 Issues raised by stakeholders

A summary of issues raised by stakeholders during the preparation of the EIS is provided in **Table 7-7**.

Table 7-7 Summary of issues raised by affected stakeholders

Stakeholder group	Comments	Where addressed
Kororo Public School	• Concerns raised about potential removal of car parking at Kororo Public School • Concerns raised about student and staff safety at Kororo Public School from altered traffic conditions during construction and operation • Concerns raised about the location and function of the bus interchange	**Chapter 5, Project description** **Chapter 8, Traffic and transport**
	• Concerns raised about potential changes to the location of Luke Bowen footbridge	**Chapter 5, Project description** **Chapter 14, Socio-economic**
	• Concerns about air quality and potential negative impacts on health during construction and operation of the highway	**Chapter 21, Air quality** **Appendix Q, Human health risk assessment**
Lindsay Transport	• The need for safe access for B-doubles to the highway from the transport depot adjacent to the project	**Chapter 5, Project description**
Bishop Druitt College	• Request for continued consultation on noise and visual impacts • Explore opportunities to improve pedestrian and cyclist access to the college	**Appendix D, Community consultation framework** **Chapter 5, Project description**
Coffs Harbour Chamber of Commerce	• Concerns about businesses that rely on passing trade that may lose business	**Chapter 14, Socio-economic**
	• Recognised potential for economic benefits from the bypass	
	• Concerned Coffs Harbour is becoming less attractive for business and tourism because of current highway congestion	

Stakeholder group	Comments	Where addressed
Coffs Harbour Bicycle user group	• Bicycle routes through interchanges • Grades on the alignment • Access for cyclists during construction, especially to Bruxner Park Road • Preference for cycle paths to be shared user paths with barriers to separate them from traffic	**Chapter 5, Project Description** **Chapter 8, Traffic and transport**
Coffs Harbour Cycle Club	• Inclusion of dedicated cycle lanes to separate cyclists from traffic • Inclusion of protected cycle lanes at all intersections and on/off ramps • Cycle lanes should be painted green for safety and include separation devices such as concrete barriers	**Chapter 5, Project Description** **Chapter 8, Traffic and transport**
Coffs Harbour Triathlon Club	• Dedicated cycle lanes/paths or shared paths should be provided wherever there is an identified safety risk to cyclists/pedestrians, including at interchanges • Road shoulders should be of suitable width and surface finish to accommodate pedestrians and cyclists safely including mechanisms to minimise gravel and debris • Consideration of a dedicated cycleway between Coffs Harbour and north of the Korora Hill interchange (with connection to the Solitary Islands Way service road) • Adequate lighting and ventilation for cyclists in any tunnels	**Chapter 5, Project Description** **Chapter 8, Traffic and transport**
	• Provision of a bike shelter/racks at the proposed Bruxner Park Road/ service road intersection • Provision for bicycle access from the proposed highway to the Old Coast Road cul-de-sac via a ramp	These issues are outside the scope of this project, however Roads and Maritime will continue to consult with Coffs Harbour Triathlon Club
Rural Fire Service (RFS)	• Concerns about issues with access to the existing Solitary RFS shed • Provided information on key risk areas for potential bushfire hazard • Provided information on fire trail networks and emergency services requirements	**Chapter 8, Traffic and transport** **Chapter 24, Hazard and risk**
Banana Growers' Association of Coffs Harbour & District	• Requested project team to consult with other banana farmers who are not members of the association • Concerns over spread of Panama disease • Increasing costs of banana farming	**Chapter 13, Agriculture** **Chapter 18, Soils and contamination** **Chapter 11, Urban design, landscape and visual amenity**

Stakeholder group	Comments	Where addressed
	• The importance of wind direction to the viability of banana crops • Concerns that large cuttings will cause microclimate impacts affecting the yields on bananas adjacent to the project. • Concerns about how existing banana farms next to the bypass will operate as a result of acquisition impacts • Concerns about shading from project landscaping on adjacent farms	
Utility providers, including Essential Energy, Telstra, NBN, Optus, NextGen, AARNet	• Ongoing consultation on project impacts and relocation of utilities	**Chapter 5, Project description**
NSW Farmers Federation	• Concerns about changes to microclimate and impacts on water and soils • Consideration of the unique climate, topography and sensitive environment of the project area	**Chapter 13, Agriculture**
	• Need to provide regular, up-to-date, relevant information to landholders • Start the compulsory acquisition phase as soon as possible • Recognition of the distress of families forced to sell their farms, many of which have been owned for generations	**Chapter 7, Consultation** **Appendix D, Draft Community consultation framework** **Chapter 5, Project Description** **Chapter 14, Socio-economic**
	• Provide tunnels to reduce impacts on current and future farming operations Limit depth and width of cuttings to ensure minimal soil movement and changes in microclimate	**Chapter 4, Project development and alternatives** **Chapter 5, Project description** **Chapter 13, Agriculture**
	• Provide appropriate access to landowners during construction and following completion	**Chapter 8, Traffic and transport** **Chapter 13, Agriculture**
Road Freight Industry Council	• Need to ensure the project design is appropriate for the heavy vehicles and freight industry	**Chapter 5, Project description** **Chapter 8, Traffic and transport**

7.3.3 Issues raised by Coffs Harbour City Council

A summary of issues raised by CHCC during the preparation of the EIS is provided in **Table 7-8**. Roads and Maritime will continue to work with Council on the issues raised below.

Table 7-8 Summary of issues raised by Coffs Harbour City Council

Issue	Comments	Where addressed
Design	• Council does not support the 2018 concept design, including cuttings and land bridges	**Chapter 4, Project development and alternatives**
Noise	• Preference for tunnels to reduce operational noise • Noise impacts in Mackays Road valley • Consideration of temperature inversion effect on noise • Visual impacts of cuttings on future development of west Coffs Harbour	**Chapter 4, Project development and alternatives** **Chapter 9, Noise and vibration** **Appendix G, Noise and vibration assessment**
Visual	• Preference for tunnels to reduce visual impacts • Impact of narrow median on visual amenity • Visual impacts in Mackays Road valley • Visual impacts of cuttings on future development of west Coffs Harbour	**Chapter 11, Urban design, landscape and visual amenity**
Dangerous goods	• Request to conduct a detailed dangerous goods vehicle assessment	**Chapter 24, Hazard and risk**
Biodiversity	• Mitigation measures to maintain fauna connectivity during and after construction • Consideration of CHCC revegetation work within the project's landscaping • The importance of pockets of rainforest vegetation	**Chapter 10, Biodiversity** **Chapter 11, Urban design, landscape and visual amenity** **Chapter 14, Socio-economic**
Flooding and flood mitigation	• Flood emergency management for the North Boambee Valley and Coffs Harbour Health Campus • Crossing of floodways via bridges instead of culverts. • Acceptable maximum flood impacts • Incorporating climate change impacts into flood modelling • Consideration of future flood mitigation work by CHCC • Consideration of flooding impacts to essential and sensitive facilities, including Coffs Harbour Health Campus	**Chapter 5, Project description** **Chapter 17, Flooding and hydrology**
CHCC assets and maintenance requirements	• Impacts on Coffs Coast Resource Recovery Park • Lack of direct access to project for the Solitary RFS shed at Korora	**Chapter 5, Project description** **Chapter 6, Construction**

Issue	Comments	Where addressed
	• Access to CHCC assets, such as utilities, for maintenance • More median crossovers to allow for on-highway contraflows when maintenance access is required • Maintenance of existing Pacific Highway during construction of the project • Consideration of impacts of utility relocations • Maintaining existing bicycle crossings.	**Chapter 8, Traffic and transport** **Chapter 12, Land use and property** **Chapter 14, Socio-economic**
Roads and traffic	• Request to extend Mackays Road to tie-in with the current sealed network. • Need to improve access to Isles Drive • Increased school and general traffic on James Small Drive and road safety concerns • Increased school traffic on Old Coast Road and impact on existing timber beam bridges • Concern about the use of steel wire rope safety barrier in the median, instead of concrete barriers • Concern about the capacity of Coramba Road to carry traffic to and from the Coramba Road interchange • Implications of use of narrow median on the cost of future widening • Consideration for future council road upgrades, eg North Boambee Road.	**Chapter 5, Project description** **Chapter 8, Traffic and transport** **Chapter 16, Non-Aboriginal cultural heritage** **Chapter 9, Noise and vibration** **Chapter 4, Project development and alternatives**
Air quality	• Consideration of temperature inversion effect on air quality	**Chapter 21, Air quality**
Social	• Impact of bypass on affordable housing	**Chapter 14, Socio-economic**

7.3.4 Issues raised by Aboriginal stakeholders

A summary of issues raised by Aboriginal stakeholders during the preparation of the EIS is provided in **Table 7-9**. More detail on issues raised by Aboriginal stakeholders is contained in **Appendix L, Aboriginal cultural heritage assessment report**.

Table 7-9 Summary of issues raised by Aboriginal stakeholders

Stakeholder group	Comments	Where addressed
CH&D LALC Garby Elders Aboriginal Corporation	• Involvement in protection and recording of Aboriginal cultural heritage, including: – Interest in the approach to cultural heritage investigations – Involving cultural knowledge holders in the process	**Chapter 15, Aboriginal cultural heritage** **Appendix L, Aboriginal cultural heritage assessment report**

Stakeholder group	Comments	Where addressed
Jagun Aged Care Elders Gumbaynggir People Wanggaan Gumbaynggirr Corporation Kullila Site Consultants Norman Frank Archibald National Koori Site Management	– Identification of known sites of special cultural significance such as Roberts Hill and the Gumgali Pathway – Consultation about the archaeological field survey methodology and identification of significance of artefacts – Identification of ancestral associations with the land, including connection and descendants from the original traditional owners – Connectivity of sites and pathways throughout the landscape – Creek lines, particularly larger landscape features and waterways • Concerns about the project's potential to disturb significant sites and paths between sites • Concern for burial, as their locations are not always known and can be found anywhere • Responsibility to look after the land, including the heritage sites, plants and animals, creeks, rivers, ocean and the land itself • Concerns about the archaeological assessment methodology • Strong preference for tunnels over cuttings to reduce Aboriginal heritage impacts • Adequacy of mitigation measures • The importance of updating Aboriginal stakeholders on design changes • Use of the images of deceased people in the EIS is not permitted	

7.3.5 Issues raised by the community

A summary of issues raised by the community during the preparation of the EIS, including submissions on the 2018 concept design, is provided in **Table 7-10**. Community issues include submissions from CHCC councillors.

Table 7-10 Summary of issues raised by the community

Stakeholder group	Comments	Where addressed
Individual community members	• Location of corridor and historical route selection options • The route will only function as a ring road not a bypass • Support for progressing the bypass to reduce traffic congestion and heavy vehicle traffic within Coffs Harbour	**Chapter 4, Project development and alternatives**

Stakeholder group	Comments	Where addressed
	• Preference for tunnels over cuttings and land bridges to reduce biodiversity, visual, noise and Aboriginal heritage impacts • Concerns about the decision-making process for the 2018 concept design, in particular the exclusion of tunnels. • Support for the preferred concept design	
	• Project timing including construction and operation timelines • Interchange accessibility, safety, traffic and size • How local roads would link to and cross the project • Potential changes to the Luke Bowen footbridge • Location and function of the bus interchange and use of James Small Drive	**Chapter 5, Project description** **Chapter 8, Traffic and transport**
	• Lack of community consultation • Lack of consultation with affected property owners	**Chapter 7, Consultation**
	• Concerns about noise from the project especially the perceived amphitheatre effect of the hills surrounding the area and steep grade lines • Effect of wind and weather on current noise • Operational noise impacts including further information on noise mitigation including noise walls, earth mounds, double glazing and air condition to minimise noise impacts	**Chapter 9, Noise and vibration** **Appendix G, Noise and vibration assessment**
	• Potential impacts on koalas • Potential impacts on the giant barred frog • Biodiversity at Newports Creek and its frog population • Impacts on remnant rainforests • Maintaining connectivity for fauna • Retention of vegetation near Coachmans Close for screening of visual impacts • Potential impacts on migrating wedge-tailed shearwaters • Presence of platypus in Treefern Creek	**Chapter 10, Biodiversity** **Chapter 14, Socio-economic** **Appendix H, Biodiversity assessment report**
	• Consideration of the unique visual landscape of Coffs Harbour • Concerns about visual amenity, including requests for mitigation to reduce visual impacts.	**Chapter 11, Urban design, landscape and visual amenity**
	• Interest in employment opportunities for the project • Concerns about possible negative impacts to property values	**Chapter 12, Land use and property** **Chapter 14, Socio-economic**

Stakeholder group	Comments	Where addressed
	• Concern about impacts on Aboriginal cultural heritage particularly at Roberts Hill and Gatelys Road ridges	**Chapter 15, Aboriginal cultural heritage**
	• Concern about potential runoff from the project impacting on local wetlands and creeks.	**Chapter 19, Surface water quality**
	• Concerns about dust and exhaust fumes from vehicles during construction and operation • Concerns about the impact of air quality on water tank usage	**Chapter 21, Air quality**
	• Impacts on Bishop Druitt College, including noise, air quality and visual amenity	**Chapter 9, Noise and vibration** **Chapter 11, Urban design, landscape and visual amenity** **Chapter 21, Air quality**
	• Concern about the capacity of Coramba Road to carry traffic to and from the Coramba Road interchange • Design and traffic arrangements around Kororo Public School	**Chapter 5, Project description** **Chapter 8, Traffic and transport**
	• Concerns about flooding impacts	**Chapter 17, Flooding and hydrology**
	• Transport of hazardous goods	**Chapter 24, Hazard and risk**

7.3.6 Issues raised by the Community Consultative Committee

A summary of issues raised by the CCC during the preparation of the EIS is provided in **Table 7-11.** Further information is provided in the meeting minutes available at ***www.pacifichighway.nsw.gov.au/coffsharbourbypass.***

Table 7-11 Summary of issues raised by the CCC

Stakeholder group	Comments	Where addressed
Community Consultative Committee	• Support for tunnels over cuttings	**Chapter 5, Project description**
	• Concerns about further design work and lack of resources delaying the start of construction	**Chapter 6, Construction**
	• Request for feedback on the community submissions received on the 2018 concept design	**Chapter 7, Consultation**
	• Request for an independent audit of noise impacts	DPIE advised that, as part of the review process for the EIS, they engage with the EPA noise experts and they

Stakeholder group	Comments	Where addressed
		also review the noise assessment in the EIS
	• Concerns about negative impacts on youth unemployment because of the reduction in passing traffic in the CBD	**Chapter 14, Socio-economic**
	• Request for a health risk assessment of tunnels	**Appendix Q, Human health risk assessment**

7.4 Future consultation

The aims of ongoing communications and consultation are to provide the community with:

- Accurate and accessible information about the processes and activities associated with the project
- Information in a timely manner
- Appropriate avenues for providing comment or raising concerns and to ensure the community are aware of how to engage with the project team
- A high level of responsiveness to community issues and concerns throughout development and delivery of the project.

7.4.1 Consultation during the exhibition of the EIS

The EIS will be advertised and placed on public exhibition to give the community, government agencies and other interested parties an opportunity to make comment on the design, environmental impacts and mitigations for the project.

During the EIS exhibition, the community, government agencies and other interested parties are invited to make written submissions on the project to DPIE (Planning and Assessment). A number of activities will be held during the exhibition of the EIS to enable community, government agencies and stakeholders to ask questions and to provide further information for consideration in the assessment process. Activities include, but may not be limited to, community information displays, pop up displays, government agency briefings and targeted stakeholder briefings on key features of the project. The next meeting of the CCC will be held during the EIS exhibition period.

After the exhibition of the EIS, the Secretary will provide copies of submissions to Roads and Maritime or a report containing a summary of the issues raised. The Secretary of Planning, Industry and Environment will then require Roads and Maritime to prepare a submissions report to respond to the issues raised and may require a preferred infrastructure report to outline any proposed changes to the project. If significant changes to the project are proposed, the Secretary may make the preferred infrastructure report publicly available.

The Secretary will prepare an assessment report and provide it to the Minister for Planning and Public Spaces. The Minister for Planning and Public Spaces will then decide whether to approve the project and the conditions to be attached.

7.4.2 Consultation during construction stages

Community involvement would continue as part of the construction and delivery of the project. A draft community consultation framework has been prepared (refer to **Appendix D**) and will be the basis for developing a Community Liaison Implementation Plan to guide community and stakeholder involvement during detailed design, construction and leading up to project opening.

The Community Liaison Implementation Plan would provide specific information relating to community involvement during construction and the opening of the project including consultation tools, activities and timing for each project element and specific issue. The plan would also, as a minimum, include:

- A stakeholder contact list reviewed and updated regularly throughout the project
- Approach to engagement for each stakeholder group
- Map of impacted properties
- A register of potential construction impacts and timings
- An assessment of and plan to minimise impacts on the community and stakeholders
- External and internal communication protocols
- Procedure for managing and responding to enquiries and complaints
- Procedures for notifying the community of upcoming work and impacts
- Procedures for communicating the details of design and construction.

Refer to **Appendix D, Draft community consultation framework** for more detail.