

Construction Flooding Management Plan
CHBPW-FGJV-NWW-EN-PLN-000004- Revision E - Coffs
Harbour Bypass

FERROVIAL GAMUDA JOINT VENTURE

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GLOSSARY/ABBREVIATIONS

Abbreviation	Expanded Text
BOM	Australian Government Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and Environment
DPE	Department of Planning and Environment
DPE, EESG	Department of Planning and Environment – Environment, Energy and Science Group
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPA	NSW Environment Protection Authority
EWMS	Environmental Work Method Statements
FGJV	Ferrovial Gamuda Joint Venture
CFMP	Flooding Management Plan
GREP	Government Resource Efficiency Policy
MCoA	Minister's Condition of Approval
NEPM	National Environment Protection Measures
POEO Act	Protection of the Environment Operations Act 1997
REMMs	Revised Environmental Management Measures
TfNSW	Transport for NSW

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1 INTRODUCTION

1.1 CONTEXT

This Construction Flooding Management Sub Plan (CFMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Coffs Harbour Bypass (the Project).

This CFMP has been prepared to provide a framework to facilitate effective management of flooding and flood prone areas¹ during construction in accordance with the requirements of the Minister's Conditions of Approval (MCoA), the Revised Environmental Management Measures (REMMs) listed in the Coffs Harbour Bypass Environmental Impact Statement (EIS) and all applicable legislation.

1.2 BACKGROUND

The Coffs Harbour Bypass EIS (Chapter 17) considered the potential flooding impacts during the construction of the Project. The background of the Project is described in Section 1 of the CEMP.

The Project includes the construction of a 14-kilometre bypass of Coffs Harbour, including a 12-kilometre new build 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 and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

1.3 ENVIRONMENTAL MANAGEMENT SYSTEMS OVERVIEW

The CEMP describes the overall system for environmental management and that system forms part of the environmental management framework of the Coffs Harbour Bypass Project. The environmental management system overview is described in Section 4 of the CEMP.

The CFMP has been developed as part of the CEMP in consultation with:

- NSW Department of Planning and Environment
- Environment, Energy and Science Group of the Department of Planning, Industry and Environment
- Coffs Harbour Council

The relevant CFMP environmental control measures will be incorporated in detailed location or activity-specific Environmental Work Method Statements (EWMS) prepared and implemented for all high-risk construction activities that have the potential to impact on flooding. The EWMS will detail measures to avoid flooding impacts during construction activities. EWMS will be developed in accordance with Section 4.1.5 of the CEMP.

The review and document control processes for this Plan are described in Section 8 of the CFMP and further detail included in Section 9 of CEMP.

¹ For the purpose of this document, 'flood prone area' is taken to be the inundation area during a 1 in 20-year flood level or a 5% Annual Recurring Event. The footprint of this area is shown in Appendix A.

2 PURPOSE AND OBJECTIVES

2.1 PURPOSE

The purpose of this Plan is to describe how flooding impacts will be managed to reduce potential impacts to sensitive receivers during construction of the Project.

2.2 OBJECTIVES

The key objectives of the CFMP are to ensure all Project approval requirements, environmental management measures and licence requirements relevant to flooding are described, scheduled and assigned responsibility as outlined in:

- The Environmental Impact Statement, Submissions and Amendment Reports prepared for the CHB Project
- Ministers Conditions of Approval
- Transport for NSW (TfNSW) Specifications G36 and G38

To achieve compliance with the conditions and objectives of the Project documents above, the Ferrovial Gamuda Joint Venture (FGJV) will undertake the following:

- Ensure appropriate measures are implemented to address the relevant MCoA outlined in Table 3 and the safeguards detailed in the Submissions Report REMMs in Table 4.
- Ensure best management practice controls and procedures are documented, communicated and implemented during construction activities to avoid or minimise flooding impacts to sensitive receivers along the Project corridor.

2.3 TARGETS

The following targets have been established for the management of flooding impacts during the Project:

- Ensure full compliance with the relevant legislative requirements, MCoA and environmental management measures
- Ensure training on best practice flooding management is provided to all construction personnel through project and site-specific inductions

2.4 ENVIRONMENTAL PERFORMANCE OUTCOMES

Table 1 lists how each performance outcome will be achieved by the Project in relation to the Flood Management Plan, as taken from the EIS.

TABLE 1 PERFORMANCE OUTCOMES

Desired performance outcome	Project Outcome	Where addressed
<i>The project minimises adverse impacts on existing flooding characteristics.</i>	Flooding associated impacts during construction are minimised and/or managed through the implementation of the Construction Flood Management Plan	This plan
<i>Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards or dam failure.</i>	The project reduces flood extents and peak water levels downstream of the project in accordance with the floodplain management objectives.	Section 6.1

3 ENVIRONMENTAL REQUIREMENTS

This section describes the legislative, regulatory and guidance framework that applies to the Project.

3.1 RELEVANT LEGISLATION AND GUIDELINES

3.1.1 LEGISLATION

Table 2 lists the principal legislation and regulation that applies to flooding management.

TABLE 2 PRINCIPAL LEGISLATION AND GUIDELINES

Legislation and Regulation	Relevance
Commonwealth	
<i>Environment Protection Biodiversity Conservation Act, 1999 (EPBC Act) (Commonwealth)</i>	Provides for the protection of matters of national environmental significance including species, populations, communities and their habitat that could be impacted by contamination or pollution
<i>Environment Protection and Biodiversity Conservation Regulation 2000 (as amended).</i>	Provides for the protection of world heritage sites (including the Gondwana Rainforests) and wetlands of international importance (i.e. Ramsar sites).
<i>National Environmental Protection Council Act 1994</i>	Establishes the National Environmental Protection Council (NEPC) and the concept of National Environmental Protection Measures (NEPMs)
State	
<i>Environmental Planning and Assessment Act 1979 (EP&A Act).</i>	Describes the processes for consenting development in NSW, managing land use and implementing environmental planning instruments. Also describes certain permitting and licencing streaming and exclusion provisions that will apply to the Project
<i>State Emergency and Rescue Management Act 1989</i>	This act creates provisions for dealing with the management of state emergencies and rescues.
<i>State Emergency Service Act 1989</i>	Establishes the State Emergency Service and define its functions; to make provision for the handling of certain emergencies/

3.1.2 GUIDELINES

The main guidelines, specifications and policy documents relevant to this plan include:

- TfNSW QA Specification G36 – Environmental Protection (Management System)
- TfNSW QA Specification G38 – Soil and Water Management
- NSW Government’s Floodplain Development Manual (DIPNR, 2005) includes details of changes to local drainage and the potential to affect flooding behaviour.

3.2 MINISTER’S CONDITIONS OF APPROVAL

The MCoA relevant to this Plan are listed in Table 3 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

TABLE 3 CONDITIONS OF APPROVAL RELEVANT TO THE CFMP

CoA No.	Condition Requirements	Document Reference
C4	The CEMP Sub-plans in Table 3 must be prepared in consultation with the government agencies identified for each CEMP Sub-plan. The outcomes of consultation with government agencies in accordance with Condition A5 must be provided with the relevant CEMP Sub-Plan.	This Plan. Consultation records to be provided to DPE with CEMP and Sub-Plan submissions
	(c) Flooding	
	Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan
	(c) Flooding	EESG, Council
C5	The CEMP Sub-plans must state how: (a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved; (b) the mitigation measures identified in the documents listed in Condition A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	This Plan
C6	Any of the CEMP Sub-plans may be submitted along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before construction.	Noted
C8	The Flood Management Sub-Plan must include: (a) measures to minimise the loss of material during storm/flood events where the stockpiling of material within the floodplain cannot be avoided;	Section 6.4 Section 7 Appendix C
	(b) protocols to relocate site materials and machinery when a storm/flood event warning forecast has been issued by the Bureau of Meteorology (BOM);	Appendix C
	(c) procedures for safe site evacuation of staff, construction personnel and visitors; and	Appendix C
	(d) the induction of all staff, construction personnel and visitors on the project's storm/flood event emergency response procedures.	Section 8.2
C12	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary, including any minor amendments approved by the ER must be implemented for the duration of construction. Where construction of the CSSI is staged, construction of a stage must not commence until the CEMP and sub-plans for that stage have been approved by the Planning Secretary.	Document control and approvals detailed in CFMP version control table
E18	The CSSI must be designed so that the floodplain management objectives in Table 6 of Appendix H - Updated flooding and hydrology assessment of the Amendment Report are not exceeded, unless otherwise agreed by the Planning Secretary, for events up to the 1% AEP.	Section 6.1
E19	For areas outside the project boundary, the following flood afflux objectives must not be exceeded, unless otherwise agreed by the Planning Secretary, for events up to the 1% AEP: (a) Less than 10 mm for residential, commercial and industrial areas, and buildings affected by existing Finished Floor Level inundation;	Section 6.1

CoA No.	Condition Requirements	Document Reference
	(b) Less than 50 mm for agricultural land; and (c) Less than 250 mm pastoral, forest and recreational areas.	
E20	Flood information prepared for the project, including flood reports, models and geographic information system outputs, and work as executed information certifying finished ground levels and the dimensions and finished levels of all structures within the flood prone land, must be provided to the Council, EESG and NSW State Emergency Services (SES) in order to assist in preparing relevant documents and to reflect changes in flood behaviour as a result of the CSSI. The Council, EESG and SES must be notified in writing that the information is available no later than one month following the completion of construction. Information requested by the Council, EESG or SES must be provided no later than six months following the completion of construction or within another timeframe agreed with the Council, EESG and SES.	Section 6.1 Section 8.7
E21	Where the CSSI changes the design or function of Spagnolos Basin and Bennetts Road Basin, an updated Dam Safety Management Plan(s) must be prepared and provided to Council prior to construction commencing.	Section 8.7

3.3 REVISED ENVIRONMENTAL MANAGEMENT MEASURES

Relevant Revised EMMs are listed in Table 4 below. This includes references to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

TABLE 4 REVISED ENVIRONMENTAL MANAGEMENT MEASURES RELEVANT TO THIS CFMP

Ref#	Commitment	CFMP Reference
FH01	A Construction Flood Management Plan will be prepared and implemented before construction to manage the impact of a 5% AEP flood event or greater on the operation of ancillary facilities. The plan will form part of the CEMP and will detail:	This Plan
	<ul style="list-style-type: none"> The impacts on hydrology and flooding from the construction phase 	Section 5
	<ul style="list-style-type: none"> Control measures and procedures for construction activities to avoid, minimise or manage potential adverse impacts to construction works in the event of a flood within or adjacent to the Project 	Section 7
	<ul style="list-style-type: none"> Management responses for ancillary sites provided in Table 17-5 of the EIS and Table 5.10-2 of the Amendment Report 	Section 8.1
	<ul style="list-style-type: none"> Flood monitoring to forecast large rainfall and flood events and notification measures 	Section 8.4
	<ul style="list-style-type: none"> Emergency response and evacuation procedures in the event of a flood during the construction phase 	Appendix C
	<ul style="list-style-type: none"> Suitable evacuation routes and procedures for evacuation of site personnel 	Appendix C
	<ul style="list-style-type: none"> A register of all materials stored in work areas prone to flooding 	Appendix D
	<ul style="list-style-type: none"> Control measures for stockpiling within the floodplain to minimise loss of material in flood events. 	Section 7 Appendix C
	<ul style="list-style-type: none"> Protocols for equipment and materials that can be removed from the subject area during a flood event where reasonable and feasible 	Appendix C
FH02	<ul style="list-style-type: none"> Consultation and coordination with local residents, CHCC and other relevant stakeholders 	Section 6.2 Appendix C
	<ul style="list-style-type: none"> Induction of all construction site staff and visitors to familiarise with the emergency response procedures. 	Section 8.2
FH02	If the detailed construction plan requires staging of additional earthworks within floodplain(s) crossed by the Project, revised flood modelling will be carried out as part of the detailed design to determine the potential for changed flooding impacts and any required mitigation and/or management response.	Section 6.1

Ref#	Commitment	CFMP Reference
FH03	<p>Temporary waterway crossings will be designed, constructed and maintained in accordance with the following requirements:</p> <ul style="list-style-type: none"> • Low-flow conditions will be maintained • No additional flooding impacts will occur greater than those assessed for the operational phase • Fish passage will be maintained in accordance with the relevant waterway classification and DPI guideline, Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003) • Material used in temporary waterway crossings will 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 will be removed following construction and the site rehabilitated to its existing condition where reasonable and feasible. <p>The above requirements will be supplemented by learnings from the Woolgoolga to Ballina Pacific Highway upgrade Project, specifically the requirements of the Technical Briefing Note: Temporary Waterway Crossings Minimum Standards (Pacific Complete 2017) developed in consultation with EPA and other relevant government agencies.</p>	Section 6.3
FH04	<p>Creek realignments and/or adjustments 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 (DPI 2013). Revegetation and adequate scour protection will be provided so there are no hydraulic impacts on bed and bank stability, erosion, sedimentation or riparian vegetation in accordance with the Controlled Activities for Works on Waterfront Land – In-stream Works (DPI 2012c).</p> <p>Detailed design of waterway realignments and adjustments will be developed in consultation with Regions, Industry, Agriculture and Resources, DPE and will consider:</p> <ul style="list-style-type: none"> • 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 Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003). 	Section 6.3
FH07	<p>NSW State Emergency Services will be notified of any partial or total road closures during construction because of the Project. The CFMP should detail any impacts on existing flood conditions in relation to flood evacuation routes.</p>	Section 6.2 Section 6.5 Appendix C Appendix E
FH08	<p>A whole of government approach will be investigated with CHCC which considers the relationship between the Project and North Boambee Valley (West) Urban Release Area and what reasonable and feasible options could be implemented to assist in managing potential flood impacts.</p>	Section 6.1
FH09	<p>Proposed mitigation measures for the North Boambee Valley catchment as described in Table 17 of Appendix H, Updated flooding and hydrology assessment of the Amendment Report. The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, Environment, Energy and Science Group, DPE and adjacent property owners.</p>	Section 6.1
FH10	<p>Proposed mitigation measures for the Coffs Creek catchment as described in Table 20 of Appendix H, Updated flooding and hydrology assessment of the Amendment Report will be investigated during detailed design. The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, Environment, Energy and Science Group, DPE and adjacent property owners.</p>	Section 6.1

Ref#	Commitment	CFMP Reference
FH11	Proposed mitigation measures for the Northern creeks catchment as described in Table 23 of Appendix H, Updated flooding and hydrology assessment of the Amendment Report will be investigated during detailed design. The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, Environment, Energy and Science Group, DPE and adjacent property owners.	Section 6.1

4 EXISTING ENVIRONMENT

The following sections summarise what is known about factors influencing flooding impacts and management associated with the Project, within and adjacent to the Project corridor.

The key reference document is Chapter 17 of the EIS.

4.1 DRAINAGE FEATURES AND CATCHMENTS

Key drainage features of the study area are two topographic zones; a hillside zone (areas above the 50m contour) and the lowland area (areas below 50m contour). The hillside zone comprises steep slopes and ridges which rise to about 150-250m AHD. Major ridge lines Project from the Great Dividing Range such as the prominent ridge to the south of Coramba that ends at Roberts Hill. Numerous drainage channels that typically flow east to the lowland area, incise the hillside area. Most of the steep slopes and ridges are either forested or used for banana cultivation.

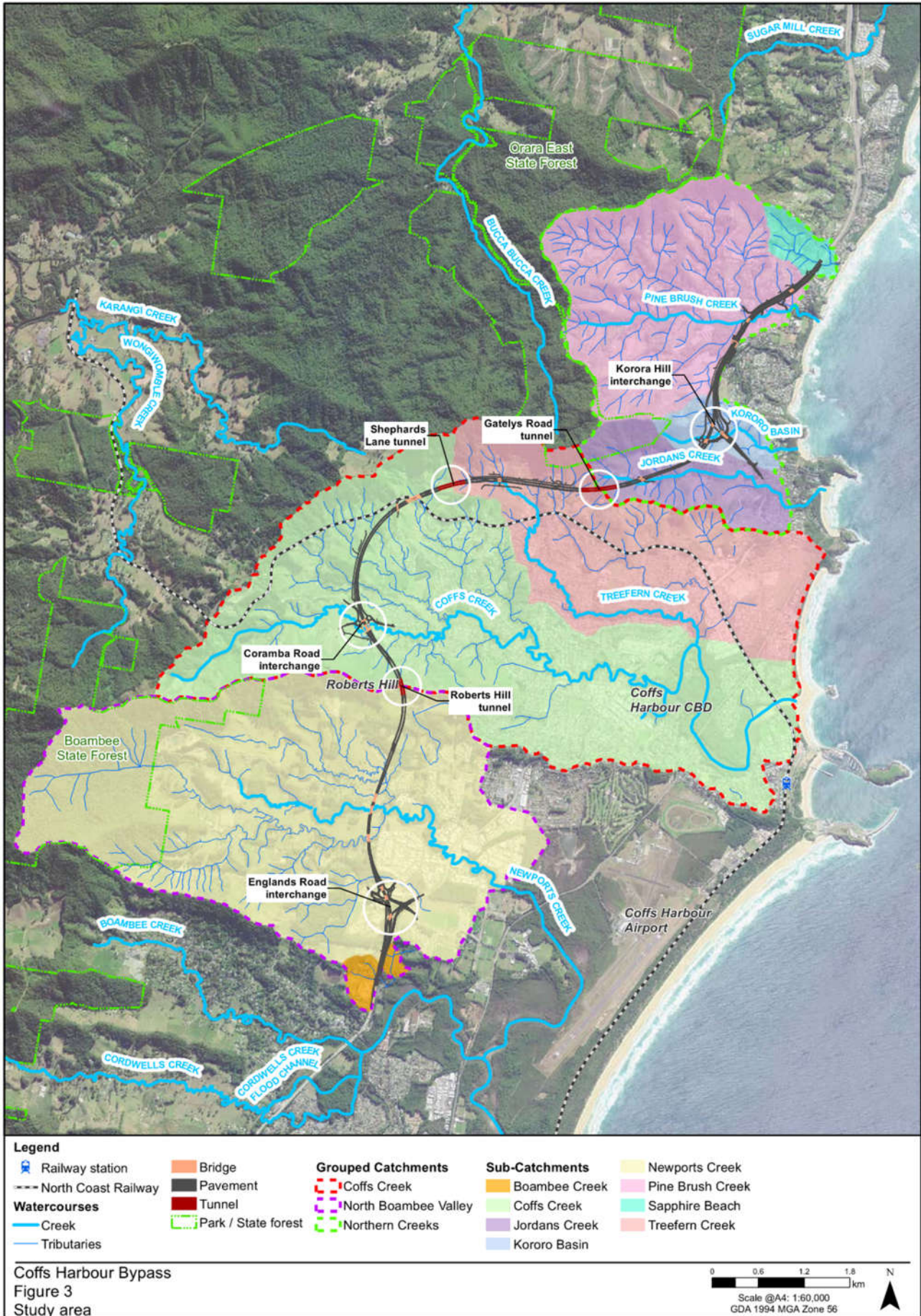
The lowland area is characterised by low undulating residual hills with gentle gradients and alluvial floodplains including backswamps and dunes.

The Project covers several catchments which largely drain from the western ridges of the Great Dividing Range towards the Pacific Ocean, as illustrated in Figure 4-1.

The catchments have been grouped by locality and relate to the creeks and watercourses to which they drain. They also relate to catchments as they are defined within existing flood models. The Project catchments as listed below are referred to throughout this Plan as, North Boambee Valley, Coffs Creek and northern creeks. The primary waterways within each catchment are:

- North Boambee Valley:
 - Tributary of Boambee Creek
 - Newports Creek
- Coffs Creek:
 - Coffs Creek
 - Treefern Creek
- Northern creeks:
 - Jordans Creek
 - Kororo Basin – Kororo Basin is a catchment located south east of the Pine Brush Creek, it is not related to the Korora, which is located in the upper catchment area of Pine Brush Creek
 - Pine Brush Creek
 - Sapphire Beach – this relates to an unnamed waterway at this location.

FIGURE 4-1: DRAINAGE FEATURES AND CATCHMENTS (SOURCE: EIS FIGURE 17-1)



4.2 HISTORIC FLOODS AND FLOOD PROTECTION

Coffs Harbour has a history of substantial flooding events since 1917, with two of these being declared natural disasters (CHCC 2018a). Of these, the 1996 and March/April 2009 flood events were by far the largest and Coffs Harbour was declared a natural disaster zone following these events.

Detention basins have been constructed in the Coffs Harbour LGA to mitigate the risk to the community in extreme flood events, including:

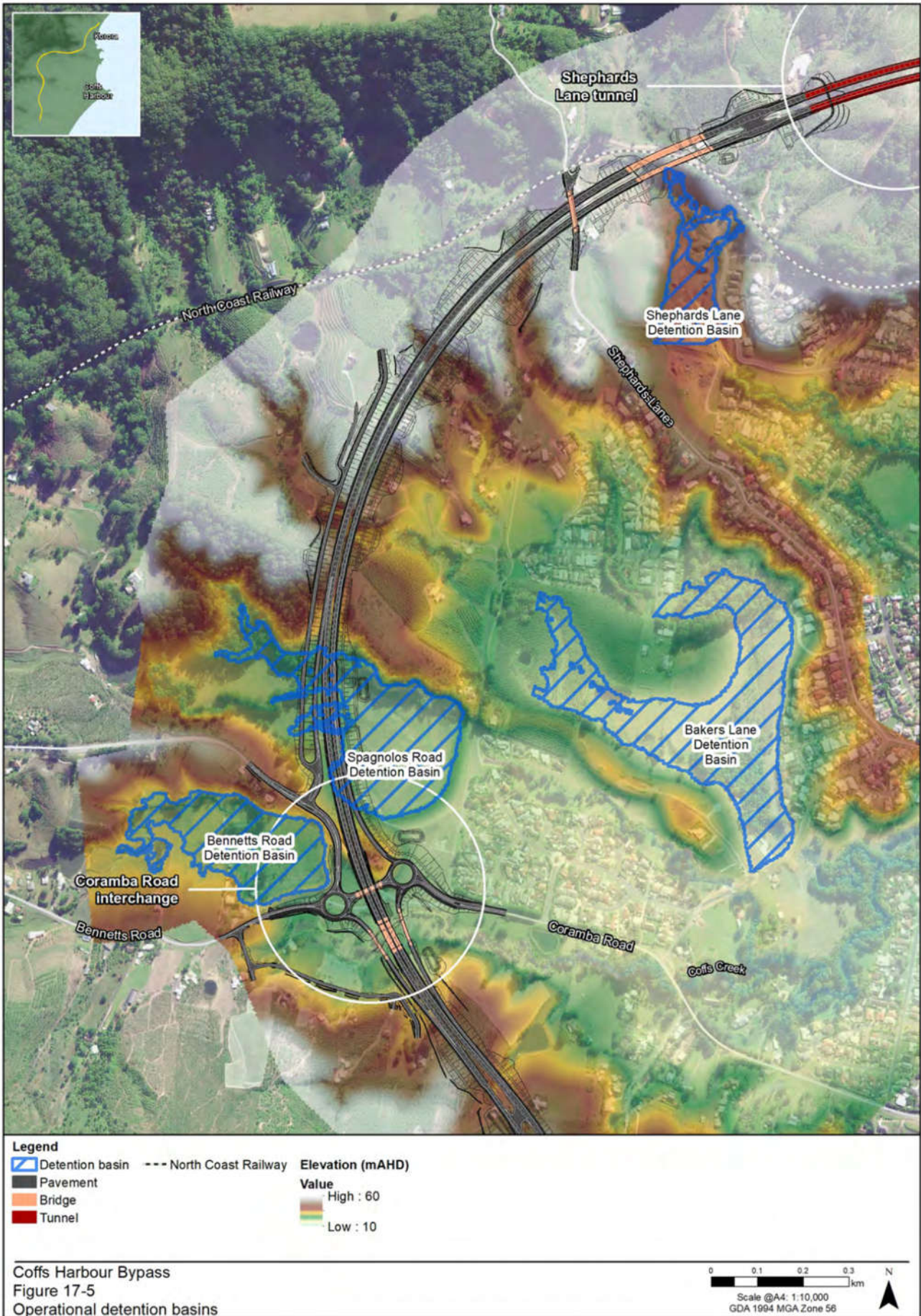
- A basin near Goodenough Terrace in the upper tributaries of Coffs Creek
- A basin next to Isles Drive in North Boambee Valley (Webb, Mckeown & Associates Pty Ltd. 2007)
- Several small basins located in the upper regions of the Coffs Harbour LGA. These are assumed to be at full capacity already as a conservative measure and only for agricultural use.

Additionally, four detention basins were designed as part of the CHCC Flood Mitigation Programme (CHCC 2018a) to provide flood protection for a 1 per cent AEP event. These basins were designed to alleviate the downstream flooding in the Coffs Creek catchment.

- Bakers Road detention basin at William Sharpe Drive, West Coffs Harbour
- Bennetts Road detention basin
- Spagnolos Road detention basin
- Shephards Lane detention basin.

The four detention basins were constructed and are fully operational. The Project would affect the Bennetts Road and Spagnolos Road detention basins at the Coramba Road interchange as illustrated in below Figure 4-2. The Shephards Lane detention basin is potentially affected by the bridge over the North Coast Railway (BR12) and the Bakers Lane detention basin is downstream of the Project.

FIGURE 4-2: DETENTION BASINS (SOURCE: EIS FIGURE 17-5)



5 ENVIRONMENTAL ASPECTS AND IMPACTS

5.1 CONSTRUCTION ACTIVITIES

Project construction activities have the potential to result in altered surface water flow conditions where the landscape is modified by:

- Construction of ancillary facilities, including:
 - Stockpiling of material onsite including; spoil, topsoil, mulch
 - Storage of plant, equipment
- Earthworks for the Project, including construction of road embankments and foundation drainage
- Alterations to catchment drainage
- Construction of temporary waterway crossings

Refer also to the Aspects and Impacts Register as part of the CEMP. The construction of new developments increases the amount of hardstand and will affect hydraulic runoff which may change the intensity of the flows and alter flow paths.

Flooding can be managed provided that effective management, mitigation and monitoring measures are in place, any effects would be temporary and relatively short-lived, and subject to at-source mitigation measures and proactive management measures to reduce impacts to sensitive receivers.

5.2 IMPACTS

Potential impacts due to flooding include:

- Partial or full blockage of key flow paths by embankments, stockpiles etc., causing increased flood in upstream areas.
- Increases in the rate of flow in the receiving drainage lines could result in scour and channel erosion, as well as a possible widening of the watercourse through a process of bank erosion
- Potential to impact emergency response and evacuation routes during flood events because of changed road conditions and or total road closures needed for the construction of the Project
- Increases in the rate of flow in the receiving drainage lines could result in scour and channel erosion, as well as a possible widening of the watercourse through a process of bank erosion
- Partial blockage of transverse drainage by debris could result in floodwater surcharging onto the road during storms with ARI's less than 100 year ARI
- Surface water contamination if chemical storage areas are breached and hazardous chemicals migrate offsite
- Restricted access to ancillary construction areas and construction areas
- Safety risks associated with high flow velocities and/or deep water, constituting a hazard to personnel and equipment
- Inundation and damage to construction plant and equipment
- Increased runoff and sedimentation, especially if ERSSED controls are damaged

Some impacts on flooding attributable to the Project are anticipated and have been described in the EIS. Section 6 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

6 FLOOD MANAGEMENT

6.1 FLOOD MANAGEMENT IN DESIGN

There are a number of CoA and REMMs that are to be managed as part of the Project detailed design preparation and review process, as identified in Section 3. These will be documented as part of the Design Packages for relevant packages, and will be subject to a design review process, including a review on compliance with relevant Project requirements.

REMM FH08 requires a whole of government approach will be investigated with CHCC which considers the relationship between the Project and North Boambee Valley (West) Urban Release Area and what reasonable and feasible options could be implemented to assist in managing potential flood impacts. This consultation will be led by Transport for New South Wales.

6.2 COMMUNICATION

Internal and external communication mechanisms are described in Section 6 of the CEMP.

FGJV has developed a Community Stakeholder Engagement Management Plan (CSMP) that meets the requirements of the Project CoA. This plan builds on the Community Communication Strategy, prepared by TfNSW, and approved by the Planning Secretary during the development of the Project, with a focus on construction activities. Any standard (i.e. non-emergency) communications with the community will be undertaken in accordance with this document.

The Project will be managed under an Environmental Protection License (EPL), which requires the preparation of a Pollution Incident Response Management Plan (PIRMP). In accordance with the NSW Environmental Protection Agency PIRMP Guideline, the PIRMP will include content on:

- procedures for contacting the relevant authorities including the EPA, the local council, NSW Health, SafeWork NSW, Fire and Rescue NSW and their contact details;
- procedures for contacting the owners or occupiers of premises in the vicinity;
- the procedures for communicating with the community;
- mechanisms for providing early warnings and regular updates to premises in the vicinity; and
- an inventory of potential pollutants on the premises or used in carrying out the relevant activity.

In the case of actual or risk of environmental impact from the Project as a result of flooding, communication will be undertaken in accordance with the PIRMP.

Consultation and coordination with local residents, CHCC and other relevant stakeholders, including the SES, in the case of flooding is described in Appendix C and will be further detailed in the Project safety documentation.

Additionally, SES will be notified of:

- Any partial or total road closures required during construction of the Project or of
- Any impacts to flood evacuation routes as a result of the Project (refer to Section 6.5)

6.3 TEMPORARY WATERWAY CROSSINGS AND DIVERSIONS

Temporary crossings may be required to cross Newports Creek, Coffs Creek, Treefern Creek, Jordans Creek, Pine Brush Creek and other small unnamed drainage lines and watercourses to enable materials to be hauled within the construction footprint. These have the potential to impact on the hydraulic function of the waterway, aquatic environment and bank stability, causing water levels to rise upstream of the crossing during a flood event.

All temporary waterway crossings and diversions will be designed by an environmental practitioner who holds qualification under the Certified Professional in Erosion and Sediment Control (CPESC) scheme, in accordance with the following requirements.

Temporary waterway crossings:

- Low-flow conditions will be maintained

- No additional flooding impacts will occur greater than those assessed for the operational phase
- Fish passage will be maintained in accordance with the relevant waterway classification and DPI guideline, Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003)
- Material used in temporary waterway crossings will 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 will be removed following construction and the site rehabilitated to its existing condition where reasonable and feasible.

The above requirements will be supplemented by learnings from the Woolgoolga to Ballina Pacific Highway upgrade Project, specifically the requirements of the Technical Briefing Note: Temporary Waterway Crossings Minimum Standards (Pacific Complete 2017) developed in consultation with EPA and other relevant government agencies.

Creek realignments and/or adjustments

- 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 (DPI 2013).
- Revegetation and adequate scour protection will be provided so there are no hydraulic impacts on bed and bank stability, erosion, sedimentation or riparian vegetation in accordance with the Controlled Activities for Works on Waterfront Land – In-stream Works (DPI 2012c).
- Detailed design of waterway realignments and adjustments will be developed in consultation with Regions, Industry, Agriculture and Resources, DPE 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 Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003).

Additional considerations will be given to the following mitigation requirements:

- Affected waterway crossings are to be constructed so that natural flow conditions are maintained as much as possible and carried out in accordance with environmental and fish conservation requirements.
- Existing waterway areas are to be maintained as much as possible to minimise potential flood impact during construction.
- Flood modelling may be required to determine the extent of flood impacts and to aid in the appropriate sizing and location of temporary culverts or structures.
- Realigned channels are to be constructed offline and generally remain free of external flows to allow adequate establishment of vegetation, prior to initiation of the ultimate waterway arrangement
- Temporary haul road crossing structures may also be required in areas of overland flows and are to be constructed such that low and high flows are maintained and fine sediment materials are avoided or contained within the haul road formation.
- Following construction completion, affected waterway crossing areas are to be rehabilitated to existing (or improved) conditions.

Additional information on temporary waterway crossings and diversions can be found in the Project Soil and Water Management Plan.

6.4 ANCILLARY FACILITIES

Several ancillary sites have been identified to facilitate construction of the Project. These sites may be used for various construction activities and may include, site compounds, the stockpiling or laydown of materials, crushing and screening facilities, concrete batching plants, haul roads to and from the main construction works, temporary access roads to and from the ancillary sites and the storage of plant.

The Project Submission Report included an assessment of potential ancillary facilities located within the 5 per cent AEP flood extent, which have a higher risk of potential flood impacts, which includes twelve of the 17 potential sites for ancillary. The flood extents and ancillary facilities are shown in Appendix B.

Further flood modelling assessments of potential flood impacts of the construction ancillary sites will be carried out during detailed design to inform the appropriate uses within these facilities. Where modelling confirms risk of flooding, the ancillary facility must be designed with the intent of minimising potential flood impacts, including the following site-specific considerations as listed in the Amendment Report and provided in Table 5.

TABLE 5 ANCILLARY FACILITY FLOOD MANAGEMENT MEASURES

Site ID	Flood Risk and Potential Impact	Management Measure
1C	The northern portion of this site (0.2 ha / 15% of the total site area) is part of the Newports Creek floodplain. It is within the 5% AEP flood extent and is at risk of frequent (18% AEP) high flood depths and velocities. Isles Drive industrial area and the existing Pacific Highway (providing access to the Coffs Harbour Health Campus) are downstream of this site. Locating site compounds or other facilities within the flood-prone portion of this site could cause higher risk of impacts to Englands Roads, Isles Drive and nearby industrial lots.	Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.
1D	The northern portion of this site is part of the Newports Creek floodplain, is within the 5% AEP flood extent and at risk of frequent (18% AEP) high flood depths and velocities. Because Isles Drive industrial area is affected in the PMF event and is immediately downstream of this site, locating site compounds or other facilities within the flood-prone portion of this site could cause higher risk of impacts to nearby industrial lots in the PMF event.	Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.
1G	This area is predominately flood immune apart from small areas at the north east corner and along the southern boundary which are part of the Newports Creek floodplain. Locating ancillary facilities in areas affected by flooding may result in redirection of flows and cause previously flood free areas to be inundated. As the site is in the upper reaches of the catchment, potential impacts on flooding are expected to be minimal.	Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site. Conveyance of the existing small tributary within the site and its associated flows should be maintained. The site access road is at risk of inundation from flooding, which will make the site inaccessible during flood periods. The use of flood depth gauge boards along the site access road will be implemented guide appropriate road use.
2A	This site is flood immune in the 1% AEP event and is subject to flooding during a PMF event. Use of this area for ancillary facilities has a relative low flood risk.	Not required.
2C	This area is predominately flood immune apart from a tributary which originates in the site. The redirection of this tributary and its flows may cause previously flood free areas to be impacted, however, because the site is in the upper reaches of the catchment, potential impacts on flooding and hydrology are expected to be minimal.	Conveyance of the existing small tributary within the site and its associated flows should be maintained.
2D	An existing farm dam upstream of the site controls inundation of this area and the site is impacted by the 5% AEP flood event. Ancillary facilities may result in redirection of flows and may cause previously flood free areas to be impacted, however, because the site is in the upper reaches of the catchment, potential impacts on flooding and hydrology are expected to be minimal.	Inspection of the existing condition of the dam before construction activities. Inspection of the dam should also be carried out, after storm events during construction. Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.

Site ID	Flood Risk and Potential Impact	Management Measure
2E	The southern portion of this site is in the upper reaches of Treefern Creek and is impacted in a 5% AEP flood event. Locating ancillary facilities in areas affected by flooding may result in redirection of flows and cause previously flood free areas to be inundated. As the site is in the upper reaches of the catchment, potential impacts on flooding are expected to be minimal. Because of the proximity of residences to the flood extents downstream of the rail line, locating ancillary facilities within the areas of flood risk could cause higher risk of impacts to downstream properties and the rail line.	Conveyance of existing small tributary within the site and its associated flows should be maintained. Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.
2G	Most of this site is within the 5% AEP flood extents and is at risk of frequent (18% AEP) high flood depths and velocities. Locating ancillary facilities within the area of frequent flooding may result in redirection of flows and result in flood impact to surrounding agricultural land and the residential property nearby.	Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.
3A	The south eastern part of this site (1.5 ha / 17% of the total site area) is within the 5% AEP flood extent and is at risk of frequent (18% AEP) high flood depths and velocities. Locating ancillary facilities within the floodprone portion of this site may result in flood impacts to surrounding areas (i.e. the Banana Coast Caravan Park) and cause previously flood free areas to be inundated.	Site compounds, stockpiling and plant machinery should be placed outside of the flood-prone portion of the site.
3D	This area is predominately flood immune apart from three flow paths which pass through the site in all events. Redirection of these flows may cause previously flood free areas to be impacted, however, because the site is in the upper reaches of the catchment, potential impacts on flooding are expected to be minimal.	Conveyance of existing small tributaries within the site and its associated flows should be maintained.
3E	Most of the site is within the 5% AEP flood extent and is at risk of frequent (18% AEP) high flood depths and velocities. Consequence of inundation is high because of the relative proximity of properties.	Site compounds, stockpiling and plant machinery should be placed outside of the flood hazard area. Use of this site should be limited to outside of the 1% AEP flood affected area due to the risk of frequent high flood depths and velocities.
3F	This site is flood immune in the 1% AEP event and is subject to flooding during a PMF event (in the existing case). With the project in place, approximately 20% of the site would experience shallow inundation in a 1% AEP event. Use of this area for ancillary facilities has a relative low flood risk and the consequence of inundation is low because surrounding areas are predominantly recreational land.	Management of the site uses outside of the PMF event are not required because of the low probability of flooding. As the construction phase progresses, consideration of changes to the flood risk need to be carried out.
3G	Most of this site is flood free apart from an area along the southern boundary which is at risk of frequent (18% AEP) high flood depths and velocities. Locating ancillary facilities in areas affected by flooding may result in redirection of flows and cause previously flood free areas to be inundated, potentially impacting nearby residences.	Site compounds, stockpiling and plant machinery should be placed outside of the flood hazard area. Conveyance of existing stream should be maintained.

6.5 FLOOD EVACUATION ROUTES

Flood evacuation routes were identified as part of flood mapping included in the EIS (EIS Volume 9, Appendix O - Hydrology and Flooding), which reflects the figures in the SES document Coffs Harbour Local Flood Plan (2017). For consistency with the consideration of 'Flood Prone Areas' the 1 in 20 year flood extent has been included as Appendix E.

This assessment of flood changes caused by construction on existing evacuation routes shows some potential flooding of the identified evacuation route at MacKays Road near the Masonic Village, of about 10 centimetres, with deeper flooding within Treefern Bridge, which is accessible via bridge and not likely to be affected to a notably greater depth than the surrounding adjacent flood plain.

This potential impact will be communicated to SES as required by the Project approval. Further, ongoing consultation will occur with the SES during construction of the Project, to ensure impacts are communicated and alternative routes identified as required.

Any revisions to flood modelling during detailed design will be used to update the Flood Management Plan and reassess impacts (if any) on current flood evacuation routes at that time. This revision will occur either at the completion of revised modelling, and/or as part of the management review of the CEMP, and/or as triggered by changes to the flood evacuation routes communicated by SES.

7 ENVIRONMENTAL MITIGATION AND MANAGEMENT MEASURES

Specific measures and requirements to meet the objectives of this CFMP and to address impacts on flooding are outlined in Table 6.

TABLE 6 FLOODING MANAGEMENT AND MITIGATION MEASURES

ID	Measure/Requirement	Timing	Responsibility	Reference
F01	Training will be provided to all Project personnel, including relevant sub-contractors on flooding and emergency response procedure and the requirements from this plan through inductions, toolboxes and targeted training.	Prior to and during construction	All Project personnel	REMM FH01, good practice
F02	Flooding control measures from this plan will be included in relevant Environmental Work Method Statements (EWMS) and/or Erosion and Sediment Control Plans (ESCP).	During construction	Environment Manager Project Engineer	Good practice
F03	Temporary works such as hardstand areas and access tracks that are located in flood prone areas or overland flow paths are to be designed and constructed to withstand flooding.	Pre-construction Construction	Project Engineer	Good Practice
F04	Minimising the extent of obstructions within the flood prone areas as far as practicable at all times during construction	During construction	Project Engineer	TfNSW Specification G1
F05	Removing construction infrastructure and equipment from the flood prone areas in the event of a forecast flood to minimise both the risk of damage to infrastructure /equipment and the risk of flood impacts on properties.	During construction	Project Engineer Foreman	REMM FH01, TfNSW Specification G1
F06	Stockpile areas will be above the 1 in 20 year flood level.	During construction	Environment Manager Project Engineer	REMM FH01, TfNSW Specification G38
F07	A register of all material stored in flood prone areas must be maintained at each construction area. This will be routinely reviewed to capture any changes during construction. This may be prepared as part of: <ul style="list-style-type: none"> • Stockpile register • PIRMP inventory of potential pollutants 	During construction	Environment Manager	REMM FH01
F08	State Emergency Services will be notified of any partial or total road closures during construction.	During construction	Environment Manager Project Engineer	REMM FH07
F09	Monitor Bureau of Meteorology (BoM) forecast for heavy rainfall events and flood warnings in order to allow sufficient time to vacate and prepare the site prior to the commencement of heavy rainfall and flood events. Communicate any flood warnings to Construction area managers as soon as they are known.	During construction	Environment Manager Project Engineer	REMM FH01, TfNSW Specification G38
F10	The emergency exit route to be taken before flood waters rise is to be shown in key locations around site and included in the relevant site induction.	Construction	Project Engineer	REMM FH01

F11	Within flood prone area, secure objects that are likely to float and cause damage.	During construction	Project Engineer Foreman	Good practice
F12	Ensure construction plant, equipment and materials are removed from the low areas especially around the creek areas, and relocate on high ground when flooding is expected.	During construction	Project Engineer Foreman	Good practice
F13	Wherever possible store waste containers, chemicals and dangerous goods above the 1 in 20 ARI. In the event of a Level 2 event, the incident controller is to review site and relocate plant, stockpiles and storage as required.	During construction	Project Engineer Foreman	Good practice
F14	Ensure effective erosion control in the form of ground cover is in place, especially at culvert worksites.	During construction	Environment Manager Project Engineer	Good practice
F15	Where minor flooding occurs in the works area set up temporary diversion or pumping of low flows around the works area where possible.	During construction	Environment Manager Project Engineer	Good practice
F16	Remediate areas of damage, this includes clearing away of debris, sedimentation, blockages and temporary flood mitigation structures as soon as practicable and safe to do so.	Following flood event	Environment Manager Project Engineer	Good practice
F17	Ancillary Facility layout will be designed in consideration of flood risk.	During construction	Environment Manager Project Engineer	Good practice
F18	Location of storage areas of hazardous materials will be included in the Sensitive Area Plans and/or PIRMP (which requires the location of potential pollutants on the premises to be identified)	During construction	Environment Manager Project Engineer	Good practice
F19	Creek crossings and temporary diversions will be designed in accordance with this document, and the design will be prepared or reviewed by a CPESC qualified environmental practitioner.	During construction	Environment Manager Project Engineer	FH03 FH04
F20	Detailed design of waterway realignments and adjustments will be developed in consultation with Regions, Industry, Agriculture and Resources, DPE.	During construction	Environment Manager Project Engineer	FH04
F21	Impact on flood evacuation routes to be communicated to SES, and reviewed during construction as defined in Section 6.5.	During construction	Safety Manager Foreman	CoA C8, REMM FH01
F22	Flood prone areas will be shown on the Project Sensitive Area Plans	During Construction	Environment Manager	Best Practise

8 COMPLIANCE MANAGEMENT

8.1 ROLES AND RESPONSIBILITIES

The Project team's organisational structure and overall roles and responsibilities are outlined in Section 4.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

8.2 TRAINING

All employees, subcontractors and utility staff working on site will undergo site induction training relating to flooding management issues. The induction training will address elements related to flooding management including:

- Existence and requirements of this sub-plan
- Relevant MCoA and legislation
- Roles and responsibilities for flooding management
- Flooding mitigation and management measures
- Procedure to be implemented in the event of a flood.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in flooding management.

Further details regarding staff induction and training are outlined in Section 5 of the CEMP.

8.3 COMPLAINTS MANAGEMENT

Community enquiries and complaints will be managed via the Community Complaints Management System as detailed in with the approved Community Communications Strategy.

8.4 MONITORING

Environmental Inspections will be completed weekly on the Project which will include the following:

- Monitoring the BOM website for flooding in the Coffs Harbour area
- Flood Warning Services
- Creek Heights prior to a flood event

In the event a flood warning has been received/identified Appendix A will be completed.

8.5 ONGOING FLOODING RISK ANALYSIS

The FGJV Project team are required to ensure that the specific management and mitigation measures are implemented appropriately, the required actions are to be included in the EWMS prepared prior to commencement of works in accordance with requirements detailed in the CEMP Section 4.1.5 and the details below. The EWMS are to include the relevant reasonable and feasible mitigation measures to be implemented, in accordance with the management and mitigation measures detailed in this Plan.

The management review procedures described in Section 9 of the CEMP which forms part of the ongoing Project environmental risk review process is to include flooding management issues to ensure that best practice outcomes are achieved, and to incorporate lessons learnt in the planning process for ongoing works.

8.6 AUDITING

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, MCoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 8.3 of the CEMP.

8.7 REPORTING

Reporting requirements related to flooding monitoring are detailed in Section 8.4, all other reporting requirements and responsibilities are documented in Section 8 of the CEMP.

In accordance with CoA E20, flood information prepared for the Project will be provided to external stakeholders as described in that condition. This will be provided within six months of completion of construction.

In accordance with CoA E21, should the Project alter the design or function of Spagnolos Basin and Bennetts Road Basin, an updated Dam Safety Management Plan(s) will be prepared. Impacts to these basins will be determined during detailed design and will be provided to Council prior to construction commencing.

9 REVIEW AND IMPROVEMENT

9.1 CONTINUOUS IMPROVEMENT

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives, and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

9.2 CFMP UPDATE AND AMENDMENT

The processes described in Section 1.5 and Section 9 of the CEMP may result in the need to update or revise this plan. This will occur as needed.

Only the Environment Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 1.3 and 1.4 of the CEMP.

APPENDICES

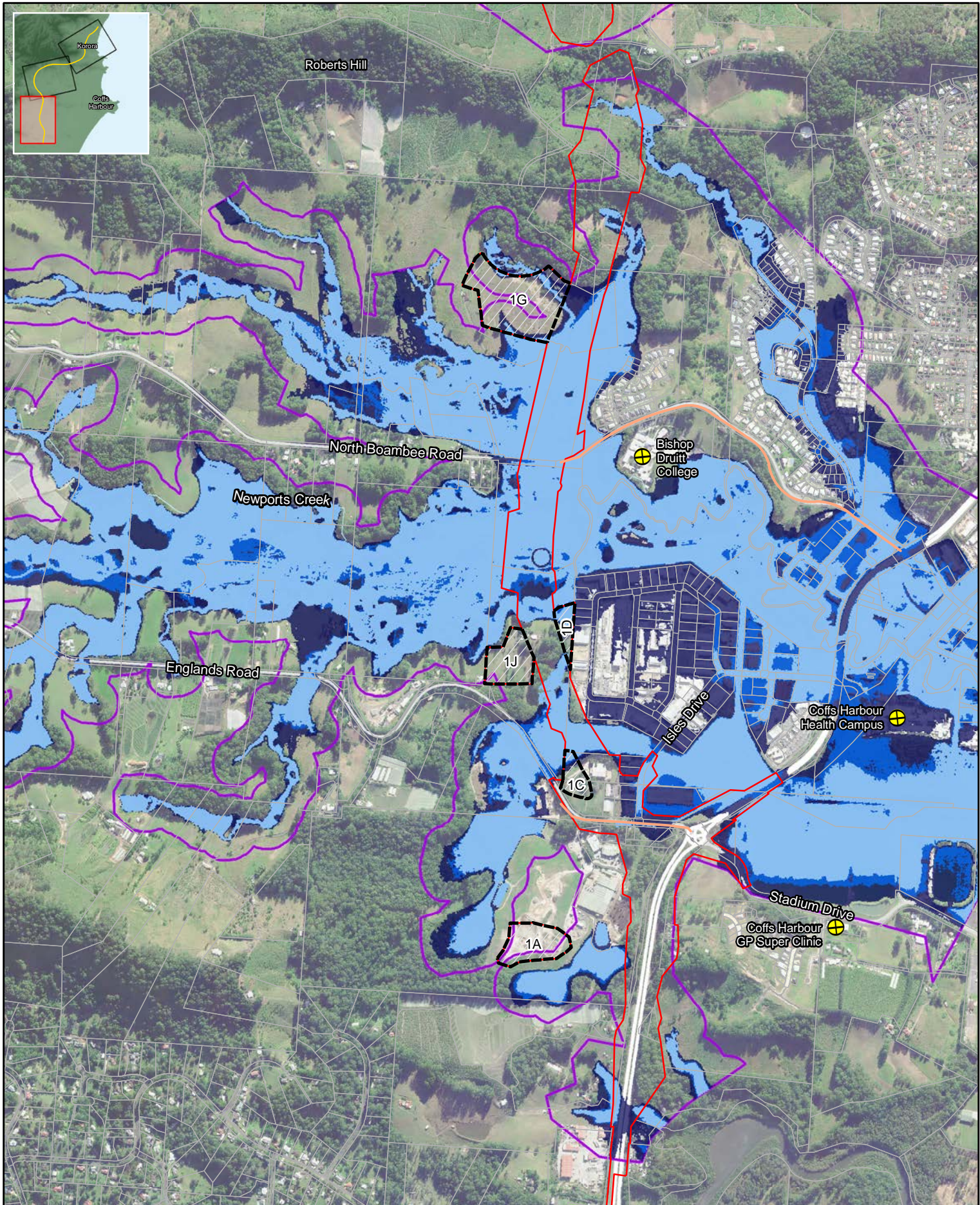


APPENDIX A EXAMPLE FLOOD EVENT PLANNING CHECKLIST

No.	Action	Yes/No - Comments
1	Are there any objects that are likely to float and cause damage. If so, can they be secured? If they can't be secured, Is there a potential risk of downstream impact or damage and has this been communicated to adjacent landholders?	
2	Ensure construction plant, equipment and materials are removed from the low areas especially around the creek areas, and relocate on high ground when flooding is expected.	
3	Relocate waste containers, chemicals and dangerous goods above the 1 in 20 ARI.	
4	Ensure effective erosion control in the form of ground cover is in place, especially at culvert worksites.	
5	Where timing and access permits, amenities wastewater is to be transported offsite by a licensed operator to a licensed disposal facility.	
6	Where minor flooding occurs in the works area set up temporary diversion or pumping of low flows around the works area.	
7	Turn off electricity, secure generators and secure gas cylinders.	
8	Remove any drainage blockages on or adjacent to site	

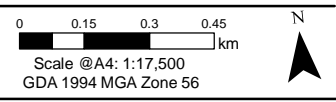
APPENDIX B

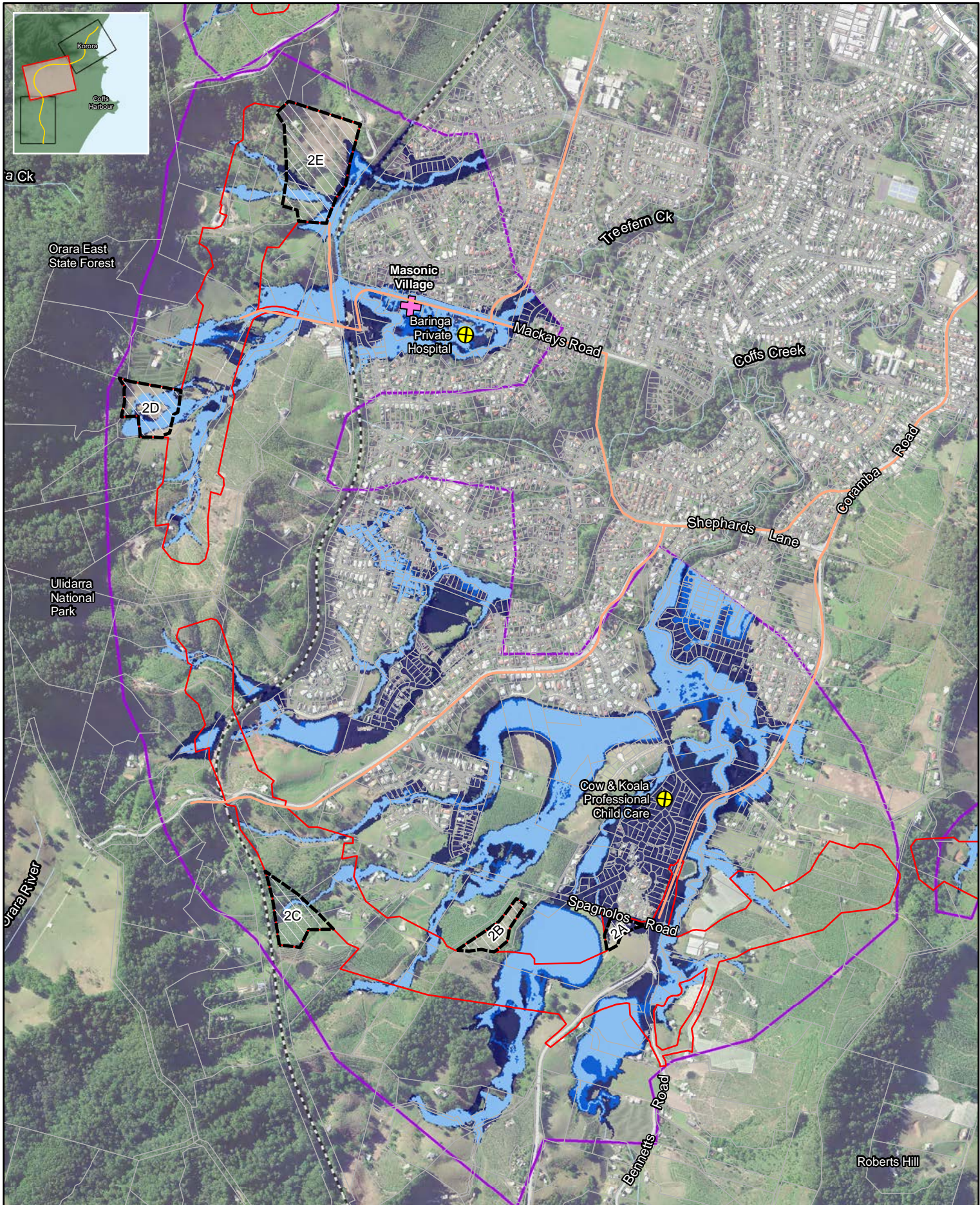
FLOOD PRONE AREA MAPS



- Legend**
- North Coast Railway
 - ▭ Cadastre
 - ▭ Construction footprint
 - ▭ Flood model extents
 - ⊕ Critical Infrastructure
 - ⊕ Assembly areas
 - ▭ Potential construction access
 - ▭ Potential ancillary sites
 - ▭ 5 % AEP flood extent
 - ▭ 1 % AEP flood extent
 - ▭ PMF flood extent

Coffs Harbour Bypass
 North Boambee Valley ancillary sites peak flood inundation
 C1



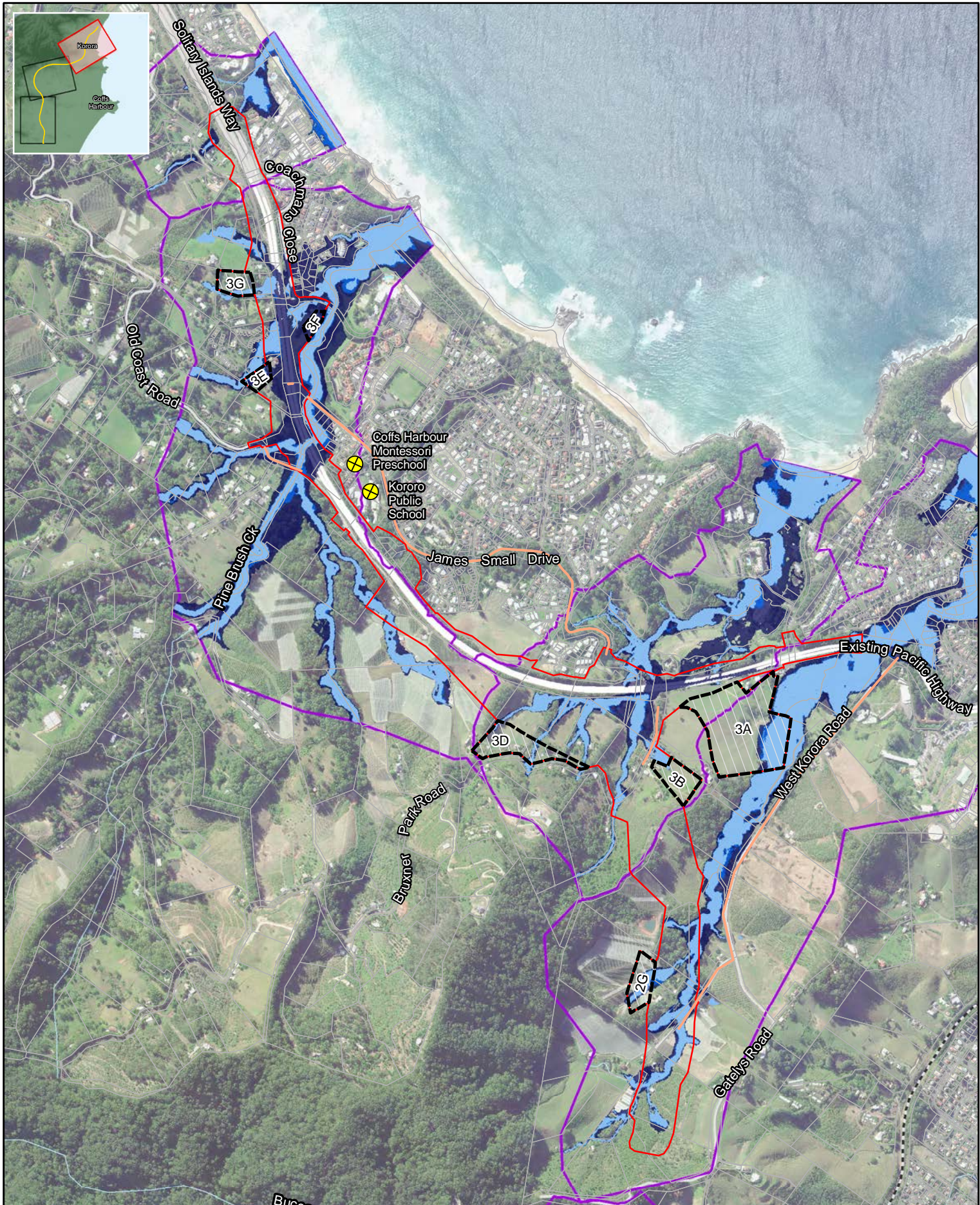


Legend

--- North Coast Railway	✚ Assembly areas	Light Blue 5 % AEP flood extent
▭ Cadastre	— Potential construction access	Medium Blue 1 % AEP flood extent
▭ Construction footprint	▭ Potential ancillary sites	Dark Blue PMF flood extent
▭ Flood model extents	✚ Critical Infrastructure	

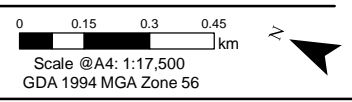
Coffs Harbour Bypass
 Coffs Creek ancillary sites peak flood inundation
 C2

0 0.15 0.3 0.45 km
 Scale @A4: 1:17,500
 GDA 1994 MGA Zone 56



- Legend**
- North Coast Railway
 - ▭ Cadastre
 - ▭ Construction footprint
 - ▭ Flood model extents
 - ⊕ Critical Infrastructure
 - ⊕ Assembly areas
 - ▭ Potential construction access
 - ▭ Potential ancillary sites
 - ▭ 5 % AEP flood extent
 - ▭ 1 % AEP flood extent
 - ▭ PMF flood extent

Coffs Harbour Bypass
 Northern creeks ancillary sites peak flood inundation
 C3



APPENDIX C

FLOODING EMERGENCY RESPONSE AND EVACUATION PLAN

Flood Procedure
Revision A - Coffs Harbour Bypass

FERROVIAL GAMUDA JOINT VENTURE

VERSION CONTROL

Revision	Date	Description	Approval
A	11/11/2022	FGJV version for review	
B			
C			
D			
E			

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This plan is to be implemented as part of the overarching Project Emergency Management Plan (EMP), which is intended to be the lead document for all emergency issues, including flooding. This plan should be read and implemented in combination with the Construction Environmental Management Plan (CEMP) Flood Management Plan.

This plan has been prepared to meet the requirements of the Project Approval and will describe:

- Measures to minimise the loss of material during storm/flood events where the stockpiling of material within the floodplain cannot be avoided;
- Protocols to relocate site materials and machinery when a storm/flood event warning forecast has been issued by the Bureau of Meteorology (BOM);
- Procedures for safe site evacuation of staff, construction personnel and visitors;
- Emergency response and evacuation procedures in the event of a flood during the construction phase;
- Suitable evacuation routes and procedures for evacuation of site personnel;
- Control measures for stockpiles within the floodplain to minimise loss of material in flood event;
- Protocols for equipment and materials that can be removed from the subject area during a flood event where reasonable and feasible;
- Consultation and coordination with local residents, CHCC and other relevant stakeholders; and
- NSW State Emergency Services will be notified of any partial or total road closures during construction because of the project. The CFMP should detail any impacts on existing flood conditions in relation to flood evacuation routes.

The BOM produces warnings and advice to local communities who are experiencing, or are at risk of experiencing riverine flooding. The BOM Weather Warning System is a key component of the Flooding Emergency Response and Evacuation Plan.

Please note: the Project Emergency Management Plan is the lead document to be implemented in the case of any emergency, including flooding.

2 BOM WEATHER WARNING SYSTEM

The BOM weather warning system will be used to determine if a potential flood emergency exists. This system provides an accurate and appropriate warning levels, of storm event and potential flood impacts. Two types of flooding may occur as described in detail below.

2.1 RIVERINE FLOODING

Riverine floods (i.e. when regular water courses like creeks and rivers rise and even break their banks, resulting in the spread of water across adjacent areas) typically occur six or more hours after heavy rainfall. The BOM provides three riverine flood classifications, with the following descriptions:

- 1) **Minor flooding:** refers to inundation of low-lying areas next to watercourses. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths.
- 2) **Moderate flooding:** the area of inundation is more substantial. Main traffic routes may be covered and some buildings may be affected above floor level. Evacuation of flood affected areas and removal of stock may be required.
- 3) **Major flooding:** can be very dangerous and may result in extensive inundation of rural and urban areas. Properties and towns are likely to be isolated and major traffic routes and rail routes are likely to be closed. Evacuation of people from flood affected areas may be required and utility services may be impacted.

Based on the likelihood and impact of a possible riverine flood, the BOM will issue either a flood watch or flood warning. Flood Watches provide early advice of a developing situation that may lead to flooding. While Flood Warnings are issued when floods are likely to occur or are already occurring. More details are provided below:

2.1.1 FLOOD WATCH

A Flood Watch is issued when forecast rainfall suggests that local and riverine flooding is possible. Its purpose is to provide early advice of a developing situation that may lead to flooding. A Flood Watch isn't a warning of imminent flooding.

A Flood Watch provides information about a developing weather situation including forecast rainfall totals and catchments at risk of flooding. It can also indicate how severe a possible flood might be. It provides links to weather warnings, other flood-related information, and contact details of relevant emergency services.

A Flood Watch can be issued up to four days in advance of expected flooding. They are updated at least daily and finalised once all areas are covered by Flood Warnings or the risk of flooding has passed.

If a Flood Watch is issued for your area, look out for future updates and possible Flood Warnings. Follow the advice of your local emergency services. If flooding develops, consider moving livestock, family and possessions to higher ground.

2.1.2 FLOOD WARNING

BOM issues a Flood Warning when its more certain that flooding is expected at a particular location. Flood Warnings are more targeted and are issued for specific catchments and locations within catchments. The BOM will forecast how severe the flood is expected to be in each Flood Warning.

Flood Warnings typically include predictions about the level of expected rise, however where less data are available, Flood Warnings may include a statement about future flooding that is more general and is based on forecast rainfall and knowledge of historical flood response. Generalised warnings advise that flooding is expected in particular river valleys but don't provide information about how severe the flood may be or precise locations.

The type of information provided in a Flood Warning depends on the:

- quality of real-time rainfall and river-level data available
- capability of rainfall and hydrological forecast models

- level of service agreed with partner organisations.

2.1.3 FLASH FLOODING

Sometimes short bursts of heavy rainfall can lead to rapid onset flooding, known as flash flooding. In the case of flash floods the best warning advice comes in the form of a Severe Weather Warning. Flash floods typically happen quickly and while BOM cannot warn for flash floods, forecasts and warnings for severe weather conditions and potential heavy rainfall that can cause flash flooding are alerted and can be used to guide a management response.

More information on BOM weather warning services and warning descriptions can be found at: <http://www.bom.gov.au/australia/flood/knowledge-centre/about-warning-service.shtml>

3 FLOOD EMERGENCY RESPONSE

Noting that BOM predictions and warnings are all publicly available, the Safety Manager (or their delegate) will be responsible for developing the communication process for notifying relevant personnel of potential flooding. This process will be described in the Project EMP.

The Safety Manager in consultation with the Project Director will alert of a potential flood in general accordance with the Trigger Levels described in Table 1.

Table 1 nominates the relevant actions for each Trigger Level, and Table 2 provides the details of actions to be implemented.

TABLE 1 TRIGGER LEVELS

Trigger Description	Alert		
	Trigger Level 1 – low	Trigger Level 2 – medium	Trigger Level 3 – high
Rain/storm	50mm (or greater) of rainfall is expected over a 5-day period. Or BOM Severe weather warning for nearby regions is announced	Forecast rain fall (>50% chance) of 50-100mm within 24 hours in immediate catchment area. Or BOM Severe weather warning for Project regions is announced	Forecast rain fall (>50% chance) of >100mm within 24 hours in immediate catchment area. Current/immediate risk of waterways flooding. Or BOM Flash Flood Warning Announced
Flood	Flood warning for nearby regions	BOM Flood Watch alert announced	BOM Flood Warning announced

TABLE 2 TRIGGER LEVEL ACTIONS

Position	Trigger Level 1 - low	Trigger Level 2 - medium	Trigger Level 3 - high
Project Manager	<ul style="list-style-type: none"> Communicate status to all Section Managers. 	<ul style="list-style-type: none"> Communicate status to with Conduct Planning session with relevant staff (function support managers) Consider mobilisation of ERT Communicate status to SLT 	<ul style="list-style-type: none"> Communicate status to senior Managers. Conduct Planning session with relevant staff (function support managers) Mobilise ERT Communicate status to SLT Announce full Project Evacuation as required.
Superintendent/Incident Controller	<ul style="list-style-type: none"> Communicate status to sub-contractors Ensure new environmental conditions are assessed by contractors and Identify temporary works at risk in event of escalation Communicate status to Project Leader 	<ul style="list-style-type: none"> Communicate status to Project leader Conduct planning session with sub-contractor and develop action plan Prepare for implementation of Emergency Management Plan. Monitor progress and close out of action plan Communicate status to Project Leader 	<ul style="list-style-type: none"> Communicate status to Project Leader Ensure Project emergency management plans are activated Conduct planning session with ERT and develop action plan Monitor progress of action plan Communicate status to Project Leader
Community Manager	<ul style="list-style-type: none"> No action 	<ul style="list-style-type: none"> Communicate to adjacent upstream and downstream neighbouring properties as identified as part of the EMP. 	<ul style="list-style-type: none"> No action – all communications should be taken from State Emergency Services or Emergency Service agencies (i.e. Police, Fire Brigade, Ambulance)
Environmental Staff	<ul style="list-style-type: none"> Conduct inspections as required Monitor and communicate information relating to inclement weather to Project Leader 	<ul style="list-style-type: none"> Conduct inspections as required Monitor and communicate information relating to inclement weather to Project Leader Provide advice on environmental preparation Undertake the Flood Event Planning Checklist (FMP Appendix A) 	<ul style="list-style-type: none"> Conduct inspections as required Monitor and communicate information relating to inclement weather to Project Leader Provide advice on environmental preparation Undertake the Flood Event Planning Checklist (FMP Appendix A)
Health and Safety	<ul style="list-style-type: none"> Assist with site emergency response protocols are followed 	<ul style="list-style-type: none"> Assist with site emergency response protocols are followed 	<ul style="list-style-type: none"> Assist with site emergency response protocols are followed

TABLE 3 TABLE FLOOD WARNING MITIGATION MEASURES

Low Level		
Low 1	At least daily monitoring of forecast rainfall will occur and BOM Weather Warning system. Details regarding weather forecasts will be made available to the project personnel through prestart briefings and where relevant, notice boards.	Safety Manager
Low 2	Review erosion and sediment control to ensure controls are implemented and maintained in accordance with the approved Erosion and Sediment Control Plan.	Environmental Manager
Low 3	Preparation/planning for the potential removal of plant and equipment for work within flood prone areas, including the identification of potential relocation areas and higher risk plant/equipment.	Site Foreman
Low 4	Assessment of material within flood prone areas to ensure minimal impact to the receiving environment in the event of a flood (i.e. potential removal of material or additional stabilisation if practical)	Site Foreman
Low 5	Prepare to treat and dewater sediment basins within five days in accordance with the Soil and Water Management Plan, where this will not exacerbate potential flood risk.	Site Foreman
Medium Level		
Medium 1	Around 3-hourly monitoring of BOM Weather Warning system.	Safety Manager
Medium 2	Relevant construction personnel toolboxed on Flood Status and proposed mitigation measures.	Site Foreman
Medium 3	Community Manager to undertake notifications to neighbouring properties and Council in accordance with the EMP.	Community Manager
Medium 4	Where safe, construction plant and equipment is to be removed to an area 100m outside of the 5% AEP flood zone (refer Appendix A of the FMP).	Superintendent Site Foreman
High Level		
High 1	Around 1-hourly monitoring of BOM Weather Warning system.	Safety Manager
High 2	Where safe, construction plant and equipment is to be removed to an area 100m outside of the Q100 flood zone (refer Appendix D).	Project Manager
High 3	Pacific Highway and local road evacuation routes confirmed and Staff Notified of Evacuation Process.	Safety Manager Superintendent
High 4	Evacuate if ordered by the Project Director, State Emergency Services or Emergency service agencies	Project Director

4 FLOOD EMERGENCY MANAGEMENT

In the event of an emergency the requirements set out in the FGJV Coffs Harbour Bypass Emergency Management Plan will be implemented. The FGJV Coffs Harbour Bypass Emergency Management Plan can be found at the main compound. Where it has been identified that other action is required and it has been deemed safe by the Safety Manager (or their delegate), additional measures may be implemented.

Further communications for updated information may be made on a case-by-case basis via pre-starts, toolboxes and other Project communication forums.

4.1 RESOURCES

Adequate resources will be made available to ensure that the mitigation measures detailed in this management plan are implemented accordingly. This includes additional personnel resources and equipment if required and determined appropriate by the Safety Manager or Construction Manager in consultation with the Project Director.

4.2 EXTERNAL NOTIFICATION AND COMMUNICATION

All environmental emergencies will be managed in accordance with the CHB FMP. In the event that an incident has caused, is causing, or is likely to cause material or serious environmental harm, whether the harm occurs on or off the site, the Environmental Manager will report the incident to TfNSW and NSW EPA as required.

Any communication to residents in relation to flooding and potential impacts from construction activities will be managed in accordance with the Emergency Management Plan.

4.3 EVACUATIONS

In the event that an evacuation may be required at any time prior to or during the flood event, staff will evacuate to evacuation zones nominated within the FGJV Coffs Harbour Bypass Emergency Management Plan.

To accommodate for changes during the Project, there will be set emergency muster points for each site/work area and the current relevant evacuation route/s will be available at each gate location and muster point.

Flood Maps are attached to **Appendix A** of the FMP, which show the 5% AEP Flood Levels shaded in blue.

5 MANAGEMENT AFTER A FLOOD

Site inspections would be undertaken within reasonable time which is considered safe of the flood event. Results of the initial site inspections will be provided to the Project Manager and reported to TfNSW. The site inspection will include a review of any potential flood damage, and of material which may have been lost during the event. All dewatering will be undertaken in accordance with the Contractor's Construction Soil and Water Management Plan. Records would be retained of post-flood inspections and actions undertaken in response to the event.

APPENDIX D

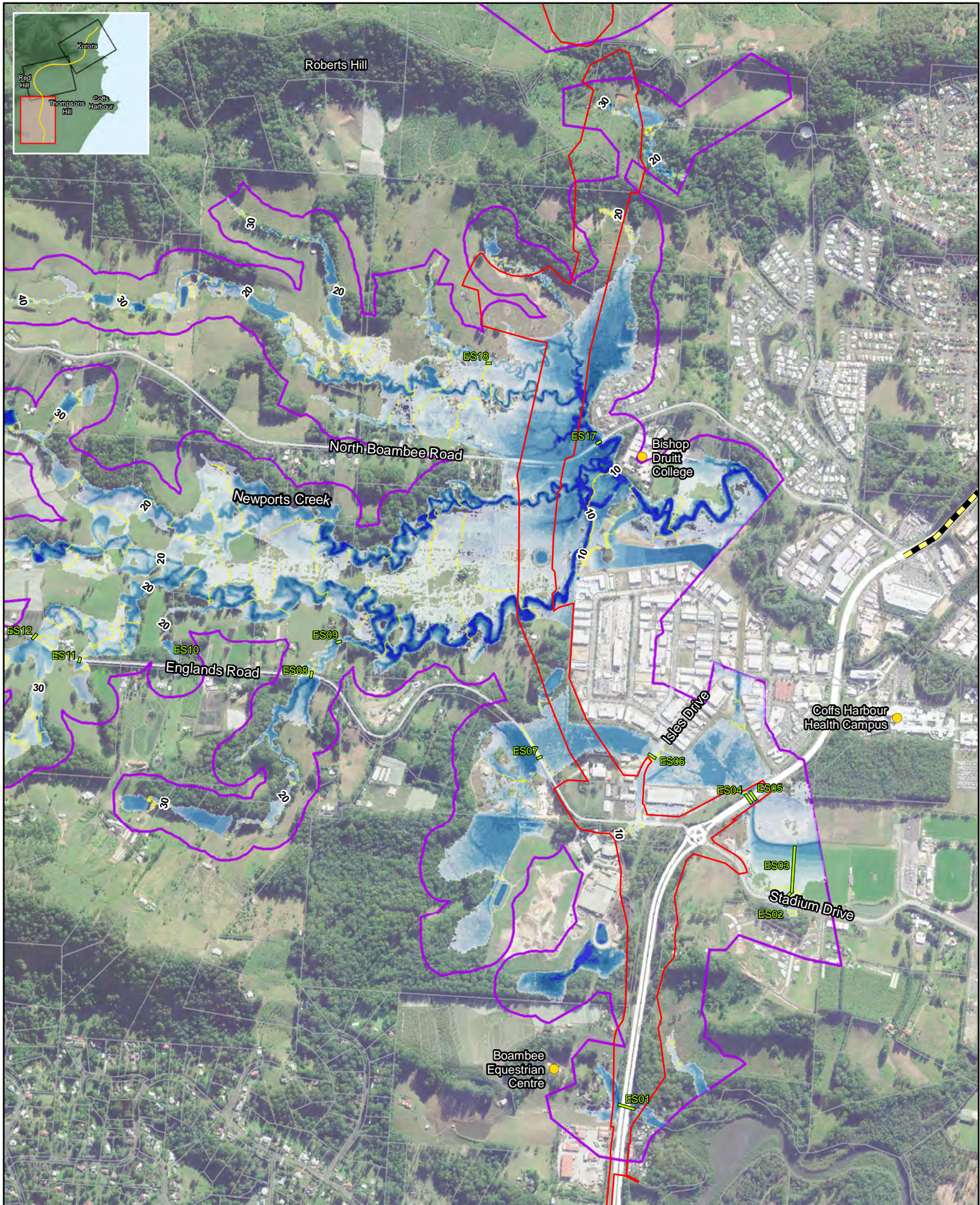
EXAMPLE FLOOD PRONE MATERIALS REGISTER

Materials Register (Flood Prone Areas)

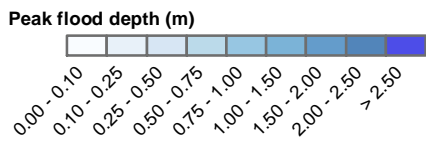
Site Location/Description	Items to relocate in event of flood warning	Resource requirements	Relocation Site/Description	Comments
<i>Example – Main compound, south-eastern gate</i>	<i>Spill kits, General waste bins (3m3)</i>	<i>Labourers, Hiab truck and operator</i>	<i>Main compound western fence-line</i>	<i>Ensure no obstruction to car parking area</i>

APPENDIX E

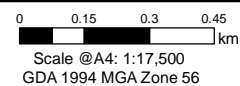
EVACUATION ROUTE IMPACTS

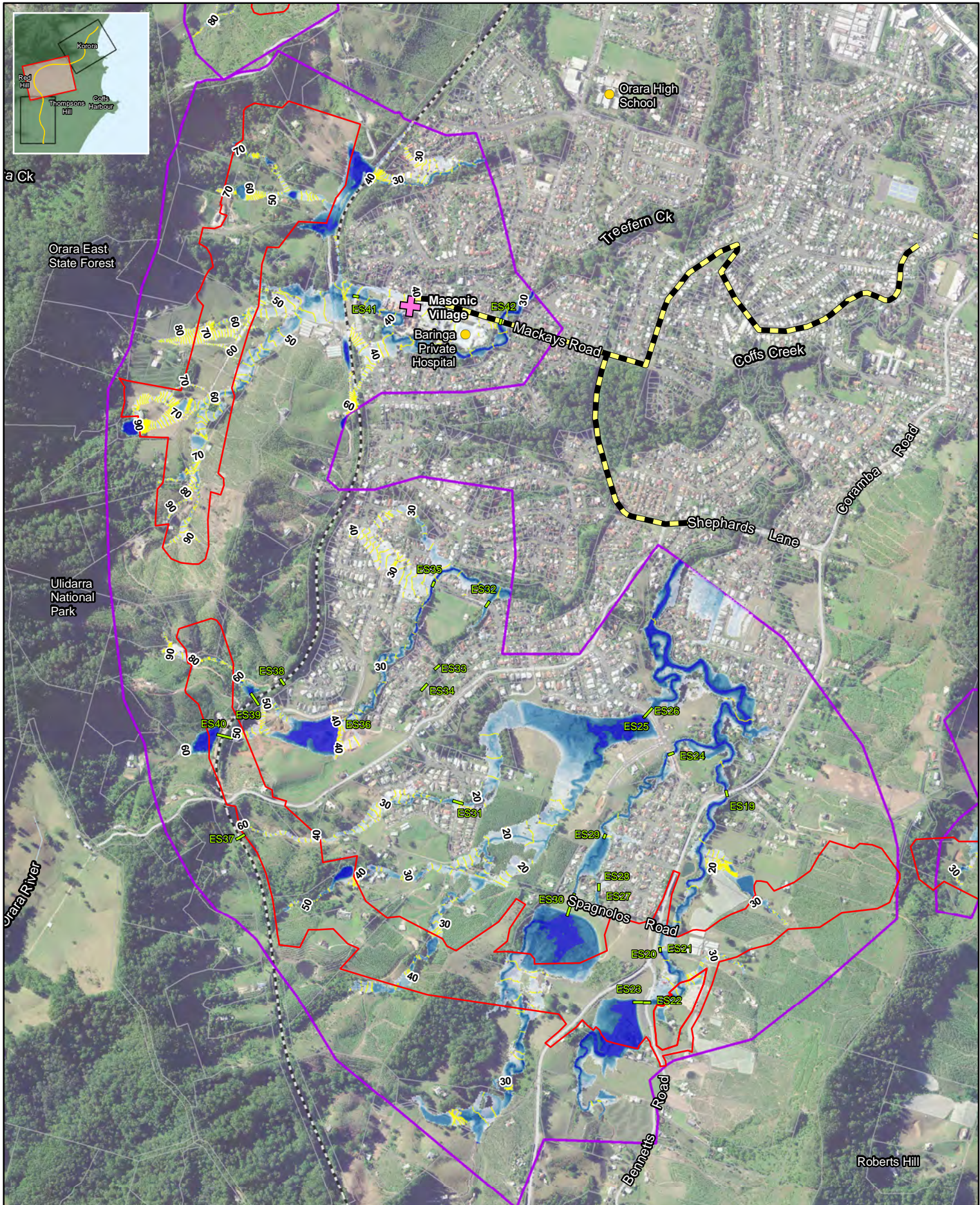


- Legend**
- North Coast Railway
 - Evacuation routes
 - ▭ Cadastre
 - ▭ Construction footprint
 - ▭ Flood model extents
 - Peak flood level (mAHD at 1m contours)
 - Modelled structures
 - Sensitive receiver
 - ⊕ Assembly areas

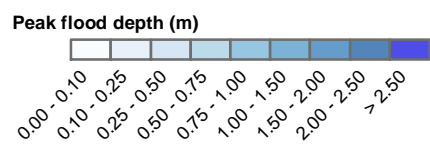


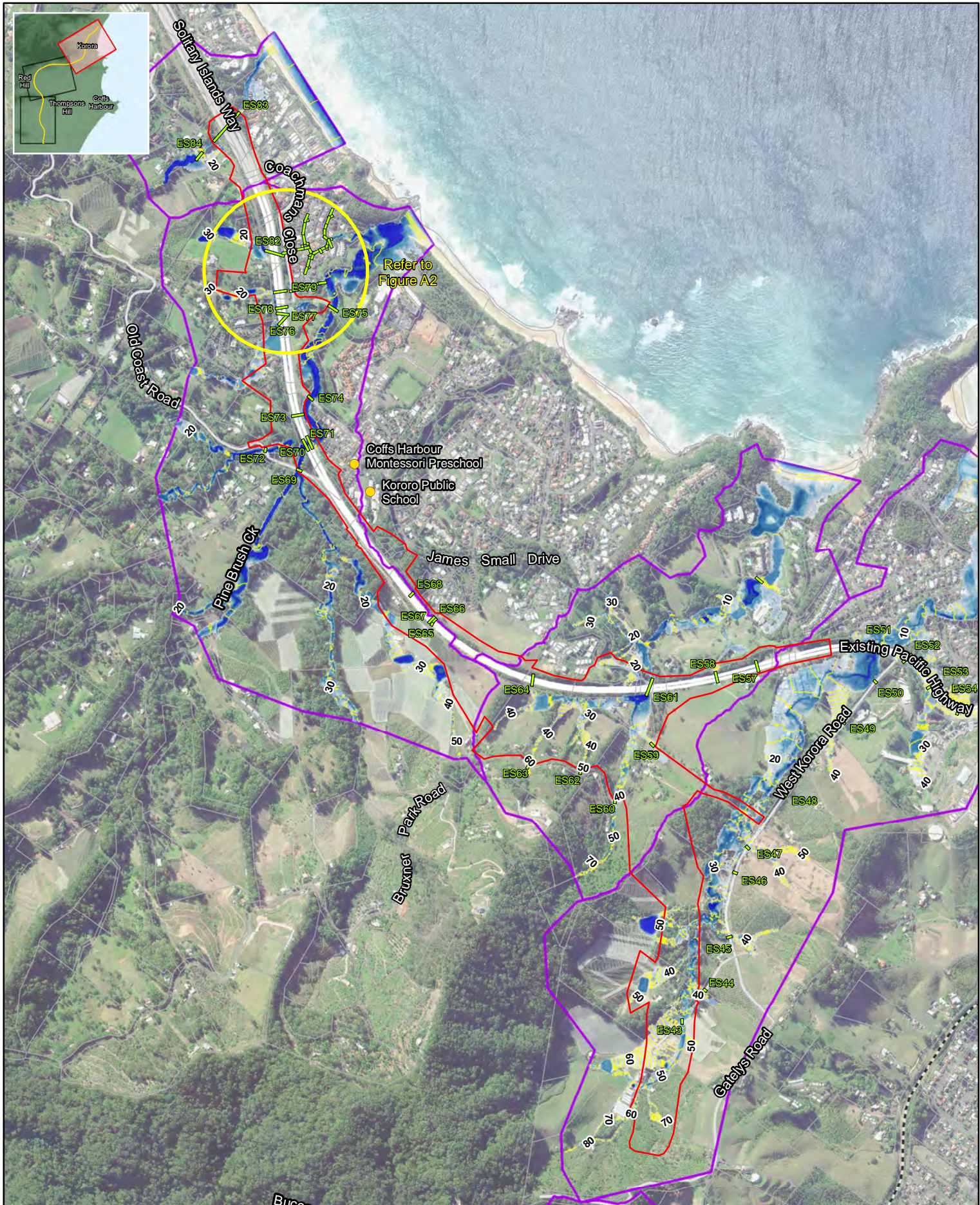
Coffs Harbour Bypass
 North Boambee Valley 5 % AEP peak flood level and depth
 B1.1.3



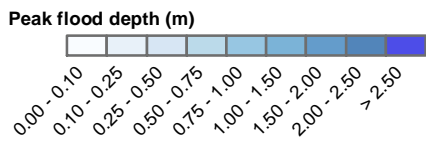


- Legend**
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Coffs Harbour Bypass
 Northern Creek 5 % AEP peak flood level and depth
 B1.3.3

