SES
NSW STATE EMERGENCY SERVICE

Coffs Harbour

Local Flood Plan

FloodSafe

CITY OF COFFS HARBOUR FLOOD EMERGENCY SUB PLAN

A Sub Plan of the Local Emergency Management Plan (EMPLAN)

Volume 1 of the City of Coffs Harbour Flood Emergency Sub Plan

Endorsed by the Emergency Management Committee

Endorsed Date: 17 January 2023

AUTHORISATION

The City of Coffs Harbour Flood Emergency Sub Plan is a sub plan of the City of Coffs Harbour Local Emergency Management Plan (EMPLAN). It has been prepared in accordance with the provisions of the ***State Emergency Service Act 1989*** (**NSW**) and is endorsed by the Local Emergency Management Committee in accordance with the provisions of the ***State Emergency and Rescue Management Act 1989*** **(NSW)**.

Authorised

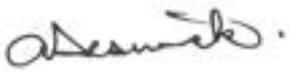
Signature: 

NSW SES Local/Unit Commander

Print Name: Jeannie Veitch

Date: 11/1/2023

Endorsed

Signature: 

Chair, Local Emergency Management Committee

Print Name: Andrew Beswick

Date: 17/1/2023

VERSION HISTORY

Version Number	Description	Date
	Coffs Harbour Flood Emergency Sub Plan	Sep 2017
	Coffs Harbour City Local Flood Plan	Nov 2012
	Coffs Harbour City Local Flood Plan	Dec 2006

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

Manager Emergency Planning
NSW State Emergency Service
PO Box 6126, Wollongong NSW 2500
nswses.communityplanning@ses.nsw.gov.au

Amendments in the list below have been entered in this plan.

Amendment Number	Description	Updated by	Date
1.1	**Update to City of Coffs Harbour to include Lifeguard Services**	**T Ware**	**8.12.22**
1.2	**Updates of references to Council as requested.**	**T Ware**	**10.1.23**

DISTRIBUTION LIST

Available for general use and distribution on the NSW State Emergency Service website www.ses.nsw.gov.au

CONTENTS

1 OUTLINE AND SCOPE

1.1 PURPOSE

1.1.1 The purpose of this plan is to set out the multi-agency arrangements for the emergency management of flooding in the Coffs Harbour Local Government Area (LGA).

1.2 AUTHORITY

1.2.1 This plan is written and issued under the authority of the *State Emergency and Rescue Management Act 1989* (NSW) ('SERM Act'), the *State Emergency Service Act 1989* (NSW) ('SES Act') and the NSW State Emergency Management Plan (EMPLAN).

1.2.2 This plan is a sub plan to the City of Coffs Harbour Local Emergency Management Plan (EMPLAN) and is endorsed by the Emergency Management Committee (LEMC).

1.3 ACTIVATION

1.3.1 This plan does not require activation. The arrangements set out in this plan are always active.

1.3.2 The City of Coffs Harbour Emergency Management Plan (EMPLAN) is active at all times in anticipation of the need to coordinate support and resources requested by combat agencies, including the NSW State Emergency Service (NSW SES).

1.4 SCOPE

1.4.1 The area covered by this plan is the Coffs Harbour LGA. The Coffs Harbour LGA and its principal towns, villages, rivers and creeks are shown in Appendix A.

1.4.2 The City area is in the NSW SES Northern Zone and for emergency management purposes, is part of the North Coast Emergency Management Region.

1.4.3 The plan sets out the City of Coffs Harbour local emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Coffs Harbour LGA. Hazard and Risk information can be found in Volume 2 of this document, and NSW SES Response Arrangements can be found in Volume 3.

1.4.4 In this plan a flood is defined as a relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences.

1.4.5 The arrangements for dealing with episodes of coastal erosion by severe weather, are described in the NSW State Storm Plan.

1.4.6 The arrangements for the emergency management of tsunami are dealt with in the NSW State Tsunami Emergency Sub Plan.

1.4.7 This plan outlines the local level arrangements for the management of downstream consequences of flooding due to dam failure, however it does not cover the management of flooding of an underground mine by inrush or other cause, which should be covered by the Mine Emergency Sub Plan for the respective mine.

1.5 GOALS

1.5.1 The primary goals for flood emergency management in NSW are:

a. Protection and preservation of life.

b. Establishment and operation of flood warning systems.

c. Issuing of community information and community warnings.

d. Coordination of evacuation and welfare of affected communities.

e. Protection of critical infrastructure and community assets essential to community survival during an emergency incident.

f. Protection of residential property.

g. Protection of assets and infrastructure that support individual and community financial sustainability and aid assisting a community to recover from an incident.

h. Protection of the environment and conservation values considering the cultural, biodiversity and social values of the environment.

1.6 KEY PRINCIPLES

1.6.1 The protection and preservation of human life (including the lives of responders and the community) is the highest priority.

1.6.2 Evacuation is the primary response strategy for people impacted by flooding.

1.7 ROLES AND RESPONSIBILITIES

1.7.1 General responsibilities of emergency service organisations and functional areas are set out in the NSW State EMPLAN and NSW State Flood Sub Plan.

1.7.2 Specific roles and responsibilities for agencies, functional areas and organisations in relation to flooding within City of Coffs Harbour are detailed within this plan, Appendix B and Appendix C.

1.7.3 Any agency with agreed responsibilities in this plan that are temporarily unable, or no longer able to fulfil their responsibilities in response operations must as soon as possible notify:

a. The NSW SES Incident Controller (for local or zone level responsibilities during response operations).

b. The NSW SES Zone Duty Commander (for regional level responsibilities outside of response operations).

1.8 PLAN MAINTENANCE AND REVIEW

1.8.1 NSW SES will maintain the currency of this plan by:

a. Ensuring that all supporting emergency services and functional areas, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conduct a minimum of one exercise every five years or within two years of the plan being reviewed.

c. Reviewing the contents of the plan:

- When there are changes which alter agreed plan arrangements.
- When changes to land use strategic plans and policies increase the population at risk.
- After a flood including recommendations from after action reviews, reports, or inquiries.
- As determined by the NSW SES Commissioner.

d. The plan is to be reviewed no less frequently than every five years or after a significant flood event.

1.9 SUPPLEMENTARY DOCUMENTS

1.9.1 Supplementary and supporting material of the Local Flood Emergency Sub Plan is maintained on the NSW SES website at: https://www.ses.nsw.gov.au/about-us/flood-storm-and-tsunami-plans/ including:

a. Flood Plan Glossary.

b. NSW SES Dam Failure Notification Flowchart.

c. NSW SES Resupply Flowchart.

2 OVERVIEW OF NSW FLOOD HAZARD AND RISK

2.1 THE FLOOD THREAT

2.1.1 NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Coffs Harbour LGA. This is outlined in Volume 2 – Hazard and Risk in City of Coffs Harbour.

2.1.2 Declared dams in or upstream of the Coffs Harbour City Local Government Area.

Dam Name	Owner	High Risk Dam
Woolgoolga Dam	City of Coffs Harbour	No
Bakers Road Detention Basin	City of Coffs Harbour	No
Bennetts Road Detention Basin	City of Coffs Harbour	No
Karangi Dam	City of Coffs Harbour	No
Spagnolos Road Detention Basin	City of Coffs Harbour	No

3 PREVENTION/ MITIGATION

3.1 INTRODUCTION

3.1.1 The Floodplain Development Manual outlines the NSW Government's Flood Prone Land Policy which details the framework for managing flood prone land in New South Wales. Incorporation of floodplain risk management into land use planning is one of the key means to limit the exposure to flood risks to our communities and help build long term resilience to future flood events.

3.2 LAND USE PLANNING

3.2.1 **Strategy:** Effective land use planning is a key focus for minimising the impacts of flooding. NSW SES will work with land use planning and consent authorities to inform and influence the consideration of the risks arising from flood, storm and tsunami, to prevent the creation of intolerable impacts of these hazards on the community.

Actions:

a. NSW SES will provide strategic input about land use planning matters which have or will create significant flood risk to life and/or property due to flooding.

b. NSW SES will provide responses to land use planning proposal referrals that have or will create significant flood risk to life and/or property due to flooding.

3.3 FLOODPLAIN RISK MANAGEMENT

3.3.1 **Strategy**: Advocate for consideration of emergency management in decision making to reduce risks to the existing community and minimise the growth in future, continuing and residual risk due to development through input to the floodplain management program.

Actions:

a. NSW SES will provide coordinated and consistent emergency management advice to councils and other agencies in relation to the management of land that is subject to flooding or coastal inundation.

b. NSW SES will provide advice, support, technical resources and training for NSW SES representatives to contribute effectively on local Floodplain Management Committees.

4 PREPARATION

4.1 INTRODUCTION

4.1.1 Preparation includes arrangements or plans to deal with an emergency or the effects of an emergency.

4.2 FLOOD EMERGENCY PLANNING

4.2.1 **Strategy**: NSW SES develop, review and maintain Flood Emergency Sub Plans.

Actions:

a. Develop and review this NSW SES Local Flood Emergency Sub Plan as required. Local Flood Emergency Sub Plans outline the specific arrangements for management of flood events within an LGA, and may include cross boundary arrangements.

b. Review plans as per Section 1.8.

4.2.2 Local EMPLAN Consequence Management Guides (CMG's) for flood are not required for communities covered by NSW SES Local Flood Emergency Sub Plans however may be utilised in place of Local Flood Emergency Sub Plan if agreed to by NSW SES.

4.3 FLOOD INTELLIGENCE SYSTEMS

4.3.1 **Strategy**: NSW SES develop and maintain a flood intelligence system to identify flood behaviour, its impact on the community and required response actions.

Actions:

a. Gather and assess flood information for the full range of flood types and severities.

b. Collect, collate, and assess information on the characteristics of communities at risk and the potential effects of flooding on communities at risk.

c. Share flood intelligence information with supporting agencies.

4.4 DEVELOPMENT OF WARNING SYSTEMS

4.4.1 **Strategy**: Develop, maintain and prepare systems for the provision of flood warnings and associated warning services.

Actions:

a. All levels of government work in partnership to develop and maintain flood warning infrastructure.

b. NSW SES maintains a list of the requirements for flood warnings for flood gauges in NSW (including flood classifications, warning times required and key statistics) and can be found in the supplementary document to the NSW State Flood Plan (see Section 1.9). Gauges of relevance within the Coffs Harbour LGA are also listed in Volume 3 of this plan.

c. NSW SES will recommend new warning services and changes to warning alert levels for gauges to the NSW and ACT Flood Warning Consultative Committee.

d. The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required.

e. City of Coffs Harbour has developed and maintains a flash flood warning system for Coffs Creek by monitoring the Coffs Creek Highway Bridge gauge (AWRC no. 205439) and the City of Coffs Harbour stream gauges located at

Bray Street, Gundagai Street, Grafton Street, Loaders Lane plus other rainfall gaugest in the locality.

f. Dam Owners will provide Dam Emergency Plans (where required) and consult with NSW SES on alert levels and messaging. Alert level definitions are listed in Dam Emergency Plans.

g. NSW SES maintains a dedicated dam failure hotline and procedures to ensure priority dissemination of dam failure warnings.

h. NSW SES develops and maintains warning and flood information products by:

- Utilising flood intelligence data.
- Developing warning and flood information products.
- Continuously reviewing warning and flood information products.
- Consulting with affected communities, key stakeholders, Dam Safety NSW and the NSW and ACT Flood Warning Consultative Committee, and maintains Operational Readiness.
- Participating in the development of public information and warning systems.

i. Gauge owners adequately maintain flood warning gauges and systems, including those identified in the 'Service Level Specification' maintained by the Bureau of Meteorology (Bureau) and those identified in the 'Provision and Requirements for Flood Warning in New South Wales' maintained by NSW SES.

4.5 BRIEFING, TRAINING AND EXERCISING

4.5.1 **Strategy**: Ensure NSW SES, supporting agencies, functional areas and the community are prepared and familiar with the strategies and arrangements within the Flood Emergency Sub Plan and supporting documents.

Actions:

a. NSW SES will consult stakeholders throughout the development of plans.

b. NSW SES will inform stakeholders of content changes after revisions.

c. NSW SES will ensure their facilities and resources are maintained and operationally ready.

d. NSW SES will train personnel for their expected flood operation roles.

e. NSW SES will regularly brief stakeholders on the exercise arrangements contained in the NSW Flood Emergency Sub Plan.

4.6 COMMUNITY RESILIENCE TO FLOODING

4.6.1 **Strategy**: NSW SES provides and maintains a flexible volunteer workforce to support community resilience.

Actions:

a. Ensure ongoing recruitment and training of a diverse range of volunteers.

b. Ensure pre-planning to facilitate the management of spontaneous volunteers and community members during a flood.

4.6.2 **Strategy**: NSW SES works with individuals, communities, businesses and government agencies to build flood resilience.

Actions:

a. Partners with and engage communities to understand and manage the risks associated with floods, including providing business continuity guidance (NSW SES Business FloodSafe), family preparedness (NSW SES Home FloodSafe) and other engagement strategies.

b. NSW SES will collate, assess and disseminate flood information to the community.

c. Collaborate with individuals, businesses, government agencies and communities when developing flood intelligence, preparedness and response information.

d. Plan for floods collaboratively with communities through community and stakeholder participation and engagement.

e. Collaborate with community sector and recognise the needs of individuals within communities who have an increased susceptibility during floods.

5 RESPONSE

5.1 INTRODUCTION

5.1.1 Flood response operations will begin:

a. On receipt of a Bureau Severe Weather Warning or Thunderstorm Warning that includes heavy rain or storm surge; or

b. On the receipt of a Bureau Flood Watch or Flood Warning; or

c. On receipt warnings for flash flood; or

d. On receipt of a dam failure alert; or

e. When other evidence leads to an expectation of flooding.

5.2 INCIDENT MANAGEMENT ARRANGEMENTS

5.2.1 **Strategy**: Maintain effective control of flood operations across NSW.

Actions:

a. NSW SES uses the Australasian Inter-service Incident Management System (AIIMS) to manage the flood response.

b. Control of flood response will be at the lowest effective level and may be scaled to suit the incident.

c. The NSW SES State Controller (or delegate) will appoint Incident Controllers and establish Incident Control Centres (see NSW SES facilities on map in Appendix A).

d. The NSW SES Incident Controller, in consultation with participating supporting emergency services and functional areas will determine the appropriate breakdown of an Area of Operations into Divisions and/or Sectors in accordance with the principles of AIIMS.

5.2.2 **Strategy**: Maintain Incident Control Centre(s).

Actions:

a. NSW SES will operate Incident Control Centre(s) as required.

b. The NSW SES Incident Control Centre(s) will:

- Control resources from NSW SES and coordinate resources of supporting emergency services and functional areas.
- Manage Request for Assistance (RFA) tasking and ensure they are actioned in a timely manner.
- Undertake response planning and determine future resourcing requirements.
- Coordinate information flow, including warnings, public information and social media.

5.2.3 **Strategy**: Provide effective liaison between NSW SES and supporting agencies or functional areas in accordance with Local EMPLAN.

Actions:

a. Supporting emergency services and functional areas should provide Liaison Officers to NSW SES Incident Control Centre(s) and/or Emergency Operation Centres as required.

b. NSW SES will provide Liaison Officer(s) to Emergency Operations Centres as required.

c. Where possible Emergency Operation Centres to be co-located with NSW SES Incident Control Centres for Flood Emergency Response.

5.2.4 **Strategy**: Coordinate resources and logistics support to ensure operational effectiveness.

Actions:

a. The NSW SES Incident Controller will notify agencies of potential access issues between locations, for the consideration of pre-deploying of resources.

b. NSW SES may request resources and logistics support directly from a supporting emergency service or functional area.

c. Wherever possible, supporting organisations are to provide their own logistic support in consultation with NSW SES where appropriate.

d. The NSW SES Incident Controller will control air support operations and may utilise supporting agencies in the management of aircraft.

5.3 USE OF INFORMATION AND COLLECTION OF INTELLIGENCE

5.3.1 **Strategy**: Ensure flood information is effectively utilised, communicated and collected during and post a flood.

Actions:

a. Information relating to the consequences of flooding, response strategies, situational awareness and operational updates will be distributed by NSW SES to supporting emergency services and functional areas listed under this Plan.

b. All supporting emergency services and functional areas and City will accurately record and report information relevant to their activities and any real time flood information (including road closure information) to the NSW SES Incident Controller. This may be in the form of a combined Emergency Operations Centre (EOC) report, or direct from agencies where an EOC has not been established.

c. NSW SES may establish and operate a Joint Intelligence Unit to coordinate the collection, collation, interpretation, mapping, actioning and dissemination of information.

d. Reconnaissance, mapping, damage assessments, intelligence validation and post flood evaluation will be coordinated by NSW SES. This may occur post impact and continue into the recovery phase.

e. NSW SES may request Engineering to assist with the gathering of flood intelligence including (not limited to) maximum flood extents, peak flood heights, recording major flood damage at key high velocity locations and preparation of After-Flood Report.

5.3.2 **Strategy**: Ensure flood intelligence is incorporated into operational decision-making.

Action: NSW SES will use flood intelligence, official forecasts, warnings, and flood scenario products to undertake an assessment of the predicted impact of a flood and to inform operational decision-making.

5.4 PROVISION OF INFORMATION AND WARNINGS TO THE COMMUNITY

5.4.1 **Strategy**: Timely and effective warnings are distributed to the community.

Actions:

a. The Bureau issues public weather and flood warning products before and during a flood. These may include:

- Severe Thunderstorm Warnings – Detailed - issued for all capital cities and surrounding areas when individual severe thunderstorms are within range of the capital city radars.
- Severe Thunderstorm Warnings - Broad-based - issued for the entire Australian State or territories affected highlighting broad areas where severe storms may occur within the next 3 hours.
- Severe Weather Warnings with reference to heavy rainfall and/or storm surge.

- Flood Watches.
- Flood Warnings.

b. Citys, DPE, Water NSW and the BOM will use the established flash flood warning system for Coffs Harbour LGA to provide warnings and information to NSW SES, key stakeholders and the community. Data gathered from the flash flood and riverine warning system provides NSW SES and City of Coffs Harbour with procedure to estimate flood levels at:

    - Coffs Creek;
    - Newports Creek;
    - North Tributary Coffs Creek (Bray Street);
    - Boambee Creek;
    - Woolgoolga Creek;
    - Middle Creek (Sawtell);
    - Bonville Creek;
    - Corindi Creek;
    - Orara River.

c. Dam Owners will utilise the Dam Emergency Plan to provide warnings and information to NSW SES and communities (where appropriate).

d. NSW SES Incident Controllers will issue the following NSW SES Flood Warnings aligning to the Australian Warning System:

    - Advice;
    - Watch and Act; and
    - Emergency Warning.

e. NSW SES liaises with the Bureau to discuss the development of flood warnings as required.

f. NSW SES provides alerts and deliver flood information to affected communities using a combination of public information.

g. NSW SES may request supporting agencies redistribute NSW SES alerts and information, including through the provision of doorknocking teams.

h. Road closure information will be provided to the community through the following agencies/methods:

    - City of Coffs Harbour website.
    - Transport for NSW 'Live Traffic' website: www.livetraffic.com or 'Transport InfoLine': 131 500. VMS messaging on roadways may also be used to advise motorists.

i. The Public Information and Inquiry Centre will be established by NSW Police Force where required to provide information regarding evacuees and emergency information. Contact details will be broadcast once the centre is established.

j. The Disaster Welfare Assistance Line will be established by Disaster Welfare Services where required to provide information on welfare services and

assistance. Assistance line contact details will be broadcast once Disaster Welfare Services commence.

5.5 PROTECTION OF PROPERTY

5.5.1 **Strategy**: Coordinate the protection of property from destruction or damage arising from floods.

Action: NSW SES, supporting agencies, and community volunteers will assist the community (where resources are available, feasible and safe to do so) in:

a. The protection of properties including critical infrastructure through flood protection systems (e.g. sandbagging) to minimise entry of water into buildings.

b. The raising or moving of household furniture and commercial stock/equipment.

5.6 ROAD AND TRAFFIC CONTROL

5.6.1 **Strategy**: Coordinate the closing and re-opening of flood affected roads.

Actions:

a. City of Coffs Harbour will coordinate the closure and reopening of City managed roads once inspections have been carried out by the relevant authority.

b. Transport for NSW will coordinate the closure and reopening of the state road network.

c. NSW Police Force may close and re-open roads but will normally only do so (if the City of Coffs Harbour or Transport for NSW have not already acted and if public safety requires such action.

d. NSW SES will assist with erecting road closure signs and barriers when time and resources permit.

5.6.2 **Strategy**: Coordinate traffic control measures in flood affected areas.

a. The NSW SES Incident Controller may direct the imposition of traffic control measures into flood affected areas in accordance with the provisions of the *State Emergency Service Act, 1989* and the *State Emergency Rescue Management Act, 1989.*

b. The NSW SES Incident Controller may request the Local Emergency Operations Controller provide suitable personnel to assist with traffic coordination.

5.7 PROTECTION OF ESSENTIAL SERVICES

5.7.1 Arrangements for the protection of local assets are outlined in Volume 3 of this NSW SES local Flood Emergency Sub Plan. In addition, Local and Region EMPLAN's contain infrastructure inventories.

5.7.2 **Strategy**: Minimise disruption to the community by ensuring protection of infrastructure and supply of essential energy, utility services and lifelines.

Actions:

a. The Transport Services Functional Area is to coordinate the provision of information about the assessment and restoration of transport network infrastructure.

b. The Energy and Utility Services Functional Area is to coordinate the assessment and restoration of essential energy and utility services (not including telecommunications).

c. The Telecommunications Services Functional Area is to coordinate the assessment and restoration of telecommunications and the Public Safety Network.

d. The Engineering Services Functional Area is to:

- Coordinate the assessment and restoration of critical public buildings for example hospitals.
- Assessment and operation of flood protection levees.
- Protection of property.
- Construction and repair of levees.
- Dam safety assessment and dam stability.
- Water supply and sewerage operations.
- Other critical infrastructure.

e. The Functional Areas and City will keep NSW SES informed of the status of utilities and infrastructure.

5.8 EVACUATION

5.8.1 Evacuation is NSW SES's primary response strategy for managing the population at risk of flooding.

5.8.2 Community specific evacuation arrangements are located in Volume 3 of this Plan.

5.8.3 **Strategy**: Conduct planning to ensure all evacuation constraints are considered.

Actions:

a. Evacuations will take place when there is a risk to public safety. Circumstances may include:

- Evacuation of people when their homes or businesses are likely to flood.
- Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.
- Evacuation of people where essential energy and/or utility services are likely to fail or where buildings have been or may be made uninhabitable.

b. NSW SES will consider the following in evacuation decisions:

- Duration of evacuation.
- Characteristics of the community.

- Numbers requiring evacuation.
- Availability of evacuation routes and transport.
- The ability for existing levees or other flood protection works to fulfil their intended function.
- Time available for evacuation.
- Evacuee management requirements.
- Resources and delivery of evacuation information.
- Length of isolation.

c. NSW SES Incident Controllers, planning and intelligence officers will carefully consider the risks involved in conducting evacuations.

d. All evacuation decisions will be made as per the current NSW SES policies and procedures, and consistent with the NSW Evacuation Management Guidelines.

e. Potential Evacuation Centres are located in Volume 3 / Local EMPLAN.

f. NSW Police Force will coordinate the provision of overall security for evacuated areas.

5.8.4 **Strategy**: Evacuate people pre-emptively from dangerous or potentially dangerous places and or locations created by the flood hazard to safe locations away from the hazard.

a. NSW SES will control and coordinate the evacuation of affected communities.

b. The NSW SES Commissioner (or delegate) will warn communities to prepare for a possible evacuation, where circumstances allow such lead time.

c. The NSW SES Commissioner (or delegate) will order any necessary evacuations and provide information to the community about when and how to evacuate.

d. Support to evacuation operations may be requested from other emergency services and supporting agencies using arrangements in the local EMPLAN and supporting plans.

e. The Health Services Functional Area will coordinate the evacuation of hospitals, health centres and aged care facilities (including nursing homes) in consultation with NSW SES and Welfare Services.

f. School administration offices (Government and Private) will coordinate the evacuation of schools in consultation with NSW SES and Welfare Services, if not already closed.

g. Caravan Park proprietors will inform the NSW SES Incident Controller when caravan park evacuations have been completed.

h. People who are reluctant or refuse to comply with any Emergency Warning will be referred to NSW Police Force.

5.9 EVACUEE MANAGEMENT AND WELFARE

5.9.1 Research and experience in flood operations shows that most evacuees go to family, friends and commercial accommodation outside the impact area.

5.9.2 **Strategy**: Maintain the welfare of communities and individuals affected by the impact of a flood.

Actions:

a. NSW SES will provide initial welfare for evacuees where required but will hand the responsibility over to the Welfare Services Functional Area as soon as possible. NSW SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.

b. The Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the Welfare Services Functional Area Supporting Plan.

c. Schools Administration (Government and Private) will manage the safety of students directly affected by flooding and will work with NSW SES in the temporary closure of schools and will coordinate with NSW SES, Transport and Welfare Services in the management of school evacuees.

d. Disaster Victim Registration will be controlled and coordinated by NSW Police Force with the assistance of NSW SES and the Welfare Services Functional Area.

e. NSW SES will provide details of all residents assisted in evacuations to the Welfare Services Functional Area as early as possible.

f. Where the expected remaining number of evacuees and the duration of evacuation is assessed to be beyond the capability and capacity of the established evacuation centre arrangements the SEOCON may establish Major Evacuation Centres or Mass Care facilities.

g. The decision to establish Major Evacuation Centres or Mass Care Facilities will be made by NSW SES and SEOCON in consultation with members of the State Emergency Management Committee.

5.9.3 **Strategy**: Coordinate available and accessible health services for flood affected communities.

Action: The provision of environmental health advice, assessment of public health risks and coordination of immediate mental health support will be provided by the Health Services Functional Area.

5.9.4 **Strategy**: Maintain the welfare of animals impacted by a flood.

Actions:

a. The Agriculture and Animal Services Functional Area will coordinate the welfare of livestock, pets, companion animals and wildlife including support to primary producers, animal holding establishments and community members.

b. The Agriculture and Animal Services Functional Area role will coordinate the evacuation, emergency care of animals and assessment, humane destruction

and disposal of affected animals, and supply of emergency fodder, water and aerial support where necessary.

5.10 FLOOD RESCUE

5.10.1 **Strategy**: Control and coordinate flood rescue of people and domestic animals.

Actions:

a. NSW SES will perform flood rescue, where training and equipment is suitable and where a risk assessment has indicated that the risk to rescuers is acceptable.

b. Flood rescue operations will be conducted in accordance with the State Rescue Board NSW State Rescue Policy which sets out the framework, governance, responsibilities and requirements for the management and conduct of flood rescue in NSW.

c. NSW SES may request other supporting emergency services to undertake flood rescues on behalf of NSW SES. Agencies must be authorised/accredited to undertake flood rescue operations in accordance with State Rescue Board requirements, as prescribed by NSW SES. Supporting emergency services must supply information regarding rescues performed to NSW SES. Notification arrangements with NSW Police Force are outlined in the State Rescue Board NSW State Rescue Policy; and

d. Rescue agencies will conduct rescue of domestic small and large animals as per the State Rescue Board NSW State Rescue Policy (and may include Large Animal Rescue of family horses and cows at a residence or property). The rescue of livestock (which includes commercial animals found on farming and breeding enterprises) will be coordinated through the Animal and Agriculture Services Functional Area.

5.11 RESUPPLY

5.11.1 **Strategy**: Coordinate resupply to towns and villages isolated by flooding to minimise disruption to the community.

Actions:

a. NSW SES will advise communities and businesses if flood predictions indicate that areas are likely to become isolated, and indicative timeframes where possible.

b. Retailers should be advised to ensure sufficient stock is available for the duration of the flood.

c. When isolation occurs, NSW SES will establish loading points where retailers can instruct suppliers to deliver goods.

d. NSW SES will endeavour to support the delivery of mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

e. NSW SES will assist hospitals with resupply of linen and other consumables where able.

f. NSW SES may request resupply assistance from supporting agencies.

g. NSW SES may conduct resupply operations as per the designated resupply plan for the event.

h. Where additional supplies are required Engineering be requested to coordinate the supply of goods and services in response to and recovery from the emergency.

5.11.2 **Strategy**: Coordinate resupply to rural properties isolated by flooding.

Actions:

a. When requested, NSW SES will establish a resupply schedule and coordinate the resupply for isolated rural properties.

b. NSW SES will provide local suppliers with designated loading points. Resupply items are to be packaged by the supplier.

c. Isolated households unable to afford resupply items will be referred to the Welfare Services Functional Area for assistance.

5.12 RETURN

5.12.1 **Strategy**: Coordinate the safe return of communities to flood affected areas when the immediate danger to life and property has passed.

Actions:

a. The NSW SES Incident Controller will determine when it is safe to progressively return in consultation with the relevant Emergency Operations Controller and supporting agencies considering the ongoing risk to public safety.

b. The NSW SES Incident Controller will specify the level of access to affected communities as the following:

- Not suitable for access; or
- Limited access by emergency services and response agencies; or
- Limited access by residents and/or business operators; or
- Full access.

c. The NSW SES Incident Controller will issue an Advice Warning advising 'Reduced Threat: Return with Caution' when the immediate danger to life and property has passed for areas.

d. NSW SES will facilitate the return of evacuees to their homes.

5.13 END OF RESPONSE OPERATIONS

5.13.1 **Strategy**: Conclude response operations.

Actions:

a. Response operations will conclude when:

- There is a reduced likelihood of additional flooding within the Area of Operation and flood waters have receded.

- All requests for assistance related to the flood have been completed.
- The need for warning and evacuation no longer exist.
- There is no further likelihood of rescuing people.
- Resupply is no longer required (resupply operations may occur concurrently with the recovery phase).
- Response to fire and hazardous material incidents have concluded (not including subsequent clean-up of contaminated sites).
- All affected areas have had a 'Reduced Threat: Return with Caution' issued.

5.14 POST IMPACT ACTIONS

5.14.1 **Strategy**: Learnings from the event are used to inform recovery and future events.

Actions:

a. NSW SES will continue to engage with communities after significant floods through convening one or more community forums, workshops or other opportunities to provide communities a chance to provide feedback, address any concerns and provide input into the recovery process. These will typically include other agencies such as the Bureau, Welfare Services and City of Coffs Harbour representatives.

b. NSW SES will conduct After Action Reviews, at the conclusion of response operations, which will involve all stakeholders. Findings will be shared and incorporated into improved disaster resilience planning.

c. NSW SES will provide information and data throughout the emergency response to inform community recovery. A report will be developed at the request of the SERCON at the conclusion of the response within an area. Should a response summary report be required it will include the following:

   - The emergency action plan in place at conclusion of the response emphasising any continuing activities including community meetings/ engagement activities.
   - Resources allocated to the emergency response and associated exit strategies.
   - Details of any areas or situations with potential to re-escalate the emergency.
   - A recommendation for the conclusion of NSW SES as lead agency to transition to Resilience NSW as the lead agency for Recovery.
   - Any actions that are incomplete or outstanding.
   - Damage Assessment Data and Information obtained throughout the response phase which will further support the long-term recovery of communities.

d. NSW SES will undertake/coordinate a comprehensive review of intelligence and plans following significant flood events.

5.14.2 **Strategy:** Participate in post flood data collection analysis.

Actions: NSW SES works with relevant stakeholders and City of Coffs Harbour on post flood data collection analysis including review of flood intelligence where necessary.

6 RECOVERY OPERATIONS

6.1 INTRODUCTION

6.1.1 Recovery is the process of returning an affected community to its proper level of functioning after an emergency. It will generally commence simultaneously with the Response phase.

6.1.2 Recovery operations will be initiated and conducted as outlined in the NSW State EMPLAN and as further detailed in the NSW Recovery Supporting Plan.

6.2 NSW SES RECOVERY ROLE

6.2.1 **Strategy**: NSW SES will support recovery operations and established Recovery Committees.

6.2.2 **Actions**:

a. NSW SES will provide representation to Recovery Committees as required and may have an ongoing role in the Recovery phase.

b. NSW SES roles on Recovery Committees may include providing information about any continuing response, guidance on mitigation strategies and general advice and assistance to the committee as a subject matter specialist and or expert.

c. NSW SES will provide information to Resilience NSW to support applications to Treasury for Natural Disaster Relief and Recovery Arrangements.

d. NSW SES, in conjunction with a Recovery Committee, will provide a service to support the information needs of a community immediately following a flood.

e. NSW SES and where required supporting agencies will assist with clean-up operations after floods, where possible when resources and personnel permit.

f. NSW SES may coordinate immediate relief in collaboration with Resilience NSW.

7 ABBREVIATIONS

For a full list of abbreviations refer to the NSW State Flood Plan - Abbreviations

8 GLOSSARY

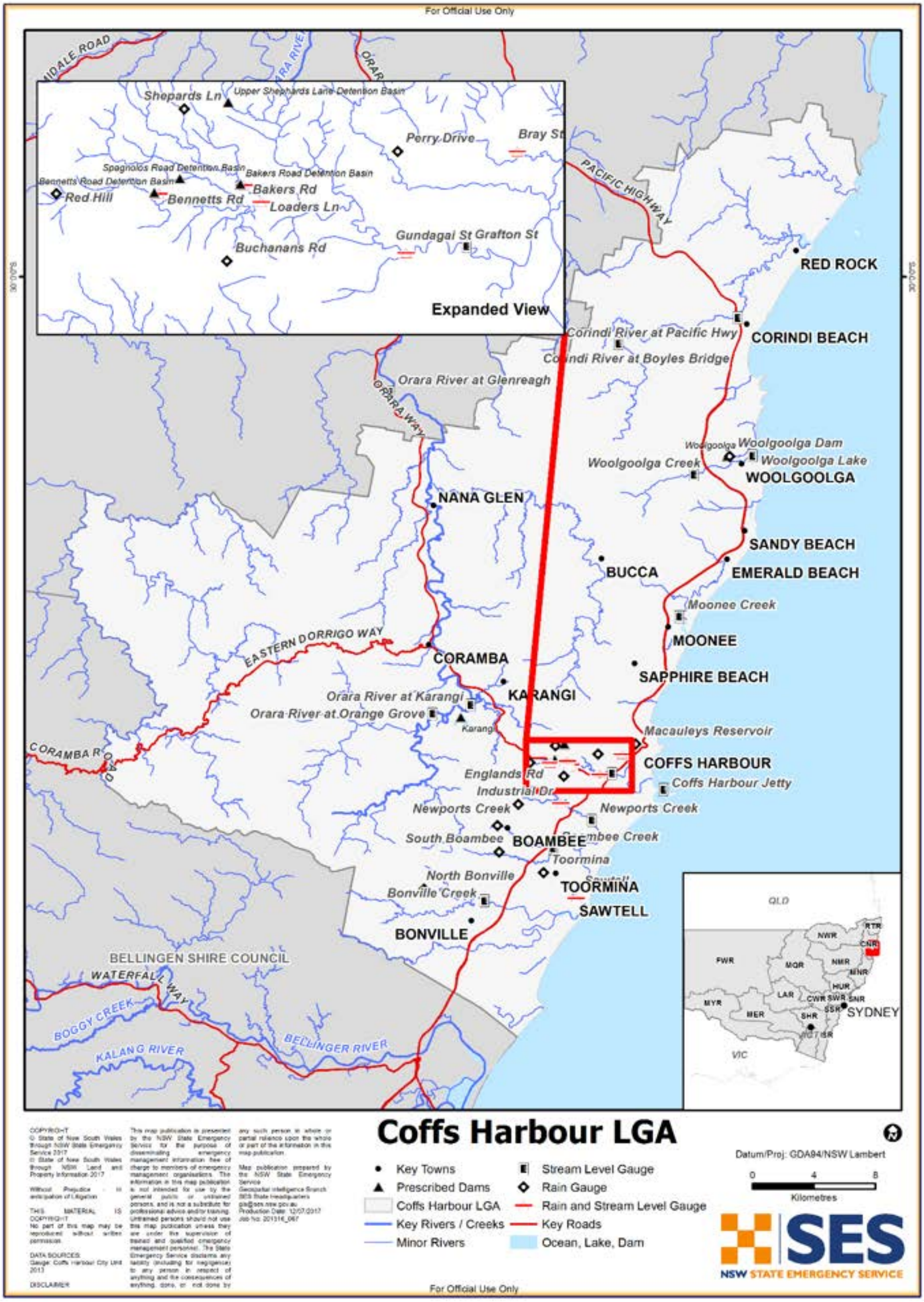
Common emergency service terminology can be found within the Australian Disaster Resilience Glossary.

Readers should refer to EMPLAN Annex 9 – Definitions.

Refer to the NSW State Flood Plan for a complete glossary of terminology used throughout this plan and within NSW SES Flood Plans.

For a full list of definitions refer to the Supporting Document - State Flood Plan Glossary https://www.ses.nsw.gov.au/media/2650/glossary.pdf

9 Appendix A – Map of Coffs Harbour LGA



10 Appendix B – Roles and Responsibilities

AGENCY	RESPONSIBILITIES
NSW State Emergency Service	NSW SES is the designated Combat Agency for floods, storms and tsunami and controls response operations. NSW SES roles and responsibilities in relation to floods are outlined in the NSW State Flood Plan.

AGENCY	RESPONSIBILITIES
Agriculture and Animal Services Functional Area	The roles and responsibilities for Agriculture and Animal Services are outlined in the Agriculture and Animal Services Supporting Plan and NSW State Flood Plan.
Australian Government Bureau of Meteorology	The roles and responsibilities for the Australian Government Bureau of Meteorology are outlined in the NSW State Flood Plan.
City of Coffs Harbour (Council)	**Preparedness** • Establish and maintain floodplain and coastal risk management committees and ensure that key agencies are represented. • Develop and implement floodplain risk management plans in accordance with the NSW Government's Flood Prone Land Policy and the Floodplain Development Manual. • Provide levee studies, flood studies and floodplain management studies to NSW SES. • Maintain Dam Emergency Plans for the City of Coffs Harbour dams and provide copies to NSW SES. • Provide information on the consequences of dam failure to NSW SES for incorporation into planning and flood intelligence. • Coordinate the development of warning services for catchments prone to flash flooding (small catchments), where appropriate. • Maintain City-owned flood warning networks and flood mitigation works. • Participate in NSW SES-led flood emergency planning meetings, to assist in the preparation of Flood Sub Plans. • Maintain a plant and equipment resource list for the City area. • Contribute to community engagement activities. **Response** • Subject to the availability of City resources, assist NSW SES with flood operations including: – Traffic management on City managed roads.

AGENCY	RESPONSIBILITIES
	– Provision of assistance to NSW SES (plant, equipment and personnel where able and requested). – Property protection tasks including sandbagging. – Assist with the removal of caravans from caravan parks. – Warning and/or evacuation of residents and other people in flood liable areas. – Provision of back-up radio communications. – Resupply of isolated properties. – Technical advice on the impacts of flooding. – Close and reopen City roads (and other roads nominated by agreement with Transport for NSW) and advise NSW SES, NSW Police Force and people who contact the City for road information. – Assist NSW SES to provide filled sandbags and filling facilities to residents and business in areas which flooding is expected. • Assist with making facilities available for domestic pets and companion animals of evacuees during evacuations. • Operate flash flood warning systems. • Operate flood mitigation works including critical structures such as detention basins and levees and advise NSW SES regarding their operation. • Manage and protect City-owned infrastructure facilities during floods. • Provide advice to NSW SES and the Health Services Functional Area during floods about key City managed infrastructure such as sewerage treatment and water supply. • Advise the Environmental Protection Authority of any sewerage overflow caused by flooding. • Work with NSW SES and NSW Department of Planning and Environment to collect flood related data during and after flood events. • **Lifeguard Services – (City of Coffs Harbour)** – Assist NSW SES with flood rescue operations, where training and equipment are suitable. **Recovery** • Provide for the management of health hazards associated with flooding including removing debris and waste. • Ensure premises are fit and safe for reoccupation and assess any need for demolition. • Provide services, assistance and advice to State Government in

AGENCY	RESPONSIBILITIES
	accordance with the State Recovery Plan.
Caravan Park Proprietor(s)	• Prepare a flood emergency plan for the Caravan Park. • Ensure that owners and occupiers of movable dwellings are aware that the caravan park is flood liable by providing a written notice to occupiers taking up residence and displaying this notice and emergency management arrangement within the park. • Ensure that owners and occupiers of movable dwellings are aware that if they are expecting to be absent for extended periods, they should: – Provide the manager of the caravan park with a contact address and telephone number in case of an emergency. – Leave any movable dwelling in a condition allowing it to be relocated in an emergency (i.e.: should ensure that the wheels, axles and draw bar of the caravans are not removed and are maintained in proper working order). • Ensure that occupiers are informed of Flood Information. At this time, occupiers should be advised to: – Ensure that they have spare batteries for their radios. – Listen to a local radio station for updated flood information. – Prepare for evacuation and movable dwelling (cabins) relocation. • Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation when flooding occurs. • Coordinate the evacuation of people and the relocation of movable dwellings when floods are rising and their return when flood waters have subsided. Movable dwellings will be relocated back to the caravan park(s) by owners or by vehicles and drivers arranged by the park managers. • Secure any movable dwellings that are not able to be relocated to prevent floatation. • Inform NSW SES of the progress of evacuation and/or movable dwellings relocation operations and of any need for assistance in the conduct of these tasks.
Childcare Centres and Preschools	• When notified of possible flooding or isolation, childcare centres and preschools should. – Liaise with NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures. – Assist with coordinating the evacuation of preschools and childcare

AGENCY	RESPONSIBILITIES
	centres.
Dams Safety NSW	The roles and responsibilities for Dams Safety NSW (formerly NSW Dam Safety Committee) are outlined in the NSW State Flood Plan.
Department of Defence	Arrangements for Defence Assistance to the Civil Community are detailed within the State EMPLAN (section 448).
Energy and Utilities Services Functional Area	The roles and responsibilities for Energy and Utilities Services are outlined in the Energy and Utility Services Supporting Plan (EUSPLAN). Roles and responsibilities in addition to the Supporting Plan are: • Assist NSW SES with identification of infrastructure at risk of flood damage where resources are available. • Facilitate local utility service distribution providers (electricity, gas, water, wastewater) to: – Provide advice to NSW SES of any need to disconnect power/gas/water/wastewater supplies or of any timetable for reconnection. – Advise NSW SES of any hazards from utility services during flooding and coastal erosion/inundation. – Advise the public with regard to electrical hazards during flooding and coastal erosion/inundation, and to the availability or otherwise of the electricity supply. – Clear or make safe any hazard caused by power lines or electricity distribution equipment. – Reconnect customers' electrical/ gas/ water/wastewater installations, when certified safe to do so and as conditions allow. – Assist NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
Engineering Services Functional Area	The roles and responsibilities for Engineering Services are outlined in the Engineering Services Supporting Plan and NSW State Flood Plan.
Environmental Services Functional Area	The roles and responsibilities for Environmental Services are outlined in the Environmental Services (ENVIROPLAN) Supporting Plan.
Floodplain Management Australia	The roles and responsibilities for Floodplain Management Australia are outlined in the NSW State Flood Plan.
Fire and Rescue NSW	The roles and responsibilities for Fire and Rescue NSW are outlined in the NSW State Flood Plan.
Forestry Corporation of NSW	The roles and responsibilities for Forestry Corporation of NSW are outlined in the NSW State Flood Plan.
Health Services Functional	The roles and responsibilities for Health Services are outlined in the

AGENCY	RESPONSIBILITIES
Area	Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
Local Emergency Operations Controller (LEOCON)	• Monitor flood operations. • If requested, coordinate support for the NSW SES Incident Controller.
Local Emergency Management Officer (LEMO)	• If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations.
Manly Hydraulics Laboratory (MHL)	The roles and responsibilities for Manly Hydraulic Laboratory are outlined in the NSW State Flood Plan.
Marine Rescue NSW	The roles and responsibilities for Marine Rescue NSW are outlined in the NSW State Flood Plan.
NSW Ambulance	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission	The roles and responsibilities for NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission are outlined in the NSW State Flood Plan.
NSW Department of Planning and Environment (Environment and Heritage Group)	The roles and responsibilities for NSW Department of Planning and Environment (Environment and Heritage Group) are outlined in the NSW State Flood Plan (referred to as DPIE EES).
NSW Department of Planning and Environment (Water)	The roles and responsibilities for NSW Department of Planning and Environment (Water) are outlined in the NSW State Flood Plan.
NSW Food Authority	The roles and responsibilities for NSW Food Authority are outlined in the Food Safety Emergency Sub Plan.
NSW National Parks and Wildlife Services	The roles and responsibilities for NSW National Parks and Wildlife Services are outlined in the NSW State Flood Plan.
NSW Police Force	The roles and responsibilities for NSW Police Force are outlined in the NSW State Flood Plan.
NSW Rural Fire Service	The roles and responsibilities for NSW Rural Fire Service are outlined in the NSW State Flood Plan.
Owners of Declared Dams within or upstream of the LGA	The roles and responsibilities for Owners of Declared Dams are outlined in the NSW State Flood Plan.
Public Information Services Functional Area	The roles and responsibilities for Public Information Services are outlined in the Public Information Services Supporting Plan and NSW State Flood. Plan**.**

AGENCY	RESPONSIBILITIES
Resilience NSW	The roles and responsibilities for Resilience NSW are outlined in the NSW State Flood Plan.
SEOCON/SEOC	The roles and responsibilities for the SEOCON/SEOC are outlined in the NSW State Flood Plan**.**
Surf Life Saving NSW	The roles and responsibilities for Surf Life Saving NSW are outlined in the NSW State Flood Plan.
Telecommunications Services Functional Area	The roles and responsibilities for Telecommunications Services are outlined in the Telecommunications Services (TELCOPLAN) Supporting Plan.
Transport for NSW	• Transport for NSW coordinates information on road conditions for emergency services access. • Transport for NSW coordinates the management of the road network across all modes of transport. • Transport for NSW in conjunction will assist NSW SES with the evacuation of at-risk communities by maintaining access and egress routes. • Assist NSW SES with the communication of flood warnings and information provision to the public through Live Traffic and Social Media according to the VMS protocols and procedures. • Assist NSW SES with identification of road infrastructure at risk of flooding.
Transport Services Functional Area	The roles and responsibilities for Transport Services are outlined in the Transport Services Functional Area Supporting Plan and NSW State Flood Plan.
VRA Rescue NSW	The roles and responsibilities for VRA Rescue NSW are outlined in the NSW State Flood Plan.
Water NSW	The roles and responsibilities for Water NSW are outlined in the NSW State Flood Plan.
Welfare Services Functional Area	The roles and responsibilities for Welfare Services are outlined in the Welfare Services Functional Area Supporting Plan and NSW State Flood Plan.

11 Appendix C – Community Specific Roles and Responsibilities

Community Members	**Preparedness** • Understand the potential risk and impact of flooding. • Prepare homes and property to reduce the impact of flooding. • Understand warnings and other triggers for action and the safest actions to take in a flood. • Households, institutions and businesses develop plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours. • Have an emergency kit. • Be involved in local emergency planning processes. **Recovery** • Assist with community clean-up if required and able to do so. • Participate in After Action Reviews if required.

NSW STATE EMERGENCY SERVICE

HAZARD AND RISK IN COFFS HARBOUR

Volume 2 of the City of Coffs Harbour Flood Emergency Sub Plan

Last Update: December 2023

FloodSafe

AUTHORISATION

The Hazard and Risk in the City of Coffs Harbour has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process. The information contained herein has been compiled from the latest available technical studies.

Approved

Signature _____

NSW SES Manager Emergency Planning / NSW SES Coordinator Planning

Print Name:

Date: 28/11/2023

Approved

Signature: _____

NSW SES North Eastern Deputy Zone Commander or Zone Commander

Print Name Superintendent Joanna Jones (DZC)

Date: 28/11/2023

Date Tabled at LEMC 05/12/2023

CONTENTS

LIST OF TABLES

LIST OF FIGURES

VERSION LIST

The following table lists all previously approved versions of this Volume.

Description	Date

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

Manager, Emergency Risk Manager

NSW State Emergency Service

PO Box 6126, Wollongong NSW 2500

nswses.communityplanning@ses.nsw.gov.au

Amendments promulgated in the amendments list below have been entered in this Volume.

Amendment Number	Description	Updated by	Date

Document Issue: Version 3-02052016

1 THE FLOOD AND COASTAL EROSION THREAT

1.1 OVERVIEW

a. Flooding within the City of Coffs Harbour area can occur from several short east-flowing coastal creeks, the upper reaches of the Orara River and its tributaries, and from some minor tributaries of the Nymboida River. There is also a risk of coastal inundation as a result of storm conditions. Most of the flooding in the eastern areas occurs with little warning time (less than 30 minutes) as the catchment is characterised as a flash flood environment, where the flooding occurs shortly after heavy rainfall. In most cases, episodes of flooding last for only a few hours, though on rare occasions they may last up to two days. Landforms and River Systems

1.2 LANDFORMS AND RIVER SYSTEMS

Coffs Harbour and Coastal Streams

a. Coastal Creeks (North and South Arrawarra, Woolgoolga, Double Crossing, Blackadder, Coffs, Newports, Cordwells, Boambee, Middle, Bonville, Pine, Bundageree, Moonee, and Corindi Creeks). These creeks are short and they each drain steep catchments of only a few square kilometres in size. They originate in the coastal range up to 12 kilometres (km) from the sea. Floodplain development is limited to the lower reaches, which are subject to tidal influence. The most significant of these creeks are:

   i. **Bonville Creek**, which has a catchment area of approximately 115 km^2, extending 16 km inland to Tuckers Nob State Forest and discharging into the ocean at Sawtell. The creek rises from sea level at Sawtell to a maximum elevation of 500 metres (m). Two major tributaries join Bonville Creek; Pine Creek from the south and Middle Creek from the north. The physical characteristics of the catchment vary from steep heavily vegetated slopes in the upper reaches, to lightly timbered areas in the middle and lower reaches. There is some rural and residential development on the lower slopes of the Bonville Creek catchment.

   ii. The Boambee, Cordwells and Newports Creek catchment is located between Sawtell and Coffs Harbour. It has a catchment area of approximately 49 km^2, extending 8 km from the coast with a floodplain approximately 3 km wide. The largest of the tributaries is Newports Creek, to the north, followed by Boambee Creek draining the middle portion of the catchment. It is predominantly open to the ocean and consequently has a wave dominated delta at the river mouth flanked by vegetation and swamp. Tidal influence extends to the west of the

Pacific Highway on Boambee (to the old concrete weir) and to the weir for Cordwells Creek.

iii. Coffs Creek Catchment, has a relatively small area of around 25km². The flat coastal floodplain rises steeply to an escarpment in the west. Elevations rapidly increase from below 10m AHD to more than 400m AHD over just a few kilometres. The Coffs Creek estuary forms the downstream limit of the catchment. The catchment is bound to the north by densely vegetated ranges of state forest and national parkland. Much of the low lying floodplain area is urban development, consisting of residential, commercial and industrial properties. The upper catchment is primarily used for agriculture and horticulture purposes (1). Floodplain development begins as the creek enters the town of Coffs Harbour in the vicinity of Shephards Lane. Within the town, the creek is crossed by three bridges and some other minor structures. One of which is the Pacific Highway which cuts across the catchment and provides a clear divide between the creek and estuary. Many tightly meandering, vegetated tributaries drain through the catchment upstream of the highway, before merging into a wider and clearer channel flowing into the ocean. The North Coast Rail crosses Coffs Creek near the ocean mouth, before heading to the west adjacent to the northern catchment boundary. Located between the railway line and the beach is the suburb of Coffs Harbour known as Park Beach. The Park Beach area is very flat with poor drainage. Due to the basin-like topography in Park Beach, the area will fill with floodwater during periods of high rainfall. The majority of the area drains to the west across the North Coast Railway line through a system of culverts. However, the northern most sub-catchment known as Macauleys Headland drains east to the beach, and the southern sub-catchments, including the Park Beach Caravan Park, discharge to the south directly into Coffs Creek. The Coffs Creek Catchment is comprised of three major systems:

- Bray street tributary which has a catchment area of 2.8 km^2.
- Argyll street tributary which has a catchment area of 2.5 km^2.
- Park Beach area which has a catchment area of 2.5 km^2.

The topography of the Coffs Creek catchment is conducive to extreme weather events. During the formation of a low pressure system off the coast known as an east coast low (ECL), the steep terrain located very close to the coastline is exposed. In the presence of strong onshore wind, moisture filled air masses are pushed towards the hills, where they rapidly rise facilitating intense rainfall over the upper catchment. The phenomenon of increased rainfall across the upper catchment was found to be consistent across a number of historic rainfall events. The Coffs Creek catchment is prone to severe flash flooding as it

is a relatively small catchment with steep upper slopes, a high level of urban development on the floodplain and the tendency for high rainfall (2).

iv. Moonee Creek has a catchment area of 32.59 km2, extending from the Pacific Ocean to the mountain ranges approximately 5 km to the west. The upper reaches of the catchment are relatively steep and rugged while the middle and lower reaches are located on a gently undulating to flat coastal plain. The vegetation of the catchment consists of hardwood forests, rainforest, banana plantations and cleared grazing, agricultural and rural – residential land with hardwood forest and mangroves on Moonee Beach Nature Reserve. The catchment area comprises four major sub catchments:

- Upper Moonee Creek which has a catchment area 19.21 km2.
- Sugarmill Creek which has a catchment area of 9.4 km2
- Skinners Creek which has a catchment area 6.73 km2.
- Cunningham Creek which has a catchment area 4.39 km2.
- Tidal reaches of Moonee Creek which has a catchment area 2.2 km2.

v. Woolgoolga Lake is a tidal lake located approximately 20 km north of Coffs Harbour. The main tributaries are the Woolgoolga, Jarrett and Poundyard Creeks, which are the main source of flooding. It is an intermittently closed and open lagoon (ICOLL) located behind the coastal dune system. The catchment encompasses approximately 22 km2, grading steeply from the upper slopes to the floodplain areas of Woolgoolga Creek. Sediments build up during heavy seas to close the entrance to the ocean, which is re-opened during rainfall events. If the entrance does not open at 1.8m AHD, Council may initiate artificial opening (3).

vi. Corindi River is located approximately 35 km north of Coffs Harbour. The Corindi River is the largest coastal catchment in the City of Coffs Harbour Local Government Area at approximately 147.4 km2. Corindi River is a wave dominated barrier estuary with an open entrance. The upper Corindi River catchment has a relative steep terrain, and the lower part of the catchment is considerably flat. The channel in the upper reaches is mostly confined between steep banks, and flows into a wide extensive floodplain. Blackadder Creek, Cassons Creek and Saltwater Creek are the main tributaries of the Corindi River joining the main river downstream of the new highway. The villages and localities are Corindi Beach and Red Rock (4).

Clarence Valley

b. Upper Orara River. The Orara River drains a long, narrow valley west of the coastal range, forming part of the Clarence River catchment. It flows generally in a north westerly direction. Tributaries in the upper reaches include Urumbilum River and the

Mirim, Fridays, Nana, Coldwater, Kings, Finberg, Walgarah, Kalbury, Wongiwomble and Bucca Bucca Creeks. The catchment area is forested except for the villages of Karangi, Coramba and Nana Glen and agricultural areas which are located on the small floodplains along the river. Floods on the Orara River take longer to rise than those on the eastward-flowing creeks, however many houses can be inundated and isolated (5).

c. Nymboida River Tributaries. The Little Nymboida River and Bobo Creek rise within the Coffs Harbour City Council area to the west and flow to the Nymboida River. These streams drain rugged, dissected and forested country with no significant floodplain development.

1.3 STORAGE DAMS

a. The dams within the LGA are:

   i. Karangi Dam; and

   ii. Woolgoolga Dam.

b. There are also a number of detention basins throughout the LGA listed in Section 1.3.

KARANGI DAM

c. The Karangi Dam is an off stream storage dam located 9.2 km west of Coffs Harbour. It draws water by pumping from a natural pond (Cochranes Pool) on the Orara River and has a link to Nymboida River by an underground pipe. The pumping is regulated by the Coffs Harbour City Council dependent on the flows of the rivers (6). A current Dam Safety Emergency Plan (DSEP) exists for this dam, which will be referred to in the event of dam failure emergencies.

d. Failure may occur as a consequence of extreme flood levels overtopping the embankment, or 'sunny day' failure as a consequence of rapidly deteriorating structural deficiency, earthquake or internal erosion. Up to 101 houses may be at risk of dam failure in conjunction with a probable maximum flood (PMF).

e. Details of the dam are summarised in Table 1.

Table 1: Prescribed Dams in Coffs Harbour LGA; summary of information about Karangi Dam

Karangi Dam	
Owner / Operator	Coffs Harbour City Council
Description of Dam	Earthfill embankment dam with zoned rock fill on top. The spillway is designed to withstand a PMF inflow (5 hours at 90m3/s). It has a storage capacity of 5600ML with a crest height of RL 146mAHD.
Location	Off stream storage, 9.2km west of Coffs Harbour. 153°01'46"E, 30°15'40"S

Communities Downstream	The principal impacts resulting from Dam failure are the following: **Sunny day failure** • The Sunny Day Failure will overtop Upper Orara Road immediately downstream of the dam wall. • Rail Services would not be affected. • Coramba Road would be overtopped at Poperaperan Creek, with properties in the immediate area along Poperanean Creek affected by backwater from the Orara River. • 3 premises would experience over floor flooding. **1 % AEP flood** • Extensive flooding through the catchment would occur. • The 1 % AEP Failure will overtop Upper Orara Road immediately downstream of the dam wall. • Rail Services would be Halted due to significant inundation (>1 m) of the rail tracks. • Road Access to the Dam would be cut by inundation of Upper Orara Road over Wongiwomble Creek. • Coramba Road would be overtopped at Poperaperan Creek, with properties in the immediate area along Poperanean Creek affected by backwater from the Orara River. • Access to/from Coramba will be cut-off by rising flood waters along Orara Way to the north and south of the town. • Access to/from Nana Glen will be cut-off by rising flood waters along Orara Way to the south of Town, Grafton Street to the west of the town, Bucca Road to the East of Town and Morrows Road to the north of Town. • 42 premises would experience over floor flooding. **PMF Flood** • Extensive Flooding throughout the catchment would occur. • The PMF Failure will overtop Upper Orara Road immediately downstream of the dam wall. • Road Access to Karangi Dam would be cut-off by significant inundation of to all roads leading to the Dam. • Major roads leading to/from townships of Karangi, Coramba and Nana Glen would be cutoff by rising flood waters at multiple locations. • Rail Services would be halted due to significant inundation (>1 m) over the rail tracks. • Road Access to the Dam would be cut by inundation of Upper Orara Road over Wongiwomble Creek. • 119 premises would experience over floor flooding. Population at risk (PAR) 317
Monitoring System	Monitoring instruments are monitored electric and hydraulic piezometers and seepage monitoring, ultrasonic level sensor linked to the local telemetry system.
Warning System	The warning system is limited to notification of NSW SES and evacuation as required.
Other	The flood wave is expected to reach Glenreagh Road Bridge in 2 hours and 10 minutes for a PMF failure and 3 hours for a Sunny Day failure.
White Alert	Storage at RL 144.60 m AHD (600 mm above spillway). Outflow 12.6m3/s and warning time between alert under PMF case ***126 minutes from start of storm to alert level.***
Amber Alert	Storage at RL 145.20 m AHD (1200 mm above spillway). Outflow 30.9m3/s and warning time between alert under PMF case 71minutes from white alert to Amber alert so at an estimated ***197 minutes.***

	Cracks, gradual increase in seepage, major leakage from outlet pipes, erosion tunnelling on embankments, jamming or rupture of outlet valves, breakage of control rods, failure to seal
Red Alert	Storage at RL 145.60 m AHD (0.2m below embankment crest level; 1800 mm above spillway crest). ***Estimated 270 minutes.***

WOOLGOOLGA DAM

f. The Woolgoolga Dam is an off stream storage dam located 1.5 km northwest of Woolgoolga. The dam is filled by gravity from a pipe head weir on Woolgoolga Creek and /or pumped from the mains system. The Dam was constructed by the Public Works Department in 1967 (7). It was taken out of active service in 1986, but remains for emergency use in droughts. A current DSEP exists for this dam, which will be referred to in the event of dam failure emergencies.

g. Failure may occur as a consequence of extreme flood levels overtopping the embankment, or 'sunny day' failure as a consequence of rapidly deteriorating structural deficiency, earthquake or internal erosion. Two properties were identified at risk, with an additional three requiring advice that flood water may encroach their land. There are no lives expected to be at risk (7).

h. Details of the dam are summarised in Table 2.

Table 2: Prescribed Dams in Coffs Harbour LGA; summary of information about Karangi Dam.

Woolgoolga Dam	
Owner / Operator	• Coffs Harbour City Council
Description of Dam	• Crest level is 18.9m, which equates to an imminent failure flood • Spillway is at 17.7m AHD (7)
Location	• Off stream storage dam located 1.5km northwest of Woolgoolga. Access to the dam is via Newmans Road.
Communities Downstream	The principal impacts resulting from Dam failure are the following: Sunny day failure • The Sunny Day Failure will overtop Solitary Islands Way immediately downstream of the dam wall and a portion of Lake Road along the beachfront. Flood depths of 0.5m and 0.27m are noted over the road formations of Solitary Islands Way and Lake Road respectively. • Portions of the Sunset Caravan Park will become flooded by up to 0.5m along the frontage to Woolgoolga Lake • Portions of the sports fields near the Woolgoolga Tennis Courts will become flooded, however the depth of flooding will be less than 0.3 m. • A few other premises will experience flooding less than 0.3 m deep at the following locations: – Western Cul-de-sac of Melaluca Avenue – Properties in the low lying area between Ganderton Street and Wharf Street, north of Beach Street – Properties in the low lying area between Bultitude Street and Boundary Street, north of Beach Street. 1 % AEP flood dambreak affected zone

	• The 1% AEP flood with Dam failure will overtop Solitary Islands Way immediately downstream of the dam wall and Lake Road along the beachfront. • Buildings located at Nos 1, 3, 5, 9, 15, 23, 25, 27, 33, 37, 37, 39, 43, 45, 47, 49, 51, 51A, 53, 53A, 55, 52, 54, 56, 58B and 60 Melaleuca Avenue, together with houses located on Clear Place and Pandanus Place will potentially be flooded to a depth greater than 300 mm than the depth without dambreak. • Woolgoolga Lakeside Holiday Park will be inundated to a depth greater than 300 mm more than the depth without dambreak. • Generally, low lying areas south of Melaluca Avenue along Poundyard Creek and Jarret Creeks will become inundated, however the additional flooding due to the dambreak event will be less than 0.3m deeper than without the dambreak event PMF flood dambreak affected zone • Extensive flooding in the catchment downstream of Woolgoolga Dam will occur for the natural PMF flood without dambreak, however the increased flooding due to dambreak is generally less than 300 mm greater than the natural flood depths. • The PMF dam failure event will result in increased flood depths greater than 300 mm compared to the non-dambreak PMF event for Solitary Islands Way immediately downstream of the dam wall.
Monitoring System	• Piezometers and seepage collection pit are installed for dam monitoring. • There is no dam site operator. Woolgoolga Dam does not presently have any automatic monitoring instrumentation installed at the dam, apart from a dam reservoir level monitor that is connected to SCADA. Results from monitoring instrumentation (e.g., seepage) are recorded manually during inspections.
Warning System	• The warning system is limited to notification of NSW SES and evacuation as required. No other warning system has been identified.
Other	• Flood wave travel time to the Pacific Highway is estimated to be 5 minutes.
White Alert	• RL 18.2m AHD storage • Minimum time to reach alert level of 30 minutes. >RL 18.2 m (<1:100 AEP flood, outflow ~0.1 m3/s) • (115 min from start of storm to White Alert for PMF) • (<1:100 AEP)
Amber Alert	• RL 18.4m storage; • Minor explosion with visible damage not enough to cause imminent failure. • Minimum time to reach alert level of 1 hour. >RL 18.4 m (~1:300 AEP flood, outflow ~0.4 m3/s • (26 min from White alert to Amber alert in PMF) • (1:300 AEP approx)
Red Alert	• RL 18.7m storage; • MM IV earthquake; • Major explosion with imminent or probable failure. • Minimum time to reach alert level of 1 hour 35 minutes. >RL 18.7 m (~1:3,000 AEP, outflow ~0.6m3/s • (45 min from Amber alert to Red alert in PMF) • (1:3,000 AEP approx)

DETENTION BASINS

i. flooding arising from storms. Details of the basins are summarised in the following tables.

Table 3: Prescribed Dams in Coffs Harbour LGA; summary of information about Bakers Road Detention Basin

Bakers Road Detention Basin	
Owner / Operator	Coffs Harbour City Council
Description of Dam	Dry detention basin to reduce flooding of Coffs CBD during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters. The design 100% full level is RL 17.1m AHD (5.6m Gauge Height 559055). Water starts to overflow into the outlet structure at this level. The embankment crest (spillway) is at a height of 17.6m AHD (6.1m Gauge Height) The dam storage volume at FSL is 240 ML. Design outflow (100 year ARI) is 22.58m^3/s and inflow is 47.04m^3/s. High C consequence dam.
Location	Coffs Creek, Bakers Road, 5km upstream of Coffs Harbour CBD
Communities Downstream	Consequences of failure under a; -1% AEP storm event: 545 houses flooded (454 of which would have been flooded without dam break). This equates to a population at risk of 1526. -PMF scenario: 1307 houses flooded (1300 of which would have already been flooded in a PMF, therefore incrementally 7). This equates to approximately 3660 persons at risk. Loss of life is possible. Flood inundation maps for each scenario are supplied in the Dam Safety Emergency Plan.
Monitoring System	Water level telemetry is installed at Bakers Creek Detention Basin and is monitored by the City of Coffs Harbour. Bakers Road Detention Basin gauge 559055.
Warning System	Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council's flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Local Flood Plan.
Other	The flood wave is expected to Shephards Road in 11 and 8 mins in a 1% AEP storm and PMF event respectively. During flooding, alternate access is available only via helicopter.
White Alert	White alert is activated at 17.1m. This is approximate to a 1% AEP flood. It is expected that it will take 7 mins in a PMF to reach Red Alert.
Amber Alert	Not identified.
Red Alert	Red alert is activated at 17.5m. This is identified as the low point where spilling commences. It is estimated that it will take 40 mins from red alert to failure in a PMF.

Table 4: Prescribed Dams in Coffs Harbour LGA; summary of information about Bennetts Road Detention Basin.

Bennetts Road Detention Basin	
Owner / Operator	Coffs Harbour City Council

Description of Dam	Dry detention basin to reduce flooding of Coffs CBD during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters. The design 100% full level is RL 28.5m AHD (7.5m Gauge Height). The embankment crest (spillway) starts to overflow at this level. The dam capacity is 182 783m^3. The dam capacity is 182 783m^3. Design outflow (1% AEP) is 31.54m^3/s and inflow is 57.44m^3/s. High B consequence dam.
Location	Bennetts Road to the West of Coffs Harbour CBD
Communities Downstream	Consequences of failure under a; -PMF scenario: 225 houses affected (88 of which would have already been flooded in a PMF). This equates to approximately 518 persons at risk. Potential loss of life is estimated to be 2.2.
Monitoring System	Water level telemetry is installed at Bennetts Road Detention Basin and is monitored by the City of Coffs Harbour (Bennets Road detention Basin gauge 559063)
Warning System	Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council's flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Local Flood Plan.
Other	The flood wave is expected to reach the first affected dwelling in 30 mins in a PMF event. If Bennetts Road or Coramba Road are flooded, alternate access is available only via helicopter.
White Alert	White alert is activated at 28.2m. This is approximate to a 1% AEP flood. It is expected that it will take 3 mins in a PMF to reach Red Alert.
Amber Alert	Not identified
Red Alert	Red alert is activated at 28.5m. This is identified as the low point where spilling commences. It is estimated that it will take 45 mins from red alert to failure in a PMF.

Table 5: Prescribed Dams in Coffs Harbour LGA; summary of information about Spagnolos Road Detention Basin.

Spagnolos Road Detention Basin	
Owner / Operator	Coffs Harbour City Council
Description of Dam	Dry detention basin intended to reduce flooding of Coffs Harbour Central Business area during a 1% AEP storm event. Homogenous embankment, dry detention basin. Height 5.5m Length of embankment crest 340 m Lowest embankment crest level RL 23.4 mAHD Fully Supply Level (FSL) RL 23.4 mAHD Design flood level (100year ARI) RL 23.25 mHD Probable Maximum Flood (PMF) level RL 24.21 mAHD Storage Volume at FSL 200,000m3 Catchment area 1.2Km2 Spillway type: Uncontrolled overflow spillway located near the left abutment of the dam. Spillway length 70 m Spillway level (lowest point) RL 23.4 m AHD

<table>
<tr><td>Location</td><td>Spagnolos road detention basin is located some 3.5km North West of Coffs Harbour City Centre. Located immediately west of the intersection of Spagnolos and Roselands road.</td></tr>
<tr><td>Communities Downstream</td><td>Consequences of Dam Failure (PMF)
Population at Risk (PAR)- Total 280 (assuming 4 persons per dwelling)
Population at Risk (PAR) – Incremental 20
Positional number of houses affected – Total 70
Design flood outflow (100 Year ARI) 12m3/s
Consequence Category High A
The number of houses inundated by the PMF Dambreak is estimated at 80 to Sheppard lane.
<table>
<tr><th>LOCATION</th><th>CHAINAGE D/S OF THE BASIN (KM)</th><th>MAX DEPT OF INUNDATION (M)</th><th>START OF INUNDATION (HRS:MIN)</th><th>END OF INUNDATION (HRS:MIN)</th></tr>
<tr><td>Storage</td><td>1249</td><td>N/A</td><td>0:00</td><td>6:00</td></tr>
<tr><td>d/s Spagnolos Rd</td><td>1104</td><td>0.85</td><td>1:25</td><td>4:00</td></tr>
<tr><td>Roseland Dr</td><td>1057</td><td>0.22</td><td>1:36</td><td>2:10</td></tr>
<tr><td>Leander Cl</td><td>959</td><td>0.28</td><td>1:38</td><td>2:02</td></tr>
<tr><td>Rosalee Cl</td><td>826</td><td>0.71</td><td>1.21</td><td>2:45</td></tr>
<tr><td>Cardinia Cl</td><td>776</td><td>1.62</td><td>0:17</td><td>4:50</td></tr>
<tr><td>Bakers Cl</td><td>552</td><td>0.75</td><td>0:58</td><td>2:40</td></tr>
</table></td></tr>
<tr><td>Monitoring System</td><td>Water level telemetry is installed at Spagnolos Road Detention Basin and is monitored by the City of Coffs Harbour</td></tr>
<tr><td>Warning System</td><td>Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council’s flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Local Flood Plan.</td></tr>
<tr><td>Other</td><td>The flood wave is expected to Shepherds Lane in 11 and 8 mins in a 1% AEP storm and PMF event respectively.
During flooding, alternate access is available only via helicopter. Suitable areas for landing a helicopter will be the high ground immediately north of the storage.</td></tr>
<tr><td>White Alert</td><td>White Alert - Set at 23.25m AHD. The level is set as FSL, just below the estimated flood magnitude of 1:100 ARI.</td></tr>
<tr><td>Amber Alert</td><td>Not identified.</td></tr>
<tr><td>Red Alert</td><td>Red alert is activated at 23.40. This is identified as the low point where spilling commences. It is estimated that it will take 40 mins from red alert to failure in a PMF.</td></tr>
</table>

Table 6: Prescribed Dams in Coffs Harbour LGA; summary of information about Kathleen Drive Corindi Dam. (8)

Stage 3 Dam – Kathleen Drive Corindi	
Owner / Operator	Vitalharvest Pty Ltd – Operator is Costa Group Holdings
Description of Dam	Irrigation water storage Zoned earthen embankment construction with riprap wave protection. Filter bed and shear key included in downslope batter. Spillway consisting of a 60m wide concrete sill and reno-mattress drop into grassed spillway. Maximum wall height 9.5m, length 650m

	Maximum storage 900ML at a TWL of 99m AHD. Wall crest 100.45m AHD Spillway crest 99.1m AHD Spillway capacity 185m3/s (PMF capacity) Seepage flows discharge to monitoring point below dam.
Location	Off Kathleen Drive or Ridge Road, Upper Corindi/Dirty Creek. 40km north of Coffs Harbour
Communities Downstream	The impacts of a dam break scenario are most significant immediately downstream of the dam: • Horticultural areas exist for 2500m downstream of the Stage 3 dam. The low-lying areas of these farms would be most at risk during a dam break scenario, see Figure 6. These areas have the potential to contain itinerant workers (picking/pruning) as well as regular staff managing irrigation, canopy training, weed control etc. • Although not explicitly estimated in the Dam Break Study the travel time for the flood wave over the first 2500m downstream of the dam would be a matter of minutes. • A large, shallow water body exists 2500m downstream of the Stage 3 dam. This would have an attenuating effect on a flood wave resulting from dam failure. Dwellings in this vicinity are located on higher ground and were found to be outside the inundation zone. • At a distance of 4800m downstream of the Stage 3 dam the floodplain of Dundoo Creek widens significantly at the confluence with Palm Creek and hence the impacts of the dam break flood wave are predicted to be negligible.
Monitoring System	Seepage monitoring point below the dam
Warning System	Dam owner to advise SES and SES to use AWS to warn the public
Other	Although not explicitly estimated in the Dam Break Study the travel time for the flood wave over the first 2500m downstream of the dam would be a matter of minutes. A large, shallow water body exists 2500m downstream of the Stage 3 dam. This would have an attenuating effect on a flood wave resulting from dam failure. Dwellings in this vicinity are located on higher ground and were found to be outside the inundation zone.
White Alert	Flood level in dam 99.4m RL or; Structural defect with potential risk of dam failure if not repaired
Amber Alert	Flood level in dam 99.8m RL or; Structural defect posing risk of dam failure if not repaired
Red Alert	Flood level in dam 100m RL or; Structural defect posing imminent threat of dam failure

Table 7: Prescribed Dams in Coffs Harbour LGA; summary of information about Upper Shephards Lane Detention Basin. (9)

Upper Shephards Lane Detention Basin	
Owner / Operator	Coffs Harbour City Council
Description of Dam	Dry detention basin to reduce flooding of Coffs CBD during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters. Lowest embankment crest level RL 43.30 mAHD

	Design flood level (1% AEP) RL 42.10 mAHD Probable Maximum Flood (PMF) level RL 43.5 mAHD Minimum freeboard 1m Storage volume at Design Flood Level 100 ML 19.2 m3/s for the 1in 100 AEP High C consequence dam.
Location	Corner of Coffs and Castle Street, Coffs Harbour, NSW, 2450. Easting 508485, Northing 6650594
Communities Downstream	Population at Risk (PAR) – Total 327 Population at Risk (PAR) - Incremental 207 Potential number of houses affected - Total 142 Design flood outflow (1 in 100 AEP) 19.2 m3/s
Monitoring System	Water level telemetry is installed at Bakers Creek Detention Basin and is monitored by the City of Coffs Harbour
Warning System	• Water level and flow gauges: New standalone water level/flow gauges • Telemetry equipment: Comprises of a measurement and control unit, communications equipment and power supply. • Rainfall gauging station
Other	Time of start of storm to start of dam breach. = 1 hr 45 mins Further details are available in the DEP Table 4-3 describing each lot and DP.
White Alert	Set at FSL of RL 42.1m AHD. The level is at the estimated flood magnitude of 1 in 100 AEP.
Amber Alert	Not identified.
Red Alert	Set at FSL of RL 43.2m AHD. This level was considered appropriate as it is the low point of the road embankment where spilling commences. 100mm below initial breaching of dam.

j. Maclean Street Detention Basin is located to the South of Grafton Street. Overtopping occurs around 5.14 m at Coffs Creek (Highway Bridge) (which occurred in 2009), with minor inundation occurring to the adjacent oval only (10). No further detail is available at this time.

k. Marcia Street/Ann Street Detention Basin is located to the west of Marcia Street and was completed to reduce flood impacts of floods below the 1% Annual Exceedance Probability (AEP). No further detail is available at this time.

1.4 WEATHER SYSTEMS AND FLOODING

a. The average annual rainfall at Coffs Harbour is about 1565 mm and 1400mm at Woolgoolga. Flooding results from heavy short-term precipitation. Rainfall exceeding 200 mm in a 24-hour period is not uncommon and falls of more than 400 mm over such periods have occurred in the council area. The orographic influence of the Coast Range is strong and falls are usually higher in the elevated areas than along the coast. Dorrigo, in the neighbouring Bellingen Council area, has recorded 809 mm in a 24-hour period (11; 12).

b. The heavy rain which produces flooding usually comes from cyclonic depressions, east coast lows or thunderstorms. Some of the principal flood-producing weather mechanisms are (11):

   i. Ex-tropical cyclones migrating southwards during the summer and autumn months. Significant flooding occurred in 1963 and 1974 as a result of the `tails' of deep depressions passing near Coffs Harbour. Such depressions may produce storms lasting for up to 36 hours and producing several short bursts of heavy rain. They may also cause storm surge conditions.

   ii. East Coast low-pressure systems can occur throughout the year, but are most common between the autumn and winter months. They travel slowly along the coast, creating heavy rain over the coastal strip and nearby upland country. The flood of November 1996 and 2009 were the result of such a weather event. These systems may also produce storm surges as occurred in 1996.

   iii. High-intensity, short-duration convective thunderstorms. These storms are concentrated in the summer months and can cause flooding very quickly after passing. Their impacts are most apparent on the short coastal creeks and in town drainage systems which may surcharge soon after heavy rain. The weather event that produced the flood of 1996 and in Corindi 2021 both incorporated thunderstorm activity.

c. Floods can occur at any time of year, but there is a distinct wet season between November and July and most flooding occurs in this period. The period of highest rainfall at Coffs Harbour itself is in March and April and the most serious floods there and on Middle Creek at Sawtell appear to have occurred in March, April and May.

1.5 CHARACTERISTICS OF FLOODING

a. Coffs Creek catchment, and the coastal creeks in the LGA including Middle Creek and Newports Creek, are “flash flood” and heavily influenced by tidal fluctuations. Therefore, an effective response to flash flood will need to start before heavy rain has commenced. Coffs Creek is tidal to just upstream of the Pacific Highway. Flood events can occur on individual creek systems, without affecting the other creek systems. Examples of this include; the 1996 flooding which mostly occurred in the Coffs Creek catchment, without much flooding in the Boambee valley, in 2021 the event only affected Corindi and Arrawarra.

b. In addition to creek and riverine flooding, raised sea levels as a result of storm surge conditions could cause flooding of low-lying areas along the coast and impede drainage from the creeks. In a 5% AEP storm event, sea levels could rise to 2.2 m AHD; in a 1% AEP storm event they could rise to 2.6 m AHD (11).

c. In the Upper Orara River, in the 20% and 5% AEP floods (estimated between 6 and 7.5 m at Karangi), flood water is expected to inundate a number of key structures and bridges and isolate a few properties; however, the majority of Nana Glen, Coramba and Karangi would largely be unaffected by flood waters. Flood velocities are expected to be generally below 2m/s, except in steep confined creeks where the velocities will exceed this threshold. In the 1% AEP (estimated between 8 and 9 m at Karangi) widespread flooding is expected, inundating properties along Thrower Avenue and in the vicinity of Star Creek Road in Coramba. Flooding is also expected along Weir Street and Morrows Road in Nana Glen and low lying properties along Brewers Road. A large number of properties are expected to be isolated.

Table 8: Gauge design flood heights (m relative to gauge height) (2) (13) (14) (11)and Council Operational Trigger Heights

Gauge	Council Operational Trigger		Min	Mod	Maj	5% AEP	1% AEP	0.5% AEP	PMF
Coffs Creek (Highway Bridge) (0)			3.0	-	4.7	4.4	4.9	5.1	6.7
Gundagai Street (1.5m) (Coffs Creek)	3.3		-	-	-	4.7	4.3	5.4	6.8
Loaders Lane (10m) (Coffs Creek)	3.0		-	-	-	3.8	4.0	4.4	5.5
Bray Street (3.5m) (Coffs Creek)	1.8		-	-	-	3.5	3.6	3.6	4.2
Bennetts Road Detention Basin (21m) (Coffs Creek)	4.5		-	-	-	6.1	7.6	7.9	8.8
Englands Road (31.5)(Newports Creek)	2.0		-	-	-	3.4	3.6	-	5.1
Industrial Drive (3.0)(Newports Creek)	3.5		-	-	-	5.25	5.4	-	6.3
Newports Creek (0m) MHL	-		-	-	-	2.8	3.1	-	4.2
Boambee Sawtell Rd	-		-	-	-	2.90	3.1	3.6	4.4
Bonville Creek (0m)	-		-	-	-	4.13	4.85	3.70	7.09
Middle Creek Sawtell	2.4		-	-	-	3.9	4.3	4.4	6.0
Moonee Creek (0m)	-		-	-	-	-	2.8	-	3.6
Woolgoolga Creek (17.08m)			-	-	-	3.62	4.02	-	6.12
Woolgoolga Lake (13.606)						2.85	3.1	4.9	

Gauge	Council Operational Trigger		Min	Mod	Maj	5% AEP	1% AEP	0.5% AEP	PMF
Corindi (rainfall) at Highway	4.0		-	-	-	5.8	190 mm/h over six hours; 6.4	-	n/a
Spagnolos Road Detention Basin	2.8		-	-	-	4.4	5.6	5.8	6.8
Bakers Road Detention Basin (11.5m)	4.5		-	-	-	4.7	5.6	-	7.2
Shepherds Lane Detention Basin	3m						6.4		
Corindi River at Boyles Bridge	3.5		-	-	-	7.07	7.43	7.53	8.54

1.6 FLOOD HISTORY

a. Floods have significant effects on property and activities within the Coffs Harbour LGA, especially along the east-flowing streams and in the Coramba-Nana Glen area. Rises on the Little Nymboida River and Bobo Creek have little impact as the population in the far west of the range is sparse.

b. Coffs Creek. There is a long history of flooding in the catchment, dating back to at least 1917.

   i. Significant floods are reported to have occurred in November 1917; February 1921; July 1921; February 1938; June 1950; April 1962; April 1963; March 1974; May 1977; April 1989; December 1991; November 1996; March 2009; November 2009; January 2013; and February 2013, Feb 2015, and March 2016, (Figure 1).

   ii. The November 1996 flood was declared a natural disaster and is the largest recorded flood to occur on Coffs Creek. The flood exceeded the estimated 1% AEP (4.75 m at Coffs Creek (Highway Bridge)) flood level throughout the majority of the catchment including main Coffs Creek and on North Coffs Creek and reached a peak of 5.43 m at Coffs Creek (Highway Bridge). Up to 500 mm of rainfall was recorded in the upper parts of the catchment, with most of the rain falling within a 6-hour period and 270 mm falling in 3 hours. This is equivalent to 5 times the average monthly total for November, or approximately 30% of the average yearly rainfall total, all within a 6-hour period. The flooding and rainfall was less severe east of the Highway, recording levels equivalent to a 5% AEP storm event (15). Extensive overland flow occurred as a result of surcharging of the piped drainage system and road reserve capacity. At the same time the two-hour rainfall at the nearby Coffs Harbour airport was only 73 mm. It has been estimated that some 260

residential homes and 200 commercial properties were inundated above floor level during this flood (15) (16), with 300 persons evacuated (16), and a total damage bill reported to be in excess of $30 million (15).

iii. On 31 March 2009, a storm saw 220 mm falling in 3 hours resulting in a peak in Coffs Creek of 5.14 m on Coffs Creek (Highway Bridge) resulting in flash flooding in the Coffs Harbour CBD and surrounding streets. On 5 November 2009, another major storm saw approximately 120 mm fall in 3 hours resulting in a peak of 4.43 m at Coffs Creek (Highway Bridge) despite more than 500 mm of rain fall within 48 hours resulting in further flash flooding in the city centre area. The variation between total rainfall, hourly rainfall and the resultant flood peaks highlights the importance of monitoring rainfall within a critical period rather than the 24 hour totals (16).

iv. The 1991 flood was predicted to have been a ~5% AEP event, occurring after two days of heavy rain. On the second day 200 mm was recorded at a number of locations in the catchment. The highest falls were over the lower reaches at a time when the creek was already full.

v. Significant flood events also occurred in May 1974, May 1977, April 1989, and December 1991. Flows in these events were dangerously fast, and created a high potential for property damage and loss of life within the town.

vi. In March 2016, Coffs Harbour reached 2.65 m on the Coffs Creek (Highway Bridge) gauge (2.92 m at Gundagai Street gauge 559058). An Evacuation Order was issued for Korff Street, Robyn Street, Loaders Lane, Goodenough Terrace, Don Patterson Drive, Gundagai Place, Gundagai Street, Long Street and West High Street. However, the creek did not exceed the banks in these locations (17).

vii. Serious flooding within Park Beach resulted from heavy, intense rainfall in November 2009 and more recently in February 2015. Both events particularly highlighted the severity of flooding affecting properties in low-lying areas of San Francisco Avenue and York Street.

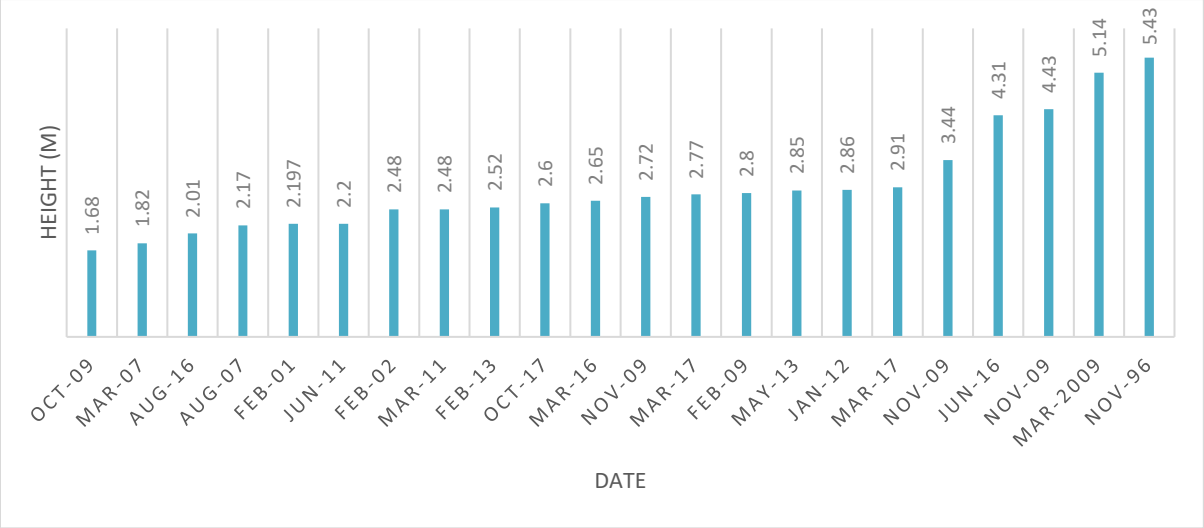


Figure 1: Flood history at Coffs Creek Gauge (205439) up to 2017

c. Other Coffs Harbour Coastal Creeks have had varying levels of inundation dependent of the rainfall in the respective areas.

i. Pine Creek, a tributary of Bonville Creek, has had a number of severe floods over recent decades, the worst of them during the summer of 1949-50, March 1974 and April 1990. Low-lying areas near the creek were inundated in these events. A level of 4.8m AHD was reported at the North Coast Railway Bridge in 1950.

ii. Several floods have occurred in Moonee Creek in 1974, 1991 and 1996 causing only nuisance flooding to residential and rural households. Ponding also occurs in the Heritage Park Estate, however all houses are above the 1% AEP (2.64m Moonee Creek gauge) flood level.

iii. Middle Creek, a tributary of Bonville Creek, has had a number of severe floods over recent decades, the worst of were experienced in June 1950, March 1974, April 1990, November 1996, March 2009 and again in March 2017. Low-lying areas near the creek are inundated in such events which can be worsened somewhat by the constriction formed by the railway bridge at Sawtell. Lyons Bridge is a road bridge over Middle Creek which can become flooded.

iv. June 1950 event - the 1992 Flood Study reported that no rainfall gauges were active during the event. However, anecdotal evidence suggests flood waters inundated properties on Boronia Street up to a level of 4.7 mAHD.

v. March 1974 event - no rainfall gauges were active in the catchment. However, the Bureau of Meteorology (BOM) was operating two pluviograph gauges in the greater region. Anecdotal evidence suggests flood waters inundated properties in Boronia Street up to a level of 3.8 mAHD.

vi. November 1996 event - six pluviographs were operational in the greater region. The 1998 Floodplain Management Plan indicated that 300 mm fell over 24hrs and the event was likely between a 50% and 20% AEP. The 1996 event had little impact on the Middle Creek catchment and limited information was recorded within the catchment for the November 1996 event as it mostly affected the Coffs Creek catchment.

vii. The March 2009 and 2017 events have not been previously documented; however, rainfall data was recorded for both events. Water levels, rainfall depths and patterns, anecdotal evidence and photos were recorded for these event. During the March 2009 event, the SES were required to rescue two people. During the event nine pluviographs and two water level gauges were operational in the greater region, flood peak is estimated at 4.5mAHD. The England's Road pluviograph recorded a 24hr total of 402 mm and a daily recording gauge within the Middle Creek catchment overflowed on 31 March at 339 mm. The March 2017 event was a relatively small event compared to the 2009 event, recording a 48hr total of 294 mm at the newly installed 23rd Ave pluviography with an estimated peak of 4mAHD (18).

viii. Newports Creek has a history of flooding major infrastructure including the high risk cancer and respite residence, hospital facilities at the Coffs Harbour Health Campus (CHHC) and a large number of commercial premises. In 2009, the hospital car park was flooded and 400 cars were damaged. In 1996, prior to the development of this area, this area was flooded. In 2012 and 2013 roads were closed in the area and the campus became isolated. 900 people stranded at Bishop Druitt College until 11pm. Of these 900 people, 150 students needed to spend the night at the school and four students were required to be medically evacuated to Coffs Harbour Health Campus for diabetes and epilepsy conditions. This isolation was due to the inundation of the main access route, North Boambee Road, which has a high risk of inundation in floods as frequent as the 20% AEP event. The road is also at risk of inundation due to discharges from the Lakes Estate catchment and inundation due to Newports Creek.

The flood event was particularly stressful to the school body and parents (19; 20). The CHHC was completely isolated without road access. This poses significant risk as medical emergency services would need to be diverted to other hospitals. The CHHC activated the Campus Disaster Plan due to flooding of premises and buildings. Damage occurred to records and equipment, emergency services were disrupted (requiring diversion of ambulances to Macksville and Grafton) and some 600 staff, outpatients and visitors required to be registered and evacuated to the main hospital building. The costs incurred at this facility during the course of the 2009 flood due to damage and

clean-up were estimated by hospital staff to be approximately $500,000, which included damage to vehicles (19).

d. Woolgoolga. There is little recorded history of flooding in Woolgoolga. The largest recorded flood was 4.25m AHD in March 1974, with two more recent floods occurring in June 2011 and January 2012 of 3.83 and 3.57m AHD respectively (Figure 2). Peak heights of between 2.57 and 3.52m AHD have been recorded as a consequence of lake entrance conditions rather than catchment flooding (3). In the 1974 flood (4.25 metres) Woolgoolga experienced inundation in the library in Ganderton Street (1-1.5 metres deep), Boundary Street and Market Street and up to 3 metres in the Sunset Caravan Park (19).

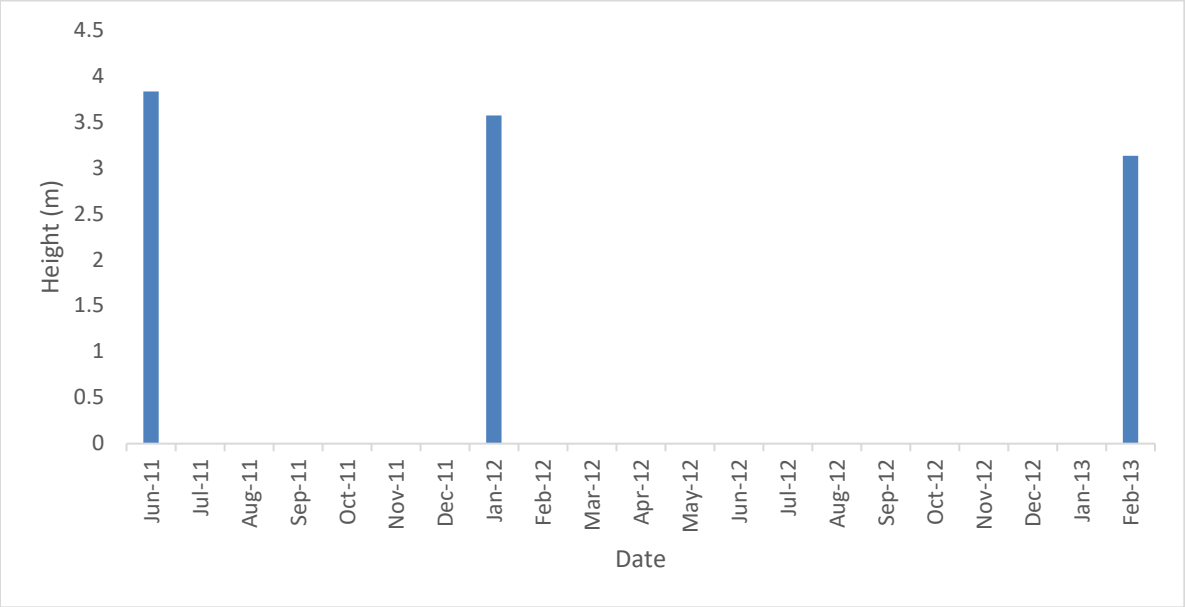


Figure 2: Flood history for floods above 3.0 m at Woolgoolga Creek gauge (205441) between 1991 and 2013

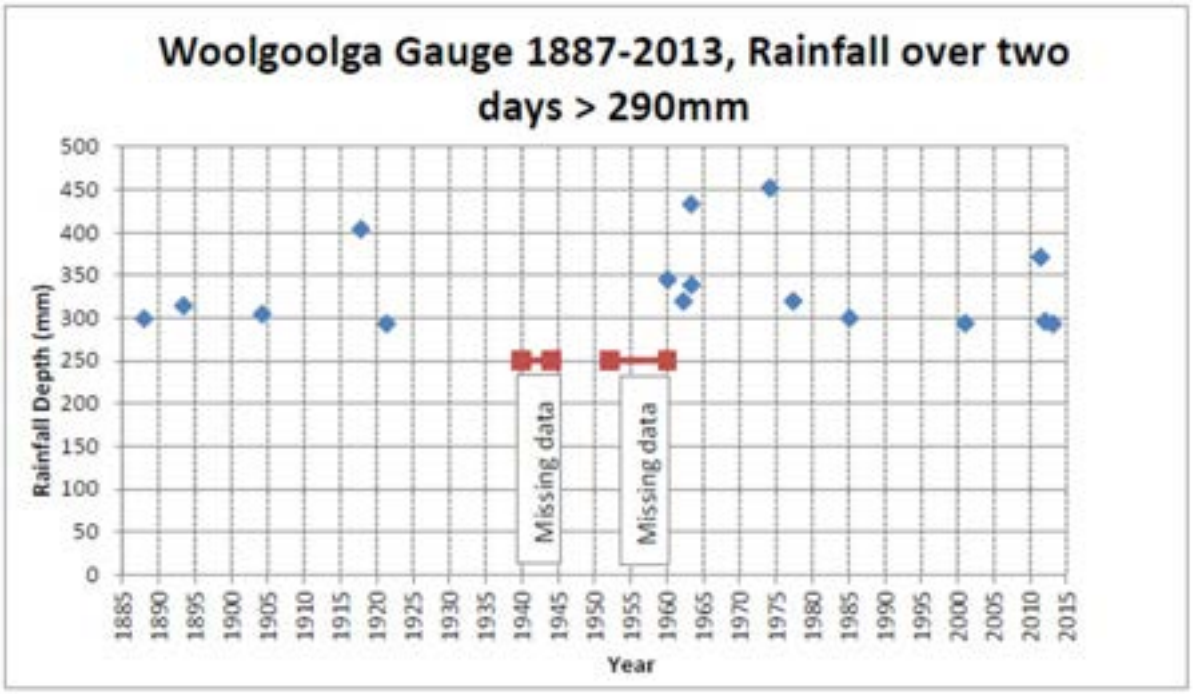


Figure 3: Woolgoolga rainfall gauge- 1887-2013 – Two day rainfall events exceeding 290mm

e. Corindi. The catchment has experienced significant flooding February 2021, June 2016, February 2013, January 2012, June 2011 and March 2017. Analysis of the historic records show that there is a reoccurrence of floods of varying magnitude throughout the years from as early as 1887. The flooding in Upper Corindi in February 2021 was rather extreme and flooded houses and farm buildings that have not been affected before. The 2021 event was the most significant on record. During the event, 295 mm of rainfall was recorded over a six hour period at Boyles Bridge (559070). Comparison of the 2021 event with BOM IFD and other historical events at Boyles Bridge showed that rainfall recorded at Boyles Bridge was a very rare event and exceeded 0.2% AEP. (4)

Table 9: Corindi River historic peak heights since 2012 for available river gauges

Event	Historic Peak Height (m Gauge Height)	
	Boyles Bridge *	Pacific Highway *
Jan-12^	6.59	6.5
Feb-13^	6.26	6.34
Jun-16	6.09	6.13
Mar-17	5.31	4.25
Dec-18	4.84	4.66
Feb-20	6.49	N/A#
Feb-21	7.52	7.40

*Boyles Bridge Gauge Zero = 21.0 mAHD
Pacific Highway Gauge Zero = 2.85 mAHD
Gauge failed
^ Estimated

f. Orara Valley. Karangi (204025/559023) has experienced significant flooding in 1971, 1973, 1977 (6.36 m), 1982, 1986, 1989, 1990, 1996, 1997, 1999, 2001, 2000, and 2009 (4), 2012, 2013 and 2020 (floods between 1970 and 2020 are shown on Figure 4).

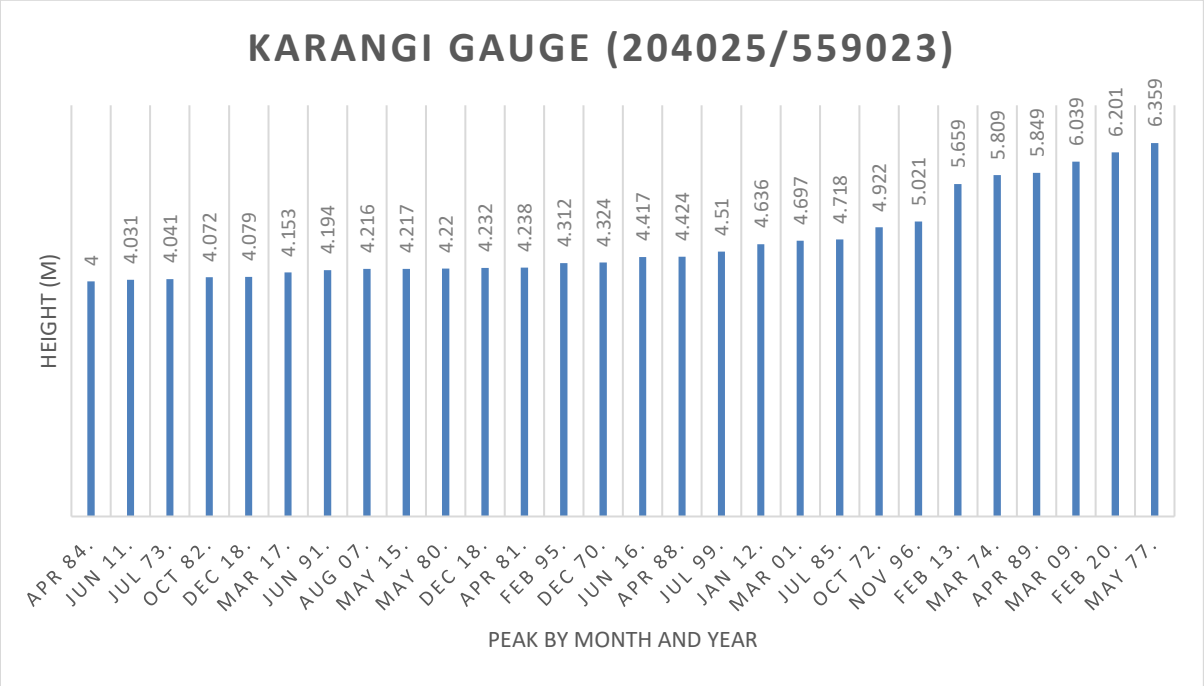


Figure 4: Flood history for floods above 4 m at Karangi gauge (204025) between 1970 and 2020

1.7 FLOOD MITIGATION SYSTEMS

a. The following works are aimed at reducing stormwater drainage problems through the Central Business District (CBD) in Coffs Creek primarily by diverting stormwater flow from local catchment areas away from the area and surcharge paths, with major stream alignment occurring in the 1990's (20):

   i. Diversion of street drainage on the west side of Grafton Street away from the CBD area.

   ii. Diversion of the Park Avenue West drainage system away from the CBD to Carralls Creek.

   iii. Taloumbi Road, Bray Street, Oxley Place, Murphy Crescent, Bellingen Road, Merino Drive, Norfolk Crescent and King Street Coffs Harbour.

b. Mainstream flooding from Coffs Creek can occur where creek banks adjacent to the CBD are overtopped, or where the banks upstream of Grafton Street are overtopped resulting in overland flooding across Grafton Street into the CBD area.

c. Loaders Lane Levee. The levee provides a level of flood protection for properties in Loaders Lane, Goodenough Terrace, Brindley Court, McCann Court and Charlotte Court. The levee at Loaders Lane is no longer overtopped during the 1% AEP design flood event due to the effect of the detention basins. Levee breaching would be initiated near the driveway of 28 Loaders Lane, where the levee crest is elevated to around 14.1m AHD. Under existing design flood conditions, the peak flood level at this location is currently just over 14.0m AHD. The levee is currently just providing protection to the 1% AEP level; however, no additional allowance is made for freeboard. The levee currently overtops during the 0.5% AEP event, with a peak flood level of 14.3m AHD modelled at the levee. Properties located behind the Collice Place / Langker Place levee become inundated by floodwater during the 1% AEP event with a typical depth of flooding of up to 0.5m being modelled. Flood waters currently spill out of the drainage channel north of the levee, through the backyard of 8 Gillies Close and 7 Langker Place. A 900mm diameter pipe discharges flows from under the rail embankment into the Bray Street Arm of Coffs Creek.

d. A number of small detention basins have been constructed to reduce local drainage / flooding problems at the following locations:

- Spoonbill Lake, Boambee (Boambee Creek).
- Playford and Linden Avenues, Bayldon (Bonville Creek).
- Ashmore Close, Bayldon (Bonville Creek).
- The access road to the Sawtell Sewage Treatment Plant off the end of Newcastle Drive has been raised to act as detention basin to provide flood protection for (Middle Creek) (11).
- Arthur Street, Coffs Harbour (Coffs Creek).
- Toormina Place, Coffs Harbour (Coffs Creek).
- Roselands Drive, Coffs Harbour (Coffs Creek).
- Hannaford Place, Coffs Harbour (Coffs Creek).
- Maclean Street, Coffs Harbour (Coffs Creek).
- Albany Street, Coffs Harbour (Coffs Creek).
- Bennetts Road, Coffs Harbour (Coffs Creek), refer to Section 1.3.
- Bakers Lane, Coffs Harbour (Coffs Creek), refer to Section 1.3.
- Marcia Street/ Ann Street, Coffs Harbour (Coffs Creek).
- Fawcett Street, Woolgoolga (Woolgoolga Creek).
- Upper Shepherds Lane, Coffs Harbour (Coffs Creek)
- Spagnolos Road, Coffs Harbour (Coffs Creek)
- Carrington Street, Woolgoolga (Woolgoolga Creek).

e. Mitigation works for stream alignment were constructed in:

- Wybalena Crescent in Toormina, Betel Palm Close Boambee (Boambee Creek).
- Gale Street and Coramba Road, Coramba (Orara River).
- Trafalgar Lane and Fawcett Street Woolgoolga (Woolgoolga Creek).
- Masonary Road, (Newports Creek).

1.8 EXTREME FLOODING

a. In extreme flood events water levels rise much quicker with faster velocities and cover areas with no previous experience of flooding. It is likely that large areas of central Coffs Harbour would be inundated by extreme floods from Coffs Creek (11).

b. In a PMF event in the Upper Orara, flood levels are estimated to be around 13m at Karangi causing widespread flooding and a large number of rural properties to be isolated. Flood waters would be approximately 3 – 4 m deeper than the 1% AEP, with velocities expected to exceed 2 m/s (4).

c. Larger floods up to the PMF in all catchments are possible, see Table 8.

D. Design Floods for each gauge are summarised in Table 8. Triggers within Table 8 refer to NSW SES and Council operational response.

1.9 COASTAL EROSION

a. Although no locations within the Coffs Harbour LGA are a Coastal Erosion Hot Spot, the following locations have property and assets at risk of coastal erosion and inundation (21):

i. Sawtell - a sewerage asset, Boronia Street and the southern railway bridge may be impacted in severe events as well as a few properties at risk of inundation.

ii. Coffs Harbour - the stormwater assets at Park Beach and the Jetty may be impacted in severe events and the Promenade is at risk of inundation.

iii. Emerald Beach - Emerald Avenue local road may be impacted in severe events as well as a few properties at risk of inundation.

iv. Woolgoolga - Carrington Street, a local road may be impacted in severe events as well as a few properties at risk of inundation.

v. Arrawarra - Second Avenue may be impacted in severe events.

vi. Campbells Beach – Public recreation areas, Pump station, rising main, Emerald Ave, Beachfront Close and 23 properties are listed as being at risk of erosion impacts (22).

vii. Given the ongoing coastal development it is possible that additional areas of coastal erosion maybe occurring that are not listed in this report.

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

Table 10: Census of Housing and Population data (2021)

Census Description	Coffs Harbour (C)	Coffs Harbour	Sawtell	Boambee	Boambee North
Total Persons	78759	27089	3788	1770	2318
Aged 0-4 yrs	4060	1356	178	59	111
Aged 5-14 yrs	9906	3191	438	244	248
Aged 65 + yrs	18228	6334	949	395	880
Of Indigenous Origin	4558	1725	141	72	108
Who do not speak English well	1246	701	7	10	21
Have a need for assistance (profound/severe disability)	5415	2202	206	85	235
Living alone (Total)	8195	3547	494	100	233
Living alone (Aged 65+)	4291	1736	255	54	154
Residing in caravans, cabins or houseboats or improvised dwellings	834	249	41	42	0
Occupied Private Dwellings	29774	10666	1559	589	785
Unoccupied Private Dwellings	2730	887	252	20	191
No Motor Vehicle	1590	946	81	10	41
Caravan, cabin, houseboat or improvised dwelling	498	174	26	31	0
Rented via State or Housing Authority	780	496	26	0	6
Rented via Housing Co-Op or Community Church Group	460	261	55	0	3
No Internet Connection					
Average persons per occup dwelling	3.2	2.3	2.3	2.9	2.4
Average vehicles per occup dwelling	1.9	1.7	1.8	2.5	1.9

Census Description	Toormina	Bonville	Moonee Beach	Emerald Beach
Total Persons	6171	2939	2176	2677
Aged 0-4 yrs	303	142	116	173
Aged 5-14 yrs	776	419	366	418
Aged 65 + yrs	1660	616	396	456
Of Indigenous Origin	538	127	64	140
Who do not speak English well	26	20	12	4
Have a need for assistance (profound/severe disability)	579	171	109	114
Living alone (Total)	866	165	106	149
Living alone (Aged 65+)	529	111	50	60
Residing in caravans, cabins or houseboats or improvised dwellings	36	86	41	7
Occupied Private Dwellings	2493	997	741	934
Unoccupied Private Dwellings	138	42	56	78
No Motor Vehicle	195	10	10	16
Caravan, cabin, houseboat or improvised dwelling	25	59	18	7
Rented via State or Housing Authority	157	0	0	0
Rented via Housing Co-Op or Community Church Group	61	0	0	0
No Internet Connection				
Average persons per occup dwelling	2.3	2.8	2.8	2.7
Average vehicles per occup dwelling	1.6	2.4	2.2	2.2

Census Description	Woolgoolga	Safety Beach	Arrawarra	Sandy Beach	Corindi Beach
Total Persons	6151	1103	591	2913	1802
Aged 0-4 yrs	325	64	9	210	114
Aged 5-14 yrs	641	164	9	447	230
Aged 65 + yrs	1647	291	307	432	286
Of Indigenous Origin	283	44	22	194	158
Who do not speak English well	260	3	7	33	30
Have a need for assistance (profound/severe disability)	443	48	72	149	96
Living alone (Total)	693	62	140	199	116
Living alone (Aged 65+)	421	40	112	71	41
Residing in caravans, cabins or houseboats or improvised dwellings	11	0	173	0	12
Occupied Private Dwellings	2325	392	306	1030	638
Unoccupied Private Dwellings	227	29	18	68	75
No Motor Vehicle	131	9	17	16	13
Caravan, cabin, houseboat or improvised dwelling	14	0	58	0	8
Rented via State or Housing Authority	27	0	0	0	0
Rented via Housing Co-Op or Community Church Group	49	0	0	0	3
No Internet Connection					
Average persons per occup dwelling	2.4	2.7	1.9	2.7	2.7
Average vehicles per occup dwelling	1.8	2.1	1.4	2	2.1

Census Description	Red Rock	Coramba	Karangi	Nana Glen	Bucca
Total Persons	412	817	515	1132	614
Aged 0-4 yrs	5	42	21	60	29
Aged 5-14 yrs	50	110	72	151	86
Aged 65 + yrs	125	147	91	181	94
Of Indigenous Origin	35	46	25	64	14
Who do not speak English well		0	5	9	0
Have a need for assistance (profound/severe disability)	27	40	20	40	35
Living alone (Total)	55	56	34	~~73~~	32
Living alone (Aged 65+)	28	26	9	30	14
Residing in caravans, cabins or houseboats or improvised dwellings	17	0	11	3	40
Occupied Private Dwellings	167	296	181	391	195
Unoccupied Private Dwellings	94	15	14	18	25
No Motor Vehicle	5	3	0	3	5
Caravan, cabin, houseboat or improvised dwelling	8	0	4	4	18
Rented via State or Housing Authority	0	0	0	0	0
Rented via Housing Co-Op or Community Church Group	0	0	0	0	0
No Internet Connection					
Average persons per occup dwelling	2.2	2.6	2.7	2.7	2.8
Average vehicles per occup dwelling	1.8	2.3	2.5	2.3	2.4

SPECIFIC RISK AREAS - FLOOD

2.2 SAWTELL SECTOR

Sawtell, Toormina, Bonville & Boambee

2.2.1 Community Overview

a. Sawtell Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	19728
Dwellings	8725

b. Boambee is located to the south of Coffs Harbour, consisting of semi-rural Boambee (population of 1770) and more suburban Boambee East (population of 5304), with a median age of 47 and 42 respectively (22) (Table 10).

c. The population of Sawtell is around 3788, with a median age of 47 (22) (Table 10).

d. Toormina is located 11 km south of Coffs Harbour, and southeast of Boambee. It has a population of 6171 and a median age of 45 (22) (Table 10).

e. The population of Bonville is around 2939, with a median age of 44 (22) (Table 10).

f. The indigenous population is approximately 3.7% within Sawtell, and 4.3% in Bonville (22) (Table 10).

g. Approximately seven people in Sawtell and twenty people in Bonville do not have proficiency in English (22) (Table 10).

2.2.2 Characteristics of flooding

a. Sawtell is a coastal town located southeast of Coffs Harbour. Flooding in the area is driven by Bonville Creek and its tributaries Middle and Pine Creeks.

b. Bonville is located west of Sawtell, with flooding occurring as a result of small catchment flooding of Bonville Creek.

c. Boambee Creek is a flash flood catchment, rising even quicker than Coffs Creek (11).

d. The highly variable nature of storm events around the Coffs Harbour Region, combined with steep catchments, result in many of the coastal towns being highly susceptible from flash flooding. In 2009, a substantial number of properties in Sawtell downstream of the railway experienced flash flooding from Middle Creek. The catchment has a long history of flooding with major events in 1990, 2009 and 2017. (25)

e. During major events (1% AEP) downstream of the railway line becomes inundated as well as a number of roads across the catchment. The main risk area is in Boronia Street, adjacent Middle Creek where properties become inundated.

2.2.3 Flood Behaviour

a. During major flooding events (such as the 1% AEP event) several roads become inundated by depths greater than 0.1 m, some of which include: First Avenue, Boronia Street, Twenty-Third Avenue, May Street, Sixteenth Avenue, Eighteenth Avenue and Hulberts Rd.

b. Boronia Street properties adjacent to Middle Creek are inundated by flood depths greater than 1.5 m during the 1% AEP event. Within the Middle Creek catchment under existing conditions, the high hazard floodway categorisation extends into properties along Boronia Street

c. Lots on Sixteenth Avenue become inundated by depths greater than 0.5 m in the 1% AEP event.

d. Hydraulic category mapping of the 1% AEP event show that upstream of the railway the floodway is mostly confined to the main channel. While downstream of the railway the floodway encroaches on Boronia Street properties adjacent to Middle Creek.

e. The Cordwell Creek Residential area near the creek banks experiences flooding from the 20% AEP. At 20% AEP depths of 0.3m to 0.5m, 5% AEP around 0.5m in places and in 1% AEP depths can reach up to 0.8m. (19)

f. Residential dwellings along Boambee Creek, west of the Pacific Highway, can experience minor flooding, up to 0.2m in some locations during a 20% AEP, with flooding at 0.5m for a 5% AEP and up to 0.7m in some locations during a1% AEP. (19)

Figure 5: Flood function 1% AEP Middle Creek

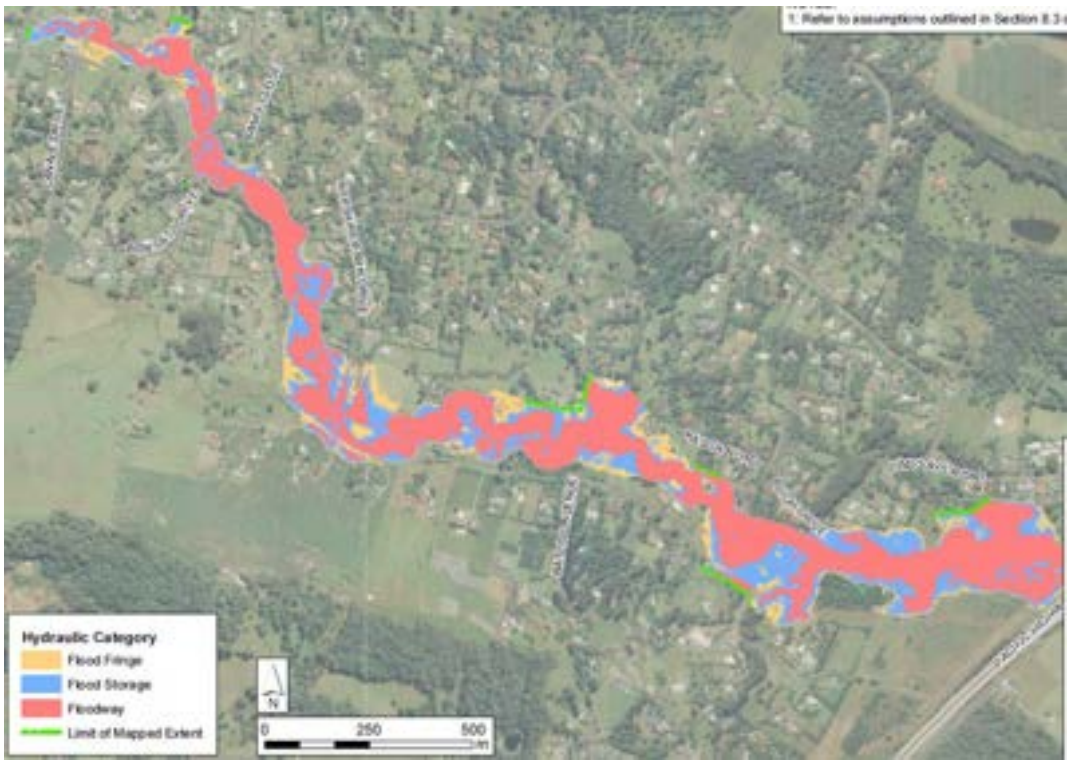


Figure 6: Flood function 1% AEP Boambee Creek in Sawtell Sector

2.2.4 Classification of Floodplain

a. For emergency management purposes, Sawtell Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
54027	West Boambee	100	36	65	Low Flood Island
54036	Boambee Creek	14	3	5	Low Flood Island
54426	South Bonville	217	95	171	Low Flood Island
54427	Coffs Christian Community School	N/A	N/A	N/A	Indirectly Affected
54428	Middle Creek	71	38	68	Low Flood Island
54429	South Boambee Creek	80	34	61	Low Flood Island
54455	Boronia Street	206	123	221	Low Flood Island
54456	Sixteenth Avenue	230	106	190	Rising Road Access

- further reference will be provided in Volume 3 as part of the Mapping.

2.2.5 Inundation

Gauge No.	Name	Gauge Type	Location	Years Active
205480 (MHL)	Bonville	Water level cont.	Bonville Creek at Waterside Gardens Caravan Park	2009-present
559050 (MHL)	North Bonville	Rainfall cont.	North Bonville Rd	1990-present
559048	Middle Boambee	Rainfall cont.	Cedarvale Rd	1900-present
559065	Boambee Resv.	Rainfall cont.	Boambee	Unknown
Unknown	South Boambee	Rainfall cont.	South Boambee	Unknown
559054	Sawtell (Middle Creek)	Rainfall cont/Water Level.	Twenty-Third Avenue Sawtell	2015
Unknown	Sawtell Wastewater Treatment Plant	Rainfall Daily	Sawtell Wastewater Treatment Plant	Unknown
205438	Boambee East	Water Level	Sawtell Road at Boambee Creek	Unknown
205475	Boambee Entrance D/S	Water Level	Boambee Creek at Boambee Entrance	Unknown

Table 11: Peak Design Flood Levels

ID	Location	Peak Flood Level (mAHD)					
		5% AEP	2% AEP	0.5% AEP	1% AEP	0.2% AEP	PMF
1	Cnr of First Ave & Boronia St	-	3.7	3.9	4.0	4.1	5.7
2	Twenty-Third Ave	-	-	4.3	4.4	4.5	6.0
3	Sixteenth Ave	-	4.2	4.4	4.5	4.6	6.1
4	Cnr of Boronia St & May St	3.9	4.1	4.3	4.4	4.6	6.0
5	Cnr of Eighteenth & Sixteenth Ave	4.8	4.8	4.9	4.9	5.0	6.2
6	Hulberts Rd	4.6	4.8	4.9	5.0	5.1	6.2
7	Minoire Dr	-	-	5.3	5.4	5.4	6.2
8	Toormina Rd	9.3	9.4	9.5	9.6	9.7	10.3

Table 12: Design rainfall depths

Duration	5% AEP	2% AEP	1% AEP
3-hour	140	177	208
6-hour	187	235	277

a. One dwelling at the corner of Lindsays and South Boambee Avenues is frequently flooded from Cordwells Creek.

b. More than a dozen properties in Boronia Street and First Avenue, Sawtell are known to be flood prone, some having been subjected to over-floor inundation on more than one occasion and some had water in their yards and/or garages when Middle Creek has broken its banks.

c. Boronia Street properties adjacent to Middle Creek are inundated by flood depths greater than 1.5m during the 1% AEP. (23)

d. Downstream of the railway line in Middle Creek, flood depths within the channel can reach up to 3m during large events such as the 1% AEP. (23)

e. Properties on Sixteenth Avenue become inundated by depths greater than 0.5m in the 1% AEP.

f. At 3.5 m on the Sawtell (Middle Creek) gauge (559054),, water encroaches on Boronia Street, and may inundate residences (10).

g. At 3.9 m (5% AEP) on the Sawtell (Middle Creek) gauge (559054), it is estimated that 16 properties will be flooded above floor (23).

h. At 4.31 m (1% AEP) on the Sawtell (Middle Creek) gauge (559054), properties in Circle Avenue, Elizabeth Street, 7th Avenue and 8th Avenue may become flooded (23).

i. Larger numbers of properties would be affected in extreme events, with 450 residential and 62 commercial properties in a PMF (6.0 m on the Sawtell (Middle Creek) gauge (559054)) (23).

j. Flooding, with flood depths of up to 0.3 m to 0.5 m in the Cordwells Creek residential area near creek banks.

k. Other key flood affected areas include:

- Spoonbill Lake and Cordwells Creek residential area near creek banks.
- Hi tech industrial area (southern edge).
- Isolated residential dwellings along Boambee Creek (west of the highway).
- Barcoo Court residential area.

Table 13: Number of houses and buildings flooded above floor level in the Middle Creek Catchment (Toormina & Sawtell)

Design Event	Residential	Commercial
5% AEP	16	0
2% AEP	29	1
1% AEP	55	1
0.5% AEP	67	1
0.2% AEP	75	2
PMF	450	62

2.2.6 Isolation

a. There is the potential for Lyons Road to flood in large events, preventing access north and south of Sawtell (27).

Table 14: Road's cut-off in the 1% AEP Flood by depths greater than 0.25m, Sawtell Sector

Road	Time road is first cut (hours)	Max duration road is cut (hours)
Lyons Road	1.7	4.14
Elizabeth Street	2.27	2.43
Boronia Street	1.88	3.52
May Street	2.35	2.24
Thirteenth Avenue	2.72	1.35
Sixteenth Avenue	0.99	5.03
Eighteenth Avenue	2.49	0.11
Kookaburra Road	0.3	3.72
Hulberts Rd	0.42	6.22
Wallis Ave	1.7	2.17
Newcastle Dr	2.36	5.54
Werambie St	0.17	3.49

Minorie Dr	0.23	1.42
Bangalee Cres	1.64	1.29
Toormina Rd	1.49	1.56
Alleena Dr	1.72	0.44
Jane Cct	0.53	0.67
Soren Larsen Cres	1.77	0.44
Lower Linden Ave	0.93	1.57
Upper Toormina Rd	0.95	1.77

b. Other road closures may include: (24)

- East Bonville Road, Bonville.
- Williams Road, Bonville.
- Pine Creek Way, Bonville.
- Archville Station Road, Bonville.
- Northwest Trail, Bonville.
- Paddymelon Circuit, Bonville.
- Bayldon Road, Sawtell.
- Johnston Lane, Sawtell.
- Elizabeth Street, Sawtell (4.31m on Middle Creek Gauge).
- Bellgrove Street, Sawtell.
- Kidd Lane, Sawtell.
- First Avenue, Sawtell.
- Second Avenue, Sawtell.
- Seventh Avenue, Sawtell (4.31m on Middle Creek Gauge).
- Eighth Avenue, Sawtell (4.31m on Middle Creek Gauge).
- Circular Avenue, Sawtell (4.31m on Middle Creek Gauge).
- Thirteenth Avenue, Sawtell.
- Eleventh Avenue, Sawtell.
- Twenty-Third Avenue, Sawtell.

2.2.7 Flood Mitigation Systems

a. There are no known flood mitigation systems in Sawtell, Toormina, Boambee or Bonville.

2.2.8 Dams

a. There are no known consequences of dam failure.

2.2.9 At Risk Facilities

a. The following schools are at risk of flooding:

- Coffs Harbour Christian Community School Senior Campus, 226 Bonville Station Road, Bonville at risk in 1% AEP (Bonville 4.85 m).
- St John Paul College Hogbin drive (Isolation),
- Coffs Harbour Bible Church School at 26 Hitech Drive, Toormina (PMF)

b. The following utilities and infrastructure are at risk of flooding (11):

- The Rail network may become inundated around 4.4 to 4.5m (Sawtell (Middle Creek) 559054)gauge) (23).

c. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.2.10 Other Considerations

a. Special events held throughout the year are listed on the City of Coffs Harbour website.

b. These areas have two peak seasons with potential for a 10% population increase associated with tourism:

- Christmas holidays December – January.
- Easter long weekend.

2.3 NEWPORTS SECTOR

North Boambee

2.3.1 Community Overview

a. Newports Creek Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	5125
Dwellings	2306

b. North Boambee is located to the west of Coffs Harbour, consisting of semi-rural (population of 2318), with a median age of 52 (22) (Table 10).

c. The area has a large proportion of mixed rural agriculture, particularly located to the west of the Pacific Highway. Also immediately to the west of the highway is a significant urban development, the Lakes Estate.

d. To the east of the Highway has a combination of public recreation, special use, industrial and low and medium density residential. This industrial area north and adjoining Newports Creek has grown considerably in the last few years (14). Adjoining this industrial area and south of Newports Creek is the Coffs Harbour Health Campus and a growing network of medical specialist's buildings.

e. The indigenous population is approximately 5% in North Boambee (22). Very few persons have been identified as not having proficiency in English in North Boambee (21 people) (22)(Table 10).

2.3.2 Characteristics of Flooding

a. The area is a flash flood environment influenced by flows from Boambee, Cordwells and Newports Creeks. These creeks tend to rise even faster than Coffs Creek.

b. In general terms, flood peaks first manifest in the upper Middle Boambee and North Boambee catchments as follows (19):

- Approximately 1.5 hours later at the Pacific Highway.
- Approximately 6.0 hours later at the Boambee Newports Creek confluence.
- Approximately 7.0 hours later at the mouth of Boambee Creek.

c. Flooding west of the highway is expected to manifest rapidly and warning times are short. East of the highway there is more opportunity to respond to flood warnings (19).

2.3.3 Flood Behaviour

a. In Newports Creek, flood velocities are generally low (well below 0.5 m/s) in the lower parts of the catchment. Higher velocities are associated with Boambee Creek, at road over flows, constrictions in the floodplain and at the Boambee mouth. In these areas velocities in the order of 1 m/s are noted. In the upper creeks isolated areas of elevated velocities can be expected, where creek inverts are steeper (19).

b. High hazard areas associated with flood depth are noted in the lower floodplain and creek channels. In the Isles Drive, Mansbridge Drive and Cook Drive industrial areas, high hazard areas are confined to the channels, with the adjacent developed areas noted as low hazard (19).

c. In Boambee Creek, west of the Pacific Highway, high hazard areas are associated with the creek channels with the adjacent floodplain being low hazard (19).

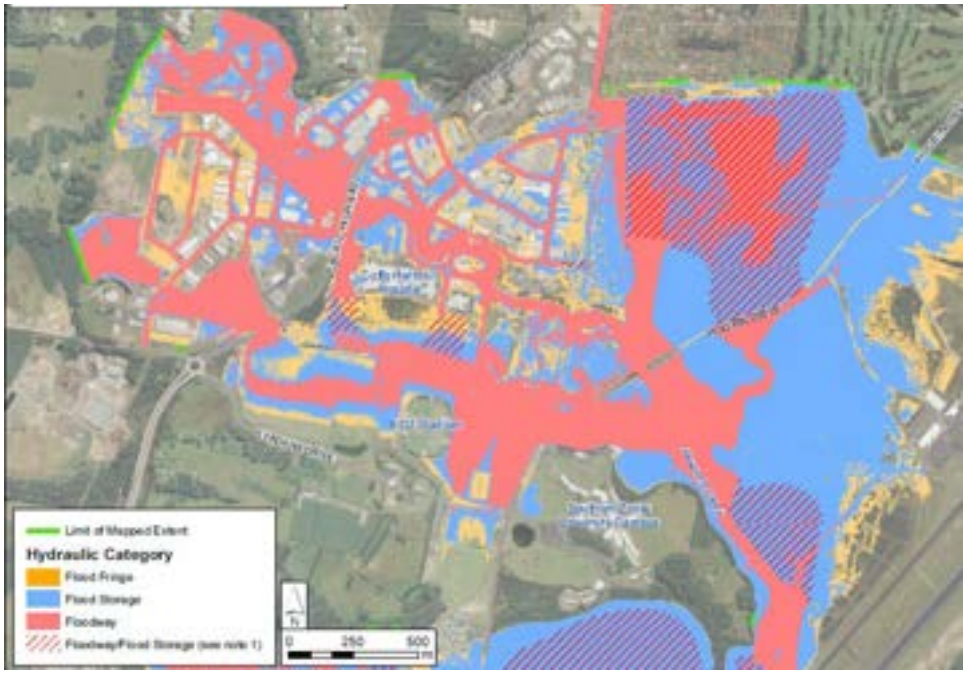


Figure 7: Flood function 1% AEP in Newports Creek

2.3.4 Classification of Floodplain

a. For emergency management purposes, Newports Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
54031	Industrial drive	N/A	N/A	N/A	Low Flood Island
54032	Health Campus	196	90	162	Low Flood Island
54033	Airport	N/A	N/A	N/A	Low Flood Island
54034	The Lakes Estate	509	251	452	Indirectly Affected
54425	North Boambee Road	N/A	N/A	N/A	Low Flood Island

- further reference will be provided in Volume 3 as part of the Mapping.

2.3.5 Inundation

a. This area utilises the following gauges (summarised in Table 14), with a flash flood warning system in place as identified in Volume 3, Chapter 1:

- Newports Creek (River level monitored by MHL)– 205460/559039.
- Englands Road (Monitored by City of Coffs Harbour) – 559051.
- Newports Creek (Industrial Drive). (Monitored by City of Coffs Harbour) – 559053.
- Newports Creek (Water level monitored by MHL) – 205460/559039

Table 15: Gauge heights (m) for various probabilities of floods (10) (25) and Council Operational Trigger Heights

Gauge	Council Operational Trigger	5% AEP	1% AEP	PMF
Englands Road (Newports Creek)	2.0	3.4	3.6	5.1
Industrial Drive (Newports Creek)	3.5	5.25	5.4	6.3
Newports Creek MHL		2.8	3.1	4.2
Boambee Creek (Sawtell Road)		2.90	3.1	4.4

b. Some industrial establishments on the Pacific Highway adjacent to Newports Creek (a tributary of Boambee Creek) are subject to shallow flooding (11).

c. In a 20% AEP (5.0 m on Industrial Drive gauge) (19):

i. A total of 6 commercial properties are at risk of overfloor flooding in the Newports Creek, Boambee area.

ii. Flooding of the roadways, with flood depths of up to 0.4 m to 0.8 m at places in Isles Drive industrial area (south of Newports Creek, west of the highway).

iii. Flooding of the roadways, with flood depths of up to 0.6 m at North Boambee Road in the Mansbridge Drive area (north of Newports Creek, west of the highway).

iv. Flooding of some roadways, with flood depths of up to 0.3 m at places in the Cook Drive industrial area (north of Newports Creek, east of the highway).

v. Minor flooding, along southern edge with flood depths less than 0.1 m in isolated locations in the hi tech industrial area (southern edge).

vi. Minor flooding, with flood depths varying up to 0.2 m at isolated locations in the isolated residential dwellings along Boambee Creek (west of the highway).

d. In a 5% AEP event, 35 commercial properties are at risk of overfloor inundation in the Newports Creek Boambee area (19).

e. In a 1% AEP (~5.3 m on Industrial Drive gauge) 25 residential and 83 commercial premises are at risk of overfloor inundation around Airport industrial area, Barcoo Court residential area, Coffs Harbour Health Centre, Isles Drive, Reid Drive, Cooks Drive, Halls Road, Hamilton Drive, Kratz Drive and Hurley Drive (19) (26).

f. In the Newports Creek Boambee Creek area, there are 622 properties at risk of inundation in a PMF, with 509 dwellings at risk of overfloor flooding (289 residential and 220 commercial). The key flood affected areas (from a flood damage perspective) within the study area are (19):

   i. Isles Drive industrial area (south of Newports Creek, west of the highway).

   ii. Mansbridge Drive area (north of Newports Creek, west of the highway).

   iii. Cook Drive industrial area (north of Newports Creek, east of the highway).

   iv. Thompson Road residential area south and western boundaries, particularly around Reid Drive.

   v. Airport industrial area.

   vi. Coffs Harbour Health Campus.

2.3.6 Isolation

a. It is also expected in a 1% AEP (~5.3 m on Industrial Drive gauge) that Hogbin Drive, Englands Road, Isles Drive, Pacific Highway at Newports Creek may close (19), isolating the airport and a number of properties to the west of the Pacific Highway (26) for short periods of time.

2.3.7 Flood Mitigation Systems

a. Spoonbill Lake acts to mitigate flooding through flood storage. It is located to the south of Boambee Creek near the river mouth, off Cordwells Creek.

2.3.8 Dams

a. There are no known dams in the Newports Sector.

2.3.9 At Risk Facilities

a. The following schools are at risk of flooding (10):

   i. North Coast Institute Coffs Harbour Campus – TAFE.

   ii. Bishop Druitt College.

b. Monitoring of Footprints Early Learning Centre, 21 Lamberts Road, Boambee may be required as well as Milestones Early Learning at 10 North Boambee Road.

c. The following facilities for the aged and/or infirm are at risk of inundation/isolation:

   i. At 5.3 m on the Industrial Drive gauge the Health Campus becomes isolated and the car park starts flooding (10).

   ii. Coffs Harbour Grange Care Community at 50 Lakes Drive Coffs Harbour is at risk in a PMF and in more frequent events.

   iii. New Horizons Disability Employment Centre located in Keona Circuit may become inundated from 5.3 m on the Newports Creek (Industrial Drive) gauge (559053).

d. The following utilities and infrastructure are at risk of flooding (11):

   i. The Coffs Harbour airport is located to the east of Newports Creek to the north of the Boambee and Toormina. The airport may become isolated when in a 1% AEP flood (5.3 m on Industrial Drive gauge), when Hogbin Drive is cut.

e. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.3.10 Other Considerations

a. Other considerations include a number of sporting fields in the area that are in low lying areas, at risk of flooding.

b. Special events held throughout the year are listed on the City of Coffs Harbour website.

c. These areas have two peak seasons with potential for a 10% population increase associated with tourism:

   i. Christmas holidays December –January.

   ii. Easter long weekend.

2.4 COFFS CENTRAL SECTOR

Coffs Harbour

2.4.1 Community Overview

a. Coffs Central Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	**13102**
Dwellings	**5875**

b. Coffs Harbour is situated on the coast along Coffs Creek and its' northern tributaries. It is divided by the Pacific Highway (Grafton Street) and has a total population of 13102 (21)Table 10).

c. Coffs Harbour has approximately 6.5% Indigenous population. Approximately 2.6% of the population do not speak English very well (22) (Table 10).

2.4.2 Characteristics of Flooding

a. Flooding in the Coffs Harbour LGA is flash flooding with extremely rapid rates of rise on the coastal creeks. Flooding is generally of only short duration. The most severe flood in recent history occurred in November 1996, resulting from an east coast low weather pattern which reached a level of 5.4 m on the Coffs Creek (Highway Bridge) Gauge. This resulted from 390 mm in 6 hours. Up to 300 mm fell in 2 hours. In 2007 a small event with 60 mm in 2 hours caused no significant flooding (11).

b. The March 2009 event was of a similar magnitude to the November 1996 event, with slightly higher flood levels recorded upstream of the Pacific Highway. The rainfall gradient phenomenon was again observed across the catchment, with rainfall depths recorded in the upper catchment up seven times those recorded at the Airport for the 3-hour critical storm duration. The Red Hill Reservoir gauge recorded rainfall more intense than design estimates for the 0.2% AEP, for durations between three to nine hours (2).

c. Serious flooding within Park Beach resulted from heavy, intense rainfall in November 2009 and more recently in February 2015. The November 2009 event was the more extreme of the two, with a total of 361mm recorded in the 24 hours to 9am on the 6th at the Coffs Harbour Airport gauge. Around 184mm of this was recorded in just three hours. Rainfall of this intensity is equivalent to design rainfall of around a 1% AEP for durations less than six hours, and around a 2% AEP for the 24 hour total.

Both events particularly highlighted the severity of flooding affecting properties in low-lying areas of San Francisco Avenue and York Street.

d. Small changes in flood levels will substantially increase and decrease the number of homes affected by flooding (an increase in the 1% AEP flood of only 0.2m would result in an additional 105 homes that would be flooded) (15).

e. Flooding will have been dangerously fast with a high potential for property damage and loss of life in the town (11).

f. Rate of rise was 1.8 m/hr in 2009, with potential to exceed this threshold (11).

2.4.3 Classification of the Floodplain

a. For emergency management purposes, Coffs Central Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
53642	Marcia Street	153	67	121	Low Flood Island
54023	Botantic Gardens	7	3	5	Rising Road Access
54026	Robin Street	867	411	740	Low Flood Island
54430	Coffs Creek	237	101	182	Low Flood Island
54855	West Robin Street	665	267	480	Low Flood Island
54856	Shephards Lane	4872	1944	3500	Indirectly Affected

- further reference will be provided in Volume 3 as part of the Mapping.

2.4.4 Inundation

a. There is a detailed flash flood warning system in place by Coffs Harbour City Council. The Bureau only currently provide a warning service to the Coffs Creek Gauge (ARWC 205439). The flash flood warning gauge network, sends an alert to the NSW SES Local unit. This network is explained in further detail in Volume 3, Chapter 1 of the Coffs Harbour Local Flood Emergency Sub Plan.

Table 16: Gauge heights and predicted flood heights in metres for various flood frequencies and Council Operational Trigger Heights.

Gauge	Council Operational Trigger	Min	Mod	Maj	5% AEP	1% AEP	0.5% AEP	PMF
Coffs Creek (Highway Bridge) – 205439/559012 (waterlevel)		3.0	-	4.7	4.4	4.9	5.1	6.7
Gundagai Street (Coffs Creek) – 559058 (rain/waterlevel)	3.3				4.7	4.3	5.4	6.8

Loaders Lane (Coffs Creek) – 559056 (rain/waterlevel)	3.0				3.8	4.0	4.4	5.5
Bennetts Road Detention Basin (Coffs Creek) – 559063 (rain/waterlevel)	4.5				6.1	7.6	7.9	8.8
Spagnolos Road detention basin – 559064 (rain/waterlevel)	2.8				4.4	5.6	5.8	6.8
Bakers Road detention basin – 559055 (rain/waterlevel)	4.5				4.7	5.6	-	7.2
Shepherds Lane detention basin – 559077 (rain/waterlevel)	3.0					6.4		
Buchanans Road – 559060 (rain)								

Table 17: Average rainfall intensities (mm/hr) (2)

Duration (hrs)	Design Rainfall Intensities (mm/hr)				
	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
0.5	87.9	98.8	113	132	147
1	61.2	69.2	79.9	94.0	105
2	41.5	47.4	55.1	65.3	73.2
3	32.9	37.8	44.1	52.5	59
6	22.1	25.6	30.1	36.1	40.9
12	14.9	17.4	20.5	24.9	28.2
24	10.0	11.8	14.0	17.0	19.4

b. Around 4.15 m on the Coffs Creek (Highway Bridge) gauge would inundate approximately 14 homes and 4 businesses above floor level. This would be equivalent to 150-200mm over 3-6 hours (27).

c. A flood around 4.7 m on the Coffs Creek (Highway Bridge) gauge would inundate 117 homes and 31 businesses over floor level. This would be equivalent to 200-300mm over 3-6 hours (27).

d. Around 5.15 m on Coffs Creek (Highway Bridge) is equivalent to 250-400mm over 2-9 hours. It is estimated that (16):

- 594 residential properties (containing a house) would be flooded over ground level (by approximately 0.5 m).

- 308 residential homes would be flooded above floor level. Homes downstream of Grafton Street generally experience greater inundation depths (to 1 m). The breakdown of the flooded properties (excluding motel units, mobile homes and caravans) is as follows (15):
- 253 commercial or industrial properties (containing buildings) would be flooded over ground level (approximately 0.5m) (15).
- 111 commercial and industrial buildings would be flooded above floor level (15).

e. A flood of 5.43 m on Coffs Creek (Highway Bridge) gauge, for example 1996 flood, will affect buildings above floor in: (24)

- Beryl Street,
- Brush Cherry Close,
- Castle Street,
- City Centre Mall,
- Duke Street,
- Elbow Street,
- Eugourie Close,
- Everingham Place,
- Frances Street,
- Goodenough Terrace,
- Grafton Street,
- Gundagai Street,
- High Street, Jean Street,
- Korff Street,
- Loaders Lane,
- Long Street,
- Moonee Street,
- Oriana Street,
- Park Avenue,
- Robin Street,
- Scarba Street,
- Shephards Lane,
- West High Street,
- West Side Close.

f. A flood of 5.43 m on Coffs Creek (Highway Bridge) gauge, for example 1996 flood, will affect buildings below floor in: (24)

- Alexander Street,
- Azalea Avenue,
- Curcoa Street,
- Flintwood Place,
- Gallipoli Road,
- Glenreagh Street,
- Little Street,
- Lyster Street,
- Majorie Street,
- Mclean Street,
- Meadow Street,
- Murray Drive,
- North Street. (24)

g. This is equivalent to a flood of 3.62 m on the Bray Street gauge, which affected properties on: (11)

- Ann Street,
- June Street,
- Lawson Crescent,
- Marcia Street,
- Melittas Avenue,
- Orlando Street,
- Harbour Drive,
- Pacific Highway (24)

h. In the PMF – 6.7 m (2) at Grafton Street almost the entire extent of the main Coffs Harbour CBD, centred on Grafton Street, is subject to inundation from extreme floods, with a frequency between the 1% AEP and PMF events. It is estimated that:

- 1,464 residential properties (containing a house) would be flooded over ground level.
- 1,087 residential homes would be flooded above floor level.
- 458 commercial or industrial properties (containing buildings) would be flooded over ground level.
- 424 commercial and industrial buildings would be flooded above floor level.

Table 18: Number of houses and buildings affected by flooding at the Coffs Creek (Highway Bridge) Gauge (24)

Location	Residential Homes			Commercial Buildings		
	5%	1%	PMF	5%	1%	PMF
DS Grafton St	42	70	299	24	67	270
Grafton Street to Robin St	14	130	527	5	41	150
Robin Street to Bakers Rd/Donn Patterson Dr	58	105	246	0	1	1
US Bakers Rd/Donn Patterson Dr	3	3	15	2	2	3
TOTAL	117	308	1087	31	111	424

2.4.5 Isolation

a. Isolation of sections of the community occurs rapidly for short periods (up to several hours).

   i. Around 5.10 m on the Gundagai Street Gauge (estimated 5% AEP) Gundagai Street closes (the evacuation route for Gundagai Place, Gundagai Street, Robin Street, Frances Street, Long Street, Jean Street, Korff Street, Tugownie Close, West High Street, Scarba Street). (24)

   ii. Around 5.43 m on the Coffs Creek (Highway Bridge) gauge Harbour Drive and Orlando Street may close, restricting traffic in the vicinity of east Coffs Harbour. Alternate access is available via Victoria Street. This height also may close Taloumbi Road and Shepherds Lane, closing the evacuation route for the Taloumbi Road area north of Bray Street and restricting access in the area (15).

   iii. Joyce Street, Mackays Road and Donn-Patterson Road may close around 3.62 m on the Bray Street gauge. This closes the evacuation route in the vicinity of Orara High School, areas to the north west (Vera Drive etc.), and areas to the west (Shephards Lane, Pearce Drive etc.) respectively.

   iv. The Pacific Highway closes at numerous locations around 5.14 m impacting traffic flow north and south of Coffs Harbour for up to several hours. (24)

2.4.6 Flood Mitigation Systems

a. A number of mitigation works are aimed at reducing stormwater drainage problems through the CBD, primarily by diverting stormwater flow from local catchment areas away from the area, identified in Section 1.7. These include a number of detention basins identified as prescribed dams by the Dams Safety Committee.

b. Loaders Lane levee is estimated to overtop at 3.65 m on the Loaders Lane gauge near Goodenough Terrace (east) (10). This levee protects properties in Loaders Lane, Goodenough Terrace, Brindley Court, McCann Court and Charlotte Court.

c. Maclean Street detention basin is expected to overtop around 5.14 m on Coffs Creek (Highway Bridge) gauge (10).

2.4.7 Dams

a. The potential impacts of detention basin failure (including Spagnolos Road, Upper Shepherds Lane, Bennetts Road and Bakers Road) on Coffs Harbour would be increased flow as the crest is reached. Section 1.3 details relevant dams and detention basins including warning systems and consequence information. Detention basins are designed for 1% AEP protection (18).

2.4.8 At Risk Facilities

a. The following schools and childcare centres are at risk of flooding and/or isolation (26):

   i. Schools

      - Narranga Primary School, Robin Street (isolated at 5.14 m on Coffs Creek (Highway Bridge) gauge 205439-559012).
      - Coffs Harbour Christian Community School Junior Campus, 27 Curacoa Street, Coffs Harbour.
      - Coffs Coast Alesco School, 66 Harbour Drive, Coffs Harbour.
      - Coffs Harbour TAFE College, 1 Glenreagh Street, Coffs Harbour.

   ii. Childcare centres

      - Happy Days Preschool and Long Day Care Centre, Harbour Drive.
      - Lilly Pilly Learning Centre, 69 Gundagai Street
      - Ohana Early Learning, 13 Scarba Street
      - Caterpillar House Occasional Child Care Association Inc, High Street.
      - Cow and Koala Professional Child Care, William Sharp Drive.
      - 3 Bears Cottage Early Education Service, Scarba Street.
      - Brayside Community Preschool becomes isolated.
      - Possums Den, 8 Earl Street in a PMF.
      - Kulai Preschool, 14 Myuna Place in a PMF.
      - Coffs Harbour Preschool, Brodie Drive in a PMF.
      - Bower Bird Child Care Centre, North Street becomes isolated in a PMF.

b. The following facilities for the aged and/or infirm are at risk of flooding and/or isolation (26):

- St Josephs Aged Care, 37 Azalea Avenue in a PMF.
- Waratah Respite Centre Community Village, Earl Street in a 1% AEP (5.15m Coffs Creek (Highway Bridge) 205439-559012).

c. The following utilities and infrastructure are at risk of flooding (11):

- Water supply infrastructure during flood events is affected by main water breakage usually as a result of erosion around water mains (11).
- Sewer pump stations are often located in low lying or flood prone areas. The pumps in the pump stations are submersible pumps and operate under water; however, each pump has an electric control panel and are generally above the 1% level (4.75 m at Coffs Creek (Highway Bridge) 205439-559012). Coffs Harbour City Council (sewer operations staff) monitor the pumping system and at-risk areas (11).
- Telephones exchanges (Telstra) may be affected in a PMF however were not affected in the 1996 flood event (11).
- Electricity substation (Bray Street) is not known to be affected by flooding.

d. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.4.9 Other Considerations

a. Special events held throughout the year are listed on the Coffs Harbour City Council website.

b. Coffs Harbour has two peak seasons with potential for a population increase: up to 10% Christmas holidays December – January and Easter long weekend.

2.5 COFFS BRAY STREET SECTOR

North Coffs Harbour

2.5.1 Community Overview

a. Coffs Bray Street Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	**10929**
Dwellings	**5373**

b. Coffs Harbour is situated on the coast along Coffs Creek and its' northern tributaries. It is divided by the Pacific Highway (Grafton Street) and has a total population of 10929 (22) (Table 10). The Coffs Bray Street Sector includes the Northern tributaries, south of the North Coast Railway Line, north of Treefern Creek and east to include Park Beach.

c. Coffs Harbour has approximately 6.5% Indigenous population. Approximately 2.6% of the population do not speak English very well (22) (Table 10).

d. In the west this sector includes urban development, and, in the east, it contains substantial retail, urban and accommodation.

2.5.2 Characteristics of Flooding

a. The Coffs Bray Street Sector includes urban and industrial areas on the northern boundaries of Coffs Harbour. This area includes the Northern Tributaries of Coffs Creek, running adjacent to Bray Street and Argyll Street; and the area located east of the railway line, draining the low-lying areas of Park Beach.

b. The topography of the Coffs Creek catchment is conducive to extreme weather events. During the formation of a low pressure system off the coast known as an east coast low (ECL), the steep terrain located very close to the coastline is exposed. In the presence of strong onshore wind, moisture filled air masses are pushed towards the hills, where they rapidly rise facilitating intense rainfall over the upper catchment. The phenomenon of increased rainfall across the upper catchment was found to be consistent across several historic rainfall events. (2)

c. The Coffs Creek catchment is prone to severe flash flooding as it is a relatively small catchment with steep upper slopes, a high level of urban development on the floodplain and the tendency for high rainfall. (2)

d. The nature of flooding along the Northern Tributaries is similarly characterised by overland flow paths through urban areas that readily become active during large flash flood events. Floodwater spills from the Bray Street tributary at various

locations between the Pacific Highway and Frederick Street. In the eastern part of this sector the Park Beach catchment is very flat, and drainage is controlled by the culverts under the railway. The channel downstream of the railway culvert closest to the Park Beach Plaza and the Orlando Street Bridge drains flows from the majority of the catchment. (2)

e. Further upstream, floodwater has a tendency to breach the banks at the Perry Drive crossing inundating properties along Apollo Drive. Flooding also occurs along a naturally occurring gully line through Antaries Avenue and Polaris Close. As the nature of the catchment topography provides significant flood storage, flooding within the broader Park Beach area is largely a function of the total volume of rainfall.

Table 19: Average Design Rainfall Intensities (mm/hr) (2)

Duration (hrs)	Design Rainfall Intensities (mm/hr)				
	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
0.5	87.9	98.8	113	132	147
1	61.2	69.2	79.9	94.0	105
2	41.5	47.4	55.1	65.3	73.2
3	32.9	37.8	44.1	52.5	59
6	22.1	25.6	30.1	36.1	40.9
12	14.9	17.4	20.5	24.9	28.2
24	10.0	11.8	14.0	17.0	19.4

2.5.3 Classification of Floodplain

a. For emergency management purposes, Coffs Bray Street Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECT ID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
328	Coffs Harbour Bray Street	9857	4990	8982	Rising Road Access
53640	Park Beach	431	263	473	Low Flood Island
53641	Hogbin Drive North	2	1	2	Rising Road Access
54457	The Shoreline	256	152	274	Indirectly Affected
54854	West Bray Street	4298	1848	3326	Indirectly Affected

- further reference will be provided in Volume 3 as part of the Mapping.

2.5.4 Inundation

a. Properties along Apollo Drive will become inundated when floodwaters breach the banks at the Perry Drive crossing. Inundation also occurs along a naturally occurring gully line through Antaries Avenue and Polaris Close.

b. Properties located behind the Collice Place / Langker Place levee become inundated by flood water during the 1% AEP event with a typical depth of flooding of up to 0.5m being modelled. Flood waters currently spill out of the drainage channel north of the levee, through the backyard of 8 Gillies Close and 7 Langker Place.

c. Anecdotal reports by community members on the Facebook page indicated that the eastern ends of Boultwood Street and Prince Street (toward Ocean Parade) experienced significant flooding and were not passable by car during the 2015 event. (2).

d. During the PMF, typical flood depths of around 1.2m would be expected in Park Beach (2).

Table 20: Modelled Peak Flood Levels (mAHD) and predicted flood height in metres for various flood frequencies and Council Operational Trigger Heights. (2)

Gauge	Council Operational Trigger	Min	Mod	Maj	5% AEP	1% AEP	0.5% AEP	PMF
York Street Playing Fields					4.7	4.7	4.8	6.0
Bray Street (3.5m) (Coffs Creek) – 559057 (rain/waterlevel)	1.8				3.5	3.6	3.6	4.2

Table 21: Number of houses and buildings affected by flooding at the Coffs Creek (Highway Bridge) 205439/559012 (15)

Location	Residential Homes			Commercial Buildings		
	5%	1%	PMF	5%	1%	PMF
Park Beach East of the Pacific Highway	12	33	1123	0	7	192
TOTAL	129	341	2210	31	118	616

e. A flood of 5.43 m on Coffs Creek (Highway Bridge) gauge, for example 1996 flood, is equivalent to a flood of 3.62 m on the Bray Street gauge, which affected properties on

- Antaries Avenue,
- Apollo Drive,
- Argyll Street,

- Bradley Street,
- Bray Street (including the commercial premises),
- Collice Place,
- Deborah Close,
- Dutton Crescent,
- Elm Street,
- Frederick Street,
- Seccombe Close,
- Gosling Close,
- Grant Close,
- Hannaford Place,
- Hughes Close,
- Katherine Close,
- Kurrajong Street,
- Langker Place,
- Maple Street,
- Pacific Highway,
- Polaris Close,
- Taloumbi Road,
- Wilga Place (10).

2.5.5 Isolation

a. Along the Northern Tributaries, an additional flow path becomes active between the Argyll Street Arm and Bray Street Arm, across Oxley Place and Joyce Street. Northern tributaries cross Bray Street twice as well as crossing the western (Mackay's Road) and southern (Joyce Street) evacuation routes. The north is bound by the North Coast Rail line so there is a possibility of isolation for a significant part of this sector during significant flash flood events.

b. Bray Street may close around 2.5 m on Bray Street gauge, closing evacuation route for Kurrajong, Argyle and sections of Bray Streets (26).

2.5.6 Flood Mitigation Systems

a. Just downstream of Hannaford Place, local flood mitigation works including levee walls and benching have been constructed since 1996 to alleviate the flood impact to properties along Langker Place and Collice Place.

2.5.7 Dams

a. There are no known consequences of dam failure for these communities.

2.5.8 At Risk Facilities

a. The following childcare centres are at risk of flooding and/or isolation (26):

   i. Park Beach Child Care Centre, Park Beach Road in a PMF.

   ii. Gumnut Cottage Child Care Centre, Park Beach Road

   iii. Jungle Club in the Bray Street Complex

b. The following facilities for the aged and/or infirm are at risk of flooding and/or isolation (26):

   i. Dalpura Village, 9 Bray Street

2.5.9 Other Considerations

a. Special events held throughout the year are listed on the Coffs Harbour City Council website.

b. These areas have two peak seasons with potential for a 10% population increase associated with tourism: Christmas holidays December –January and Easter long weekend.

2.6 WOOLGOOLGA SECTOR

Woolgoolga, Safety, Emerald, Sandy, Moonee and Sapphire Beaches

2.6.1 Community Overview

a. Woolgoolga Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	19593
Dwellings	8423

b. There are a number of small individual coastal communities to the north of Coffs Harbour, which may be affected by Moonee Creek, Skinners Creek, Sugar Mill Creek and Cunningham Creek floods. The area is dominated by rural land holdings (Table 10).

c. Moonee Beach and Sapphire Beach have a population of 1933 and 2084, and median ages of 40 and 46 respectively.

d. Emerald Beach and Sandy Beach have populations of 2234 and 2287, and a median age of 42 and 38 respectively.

e. Woolgoolga (population 5290) is the main township within the Woolgoolga Creek catchment. It is located to the south of Woolgoolga Lake, straddling Woolgoolga and Jarrett Creeks. Woolgoolga has approximately 4% indigenous population, and 2% of persons that do not speak English well or not at all (22) (Table 10).

f. Safety Beach (population 930) is located on the northern banks of Woolgoolga Lake and Poundyard Creek and to the south of Darkum Creek (22). Safety Beach has approximately 3% indigenous population and no persons identified without proficiency in English (22) (Table 10).

g. The percentage of indigenous persons in Moonee, Sapphire, Emerald and Sandy Beaches are approximately 3%, 2%, 5% and 6% respectively (22) (Table 10). No persons have been identified as not having proficiency in English (22) (Table 10).

2.6.2 Characteristics of Flooding

a. This area is a flash flood environment. As it is located within close proximity of the coast it is influenced by tides up to 7.7 km upstream of the entrance (1).

b. Woolgoolga Lake is an intermittently closed and open lagoon (ICOLL). The natural breakout of Woolgoolga Lake typically occurs when water levels in the lake are between 1.2 to 1.8m AHD (GeoLINK, 2011). When the water level in the lake reaches 1.6m AHD and natural breakout does not occur then Council may initiate a mechanical breakout of the lake entrance. This is to prevent flooding of property and other key assets (28).

c. Flooding in the Arrawarra Creek Catchment is affected by Riverine and tidal inundation.

d. The Darkum Creek catchment is a very small fast responding catchment. Both riverine and the overland flow through Safety Beach influence flooding in the catchment and tidal level and berm heights at the mouth of the creek may also influence flood levels in the lower reaches.

e. Berm geometry, oceanic influences, riverine and some overland flooding may impact flooding in the small Willis Creek Catchment in some way.

f. Berm geometry, oceanic and riverine processes are all considered to influence flooding in the Double-Crossing Creek Catchment. The catchments estuary Hearnes Lake has an entrance that is considered an ICOLL.

g. Fiddamans Creek catchment is a small fast responding catchment. Berm geometry, oceanic and riverine processes are all considered to influence flooding in the catchment.

h. Flooding in the tidal areas of Moonee Creek and major tributaries are influenced by ocean water levels. In the Moonee Creek floodplain between the Pacific Highway and Moonee Creek, flooding is controlled by the culverts under the highway; across the Moonee Creek floodplain to the west (upstream) of the Pacific Highway, flooding is determined by runoff and the capacity of the culverts under the highway. In the upper reaches of Sugarmill Creek and tributaries, flooding is determined solely by runoff (29; 23).

2.6.3 Flood Behaviour

a. Flooding in Woolgoolga is due to both mainstream flooding from Woolgoolga Creek and Jarrett Creek and local catchment runoff from the south. The catchments are relatively steep in nature and the majority of flood waters are contained within the watercourses and adjacent floodplain. However, within Woolgoolga itself there is more extensive inundation of low-lying areas, including developed zones.

b. During major flood events, when the capacity of Woolgoolga Creek is exceeded, flood flows occur through the Haines Close and Sunset Caravan Park localities.

c. There is limited out-of-bank flooding along the Poundyard Creek alignment. However, flooding emanating from Jarrett Creek and smaller local catchments does present an associated flood risk within Woolgoolga, with the flood risk to developed areas primarily affecting these two locations. Given the size of the Woolgoolga Lake catchment, and relative steepness along the main flow path alignments, the catchment is highly responsive to rainfall such that the critical flood conditions within Woolgoolga relate to high intensity short duration events of the order of 2 to 6 hours.

d. Figures 8, 9, 10 and 11 show the Hydraulic categorisation (floodway, flood storage and flood fringe) for Darkum Creek, Fiddamans Creek, Hearnes Lake, Willis Creek and Woolgoolga Creek (30).

Figure 8: Darkum Creek Hydraulic Categorisation 1% AEP (30)

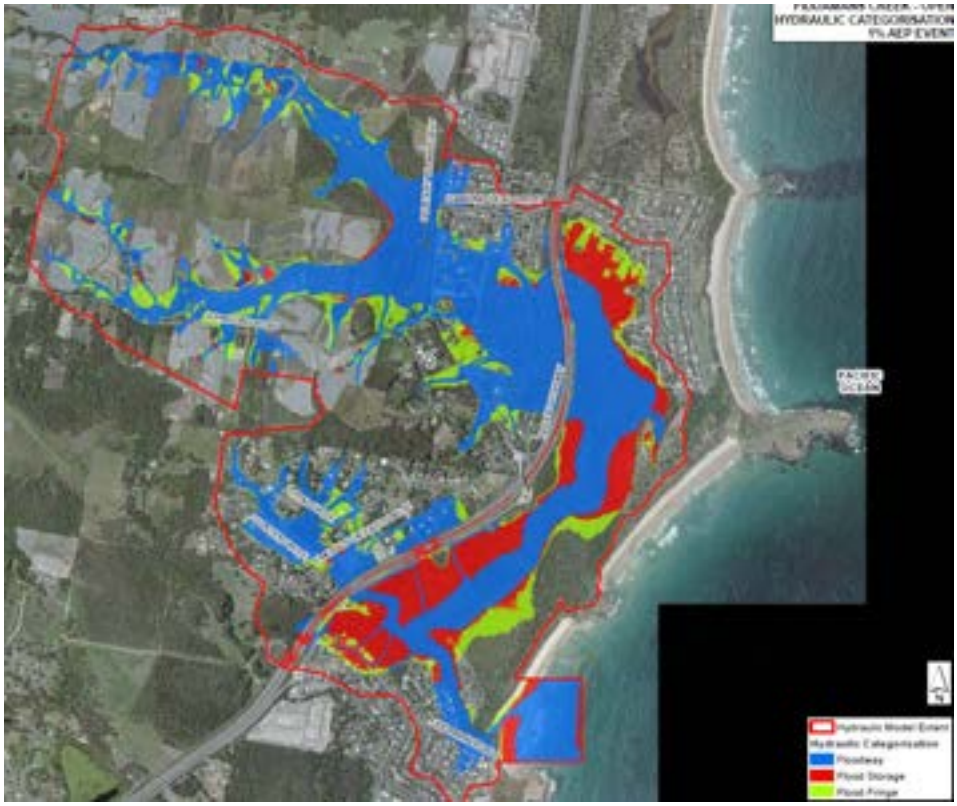


Figure 9: Fiddamans Creek Hydraulic categorisation 1% AEP event (30)

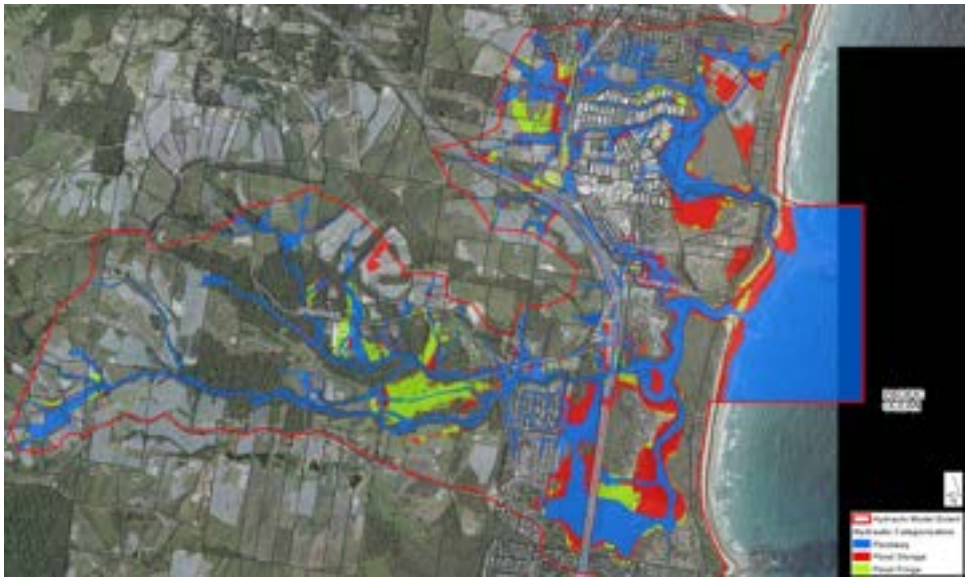


Figure 10: Hearnes Lake & Willis Creek Hydraulic Categorisation 1% AEP event (30)

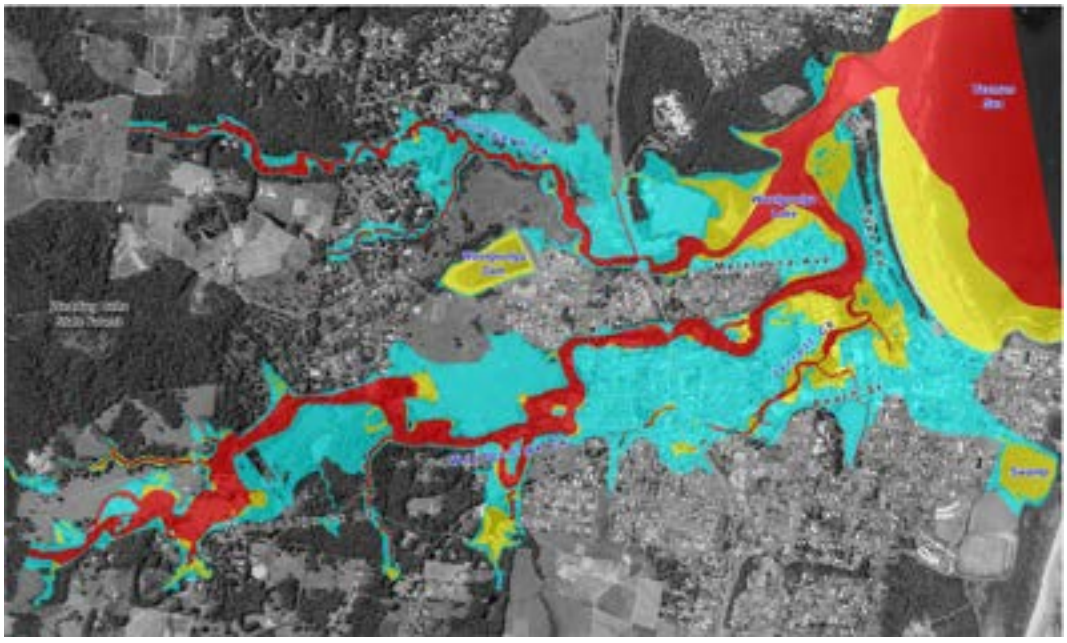


Figure 11: Woolgoolga Hydraulic Categorisation 1% AEP event (30)

2.6.4 Classification of Floodplain

a. For emergency management purposes, Woolgoolga Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
54037	Sapphire Beach	173	72	130	Low Flood Island
54448	Sunset Caravan Park	77	102	184	Low Flood Island
54449	Heritage Park	66	21	38	Rising Road Access
54450	Moonee Beach	201	80	144	Rising Road Access

54454	Woolgoolga	453	259	466	Low Flood Island

- further reference will be provided in Volume 3 as part of the Mapping.

2.6.5 Inundation

a. Moonee Creek gauge (205435) is monitored by MHL and is used for Moonee Beach floods.

Table 22: Gauge heights (m) for flood probabilities at Moonee Creek gauge (3)

Gauge	5%	1%	PMF
Moonee Creek MHL	-	2.8	3.6

b. Woolgoolga utilises the following gauges:

i. Woolgoolga Creek gauge (monitored by MHL) – 205441/559043.

ii. Woolgoolga Lake gauge (monitored by MHL) – 205455.

iii. Woolgoolga Dam (monitored by City of Coffs Harbour) – 559061. Trigger rainfall of 60mm in 3hours.

Table 23: Gauge heights (m) for various flood frequencies in metres for Woolgoolga Creek, dependent upon berm conditions (3)

Gauge	5%	1%	PMF
Woolgoolga Creek (205441)	3.62 (280mm in 24 hours)	4.02 (376mm in 24 hours)	6.12
Woolgoolga Lake	2.85	3.1	-

c. A few low-lying dwellings may be flood prone if local creeks break their banks or storm surges cause back up of flood water. Roads and properties on the following roads may be affected in a 1% flood (2.68 m) (26):

- Tiki Road, Moonee Beach.
- Heritage Drive, Moonee Beach.
- Tidal Crescent, Moonee Beach.
- Kumbaingeri Close, Moonee Beach.
- Moonee Beach Road, Moonee Beach.
- Old Bucca Road, Moonee Beach (alternate routes available for properties west of the highway).
- Beach Road, Sapphire Beach.
- North Sapphire Road, Sapphire Beach - Closing evacuation route for Red Ash Road, Paperbark Street, White Bluff Road, and Island Road.
- Split Solitary Road (East), Sapphire Beach.

- Crystal Drive (East), Sapphire Beach.
- North Solitary Drive (South), Sapphire Beach - Closing evacuation route for Green Bluff Road, Fisher Road and Bare Bluff Crescent.
- Solitary Island Way (formerly Graham Drive), Sandy Beach.
- Fiddaman Road, Emerald Beach.
- Fishermans Drive, Emerald Beach.

d. Floods of 3.56 m on the Woolgoolga Creek gauge inundates approximately 20 properties in Haines Close, Newman Street, Bultitude Street, Trafalgar Lane, Pacific Street and Sunset Caravan Park (10).

e. No gauges exist for the streams to the north of Woolgoolga (including Arrawarra and Darkum Creeks).

f. The flood risk to developed areas is primarily located in the Woolgoolga Creek – Jarrett Creek confluence area and the surrounding floodplain, particularly Newman Street, Boundary Street, Ganderton Street and Wharf Street. In addition to the main stream sources, local runoff and overland flows are likely to affect a number of locations, including Clarence Street (Old Pacific Highway), Turon Parade, Market Street and Trafalgar Street (3).

g. Safety Beach is susceptible to flooding from Darkum Creek tributaries to the north of Admiralty Drive, and on the north-western end of Woolgoolga Lake in the vicinity of the Cemetery and school entrance (26).

h. The most significant risks are (3):

   i. Low-lying floodplain areas around the Woolgoolga Creek-Jarrett Creek confluence.

   ii. Areas around Turon Parade and Clarence Street (Pacific Highway) where an overland path occurs upstream of Jarrett Creek's open channel.

   iii. Flooding in the vicinity of Sunset Caravan Park can become very deep and dangerous (exceeding 3 m).

   iv. Areas around Market Street and Beach Street where floods are sensitive to stormwater drainage network blockages.

2.6.6 Isolation

a. Some properties may be isolated as a consequence of flash flooding, with potential periods of isolation up to several hours (26).

b. Roads susceptible to flooding in a 1% AEP (4.02 m) flood include (3);

- Clarence Street (Old Pacific Highway), Woolgoolga.

- Hibbard Street, Woolgoolga.
- Pullen Street, Woolgoolga.
- Turon Parade, Woolgoolga.
- Market Street, Woolgoolga.
- Trafalgar Street, Woolgoolga.
- Ganderton Street, Woolgoolga.
- Beach Street, Woolgoolga.
- Boundary Street, Woolgoolga.
- Burton Drive, Woolgoolga.
- Lake Road, Woolgoolga.
- Newman Street, Woolgoolga.
- Solitary Islands Way, Woolgoolga.
- Alternate access is available in Woolgoolga in a 1% AEP flood (4.02 m).

2.6.7 Flood Mitigation Systems

a. There are no known flood mitigation systems; however, a number of private dwellings have placed ad hoc protection from erosion along Sugar Mills Creek, residential housing and caravan park foreshore (1).

2.6.8 Dams

a. Woolgoolga Dam is an off stream storage dam located 1.5 km northwest of Woolgoolga. Failure may occur as a consequence of extreme flood levels overtopping the embankment, or 'sunny day' failure. A number of properties (26 in Melaleuca Avenue as well as others in Cedar Place and Pandanus Place) are at risk of over floor flooding up to a depth of 300mm. Woolgoolga Lakeside Holiday Park will also be inundated to approx. 300mm. The crest level is 18.9 m, with a spillway at 17.7 m. White, Amber and Red alerts exist for the dam; which are 18.2, 18.4 and 18.7 m respectively (2).

2.6.9 At Risk Facilities

a. The following schools and childcare centres are at risk of flooding and/or isolation in approximately the 1% AEP flood (~4.02 m, noting larger floods are possible) (26):

   i. Schools

      - Woolgoolga High School, Centenary Drive, Woolgoolga.
      - Childcare centres
      - Woolgoolga Child Care Centre, Turon Parade, Woolgoolga.

   ii. The following facilities for the aged and/or infirm are at risk of flooding and/or isolation:

- Plantations by Ingenia Lifestyle. Off McIntosh Crescent

b. There are no utilities or infrastructure at known risk of flooding.

c. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.6.10 Other Considerations

a. Special events held throughout the year are listed on the Coffs Harbour City Council website, including the Curry Festival in September.

b. Woolgoolga has two peak seasons with potential for a 20% population increase associated with tourism:

- Christmas holidays December –January.
- Easter long weekend, particularly when coinciding with school holidays.

2.7 CORINDI SECTOR

Corinidi, Arawarra, Mullaway and Red Rock

2.7.1 Community Overview

a. Corindi Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	3709
Dwellings	1675

b. Corindi (population approximately 1453) is located on the coast, approximately 35 km north of Coffs Harbour. It is located to the south east of Corindi River. Corindi has 8% indigenous population and very few persons without proficiency in English (22) (Table 10).

c. Red Rock (population approximately 435) is located on the coast to the north of Corindi, on the southern banks of the Corindi River entrance. Around 7% of its population are indigenous and no persons identified without proficiency in English (22) (Table 10).

d. Mullaway (population of approximately 567) is located on the coast between Darkum and Arrawarra Creeks to the north of Woolgoolga. Mullaway has approximately 6% indigenous population and no persons identified without proficiency in English (22).

e. Arrawarra (population of approximately 523) is located on the coast to the north of Mullaway and Arrawarra Creek and to the south of Arrawarra Gully. Arrawarra has approximately 4% indigenous population and very few persons without proficiency in English (22) (Table 10).

2.7.2 Characteristics of Flooding

a. This catchment is a flash flood environment, reaching its peak generally within less than 12 hours from the start of a storm. It is influenced by tidal fluctuations and the entrance conditions (31).

b. Flood levels, speed, duration and behaviour in the vicinity of Blackadder Creek at the Pacific Highway have been modified and divert flows into Cassons Creek/Cox's Lane area (31).

2.7.3 Flood Behaviour

a. The lower reaches of the Corindi River catchment are relatively flat and contain a broad floodplain that allows floodwaters to spill into the adjoining Blackadder and

Cassons Creeks. In contrast to the flat lower reaches, the upper reaches of the catchment are more rugged.

b. The floodplain extent in the Upper Corindi area is narrow and flow does not spread out as much as downstream areas mainly due to the higher slopes in the river and faster flow velocity. However, the river breaks its banks in a 20% AEP and rarer events just upstream Boyle's Bridge and floods Sherwood Creek Road and joins Corindi River again downstream from the bridge. Flow velocity upstream of the Pacific Highway is generally higher in the main creek and floodplain compared to the floodplain downstream (4).

c. Significant rainfall events in the upper catchment can cause flash flooding in the Corindi Park Drive area.

2.7.4 Classification of Floodplain

a. For emergency management purposes, Corindi Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
310	Corindi Park Drive	82	31	56	Low Trapped Perimeter
51600	Pebby Beach Campground	309	103	103	Overland Escape route
51604	Station Creek Campground	111	37	37	Rising Road Access
54442	Cassins Creek	50	19	34	Low Flood Island
54443	Sherwood Creek Road	21	8	14	Rising Road Access
54445	Corindi Red Rock	2011	951	1711	Indirectly affected
54446	Arrawarra	85	50	90	Low Flood Island

- further reference will be provided in Volume 3 as part of the Mapping.

2.7.5 Inundation

a. Corindi Road at Boyles Bridge gauge (559070) and Corindi River on Solitary Islands Way (Previously Pacific Highway) (559069) are monitored by Coffs Harbour City Council and are used for Corindi River floods.

b. As a result of the 2021 major Corindi Flash Flood event a flash flood warning system has been implemented for Lower Corindi. The new free Council automated "opt-in system" sends SMS flood warning messages based on certain rainfall and river height data being recorded at Boyles Bridge and Old Pacific Highway gauge. (32)

Table 24: Rainfall for various flood frequencies for Corindi River (31; 11) and Council Operational Trigger Heights

Gauge	Council Operational Trigger	5%	1%	PMF
Corindi Creek (Solitary Island Way)	4.0	5.8	6.4 (190 mm over six hours)	n/a
Corindi River at Boyles Bridge	3.5	7.07	7.43	8.54
Corindi Solitary Islands Way (3M)		9.74	9.96	10.62

c. During floods in the order of 170 mm over 6 hours (2% AEP), as was seen in 2012, properties in Corindi Park Drive, Cox's Lane and Blackadder Road become flooded. During these events approximately 14 properties are inundated to depths up to several metres. Some properties become high flood islands in such floods, with the potential to inundate if the flood waters continue to rise (10).

d. The Corindi Park rural residential drive area, and Cox's Lane, Blackadder Road and Solitary Islands Way are all at risk of inundation. (4)

e. Flooding in Upper Corindi is confined by a narrow floodplain. Downstream of Solitary Islands Way the floodplain broadens. A number of properties are located in the floodplain including in Upper Corindi, Coxs Lane/ Solitary Islands Way area, Corindi Park Drive and Red Rock. A break out occurs from Corindi River upstream of Boyles Bridge. Flow paths develop across Corindi Park Drive cutting evacuation routes.

f. Solitary Islands Way is overtopped in the 20% AEP event (see table 30) (4). Properties along the eastern side of Beach Drive are inundated in frequent events (20% AEP) and in rarer events all of Beach Drive and First Avenue are overtopped. In the 5% AEP and rarer events the Darlington Beach Holiday Resort and Stringybark Drive are inundated.

g. Arrawarra Creek overflows it's banks in a 20% AEP and inundates the Arrawarra Caravan Park (South of Arrawarra Beach Road). (4)

h. There is the potential for a greater number of properties to become inundated in larger floods up to the PMF; however, this data is currently unavailable.

2.7.6 Isolation

a. Properties in Corindi Beach and Red Rock may be isolated for several hours due to road closures, including the Solitary Islands Way north and south of Corindi, in 1% AEP storm events.

2.7.7 Flood Mitigation Systems

a. There are no identified flood mitigation systems.

2.7.8 Dams

a. Stage 3 – Corindi Dam is an off stream storage dam located 40 km north of Coffs Harbour. Failure may occur as a consequence of extreme flood levels overtopping the embankment, or 'sunny day' failure. Populations downstream of the dam include farm worker in agricultural areas, buildings, pump sheds, on roads. Land occupied by Costa includes the "Fullers" and "Tolsons" areas which are immediately downstream of the dam. The crest level is 100.45 mADH, with a spillway at 99.1 mAHD. White Alert at 99.4 m RL, Amber at 99.8 m RL and Red alerts exist for the dam at 100m RL.

2.7.9 At Risk Facilities

a. The following schools and childcare centres may be at risk of isolation as Corindi becomes isolated in a 1% AEP flood and greater for short periods of time (hours) – no data is currently available for larger floods. Access to these facilities from within the sector is still possible.

   i. Schools

      - Corindi Beach Public School, Coral Street.

   ii. Child Care Centres

      - Tiny treasures Preschool, Coral Street.

b. There are no facilities for the aged and/or infirm at known risk of flooding and/or isolation.

c. There are no utilities or infrastructure at known risk of flooding.

d. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.7.10 Other Considerations

a. Special events held throughout the year are listed on the Coffs Harbour City Council website.

b. Corindi has two peak seasons with potential for a 40% population increase associated with tourism:

   - Christmas holidays December – January.
   - Easter long weekend.

2.8 UPPER ORARA SECTOR

Coramba, Nana Glen, Karangi and Bucca

2.8.1 Community Overview

a. Orara Sector has the following details according to the Australian Exposure Information Platform (AEIP) (21):

Population	2947
Dwellings	1218

b. The Upper Orara is comprised of rural areas. It encompasses Coramba, Nana Glen, Karangi and Bucca.

c. Coramba has a population of 810; Karangi has a population of 586; Nana Glen and Bucca have populations 1,055 and 553 respectively (22) (Table 10).

d. The area has approximately 4% indigenous population and no persons who have identified they do not speak English (22) (Table 10).

2.8.2 Characteristics of Flooding

a. Flood velocities are expected to be generally below 2 m/s, except in steep confined creeks where the velocities will exceed this threshold. Flood peaks can rise quickly and isolate the communities and rural properties. The peak recedes within 1-2 days; however, properties may remain isolated for several days (5).

2.8.3 Flood Behaviour

a. The Orara River and Bucca Bucca Creek (Bucca Creek) catchments are located to the west of Coffs Harbour on the NSW Mid North Coast (Appendix A). Both creeks drain to the Clarence River. The creeks rise in the south and flow generally in a north westerly direction, through the villages of Karangi, Coramba, Nana Glen and Glenreagh. The main road, Orara Way, is located along the left bank of the Orara River and the Grafton to Coffs Harbour railway line, along the right bank

b. The majority of the Orara River and Bucca Bucca Creeks are designated as being high hazard, due to the excessive flow depths. In the 20% and 5% AEP events, only small areas on the floodplain are designated as low or medium hazard. In a 1% AEP event, almost the entire valley, with exception of a few areas, is considered high hazard. This would mean that a number of access tracks to rural properties and road crossings would be expected to be isolated by high hazard flood waters.

2.8.4 Classification of Floodplain

a. For emergency management purposes, Upper Orara Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
54453	Orara	360	143	257	Low Flood Island

- further reference will be provided in Volume 3 as part of the Mapping.

2.8.5 Inundation

a. The Upper Orara (Nana Glen, Coramba and Karangi) utilises the Karangi (204025 – 559023), Orange Grove (204068-559018) and Glenreagh gauges (204906-559066 & 204907-59123) (Table 26). The Bureau provides a warning service for the Glenreagh Bridge gauge (204907-59123).

Table 25: Gauges and gauge heights (m) for flood classifications on the Upper Orara on the Orara River (5)

Gauge	Minor (m)	Moderate (m)	Major (m)
Karangi (205025)	-	-	-
Orange Grove (204068)	-	-	-

b. Properties within the towns are not known to be inundated, but in an extreme flood it is likely that some houses would be flooded along with very large areas of rural land.

c. From 5.66 m on the Karangi gauge (2013 flood), some properties in Coramba and Nana Glen experience overfloor flooding (5).

d. In the 1% AEP (~6.36 m) widespread flooding is expected, inundating properties along Thrower Avenue (approximately 3 houses) and in the vicinity of Star Creek Road in Coramba. Flooding is also expected along Weir Street (approximately 2 houses), Brewers Road (approximately 6 houses) and potentially in Morrows Road in Nana Glen and low lying properties along Brewers Road. A large number of properties are expected to be isolated (5).

e. In a PMF event, flood levels are estimated to be 2 to 3 m deeper than the 1% AEP (~6.36 m) (5).

f. A small river rise of as little as 2 m on the Orara River can result in a need for farmers to shift pumps and move cattle to higher ground (5).

2.8.6 Isolation

a. A large number of farm properties are expected to be isolated in Coramba and Nana Glen (5).

b. Flooding of considerable areas of farmland occurs around these centres, and several roads and bridges (including Scoullers Bridge on Dairyville Road, Karangi, the East Bank Road at Kalbury Creek, Mt Browne Road at Wongiwomble Creek and the lower Bucca Road at Nana Glen) may be closed to traffic.

c. In the 20% and 5% AEP (estimated between 6 and 7.5 m at Karangi) events, flood water is expected to inundate a number of key structures and bridges and isolate a few properties. The majority of Nana Glenn, Coramba and Karangi would largely be unaffected by flood waters (5).

d. Other roads susceptible to inundation (5) (exact gauge reference unknown) include Dairyville Road, Pine Road, North and South Island Loop Road, Orara Way, Orara Road, Cochranes Pool Road , Fridays Creek Road, and Jaboh Close in Upper Orara; Lower Bucca Road, Grafton Street , Nana Creek Road, Solomons Close, Ferretts Road and Morrows Road in Nana Glen; Hartleys Road and Duncans Bridge Road in Coramba; Bucca Road, Randalls Road, McClellands Road, Gillards Road and Herds Road in Bucca; Sherwood Creek Road in Upper Corindi; and Lower Bobo Road in Ulong (33).

e. Isolation tends to be short-term of up to five or six days, except in prolonged floods. Most people in the area are self-sufficient for this period of isolation. If any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (11).

f. Floods can cause considerable damage to fences and pastures as well as causing stock losses (5).

2.8.7 Flood Mitigation Systems

a. There are no identified flood mitigation systems.

2.8.8 Dams

a. Karangi Dam is an offstream storage dam located 9.2 km west of Coffs Harbour. It is designed to withstand a PMF. If a dambreak occurred during a PMF, approximately 119 houses are likely to be flooded (PAR 317), with little warning time for persons upstream of Old Karangi Pump Station. White, Amber and Red alerts are at 144.60, 145.20 and 145.60 m AHD (0.2 m below embankment crest and 1800 mm above spillway) respectively (6).

2.8.9 At Risk Facilities

a. Schools and child care centres may become isolated, particularly affecting out of area school children including (5):

   i. Schools

      - Ulong Public School, Hutchison Street, Ulong.

- Orara Upper Public School, Orara Road, Upper Orara.
- Karangi Public School, Karangi.
- Coramba Public School & OOSH, 6 Short Street, Coramba.
- Lowanna Public School, Coramba Road, Lowanna.
- Nana Glen Public School, Coffs Harbour-Grafton Road, Nana Glen.

ii. Childcare centres

- The Mountain Preschool, Lowanna.
- Lower Bucca Community Preschool, Bucca Road, Bucca.
- Nana Glen Preschool, Orara Way, Nana Glen.

b. There are no facilities for the aged and/or infirm at known risk of flooding and/or isolation.

c. The following utilities and infrastructure are at risk of flooding:

d. The railway line may be cut at Nana Glen and Karangi in floods in the order of 1% (6.36 m at Karangi) (5).

e. Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).

2.8.10 Other Considerations

a. Special events held throughout the year are listed on the Coffs Harbour City Council website.

ROAD CLOSURES AND ISOLATED COMMUNITIES

2.9 ROAD CLOSURES

a. Table 26 lists major roads liable to flooding in the Coffs Harbour LGA. In addition to these roads, smaller roads susceptible to flooding are identified for each community in Section 2.2 of this Volume of the Coffs Harbour Local Flood Plan.

Table 26: Roads liable to flooding in Coffs Harbour LGA.

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
First Ave, Sawtell	Middle Creek	Preventing access into and out of Sawtell to the south	To the north	3.7m Sawtell (Middle Creek) gauge (559054)
Corindi Park Drive	Corindi Creek	Cuts evacuation routes		6.5m at Corindi Road at Solitary Islands Way Gauge (559069)
Hogbin Drive, Boambee	Newports Creek	Restricting access to the airport from Coffs Harbour	Access may be available via Stadium Dr	From 5.3m Newports Creek (Industrial Drive) gauge (559053)
Gundagai Street	Coffs Creek	Closing main evacuation route for Gundagai Place, Gundagai Street, Robin Street, Frances Street, Long Street, Jean Street, Korff Street, Tugownie Close, West High Street, Moonee Street, Scarba Street	Alternative route available via Beryl Street, Joyce Street and Bailey Ave.	5.10m Gundagai Street Gauge (559058)
Pacific Hwy (Grafton Street)	Near Bray St; Tree Fern Creek; Coffs Creek	Restricting traffic north and south of Coffs Harbour and dividing the town.	-	4.8m Coffs Creek (Highway Bridge) gauge (205439-559012)
Taloumbi Road	Coffs Creek	Closing evacuation route for	-	2.9m Bray Street gauge (559057)

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
		Taloumbi Road area north of Bray Street		
Bray Street, Coffs Harbour	Coffs Creek	Closes sections of Bray Streets alternative evac routes of Argyle and Kurrajong close at 3m	-	2.5m Bray Street gauge (559057)
Joyce Street, Coffs Harbour	Tree fern Creek	Closes evacuation route in the vicinity of Orara High School	-	3.5m Bray Street gauge (559057)
Mackays Road, Coffs Harbour	Tree fern Creek	Closes evacuation route for areas to the west (Vera Drive etc.)	-	3.5m Bray Street gauge (559057)
Donn-Patterson Drive, Coffs Harbour	Vegetated area	Closes evacuation route for areas to the north west (Shepherds Lane, Pearce Drive etc.)	-	3.62m Bray Street gauge (559057)
Shepherds Lane	Coffs Harbour Creek	Restricting access in the area		5.43m Coffs Creek (Highway Bridge) gauge (205439-559012)
Mt Browne Road, Wongiwomble Creek	Orara River	Restricting access to Coffs Harbour	Upper Orara Road	-
Orara Way	Bluff Bridge (near Kungala) and Near Kremnos	Restricting access between Glenreagh and Grafton and isolating rural properties (150)	Bucca Road until 7.6m	5.8m Glenreagh (204907-59123) or 7.3m on Glenreagh TM (204906-559066)
Orara Way	Glenreagh Creek	400 properties isolated at Glenreagh	-	from 7.6m on the Glenreagh gauge (204907-59123) or 9.75m on Glenreagh TM (204906-559066)
North Boambee Road at Pacific Highway Corner (KFC)	Newports Creek	Isolates Bishop Druitt College		1.6m Newports Creek (Industrial Drive) gauge (559053)

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Eastern Dorrigo Way	Bobo Creek (Brooklana)	Coramba to Dorrigo Road. Alternate routes may be available via Armidale Rd or Waterfall Way.	Ungauged creek	Closed due to landslip

2.10 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

a. Areas in the Coffs Harbour LGA may be susceptible to short-term isolation as a consequence of road closures (usually in the order of hours).

b. There is the potential for Lyons Road to flood in large events, isolating Sawtell (34; 14).

c. North and South Lindsays Road, Boambee may close isolating North Boambee.

d. North Boambee Road, Boambee is expected to close around 1.6 m on Newports Creek Industrial Drive Gauge. This causes isolation of Bishop Druitt College on North Boambee Road.

e. In a 1% AEP (~5.3 m on Industrial Drive gauge) that Hogbin Drive, Englands Road and Isles Drive may close, isolating the airport and properties to the west of the Pacific Highway (35) for short periods of time.

f. Isolation of sections of Coffs Harbour occurs rapidly for short periods (up to several hours) Gundagai Place, Gundagai Street, Robin Street, Frances Street, Long Street, Jean Street, Korff Street, Tugownie Close, West High Street, Scarba Street) (10), Kurrajong, Argyle and sections of Bray Streets (35), Orara High School, areas to the north west (Vera Drive etc.), and areas to the west (Shephards Lane, Pearce Drive etc.)

g. Some properties may be isolated in Moonee Beach as a consequence of flash flooding, with potential periods of isolation up to several hours (26).

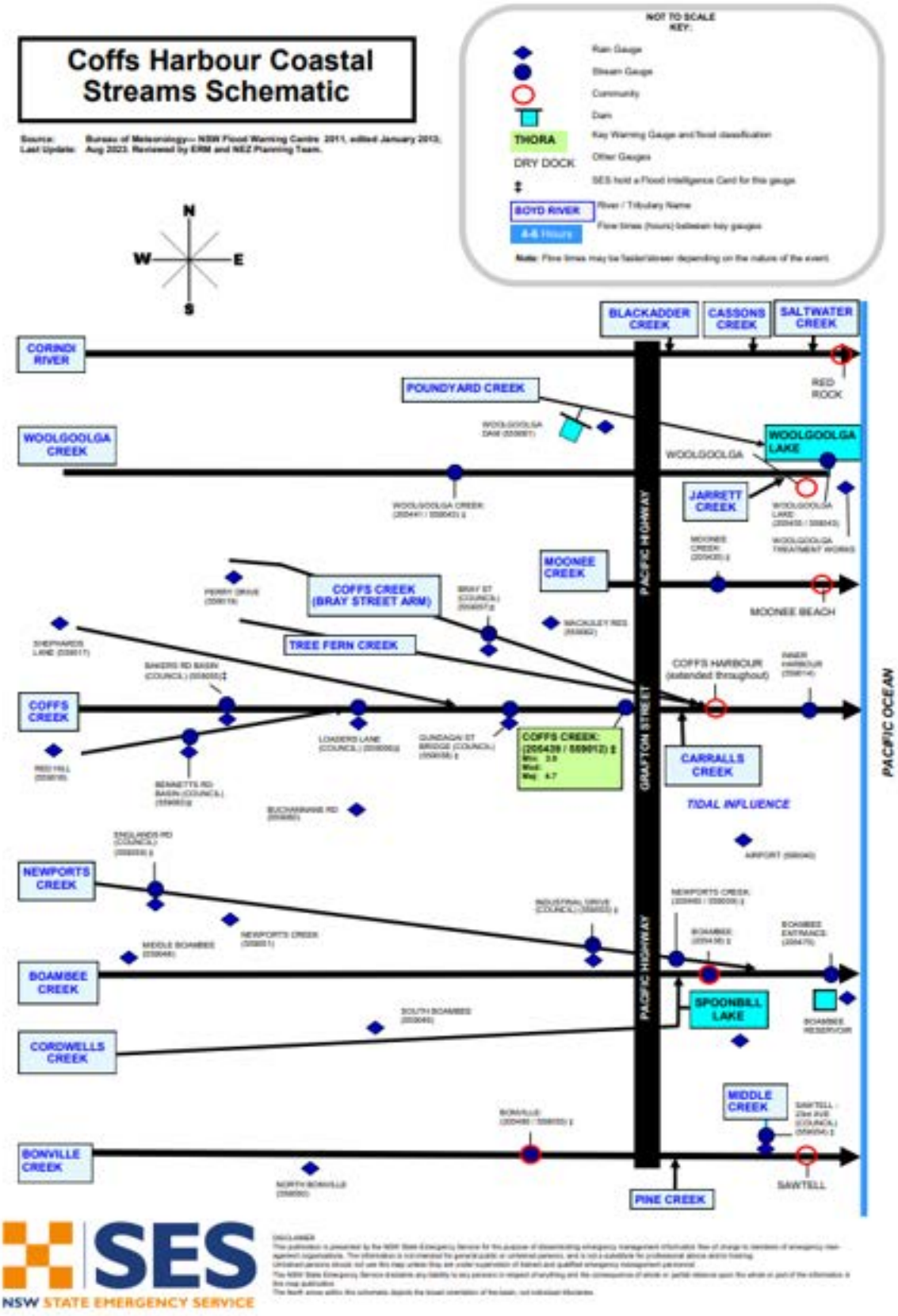
h. Residents in Arawarra, Corindi, Sherwood Creek Road, and Red Rock become isolated in a 1% AEP event when Solitary Islands Way at Arrawarra Gully becomes flooded. (4) (30)

i. Rural properties located in Upper Orara may become isolated for several days as a consequence of Orara Way closure. Properties in this area may require resupply in larger floods and should be monitored. A large number of properties are expected to be isolated in Kremnos, Kungala, Coramba and Nana Glen (around 550 properties) (5).

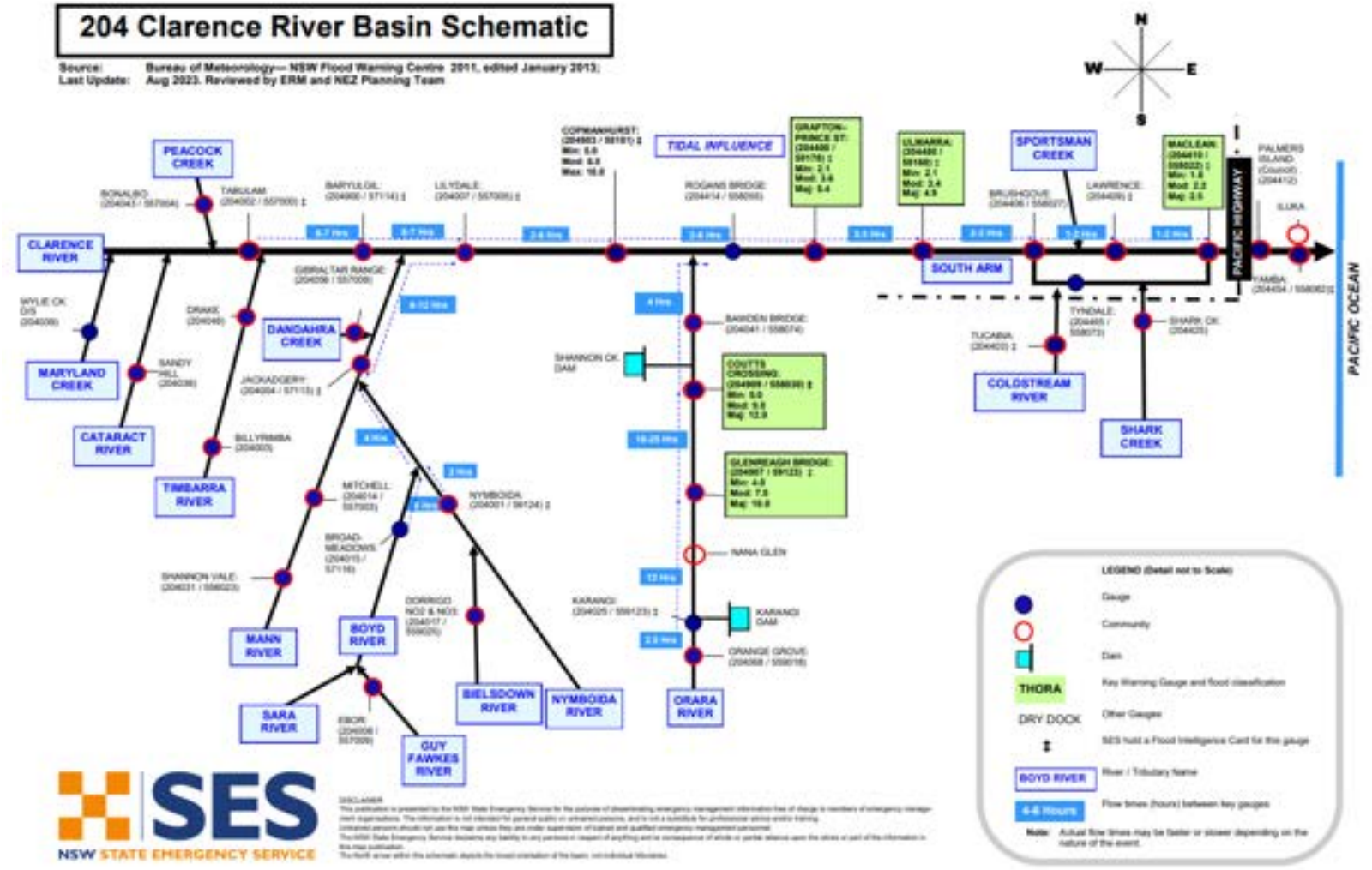
j. Isolation tends to be short-term of up to five or six hours, except in prolonged floods. Most people in the area are self-sufficient for this period of isolation. If any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (11).

k. The Pacific Highway is inundated where it crosses Corindi Creek in the North and Double Crossing Creek in the South. (4) (30)

ANNEX 1: COFFS HARBOUR COASTAL STREAMS SCHEMATIC – BELLINGEN RIVER BASIN



ANNEX 2: CLARENCE RIVER BASIN SCHEMATIC



ANNEX 3: FACILITIES AT RISK OF FLOODING AND/OR ISOLATION

Sawtell Sector	Type	Address	
St John Paul College	Education Facility	Hogbin Drive	Isolation
Coffs Harbour Christian Community School	Education Facility	226 Bonville Station Road, Bonville	Isolation
Coffs Harbour Bible Church School	Education Facility	26 Hitech Drive	Inundation
Goodstart Early Learning Toormina/ABC Developmental Learning Cemtre	Child Care Centres and Preschools	631B Hogbin Drive	Inundation
Toormina Community Preschool	Child Care Centres and Preschools	50 Minorie Drive Toormina	Inundation
Community OOSH Services (Fun Factory Toormina)	Child Care Centres and Preschools	5 Craft Close/600b Hogbin Drive	Inundation
Sawtell Beach Caravan Park	Caravan Parks & Camping Grounds	5 Lyons Road	Isolation
Koala Villas & Caravan Park	Caravan Park and Camping Grounds	539 Pacific Highway	Partially inundated
Sawtell Legacy Units	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	10 Lyons Road	Isolation
Coffs Central Sector	**Type**	**Address**	
Coffs Coast Alesco School	Education Facility	66 Harbour Drive	Inundation
Coffs Harbour Christian Community School Junior Campus	Education Facility	27 Curacoa Street	Inundation and isolation
Narranga Public School & OOSH	Education Facility	Robin Street	Inundation
Coffs Harbour Tafe College	Education Facility	1 Glenreagh Street	Inundation
Lilly Pilly Early Learning Centre	Child Care Centres and Preschools	69 Gundagai Street	Inundation
Ohana Early Learning - 13 Scarba	Child Care Centres and Preschools	13 Scarba St	Inundation
Possum's Den Coffs Harbour	Child Care Centres and Preschools	8 Earl Street	Inundation
Cow and Koala Professional Child Care	Child Care Centres and Preschools	15 William Sharp Drive	Inundation
Caterpillar House Occasional Child Care Association Incorporated	Child Care Centres and Preschools	205 Harbour Dr	Inundation
Coffs Harbour Preschool Association Incorporated	Child Care Centres and Preschools	Coffs Harbour Pre School, 11 Brodie Drive	Inundation
Happy Days Preschool and Long Day Care Centre	Child Care Centres and Preschools	207 Harbour Drive	Inundation
Life Without Barriers	Child Care Centres and Preschools	2/115 West High Street	Inundation
3 Bears' Cottage Early Education Service	Child Care Centres and Preschools	11 Scarba Street	Inundation
Brayside Community Preschool	Child Care Centres and Preschools	38-40 Corriedale Drive	Isolation
Kulai Preschool	Child Care Centres and Preschools	14 Myuna Place	Inundation

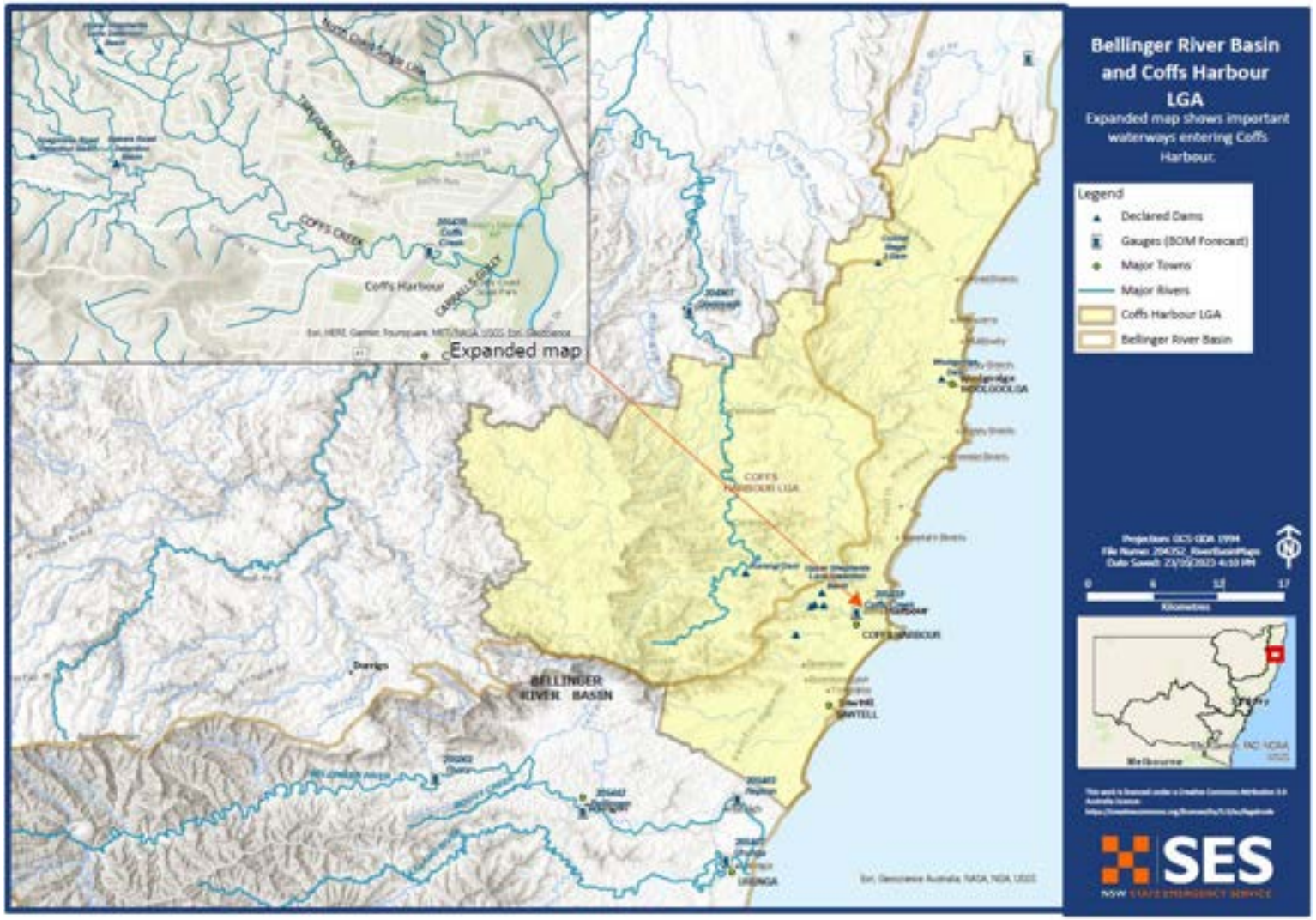
Bower Bird Child Care Centre	Child Care Centres and Preschools	North Street Coffs Harbour	Inundation
Coffs Harbour Tourist Park	Caravan Parks & Camping Grounds	Grafton Street/215 Pacific Highway	Inundation
Harbour City Holiday Park	Caravan Parks & Camping Grounds	123 Pacific Highway (Showground)	Inundation
St Josephs Aged Care	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	37 Azalea Avenue	Isolated in a PMF
Waratah Respite Centre Community Village	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	Earl Street	Inundation
Dept of housing aged units	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	51 Moonee Street	Inundation
Newports Sector	**Type**	**Address**	**Type**
Coffs Harbour Health Campus	Hospital	Pacific Highway	Inundation
Coffs Harbour Senior College	Education Facility	Hogbin Drive	Isolation
Coffs Harbour Tafe College	Education Facility	Hogbin Drive	Isolation
Southern Cross University	Education Facility	Hogbin Drive	Isolation
Bishop Druitt College & OOSH	Education Facility	111 North Boambee Road	Isolation
Petit Early Learning	Child Care Centre & Pre-School	1 Kiddell Place North Boambee	Inundation
Milestones Early Learning	Child Care Centre & Pre-School	10 North Boambee Road, North Boambee	Inundation
Ohana Early Learning or Family Day Care Scheme	Child Care Centre & Pre-School	10 North Boambee Road	Inundation
Family Link Centre	Child Care Centre & Pre-School	101 Stadium Drive	Isolation
Coffs Harbour Grange Care Community	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	50 Lakes Drive Coffs Harbour	Inundation (PMF)
Coffs Bray Street Sector	**Type**	**Address**	
Gumnut Cottage Child Care Centre	Child Care Centres & Pre-Schools	65 Perry Drive Coffs Harbour	Isolation
Park Beach Child Care Centre	Child Care Centres & Pre-Schools	45 Park Beach Road, Coffs Harbour	Isolation
Jungle Club	Child Care Centres & Pre-Schools	6 Bray Street Complex	Inundation
Dalpura Village	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	9 Bray Street	Inundation

Woolgoolga Sector	**Type**	**Address**	**Type**
Woolgoolga Sunset Caravan Park	Caravan Parks & Camping Grounds	64 Newman Street	Inundation
Lakeside Caravan Park	Caravan Parks & Camping Grounds	Lake Road	Isolation
Woolgoolga Beach Caravan & Camping	Caravan Parks & Camping Grounds	Beach Street	Inundation
Sapphire Beach Holiday Park	Caravan Parks & Camping Grounds	Split Solitary Road	Isolation
Woolgoolga Child Care Centre- Inc/Rainbow Cottage	Child Care Centres & Pre-Schools	71 Turon Parade, Crn Scarborough St & Short St	Inundation

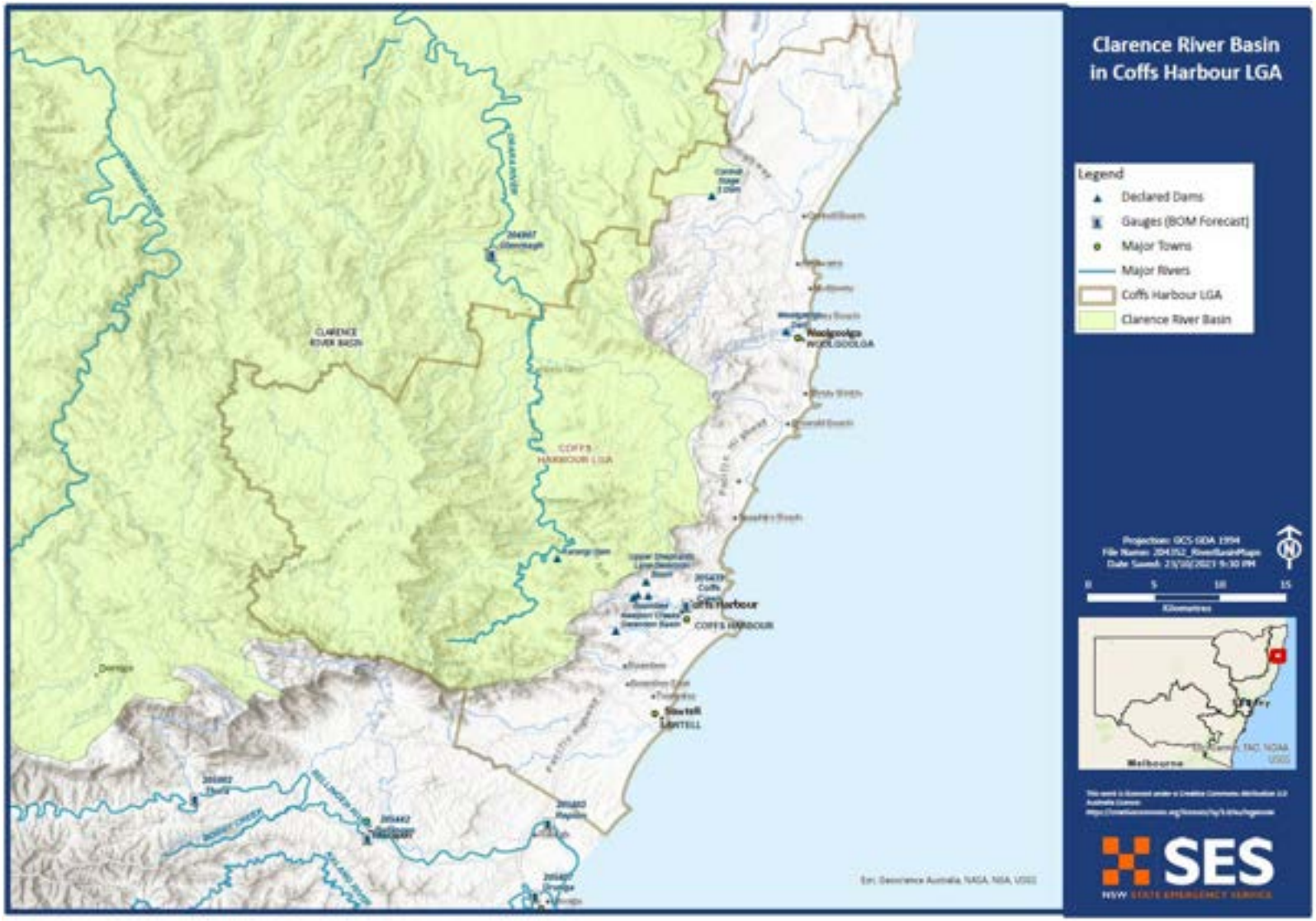
Woolgoolga Community Health Care	Health Care Facility	29 Beach Street Woolgoolga	Inundation
Plantations by Ingenia Lifestyle	Nursing Homes, Hostels, Self-Care Facilities & Retirement Villages	Off McIntosh Crescent	Inundation
Woolgoolga High School	Education Facility	Pacific Highway	Isolation
Corindi Sector	**Type**	**Address**	**Type**
Corindi Beach Public School	Education Facility	Coral Street Corindi Beach	Isolation
Tiny Treasures PreSchool & Long Day Care	Child Care Centres & Pre-Schools	135 Coral Street	Isolation
Arrawarra Beach Holiday Park	Caravan Parks & Camping Grounds	Arrawarra Beach Road	Inundation
Spot X Surf at Arrawarra	Back Packers	46 Arrawarra Beach Road	Inundation
Darlington Beach Resort	Caravan Parks & Camping Grounds	Eggins Drive	Isolation
Lorikeet Tourist Park	Caravan Parks & Camping Grounds	210 Eggins Drive	Isolation
Upper Orara Sector	**Type**	**Address**	**Type**
The Mountain Pre School Lowana	Child Care Centres & Pre-Schools		Isolation
Lower Bucca Community Preschool	Child Care Centres & Pre-Schools	872 Bucca Road	Isolation
Nana Glen Pre School	Child Care Centres & Pre-Schools	13 Orara Way	Isolation
Country Cubs Pre School	Child Care Centres & Pre-Schools	2 East Bank Road Coramba	Isolation
Ulong Public School	Education Facility	Cnr Dairyville & Upper Orara Roads	Isolation
Upper Orara Public School	Education Facility	770 Upper Orara Road	Isolation
Karangi Public School	Education Facility	1004 Coramba Road	Inundation
Coramba Public School & OOSH	Education Facility	6 Short Street	Isolation
Lowanna Public School	Education Facility	Coramba Road	Isolation
Nana Glen Public School	Education Facility	Grafton St X Nana Street	Isolation

(36)

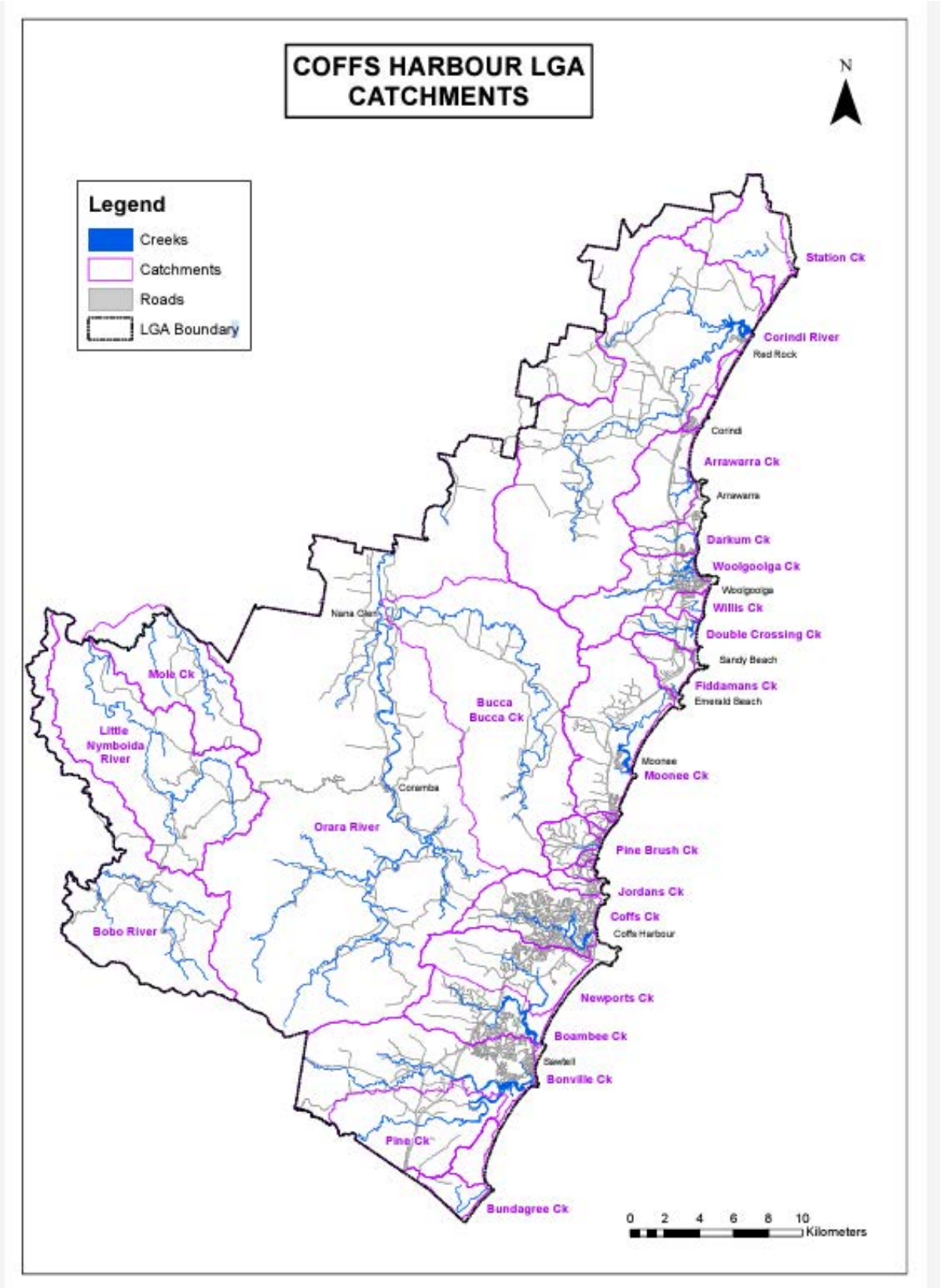
MAP 1: BELLINGER RIVERBASIN



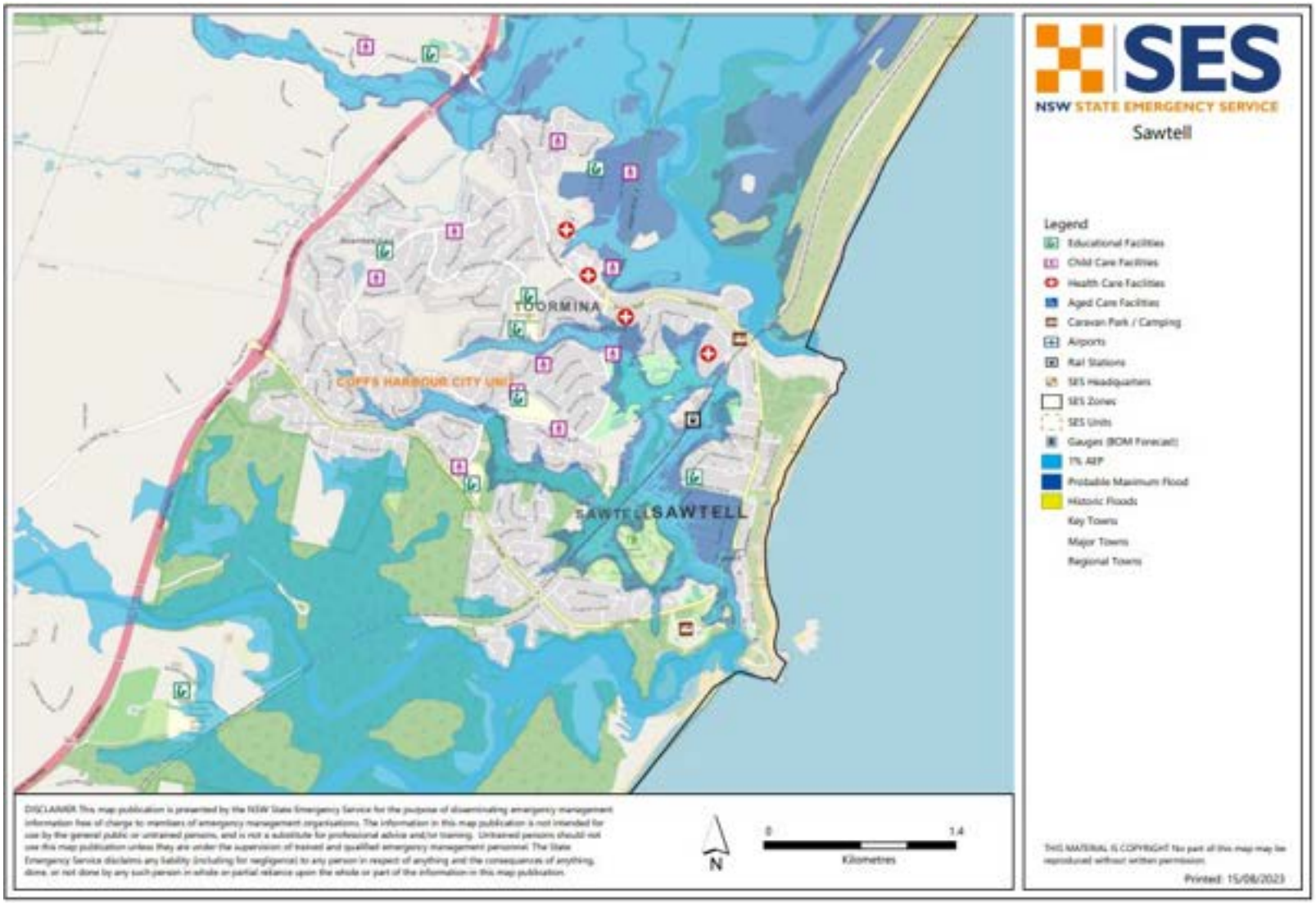
MAP 2: CLARENCE RIVERBASIN



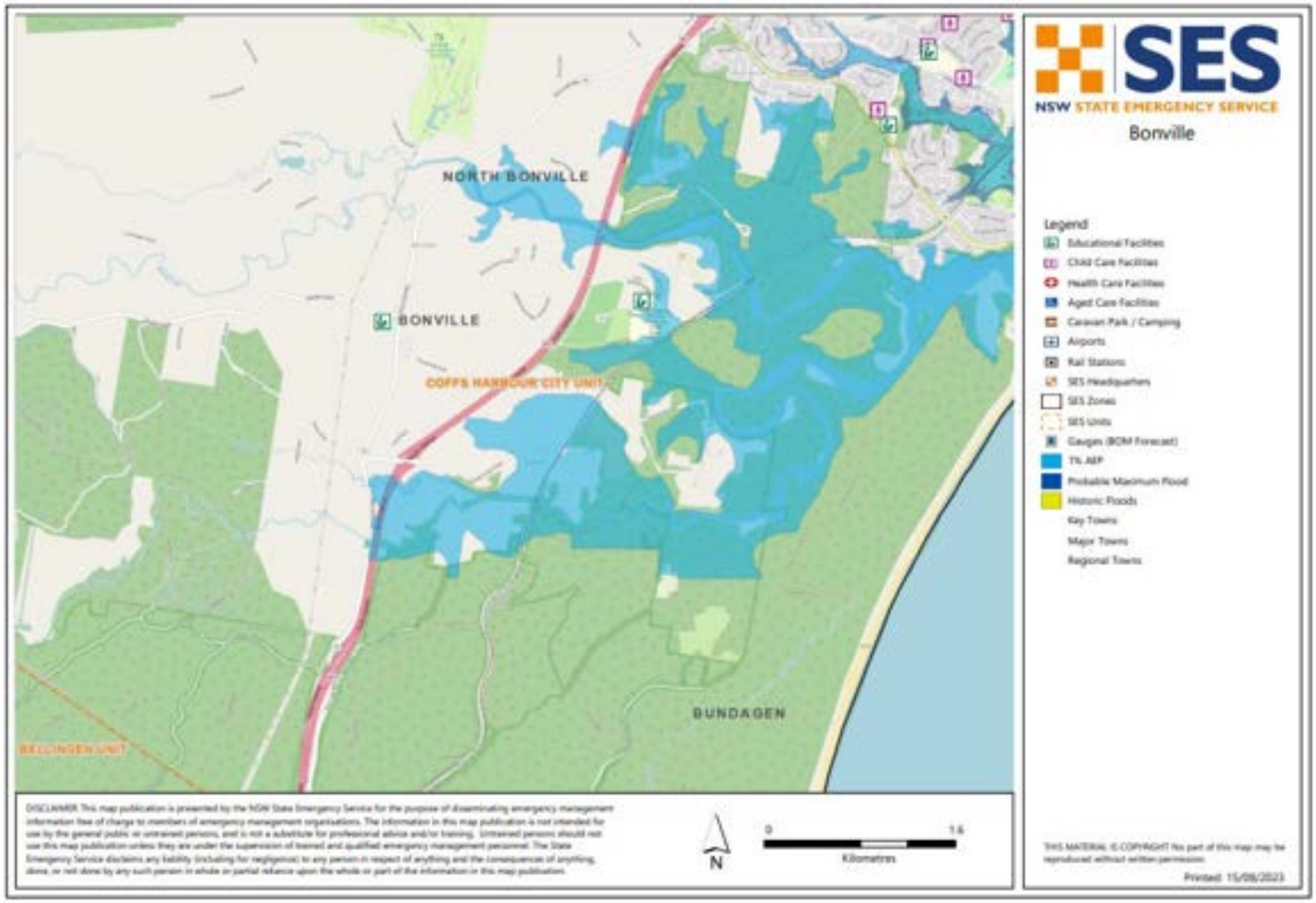
MAP 3: COFFS HARBOUR LGA CATCHMENTS



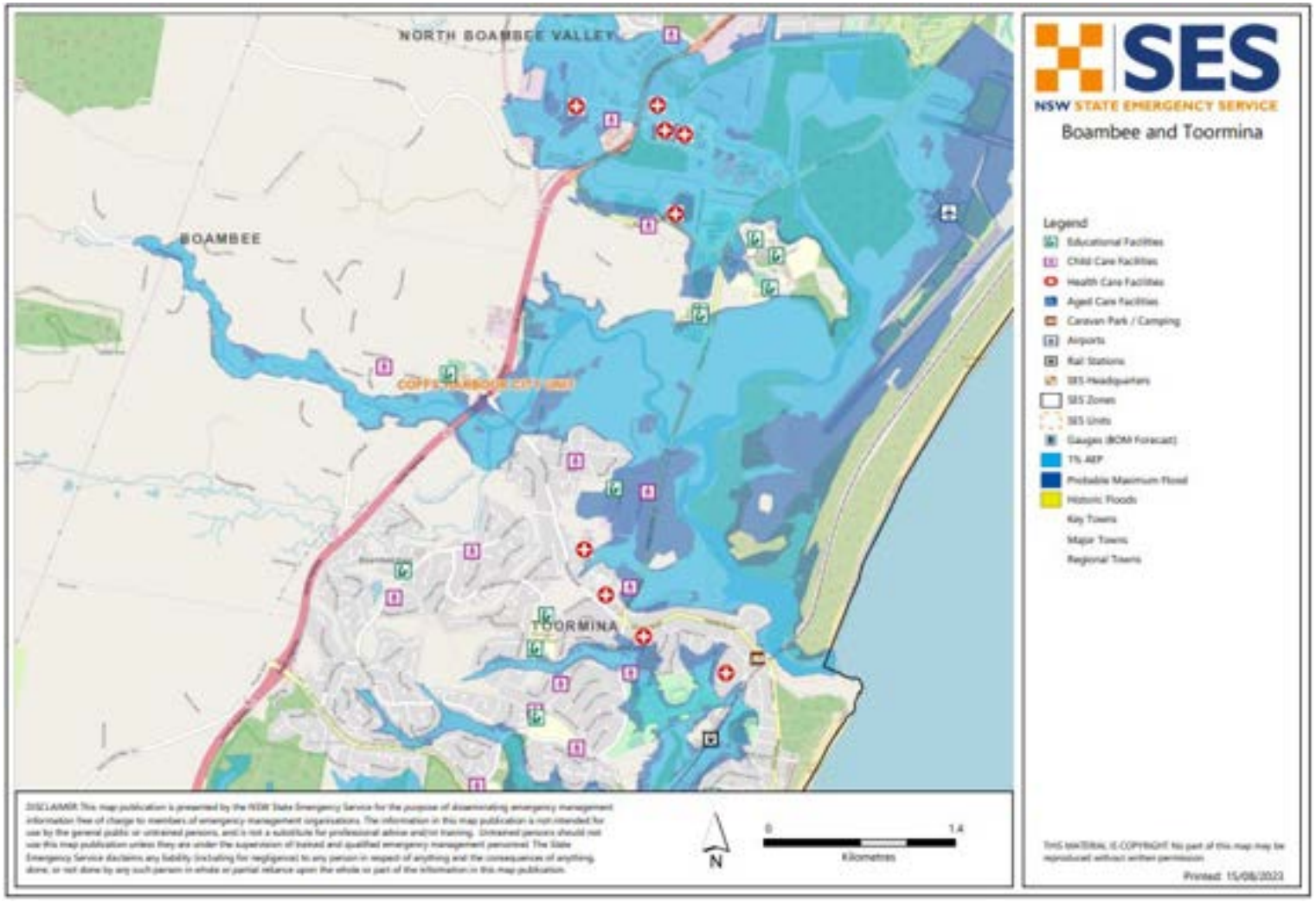
MAP 4: SAWTELL



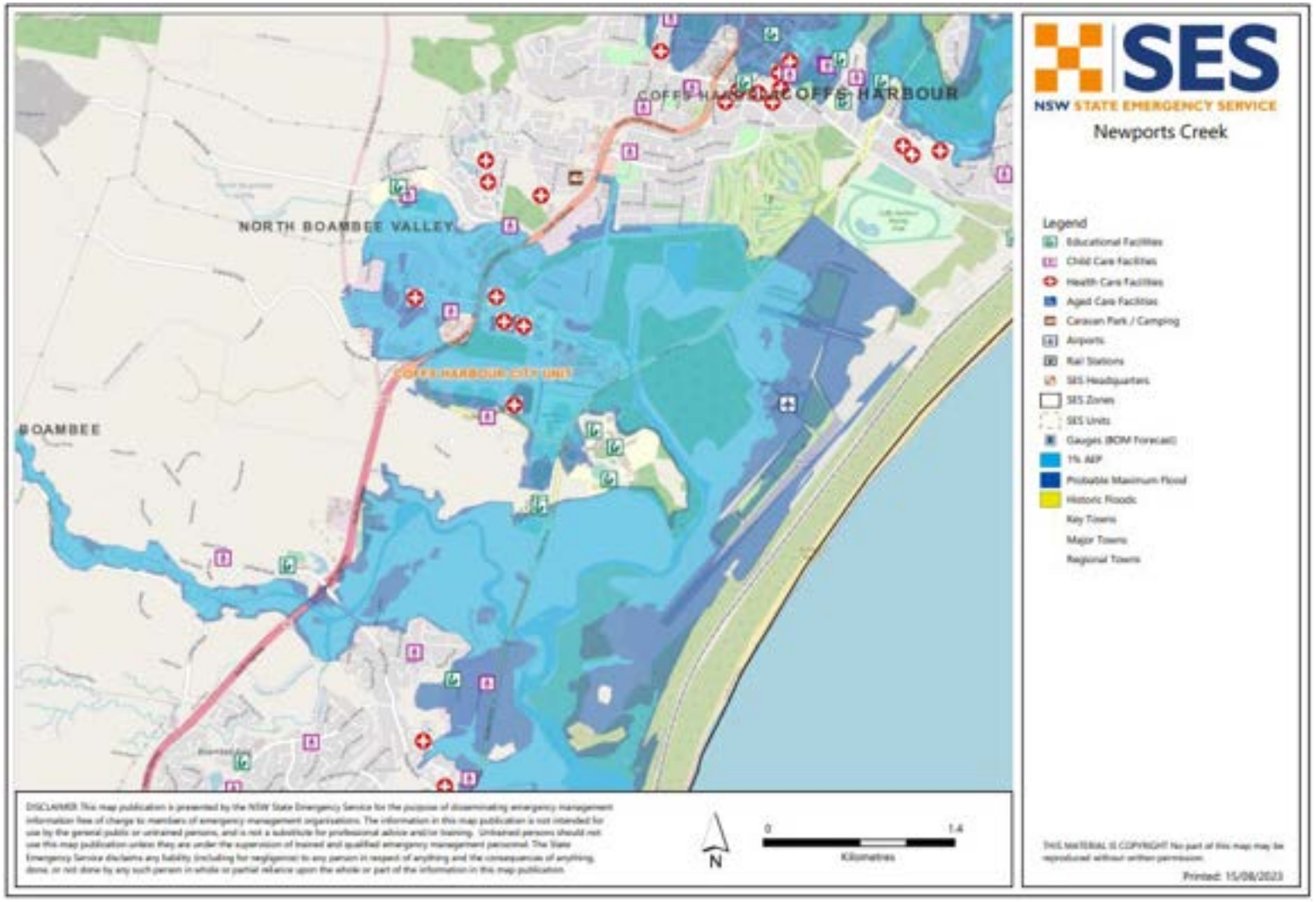
MAP 5: BONVILLE



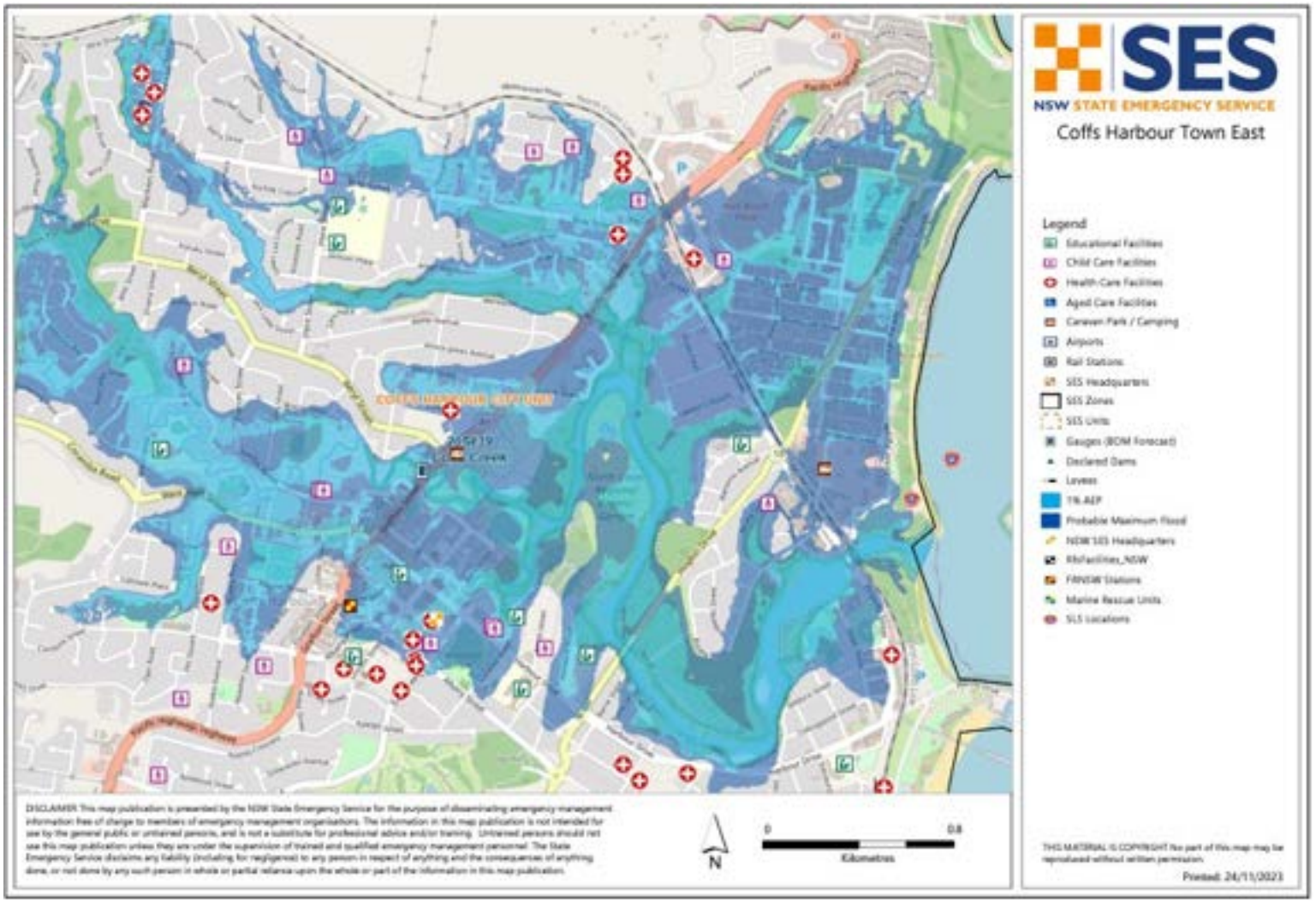
MAP 6: BOAMBEE AND TOORMINA



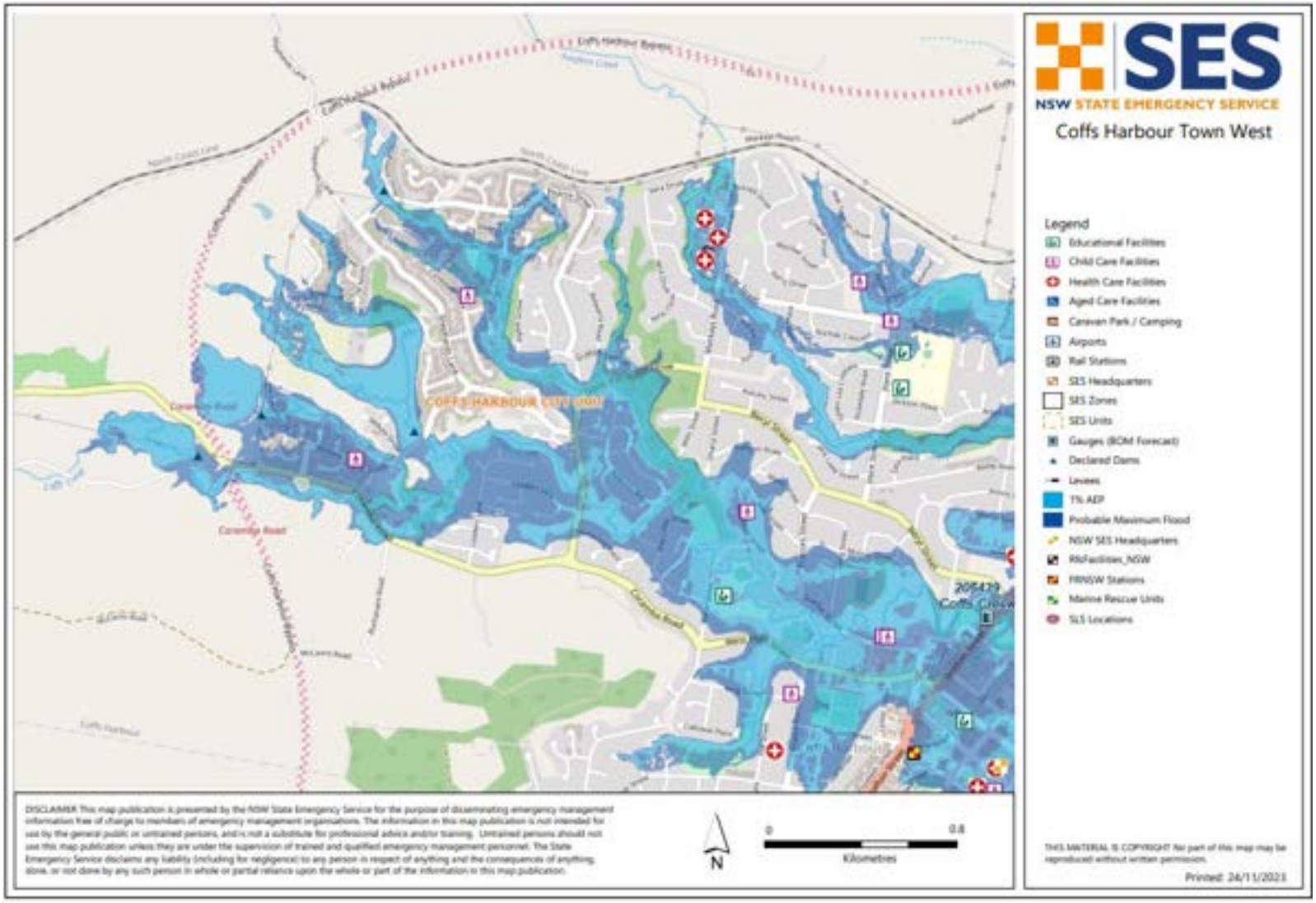
MAP 7: NEWPORTS CREEK



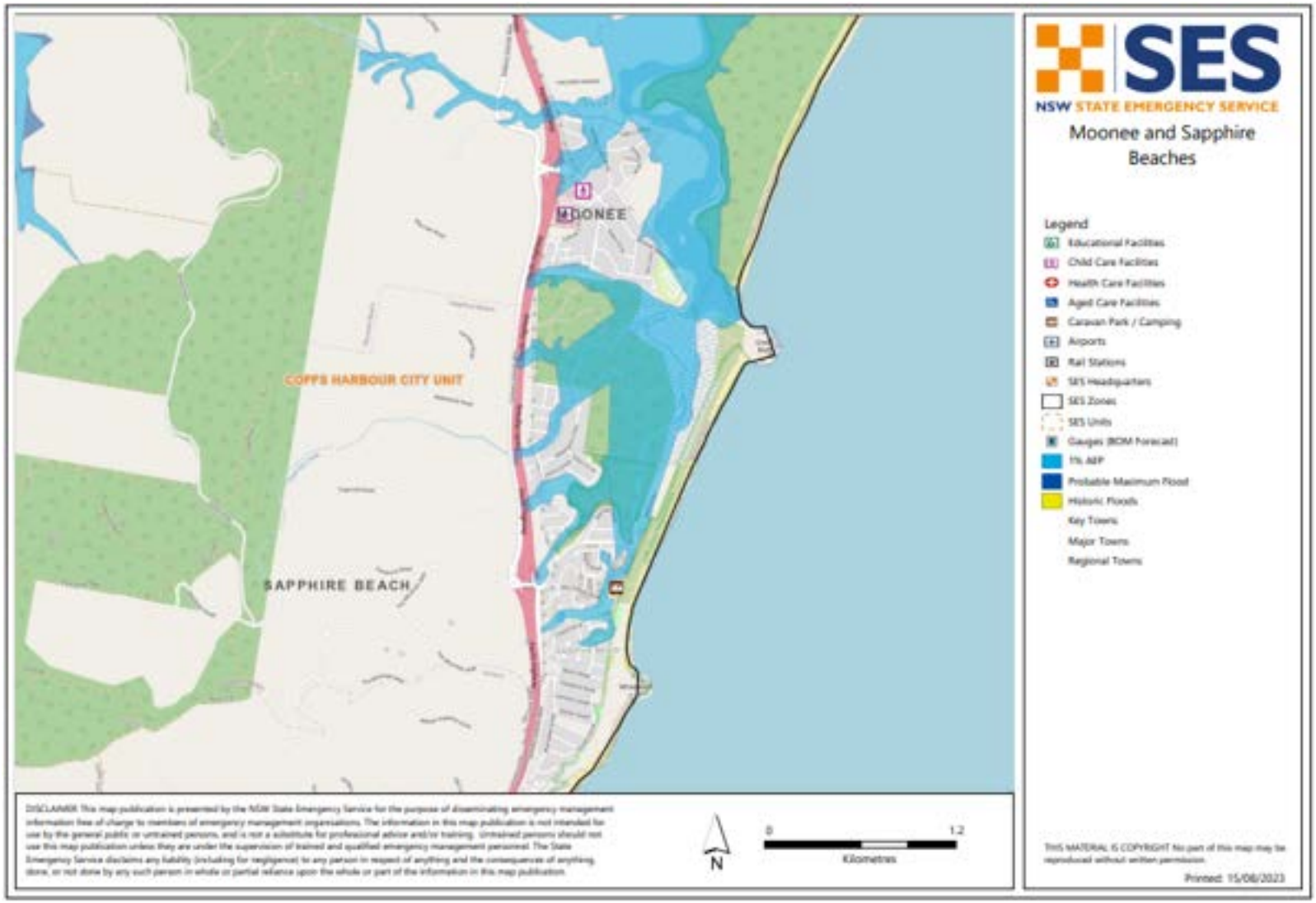
MAP 8: COFFS HARBOUR EAST



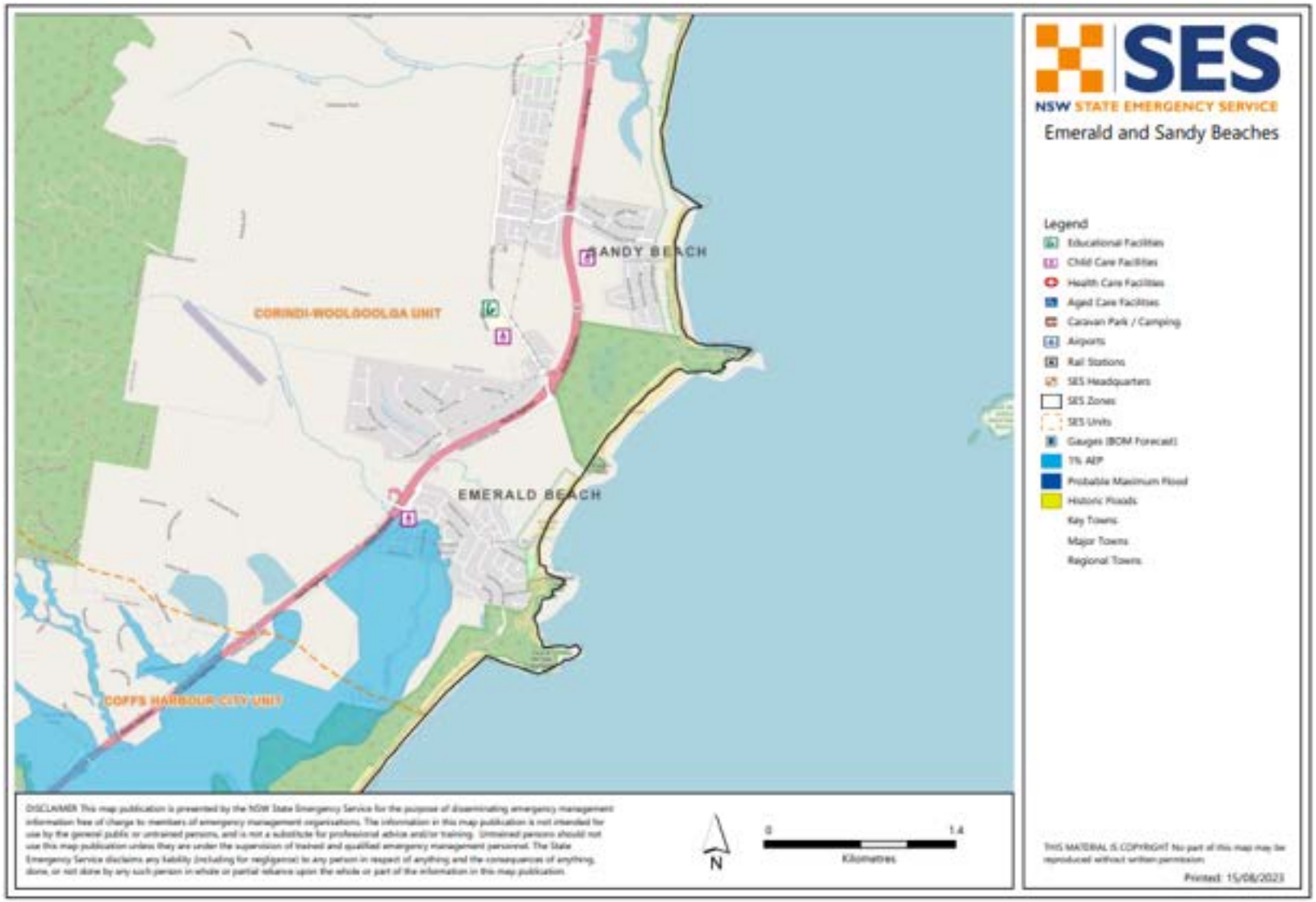
MAP 9: COFFS HARBOUR WEST



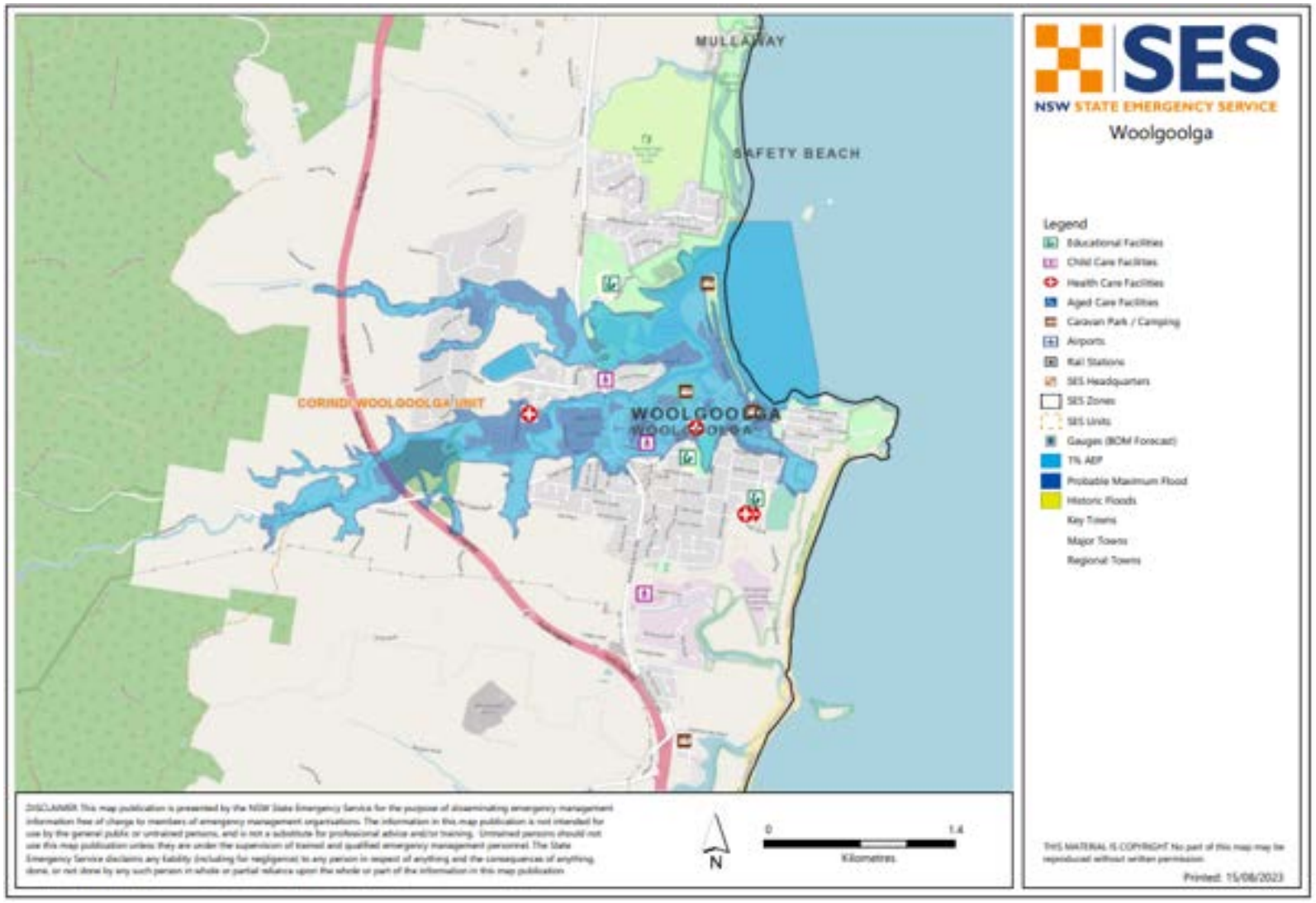
MAP 10: MOONEE AND SAPPHIRE BEACHES



MAP 11: EMERALD AND SANDY BEACHES

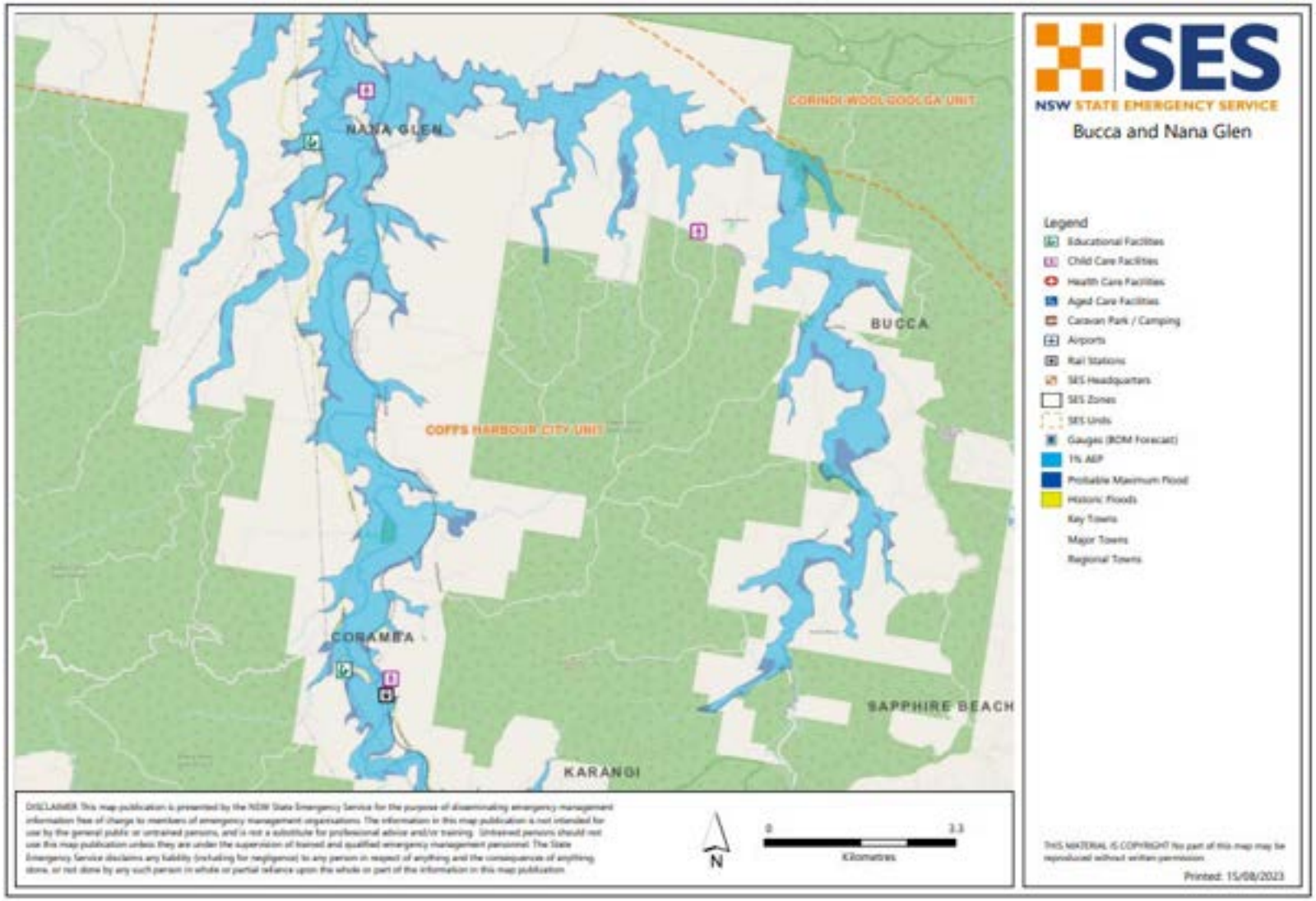


MAP 12: WOOLGOOLGA

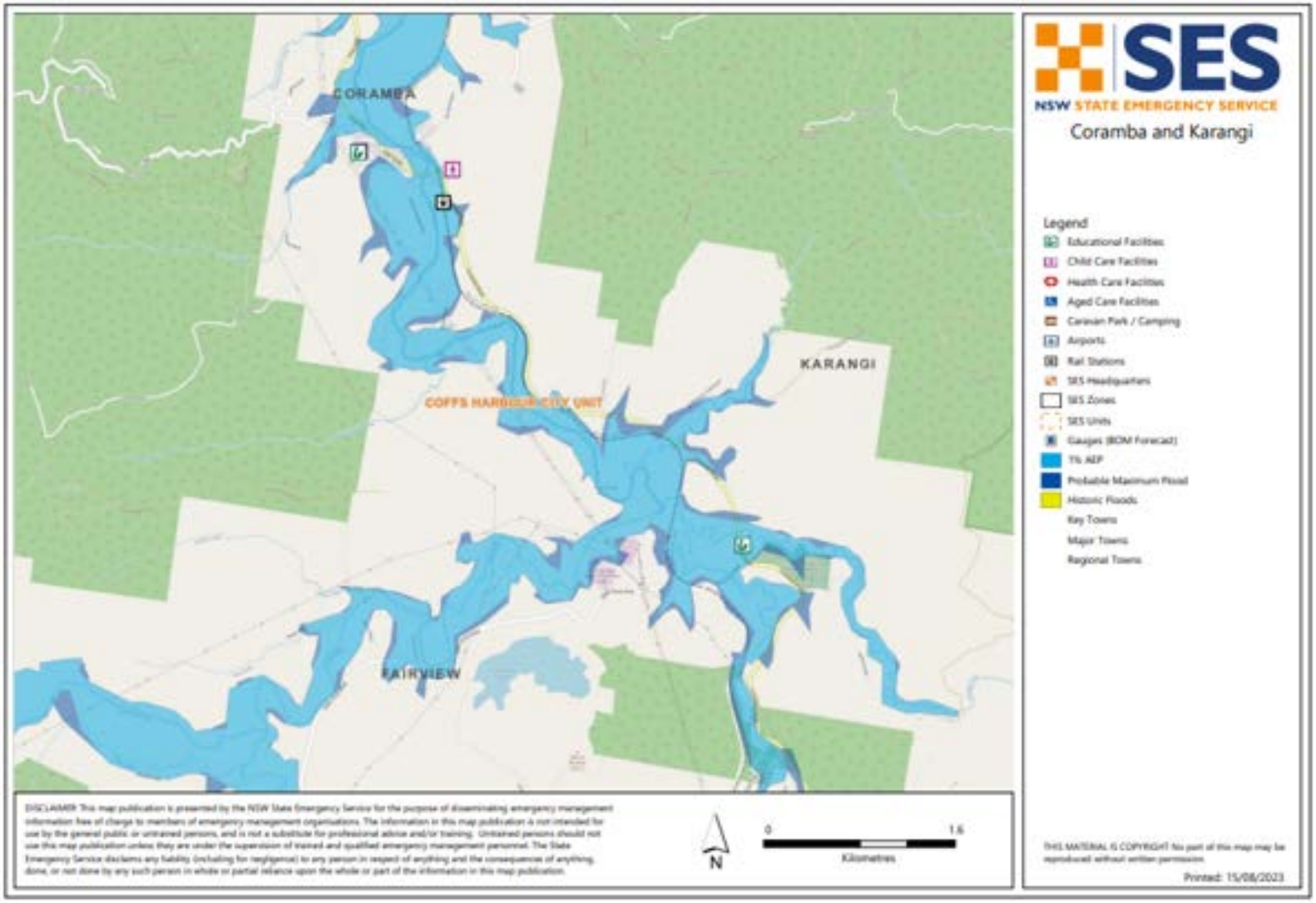


MAP 13: CORINDI BEACH

MAP 14: BUCCA AND NANA GLEN



MAP 15: CORAMBA AND KARANGI



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COFFS HARBOUR FLOOD WARNING SYSTEMS AND ARRANGEMENTS

Chapter 1 of Volume 3 (NSW SES Response Arrangements for Coffs Harbour) of the Coffs Harbour Flood Emergency Sub Plan

Last Update: March 2024

CONTENTS

LIST OF TABLES

1. GAUGES MONITORED BY THE NSW SES COFFS HARBOUR LOCAL HEADQUARTERS

Table 1: Gauges monitored by the NSW SES Coffs Harbour Local Headquarters

Gauge Name	Type	AWRC No.	Bureau Gauge No.	Stream	Flood level classification in metres			Special Reading Arrangements	Owner
					MIN	MOD	MAJ		
Bonville (Caravan Park, Pine Creek Way)	Flash Flood (Stream Height)- Automatic	205480	n/a	Bonville Creek	n/a	n/a	n/a	Monitored via MHL website	NSW Office of Environment – Manly Hydraulics Laboratory OEH (MHL)
North Bonville	Flash Flood (Rainfall)- Automatic	n/a	559050	Bonville Creek catchment)	n/a	n/a	n/a	Monitored via MHL website	OEH (MHL)
Coffs Harbour (Toormina)	Flash Flood (Rainfall)- Automatic	n/a	559052	(Middle Creek catchment)	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Coffs Harbour (Sawtell) or Sawtell (Middle Creek) ‡	Flash Flood (rainfall and		559054	Middle Creek	2.0m CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall.	Local Council

	Stream Height)-Automatic							These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	
Boambee (Sawtell Road) ‡	Flash Flood (Stream Height)-Automatic	205438	n/a	Boambee Creek	n/a	n/a	n/a	Monitored via MHL website	OEH (MHL)
Boambee Entrance	Flash Flood (Rainfall) - Automatic	205475	559049	n/a	n/a	n/a	n/a	Monitored via the Bureau of Meteorology (BOM) website	OEH (MHL)
Middle Boambee	Flash Flood (Rainfall)-Automatic	n/a	559048	(Boambee Creek sub-catchment)	n/a	n/a	n/a	Monitored via MHL website	OEH (MHL)
Newports Creek	Flash Flood (Rainfall)-Automatic	n/a	559051	(Newports Creek sub-catchment)	n/a	n/a	n/a	Monitored via MHL website	OEH (MHL)
Coffs Harbour (Englands Road) ‡	Flash Flood (Rainfall and	n/a	559059	Newports Creek	2.00 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall.	Local Council

	Stream height) - Automatic							These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	
Newports Creek (Industrial Drive) ‡	Flash Flood (Rainfall and Stream height)- Automatic	n/a	559053	Newports Creek	3.50 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Newports Creek (Hogbin Drive) ‡	Flash Flood – (Stream Height) Automatic	205460	559039	Newports Creek	n/a	n/a	n/a	Monitored via BOM website	OEH(MHL)
Coffs Harbour (Airport)	Flash Flood (Rainfall)- Automatic	n/a	599040	(East of Newports Creek catchment)	n/a	n/a	n/a	Monitored via BOM website	BOM
Coffs Harbour (Buchanans Road)	Flash Flood (Rainfall)- Automatic	n/a	559060	(Coffs Creek catchment)	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready	Local Council

								Reckoner. Monitored via Enviromon.	
Coffs Harbour (Red Hill)	Flash Flood (Rainfall)- Automatic	n/a	559016	(Coffs Creek catchment)	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	OEH(MHL)
Spagnolos Road (detention basin)	Flash Flood (Rainfall and Stream height) Automatic	n/a	n/a	(Coffs Creek catchment)	2.0 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Coffs Harbour (Bakers Road Detention Basin) ‡	Flash Flood (Rainfall and Stream height) Automatic	n/a	559055	Coffs Creek	3.65 m CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Coffs Harbour (Loaders Lane) ‡†	Flash Flood (Rainfall and	n/a	559056	Coffs Creek	3.0 m CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall.	Local Council

	Stream height) - Automatic							These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	
Coffs Harbour (Shepards Lane)	Flash Flood (Rainfall)- Automatic	n/a	559017	n/a (Coffs Creek catchment)	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	OEH(MHL)
Coffs Harbour (Bray Street) ‡	Flash Flood (Rainfall and Stream height) - Automatic	n/a	559057	Coffs Creek	1.80 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Coffs Inner Harbour *	Tide Gauge (Tide and Storm Surge)- Automatic	205470	559014	(Coffs Harbour)	n/a	n/a	n/a	Monitored via MHL website	OEH(MHL)

Coffs Harbour (Gundagai Street) ‡	Flash Flood (Rainfall and Stream height) Automatic	n/a	559058	Coffs Creek	3.30 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Coffs Creek (Highway Bridge)* ‡†	Flash Flood – (Stream Height) Automatic	205439	559012	Coffs Creek	3.0	n/a	4.7	1 hr target lead warning time for flash flooding from the BOM Monitored via BOM website	OEH(MHL)
Coffs Harbour (Perry Drive)	Flash Flood (Rainfall)- Automatic	n/a	559019	(Coffs Creek catchment) Northern Tributaries catchment)	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	OEH(MHL)
Coffs Harbour (Macauleys Reservoir)	Flash Flood (Rainfall)- Automatic	n/a	559062	n/a	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council

Bennetts Road Detention Basin ‡	Flash Flood (Rainfall and Stream height) - Automatic	n/a	559063	Coffs Creek	4.50 CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	OEH (MHL)
Moonee Creek ‡	Flash Flood(Stream Height) Automatic	205435	n/a	Moonee Creek		n/a	n/a	Monitored via MHL website	OEH(MHL)
Woolgoolga Creek ‡†	(Stream Height) Automatic	205441	559043	Woolgoolga Creek	n/a	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	OEH(MHL)
Coffs Harbour (Woolgoolga Dam)	Flash Flood (Rainfall)- Automatic	n/a	559061	n/a	n/a Trigger >= 60mm in 3hr	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council

Woolgoolga Lake	(Lake Height) Automatic	205455	n/a	Woolgoolga Creek	n/a	n/a	n/a	Monitored via MHL website	OEH(MHL)
Corindi (Pacific Hwy) ‡†	Automatic	n/a	559069	Corindi Creek	4 m CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Corindi (Boyles Bridge) ‡†	Automatic	n/a	559070	Corindi Creek	3 m CHCC trigger	n/a	n/a	SMS alerts are sent to relevant Coffs Harbour Unit members for trigger heights and rainfall. These are correlated using the Coffs Harbour Stream Gauge Ready Reckoner. Monitored via Enviromon.	Local Council
Red Rock	(Stream Height) Automatic	205450	n/a	Corindi Creek	n/a	n/a	n/a	Monitored via MHL website	OEH(MHL)
Orange Grove (Dairyville) ‡	Automatic	204068	559018	Orara River	n/a	n/a	n/a	BOM gauge	WaterNSW
Karangi ‡	Automatic	204025	559023	Orara River	n/a	n/a	n/a	Via MHL website. Monitored by the Bureau.	WaterNSW

Glenreagh* ‡†	Manual	204907	59123	Orara River	4	7	10	Bureau provide a warning service for this gauge	NSW OEH
Glenreagh ‡†	(Stream Height) Automatic	204906	559066	Orara River	5	9.0	13.0	Can be correlated to manual gauge. Monitored via BOM website	WaterNSW

Notes: The Bureau of Meteorology provides flood warnings for the gauges marked with an asterisk (*).

NSW SES Local Flood Advices are provided for the gauges marked with a single cross (†).

The NSW SES holds a Flood Intelligence Card for the gauges marked with a double cross (‡)

2. DISSEMINATION OPTIONS FOR NSW SES FLOOD INFORMATION AND WARNING PRODUCTS

As the combat agency for flood, storm and tsunami NSW SES has a statutory responsibly to issue warnings and public information to affected communities (NSW SES Act s 8). Warnings include advice about options and likely impacts of an event. The Incident Controller is accountable for preparing and disseminating accurate warning products during an incident.

2.1 DISSEMINATION OF WARNINGS:

NSW SES disseminates warnings through the following platforms: (Please note that this is not an exhaustive list and not all the following may be used during any or all events)

- NSW SES Website
    - www.ses.nsw.gov.au
- HazardWatch
    - HazardWatch is currently online at www.hazardwatch.gov.au .
    - Warnings are automatically updated/removed as managed through this platform.
- Hazards Near Me NSW App
- Doorknocking
- Emergency Alert
- Social Media
    - The following are some social media accounts:
        - Facebook (@NSWSES)
        - Facebook (@Northern Rivers NSW SES)
        - Facebook (@Clarence Valley NSW SES)
        - Facebook (Local community pages, Local business pages)
        - Twitter (@NSWSES
        - Instagram (@NSWSES)
- Community Meetings

Television Stations:

Station	Location
ABC TV (Channel 2, 20 & 21)	Northern NSW
ABC NEWS, (Channel 24)	Northern NSW
NBN (Channel 8, 81)	Northern NSW
SBS (Channel 3)	Northern NSW
WIN/10 (Channel 5)	Northern NSW
Seven West (Channel 6, 61)	Northern NSW
Sky News (Channel 53)	Northern NSW

Radio Stations:

Station	Location	Frequency	Modulation
ABC Radio	Coffs Coast	684 Kempsey 92.3 FM	
ABC Radio	North Coast	738 AM 94.5 FM	
2HC	Coffs Harbour	639 AM	
2HC	Coffs Harbour	100.5 FM	
2CSF	Coffs Harbour	105.5 FM	
2HC Super Network	Coffs Harbour	100.5 FM	
2HC Super Network	Coffs Harbour	101 FM	
hit105.5 Coffs Coast	Coffs Harbour	105.5 FM	
2CFS Triple M Coffs Coast	Coffs Harbour	106 FM	
Freedom FM 94.1	Coffs Harbour	94.1 FM	
CHY FM	Coffs Harbour	104 FM	CHY FM
2AIR	Coffs Harbour	108 FM	2AIR-FM

Digital/On-Line Services

- Streaming Services
- Podcasts
- YouTube Channels

Other Agencies:

Stakeholders include:

- Chamber of Commerce
- Business Owners
- NFP's
- NDIS and Community Care Providers
- Aged Care Providers
- Emergency Services
- Schools and Child Care
- Clarence Valley Council
- NSW Health
- Media Outlets
- Others where appropriate

COFFS HARBOUR NSW SES LOCALITY RESPONSE ARRANGEMENTS

Chapter 2 of Volume 3 (NSW SES Response Arrangements for Coffs Harbour) of the Coffs Harbour Flood Emergency Sub Plan

Last Update: March 2024

AUTHORISATION

NSW SES Locality Response Arrangements in Coffs Harbour has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

Approved

North Eastern Zone Coordinator Planning

Date:

Approved

Supt. Joanna Jones

NSW SES Zone Commander/Deputy Zone Commander

Date: 22/03/2024

Tabled at LEMC

Date: 5th March 2024

Document Issue: V3.3-05032024

CONTENTS

LIST OF TABLES

SECTOR OVERVIEW

Table 1: Overview of Sectors in the Coffs Harbour LGA. These Sectors provide further detail of the planned response strategies within Communities in the Coffs Harbour LGA**.**

Sector Name	Community	Sector Basis	Total Population within Sector	No. of Properties potentially at risk
Sawtell	Sawtell, Toormina, Bonville and Boambee	Operational response	Sawtell 3788 Toormina 6171 (Census 2021)	450 Residential 62 Commercial
Newports Creek	Coffs Harbour South (Health Campus and Industrial)	Operational response	North Boambee Valley 2318 (Census 2021)	Coffs Harbour Health Campus (300 persons approximately) 289 Residential 220 Commercial
Coffs Central	Coffs Harbour	Operational response	Coffs Harbour CBD 13574 (Census 2021)	1087 Residential 424 Commercial
Coffs Bray Street	Coffs Harbour	Operational response	4524 (Census 2021)	2201 Residential 616 Commercial
Woolgoolga	Woolgoolga, Safety Beach, Emerald Beach and Sandy Beach	Operational response	Woolgoolga 6151, Sandy Beach, 2913 Safety Beach 1103 Emerald Beach 2677, (Census 2021)	9 plus 3 caravan parks (approximately 1000 vans)
Corindi	Corindi Beach, Upper Corindi, Arrawarra, Mullaway and Red Rock	Operational response	Corindi Beach 1802, Upper Corindi 158, Arrawarra 523 591, Mullaway 607, Red Rock 412 (Census 2021)	20 2 caravan parks
Orara	Nana Glen, Coramba, Bucca, Lower Bucca, Karangi, Orara	Operational response	Karangi 515, Nana Glen 1132, Coramba 817, Upper Orara 863, Lowanna 359 (Census 2021)	Nana Glen approximately 8 Coramba approximately 4

1. SAWTELL SECTOR

SAWTELL SECTOR RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Boronia Street, southern end of Elizabeth Street, Seventh Avenue, Eighth Avenue, southern half of Circular Avenue.		
Hazard	Middle Creek Flash Flooding		
Flood Affect Classification	Rising Road Access		
At risk properties	450 Residential 62 Commercial	**Total number of properties within Sector/Community**	Sawtell 1559 Toormina 2493 (Census 2021)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name	**Name**	**AWRC No.**	**Min (m)**	**Mod (m)**	**Maj (m)**
	Coffs Harbour Sawtell also known as Sawtell (Middle Creek)	559054	3	n/a	4.7

Gauge No.	**Name**	**Gauge Type**	**Location**	**Years Active**
205480 (MHL)	Bonville	Water level cont.	Bonville Creek at Waterside Gardens Caravan Park	2009-present
559050 (MHL)	North Bonville	Rainfall cont.	North Bonville Rd	1990-present
559048	Middle Boambee	Rainfall cont.	Cedarvale Rd	1900-present
205438	Boambee (Sawtell Road)	Water Level	Sawtell Road at Boambee Creek	Unknown
205475	Boambee Entrance D/S	Water Level	Boambee Creek at Boambee Entrance	Unknown

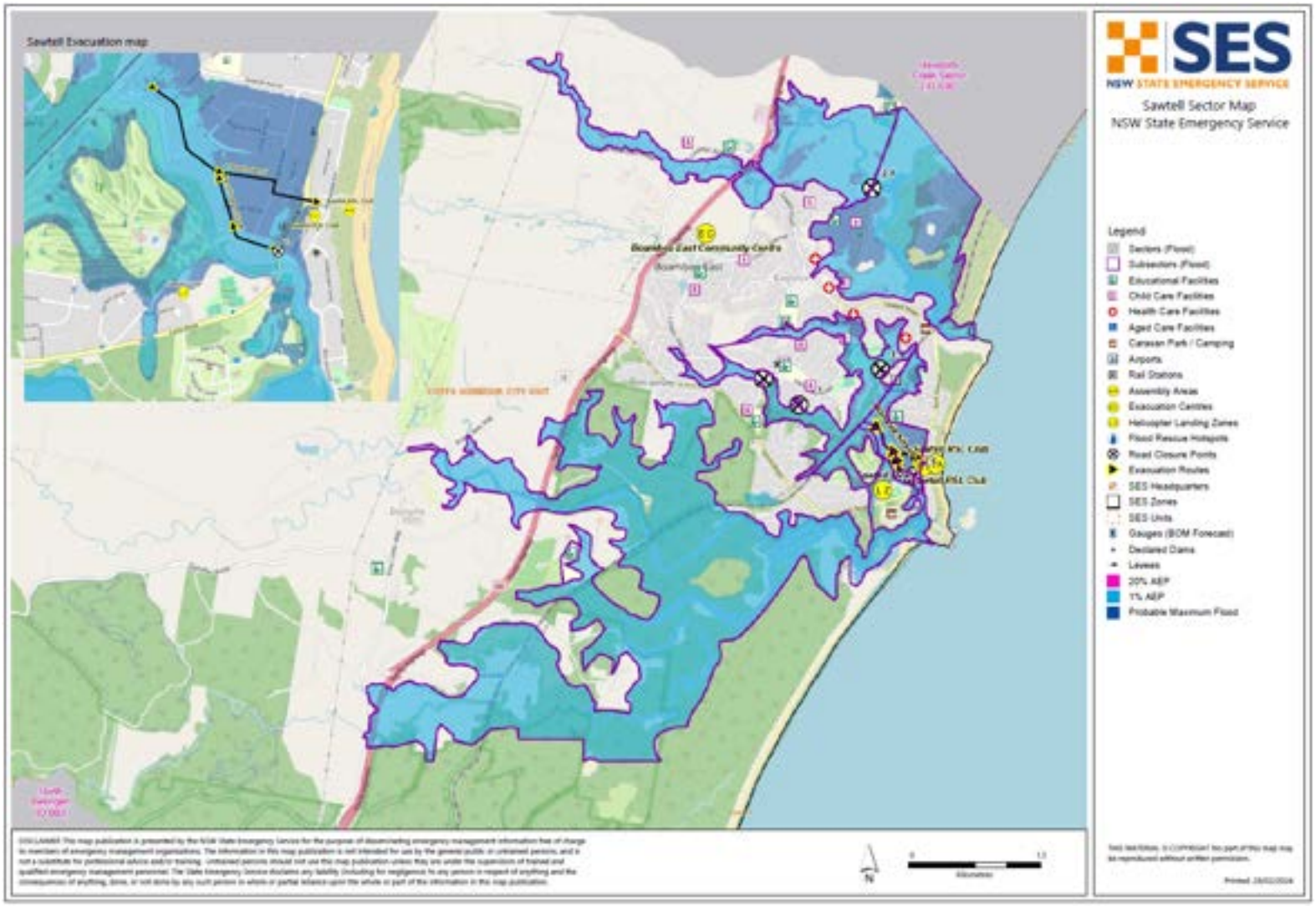
General Strategy	• Monitoring flood water levels and assist property protection where appropriate. • Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of Assembly Area or evacuation centre at the Sawtell RSL, where evacuees are able to gather while flood situation is monitored.
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential inundation of properties estimated to be for a few hours.
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning

	• Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • During a 0.5% AEP event the Rail network may become inundated, this is around 4.4 to 4.5m (Sawtell (Middle Creek) 559054) gauge.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to: • Inundation of property • Closure of main access routes • Failure of essential services
Evacuation Triggers	Due to the nature of flash flooding in the Middle Creek Catchment (Sawtell Sector) all triggers listed below will need to be monitored by on ground reconnaissance, wherever possible. Heights are likely to rise and fall very quickly and can be heavily influenced by tidal conditions and storm surge. The key scenarios for evacuation triggers based on Bureau of Meteorology flood height predictions at the Sawtell (Middle Creek) gauge (559054): **1. Prediction to reach and/or exceed 3.1m** • Emergency Warning for residents along Boronia Street (6 residential properties), requiring evacuation prior to Boronia Street at 3.1m (GEMS subsector 54455). **2. Prediction to reach and/or exceed 3.93m** • Emergency Warning for residents along south end of Circular Avenue and Elizabeth Street, Seventh Avenue Eighth Avenue (GEMS subsector 54456). • Emergency Warning for residents in low lying areas west of the railway line (GEMS subsector 54428). • Emergency Warning for residents south of the intersection of Chinamans Creek and Lyons Road (GEMS subsector 65716) **3. Prediction to reach and/or exceed 6.0m (PMF)** • Emergency Warning for residents in High Tech Drive and Craft Close (GEMS subsector 54429).
Sequencing of evacuation	• Evacuation of vulnerable facilities such as the hospital, aged care facilities, schools, and child-care facilities will require a higher priority. • **For prediction 1:** ○ Evacuation of residents in Boronia Street between May Street and Elizabeth Street. • **For Prediction 2:** ○ Evacuation of residents in Circular Avenue, Eighth Avenue, Seventh Avenue and Elizabeth Street between Boronia Avenue and Bellgrove

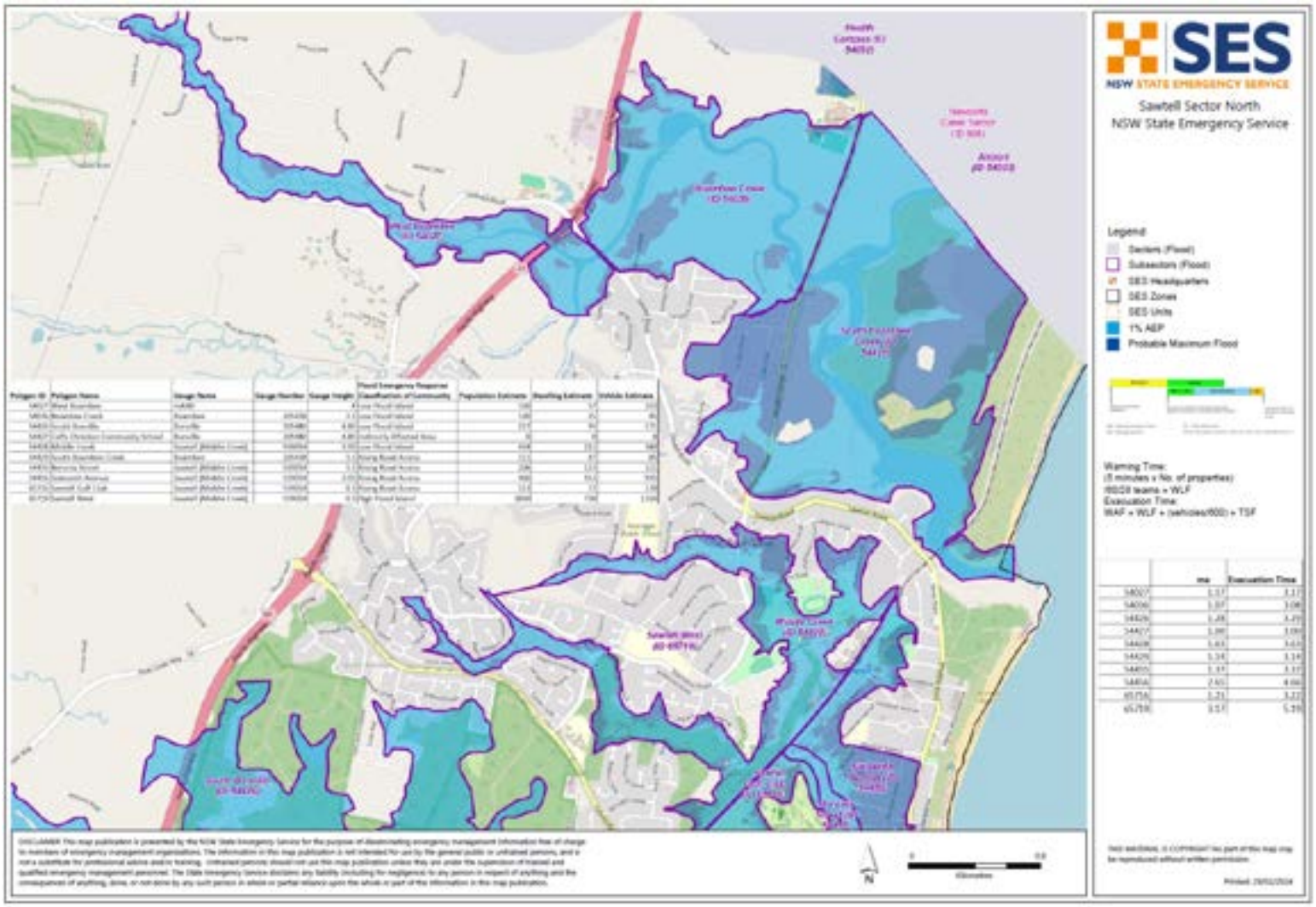
	Street. ○ Residents in low lying areas west of the railway line should move to higher ground as flooding and localised road closures may occur. • **For Prediction 3:** ○ Evacuation of residents in Hi-Tech Drive and Craft Close. • For all areas outside of these subsectors a general warning should be issued to advise of localised road closures and to avoid the area.
Evacuation Routes	***For Prediction 1*** The area of Boronia Street evacuated along Eight Avenue, then south onto Elizabeth Street then east onto Second Avenue to the evacuation centre. ***For Prediction 2*** The areas of Circular Avenue, Eighth Avenue, Seventh Avenue and Elizabeth Street between Boronia Avenue and Bellgrove Street evacuated along Second Avenue to First Avenue. ***For Prediction 3*** People within Hi-Tech Drive and Craft Close. Move to higher ground or travel via Sawtell Road and Linden Avenue to the evacuation centre at Boambee East Community Centre.
Evacuation Route Closure	Road closure affecting the sequenced evacuation route is Boronia Street (3.5 m Sawtell (Middle Creek) gauge 559054).
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Sawtell. • Primarily self-evacuation by private transport to the evacuation centre at Sawtell RSL on First Avenue or the evacuation centre at the Boambee East Community Centre on Bruce King Drive. • At risk residents will be door knocked by NSW SES, RFS, Council Lifeguards and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas of Sawtell and Toormina. • Where this is not possible the nominated evacuation centre is the Sawtell RSL First Avenue. This can be used as an Assembly Area in the short term, but could also double as an evacuation centre should the need arise. • For residents west of the railway line an alternate evacuation centre is at the Boambee East Community Centre on Bruce King Drive. • There are a number of other buildings located in flood free areas. These buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• People should be encouraged to stay with friends/relatives in high areas of Sawtell and Toormina. • Where this is not possible the nominated assembly area is the Sawtell RSL First Avenue. This can be used as an Assembly Area in the short term, but could also double as an evacuation centre should the need arise. • There are a number of other buildings located in flood free areas. These buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.

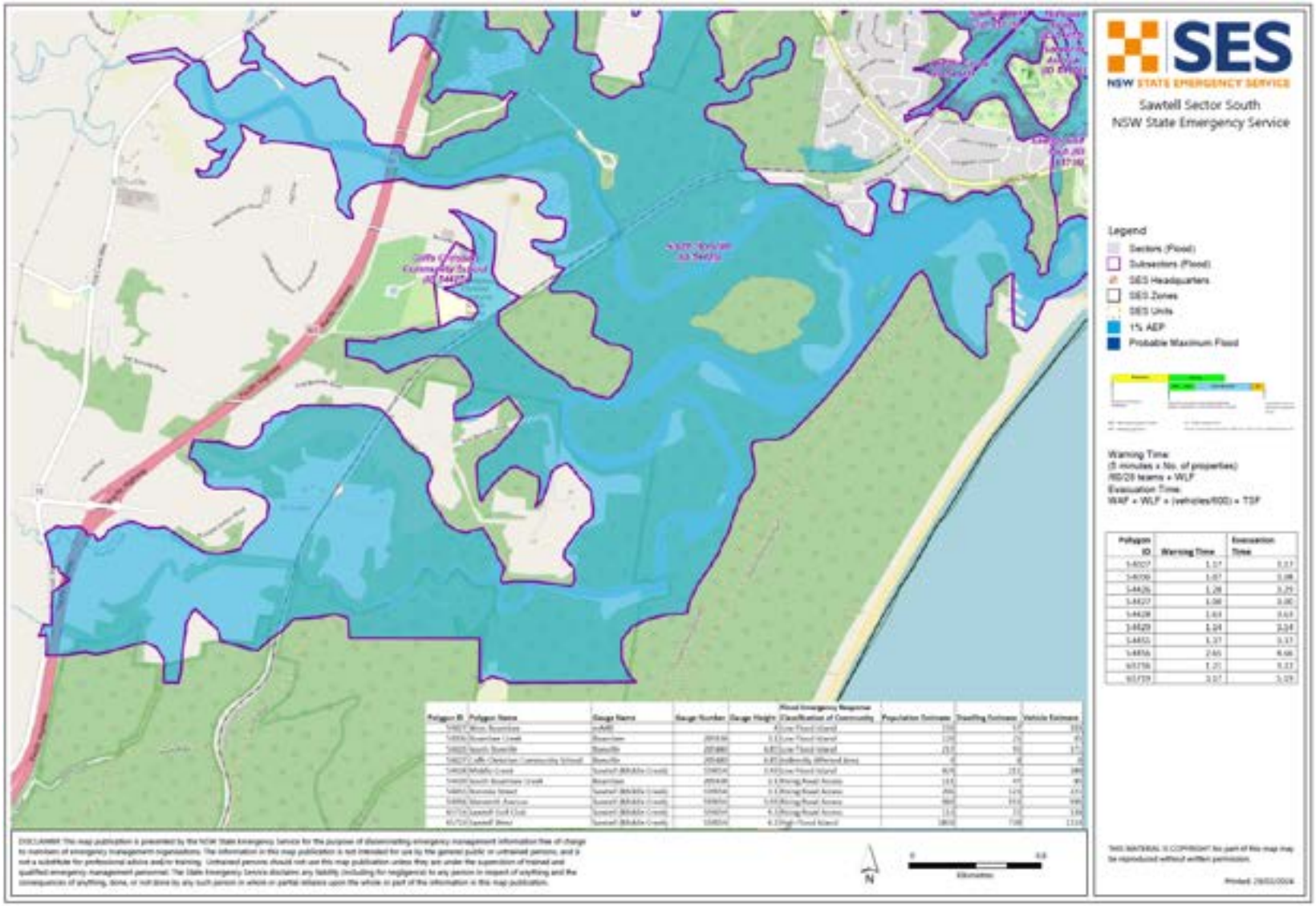
	All Flood Rescue Operations will be undertaken as per the State Rescue Policy.
	Resupply will be provided by the NSW SES through the 132500 call out system, although unlikely in this area.
	Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Suitable landing points are located at: Helicopter Landing Zones ▪ Sawtell Oval Bayldon Road Sawtell (S30° 22.154' E153° 05.4708) – Flood free NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event.
	Airports: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Coffs Harbour has two peak seasons with potential for a 10% population increase: • Christmas holidays December /January. • Easter long weekend.

SAWTELL SECTOR MAP



EVACUATION PLANNING




SES
NSW STATE EMERGENCY SERVICE
Sawtell Sector South
NSW State Emergency Service
Legend
Sectors (Flood)
Subsectors (Flood)
SES Headquarters
SES Zones
SES Units
1% AEP
Probable Maximum Flood
Warning Time:
(5 minutes x No. of properties)
/60/20 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF
Polygon ID
Warning Time
Evacuation Time
Flood Emergency Response
Polygon ID
Polygon Name
Gauge Name
Gauge Number
Gauge Height
Classification of Community
Population Estimate
Dwelling Estimate
Vehicle Estimate
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Kilometres
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2. NEWPORTS CREEK SECTOR

NEWPORTS CREEK RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Newports Creek including Englands Road, North Boambee Valley, Industrial/Isles Drive and Coffs Harbour Health Campus.		
Hazard	Newports Creek Flash Flooding		
Flood Affect Classification	Low Flood Island (with the exception of North Boambee Valley, which is a high flood island)		
At risk properties	Coffs Health Campus (357 beds + staff and visitors), including the specialist centre. Dwellings at risk of over floor flooding approximately 289 residential and 220 Commercial Isolation of North Boambee Valley (589 properties) North Boambee Valley 2318 (Census 2021)	**Total number of properties within Sector/Community**	North Boambee Valley 785 (Census 2021)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name **Note: This sector does not have a warning forecast gauge.**	**Name**	**AWRC No.**	**Min (m)**	**Mod (m)**	**Maj (m)**
	Newports Creek (Industrial Drive)	n/a (Bureau number 559053)	n/a	n/a	n/a
	Newports Creek	205460	n/a	n/a	n/a

General Strategy	• Monitoring of flood water levels and property protection where appropriate. • Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of Assembly Areas at Saint Augustine's Primary School Albany Street, where evacuees are able to gather while flood situation is monitored. • If necessary, establishment of an evacuation centre at Coffs Ex-Services Club (Cex)
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential inundation of properties estimated to be for a few hours.
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice

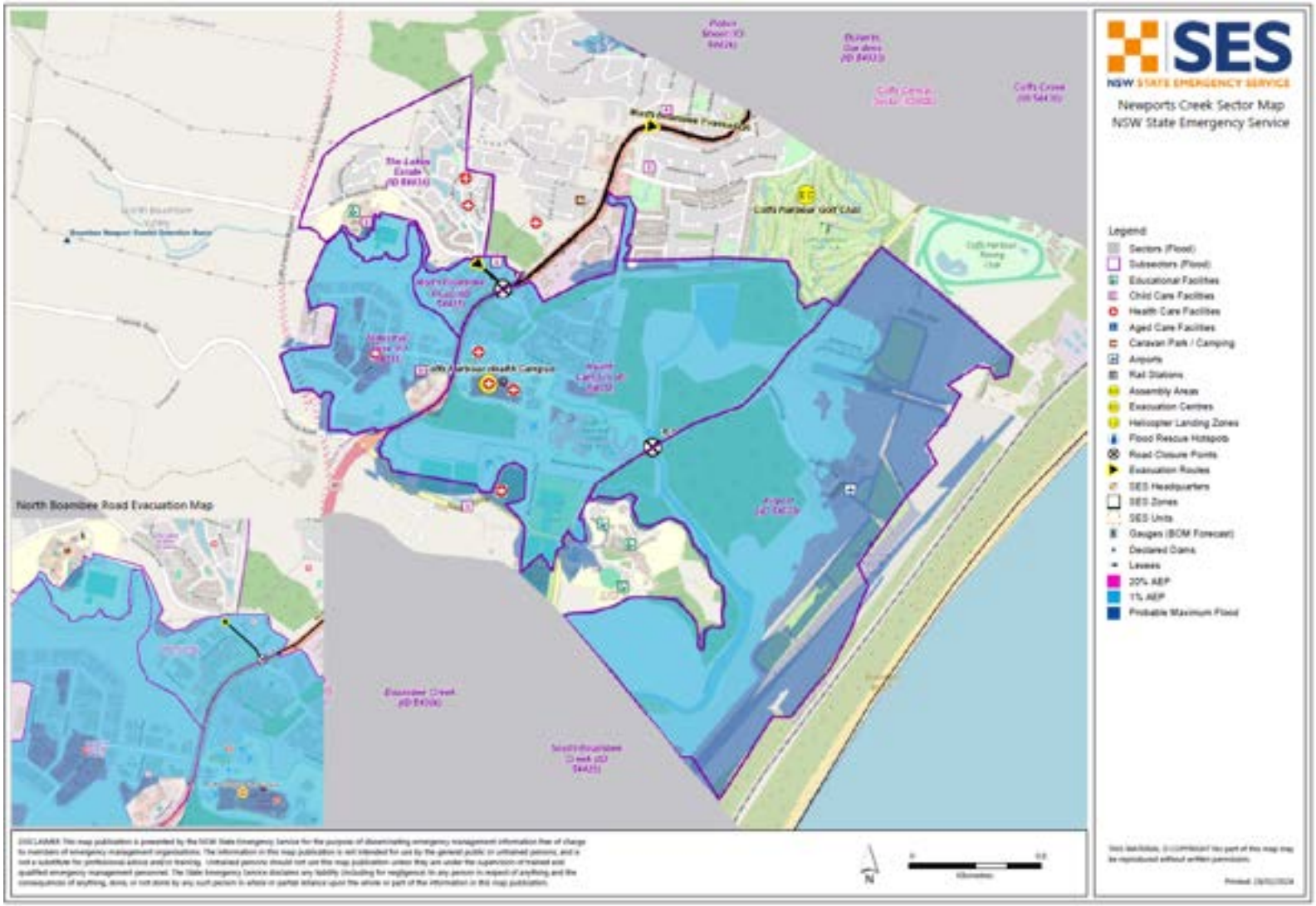
	• AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: Protection of essential infrastructure all affected at 5.6 m on Industrial Drive gauge: • Coffs Harbour Health Campus floor level • Emergency Power Supply • Ambulance station • Coffs Harbour Airport (5.3m Newports Creek (Industrial Drive) 559053)
Evacuation and/or Isolation Triggers	Evacuation may be considered due to: • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	**Note:** The Newports Creek (Industrial Drive) 559053 Gauge Zero is 3.0. mAHD can be obtained by Gauge height - 3.0m=mAHD. There are three key scenarios for evacuation triggers based on Bureau of Meteorology flood height predictions at the Newports Creek (Industrial Drive) gauge: **Prediction to reach and/or exceed 1.6 m (Newports Creek (industrial Drive) 559053)** • Emergency Warning for North Boambee Road, Bishop Druitt College (GEMS ID 54034), Mansbridge Drive and Keona Circuit (GEMS ID 54425) (20 commercial premises, including a childcare centre - Ohana) requiring evacuation prior to the North Boambee Road closure. • Residents in the Lakes Estate (GEMS ID 54034) become isolated as a high flood island. **Prediction to reach and/or exceed 4.8 m (Newports Creek (industrial Drive) 559053)** • Emergency Warning for buildings in the Cook Drive and Hawthorne, Wingara, Fraser and O'Keefe Drive areas inundated (GEMS ID 54032). • Coffs Harbour Health Campus isolated (GEMS ID 54032). **Prediction to reach and/or exceed 5.3 m (Newports Creek (industrial Drive) 559053)** • Emergency Warning for Coffs Harbour Health Campus car park, Industrial Drive and Isle Drive (this relates to 4.6 m at the Coffs Harbour Health Campus). **Prediction to reach and/or exceed 5.5m (Newports Creek (industrial Drive)** 559053) • Overfloor flooding in the hospital (Old Entrance)

Sequencing of evacuation	**Prediction to reach and/or exceed 1.6 m (Newports Creek (industrial Drive) 559053)** • Evacuation of employees in Mansbridge Drive and Keona Circuit as well as commercial premises between Newports Creek and North Boambee Road. • People in the Lakes Estate and Bishop Druitt College are to remain in place unless life threating situation occurs, as they are on a high flood island. **Prediction to reach and/or exceed 4.8 m (Newports Creek (industrial Drive) 559053)** • Evacuation of buildings in the Cook Drive and Hawthorne, Wingara, Fraser and O'Keefe Drive areas. • Coffs Harbour Health Campus isolated. **Prediction to reach and/or exceed 5.3 m (Newports Creek (industrial Drive) 559053)** • Buildings in Industrial Drive / Isles Drive precinct prepare site for isolation and inundation and evacuate. • The Coffs Harbour Health Campus car park, start to relocate to high parts of highway west of Campus. **Prediction to reach and/or exceed 5.6 m (Newports Creek (industrial Drive) 559053)** People in the following premises will be affected: • Coffs Harbour Health Campus inundated (isolated at 4.8 metres) • Bishop Druitt College isolation • Residents in the Lakes Estate will be isolated. • Access to the Coffs Harbour Regional Airport will be inundated. • Coffs Harbour Education Campus isolated. • John Paul College isolated Evacuation of vulnerable facilities (E.g. Aged care facilities, schools, child care facilities) will require higher priority, as necessary.
Evacuation Routes	**Prediction to reach and/or exceed 1.6 m** • Evacuation of employees in Mansbridge Drive and Keona Circuit as well as commercial premises between Newports Creek and North Boambee Road Travel north along Pacific Highway to the Assembly Area at Saint Augustine's Primary School Albany Street Coffs Harbour **Prediction to reach and/or exceed 5.3 m** • People with the potential to be isolated are to be evacuated early or remain in place unless life threating situation occurs.
Evacuation Route Closure	Road closures affecting the sequenced evacuation of sectors: • Intersection North Boambee Road and Pacific Highway (near KFC) closes at 1.6m (Newports Creek (industrial Drive) 559053)
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Coffs Harbour. • Primarily self-evacuation by private transport to the Assembly Areas at Saint Augustine's Primary School Albany Street Coffs Harbour. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • The AWS system will be utilised where possible.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas of Coffs Harbour. • Where this is not possible the assembly area is at Saint Augustine's Primary School Albany Street Coffs Harbour. This can be used as an Assembly Area in the short term but could also double as an evacuation centre should the need arise.

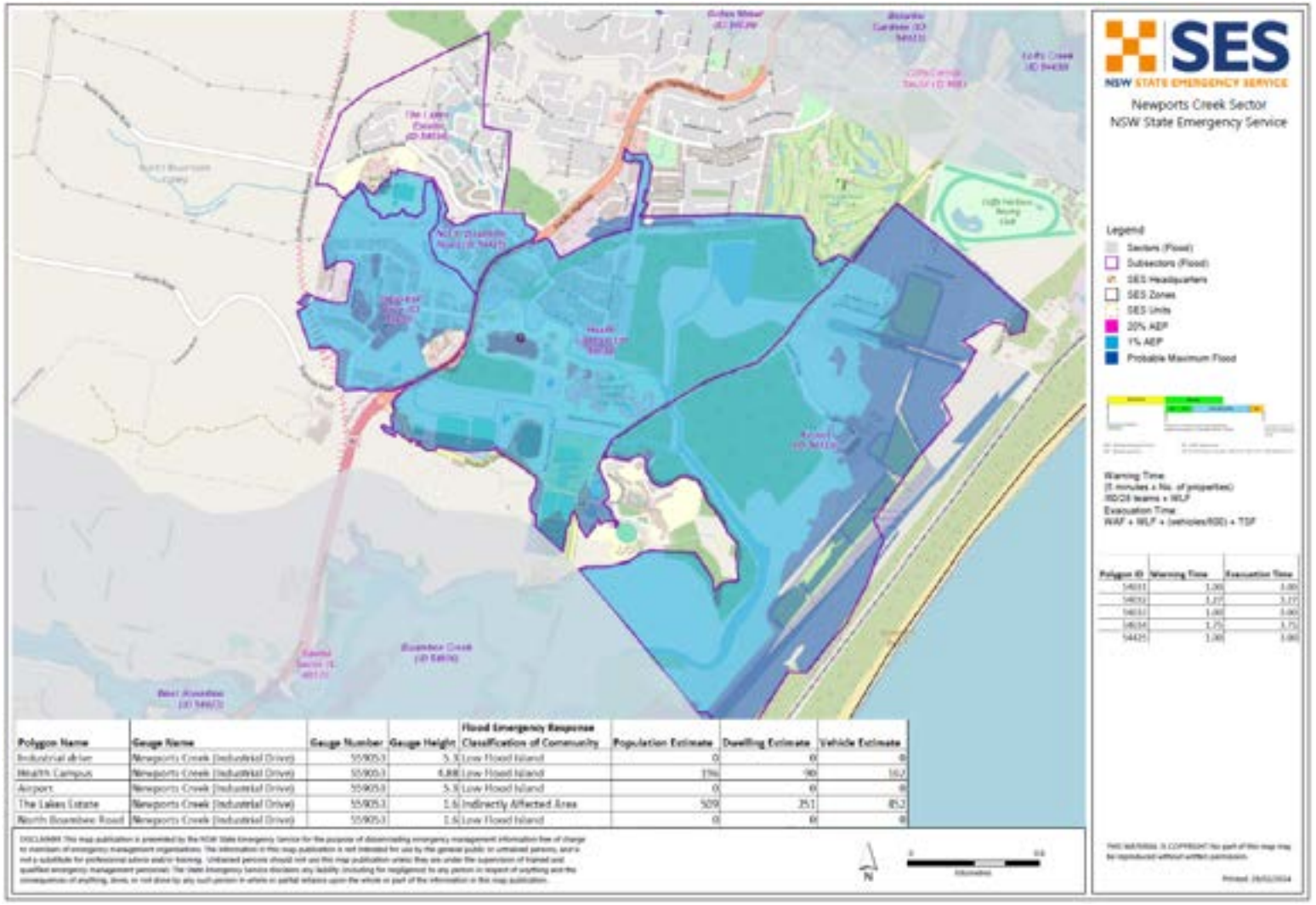
	• There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified. • Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system, although unlikely.
	Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Helicopter Landing Zones: • Coffs Harbour Health Campus (S30° 19.0138 E153° 05.3211). Located on the roof of the Health Campus. NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event.
	Airports: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.

	• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Coffs Harbour has two peak seasons with potential for a 10% population increase: • Christmas holidays December /January. • Easter long weekend.

NEWPORTS SECTOR MAP



EVACUATION PLANNING



Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
Industrial area	Newports Creek (Industrial Drive)	55905:3	5.3	Low Flood Island	0	0	0
Health Campus	Newports Creek (Industrial Drive)	55905:3	4.88	Low Flood Island	196	90	162
Airport	Newports Creek (Industrial Drive)	55905:3	5.3	Low Flood Island	0	0	0
The Lakes Estate	Newports Creek (Industrial Drive)	55905:3	1.6	Indirectly Affected Area	509	251	853
North Boambee Road	Newports Creek (Industrial Drive)	55905:3	1.6	Low Flood Island	0	0	0

3. COFFS CENTRAL SECTOR

COFFS CENTRAL RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Coffs Central including the CBD and properties along Coffs Creek – including North Coast Holiday Park.		
Hazard	Coffs Creek Flash Flooding		
Flood Affect Classification	Rising Road Access, with some areas in Coffs Harbour West becoming Low Flood Islands in larger floods (>5.15 m at Grafton Street gauge)		
At risk properties	1087 Residential 424 Commercial	**Total number of properties within Sector/Community**	Coffs Harbour 9151 (GNAF point count)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name

Name	AWRC No.	Min (m)	Mod (m)	Maj (m)
Coffs Creek (Highway Bridge) – MHL has a Bureau Warning Service Additional Council gauges with alerts include: Loaders Lane (559056) Gundagai Street (559058) Bakers Road (559055) Bennetts Road (559063) Shephards Lane Spagnolos Road	205439	3.0	n/a	4.7

General Strategy

- Monitoring of flood water levels and assistance with property protection where appropriate.
- Evacuation of at risk population.
- Self-evacuation to friends/family outside of the impact area.
- Establishment of Assembly Areas at:
  - Masonic Centre, McKay's Road (Becomes inundated around 1% 4.9m Coffs Creek (Highway Bridge)205439)
  - Orara High School, Bray Street 9 (Becomes inundated around the PMF 6.7 m Coffs Creek (Highway Bridge)205439)
  - Saint Augustine's Primary School, Albany Street (Above PMF)- where evacuees are able to gather while flood situation is monitored.

Key Risks / Consequences

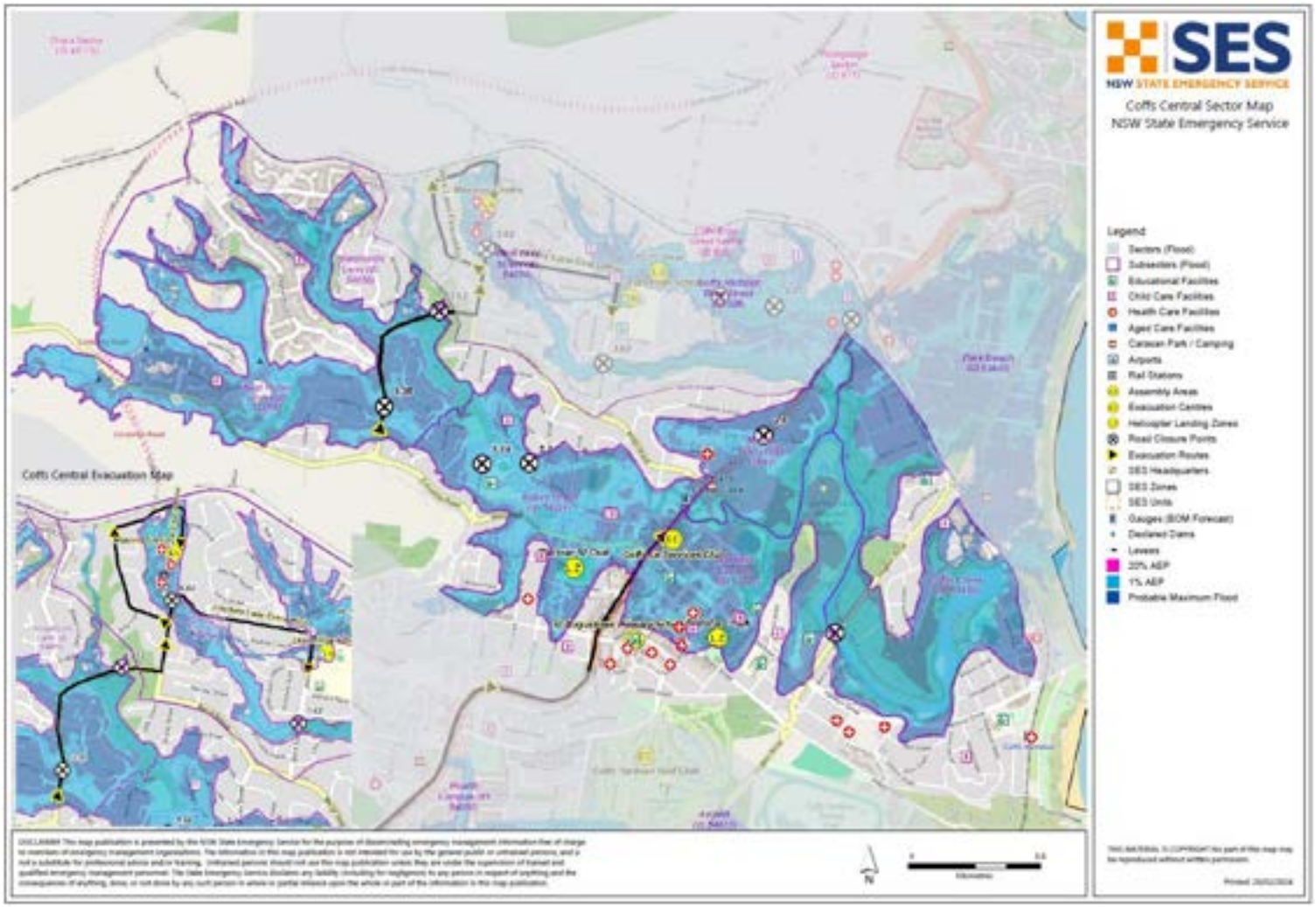
- Potential loss of life from rapid and potentially high velocity inundation.
- Potential inundation of properties estimated to be for a few hours.
- Breach of detention basin following reaching 100% capacity.
- Short term isolation

Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Relocation of valuable goods. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • Thompsons Road substation, near Windmill Motel. There may be others. • Telephone exchange in Moonee Street. • Coffs Harbour potable water supply reservoir is located on high ground above the PMF (7.5 m at Coffs Creek (Highway Bridge) gauge 205439). • The Telstra exchange for Coffs Harbour is located on Moonee Street. This exchange is powered by mains electricity. If electricity was lost during a flood then the generator (located above PMF height of 6.7 m Coffs Creek (Highway Bridge)205439)) will automatically start. The generator will last between 24-48 hours.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to; • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the following gauges: **Loaders Lane gauge:** • **Prediction to reach and/or exceed 3.35 m** Emergency Warning residents in Loaders Lane Goodenough Terrace, Brindley Court, McCann Court Charlotte Court and Shephards Lane by this height. **Gundagai Street gauge:** • **Prediction to reach and/or exceed 4.8 m** Emergency Warning for residents in Gundagai Place (including aged community), Gundagai Street, Robin Street, Frances Street, Long Street and Jean Street, Korff Street, Eugourie Close, parts of West High Street, Moonee Street and Scarba Street by this height.
Sequencing of evacuation	**For predictions of 3.35m or above on the Loaders Lane gauge:** • Goodenough Terrace, Loaders Lane, Brindley Court, McCann Court, Charlotte Court, and Shepherds Lane - To use Shepherds Lane and Don-Paterson Drive to move to Mackays Road Masonic Centre or Bray Street to Orara High School.

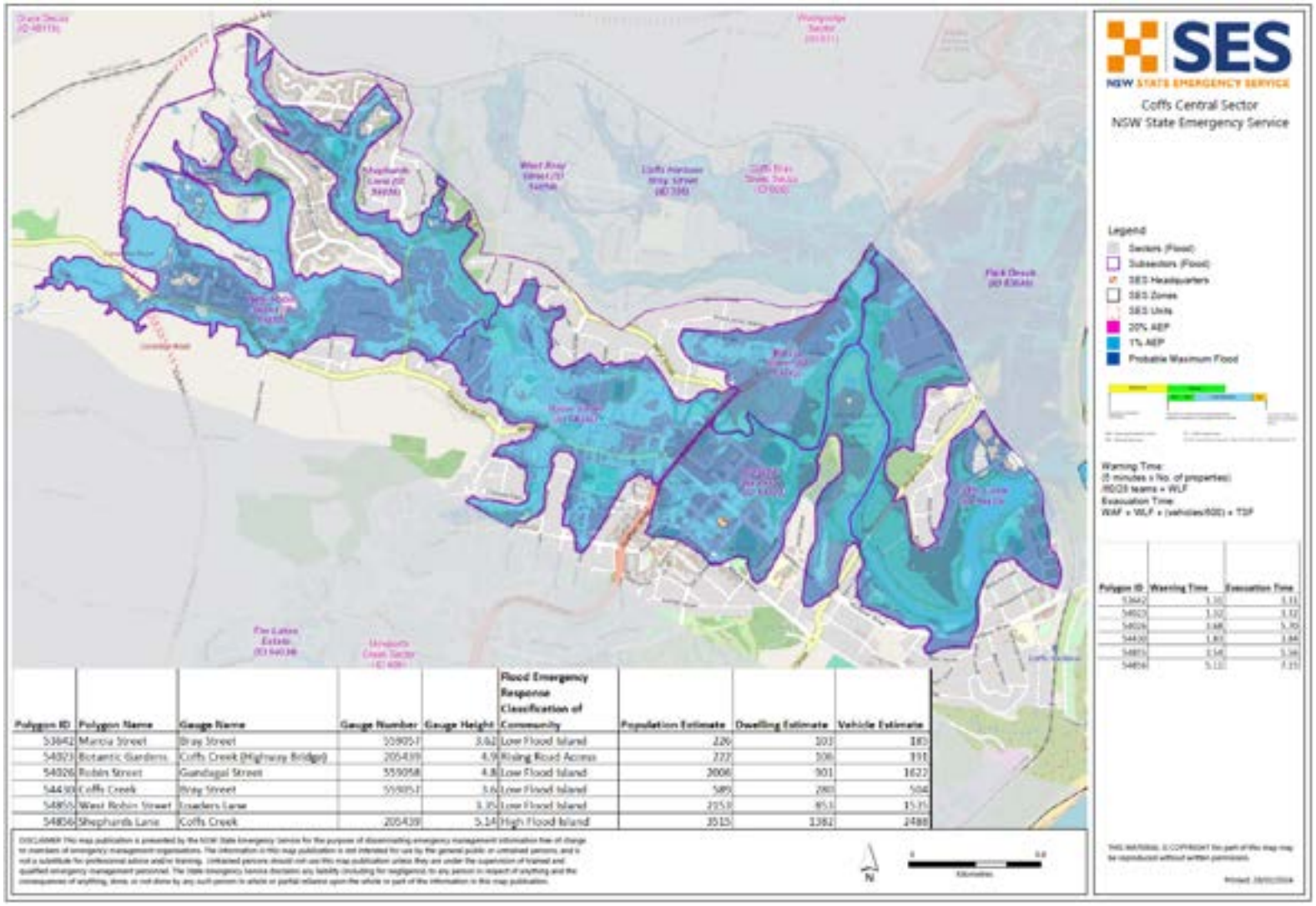
	For predicted heights of 4.8 m or above at the Gundagai Street gauge; • Gundagai Street, Robin Street, Frances Street, Long Street, Jean Street, Eugorie Close, Frances Street, Berryl Street, Mackays Road to Masonic Centre or Bray Street to Orara High School. • Gundagai Place, Korff Street, parts of West High Street, Moonee Street, Scarba Street, West High Street, Azalea Avenue, Combine Street to Saint Augustine's Primary School on Albany Street or Coffs Ex-Services Club (Cex). Evacuation of vulnerable facilities (E.g.: Aged care facilities, schools, child care facilities) will require higher priority, as necessary.
Evacuation Routes	• Goodenough Terrace, Loaders Lane, Brindley Court, McCann Court, Charlotte Court, and Shephards Lane, Shepards Lane and Don-Paterson Drive to Mackays Road Masonic Centre or Bray Street to Orara High School. • **North of Coffs Creek** Gundagai Street, Robin Street, Frances Street, Long Street, Jean Street, and Eugorie Close, move up Frances Street, Berryl Street, Mackays Road, to Masonic Centre or Bray Street to Orara High School. • **South of Coffs Creek** Gundagai Place, Korff Street, parts of West High Street, Moonee Street, and Scarba Street move via West High Street, Azalea Avenue, Combine Street to Saint Augustine's Primary School on Albany Street or Coffs Ex-Services Club (Cex).
Evacuation Route Closure	Road closures affecting the sequenced evacuation of sectors at approximately 5.15 m at the Grafton Street gauge: • Don-Paterson Drive west of Mackays Road – 3.62m Bray Street gauge (559057) • Mackays Road at Bray Street 3.62m Bray Street gauge (559057) • Joyce Street at Greenlea Crescent 3.62m Bray Street gauge (559057). • Shephards Lane and Loaders Lane - 3.35m Loaders Lane gauge (559056). Other possible closures nearby: Marcia Street Intersection cut by short heavy rainfall at 2.8 m on Grafton Street gauge.
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Coffs Harbour. • Primarily self-evacuation by private transport to Assembly Areas at Masonic Centre MacKay's Road; Orara High School Bray Street; Saint Augustine's Primary School, Albany Street; Coffs Ex-Services Club (Cex). • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • The Emergency Alert System will be utilised where possible.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas of Coffs Harbour. • Where this is not possible the nominated assembly area is the **Orara High School Auditorium**, Bray Street; **Masonic Centre**, Mackays Road; **Saint Augustine's Primary School**, Albany Street or **Coffs Ex-Services Club (Cex)**. These can be used as an Assembly Areas in the short term but could also double as an evacuation centres should the need arise. • There are a number of other buildings located in flood free areas. These buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.

	• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy. • Stadium Drive (rear access to Coffs Harbour Health Campus) can become a flood rescue hot spot from people driving into flood water during flood events.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system, although unlikely.
	Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Helicopter Landing Zones • Maclean Street Oval (S 30° 17.4936' E153° 06.3359') • Brelsford Park (S30° 18.0198 E153° 07.0625') NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event.
	Airports: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Coffs Harbour has two peak seasons with potential for a 10% population increase: • Christmas holidays December/January. • Easter long weekend.

COFFS CENTRAL SECTOR MAP



EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
53842	Marcia Street	Bray Street	559057	3.62	Low Flood Island	229	103	183
54023	Botanic Gardens	Coffs Creek (Highway Bridge)	205439	4.9	Rising Road Access	727	306	991
54026	Robin Street	Guardagal Street	559058	4.8	Low Flood Island	2006	901	1622
54400	Coffs Creek	Bray Street	559057	3.62	Low Flood Island	589	280	504
54805	West Robin Street	Evaders Lane		3.35	Low Flood Island	2253	853	1535
54806	Shephards Lane	Coffs Creek	205439	5.14	High Flood Island	3515	1382	2488

4. COFFS BRAY STREET SECTOR

COFFS BRAY STREET RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Bray Street (including the Pacific Highway), Argyle Street, Argyle Place, Maple Street, Deborah Close, Taloumbi Road, Collice Place, Wilga Place and Langker Place – including Clog Barn Caravan Park and Park Beach Plaza. There is a separate sector for Central Coffs (CBD).		
Hazard	Tree Fern Creek Flash Flooding		
Flood Affect Classification	Rising road access up to High Flood Islands		
At risk properties	2201 Residential 616 Commercial 1 High Risk Caravan Park	**Total number of properties within Sector/Community**	6975 (GNAF point count)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name

Name	AWRC No.	Min (m)	Mod (m)	Maj (m)
Bray Street (559057) Council operational Trigger 1.8m				

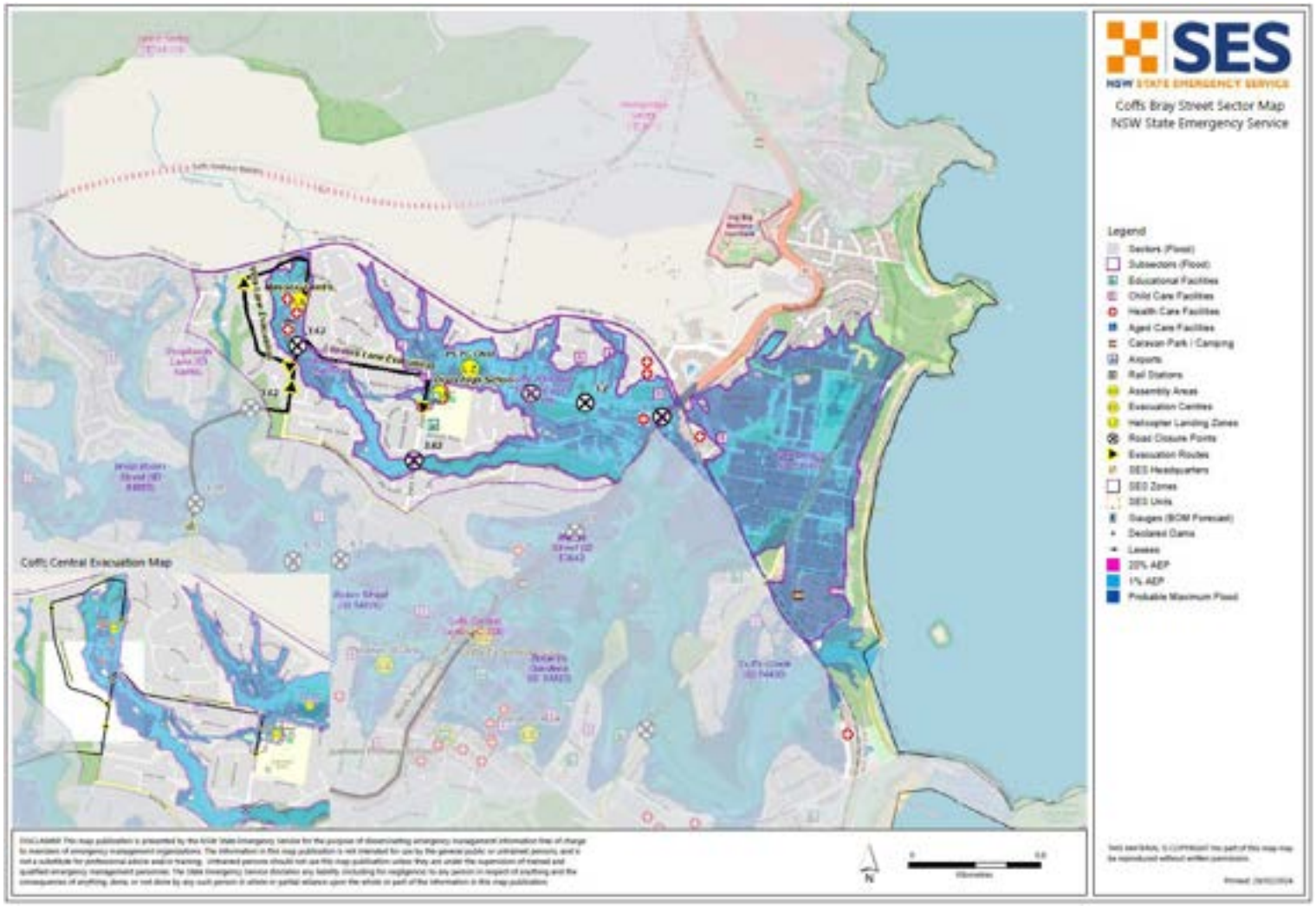
General Strategy	• Monitoring of flood water levels and assistance with property protection as required. • Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of Assembly Areas at Masonic Centre Mackays Road; Orara High School Bray Street, where evacuees are able to gather while flood situation is monitored.
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential inundation of properties around Bray Street estimated to be for a few hours.
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters.

	• Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: Electric supply substation on Bray Street.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to; • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	**Prediction to reach and/or exceed 3.5 m Bray Street (559057)** • Emergency Warning for residents along Northern Tributaries of Coffs Creek, the area bounded by South - Argyll/West Argyll, East - Pacific Highway, North – Railway Line, West – Apollo/Joyce Street, Kurrajong Street, Argyll Street, Bray Street including York Street, Northside Lane, San Fransisco Lane and Columbus Street (GEMS ID 328). **Prediction to reach and/or exceed 3.9 m** • Emergency Warning for Park Beach Plaza and Boultwood Street area including the York Street, Orlando Street, Prince Street, Lawson Street area (GEMS ID 53640).
Sequencing of evacuation	• **Northern Bray Street residents**: Bray Street will close to the west. Residents will need to drive to the Pacific Highway then west onto Argyll Street to access Assembly areas. • **Residents south of Bray street:** To avoid Bray Street road closures travel west along Argyll Street, north on Frederick Street then west along Bray Street to Orara High School. • **Residents north of Bray Street:** West of Orara High School : south down Apollo Drive then east to Orara High School. • **East of Orara High School:** south down Hannaford Place or Taloumbi Road then west to Orara High School.
Evacuation Routes	• **Northern Bray Street residents**: Travel east along Bray Street, south along Pacific Highway and West along Argyll Street, North to Frederick and West along Bray Street to Orara High School. • **Residents south of Bray street:** Travel west along Argylle Street, north on Frederick Street then west along Bray Street to Orara High School. • **Residents north of Bray Street:** West of Orara High School : south down Apollo Drive then east to Orara High School. • **East of Orara High School**: south down Hannaford Place or Taloumbi Road then west to Orara High School.
Evacuation Route Closure	Road closures affecting the sequenced evacuation of sectors (not directly affecting evacuation routes) – at around 2.4 m on the Bray Street gauge: • Bridges on Bray Street to the west of number 36 and near the intersection of Frederick Street. • Corner of Bray Street and Pacific Highway.

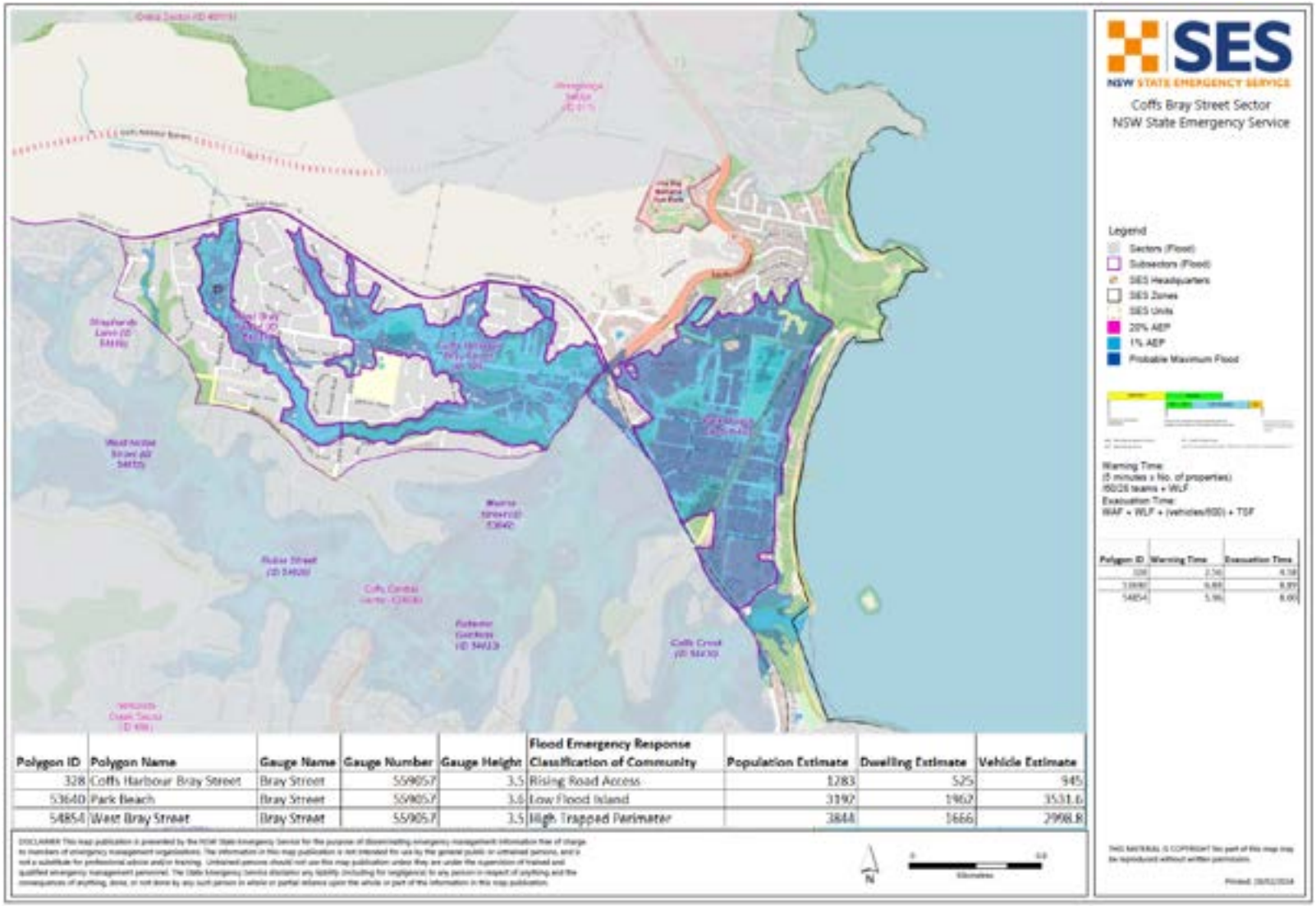
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Coffs Harbour. • Primarily self-evacuation by private transport to Assembly Areas at Masonic Centre, Mackays Road and Orara High School Bray Street. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • The Emergency Alert System will be utilised where possible.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas of Coffs Harbour. • Where this is not possible the nominated assembly area is the Masonic Centre Mackays Road or Orara High School Bray Street Coffs Harbour. These can be used as assembly areas in the short term but could also double as an evacuation centres should the need arise. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified. • Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy. • Bray Street can become a flood rescue hot spot from people driving into flood water during flood events.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system, although unlikely. Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Helicopter Landing Zones • PCYC Oval opposite Orara High School (S30^{o} 16.5179' E153^{o} 06.5285') NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event. ***Airports:*** ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053).

Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Coffs Harbour has two peak seasons with potential for a 10% population increase: • Christmas holidays December/January. • Easter long weekend.

COFFS BRAY STREET SECTOR MAP



EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
328	Coffs Harbour Bray Street	Bray Street	55905.7	3.5	Rising Road Access	1283	525	945
53640	Park Beach	Bray Street	55905.7	3.6	Low Flood Island	3192	1962	3531.6
54854	West Bray Street	Bray Street	55905.7	3.5	High Trapped Perimeter	3848	1666	2998.8

5. WOOLGOOLGA SECTOR

WOOLGOOLGA RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour Plan for more information about this Sector/Community.

Sector Description	This sector covers Woolgoolga, Sandy Beach, Safety Beach, Moonee Beach and Emerald Beach.		
Hazard	Flash Flooding on Woolgoolga Creek, Poundyard Creek and Jarrett Creek Storm surge backing up flood water Coastal erosion at Campbells Beach – temporary protection works permitted under responsibility of Coffs Harbour City Council (Coastal Erosion Emergency Action Sub Plan)		
Flood Affect Classification	Rising Road Access Caravan park Low Flood Island		
At risk properties	9 residential dwellings. Sunset Caravan Park (approximately 100 'relocatable' homes and a number of powered and unpowered sites)	**Total number of properties within Sector/Community**	Woolgoolga 2325 Sandy Beach 1030 Safety Beach 392 Emerald Beach 934 (Census 2021)

Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.				
Key Warning Gauge Name. ***There is no key warning gauge in this area.***	**Name**	**AWRC No.**	**Min (m)**	**Mod (m)**	**Maj (m)**
	Woolgoolga Creek	205441	n/a 5% = 3.62	n/a 1% = 4.02	n/a PMF = 6.12
	Woolgoolga Dam (Monitored by the City of Coffs Harbour) (559061) Trigger rainfall 60mm in 3 hours.	n/a	n/a	n/a	n/a
	Moonee Creek (205435)	n/a	n/a	n/a	n/a
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of Assembly Area at the Saint Francis Xavier School. • Establishment of an evacuation centre at the Woolgoolga RSL.				
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Potential isolation of hundreds of people estimated to be for a number of days.				

Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: No identified essential infrastructure requiring protection.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to; • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	• Heavy local rainfall can cause flash flooding. • The key evacuation triggers are based flood heights at the Woolgoolga Creek Gauge (205441). There is a two hour lag time for the flood peak to travel from the Woolgoolga Creek gauge (west of the Old Pacific Highway) to Woolgoolga Lake. • Woolgoolga Lake is an intermittently closed and open lagoon (ICOLL). The natural breakout of Woolgoolga Lake typically occurs when water levels in the lake are between 1.2 to 1.8m AHD. When the water level in the lake reaches 1.6m AHD and natural breakout does not occur then Council may initiate a mechanical breakout of the lake entrance. This is to prevent flooding of property and other key assets. **Prediction to reach and/or exceed 3.56m:** Emergency Warning of Sunset Caravan Park, 4 dwellings in Haines Close, 2 dwellings in Newman Street and 3 dwellings in Bultitude Street (GEMS ID 54448). **Prediction to reach and/or exceed 4.3m:** Emergency Warning for low lying residential areas, particularly around Wharf Street, Market Street and the Woolgoolga Beach Holiday Park (GEMS ID 54454).
Sequencing of evacuation	Woolgoolga is broken into two subsectors for sequencing of evacuation: • GEMS ID 54448 - Sunset Caravan Park Woolgoolga (100 'relocatable' homes and sites), a number of elderly residents will require assistance: Newman's Street (2 dwellings), Bultitude Street (3 dwellings) and Haines Close (4 dwellings). • GEMS ID 54454 – Low lying areas within the PMF extent. These areas will

	become inundated between the 1% (4.02m Woolgoolga Creek Gauge 205441) and PMF (6.12m Woolgoolga Creek Gauge 205441) flood events.

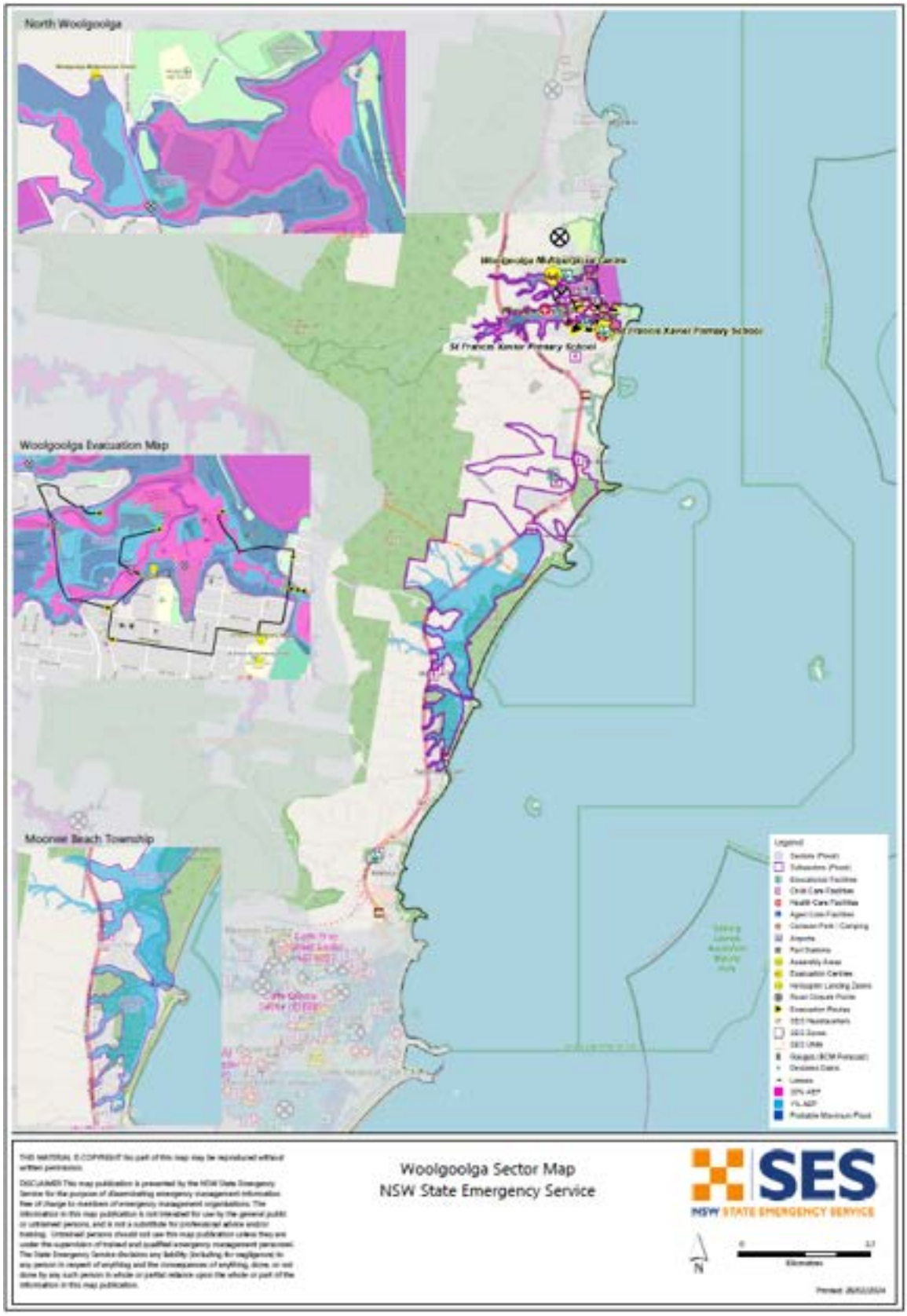
Evacuation Routes	**For the Woolgoolga RSL Evacuation Centre:**
	• GEMS ID 54448 –
	  • Areas south of Woolgoolga Creek: Newman Street, Bultiitude Street the Beach Street.
	  • Areas north of Woolgoolga Creek: Haines Close to Tomkins Avenue, west on Sunset Avenue, south on Solitary Islands Way, east on Clarence then east onto Beach Street.
	
	For the St Francis Xavier Primary School:
	• GEMS ID 54454 –
	  • Via Pullen Street onto Beach Street to the Woolgoolga RSL. Alternatively, to Beach Street, south on River Street, east on Gordon Street, north on Nightingale Street, east on Waterloo Street to Saint Francis Xavier Primary School.
	
	For the Woolgoolga Multipurpose Centre
	• GEMS ID 54454 -
	  • Areas north of Woolgoolga Creek: Melaleuca Avenue west on Sunset Avenue, north on Solitary Islands Way to an assembly area at the Woolgoolga Multipurpose Centre.

Evacuation Route Closure	Possible road closures affecting the sequenced evacuation of sectors: • Solitary Islands Way between Woolgoolga Creek and Clarence Street. • Bultitude Road at Jarrett Creek. • Low-lying areas of Beach Street. Other known road closures include: • Solitary Islands Way at Bark Hut Road Woolgoolga. • Old Pacific Highway at Post Office Lane. • Old Pacific Highway at Blackadder Creek.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • Primary self-evacuation by private transport to Woolgoolga RSL. • Primarily self-evacuation by private transport to Saint Francis Xavier School (30 06' 55.86" 153 12' 07.09" elevation 13m). • At risk residents will be door knocked by SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in higher areas. Note some of these areas may become isolated with further river rises. • Where this is not possible an evacuation centre may be established at the **Woolgoolga RSL** on Beach Street. The RSL is unaffected up to and including a 1% AEP event (4.02m Woolgoolga Creek Gauge 205441). It is within the PMF (6.12m Woolgoolga Creek Gauge 205441) extent and should not be used in these events. • If a PMF (6.12m Woolgoolga Creek Gauge 205441) is predicted or as an alternative, an assembly area may be established at the Saint Francis Xavier School. This can be used as an Assembly Area in the short term. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.

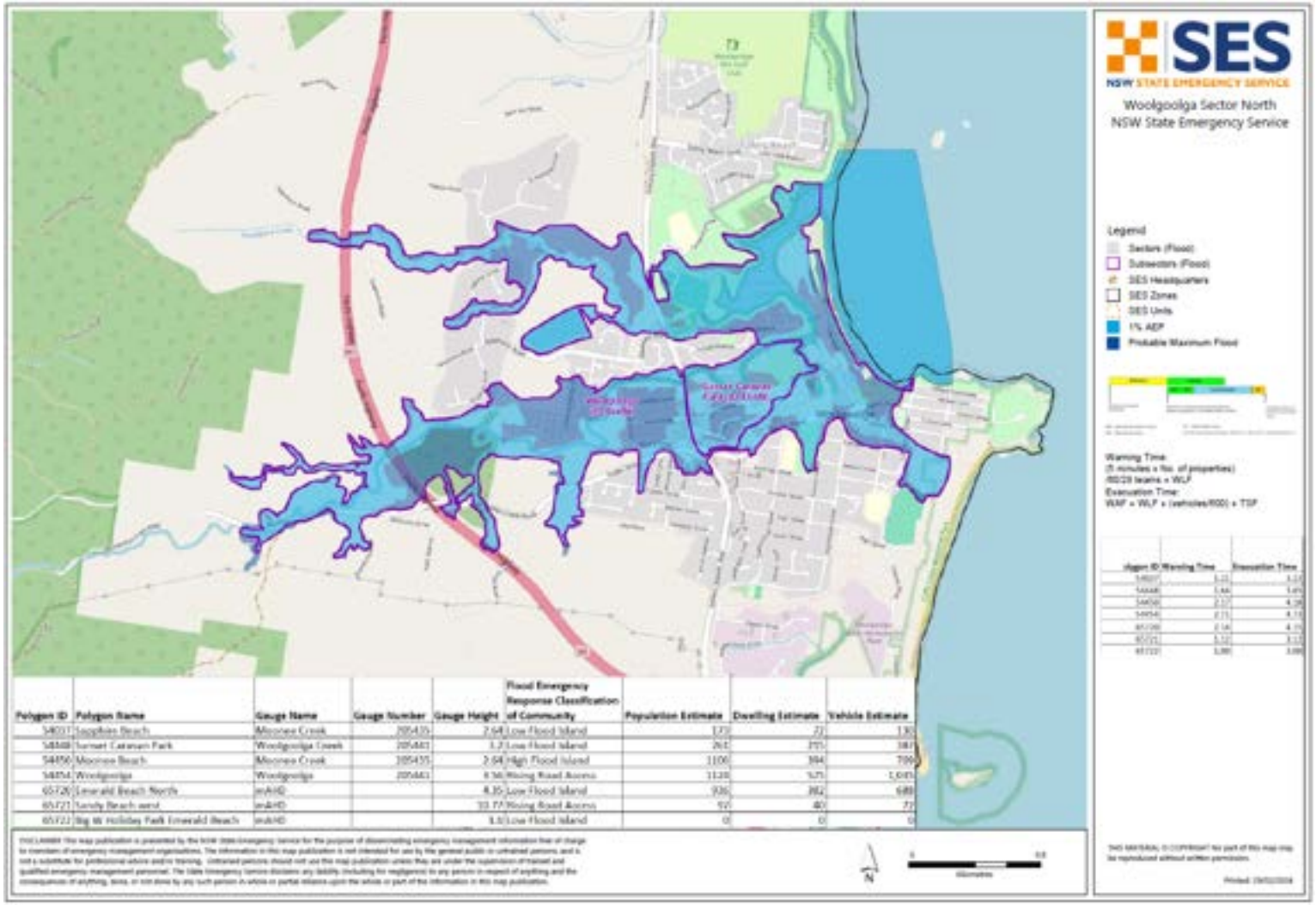
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified. • Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system. Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Helicopter Landing Zones • Helipad in playing field next to Saint Francis Xavier School (30° 06' 58.67" 153° 12 06.91") elevation 14 m. NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event. ***Airports:*** Coffs Harbour airport is approximately 25km (13.8 nautical miles) SSW from Woolgoolga: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.

	• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Woolgoolga has two main peak seasons with potential for a potential for a 20% population increase: • Christmas holidays – December/January • Easter long weekend, particularly when coinciding with school holidays. Woolgoolga Curry Festival September also sees a significant increase in population over the weekend.

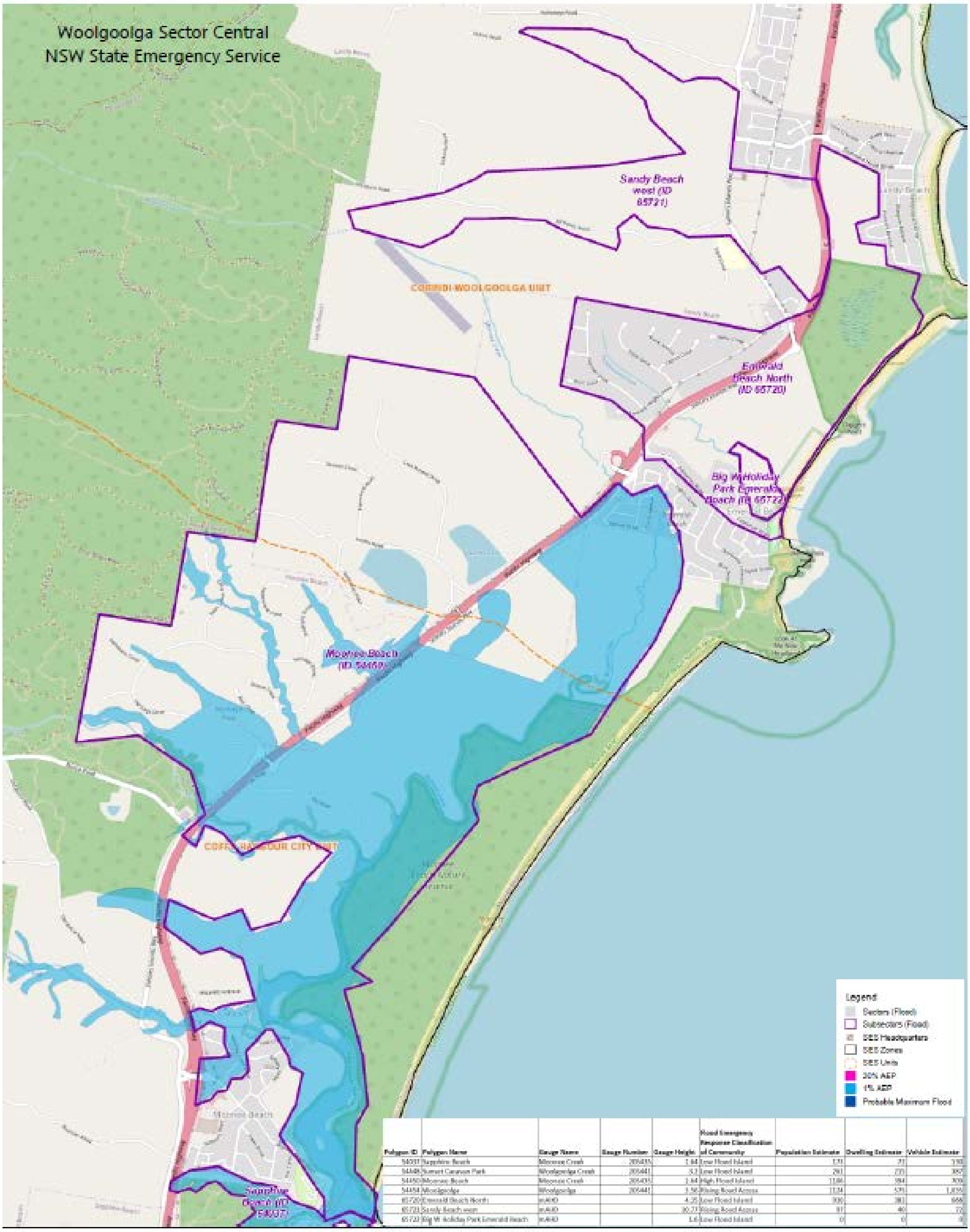
WOOLGOOLGA SECTOR MAP



EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
54037	Sapphire Beach	Moonee Creek	205435	2.64	Low Flood Island	173	72	130
54048	Sunset Caravan Park	Woolgoolga Creek	205443	3.23	Low Flood Island	261	111	183
54056	Moonee Beach	Moonee Creek	205435	2.64	High Flood Island	1106	384	706
54054	Woolgoolga	Woolgoolga	205443	8.96	Rising Road Access	1128	571	1,045
65726	Emerald Beach North	on AHD		8.35	Low Flood Island	936	382	688
65727	Sandy Beach west	on AHD		10.77	Rising Road Access	97	40	77
65722	Big W, Holiday Park Emerald Beach	on AHD		8.83	Low Flood Island	0	0	0



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
54037	Sapphire Beach	Moonee Creek	205435	1.84	Low Flood Island	171	71	110
54448	Sunset Caravan Park	Woolgoolga Creek	205441	3.3	Low Flood Island	261	235	387
54450	Moonee Beach	Moonee Creek	205435	1.84	High Flood Island	1186	384	709
54454	Woolgoolga	Woolgoolga	205441	3.58	Rising Road Access	1134	571	1,835
65720	Emerald Beach North	m440		4.25	Low Flood Island	306	381	666
65721	Sandy Beach west	m440		10.77	Rising Road Access	97	46	72
65722	Big W Holiday Park Emerald Beach	m440		1.6	Low Flood Island	0	0	0

olygon ID	Warning Time	Evacuation Time
54037	1.23	3.22
54448	1.64	3.65
54450	2.17	4.18
54454	2.71	4.73
65720	2.14	4.15
65721	1.12	3.12
65722	1.00	3.00

Warning Time:
(5 minutes x No. of properties) /60/28 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

NSW STATE EMERGENCY SERVICE

N

0 0.9
Kilometres

Printed: 29/02/2024


Woolgoolga Sector South
NSW State Emergency Service
COFFS HARBOUR CITY UNIT
Moonee Beach (ID 54450)
Sapphire Beach (ID 54037)
Orara Sector (ID 48115)
Legend
Sectors (Flood)
Subsectors (Flood)
SES Headquarters
SES Zones
SES Units
20% AEP
1% AEP
Probable Maximum Flood
Polygon ID
Polygon Name
Gauge Name
Gauge Number
Gauge Height
Flood Emergency Response Classification of Community
Population Estimate
Dwelling Estimate
Vehicle Estimate
54037 Sapphire Beach Moonee Creek 285435 2.64 Low Flood Island 172 72 130
54448 Sunset Caravan Park Woolgoolga Creek 285440 3.2 Low Flood Island 261 215 387
54450 Moonee Beach Moonee Creek 285435 2.44 High Flood Island 1186 494 789
54454 Woolgoolga Woolgoolga 285441 3.56 Rising Road Access 3124 575 1,035
85720 Emerald Beach North mAHD 4.35 Low Flood Island 936 382 680
85721 Sandy Beach west mAHD 10.77 Rising Road Access 62 48 72
85722 Big W, Holiday Park Emerald Beach mAHD 7.45 Low Flood Island 0 0 0
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Polygon ID
Warning Time
Evacuation Time
54037 1.21 3.22
54448 1.64 3.65
54450 2.17 4.18
54454 2.71 4.73
85720 2.14 4.15
85721 1.12 3.12
85722 1.00 3.00
Warning Time:
(5 minutes x No. of properties)
/60/20 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF
SES
NSW STATE EMERGENCY SERVICE
N
0
0.9
Kilometres
Printed: 29/02/2024

6. CORINDI SECTOR

CORINDI RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Corindi Beach, Arrawarra, Mullaway, Upper Corindi and Red Rock.		
Hazard	Flash flooding of Corindi Creek		
Flood Affect Classification	Corindi Park Drive and Cox Lane becomes a low flood island. Red Rock and Upper Corindi become high flood islands.		
At risk properties	20 to be confirmed by unit (11 inundated and 9 isolated)	**Total number of properties within Sector/Community**	Corindi Beach 1802, Upper Corindi 158, Arrawarra 591, Mullaway 607, Red Rock 412 (Census 2021)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name	**Name**	**AWRC No.**	**Min (m)**	**Mod (m)**	**Maj (m)**
There is no key warning gauge in this area.	Corindi R at Boyles Bridge (559070)	n/a	n/a	n/a	n/a
	Corindi R at Pacific Highway (559069)	n/a	n/a	n/a	n/a

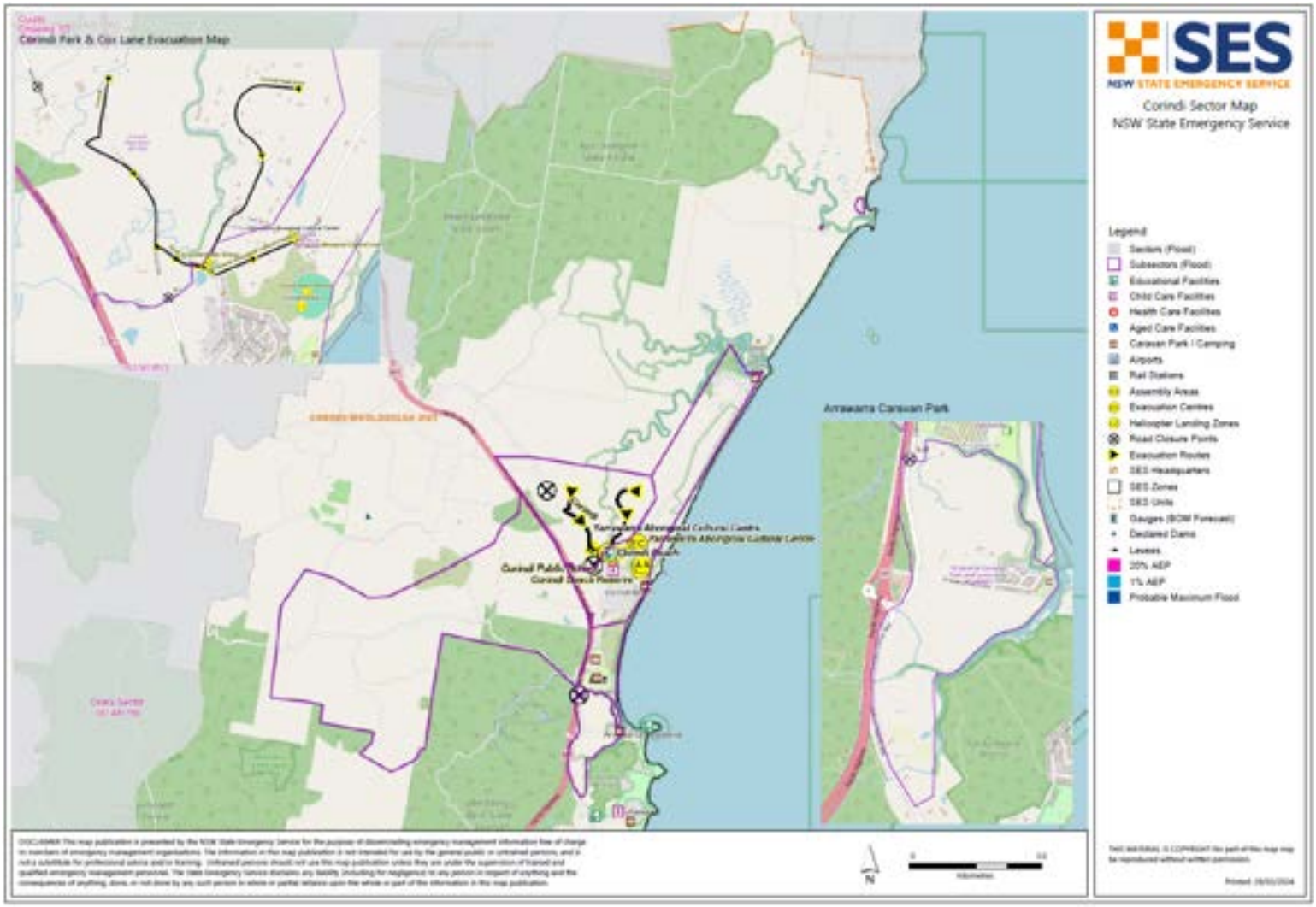
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of Assembly Area at Corindi Public School, (30 01' 16.72" 153 11' 37.46" elevation 24m) where evacuees are able to gather while flood situation is monitored. • Establishment of an evacuation centre at the Yarrawarra Aboriginal Cultural Centre • Resupply to isolated residents west of the pacific highway around Sherwood Creek Road.
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity. • Potential isolation of people for 24 hours.
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)

	City of Coffs Harbour operates a flash flood warning system that residents in Corindi Park Drive can opt into to receive text messages relating to gauge heights
	Door knocking in the Corindi Park area maybe conducted by SES volunteers or other agency personnel as required.
Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Relocation of livestock. • Relocation of farm machinery and valuable goods • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to; • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	**Prediction of 170 mm of rainfall or greater in 6 hours** (or 6 metres at the Corindi R at Pacific Highway gauge) equivalent to a (1% AEP) may require evacuation procedures to commence in the Corindi Park Drive area. The lag time between peak rainfall and flooding at the highway is three to six hours. Once water overtops Solitary Islands Way (old Pacific Highway) at Blackadder corner there is about 30 minutes before a pulse of water cuts off Corindi Park Drive (1).
Sequencing of evacuation	Evacuation of the areas of Corindi Park Drive – (GEMS ID 310) (numbers 102, 107, 111, 115, 130, 186, 205, 224, 225, and 226) and 70 Cox Lane will be carried out before isolation and inundation occurs.
Evacuation Routes	To the Assembly Area at Corindi Public School: • Corindi Park Drive, south on Coral Street to Corindi Public School. • Cox Lane, south on Solitary Islands Way, east on Coral Street to Corindi Public School. To the Evacuation Centre at the Yarrawarra Aboriginal Cultural Centre (69 Red Rock Road) • Corindi Park Drive, south on Coral Street then east onto Red Rock Road. • Cox Lane, south on Solitary Islands Way, east on Coral Street then east onto Red Rock Road.
Evacuation Route Closure	Road closures affecting the sequenced evacuation of sectors: • Solitary Islands Way at Blackadder Creek. • Solitary Islands Way at Bark Hut Road Woolgoolga. Other nearby road closures: • Solitary Islands Way at Post Office Lane.

Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Corindi. • Primarily self-evacuation by private transport to Corindi Public School or Yarrawarra Aboriginal Cultural Centre. • At risk residents will be door knocked by SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in higher areas. • Where this is not possible the nominated assembly area is the Corindi Public School, Coral Street. This can be used as an Assembly Area in the short term, • In larger events the nominated evacuation centre at the Yarrawarra Aboriginal Cultural Centre will be made available. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified. • Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy.
Resupply	Resupply will be provided by the NSW SES through the 132 500 call out system. Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** • Corindi Beach Reserve 30° 1'26.19'' S 153 12'7.36'' E – above PMF • Yarrawarra Aboriginal Cultural Centre 30° 01' 09.24" 153 11' 58.03" elevation 19 m – above PMF NOTE: due to the weather conditions associated with flooding in this area, use of aircraft is unlikely during the event. ***Airports:*** Coffs Harbour airport is approximately 35km (18.55 nautical miles) SSE from Corindi: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and

	Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

CORINDI SECTOR MAP



EVACUATION PLANNING

7. UPPER ORARA SECTOR

UPPER ORARA RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Coffs Harbour for more information about this Sector/Community.

Sector Description	This sector covers Coramba, Nana Glen, Karangi, Upper Orara, Lowanna and outlying properties in the Orara Valley.		
Hazard	Orara Riverine Flooding		
Flood Affect Classification	High Flood Islands		
At risk properties	Nana Glen approximately 8 Coramba approximately 4 are at risk of inundation. A large number of rural properties are at risk of isolation.	**Total number of properties within Sector/Community**	Karangi 515, Nana Glen 1132, Coramba 817, Upper Orara 863, Lowanna 359 (Census 2021)
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		

Key Warning Gauge Name	**Name**	**AWRC No.**	**Min (m)**	**Mod (m)**	**Maj (m)**
	Karangi	204025	n/a	n/a	n/a
	Orange Grove	204068	n/a	n/a	n/a

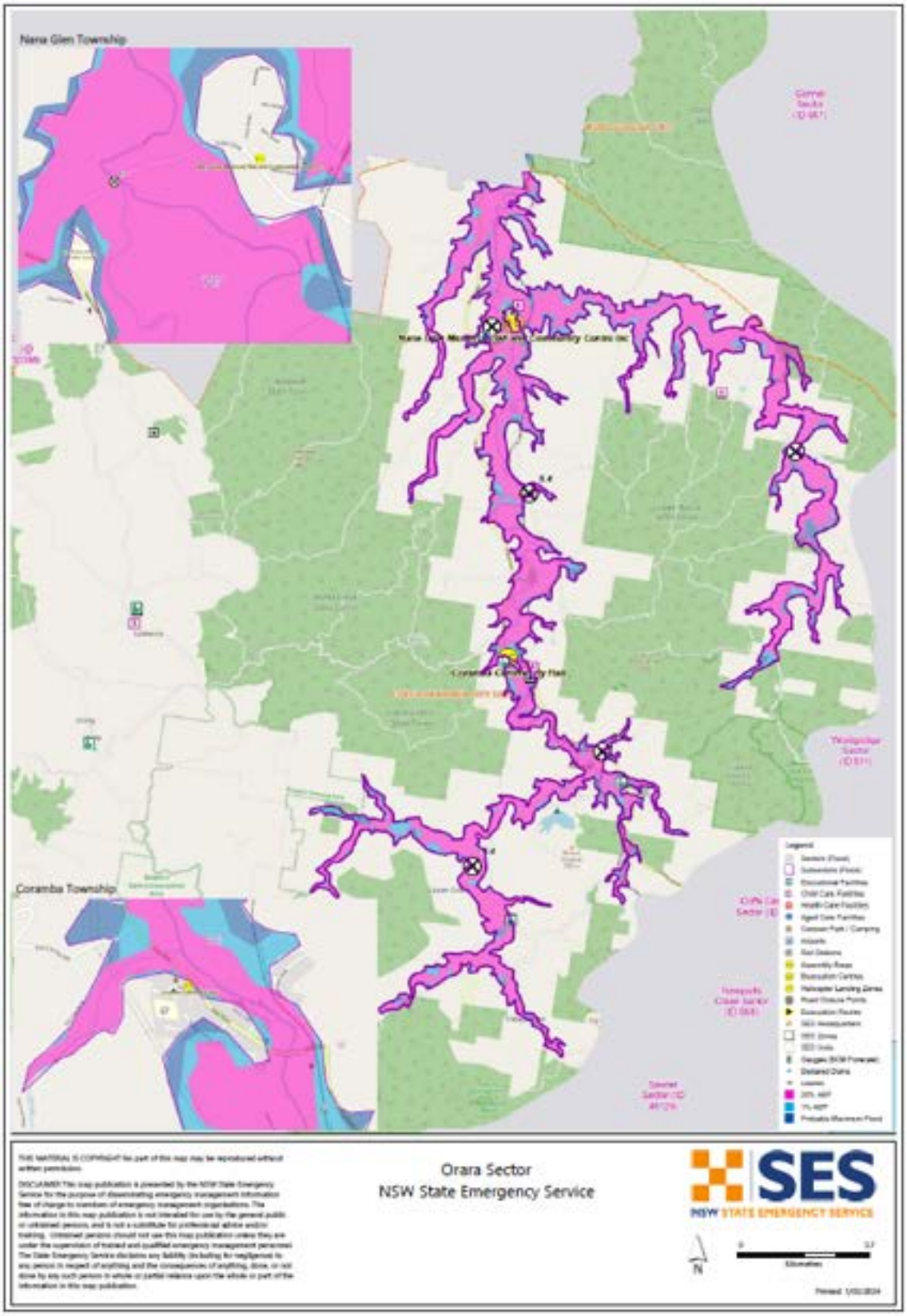
General Strategy	• Evacuation / isolation of at risk population. • Generally evacuations would not be considered in this sector other than for medical reasons. • Properties become isolated and resupply is required for extended periods.
Key Risks / Consequences	• Potential isolation of people estimated to be for a number of days. • Inundation of low-lying properties.
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation subsectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)

Property Protection	***Specific property protection measures:*** • Monitoring rising flood waters. • Relocation of valuable goods • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: No identified essential infrastructure requiring protection.
Evacuation and/or Isolation Triggers	Evacuation may be considered due to; • Inundation of property • Closure of main evacuation routes • Failure of essential services
Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the following gauges: Karangi Gauge (204025) **Prediction to reach and/or exceed 1% AEP/6.36m:** • Inundation of low lying properties in Thrower Avenue, Star Creek Road in Coramba. • Inundation of low lying properties in Weir Street, Morrows Road and Brewers Road in Nana Glen. Orange Grove Gauge (204068): **Prediction to reach and/or exceed 20% AEP/6.4m:** • Some inundation of isolated rural properties • Significant isolation with a large number of bridge and road closures.
Sequencing of evacuation	Properties may need to be evacuated for medical reasons during periods of significant flooding over an extended period; these properties would be dealt with on a single case by case situation in conjunction with the Department of Family and Community Services.
Evacuation Routes	• Eastern Dorrigo Way South to Dorrigo (Caution Road is subject to land slippage). • Mount Brown Road • Coramba Road
Evacuation Route Closure	Road closures affecting the sequenced evacuation of sectors: • Orara Way south of Glenreagh. • Bucca Road at Orara River Bridge • Orara Way east of Coramba • East Bank Road various locations.
Method of Evacuation	• There is uncertainty when local roads around the Orara, Nana Glen and Coramba areas will close, the closure will be dependent on local rainfall conditions. Property owners are recommended to remain at their properties. • Primarily self-evacuation by private transport before road closures. Access is dependent on road conditions: best option for access to evacuate residents is by helicopter when the area is isolated.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas away from the flood plain. • An evacuation centre is located at the Coramba Community Centre, which is

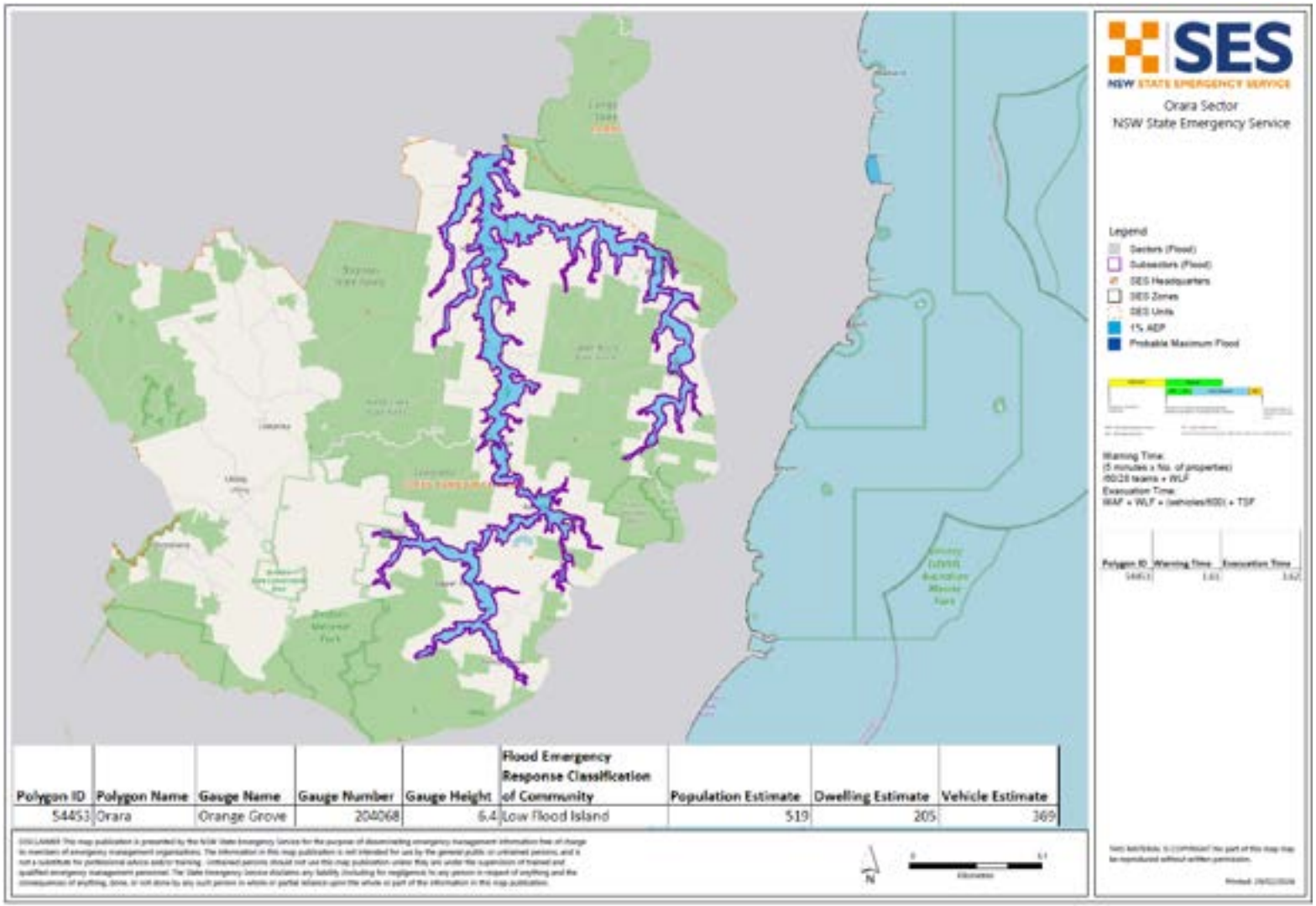
	located on Dorrigo Street, Coramba. It is outside of the PMF inundation area. • An evacuation centre is located at the Nana Glen Memorial Hall, which is located at 26 Grafton Street, Nana Glen. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Large scale evacuations	• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified. • Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated. • Assembly areas may be utilised on higher ground. • There are a number of other buildings located in flood free areas these buildings will be nominated by Department of Family and Community Services as the need arises.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. All Flood Rescue Operations will be undertaken as per the State Rescue Policy. • Bucca Road and East Bank Road can become flood rescue hot spots, from vehicles entering floodwater.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system. Table 2, in Volume 2 provides information about isolated communities in the Coffs Harbour area and potential periods of isolation.
Aircraft Management	***Helicopter Landing Points:*** Suitable landing points are located at: • Nana Primary School (S30°135814, E153°006464; Elevation 81m) • Coramba and Orara Way Junction (S30°218222, E153°009596; Elevation 98m). ***Airports:*** Coffs Harbour airport is approximately 15.45km (8.3 nautical miles) SSE from Coramba: ▪ Coffs Harbour Airport. Phone number 66504812. Located at Airport Drive Coffs Harbour. Access to the airport is likely to close around 5.3m (Newports Creek (Industrial Drive) 559053)
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other

	agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

UPPER ORARA SECTOR MAP



EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
54453	Orara	Orange Grove	204068	6.4	Low Flood Island	519	205	369

COFFS HARBOUR NSW SES
DAM FAILURE ARRANGEMENTS

Chapter 3 of Volume 3 (NSW SES Response Arrangements for Coffs Harbour of the Coffs Harbour Flood Emergency Sub Plan

Last Update: March 2024

CONTENTS

LIST OF TABLES

DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR KARANGI DAM

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Karangi Dam and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

1.1 INTRODUCTION

1.1.1 The Karangi Dam is an off stream storage dam located 9.2 km west of Coffs Harbour. It draws water by pumping from a natural pond (Cochranes Pool) on the Orara River and has a link to Nymboida River by an underground pipe. The pumping is regulated by the Coffs Harbour City Council dependent on the flow of the rivers.

The Karangi Dam is an earthfill embankment dam with zoned rock fill on top. The spillway is designed to withstand a PMF inflow 134.8 m3/s. It has a storage capacity of 5600ML with a crest height of RL 146mAHD.

1.1.2 The two most likely causes of dam failure are:

a. Failure due to flood levels overtopping the embankment.

b. Failure due to rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake, internal erosion, piping, landslide or sabotage. (This is the so-called “Sunny Day” failure, ie not induced by an inflow flood).

1.1.3 Although the dam is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

1.1.4 The Karangi Dam is estimated to be able to withstand a flood volume up to the PMF passing through the storage.

1.2 CONSEQUENCES OF FAILURE

1.2.1 Dam failure could result in the following:

a. **Sunny day failure**: The Sunny Day Failure will overtop Upper Orara Road immediately downstream of the dam wall. Rail Services would not be affected. Coramba Road would be overtopped at Poperaperan Creek, with properties in the immediate area along Poperanean Creek affected by backwater from the Orara River.

b. **1 % AEP flood**: Extensive flooding through the catchment would occur. The 1 % AEP failure will overtop Upper Orara Road immediately downstream of the dam wall.

Rail Services would be halted due to significant inundation (>1 m) of the rail tracks.

Road Access to the Dam would be cut by inundation of Upper Orara Road over Wongiwomble Creek.

Coramba Road would be overtopped at Poperaperan Creek, with properties in the immediate area along Poperanean Creek affected by backwater from the Orara River.

Access to/from Coramba will be cut-off by rising flood waters along Orara Way to the north and south of the town.

Access to/from Nana Glen will be cut-off by rising flood waters along Orara Way to the south of Town, Grafton Street to the west of the town, Bucca Road to the East of Town and Morrows Road to the north of Town.

c. **PMF Flood**

Extensive Flooding throughout the catchment would occur.

The PMF Failure will overtop Upper Orara Road immediately downstream of the dam wall.

Road Access to Karangi Dam would be cut-off by significant inundation of to all roads leading to the Dam.

Major roads leading to/from townships of Karangi, Coramba and Nana Glen would be cut off by rising flood waters at multiple locations.

Rail Services would be halted due to significant inundation (>1 m) over the rail tracks.

Road Access to the Dam would be cut by inundation of Upper Orara Road over Wongiwomble Creek.

1.2.2 With a sunny day failure, three (3) premises would experience over floor flooding. At 1%AEP flood, forty-two (42) premises would experience over floor flooding and with a PMF flood, one hundred and twenty-two (122) premises would experience over floor flooding and population at risk is three hundred and seventeen (317).

Table 1: Number of houses at risk of inundation

Modelled Event	Number of Houses	Population at Risk
1 in 100 AEP (non dambreak event)	42	110
Sunny Day Dambreak Event	3	16
PMF Dambreak Event	122	317

1.2.3 The number of houses at risk of inundation in three (3) modelled scenarios are shown in the table above. The study area of the model extends from the dam downstream to Glenreagh.

1.2.4 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Karangi Dam, some or all of these properties may require evacuation.

1.3 FLOW TRAVEL TIMES

1.3.1

Zone Description and POI's	Approximate Warning Time (time to flood Peak (hrs) to centre of zone)			
	PMF - No Breach	PMF - Breach	1% AEP- No Breach	Sunny Day - Breach
Immediately upstream of Dam Karangi Dam/ WTP/ Dam Intake/Swimming Hole	4.8	5.4	23.5	0.4
Immediately Downstream of Dam/WTP/Coramba Road Intersection/ Popenaperan Creek Road	5.4	5.6	24	0.58
Coramba township and surrounds	6	6.4	24.5	2.7
North of Coramba	7	7.2	26	6
South of Nana Glen	8.4	8.4	27	8
Nana Glen township and surrounds	10	10	29	15
Upstream of Nana Glen - Bucca Bucca Creek	10.8	10.8	30	17
Downstream of Nana Glen	11.8	11.8	31	17.5
Upstream of Glenreagh (outside of LGA)	12.8	12.8	32	20

1.3.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

1.4 INUNDATION AREA

1.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

Flood Failure

1.4.2 Flood failure may occur due to flood loading and/or scour of the spillway or embankment foundations.

Sunny Day Failure

1.4.3 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.

1.4.4 Potential non-flood mechanisms of failure may include earthquake, deterioration of the dam structure, unauthorised works or sabotage.

1.4.5 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

1.5 INUNDATION MAPPING

1.5.1 Dam break flood inundation mapping has been prepared for Karangi Dam and is contained in the Karangi Dam Safety Emergency Plan.

1.6 MONITORING

1.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

1.6.2 Monitoring instruments used are monitored electric and hydraulic piezometers and seepage monitoring, ultrasonic level sensors linked to the local telemetry system.

1.7 NOTIFICATION PROCEDURES

1.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

1.8 WARNING

1.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 3 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 2. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

1.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 2: Karangi Dam Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	RL 144.6 m (Approx. 1:100 AEP flood, outflow 12.57 m3/s)	126 min (from start of storm to White Alert)
Amber Alert	Storage at RL 145.20 m AHD (0.60 m below embankment crest level; 1400 mm above spillway crest).	71 min (from White Alert to Amber Alert)
Red Alert	Storage at RL 145.60 m AHD (0.2m below embankment crest level; 1800 mm above spillway crest).	73 min (from Amber Alert to Red Alert)

1.8.3 The NSW SES/Coffs Harbour City Council will disseminate dam failure warnings.

1.8.4 Coffs Harbour City Staff will keep the NSW SES informed of the discharge through the spillway. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

1.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Karangi.

Table 3: Notification, Warning and Evacuation Arrangements for a potential failure of Karangi Dam

WHITE ALERT	
Defining Conditions: Reservoir level exceeds 144.6 m AHD (1:100 AEP approx.)	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Coff Harbour Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)

NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub Plan. ▪ Refer to Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

AMBER ALERT	
Defining Conditions: Reservoir level exceeds 145.2 m AHD (1:10,000 AEP approx.)	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. ▪ Closely monitor the condition of Karangi Dam and implement preventative measures to return it to a safe condition as soon as possible.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Provide NSW SES AWS Warnings to the media organisations listed in Volume 3: Chapter 1, of this Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for warning and evacuation operations.
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES Zone HQ has been notified. ▪ Coordinate the delivery of Evacuation Warning to at-risk residents. ▪ Coordinate the notification of other agencies as listed in Coffs Harbour Flood Emergency Sub Plan.

LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate. ▪ Notify NSW SES doorknockers if transport to evacuation centres will be required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: Reservoir level exceeds 145.6 m AHD (1:900,000 AEP approx.)	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

1.9 EVACUATION PLANNING

Modelled Event	**Number of Houses**	**Population at Risk**	Warning Time	Evacuation Time
1 in 100 AEP (non dambreak event)	42	110	1.1	3.1
Sunny Day Dambreak Event	3	16	1.0	3.0
PMF Dambreak Event	122	317	1.4	3.4

2. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR WOOLGOOLGA DAM

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Woolgoolga Dam and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

2

2.1 INTRODUCTION

2.1.1 Woolgoolga Dam is an off-stream storage dam located 1.5km northwest of Woolgoolga. The dam is filled by gravity from a pipe head weir on Woolgoolga Creek and/or pumped from the mains system. The dam was constructed by the public works department in 1967. It was taken out of active service in 1986 but remains for emergency use in droughts.

2.1.2 The two most likely causes of dam failure are:

a. Failure due to flood levels overtopping the embankment.

b. Failure due to rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake, internal erosion, piping, landslide or sabotage. (This is the so-called “Sunny Day” failure, ie not induced by an inflow flood).

2.1.3 Although the dam is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

2.1.4 Woolgoolga Dam spillway is estimated to be able to pass a flow equivalent to the 10^{-5} AEP outflow.

2.2 CONSEQUENCES OF FAILURE

2.2.1 Dam failure could result in the following:

a) Sunny day failure

The Sunny Day Failure will overtop Solitary Islands Way immediately downstream of the dam wall and a portion of Lake Road along the beachfront. Flood depths of 0.5m and 0.27m are noted over the road formations of Solitary Islands Way and Lake Road respectively.

Portions of the Sunset Caravan Park will become flooded by up to 0.5m along the frontage to Woolgoolga Lake

Portions of the sports fields near the Woolgoolga Tennis Courts will become flooded, however the depth of flooding will be less than 0.3 m.

A few other premises will experience flooding less than 0.3 m deep at the following locations:

- Western Cul-de-sac of Melaluca Avenue.
- Properties in the low lying area between Ganderton Street and Wharf Street, north of Beach Street.
- Properties in the low lying area between Bultitude Street and Boundary Street, north of Beach Street.

b) 1 % AEP flood dambreak affected zone

The 1:100 AEP flood with Dam failure will overtop Solitary Islands Way immediately downstream of the dam wall and Lake Road along the beachfront.

Buildings located at Nos 1, 3, 5, 9, 15, 23, 25, 27, 33, 37, 37, 39, 43, 45, 47, 49, 51, 51A, 53, 53A, 55, 52, 54, 56, 58B and 60 Melaleuca Avenue, together with houses located on Clear Place and Pandanus Place will potentially be flooded to a depth greater than 300 mm than the depth without dambreak.

Woolgoolga Lakeside Holiday Park will be inundated to a depth greater than 300 mm more than the depth without dambreak.

Generally, low lying areas south of Melaluca Avenue along Poundyard Creek and Jarret Creeks will become inundated, however the additional flooding due to the dambreak event will be less than 0.3m deeper than without the dambreak event.

c) PMF flood dambreak affected zone

Extensive flooding in the catchment downstream of Woolgoolga Dam will occur for the natural PMF flood without dambreak, however the increased flooding due to dambreak is generally less than 300 mm greater than the natural flood depths.

The PMF dam failure event will result in increased flood depths greater than 300 mm compared to the non-dambreak PMF event for Solitary Islands Way immediately downstream of the dam wall.

2.2.2 Approximately two (2) properties could be inundated and an additional three (3) requiring advice that flood water may encroach their land by the failure of Woolgoolga Dam.

Table 4: Number of houses at risk of inundation

Modelled Event	Number of Houses	Population at Risk
1 in 100 AEP (dambreak event)	-	3.06
Sunny Day Dambreak event	-	2.12
PMF Dambreak event	-	4.00

2.2.3 The number of houses at risk of inundation in three (3) modelled scenarios is shown in the table above. The study area of the model extends from the dam downstream to the ocean.

2.2.4 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Woolgoolga Dam, some or all of these properties may require evacuation.

2.3 FLOW TRAVEL TIMES

2.3.1 Flow travel times are not available for Woolgoolga dam at this time.

2.4 INUNDATION AREA

2.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

Flood Failure

2.4.2 Potential mechanisms of failure in a flood event may include flood loading and/or scour of the spillway or embankment foundations, which may lead to instability of the dam structure or foundations or overtopping of the dam, which could potentially lead to failure of the embankment.

2.4.3 Other potential causes may include sabotage or earthquake; however, these are less likely to occur during a flood event.

2.4.4 In a PMF, it is likely there would be approximately 115 minutes from the start of storm to White Alert being reached, 26 minutes from White to Amber Alert and 45 minutes from Amber to Red Alert being reached. Potential time to failure is currently not available.

Sunny Day Failure

2.4.5 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.

2.4.6 Potential methods of Sunny Day Failure include but are not limited to earthquake, sabotage, unauthorised works, deterioration of the Dam embankment and associated structures.

2.4.7 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

2.5 INUNDATION MAPPING

2.5.1 Dam break flood inundation mapping has been prepared for Woolgoolga Dam and is contained in the Woolgoolga Dam Safety Emergency Plan.

2.6 MONITORING

2.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

The dam is monitored by Piezometers and seepage collection pits are installed for monitoring. There is no dam site operator. Woolgoolga Dam does not presently have any automatic monitoring instrumentation installed at the dam, apart from a dam reservoir level monitor that is connected to SCADA. Results from monitoring instrumentation (e.g. seepage) are recorded manually during inspections.

2.7 NOTIFICATION PROCEDURES

2.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North East Zone Headquarters duty officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

2.8 WARNING

2.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alert from the DSEP for flood failure have been reproduced in Table 6 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alert (as identified in the DSEP) are listed in Table 5. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

2.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 5: Woolgoolga Dam Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	>RL 18.2 m (<1:100 AEP flood, outflow ~0.1 m3/s)	115 min from start of storm to White Alert for PMF)
Amber Alert	>RL 18.4 m (~1:300 AEP flood, outflow ~0.4 m3/s	26 min from White alert to Amber alert in PMF)
Red Alert	>RL 18.7 m (~1:3,000 AEP, outflow ~0.6m3/s	45 min from Amber alert to Red alert in PMF

2.8.3 The NSW SES/Coffs Harbour Council will disseminate dam failure warnings.

2.8.4 Coffs Harbour Council Staff will keep the NSW SES informed of the discharge through the spillway. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

2.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Woolgoolga Dam.

Table 6: Notification, Warning and Evacuation Arrangements for a potential failure of Woolgoolga Dam

WHITE ALERT	
Defining Conditions: Defining Conditions:>RL 18.2 m (<1:100 AEP flood, outflow ~0.1 m3/s)	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.

NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for out of area assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub plan. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

AMBER ALERT	
Defining Conditions:	>RL 18.4 m (~1:300 AEP flood, outflow ~0.4 m3/s
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. ▪ Closely monitor the condition of Woolgoolga Dam and implement preventative measures to return it to a safe condition as soon as possible.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.

NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Provide NSW SES AWS Warnings to the media organisations listed in Volume 3: Chapter 1, of this Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for warning and evacuation operations.
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES Zone HQ has been notified. ▪ Coordinate the delivery of Evacuation Warning to at-risk residents. ▪ Coordinate the notification of other agencies as listed in Coffs Harbour Flood Emergency Sub Plan.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate. ▪ Notify NSW SES doorknockers if transport to evacuation centres will be required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: >RL 18.7 m (~1:3,000 AEP, outflow ~0.6m3/s	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

3. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR BAKERS ROAD DETENTION BASIN

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Bakers Road Detention Basin and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

3.10 INTRODUCTION

3.10.1 The Bakers Road Detention Basin is a dry detention basin to reduce flooding of Coffs Harbour Central Business District during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters.

3.10.2 The most likely causes of dam failure are:

a. Failure due to flood levels overtopping the embankment crest.

b. Piping failure during a flood event.

c. Failure due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake combined with extreme flooding.

3.10.3 Although the basin is currently in good condition and is a dry basin and designed to withstand the 1 in 100 AEP flood events, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

3.10.4 The Bakers Rd Detention Basin is estimated to be able to withstand the 1% AEP storm event and allow for flows over the crest to cater for PMF events.

3.11 CONSEQUENCES OF FAILURE

3.11.1 Dam failure could result in the following:

a. **1%AEP storm event**: 545 houses flooded (454 of which would have been flooded without dam break). This equates to a population at risk of 1526.

b. **PMF scenario**: 1307 houses flooded (1300 of which would have already been flooded in a PMF, therefore incrementally 7). This equates to approximately 3660 persons at risk.

Table 7: Number of houses at risk of inundation

Modelled Event	Number of Houses	Population at Risk
1% AEP with no dambreak	454	1271
1% AEP with no dambreak	545	1526
PMF without dambreak	1300	3640
PMF with dambreak	1307	3660

3.11.3 The number of houses at risk of inundation in two (2) modelled scenarios are shown in the table above. The study area of the model extends from the dam 10.8km along Coffs Creek to the Pacific Ocean.

3.11.4 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Bakers Rd Detention Basin, some or all of these properties may require evacuation.

3.12 FLOW TRAVEL TIMES

3.12.1 The flood wave is expected to Shephards Rd in 11 minutes in a 1% AEP event and 8 minutes in a PMF event, with travel time to downstream locations shown in table 8.

3.12.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

Table 8: Flood Wave Travel time to downstream location

Location	1% AEP Dambreak (hr:min)	PMF Dambreak (hr:min)
Downstream Embankment	0:00	0:02
Coramba Creek	0:02	0:06
Bakers Creek	0:04	0:07
Shephards Rd	0:11	0:08
Robin St Bypass	0:14	0:17
Robin St	0:32	0:30
Gundagai St	0:40	0:42
Pacific Highway	1:00	1:07
Cemetery	1:15	1:15
Glenreagh St	1:30	1:22
Englands Park	1:40	1:30
Orlando St	-	-

3.13 INUNDATION AREA

Flood Failure

3.13.1 A significant number of houses are located within the dambreak flood inundation zone.

3.13.2 The downstream area identified in the DSEP covers a length of 10.8km along Coffs Creek, running from Bakers Road to the Pacific Ocean. Along this reach lie urban areas of Coffs Harbour. Coffs Creek has a catchment of 24km2 and is enclosed by heavily vegetated hills. The upper slopes of the catchment are predominately rural and typically utilised for banana plantations. The upper reaches of the creek system are generally confined to narrow floodplains. Between Shephards Lane and Robin Street, the floodplain widens through the residential areas. The commercial and Central Business District (CBD) straddles the Pacific Highway from Murdock Street to Duke Street in the east and includes the north area of Park Avenue. Downstream of the Pacific Hwy, the channel becomes estuarine, widening to over 50m and follows a sinuous path to the ocean.

3.14 INUNDATION MAPPING

3.14.1 Dam break flood inundation mapping has been prepared for Bakers Rd Detention Basin and is contained in the Bakers Rd Detention Basin Safety Emergency Plan.

3.15 MONITORING

3.15.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

3.15.2 Water level telemetry is installed at Bakers Road Detention Basin and is monitored by the City of Coffs Harbour.

3.15.3 Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council's flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Flood Emergency Sub plan.

3.16 NOTIFICATION PROCEDURES

3.16.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

3.17 WARNING

3.17.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 10 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 9. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation. There is currently no identified Amber Alert for Bakers Rd Detention Basin.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

3.17.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 9: Bakers Rd Detention Basin Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	16.4m at the Bakers Rd Detention Basin Gauge (559055)	20 minutes from White alert to red alert in a PMF
Amber Alert	Not defined	Not defined
Red Alert	17.5m at the Bakers Rd Detention Basin Gauge (559055)	A further 16 minutes from Red alert to failure in a PMF

3.17.3 The NSW SES/Coffs Harbour City Council will disseminate dam failure warnings.

3.17.4 Coffs Harbour City Staff will keep the NSW SES informed of the Alert level. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

3.17.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Bakers Rd.

Table 10: Notification, Warning and Evacuation Arrangements for a potential failure of Bakers Rd Detention Basin

WHITE ALERT	
Defining Conditions: 17.1m at the Bakers Rd Detention Basin Gauge (559055)	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.

NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub plan. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions:	17.5m at the Bakers Rd Detention Basin Gauge (559055)
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

3.18 EVACUATION PLANNING

Modelled Event	Number of Houses	Population at Risk	Warning Time	Evacuation Time
1% AEP with no dambreak	454	1271	2.4	4.4
1% AEP with no dambreak	545	1526	2.7	4.6
PMF without dambreak	1300	3640	4.9	6.9
PMF with dambreak	1307	3660	4.9	6.9

** Based on 28 doorknocking teams, an average of 1.8 cars per household and a single road evacuation route

4. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR BENNETTS ROAD DETENTION BASIN

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Bennetts Road Detention Basin and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

4.10 INTRODUCTION

4.10.1 The Bennetts Road Detention Basin is a dry detention basin to reduce flooding of Coffs CBD during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters. The design 100% full level is RL 28.5m AHD (7.5m Gauge Height). The embankment crest (spillway) starts to overflow at this level. The dam capacity is 182 783m³. It is located at Bennetts Rd to the West of Coffs Harbour CBD.

4.10.2 The most likely causes of dam failure are:

a. Piping failure during flood events

b. Failure due to extreme flood levels

c. Failure due to earthquake combined with extreme floods (this is considered an unlikely case).

4.10.3 Although the basin is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

4.10.4 The Bennetts Road Detention Basin has been designed to withstand the 1%AEP storm event and allow for flows over the crest to cater for PMF events.

4.11 CONSEQUENCES OF FAILURE

4.11.1 Dam failure could result in the following:

a. **PMF scenario**: 225 houses flooded (88 of which would have already been flooded in a PMF). This equates to approximately 518 persons at risk.

4.11.2 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Bennetts Rd Detention Basin, some or all of these properties may require evacuation.

4.12 FLOW TRAVEL TIMES

4.12.1 The flood wave is expected to reach the first affected dwelling in 30 minutes in a PMF event.

4.12.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

4.13 INUNDATION AREA

Flood Failure

4.13.1 The basin is located on a tributary that forms Coffs Creek. The urbanised downstream areas are fairly densely populated, and floodwaters would generally travel down Coffs Creek, past Vost and Stanlan Parks, across Pacific Highway towards the CBD. A substantial number of residential houses and commercial properties are located present along the flood path and floodplain.

4.14 INUNDATION MAPPING

4.14.1 Dam break flood inundation mapping has been prepared for Bennetts Road Detention Basin and is contained in the Bennetts Road Detention Basin Safety Emergency Plan.

4.15 MONITORING

4.15.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

4.15.2 Water level telemetry is installed at Bennetts Road Detention Basin and is monitored by the City of Coffs Harbour (Bennetts Road detention Basin gauge 559063).

4.15.3 Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council's flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Flood Emergency Sub plan.

4.16 NOTIFICATION PROCEDURES

4.16.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

4.17 WARNING

4.17.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 12 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 11. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation. There is currently no identified Amber Alert for Bennetts Rd Detention Basin.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

4.17.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 11: Bennetts Rd Detention Basin Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	27.0m AHD at the Bennetts Road detention Basin gauge 559063	3 minutes from White alert to red alert in a PMF
Amber Alert	Not defined	Not defined
Red Alert	28.5m at the Bennetts Road detention Basin gauge 559063	45 minutes from Red alert to failure in a PMF

4.17.3 The NSW SES/Coffs Harbour City Council will disseminate dam failure warnings.

4.17.4 Coffs Harbour City Staff will keep the NSW SES informed of the Alert level. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

4.17.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Bennetts Rd.

Table 12: Notification, Warning and Evacuation Arrangements for a potential failure of Bennetts Rd Detention Basin

WHITE ALERT	
Defining Conditions: 28.2m at the Bennetts Road detention Basin gauge 559063	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.

NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub Plan. ▪ Refer to Coffs Harbour Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: 28.5m at the Bennetts Road detention Basin gauge 559063	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

4.18 EVACUATION PLANNING

Modelled Event	Number of Houses	Population at Risk	Warning Time	Evacuation Time
PMF with dambreak	225	518	1.7	3.7

** BASED ON 28 DOORKNOCKING TEAMS, AN AVERAGE OF 1.8 CARS PER HOUSEHOLD AND A SINGLE ROAD EVACUATION ROUTE

5. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR SPAGNOLOS ROAD DETENTION BASIN

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Spagnolos Road Detention Basin and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

5.10 INTRODUCTION

5.10.1 The Spagnolos Road Detention Basin is a dry detention basin intended to reduce flooding of Coffs Harbour Central Business area during a 1% AEP storm event. It has a homogenous embankment, dry detention basin. It has a full Supply Level (FSL) of RL 23.4 mAHD, a design flood level (100year ARI) of RL 22.6 mAHD, a probable Maximum Flood (PMF) level of RL 24.1 mAHD.

5.10.2 It is located some 3.5km North West of Coffs Harbour City Centre. Located immediately west of the intersection of Spagnolos and Roselands Road.

5.10.3 The most likely causes of dam failure are:

a. Failure due to flood levels overtopping the embankment.

b. Piping failure during flood events

c. Failure due to earthquake combined with extreme flood (this is considered an unlikely scenario).

5.10.4 Although the basin is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

5.10.5 The Spagnolos Rd Detention Basin has been designed to provide temporary storage for the 1% storm event, and the overflow spillway of 70m long has been designed to cater for floods up to the PMF event.

5.11 CONSEQUENCES OF FAILURE

5.11.1 Dam failure could result in the following:

a. Population at risk 1% dam break 91

b. Population at risk PMF dam break 131

5.11.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Spagnolos Rd Detention Basin, some or all of these properties may require evacuation.

5.12 FLOW TRAVEL TIMES

5.12.1 The flood wave travel times are outlined in the below table.

5.12.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

Table 13: Flood Wave Travel time to downstream locations

Location	Start of inunudation (hr:min)	End of inunudation (hr:min)
Storage	0:00	6:00
d/s Spagnolos Rd	1:25	4:00
Roseland Dr	1:36	2:10
Leander Cl	1:38	2:02
Rosalee Cl	1:21	2:45
Cardinia Cl	0:17	4:50
Bakers Cl	0:58	2:40

5.13 INUNDATION AREA

Flood Failure

5.13.1 The Spagnolos Rd Detention Basin DSEP covers a downstream study area on an unnamed tributary and Coffs Creek, running from the Basin to the Pacific Highway. Along this reach lie the urban areas of Coffs Harbour.

5.14 INUNDATION MAPPING

5.14.1 Dam break flood inundation mapping has been prepared for Spagnolos Rd Detention Basin and is contained in the Spagnolos Rd Detention Basin Safety Emergency Plan.

5.15 MONITORING

5.15.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

5.15.2 Water level telemetry is installed at Spagnolos Road Detention Basin and is monitored by the City of Coffs Harbour

5.15.3 Telemetry equipment and rainfall gauges comprise the warning system. Telemetry equipment comprises of a measurement and control unit, communications equipment and power supply. The Rain gauges are a component of the Council's flash flood warning system identified in Volume 3, Chapter 1 of the Coffs Harbour Flood Emergency Sub plan.

5.16 NOTIFICATION PROCEDURES

5.16.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

5.17 WARNING

5.17.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 15 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 14. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation. There is currently no identified Amber Alert for Spagnolos Rd Detention Basin.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

5.17.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 14: Spagnolos Rd Detention Basin Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	22.6m AHD. The level is set as FSL, just below the estimated flood magnitude of 1:100 ARI.	Estimated 591 minutes from start of storm to White Alert.
Amber Alert	Not defined	Not defined
Red Alert	Red alert is activated at 23.40mAHD. This is identified as the low point where spilling commences	27 minutes from White to Red alert (FSL), with a further 20 minutes to Peak Flood (PMF)

5.17.3 The NSW SES/Coffs Harbour City Council will disseminate dam failure warnings.

5.17.4 Coffs Harbour City Staff will keep the NSW SES informed of the Alert level. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

5.17.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Spagnolos Rd.

Table 15: Notification, Warning and Evacuation Arrangements for a potential failure of Spagnolos Rd Detention Basin

WHITE ALERT	
Defining Conditions: 23.25m AHD	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub Plan. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: 23.40mAHD. This is identified as the low point where spilling commences	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

5.18 EVACUATION PLANNING

Modelled Event	Number of Houses	Population at Risk	Warning Time	Evacuation Time
PMF with dam break	55	131	1.1	3.2
1% with dam break	38	91	1.1	3.1

* House numbers are based on 2021 census data of 2.4 people per household.
** Based on 28 doorknocking teams, an average of 1.8 cars per household and a single road evacuation route

6. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR KATHLEEN DRIVE CORINDI STAGE 3 DAM

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Kathleen Drive Corindi Dam and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

6.1 INTRODUCTION

6.10.1 The Dam is Irrigation water storage with a zoned earthen embankment construction with riprap wave protection and a filter bed and shear key included in downslope batter. It has a spillway consisting of a 60m wide concrete sill and reno-mattress drop into grassed spillway. Its maximum storage is 900ML at a TWL of 99mAHD.

6.10.2 It is located some 3.5km North West of Coffs Harbour City Centre. Located immediately west of the intersection of Spagnolos and Roselands road.

6.10.3 The two most likely causes of dam failure are:

- Overtopping/erosive failure due to the water levels overtopping the crest or overtopping the spillway abutments during a flood event. The severity of this risk will depend on the water level in the dam and the likely increase in water level due to forecast rainfall.
- Structural failure due to piping through the embankment. The severity of this risk will depend on the water level in the dam, the size of defect when discovered and the rate at which the defect increases with time. The defect may be visible (ie. crack or hole in wall developing) or invisible (ie. piping failure within the wall that discharges into the filter bed and out through the seepage monitoring point). This type of failure is not necessarily associated with a flood event.

6.10.4 Although the basin is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

6.10.5 The Kathleen Drive Corindi Dam is estimated to be able to withstand a flood volume up to the PMF passing through the spillway.

6.11 CONSEQUENCES OF FAILURE

6.11.1 Dam failure could result in the following:

a. Risk to horticultural areas for 2500m downstream of the stage 3 dam, potential for staff and workers to be on site at low lying areas of farms in area of impact.

6.11.2 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Kathleen Drive Corindi Dam, some or all of these properties may require evacuation.

6.11.3 Dambreak assessments show the greatest incremental effects are associated with a Sunny Day failure, with a PAR of 2.06, due to the presence of workers likely to be downstream in area of impact. There is an estimated PAR of 0.18 in a 1% AEP event and 0 in a PMF.

6.12 FLOW TRAVEL TIMES

6.12.1 Although not explicitly estimated in the Dam Break Study the travel time for the flood wave over the first 2500m downstream of the dam would be a matter of minutes.

6.12.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

6.13 INUNDATION AREA

Flood Failure

6.13.1 Populations downstream of the dam include farm worker in agricultural areas, buildings, pump sheds, on roads. Land occupied by Costa includes the “Fullers” and “Tolsons” areas which are immediately downstream of the dam.

6.14 INUNDATION MAPPING

6.14.1 Dam break flood inundation mapping has been prepared for Kathleen Drive Corindi Stage 3 Dam and is contained in the Kathleen Drive Corindi Stage 3 Dam Safety Emergency Plan.

6.15 MONITORING

6.15.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

6.15.2 Monitoring is via Seepage monitoring point below the dam.

6.16 NOTIFICATION PROCEDURES

6.16.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

6.17 WARNING

6.17.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 15 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 16. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

6.17.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 16: Kathleen Drive Corindi Dam Flood Failure Alerts

Alert	Defining Conditions
White Alert	Flood level in dam 99.4m RL or; Structural defect with potential risk of dam failure if not repaired
Amber Alert	Flood level in dam 99.8m RL or; Structural defect posing risk of dam failure if not repaired
Red Alert	Flood level in dam 100m RL or; Structural defect posing imminent threat of dam failure

6.17.3 The NSW SES will disseminate dam failure warnings.

6.17.4 Vitalharvest Pty Ltd/ Costa Group Holdings will keep the NSW SES informed of the Alert level. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

6.17.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Kathleen Drive Corindi Dam.

Table 17: Notification, Warning and Evacuation Arrangements for a potential failure of Kathleen Drive Corindi Dam

WHITE ALERT	
Defining Conditions: Flood level in dam 99.4m RL or; Structural defect with potential risk of dam failure if not repaired	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub plan. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

AMBER ALERT	
Defining Conditions:	Flood level in dam 99.8m RL or; Structural defect posing risk of dam failure if not repaired
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. ▪ Closely monitor the condition of Corindi Dam and implement preventative measures to return it to a safe condition as soon as possible.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Provide NSW SES AWS Warnings to the media organisations listed in Volume 3: Chapter 1, of this Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for warning and evacuation operations.
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES Zone HQ has been notified. ▪ Coordinate the delivery of Evacuation Warning to at-risk residents. ▪ Coordinate the notification of other agencies as listed in Coffs Harbour Flood Emergency Sub Plan.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate. ▪ Notify NSW SES doorknockers if transport to evacuation centres will be required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: Flood level in dam 100m RL or; Structural defect posing imminent threat of dam failure	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

6.18 EVACUATION PLANNING

6.18.1 Dambreak assessments show the greatest incremental effects are associated with a Sunny Day failure, with a PAR of 2.06, due to the presence of workers likely to be downstream in area of impact. There is an estimated PAR of 0.18 in a 1%AEP event and 0 in a PMF. Evacuation planning for these consequences fall within the local unit's operational capability.

7. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR UPPER SHEPHARDS LANE DETENTION BASIN

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Upper Shephards Lane Detention Basin and should be read in conjunction with the response arrangements detailed in the Coffs Harbour Flood Emergency Sub Plan, Volume 1.

7.10 INTRODUCTION

7.10.1 The Upper Shephards Lane Detention Basin is a dry detention basin designed to reduce flooding of Coffs CBD during a 1% AEP storm event. It is a zoned earthfill embankment with clay core and fully intercepting filters. Lowest embankment crest level RL 43.30 mAHD.

7.10.2 It is located Corner of Coffs and Castle Street, Coffs Harbour.

7.10.3 The two most likely causes of dam failure are:

a. Failure due to extreme flood levels overtopping the embankment.

b. Failure due to earthquake combined with extreme flood.

7.10.4 Although the basin is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

7.11 CONSEQUENCES OF FAILURE

7.11.1 Dam failure could result in the following:

a. **PMF scenario without dam failure:** 52 houses flooded with a population at risk of 120.

b. **PMF scenario with Dambreak**: 142 houses flooded. This equates to approximately 327 persons at risk.

7.11.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Upper Shephards Lane Detention Basin, some or all of these properties may require evacuation.

7.12 FLOW TRAVEL TIMES

7.12.1 The flood wave travel times is approximately 15 minutes to the first affected residences in a PMF with dambreak. The estimated time from start of storm to start of dam breach in this modelled scenario is estimated at 1 hour and 45 minutes.

7.12.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

7.13 INUNDATION AREA

Flood Failure

7.13.1 Inundation area for the Upper Shephards Lane Detention basin will follow the natural flowline and flooding characteristics of the northern tributary of Coffs Creek. This is a short but densely urbanised area of the City of Coffs Harbour.

7.14 INUNDATION MAPPING

7.14.1 Dam break flood inundation mapping has been prepared for Upper Shephards Lane Basin and is contained in the Upper Shephards Lane Detention Basin Safety Emergency Plan. The NSW SES hold a copy of the plan, however the mapping will need to be sourced from Council.

7.15 MONITORING

7.15.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

7.15.2 Water level telemetry is installed at Upper Shephards Lane Detention Basin and is monitored by the City of Coffs Harbour.

7.15.3 Warning system comprises of water level and flow gauges: New standalone water level/flow gauges, Telemetry equipment: Comprises of a measurement and control unit, communications equipment and power supply and a rainfall gauging station.

7.16 NOTIFICATION PROCEDURES

7.16.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations

Centre will subsequently notify the NSW SES North Eastern Zone Incident Controller or After Hours Duty Officer who will contact the NSW SES Local Commander and/or Unit Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

7.17 WARNING

7.17.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 19 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 18. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation. There is currently no identified Amber Alert for Upper Shephards Lane Detention Basin.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

7.17.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 18: Upper Shephards Lane Detention Basin Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	Set at FSL of RL 42.1m AHD. The level is at the estimated flood magnitude of 1 in 100 AEP	Not defined
Amber Alert	Not defined	Not defined
Red Alert	Set at FSL of RL 43.2m AHD. This level was considered appropriate as it is the low point of the road embankment where spilling commences. 100mm below initial breaching of dam	4 hours from white alert to red alert, then a further 40 hours from red to Peak storage (PMF level) of 42.5mAHD.

7.17.3 The NSW SES/Coffs Harbour City Council will disseminate dam failure warnings.

7.17.4 Coffs Harbour City Staff will keep the NSW SES informed of the Alert level. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

7.17.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Upper Shephards Lane.

Table 19: Notification, Warning and Evacuation Arrangements for a potential failure of Upper Shephards Lane Detention Basin

WHITE ALERT	
Defining Conditions: Set at FSL of RL 42.1m AHD. The level is at the estimated flood magnitude of 1 in 100 AEP.	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for Out of Area Assistance for warning and evacuation operations. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Unit Commander	▪ Confirm NSW SES North Eastern Zone HQ has been notified. ▪ Activate Flood Emergency Sub plan. ▪ Refer to Flood Emergency Sub plan for agencies to notify that the White Alert Level has been reached. (See Volume 1, Attachment 2, Dam Failure Alert Notification Arrangements Flowchart).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions: Set at FSL of RL 43.2m AHD. This level was considered appropriate as it is the low point of the road embankment where spilling commences. 100mm below initial breaching of dam.	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES State Operations Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer, NSW SES units and NSW SES LHQ. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warnings are broadcast over the radio stations listed in Volume 3: Chapter 1of this Flood Emergency Sub plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Coffs Harbour Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES SOC of the outcome of the risk assessment
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Incident Controller or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue a 'Reduced Threat - Return With Caution'. ▪ Issue a 'Reduced Threat - Return With Caution' message to NSW SES Local Commander and/or Unit Commander or After Hours Duty and NSW SES State HQ. ▪ Advise the REMO/LEMO that a 'Reduced Threat - Return With Caution' has been issued. ▪ Issue a 'Reduced Threat - Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Flood Emergency Sub plan.
NSW SES Local Commander and/or Unity Commander or After Hours Dury Officer	▪ Coordinate issue of a 'Reduced Threat - Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver a 'Reduced Threat - Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

7.18 EVACUATION PLANNING

Modelled Event	Number of Houses	Population at Risk	Warning Time	Evacuation Time
PMF without dambreak	52	120		
PMF with dambreak	142	327		

** Based on 28 doorknocking teams, an average of 1.8 cars per household and a single road evacuation route

COFFS HARBOUR NSW SES
CARAVAN PARK ARRANGEMENTS

Chapter 4 of Volume 3 (NSW SES Response Arrangements for City of Coffs Harbour) of the Coffs Harbour Flood Emergency Sub Plan

Last Update: March 2024

CONTENTS

LIST OF TABLES

1 ARRANGEMENTS FOR THE EVACUATION OF CARAVAN PARKS AND THE RELOCATION OF MOVABLE DWELLINGS

1.1 GENERAL

1.1.1 The following caravan parks and campgrounds are flood liable:

a. Sawtell Beach Caravan Park

b. Koala Villas & Caravan Park

c. Coffs Harbour Tourist Park

d. Harbour City Holiday Park

e. Woolgoolga Sunset Caravan Park

f. Lakeside Caravan Park

g. Woolgoolga Beach Caravan & Camping

h. Sapphire Beach Holiday Park

i. Arrawarra Beach Holiday Park

j. Spot X Surf Arrawarra

k. Darlington Beach Resort

l. Lorikeet Tourist Park

1.1.2 For more information on individual caravan parks see Table 1 and Table 2 at the end of this Chapter.

1.2 ADVISING PROCEDURES

1.2.1 Caravan Park proprietors will ensure that the owners and occupiers of movable dwellings are:

a. Made aware that the caravan park is flood liable by:

- Providing a written notice to occupiers taking up residence. The notice will indicate that the caravan park is liable to flooding and designate the location of flood liable land within the park (1).
- Displaying this notice and the emergency arrangements for the Caravan Park prominently in the park.

b. Made aware that if they are expecting to be absent for extended periods, they should:

- Provide the manager of the caravan park with a contact address and telephone number in case of an emergency.

- Leave any movable dwelling in a condition allowing it to be relocated in an emergency (i.e.: should ensure that the wheels, axles and draw bar of the caravans are not removed and are maintained in proper working order).

c. Informed of Flood Warning Information. At this time, occupiers will be advised to:

- Ensure that they have spare batteries for their radios.
- Listen to a local radio station for updated flood information.
- Prepare for evacuation and movable dwelling relocation.

1.2.2 The NSW SES Coffs Harbour Local Commander will ensure that the managers of caravan parks are advised of Flood Information (described in Volume 1 of the Coffs Harbour Local Flood Plan).

1.3 EVACUATION OF OCCUPANTS AND RELOCATION OF MOVEABLE DWELLINGS

1.3.1 When an emergency warning is given caravan park occupants should follow the flood evacuation procedures for the park under the direction of the caravan park management. This should include advice to:

a. Isolate power to moveable dwellings.

b. Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.

c. Lift the other contents in any remaining dwellings as high as possible.

d. Move to friends, relatives or a designated evacuation centre if they have their own transport or move to the caravan office to await transport.

e. If undertaking self-managed evacuation, register their movements with the caravan park management upon leaving the park.

1.3.2 Where possible, movable dwellings that can be moved will be relocated by their owners. Park managers will arrange for the relocation of movable dwellings as required. Council and NSW SES personnel may assist if required. Vans are to be moved to the locations outlined in Tables 1 and 2 at the end of this Chapter.

1.3.3 Caravan Park managers will:

a. Secure any movable dwellings that are not able to be relocated to prevent floatation.

b. Ensure that their caravan park is capable of being evacuated in a timely and safe manner.

c. Advise the NSW SES Coffs Harbour Local Commander of:

- The number of people requiring transport.
- Details of any medical evacuations required.

- Whether additional assistance is required to effect the evacuation.

d. Check that all residents and visitors are accounted for.

e. Inform the NSW SES Coffs Harbour Local Commander when the evacuation of the caravan park has been completed.

f. Provide the NSW SES Coffs Harbour Local Commander with a register of people that have been evacuated.

1.4 RETURN OF OCCUPANTS AND MOVEABLE DWELLINGS

1.4.1 The NSW SES Coffs Harbour Local Commander, using council resources as necessary, will advise when it is safe for the caravan parks to be re-occupied.

1.4.2 Moveable dwellings will be returned back to the caravan park(s) by owners or by vehicles and drivers arranged by the park managers.

1.4.3 Council and NSW SES personnel may assist by request where resources are available.

Table 1: Caravan Parks at risk of Inundation and/or Isolation from Flooding.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Sawtell Sector									
Sawtell Beach Caravan Park (Big4)	5 Lyons Road	Sawtell	180 camping Permanent 46 40 cabins	Isolation when Lyons Road closes	The primary evacuation route Lyons Road will close at approx. 4.3m on the Sawtell (Middle Creek) gauge	Lyons Road will close at approx. 4.3m on the Sawtell (Middle Creek) gauge	Remain onsite or move to the Sawtell Tennis Club on Lyons Road	Sawtell RSL however access to this location will close on First Avenue at 3.5m on the Sawtell (Middle Creek) gauge.	Park is a High Flood Island Peak seasons over Christmas and Easter school holidays
Koala Villas & Caravan Park	539 Pacific Highway	Sawtell	TBC	Partially inundated	West onto the Pacific Highway	n/a	Travel south on the Pacific Highway	n/a	Park is Rising Road Access. Peak seasons over Christmas and Easter school holidays

Coffs Central Sector									
Coffs Harbour Tourist Park (The clog Barn)	Grafton Street/215 Pacific Highway	Coffs Harbour	53 sites 15 Cabins 8 Van 11permanent dwellings 19 o/n sites	Inundation. Some sites are in a high hazard floodway and subject to flash flooding at approx. 4.75m	To Pacific Highway then Bailey Avenue	n/a	Bailey Avenue	Bailey Avenue	High Hazard Floodway. Peak seasons over Christmas and Easter school holidays
Harbour City Holiday Park	123 Pacific Highway (Showground)	Coffs Harbour	92 camping 27 cabins 2 residential	Inundation of some sites. Sites on the lower terrace are in a high hazard floodway and subject to flash flooding at approx. 4.75m	To Pacific Highway then west to Beryl Street	n/a	Beryl Street	Beryl Street	High Hazard Floodway. Peak seasons over Christmas and Easter school holidays

Woolgoolga Sector									
Woolgoolga Sunset Caravan Park	64 Newman Street	Woolgoolga	114 permanent sites 24 camping	Inundation and isolation from 2.2m. Complete inundation in a 1% AEP flood.	East on Newman Street, west Bultitude Street, south Beach Street into River Street, east Gordon Street, north Nightingale Street, east Waterloo Street to St Francis Xavier School	Newman Street and Bultitude Street at Jarrett Creek (Around, 2.2m AHD or 3.2m Woolgoolga gauge) – no alternate access	St Francis Xavier School playing fields, Woolgoolga	St Francis Xavier School, Woolgoolga Assembly Area	Low Flood Island. Peak seasons over Christmas and Easter school holidays
Sapphire Beach Holiday Park	48 Split Solitary Road	Sapphire Beach	21 cabins Over 72 camping 17 permanents	Isolation from local road closures	West along Split Solitary Road to the Pacific Highway interchange.	Split Solitary Road at 2.64m on the Moonee Gauge	Onsite or move to Coffs Harbour	n/a	Peak seasons over Christmas and Easter school holidays

Corindi Sector									
The Beach Arrawarra Holiday Park (Previously named Arrawarra Beach Holiday Park)	46 Arrawarra Beach Road	Arrawarra	TBC	Inundation of low-lying areas in a 20% AEP 2.13mAHD	West along Arrawarra Beach Road then south to the Pacific Highway interchange.	n/a	Arrawarra Rest Area	n/a	Peak seasons over Christmas and Easter school holidays
Spot X Surf at Arrawarra	46 Arrawarra Beach Road	Arrawarra	TBC	Inundation of low-lying areas in a 20% AEP 2.13mAHD	West along Arrawarra Beach Road then south to the Pacific Highway interchange.	n/a	Arrawarra Rest Area	n/a	Peak seasons over Christmas and Easter school holidays
Darlington Beach Resort	104-134 Eggins Drive	Arrawarra	123 tourists sites (43 tents; 80 powered sites); 196 permanent sites	Isolation and partial inundation in low lying areas below a 1% flood (no formal gauging). Almost complete inundation in a 1% AEP.	Beach Road to Solitary Island Way, Coral Street to Corindi Public School	Road closure point on Solitary Island Way at 6.1m on the Corindi Rd at Pacific Highway gauge. Alternate route through Corindi Beach (Tasman	Amble Inn car park and Yarrawarra Aboriginal Culture Centre	Corindi Public School Assembly Area	Peak seasons over Christmas and Easter school holidays

						Street then Coral Street)			
Lorikeet Tourist Park	210 Eggins Drive	Corindi	69 tourists sites (26 cabins; 25 van sites; 18 powered); 50 permanent sites	Isolation and partial inundation in low lying areas below a 1% flood (No formal gauging). Complete inundation in a 1% AEP	Eggins Road to Solitary Island way, Coral Street to Corindi Public School	Road closure point on Solitary Island Way at 6.1m on the Corindi Rd at Pacific Highway gauge. Alternate route through Corindi Beach (Tasman Street then Coral Street)	Amble Inn car park and Yarrawarra Aboriginal Culture Centre	Corindi Public School Assembly Area	Peak seasons over Christmas and Easter school holidays

Table 2: Caravan Parks at risk from Coastal Erosion and/or Coastal Inundation.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwellings relocation location	Evacuation centre	Notes
Woolgoolga Sector									
Lakeside Caravan Park	80 Lake Road	Woolgoolga	10 cabins 75 camping 1 permanent	Susceptible to storm surge	Lakes Road south, south Wharf Street, Beach Street east, Carrington Street south, Nelson west, Queen south to St Francis Xavier School	Lakes Road, Wharf Street and Beach Street can be potentially inundated by storm surge	St Francis Xavier School playing fields, Woolgoolga Assembly Area	St Francis Xavier School, Woolgoolga Assembly Area	High Trapped Perimeter for flooding. Peak seasons over Christmas and Easter school holidays
Woolgoolga Beach Caravan Park	Beach Street	Woolgoolga	3 permanents 11 cabins 54 camping	Susceptible to storm surge	Beach Street east, Carrington Street south, Nelson Street west, Queen south to St Francis Xavier	Beach Street can potentially be inundated by storm surge	St Francis Xavier School playing fields, Woolgoolga	St Francis Xavier School, Woolgoolga Assembly Area	Peak seasons over Christmas and Easter school holidays

					School				

LIST OF REFERENCES

1. **NSW Government.** *Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005 Part 3 Division 3 Subdivision 7 Clause 123.* 2005.