Warrell Creek to Urunga
Upgrading the Pacific Highway

ENVIRONMENTAL ASSESSMENT

VOLUME 1 ENVIRONMENTAL ASSESSMENT

January 2010

ISBN 978-1-921692-63-5

Sinclair Knight Merz
ABN 37 001 024 095
100 Christie Street
PO Box 164
St Leonards NSW
Australia 1590
Tel: +61 2 9928 2100
Fax: +61 2 9928 2500
Web: www.skmconsulting.com

7. Construction of the Proposal

This chapter describes the proposed construction issues associated with the Proposal.

Director-General's requirements	Where addressed in the EA	
A detailed description of the project including: ▪ route alignment and corridor width; ▪ design elements (e.g. requirements for LOS, pedestrian and cyclists , rest areas and service centres etc); ▪ differentiate the limits of the Project with respect to the existing Pacific Highway, including operational/maintenance responsibilities; ▪ potential staging; ▪ ancillary facilities (e.g. compound sites, batching plants etc); and ▪ resourcing (e.g. construction material needs, spoil disposal, natural resource consumption including water).	Section 6.2.	Requirements for Level of Service
	Section 6.4	Description of the Proposal
	Section 6.4.1	Route alignment
	Section 6.4.2	Corridor width
	Section 6.5	Design elements
	Section 6.5.7	Cyclists and Pedestrians
	Section 6.5.10	Rest areas and service centres
	Section 7.2	Potential staging
	Section 7.3	Earthworks and resources
	Section 7.3.7	Ancillary facilities
	Section 19.4.2	Waste management measures

7.1 Construction activities and methods

Table 7-1 provides details of the potential pre-construction and construction activities to be undertaken. The types of equipment and plant requirements would be refined during detailed design and during the development of the construction methodology by the construction contractor.

The methods used to construct the roadwork elements of the Proposal would generally be conventional techniques employed on major highway projects which would be adapted to account for the various Proposal-specific environmental and social constraints. Local access requirements and the geotechnical conditions would influence the final choice of construction techniques to ensure the project was constructed in a safe and efficient manner.

Geotechnical investigations undertaken for the concept design have identified that some soft soils would be encountered where embankments are constructed across flood plains and at the various river and creek crossings. Various construction techniques for these areas are described in Chapter 18 – *Soils characteristics and erosion controls*.

Table 7-1 Potential pre-construction and construction activities

Component	Typical activities	Typical plant and equipment
Procurement, award and environmental management system set-up	■ Tendering and award of contract ■ Identification of sensitive areas ■ Preparation/processing of construction environmental management plans, licenses and approvals	Not applicable
Obtain authorisation to use land	■ Confirmation of property boundaries ■ Obtain written authorisation from Forests NSW to occupy and use State Forest land for purposes of constructing the project	Not applicable
Site establishment	■ Fencing of corridor ■ Establishment of construction site facilities and access ■ Implementation of initial environmental safeguards ■ Pre-clearing and habitat surveys	Fences, portable sheds, portable toilets, fuel storage tanks, concrete and asphalt batching plants.
Relocation of services	■ Identification of utility services and consultation with utility authorities ■ Relocation or protection of services as required	Trucks, cranes, excavators, elevated platform vehicle, backhoes, trenchers, small equipment.
Site preparation	■ Harvestable timber felled and removed. This would be done by the Forests NSW. ■ Clearing and grubbing and processing (including recycling) of various materials for use in landscaping activities ■ Stripping and stockpiling of topsoil for reuse	Trucks, bulldozers, scrapers, excavators, backhoes, small equipment.
Earthworks	■ Earthworks, including movement of materials along the alignment from cutting to fill embankment areas ■ Removal and stockpiling of spoil and unsuitable material ■ Batter treatments	Trucks, bulldozers, excavators, scrapers, graders, water carts, compactors, rollers, blasting equipment,
Bridges, interchanges, and drainage and fauna crossings	■ Construction of diversion drainage and sediment basins ■ Construction of transverse drainage structures ■ Construction of subsurface and pavement drainage ■ Construction of drainage culverts and combined fauna crossings ■ Construction of interchange bridges and ramps ■ Construction of major bridge crossings of Nambucca and Kalang Rivers ■ In-stream works at water ways ■ Construction of local road overbridges and underpasses	Piling rigs, concrete pumps, cranes, excavators, trucks, small equipment, elevated platform vehicle, barges.
Pavements	■ Construction of pavement layers including selected material, sub-base and base layers	Trucks, graders, water carts, compactors, asphalt paver, vibratory rollers, rubber-tyre rollers.
Improvements to existing highway	■ Earthworks ■ Construction of pavement layers including selected material, sub-base and base layers.	Graders, backhoes, trucks, water carts, vibratory compactors, bitumen sprayers, vibratory rollers, rubber-tyre rollers.

Component	Typical activities	Typical plant and equipment
Other works	■ Installation of safety barriers, fencing and roadside furniture ■ Linemarking ■ Landscaping	Trucks, fencing and barrier materials, landscaping materials.
Finishing works	■ Remove temporary works ■ Restore and landscape temporary sites	Trucks, landscaping materials.

7.2 Potential staging

The Proposal could be constructed and operated in stages with the final staging to be determined by the RTA to suit funding and priority requirements. There are a number of possible staging opportunities which could include, but are not limited to, construction and operation of the Proposal in the following sections:

- Bypass of Warrell Creek.
- Warrell Creek to Pacific Highway just north of the Nambucca River.
- Pacific Highway just north of the Nambucca River to the Nambucca Heads Interchange.
- Nambucca Heads interchange to Ballards Road interchange.
- Ballards Road interchange to Waterfall Way interchange.
- Early works packages, for example construction of floodplain embankments.
- Construction across the soft soil areas identified in Chapter 18 in advance of other sections of the Proposal.

Other potential staging options could be identified during development of the detailed design. Combinations of the above staging options could also be possible, for example, constructing the section between the Warrell Creek interchange and Nambucca Heads interchange.

Opportunities could also be available to provide temporary connections between the Proposal and the existing highway within these potential staging options to provide early benefits for motorists by opening sections of the Proposal sooner.

If the Proposal is delivered in stages, a Staging Report would be prepared. The report would:

- Describe the proposed staging arrangements.
- Identify and assess any additional potential environmental impacts associated with the proposed staging arrangements.
- Identify any additional management measures (commitments) that would be implemented as a result of the staging process.

7.3 Earthworks and resources

7.3.1 Construction materials

The construction of the Proposal would require the use of various types of materials including, but not limited to:

- Fill (of varying quality) for use in earthworks.
- Pavement materials including selected material and road base.
- Aggregate for use in concrete batching.
- Materials for lining drainage channels.
- Sand for use as backfill around pipes.
- Cement and concrete.
- Materials to allow traffic to access soft areas.
- Safety barriers, signage and other road furniture.
- Lighting poles and lamps.
- Pre-cast materials (e.g. bridge components).
- Steel.
- Geotextiles and geofabrics.
- Fencing.
- Water.

The availability of raw and manufactured materials and prefabricated components has the potential to impact on the program of delivery of the Proposal. Preliminary estimates of raw materials for construction have been determined as part of the concept design. A preliminary study was undertaken to identify existing and potential sources of quarry materials in and around the study area and the effect of depletion of resources to the broader community, in particular in terms of other construction projects in the region.

The substantial number of bridges and culverts required for the Proposal would result in the need for a large amount of prefabricated items. As a number of the bridges cross floodplains, it is anticipated that multiple, shorter spans could be used to improve construction efficiencies through the use of prefabricated bridge beams rather than more complex cast in situ methods. Prefabricated items are likely to include:

- Bridge beams.
- Bridge headstocks and abutments.
- Box culverts.
- Drainage pipes.

- Drainage pits.
- Drainage headwalls.
- Noise barriers.

7.3.2 General, select and fill materials

The Proposal has been designed to achieve an approximate balance of cut and fill material, including allowances for topsoil and some unsuitable material. Materials for the selected fill may be sourced from the deeper cuttings throughout the Proposal. However, this is not expected to generate sufficient materials and the remainder would need to be imported. Based on the initial geotechnical investigations, pavement materials and concrete aggregates are not expected to be available from site materials. Table 7-2 identifies the concept design earthwork quantities for the Proposal.

Table 7-2 Concept design earthworks quantities

Section	Cut[1] (m^3)	Fill[1] (m^3)	Surplus/(Deficit)[1] (m^3)
Allgomera deviation to Nambucca River	1,500,000	1,190,000	310,000
Nambucca River to North Coast Railway overbridge	1,450,000	1,320,000	130,000
Nambucca Heads to Ballards Road	980,000	770,000	210,000
Ballards Road to Waterfall Way	1,880,000	1,730,000	150,000
Totals (rounded)[1]	5,810,000	5,010,000	800,000

[1] The quantities of materials would be further refined during the detailed design phase.

Material removed from cuttings would be used to construct fill embankments unless it is found to be unsuitable for that purpose. Cut material that is deemed unsuitable or is excess (as noted in Table 7-2) would be stockpiled until needed as part of the landscaping design or possibly used as visual screening or noise mounding during the construction phase. The better quality material may be processed and stockpiled on-site for use in the construction of the pavements.

The earthworks model for the concept design has been developed to balance cut and fill between the following areas:

- Warrell Creek interchange and the southern bank of the Nambucca River and from the northern bank of the Nambucca River to the Nambucca interchange so that haulage of material does not occur across the existing Pacific Highway bridge at Macksville.
- Nambucca interchange and southern bank of the Kalang River and from the northern bank of the Kalang River at Urunga to the Waterfall Way interchange so that minimal haulage of material is required across the existing Pacific Highway bridge at Urunga.

During the detailed design phase, the earthworks model would be further refined to confirm the volumes of different fill materials available from cuttings. Alternatives for sourcing additional material as part of the Proposal may include:

- Changing the vertical alignment of the Proposal to increase cut and reduce fill in areas.
- Modification of material to meet select material classifications (select refers to material required to construct the pavement and the material under the pavement that complies with a specification (e.g. strength or grade)).
- Flatten cut batters to provide more excavated material and gentler slopes for landscaping.
- Widen cut batters to provide wider verges and clear areas adjacent to the carriageway.
- Increase or lower some sections of the new local access roads.

Estimates of imported materials are based on the current concept design and available geotechnical information and have assumed that most of the selected material zone underneath the pavement and all the pavement materials may need to be imported.

Table 7-3 shows potential areas where rock cuttings are likely to produce material for use as select material.

Table 7-3 Anticipated rock units along the Proposal suiteable for use as select material

Section	Approximate chainage (m)		Formation	Potential for reuse
	From	To		
1	6700	7050	High to very high strength Hornfels	Upper zone formation or selected material
2	18120	18380	Medium to high strength phyllite	Upper zone formation
4	32300	32500	High to high strength phyllite	Upper zone formation
	36500	36900	Medium to high strength phyllite	Upper zone formation

7.3.2.1 Quarry material

It may be necessary to source some materials from nearby quarries. Table 7-4 lists the quarries within 100 kilometres of the Proposal, including the materials available and the production capacity. The Nambucca Valley Quarry is located alongside the Proposal, north of Donnellyville. Materials available from the Nambucca Valley Quarry include pavement materials, selected material, sand and concrete aggregates.

The Nambucca Valley Quarry is licensed to extract 250,000 m^3 of quarry materials per year. However, the quarry also supplies local building and construction activities which could limit the resources available for construction of the Proposal. This would necessitate obtaining imported material, if available, from other quarries as identified in Table 7-4. Access to materials from quarries near Coffs Harbour and Kempsey may be limited if construction of the Proposal occurs concurrently with the construction of other Pacific Highway upgrades on the NSW Mid North Coast.

It is expected that the local industry would be able to supply select material and aggregate required for the Proposal.

Table 7-4 Quarries within 100 kilometres of the Proposal

Name	Raw material	Pavement materials	Selected material	Sand	Concrete aggregate	Production capacity
Volcanic Resources, Wauchope	Ryalite		Yes			30,000 tonnes/year
Volcanic Resources, Kempsey	Riverstone			Yes	Yes	Commercial-in-confidence
Hurd Haulage, Dunbogan		Yes	Yes	Yes	Yes	100,000 – 500,000 tonnes/year
BJ and NJ Penson, Kempsey	Riverstone	Yes		Yes	Yes	Commercial-in-confidence
Monro Earthmoving, Valla	Granite	Yes	Yes	Yes	Yes	Commercial-in-confidence
Nambucca Valley Gravel, Macksville	Basalt	Yes	Yes	Yes	Yes	250,000 tonnes/year
Ready-mix, Boambee	Greywacke				Yes	Commercial-in-confidence
T.C Jung Quarries, Coffs Harbour	Argillite	Yes	Yes			285,000 tonnes/year

7.3.2.2 Cement

Sources of cement are likely to be Sydney, Newcastle or Brisbane, requiring transportation to site via road or rail. It is expected that storage silos would be constructed on-site adjacent to any temporary batching plants.

7.3.2.3 Bitumen

Requirements for bitumen would be dependent on the pavement type selected for the Proposal. As a minimum, bitumen would be required at the top of the select material zone (SMZ) and for local and service roads. Bitumen would be available from either Kempsey or Coffs Harbour.

7.3.3 Concrete precasting yard

There are existing concrete precasting yards at Macksville and Coffs Harbour that may be used to supply precast elements for the Proposal.

7.3.4 Spoil and waste disposal

Specific requirements for waste minimisation and management during the construction of the Proposal would be finalised during detailed design and managed through the Construction Environmental Management Plan (CEMP).

This would comply with relevant State government legislation and policies and any conditions of approval, including the Waste Avoidance and Resource Recovery Strategy 2007 (DECC 2007).

Where possible, materials would be re-used either on or off-site. These would include tree and plant material which would be mulched or chipped, and material from demolished structures, as well as any soil and rock material.

7.3.5 Natural resource consumption (including water)

The resources required for the construction of the Proposal and indicative quantities are provided in Table 7-5. Water requirements are shown in Table 7-6.

Table 7-5 Resources and indicative quantities required for construction

Resource	Source	Indicative quantity
General Fill	Cut to fill on-site	5,810,000 m^3
Steel	From sources in Sydney, Newcastle or Brisbane.	20,000 t
Sand	Local quarry materials	150,000 m^3
Pavement quality materials	From deep/rock cuttings within the corridor (SMZ)/local quarry materials	400,000 m^3
Concrete aggregates	Local quarry materials	300,000 m^3
Cement	From sources in Sydney, Newcastle or Brisbane.	200,000 t

Table 7-6 Estimated water sources and volumes required for construction

Activities and locations	Source	Estimated quantity
Manufacture of concrete	Potable water supply, groundwater	80 ML
Compaction of earthworks	Sediment basins, farm dams, creeks and/or groundwater	725 ML
Dust suppression	Sediment basins, farm dams, creeks and/or groundwater	320 ML
Vegetation water	Sediment basins, farm dams, creeks, groundwater and/or potable water supply	20 ML

Where possible, water used during construction would be sourced from sustainable sources. Construction water is generally sourced from local water resources, such as groundwater, streams and dams. Where local water or groundwater resources are utilised, any necessary licenses or agreements would be obtained. Water may be transported to where it is required on site via water carts, or stored on site in detention basins. Alternative water supply sources such as mobile desalination plants and other recycled water sources may also be used to supply some construction water. For worksites, potable water could be obtained from local authorities. Facilitates such as rainwater tanks would also be considered. The use of fit for purpose reclaimed (recycled) water from local wastewater treatments plants would be investigated for use during construction

Energy consumption and the associated greenhouse gas emissions anticipated during construction and operation are detailed in Chapter 19 –*Other environmental issues*.

7.3.6 Construction work hours

Construction would normally be limited to the following hours:

- Between 6am and 6pm Monday to Friday.
- Between 7am and 4pm Saturday.

There would be no works on Sundays or public holidays except:

a) Works that do not cause construction noise to be audible at any sensitive receivers.

b) For the delivery of materials required outside these hours by the Police or other authorities for safety reasons.

c) Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

d) Any other work as agreed through negotiations between the RTA and potentially affected sensitive receivers. Any such agreement must be recorded in writing and a copy kept on site for the duration of the works.

e) Where the work is identified in the Construction Noise and Vibration Management Plan (CNVMP) and approved as part of the Construction Environmental Management Plan (CEMP).

f) As agreed by the DECCW.

Local residents and the DECCW must be informed of the timing and duration of work approved under items (d) and (e) at least 48 hours before that work commences. Hours of work would be addressed in the CNVMP, which would be finalised in consultation with the Department of Planning and the DECCW.

7.3.7 Ancillary facilities

A number of ancillary facilities would need to be established during the construction period for the Proposal. These facilities would include construction site compounds, asphalt or concrete batching plants, lay-down areas and stockpile sites.

The locations of ancillary facilities must allow for efficient and cost-effective construction of the Proposal while minimising biophysical and social impacts. Preliminary potential locations for major work sites and ancillary construction facilities are described in Table 7-7 and shown in Figure 7-1. While it is unlikely that all of these locations would be used for construction facilities, a range of potential sites have been identified to provide flexibility for the final site selection. The criteria for the location of these ancillary facilities are described in Table 7-7.

Table 7-7 Location of potential ancillary facilities

Chainage[1]	Eastern/western side	Location
1800	Eastern side	North of Upper Warrell Creek and the North Coast Railway Line
2800	Western side	Between the North Coast Railway Line and Rosewood Road
4200	Western side	Albert Drive
5050	Eastern side	Albert Drive
7800	Western side	Bald Hill Road
9800	Eastern side	South of River Street
11150	Eastern side	North of existing Pacific Highway
11100	Western side	North of existing Pacific Highway
11900	Eastern side	Off Old Coast Road
21050	Eastern side	Nambucca Interchange
22200	Western side	Valla Road
26200	Western side	North of East West Road
29800	Split both sides	South of Ballads Road
30200	Split both sides	South of Ballads Road
35550	Eastern side	South of Kalang River
35600	Western side	South of Kalang River
35900	Eastern side	North of Kalang River
36700	Eastern side	North of Kalang River
40400	Western side	Adjacent to Raleigh Industrial Estate

[1] The potential ancillary facilities would be determined during the detailed design phase.

The final location of work sites would be determined during detailed design. The location for any ancillary facilities not identified in this environmental assessment would be located to take into account the criteria outlined in Table 7-8.

Table 7-8 Criteria for location of ancillary facilities

Location criteria	Compound site	Batching plant site	Stockpile site
Environmental			
More than 100 metres from SEPP 14 wetlands and 40m from waterways	Yes	Yes	Yes
In areas of low ecological and heritage conservation significance	Yes	Yes	Yes
In areas requiring no substantial clearance of vegetation	Yes	Yes	Yes
The distance from dwellings or other activities that may be affected by noise or other plant impacts	200 metres	200 metres	200 metres
Construction			
Easy and safe access to the main road network	Yes	Yes	Yes

Location criteria	Compound site	Batching plant site	Stockpile site
Electricity and phone services are available or able to be provided without additional environmental impacts (except for stockpiles)	Yes	Yes	No
A relatively level ground elevated to assist drainage and allow treatment of runoff	Yes	Yes	Yes
Easily accessible potable water supply or suitable dam (except for stockpiles)	Yes	Yes	No
Minimum area preferred	1 hectare	1 hectare	1 hectare

7.3.7.1 Compound sites

Construction compounds (major and minor) would be required for personnel, portable offices, vehicle parking areas, materials and plant. A number of construction compounds would be required for the Proposal.

Construction compounds could be co-located with, or separated from, the potential batching plant sites (see Section 7.3.7.2). Potential construction compounds would generally be located on:

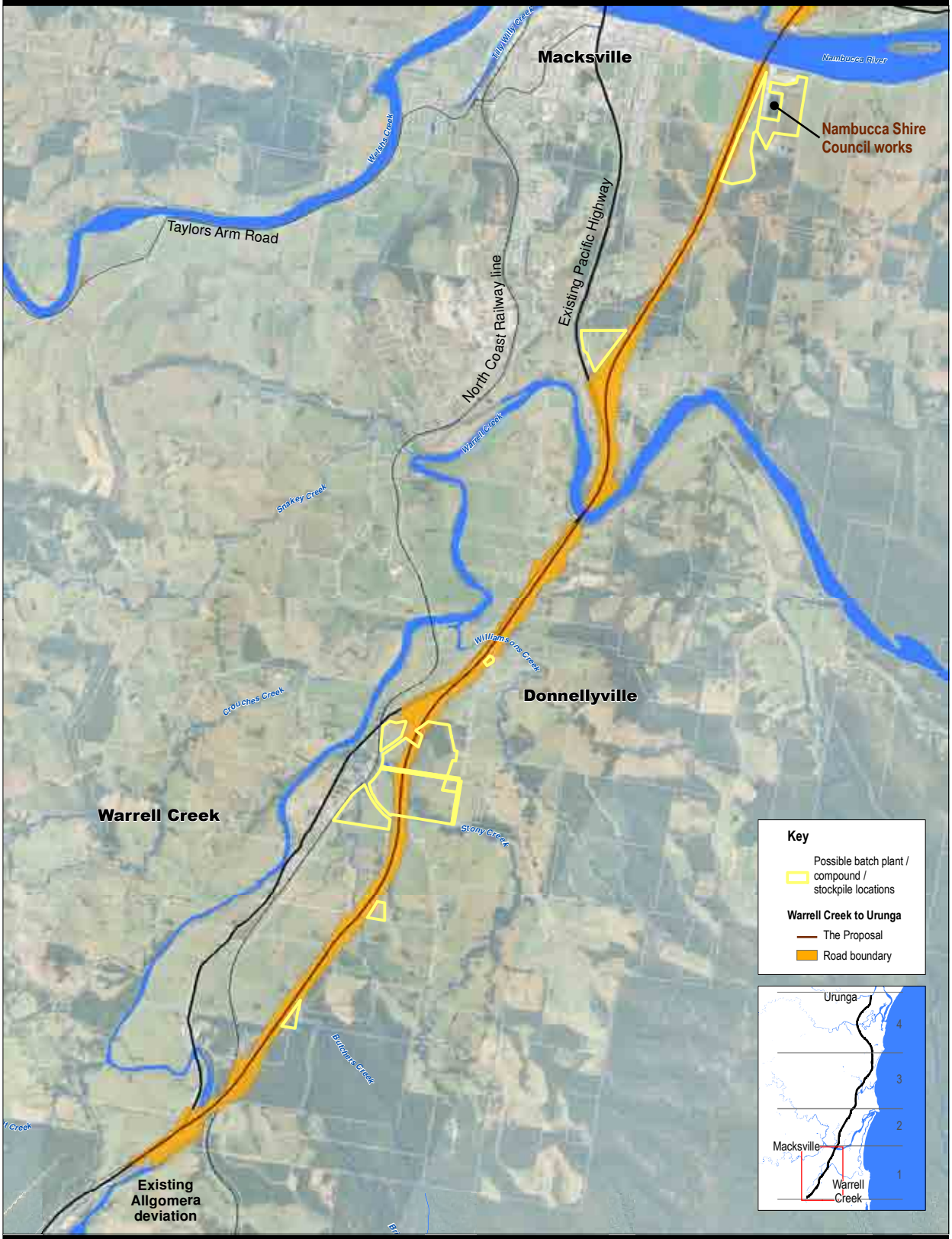
- Land owned by the RTA.
- Existing cleared areas or areas to be cleared for the Proposal.
- Available land within the road reserve.
- Leased cleared land on private property or within state forests.

7.3.7.2 Batching plants

As identified in Table 7-5, it is expected that more than 300,000 m^3 of concrete would be required for the Proposal (depending on the extent of precast materials used). It is likely that the construction contractor would establish a number of concrete batching plants on-site for bulk supply of concrete for major paving and other operations. The batching plants would also require temporary buildings for staff offices and other facilities.

The batching plant sites would result in considerable incoming and outgoing traffic movements and, as such, they can be noisy and create localised air quality impacts if stockpiles are not covered. Where possible, batching plants would be located away from sensitive residential receivers. If the Proposal is approved, the construction contractor would be required to identify specific management measures for batching plants within a CEMP and relevant sub-plans and consistent with the conditions of approval.

FIGURE 7-1a | LOCATION OF POSSIBLE CONSTRUCTION COMPOUNDS, BATCH PLANTS AND / OR STOCKPILE SITES SECTION 1 OF 4



Warrell Creek to Urunga - Upgrading the Pacific Highway

0 400 800 Metres

FIGURE 7-1b | LOCATION OF POSSIBLE CONSTRUCTION COMPOUNDS, BATCH PLANTS AND / OR STOCKPILE SITES SECTION 2 OF 4

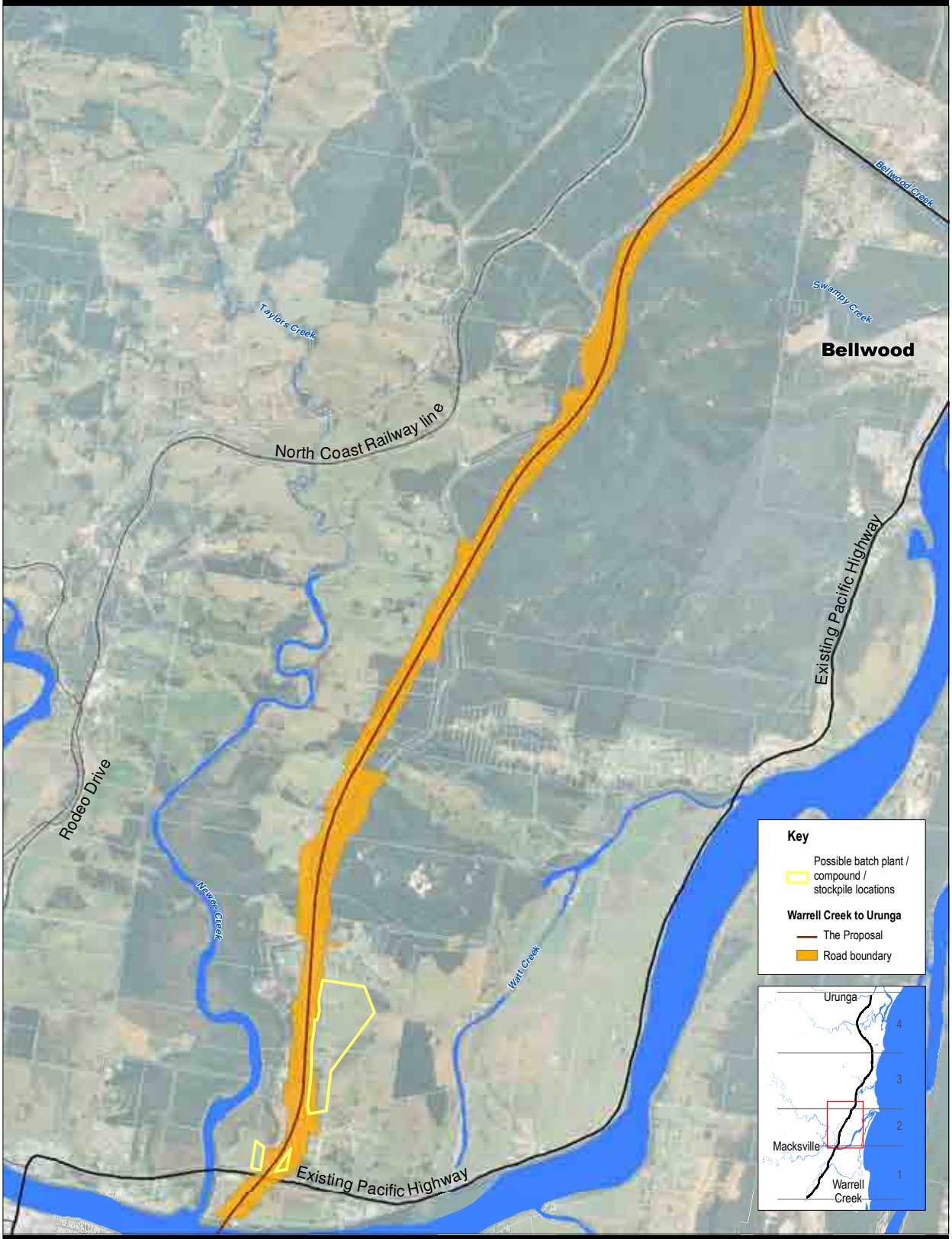
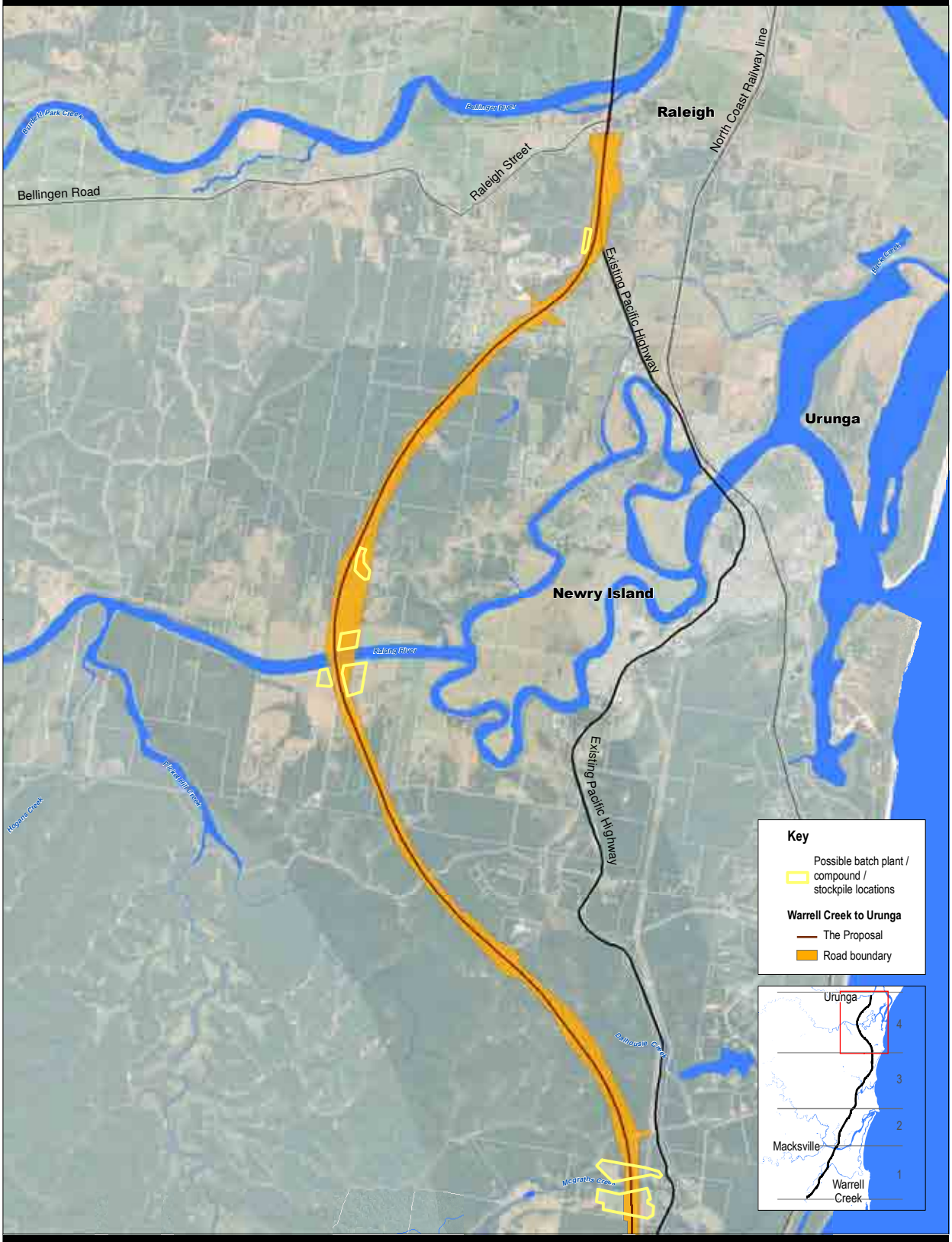


FIGURE 7-1c | LOCATION OF POSSIBLE CONSTRUCTION COMPOUNDS, BATCH PLANTS AND / OR STOCKPILE SITES SECTION 3 OF 4

FIGURE 7-1d | LOCATION OF POSSIBLE CONSTRUCTION COMPOUNDS, BATCH PLANTS AND / OR STOCKPILE SITES SECTION 4 OF 4



Warrell Creek to Urunga - Upgrading the Pacific Highway

7.3.7.3 Stockpile sites

A number of stockpile sites would be required along the Proposal. These would be used to store, prepare and distribute aggregate and other bulk materials such as topsoil, sands, pre-cast culverts, drainage pipes and drainage pits required for the construction.

Materials such as topsoil, mulched timber and any unsuitable cut material would need to be stockpiled during construction prior to being re-used in the final landscaping. The selection of these sites would be the responsibility of the successful contractor(s) and would need to comply with the relevant criteria detailed in Table 7-8.

7.3.7.4 Sediment basins

Sediment basins would be constructed along the route as shown in Figure 6-1 to Figure 6-4. Further details on the sizing of these basins, is included in Section 16.4.1.

7.3.7.5 Other ancillary facilities

Other ancillary facilities may be needed for specific activities such as surveying/ GPS towers and temporary haul roads to reduce haulage distances.