NSW STATE EMERGENCY SERVICE

Clarence Valley

Local Flood Plan

FloodSafe

June 2017

To be reviewed no later than June 2022 (5 year review cycle)

CLARENCE VALLEY FLOOD EMERGENCY SUB PLAN

A Sub-Plan of the Clarence Valley Local Emergency Management Plan (EMPLAN)

Volume 1 of the Clarence Valley Local Flood Plan

AUTHORISATION

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

Recommended

S. M. Chapple

NSW SES Clarence Valley Local Controller

Date: 3 - 7 - 2017

Approved

Chair, Local Emergency Management Committee

Date: 3.7.17

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DISTRIBUTION LIST

This Local Flood Plan is distributed through the NSW State Emergency Service in electronic format and is maintained on the NSW SES FloodSafe (www.floodsafe.com.au) website.

VERSION HISTORY

The following table lists all previously endorsed versions of this plan.

Description	Date
Clarence Valley Local Flood Plan	June 2012

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

The Clarence Valley Local Controller
NSW State Emergency Service
26 Induna Street, SOUTH GRAFTON, NSW, 2460

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

Amendment Number	Description	Updated by	Date

Document Issue: 02112015

LIST OF ABBREVIATIONS

The following abbreviations have been used in this plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AIIMS	Australasian Inter-service Incident Management System
ARI	Average Recurrence Interval (Years)
ALERT	Automated Local Evaluation in Real Time
AWRC	Australian Water Resources Council
BUREAU	Australian Government Bureau of Meteorology
CBRN	Chemical, Biological, Radiation or Nuclear
DCF	Dam Crest Flood
DSC	Dams Safety Committee
DSEP	Dam Safety Emergency Plan
DVR	Disaster Victim Registration
EMPLAN	Emergency Management Plan
FRNSW	Fire and Rescue NSW
GIS	Geographic Information System
GRN	Government Radio Network
IAP	Incident Action Plan
IFF	Imminent Failure Flood
LEMC	Local Emergency Management Committee
LEOCON	Local Emergency Operations Controller
LO	Liaison Officer
LGA	Local Government Area
MHL	Manly Hydraulics Laboratory
NOW	NSW Office of Water

NSW RFS	New South Wales Rural Fire Service
NSW SES	NSW State Emergency Service
NSW VRA	Volunteer Rescue Association
OEH	Office of Environment and Heritage (previously DECCW)
PMF	Probable Maximum Flood
PMR	Private Mobile Radio
PMP	Probable Maximum Precipitation
PIIC	Public Information and Inquiry Centre
REMC	Region Emergency Management Committee
REMO	Regional Emergency Management Officer
RMS	Roads and Maritime Services
RFS	Rural Fire Service
SEOCON	State Emergency Operations Controller
SERCON	State Emergency Recovery Controller
SEWS	Standard Emergency Warning Signal
SITREPs	Situation Reports
WICEN	Wireless Institute Civil Emergency Network

GLOSSARY

Annual Exceedance Probability (AEP). The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood level (height) has an AEP of 5%, there is a 5% chance (that is, a one-in-20 chance) of such a level or higher occurring in any one year (see also Average Recurrence Interval).

Assistance Animal. A guide dog, a hearing assistance dog or any other animal trained to assist a person to alleviate the effect of a disability (Refer to Section 9 of the Disability Discrimination Act 1992).

Assembly Area. An assembly area is a designated location used for the assembly of emergency-affected persons before they move to temporary accommodation or a nominated evacuation centre. As such these areas do not provide welfare assistance nor are they used for long term sheltering or provision of meals. An assembly area may also be a prearranged, strategically placed area, where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency.

Australian Height Datum (AHD). A common national surface level datum approximately corresponding to mean sea level.

Average Recurrence Interval (ARI). The long-term **average** number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur **on average** once every 20 years.

Catchment (River Basin). The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Coastal Erosion. The loss of land along the shoreline predominantly by the offshore movement of sand during storms.

Coastal Flooding. Flooding due to tidal or storm-driven coastal events, including storm surges in lower coastal waterways. This can be exacerbated by wind-wave generation from storm events (1).

Dambreak Study. A Dambreak Study is undertaken to determine the likely downstream inundation areas in case of a dam failure. Modelling is undertaken for a range of dam breach possibilities and design floods. The dambreak study includes information such as the extent of flooding, flood travel times and flood water velocities. The study can assist dam owners, regulators, and emergency agencies in

the preparations of evacuation plans, dam break and other flood warning systems, and hazard classification of affected areas.

Dam Failure. The uncontrolled release of a water storage. The failure may consist of the collapse of the dam or some part of it, or excessive seepage or discharges. The most likely causes of dam failure are;

- **Flood Induced Dam Failure**: Dam failure caused by flood, either due to overtopping erosion or by subsequent structural failure.
- **Sunny Day Dam Failure**: Dam Failure as a result of factors other than flood i.e. other than flood flow into the reservoir. Causes of "Sunny Day" dam failure can include internal erosion, landslide, piping, earthquake or sabotage.

Dam Safety Emergency Plan (DSEP). A DSEP outlines the required actions of owners and their personnel at dams in response to a range of possible emergency situations. The NSW Dam Safety Committee requires a quality controlled DSEP, with associated dambreak warning procedures to be prepared for prescribed dams where persons may be at risk downstream, if the dam failed.

Design Flood (or Flood Standard). A flood of specified magnitude that is adopted for planning purposes. Selections should be based on an understanding of flood behaviour and the associated flood risk, and take account of social, economic and environmental considerations. There may be several design floods for an individual area.

Emergency Alert. The national telephone warning system used by emergency services to send voice messages to landlines and text messages to mobile phones within a defined area, about likely or actual emergencies.

EMPLAN (Emergency Management Plan). The Plan established in accordance with the provisions in the *State Emergency Rescue Management Act 1989*. The object of an EMPLAN is to ensure the coordinated response by all agencies having responsibilities and functions in emergencies.

Essential Services. Those services, often provided by local government authorities, that are considered essential to the life of organised communities. Such services include power, lighting, water, gas, sewerage and sanitation clearance.

Evacuation. The temporary movement of people from a dangerous or potentially dangerous place to a safe location, and their eventual return. It is a safety strategy which uses distance to separate people from the danger created by the hazard.

Evacuation Order. Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.

Evacuation Warning. Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to warn a community of the need to prepare for a possible evacuation.

Flash Flooding. Flooding which is sudden and often unexpected because it is caused by sudden local or nearby heavy rainfall. It is sometimes defined as flooding which occurs within six hours of the rain that causes it.

Flood. 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 overtopping coastline defences, including Tsunami.

Flood Classifications. Locally defined flood levels used in flood warnings to give an indication of the severity of flooding (minor, moderate or major) expected. These levels are used by the State Emergency Service and the Australian Government Bureau of Meteorology in flood bulletins and flood warnings.

Flood Intelligence. The product of collecting, collating, analysing and interpreting flood-related data to produce meaningful information (intelligence) to allow for the timely preparation, planning and warning for and response to a flood.

Flood Fringe. The remaining area of flood prone land after floodway and flood storage have been defined.

Flood Liable Land (also referred to as Flood Prone Land). Land susceptible to flooding by the Probable Maximum Flood (PMF) event. This term also describes the maximum extent of a **floodplain** which is an area of a river valley, adjacent to the river channel, which is subject to inundation in floods up to this event.

Flood of Record. Maximum observed historical flood.

Floodplain. Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land (2).

Floodplain Management Plan. A plan developed in accordance with the principles and guidelines in the New South Wales Floodplain Development Manual. Such a plan usually includes both written and diagrammatic information describing how particular areas of flood prone land can be used and managed to achieve defined objectives.

Flood Plan. A response strategy plan that deals specifically with flooding and is a sub-plan of an Emergency Management Plan. Flood plans describe agreed roles, responsibilities, functions, strategies and management arrangements for the

conduct of flood operations and for preparing for them. A flood plan contains information and arrangements for all floods whereas an IAP is for a specific flood/event.

Flood Rescue. The rescue or retrieval of persons trapped by floodwaters.

Flood Storage Areas. Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.

Floodway. An area where a significant volume of water flows during floods. Such areas are often aligned with obvious naturally-defined channels and are areas that, if partially blocked, would cause a significant redistribution of flood flow which may in turn adversely affect other areas. They are often, but not necessarily, the areas of deeper flow or the areas where higher velocities occur.

Flood Watch. A Flood Watch is a notification of the potential for a flood to occur as a result of a developing weather situation and consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and indicates streams at risk. The Bureau will also attempt to estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood Watches are normally issued 24 to 36 hours in advance of likely flooding. Flood watches are issued on a catchment wide basis.

Flood Warning. A Flood Warning is a gauge specific forecast of actual or imminent flooding. Flood Warnings specify the river valley, the locations expected to be flooded, the likely severity of flooding and when it will occur.

Functional Area. A category of services involved in the preparations for an emergency, including the following:

- Agriculture and Animal Services;
- Energy and Utility Services;
- Engineering Services;
- Environmental Services;
- Health Services;
- Public Information Services;
- Telecommunication Services;
- Transport Services; and
- Welfare Services.

Geographic Information System (GIS). A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information.

Incident Controller. The individual responsible for the management of all incident control activities across a whole incident (3).

Incident Action Plan (IAP). An action plan for managing a specific event. Information from the Local Flood Plan is used to develop the flood IAP.

Indirect Effect. Indirect effects are generally a consequence of infrastructure damage or interruption of services and can affect communities distant from the actual flood footprint i.e. floodplain. Indirect effects can also refer to indirect losses due to disruption of economic activity, both in areas which are inundated or isolated. Indirect effects are one of the three primary sources of risk in the context of flooding (the other two are inundation and isolation).

Inundation. See definition for Flood.

Isolation. Properties and/or communities where flooding cuts access to essential services or means of supply. Isolation is one of the three primary sources of risk in the context of flooding (the other two are inundation and indirect effects).

Liaison Officer (LO). A person, nominated or appointed by an organisation or functional area, to represent that organisation or functional area at a control centre, emergency operations centre, or coordination centre. A liaison officer maintains communications with and conveys directions/requests to their organisation or functional area, and provides advice on the status, capabilities, actions and requirements of their organisation or functional area (3).

Local Emergency Management Committee (LEMC). The LEMC is responsible for the preparation of plans in relation to the prevention of, preparation for, response to and recovery from emergencies in the local government area for which it is constituted. In the exercise of its functions, the Committee is responsible to the Region Emergency Management Committee (REMC) and may communicate with the REMC for matters associated with Functional Areas that are not represented at the local Level.

Local Overland Flooding. Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

Major Flooding. Flooding which causes inundation of extensive rural areas, with properties, villages and towns isolated and/or appreciable urban areas flooded.

Minor Flooding. Flooding which causes inconvenience such as closing of minor roads and the submergence of low-level bridges. The lower limit of this class of flooding, on the reference gauge, is the initial flood level at which landholders and/or townspeople begin to be affected in a significant manner that necessitates the issuing of a public flood warning by the Australian Government Bureau of Meteorology.

Moderate Flooding. Flooding which inundates low-lying areas, requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

Moveable Dwellings. Any tent, or any caravan or other van or other portable device (whether on wheels or not), used for human habitation; or a manufactured home; or any conveyance, structure or thing of a class or description prescribed by the (Local Government) regulations (4).

Operational Area Commander. The individual commanding an operational area. An Operational Area Command may be established for an area with multiple incident management teams functioning, and can cross local government and NSW SES Region boundaries.

Peak Height. The highest level reached, at a nominated gauging station, during a particular flood event.

Prescribed Dam. "Prescribed" dams are those listed in Schedule 1 of the Dams Safety Act 1978. The NSW Dam Safety Committee will prescribe those dams with the potential for a failure which could have a significant adverse effect on community interests.

Probable Maximum Flood (PMF). The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years).

Riverine Flooding. Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam. Riverine flooding generally excludes watercourses constructed with pipes or artificial channels considered as stormwater channels (1).

Runoff. The amount of rainfall which ends up as stream flow, also known as ‘rainfall excess’ since it is the amount remaining after accounting for other processes such as evaporation and infiltration.

Stage Height. A level reached, at a nominated gauging station, during the development of a particular flood event.

Storm Surge. The increases in coastal water levels above predicted astronomical tide levels (i.e. tidal anomaly) resulting from a range of location dependant factors including the inverted barometer effect, wind and wave set-up and astronomical tidal waves, together with any other factors that increase tidal water level (1).

Stream Gauging Station. A place on a river or stream at which the stage height is routinely measured, either daily or continuously, and where the discharge is measured from time to time so as to develop a relationship between stage and discharge or rating curve.

Total Flood Warning System. A flood warning system is made up of components which must be integrated if the system is to operate effectively. Components of the total flood warning system include monitoring rainfall and river flows, prediction, interpretation of the likely impacts, construction and dissemination of warning messages, response by agencies and community members, and review of the warning system after flood events (5).

PART 1 - INTRODUCTION

1.1 PURPOSE

1.1.1 This plan covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from flooding within the Clarence Valley LGA. It covers operations for all levels of flooding within the council area.

1.1.2 The plan also covers arrangements for the management of coastal erosion in the council area.

1.2 AUTHORITY

1.2.1 This plan is issued under the authority of the *State Emergency and Rescue Management Act 1989* (NSW) and the *State Emergency Service Act 1989* (NSW). It has been approved by the NSW SES Clarence Valley Local Controller and the NSW SES Clarence Nambucca Region Controller as a NSW SES plan and endorsed by the Clarence Valley Local Emergency Management Committee as a sub plan of the Local EMPLAN.

1.3 AREA COVERED BY THE PLAN

1.3.1 The area covered by the plan is the Clarence Valley LGA which extends from the coast about 100 kilometres inland to a line through Plains Station, Newton Boyd and Hernani with a total area of 10,440 square kilometres. The Valley has a population of 50,000 spread through 43 towns and villages and rural areas. Extensive areas of National Park have been proclaimed along the Coast as well as the more mountainous foothills of the Ranges. Large areas of natural and plantation State Forest surround the rural population.

1.3.2 The council area and its principal rivers and creeks are shown in Attachment 3.

1.3.3 The council area is in the NSW SES Clarence Nambucca Region and for emergency management purposes is part of the North Coast Emergency Management Region.

1.4 DESCRIPTION OF FLOODING AND ITS EFFECTS

1.4.1 The NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Clarence Valley LGA.

1.5 RESPONSIBILITIES

1.5.1 The general responsibilities of emergency service organisations and supporting services (functional areas) are listed in the State Emergency Management Plan (EMPLAN). Some specific responsibilities are expanded

upon in the following paragraphs. The extent of their implementation will depend on the severity of the flooding. Specific responsibilities of agencies and organisations as they relate to tsunami are detailed in the State Tsunami Emergency Sub Plan.

1.5.2 **NSW SES Clarence Valley Local Controller.** The NSW SES Clarence Valley Local Controller is responsible for dealing with floods as detailed in the State Flood Plan, and will;

Preparedness

a. Ensure that NSW SES members are trained to undertake operations in accordance with current policy as laid down in the NSW SES Controllers' Guide and the NSW SES Operations Manual.

b. Coordinate the development and operation of a flood warning service for the community.

c. Participate in floodplain and coastal risk management initiatives organised by the Clarence Valley Council.

d. Coordinate a community engagement and capacity building program regarding local flood issues and associated risks to assist communities in building resilience to floods.

e. Identify and monitor people and/or communities at risk of flooding and coastal erosion.

f. Ensure that the currency of this plan is maintained.

Response

g. Appoint an appropriate Incident Controller to undertake response roles. The Incident Controller will;

- Control flood and storm response operations. This includes;
  - Directing the activities of the NSW SES units operating within the council area.
  - Coordinating the activities of supporting agencies and organisations and ensuring that liaison is established with them.
  - Contribute to preparation of Region IAP.
- Coordinate the provision of information services in relation to;
  - Flood heights and flood behaviour.
  - Coastal erosion / inundation.
  - Road conditions and closures.
  - Advice on methods of limiting property damage.
  - Confirmation of evacuation warnings and evacuation orders.
- Direct the conduct of flood rescue operations.

- Coordinate the provision of the evacuation of people and/or communities.
- Provide immediate welfare support for evacuated people.
- Coordinate the provision of emergency food and medical supplies to isolated people and/or communities.
- Coordinate operations to assist the community to protect property. This may include;
  - Arranging resources for sandbagging operations.
  - Lifting or moving household furniture.
  - Lifting or moving commercial stock and equipment.
- Assist the Clarence Valley Council to organise temporary repairs or improvements to levees.
- Where possible, arrange for support (for example, accommodation and meals) for emergency service organisation members and volunteers assisting them.
- Ensure that the managers of caravan parks are advised of flood warnings and the details of any evacuation order.
- If NSW SES resources are available, assist with emergency fodder supply operations conducted by Agriculture and Animal Services.
- If NSW SES resources are available, assist the NSW Police Force, RMS and Council with road closure and traffic control operations.
- Exercise financial delegations relating to the use of emergency orders as laid down in the NSW SES Controllers' Guide.
- Coordinate the collection of flood and coastal erosion/inundation information for development of intelligence.
- Submit Situation Reports to the NSW SES Clarence Nambucca Region Headquarters and agencies assisting within the council area. These should contain information on;
  - Road conditions and closures.
  - Current flood behaviour.
  - Current operational activities.
  - Likely future flood behaviour.
  - Likely future operational activities.
  - Probable resource needs.
- Keep the Local Emergency Operations Controller advised of the flood situation and the operational response.
- Issue the 'All Clear' when flood operations have been completed.

Recovery

h. Ensure that appropriate After Action Reviews are held after floods.

i. Provide appropriate representation to the recovery committee for the duration of the response phase of an event and as agreed during the recovery phase.

1.5.3 NSW SES Brushgrove, Copmanhurst, Grafton City, Lawrence, Maclean, Nymboida, Ulmarra, Wooli-Yuraygir, and Yamba Unit Controller(s)

a. Assist the NSW SES Clarence Valley Local Controller with flood preparedness activities, including;

- Flood planning.
- Training of unit members.
- The development of flood and coastal erosion/inundation intelligence.
- The development of warning services.
- Floodplain and coastal risk management initiatives.
- Community engagement and capacity building.

b. Conduct flood and coastal erosion operations within the Clarence Valley LGA as directed by the NSW SES Incident Controller.

c. Submit Situation Reports to the NSW SES Clarence Nambucca Region Headquarters and agencies assisting within the local area.

1.5.4 NSW SES Brushgrove, Copmanhurst, Grafton City, Lawrence, Maclean, Nymboida, Ulmarra, Wooli-Yuraygir, and Yamba Unit Members

a. Carry out flood and coastal erosion response tasks. These may include;

- The management of the NSW SES Clarence Valley Unit Headquarters Operations Centres.
- Assist in the collection of flood and coastal erosion/inundation information for the development of intelligence.
- Flood rescue.
- Evacuation.
- Providing immediate welfare for evacuated people.
- Delivery of warnings and information.
- Resupply.
- Levee monitoring.
- Sandbagging.
- Lifting and/or moving household furniture and commercial stock.
- Animal rescue.
- Assisting in repairing or improving levees.
- Assisting with road closure and traffic control operations.

- Assisting with emergency fodder supply operations.

b. Assist with preparedness activities.

c. Undertake training in flood and storm response operations.

1.5.5 Clarence Valley Local Emergency Operations Controller (LEOCON)

a. Monitor flood operations.

b. Request and coordinate support to the NSW SES Clarence Valley Incident Controller if requested to do so.

1.5.6 Clarence Valley Local Emergency Management Officer

a. Provide executive support to the LEMC and LEOCON in accordance with the Clarence Valley Local Emergency Management Plan.

b. At the request of the NSW SES Clarence Valley Local Controller, advise appropriate agencies and officers of the start of response operations.

1.5.7 Clarence Valley Council

Preparedness

a. Develop and implement floodplain risk management plans in accordance with the NSW Government's Flood Prone Land Policy and the Floodplain Development Manual.

b. Establish and maintain floodplain and coastal risk management committees and ensure that key agencies are represented on such committees.

c. Provide levee studies, flood studies, floodplain management studies and coastal management studies to the NSW SES.

d. Maintain Dam Safety Emergency Plans for the Shannon Creek Dam and Rushforth Road 100 Megalitre Reservoir and provide copies to the NSW SES.

e. Provide information on the consequences of dam failure to the NSW SES for incorporation into planning and flood intelligence.

f. Maintain a plant and equipment resource list for the council area.

g. Work with NSW SES on the development and implementation of a community engagement and capacity building program.

Response

h. At the request of the NSW SES Incident Controller, deploy personnel and resources for flood and coastal erosion related activities.

i. Close and reopen council roads (and other roads nominated by agreement with the RMS) and advise the NSW SES Incident Controller and the Police.

j. Provide information on the status of roads including through the website www.myroadinfo.com.au.

k. Provide filled sandbags to urban areas and sand to village areas in which flooding is expected.

l. Provide back-up radio communications.

m. In the event of evacuations, assist with making facilities available for the domestic pets and companion animals of evacuees.

n. During periods of coastal erosion from ocean storms:

- Liaise with the NSW SES Local Controller to provide advice regarding the need for response actions by the NSW SES such as evacuations.
- Activate the Clarence Valley Council Coastal Zone Management Plan – Emergency Action Plan.
- Establish and maintain Coastal Zone Management Committees to facilitate the development of Coastal Zone Management Plans and ensure that key agencies are represented on such committees.
- Assist the NSW SES with reconnaissance of areas susceptible to coastal erosion /inundation.
- Where surf lifeguard services are operated by Local Government Councils distribute advice contained in weather warnings to people on beaches when dangerous surf conditions are predicted.
- Close beach water areas when dangerous conditions caused by storms occur and notify the SES and Surf Life Saving NSW.
- Where emergency physical mitigation works to protect coastal property or other structures have been identified as being required in a Coastal Zone Management Plan, construct works. Where no Coastal Zone Management Plan exists Councils should seek appropriate technical, legal and environmental advice before constructing or allowing the construction of physical mitigation works to protect coastal property or other structures. These works should ensure protection of beach environments and beach amenity and allow continuing and undiminished access to beaches, headlands and waterways.
- After the storm, remove and/or mitigate the impact of temporary physical protective measures on the beach; and Assist the SES with the protection of readily moveable household and business contents in areas where coastal storms (likely to result in coastal erosion /inundation) are forecast or occurring.

Recovery

o. Provide for the management of health hazards associated with flooding. This includes removing debris and waste.

p. Ensure premises are fit and safe for reoccupation and assess any need for demolition in liaison with Engineering Services Functional Services.

1.5.8 Community Members

Preparedness

a. Understanding the potential risk and impact of flooding;

b. Preparing homes and property to reduce the impact of flooding;

c. Understanding warnings and other triggers for action and the safest actions to take in a flood;

d. Households, institutions and businesses developing plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours;

e. Having an emergency kit;

f. Being involved in local emergency planning processes.

1.5.9 **Agriculture and Animal Services Functional Area**

a. When requested by NSW SES;

- Activate the Agriculture and Animal Services Supporting Plan as required and coordinate the provision of required services which may include;
  - Co-ordinate response for all animals including pets, livestock and wildlife.
  - Supply and delivery of emergency fodder.
  - Emergency water replacement in certain circumstances.
  - Coordinate the management of livestock and farm animals.
  - Advice on dealing with dead and injured farm animals.
  - Financial, welfare and damage assessment assistance to flood affected farmers.
  - Co-ordinate the establishment of animal shelter facilities for the domestic pets and companion animals of evacuees.

1.5.10 The **New South Wales Ambulance**

a. Assist with the evacuation of at risk communities (in particular elderly and/or infirm people).

b. Deploy ambulance resources to appropriate locations if access is expected to be lost.

c. Assist the NSW SES with flood rescue operations.

1.5.11 **Australian Government Bureau of Meteorology (The Bureau)**

a. Provide Flood Watches for the Clarence River Basin.

b. Provide Flood Warnings, incorporating height-time predictions, for Grafton (AWRC 204904 (Prince Street)), Ulmarra (AWRC 204905), Maclean (AWRC 204410), Glenreagh (AWRC 204906) and Coutts Crossing (AWRC 204909 (Orara River)) gauges.

c. Provide severe weather warnings when large waves and/or storm surge conditions are forecast to result in coastal erosion/inundation.

d. Provide severe weather warnings when flash flooding is likely to occur.

1.5.12 Caravan Park Proprietor(s)

a. Prepare a flood emergency plan for the Caravan Park.

b. Ensure that owners and occupiers movable dwellings are 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.
- Displaying this notice and the emergency arrangements for the Caravan Park prominently in the park.

c. 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) (6).

d. 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 relocation.

e. Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation when flooding occurs.

f. 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.

g. Secure any movable dwellings that are not able to be relocated to prevent floatation.

h. Inform the 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.

1.5.13 Child Care Centres and Preschools

a. Childcare centres are to be contacted by the NSW SES in the event of possible flooding or isolation.

b. When notified the childcare centres and preschools should;

- Liaise with the 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 child care centres.

1.5.14 Energy and Utility Services Functional Area

a. When requested by NSW SES;

- Implement the Energy and Utilities Services Functional Area Supporting Plan.
- Where required, coordinate energy and utility services emergency management planning, preparation, response and recovery, including the restoration of services following a flood event.
- Coordinate advice to the NSW SES of any need to disconnect electricity, gas, water or wastewater services.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
- Identify interdependencies between flooding and utility services due to secondary impacts of flooding and advise the NSW SES.
- Assist the NSW SES with advisory notices relating to hazards from utility services during flooding.
- Coordinate with utilities on restoration of services, including advisory notices relating to estimated time for restoration and mandatory safety checks prior to reconnection. Advise the NSW SES and the relevant recovery committee and coordinator of the timetable for restoration.

b. Local utility service distribution providers (electricity, gas, water, waste water):

- Provide advice to the NSW SES Clarence Valley Local Controller of any need to disconnect power/gas/water/waste water supplies or of any timetable for reconnection.
- Advise the 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/waste water installations, when certified safe to do so and as conditions allow.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.15 **Engineering Services Functional Area**

a. When requested by NSW SES;

- Provide engineering advice regarding the integrity of damaged structures.
- Assist the NSW SES with damage assessment.
- Acquire and/or provide specialist technical engineering expertise.
- Assist the NSW SES and councils with the assessment and operation of flood protection levees when requested.
- Assist with property protection, including the construction or repair of levees.
- Coordinate the restoration of critical public facilities.

b. When requested by the Recovery Coordinator:

- Establish Recovery Centres by the procurement and fit-out of suitable properties.

1.5.16 **Environmental Services Functional Area**

a. When requested by NSW SES;

- Implement the Environmental Services Functional Area (Enviroplan) Supporting Plan if required.

1.5.17 **Fire and Rescue NSW, Grafton, Maclean, South Grafton and Yamba**

a. FRNSW responsibilities are primarily confined to the FRNSW Fire District. Any deployment of FRNSW resources to assist NSW SES in flood events rests with the respective FRNSW Commander which must be a Senior Officer.

b. The FRNSW Commander will assess the capability of FRNSW to assist NSW SES in the following tasks:

- Assist the NSW SES with the warning and/or evacuation of at risk communities.
- Assist the NSW SES with the monitoring / reconnaissance of flood prone areas.
- Assist the NSW SES with the resupply of isolated communities and/or properties.

- Assist the NSW SES with property protection tasks including sandbagging.
- Provide resources for pumping flood water out of buildings and from low-lying areas.
- Assist with clean-up operations, including the hosing out of flood affected properties.
- Coordinate the deployment of fire resources to communities within Fire and Rescue NSW fire districts if access is expected to be lost in consultation with the NSW SES.

c. FRNSW will use its best endeavours to deploy appliances and or resources into locations where access is expected to be lost.

1.5.18 **Forestry Corporation of NSW**

a. Close and evacuate at risk camping grounds in State Forest managed areas.

b. Close and reopen Forestry Corporation of NSW roads when affected by flood waters and advise the NSW SES of its status.

c. Facilitate the safe reliable access of emergency resources on Forestry Corporation managed roads.

d. Assist the NSW SES with identification of road infrastructure at risk of flooding.

e. Manage traffic in Forestry Corporation of NSW roads.

f. Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

1.5.19 **Health Services Functional Area**

a. When requested by NSW SES;

- Activate Healthplan if required.
- Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods.
- Provide medical support to the NSW SES.
- Establish health surveillance in affected areas.
- Assess potential public health risks that either acutely endanger the health of human populations or are thought to have longer term consequences.
- Provide environmental health advice.
- Provide public health warnings and advice to affected communities.

- Provide psychological counselling support to the community and emergency response workers impacted, via NSW Health Mental Health Division.
- Assist the NSW SES with the warning and coordination of evacuation of public hospitals, private hospitals and residential aged care facilities.
- Undertake vulnerable persons assessment for mental health and drug and alcohol dependant persons, dialysis, community health clients and oxygen dependant persons in the community, known to the health service.

1.5.20 Marine Rescue NSW

a. Assist the NSW SES with the delivery of evacuation warnings and evacuation orders.

b. Assist the NSW SES with the conduct of evacuations.

c. Assist with property protection for vessels that have come adrift or dragged anchor, in the lower river reaches, if safe to do so.

1.5.21 NSW Office of Water

a. Collect and maintain flood data including data relating to flood heights, velocities and discharges.

b. Provide the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings.

c. Provide flow rating charts for river height gauges.

d. Manage (with technical support from OEH) the approval process under the Water Act 1912 and Water Management Act 2000 for flood control works (earthworks, embankments and levees which can affect the distribution of floodwaters) including;

- Assessment and approval of flood control works (including flood mitigation works) in rural areas designated under the Acts.
- Use of floodplain management plans prepared by OEH in rural areas designated under the Acts to assess flood control work approvals.
- Giving the NSW SES access to relevant studies regarding flooding and studies supporting floodplain management plans prepared by OEH including flood studies, floodplain risk management studies and flood behaviour investigations.

1.5.22 NSW Police Force, Coffs-Clarence Local Area Command (LAC)

a. Assist the NSW SES with the delivery of evacuation warnings and evacuation orders.

b. Assist the NSW SES with the conduct of evacuation operations.

c. Conduct road and traffic control operations in conjunction with council and/or RMS.

d. Coordinate the registration of evacuees.

e. Secure evacuated areas.

1.5.23 NSW Rural Fire Service (RFS Clarence Valley Zone)

a. Provide personnel in rural areas and villages to;

- Inform the NSW SES Clarence Valley Local Controller about flood conditions and response needs in their own communities, and
- Disseminate flood information.

b. Provide personnel and high-clearance vehicles for flood related activities.

c. Assist the NSW SES with the delivery of evacuation warnings and evacuation orders.

d. Assist the NSW SES with the conduct of evacuations.

e. Provide equipment for pumping flood water out of buildings and from low-lying areas.

f. Assist with the removal of caravans.

g. Provide back-up radio communications.

h. Assist with clean-up operations, including the hosing of flood affected properties.

i. Deploy fire resources to appropriate locations if access is expected to be lost.

1.5.24 Office of Environment and Heritage

a. Assist the NSW SES gain access to relevant studies regarding flooding, including Flood Studies and Floodplain Risk Management Studies undertaken under the Floodplain Management Program.

b. Assist the NSW SES in obtaining required outputs (Section 3.1.4) from Flood Studies and Floodplain Risk Management Studies under the Floodplain Management Program which assist the NSW SES in effective emergency response planning and incorporating information into the NSW Floods Database.

c. Coordinate the collection of post event flood data, in consultation with the NSW SES.

d. Provide specialist advice to the NSW SES on flood related matters on;

- The identification of flood risks.
- Conditions which may lead to coastal flooding or retarded river drainage near the coast.

e. Collect and maintain flood data relating to flood heights, velocities and discharges in coastal areas of NSW (through a contract with MHL as discussed separately).

f. Provide data to the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings (through a contract with MHL as described in the Response section of this plan).

g. Assist the NSW SES in the exercising of this Flood Sub Plan.

h. **Parks and Wildlife Service**

- Close and reopen Parks and Wildlife Service roads when affected by flood waters and advise the NSW SES of its status.
- Facilitate the safe reliable access of emergency resources on National Parks and Wildlife Service managed roads.
- Assist the NSW SES with identification of road infrastructure at risk of flooding.
- Manage traffic on Parks and Wildlife Service roads.
- Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

1.5.25 **Owners of Prescribed Dams within or upstream of Clarence Valley**

Dam	Owner
Shannon Creek Dam	Clarence Valley Council
Rushforth Road 100ML Reservoir	Clarence Valley Council

a. Maintain and operate the Dam Failure Warning System for their Dam(s).

b. Contribute to the development and implementation of community engagement and capacity building programs on flooding.

c. Consult with NSW SES on the determination of dam failure alert levels and notification arrangements when developing Dam Safety Emergency Plans.

d. Maintain a Dam Safety Emergency Plan and provide copies to the NSW SES.

e. Provide information on the consequences of dam failure to the NSW SES for incorporation into planning and flood intelligence.

f. Close and evacuate at risk camping grounds/recreational areas within their managed areas.

1.5.26 **Private Companies**, **NSW Bus and Coach Association (Bus Ways)**

a. Assist with the provision of;

- Bus transport and drivers for evacuation, resupply or commuting purposes.

1.5.27 **Public Information Services Functional Area**

a. When requested by NSW SES;

- Assist the NSW SES in the establishment and operation of a Joint Media Information Centre.

1.5.28 **Roads and Maritime Services**

a. Manage traffic on state roads, state highways and waterways affected by flood waters and advise the NSW SES of their status including the Pacific Gwydir Highways and Summerland Way.

b. Facilitate the safe reliable access of emergency resources on RMS managed roads.

c. Assist the NSW SES with identification of road infrastructure at risk of flooding.

d. Assist in Traffic management associated with evacuations where necessary.

e. Enter state road closure information into the Live Traffic site.

f. Assist the NSW SES and local councils with the communication of warnings and information provision to the public through variable message signs.

g. Cooperate with the North Coast Transport Services Functional Area Coordinator.

1.5.29 **School Administration Offices (including Catholic Education Office Grafton, Department of Education Grafton and Private Schools)**

a. Liaise with the NSW SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures (or where required, for students to be moved to a suitable location until normal school closing time).

b. Pass information to school bus drivers/companies and/or other schools on expected or actual impacts of flooding.

c. Assist with coordinating the evacuation of schools when flooding or isolation is expected to occur.

d. Provide space in schools for evacuation centres where necessary.

1.5.30 **Service and Sporting Clubs, Brooms Head Bowling Club, Wooli Bowling & Recreation Club, Yamba Bowling & Recreation Club, Glenreagh School of Arts**

a. Assist with provision of evacuation centres.

1.5.31 **Surf Life Saving NSW**

a. Assist the NSW SES with the warning and/or evacuation of at risk communities;

b. Provide space in Surf Life Saving facilities for evacuation centres where required; and

c. Assist the NSW SES with flood rescue operations.

1.5.32 **Telecommunication Services Functional Area**

a. When requested by NSW SES;

- Coordinate the restoration of telephone facilities damaged by flooding.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.33 **The North Coast Transport Services Functional Area Coordinator (TSFAC)**

a. The TSFAC will assist NSW SES, emergency services and other functional areas through the provision of traffic and transport operations as consistent with the roles of Transport organisations, including;

- The movement of emergency equipment and personnel.
- The movement of emergency supplies and goods, including water, fuel and food.
- The evacuation of people and animals.
- Assistance for medical transport.
- Transportation of animals and infectious material/dangerous goods.
- Maintaining and operating a transport route advisory service to the NSW SES, emergency services organisations and other Functional Areas and members of the community.
- Coordinate the provision of traffic and transport operations as consistent with the roles of Transport organisations.

1.5.34 **NSW Train Link**

a. Operate NSW regional and interstate rail services through the Clarence Valley including the management of railway services affected by flood waters and advise the NSW SES.

b. Assist the NSW SES with the movement or evacuation of people during flood response operations if required.

c. Convey flood information and flood warnings to passengers and travellers on NSW trains.

d. Cooperate with, and assist the NSW SES Local Controller in relation to public safety during flood emergencies.

e. Cooperate with the North Coast Transport Services Functional Area Coordinator.

1.5.35 **Welfare Services Functional Area**

a. When requested by NSW SES;

- Establish and manage evacuation centres, and provide disaster welfare services from recovery centres.
- Administer the Personal Hardship and Distress component of the NSW Disaster Relief Scheme established to provide financial assistance to people affected by emergencies.
- Support the Red Cross representatives deployed to Lawrence and Brushgrove.

1.5.36 **Jana Ngalee and Baryulgil Square Local Aboriginal Land Council**

a. Act as the point of contact between the NSW SES and the Malabugilmah and Baryulgil Aboriginal Communities respectively.

b. Inform the NSW SES Clarence Valley Local Controller about flood conditions and response needs.

c. Disseminate flood information, including flood and evacuation warnings, to the Malabugilmah and Baryulgil Aboriginal Communities.

1.5.37 **Sandon/Buccarumbi Flood Network**

a. Provide flood information to the NSW SES Clarence Valley Local Controller.

b. Distribute flood warnings and flood information provided by the NSW SES Clarence Valley Local Controller.

1.6 CROSS-BORDER ASSISTANCE ARRANGEMENTS

1.6.1 A local cross-border mutual assistance arrangement exists in which the NSW SES Clarence Valley and the NSW SES Richmond Tweed Region will deploy resources to support each other.

1.6.2 Operations involving the Ewingar area will be conducted by the NSW SES Tabulum Unit. This includes the management of isolation and the coordination of resupply Operations. Operations involving the Mororo area will be conducted by the NSW SES Woodburn Unit when the area is cut off from Maclean by flood waters.

1.6.3 A local cross border arrangement exists for NSW SES Corindi Unit, covering operational response in the Glenreagh-Kungala area in the Clarence Valley LGA.

PART 2 - PREPAREDNESS

2.1 MAINTENANCE OF THIS PLAN

2.1.1 The NSW SES Clarence Valley Local Controller will maintain the currency of this plan by;

a. Ensuring that all agencies, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conducting exercises to test arrangements.

c. Reviewing the contents of the plan;

- After each flood operation.
- When significant changes in land-use or community characteristics occur.
- When new information from flood studies become available.
- When flood control or mitigation works are implemented or altered.
- When there are changes that alter agreed plan arrangements.

2.1.2 The plan is to be reviewed no less frequently than every five years.

2.2 FLOODPLAIN AND COASTAL RISK MANAGEMENT

2.2.1 The NSW SES Clarence Valley Local Controller will ensure that;

a. NSW SES participates in local floodplain and coastal risk management committee activities when those committees are formed, in accordance with the protocols outlined in the NSW SES Controllers' Guide.

b. The NSW SES Clarence Nambucca Region Headquarters is informed of involvement in floodplain and coastal risk management activities.

2.3 DEVELOPMENT OF FLOOD INTELLIGENCE

2.3.1 Flood intelligence describes flood behaviour and its effects on the community.

2.3.2 The NSW SES maintains a centralised flood intelligence system.

2.4 DEVELOPMENT OF WARNING SYSTEMS

2.4.1 The NSW SES establishes total flood warning systems for areas affected by flooding. This requires;

a. An identification of the potential clients of flood warning information at different levels of flooding (i.e. who would be affected in floods of differing severities).

b. Available information about the estimated impacts of flooding at different heights.

c. Identification of required actions and the amounts of time needed to carry them out.

d. Appropriate means of disseminating warnings to different clients and at different flood levels.

2.5 COMMUNITY RESILIENCE

2.5.1 The community needs to be as prepared as emergency agencies for the impact of all hazards (5), including flooding.

2.5.2 As the combat agency, NSW SES has the primary responsibility for the collation, assessment and public dissemination of information relating to flooding (3). To do this, NSW SES will require assistance from other agencies, particularly local government councils, dam owners, and the Bureau in the development and delivery of materials.

2.5.3 The NSW SES Clarence Valley Local Controller, with the assistance of the Clarence Valley Council, the NSW SES Clarence Nambucca Region Headquarters and NSW SES State Headquarters, is responsible for the collation, assessment and public dissemination of information relating to flooding (3).

2.5.4 A range of tailored strategies to be employed with NSW communities include:

a. Dissemination of flood-related brochures and booklets in flood liable areas.

b. Dissemination of coastal erosion related brochures in coastal erosion liable areas.

c. Talks and displays orientated to at-risk groups, community organisations, businesses and schools.

d. Publicity given to this plan and to flood-orientated NSW SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

2.6 TRAINING

2.6.1 Throughout this document there are references to functions that must be carried out by the members of the NSW SES Units. The NSW SES Clarence Valley Local Controller is responsible for ensuring that the members are;

a. Familiar with the contents of this plan.

b. Trained in the skills necessary to carry out the tasks allocated to the NSW SES.

2.7 RESOURCES

2.7.1 The NSW SES Clarence Valley Local Controller is responsible for maintaining the condition and state of readiness of NSW SES equipment.

2.7.2 The NSW SES Brushgrove, Copmanhurst, Grafton City, Lawrence, Maclean, Nymboida, Ulmarra, Yamba, and Wooli-Yuraygir Unit Controllers have similar responsibilities in relation to the Clarence Valley Unit Headquarters and equipment.

PART 3 - RESPONSE

CONTROL

3.1 CONTROL ARRANGEMENTS

3.1.1 The NSW SES is the legislated Combat Agency for floods and is responsible for the control of flood operations. This includes the coordination of other agencies and organisations for flood management tasks.

3.1.2 The NSW SES is the designated Combat Agency for damage control for storms. This includes damage control for coastal erosion and inundation from storm activity, specifically the protection of life and the coordination of the protection of readily moveable household goods and commercial stock and equipment. The NSW SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works.

3.1.3 The Local EMPLAN will operate to provide support as requested by the NSW SES Incident Controller.

3.2 OPERATIONAL MANAGEMENT

3.2.1 NSW SES utilises the Australasian Inter-service Incident Management System (AIIMS), which is based on five principles;

a. Flexibility;

b. Functional management;

c. Management by objectives;

d. Unity of Command; and

e. Span of control.

3.2.2 AIIMS provides for different incident levels based on the complexity of management.

3.2.3 The Local Government Area may be divided into sectors and divisions to manage the flood and/or coastal erosion event (divisions are usually a group of sectors).

3.2.4 Sectors and divisions may be based on floodplain classifications, geographical, physical or functional boundaries. A town, city or suburb may be one sector or split into several sectors and divisions.

3.2.5 The Clarence Valley Council area has nine units and is split into numerous operational sectors during significant flood events. Operational sectors can change during an unknown change in flood behaviour, but usually include:

a. Brushgrove – including Cowper

b. Cangai – including Jackadgery, Coombadjha and Cangai (isolation)

c. Copmanhurst – including Copmanhurst, Gordonbrook, Coaldale, Carnham, Barretts Creek, Moleville, Seelands and Waterview Heights

d. Glenreagh - note, NSW SES Corindi Unit have a cross border arrangement to respond to this area

e. Grafton – including Eatonsville, Mountain View, South Grafton, Dovedale, Westlawn, Grafton CBD, North Grafton, Junction Hill, Koolkhan, Trenayr and Alumy Creek

f. Iluka – including Iluka and Woombah

g. Lawrence – including Lawrence and Southgate

h. Maclean – Including Maclean, Ashby Island, Brooms Head, Harwood Island, Ilarwill, Warregah Island and Chatworth Island

i. Nymboida – including Coutts Crossing, Braunstone, McPherson Crossing, Nymboida, Kangaroo Creek, Blaxlands Flat and Lanitza (isolation)

j. Sandon

k. Tyringham - Dundurrabin including Billys Creek, Tyringham and Clouds Creek

l. Ulmarra – including Tucabia, Ulmarra and Gilletts Ridge

m. Wooli – including Minnie Waters, Wooli and Pillar Valley

n. Yamba – including Yamba, Palmers Island, and Woolawehay

3.3 START OF RESPONSE OPERATIONS

3.3.1 This plan is always active to ensure that preparedness actions detailed in this plan are completed.

3.3.2 Response operations will begin;

a. On receipt of a Bureau of Meteorology Preliminary Flood Warning, Flood Warning, Flood Watch, Severe Thunderstorm Warning or a Severe Weather Warning for flash flooding or severe ocean conditions.

b. On receipt of a dam failure alert.

c. When other evidence leads to an expectation of flooding or coastal erosion within the council area.

3.3.3 Contact with the Bureau of Meteorology to discuss the development of flood warnings will normally be through the NSW SES Clarence Nambucca Region Headquarters and/or NSW SES State Headquarters.

3.3.4 The following persons and organisations will be advised of the start of response operations regardless of the location and severity of the flooding anticipated:

a. NSW SES Clarence Nambucca Region Headquarters.

b. NSW SES Brushgrove, Copmanhurst, Grafton City, Lawrence, Maclean, Nymboida, Ulmarra, Wooli-Yuraygir and Yamba Unit Controllers.

c. NSW SES Clarence Valley Brushgrove, Copmanhurst, Grafton City, Lawrence, Maclean, Nymboida, Ulmarra, Wooli-Yuraygir and Yamba Units.

d. Clarence Valley Local Emergency Operations Controller (for transmission to the NSW Police Force).

e. Clarence Valley Local Emergency Management Officer (for transmission to appropriate council officers and departments).

f. Clarence Valley Council Mayor.

g. Other agencies listed in this plan will be advised by the Local Emergency Management Officer on the request of the NSW SES Incident Controller and as appropriate to the location and nature of the threat.

3.4 RESPONSE STRATEGIES

3.4.1 The main response strategies for NSW SES flood operations include;

a. Information Provision and Warning

- Provision of warnings, information and advice to communities.
- Inform the community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.
- Inform the community regarding the potential impacts of coastal erosion and what preparatory actions to undertake.
- Provide timely and accurate information to the community.

b. Property protection

- Protect the property of residents and businesses at risk of flood damage.
- Assistance with property protection by way of sandbagging and the lifting or transporting of furniture, personal effects, commercial stock and caravans.
- Assistance with the relocation of readily moveable household goods and commercial stock and equipment from properties threatened by coastal erosion.
- Assistance with the protection of essential infrastructure.

c. Evacuation

- Evacuation is a risk management strategy that may be used to mitigate the effects of an emergency on a community. It involves the movement of people to a safer location and their return. For an evacuation to be effective it must be appropriately planned and implemented (7).

d. Flood Rescue

- The rescue or safe retrieval of persons or animals trapped by floodwaters.

e. Resupply

- Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.
- Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.

3.4.2 The NSW SES Incident Controller will select the appropriate response strategy to deal with the expected impact of the flood in each sector and/or community. The impact may vary so a number of different strategies may need to be selected and implemented across the whole operational area. The available strategies for each sector and/or community are maintained by the NSW SES.

3.4.3 Supporting agency strategies may include;

a. Protect the community from incidents involving fire and hazardous materials.

b. Maintain the welfare of communities and individuals affected by the impact of a flood.

c. Minimise disruption to the community by ensuring supply of essential energy and utility services.

d. Ensure coordinated health services are available to and accessible by the flood affected communities.

e. Maintain the welfare of animals affected by the impact of a flood.

3.5 OPERATIONS CENTRES

3.5.1 The Clarence Valley Emergency Operations Centre is located at the Local Land Services Building, 24-26 Mulgi Drive, South Grafton, 2460.

3.5.2 NSW SES Unit Operations Centres are located at:

a. Brushgrove Unit - Short Street, BRUSHGROVE, NSW 2460,

b. Copmanhurst Unit - 15 Prescott Street, COPMANHURST, NSW 2460,

c. Grafton City Unit - Irene Street, GRAFTON, NSW 2460

d. Lawrence Unit - 59 High Street, LAWRENCE, NSW 2460,

e. Maclean Unit - 74 River Street, MACLEAN, NSW 2463,

f. Nymboida Unit - Kangaroo Creek Rd, COUTTS CROSSING, NSW 2460

g. Ulmarra Unit - 20 Coldstream Street, ULMARRA, NSW 2462,

h. Wooli-Yuraygir Unit – Wooli Road, WOOLI, NSW 2462, and

i. Yamba Unit - Lot 323 Neptune Place, YAMBA, NSW 2464.

3.6 LIAISON

3.6.1 Any agency with responsibilities identified in this plan may be requested by the NSW SES to provide liaison (including a liaison officer where necessary) to the Clarence Valley Operations Centre, or designated Emergency Operations Centre.

3.6.2 In accordance with NSW EMPLAN, Liaison Officers will;

a. Maintain communication with and convey directions/requests to their organisation or functional area;

b. Provide advice on the status, resource availability, capabilities, actions and requirements of their organisation or functional area, and

c. Where appropriate, have the authority to deploy the resources of their parent organisation at the request of the NSW SES Incident Controller.

3.7 END OF RESPONSE OPERATIONS

3.7.1 When the immediate danger to life and property has passed the NSW SES Operational Area Commander or the NSW SES Incident Controller will issue an 'All Clear' message signifying that response operations have been completed. The message will be distributed through the same media outlets as earlier evacuation messages. The relevant Controller will also advise details of recovery coordination arrangements, arrangements made for clean-up operations prior to evacuees being allowed to return to their homes, and stand-down instructions for agencies not required for recovery operations.

PLANNING

3.8 COLLATING SITUATIONAL INFORMATION

Strategy

3.8.1 The NSW SES maintains and records situational awareness of current impacts and response activities.

Actions

3.8.2 The NSW SES Clarence Valley Unit Headquarters' collate information on the current situation in the Clarence Valley LGA and incorporates in Situation Reports.

3.8.3 The NSW SES Clarence Nambucca Region Headquarters collates Region-wide information for inclusion in NSW SES Region Situation Reports.

3.8.4 Sources of situational information during times of flooding are;

a. **Agency Situation Reports**. Agencies and functional areas provide regular situation reports (SITREPs) to the NSW SES.

b. **Active Reconnaissance**. The NSW SES Incident Controller is responsible for coordinating the reconnaissance of impact areas, recording and communicating observations. Reconnaissance can be performed on the ground and using remote sensing (more commonly aerial). The NSW SES monitors the following problem areas:

- Refer to Volume 3 for further information

c. The **Bureau of Meteorology's Flood Warning Centre** provides river height and rainfall information, data is available on the website http://www.bom.gov.au/nsw/flood/.

d. **Manly Hydraulics Laboratory (a business unit within NSW Public Works)** automated river watch system funded by the Office of Environment and Heritage. This system provides river height and rainfall readings for a number of gauges in the Clarence Valley LGA. Recent data from this system is available on the Manly Hydraulic Laboratory website: http://www.mhl.nsw.gov.au. A history of area floods is also available upon request via the website.

e. **NSW Office of Water**. This office advises flow rates and rates of rise for the Clarence and Orara Rivers. Daily river reports containing information on gauge heights and river flows are available from the website: http://waterinfo.nsw.gov.au/.

f. **Shannon Creek Dam Storage Monitoring System.** This system provides information on Shannon Creek Dam.

g. **NSW SES Clarence Nambucca Region Headquarters**. The Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins and Situation Reports).

h. **Clarence Valley Council**. Provide information on road closures on website www.myroadinfo.com.au for local owned roads.

3.8.5 During flood operations sources of information on roads closed by flooding include;

a. My Road Info website (www.myroadinfo.com.au).

b. Coffs-Clarence Police Local Area Command.

c. Roads and Maritime Services (www.livetraffic.com).

d. NSW SES Clarence Nambucca Region Headquarters.

e. NSW SES Clarence Valley Unit Headquarters.

3.8.6 Situational information relating to consequences of flooding and/or coastal erosion should be used to verify and validate NSW SES Flood Intelligence records.

3.9 PROVISION OF FLOOD INFORMATION AND WARNINGS

Strategy

3.9.1 The NSW SES Clarence Valley Unit Headquarters provides advice to the NSW SES Clarence Nambucca Region Headquarters on current and expected impacts of flooding in the Clarence Valley LGA.

3.9.2 The NSW SES Clarence Nambucca Region Headquarters issues NSW SES Flood Bulletins, NSW SES Livestock and Equipment Warnings, Evacuation Warnings and Evacuation Orders to media outlets and agencies on behalf of all NSW SES units in the Region.

Actions

3.9.3 The **NSW SES Incident Controller** will ensure that the NSW SES Operational Area Commander is regularly briefed on the progress of operations.

3.9.4 **NSW SES Clarence Valley Unit Headquarters operations staff** will be briefed regularly so that they can provide information in response to inquiries received in person or by other means such as phone or fax.

3.9.5 **Bureau of Meteorology Severe Thunderstorm Warning**. These are issued direct to the media by the Bureau when severe thunderstorms are expected to produce dangerous or damaging conditions, including flash flooding. Severe thunderstorms are usually smaller in scale than events covered by Flood Watches and Severe Weather Warnings.

3.9.6 **Bureau of Meteorology Severe Weather Warnings for Flash Flooding**. These are issued direct to the media by the Bureau and provide a warning of the possibility for flash flooding as a result of intense rainfall. These warnings are issued when severe weather is expected to affect land based communities with 6 to 24 hours. Severe Weather Warnings may also include other conditions such as Damaging Surf, Dangerous Surf or tides, or Damaging Winds.

3.9.7 **Bureau of Meteorology Flood Watches**. Flood Watches are issued by the Bureau to advise people of the potential for flooding in a catchment area based on predicted or actual rainfall. Flood Watches will be included in NSW SES Flood Bulletins issued by the NSW SES Clarence Nambucca Region Headquarters.

3.9.8 **Bureau of Meteorology Flood Warnings.** The NSW SES Clarence Nambucca Region Headquarters will send a copy of Bureau Flood Warnings to the NSW SES Clarence Valley Unit. On receipt the NSW SES Incident Controller will provide the NSW SES Clarence Nambucca Region Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in NSW SES Region Flood Bulletins.

3.9.9 **NSW SES Livestock and Equipment Warnings**. Following heavy rain or when there are indications of significant creek or river rises (even to levels below Minor Flood heights), the NSW SES Incident Controller will advise the NSW

SES Clarence Nambucca Region Headquarters which will issue NSW SES Livestock and Equipment Warnings.

3.9.10 **NSW SES Local Flood Advices**. The NSW SES Incident Controller may issue Local Flood Advices for locations not covered by Bureau Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into NSW SES Region Flood Bulletins.

3.9.11 **NSW SES Flood Bulletins**. The NSW SES Clarence Nambucca Region Headquarters will regularly issue NSW SES Flood Bulletins which describe information on the estimated impacts of flooding at the predicted heights (using information from Bureau Flood Warnings and NSW SES Local Flood Advices) to NSW SES units, media outlets and agencies on behalf of all NSW SES units in the Region. When operations relating to coastal erosion/inundation are being undertaken, NSW SES Region Bulletins will contain information and advice about property damage mitigation measures and evacuation in affected areas.

3.9.12 **NSW SES Evacuation Warnings and Evacuation Orders**. These are usually issued to the media by the NSW SES Operational Area Commander on behalf of the NSW SES Incident Controller.

3.9.13 **Dam Failure Alerts**. Dam failure alerts are issued to NSW SES by the dam owner, in accordance with arrangements in the Dam Safety Emergency Plan (DSEP), the system involves the Dam Owner notifying NSW SES State Headquarters Operations Communications Centre, who in turn distribute the warning to the NSW SES Region Headquarters and NSW SES Unit Headquarters.

3.9.14 A flow chart illustrating the notification arrangements for potential dam failure is shown in Attachment 2.

3.9.15 Dam failure alert levels are set in consultation with the NSW SES and are used to trigger appropriate response actions. The conditions that define each of the alert levels are listed in the relevant DSEP. Responses escalate as the alert level migrates from white to amber to red. Table 1 briefly outlines example defining conditions and appropriate NSW SES responses associated with each alert.

Alert Level	Example Defining Condition	NSW SES Response	NSW SES Warning Product
White	▪ May be a structural anomaly. ▪ May be increased monitoring in response to a heavy rainfall event	▪ Implements notification flowchart. ▪ Check operational readiness.	This is a preliminary alert to assist the NSW SES in its preparation. This is not a public alert.
Amber	▪ Failure possible if storage level continues to rise or structural anomaly not fixed	▪ Implements notification flowchart. ▪ Warn downstream population at risk to prepare to evacuate	NSW SES Evacuation Warning

Red	▪ Failure imminent or occurred	▪ Implements notification flowchart. ▪ Evacuation of downstream populations	NSW SES Evacuation Order

Table 1: Dam Failure Alert Levels

Note: Some DSEPs will have alert levels that proceed directly from White to Red. This is the case if adequate time does not exist between the three alert levels to evacuate the downstream population at risk. The decision to omit the Amber Alert level, and the general setting of Alert levels should be undertaken in consultation with the NSW SES.

3.9.16 The NSW SES / Dam Owner will disseminate warnings to the population at risk of dam failure (these arrangements are specific to each dam, are negotiated between the Dam Owner and NSW SES, and are documented in the DSEP).

3.9.17 **Standard Emergency Warning Signal (SEWS).** This signal may be played over radio and television stations to alert communities to Evacuation Warnings, Evacuation Orders, Special Warnings or Dam-Failure Warnings. Approval to use the signal is associated with who approves the warning/order message.

3.9.18 **The Public Information and Inquiry Centre (PIIC)** (operated by the NSW Police Force) will answer calls from the public regarding registered evacuees and provide authorised emergency information to the public.

3.9.19 **The Disaster Welfare Assistance line** is a central support and contact point for disaster affected people inquiring about welfare services advice and assistance. This normally operates during business hours, but can be extended when required.

3.9.20 **The RMS Transport Information Line** will provide advice to callers on the status of roads. The RMS website also lists road closure information.

3.9.21 **Clarence Valley Council** will provide information on the status of roads at www.myroadinfo.com.au and or phone in service on 66430200.

3.9.22 Collation and dissemination of road information is actioned as follows:

a. As part of Situation Reports, the NSW SES Incident Controller provides road status reports for main roads in the council area to the NSW SES Clarence Nambucca Region Headquarters.

b. The NSW SES Clarence Nambucca Region Headquarters distributes information on main roads to NSW SES units, media outlets and agencies as part of NSW SES Flood Bulletins.

OPERATIONS

3.10 AIRCRAFT MANAGEMENT

3.10.1 Aircraft can be used for a variety of purposes during flood operations including evacuation, rescue, resupply, reconnaissance and emergency travel.

3.10.2 Air support operations will be conducted under the control of the NSW SES Region Headquarters, which may allocate aircraft to units if applicable.

3.10.3 NSW SES maintains the following information for the Clarence Valley Council area;

a. Locations of suitable helicopter landing points.

b. Locations of suitable airports and records detailing aircraft size and type that can land at airports.

c. Intelligence on when access to these locations is expected to be lost.

3.11 ASSISTANCE FOR ANIMALS

3.11.1 Matters relating to the welfare of livestock, companion animals and wildlife are to be referred to Agriculture and Animal Services Functional Area.

3.11.2 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be referred to Agriculture and Animal Services Functional Area.

3.11.3 Requests for animal rescue should be referred to the NSW SES.

3.12 COMMUNICATION SYSTEMS

3.12.1 The primary means of communications between fixed locations is by telephone, email and facsimile.

3.12.2 The primary means of communication to and between deployed NSW SES resources is by UHF PMR and mobile telephone.

3.12.3 All liaison officers will provide their own communication links back to their parent agencies.

3.12.4 All other organisations will provide communications as necessary to their deployed field teams.

3.12.5 Back-up communications are provided as follows:

a. RFS UHF PMR

b. CVC UHF PMR

3.13 PRELIMINARY DEPLOYMENTS

3.13.1 When flooding is expected to be severe enough to cut road access to towns, within towns and/or rural communities, the NSW SES Incident Controller will ensure that resources are in place for the distribution of foodstuffs and medical supplies to the areas that could become isolated.

3.13.2 When access between Grafton and Junction Hill is expected to be cut, the NSW SES Incident Controller will advise appropriate agencies so that resources (including sandbags, firefighting appliances, ambulances, etc.) are deployed to ensure that operational capability is maintained.

3.14 ROAD AND TRAFFIC CONTROL

3.14.1 A number of roads within the council area are affected by flooding. NSW SES maintains details of these roads.

3.14.2 The council closes and re-opens its own roads.

3.14.3 The NSW Police Force has the authority to close and re-open roads but will normally only do so (if the Council or the RMS have not already acted) if public safety requires such action.

3.14.4 When resources permit, the NSW SES assists Council, RMS or the Police by erecting road closure signs and barriers.

3.14.5 In flood events, the NSW SES Incident Controller may direct the imposition of traffic control measures. The entry into flood affected areas will be controlled in accordance with the provisions of the State Emergency Service Act, 1989 (Part 5, Sections 19, 20, 21 and 22) and the State Emergency Rescue Management Act, 1989 (Part 4, Sections 60KA, 60L and 61).

3.14.6 Police, RMS or Council officers closing or re-opening roads or bridges affected by flooding are to advise the NSW SES Clarence Valley Local Controller, which will then provide a road information service to local emergency services, the public and the NSW SES Clarence Nambucca Region Headquarters. All such information will also be passed to the Police, RMS and the Council.

3.15 STRANDED TRAVELLERS

3.15.1 Flood waters can strand travellers. Travellers seeking assistance will be referred to the Welfare Services Functional Area for the arrangement of emergency accommodation.

3.16 MANAGING PROPERTY PROTECTION OPERATIONS

Strategy

3.16.1 Protect the property of residents and businesses at risk of flood damage.

Actions

3.16.2 The NSW SES is the responsible agency for the coordination of operations to protect property.

3.16.3 Property may be protected from floods by;

a. Lifting or moving of household furniture.

b. Lifting or moving commercial stock and equipment.

c. Sandbagging to minimise entry of water into buildings.

3.16.4 The NSW SES maintains stocks of sandbags.

3.16.5 Property protection options are however very limited in the Clarence Valley LGA due to the large number of properties that can be affected and the depth of floodwaters arising from severe flooding on the Clarence and Orara Rivers

3.16.6 Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment. The NSW SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works.

3.17 MANAGING FLOOD RESCUE OPERATIONS

Strategy

3.17.1 Rescue of people and animals from floods.

Actions

3.17.2 The NSW SES Incident Controller controls flood rescue in Clarence Valley LGA during a flood emergency.

3.17.3 Flood rescues, may be carried out by accredited units in accordance with appropriate standards.

3.17.4 Additional flood boats and crews can be requested through the NSW SES Clarence Nambucca Region Headquarters.

3.17.5 There may be some residual population which did not evacuate during the early stages of flooding and which require rescue.

3.18 MANAGING EVACUATION OPERATIONS

Strategy

3.18.1 When there is a risk to public safety, evacuation is the primary strategy. Circumstances may include;

a. Evacuation of people when their homes or businesses are likely to flood.

b. Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.

c. Evacuation of people where essential energy and utility services are likely to fail, have failed or where buildings have been made uninhabitable.

d. Evacuation of people when their homes or business are at threat of collapse from coastal erosion.

Actions

3.18.2 The evacuation operation will have the following stages:

a. Decision to evacuate.

b. Mobilisation (mobilisation may begin prior to the decision to evacuate).

c. Evacuation Warning delivery.

d. Evacuation Order delivery.

e. Withdrawal.

f. Shelter.

g. Return.

3.18.3 During floods evacuations will be controlled by the NSW SES. Small-scale evacuations will be controlled by the NSW SES Incident Controller. Should the scale of evacuation operations be beyond the capabilities of local resources control may be escalated to the next operational command level.

Decision to evacuate

3.18.4 In most cases the decision to evacuate rests with the NSW SES Incident Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the NSW SES Operational Area Commander and the Local Emergency Operations Controller.

3.18.5 In events that require large scale evacuations, the decision to evacuate must be escalated to the NSW SES Operational Area Commander or the State Controller.

3.18.6 Some people will make their own decision to evacuate earlier and move to alternate accommodation, using their own transport. This is referred to as self-managed evacuation (8).

Mobilisation

3.18.7 The NSW SES Incident Controller will request the following personnel for doorknock teams for designated Sectors/locations:

a. NSW SES Clarence Valley Unit members.

b. RFS Clarence Valley Zone District members via the RFS Fire Control Officer.

c. Local Police Force officers via the local area command.

3.18.8 The NSW SES Operational Area Commander will request any additional personnel required to assist with doorknock teams using;

a. NSW SES members from the NSW SES Clarence Nambucca Region and surrounding NSW SES Regions.

b. FRNSW personnel arranged via the FRNSW Liaison Officer.

c. RFS personnel arranged via the RFS Liaison Officer.

3.18.9 The NSW SES Incident Controller will request the LEMC to provide Council personnel to assist with traffic coordination within Sector(s)/Community.

3.18.10 The NSW SES Incident Controller will arrange liaison officers for Sector Command Centres.

3.18.11 The NSW SES Operational Area Commander will request the required number of buses for Sectors via the Transport Services Functional Area.

3.18.12 The first *evacuation warnings* issued in the Clarence Valley Council area can be expected under the following conditions:

a. Predicted to exceed 5m at the Grafton gauge Brushgrove, Cowper and Palmers Island.

b. Predicted to exceed 4.5m at the Grafton gauge – Southgate area.

c. Predicted to exceed 5m at the Ulmarra gauge – properties in the Ulmarra area, lower lying areas outside the Grafton flood protection levee, lower areas in the Maclean area.

d. Predicted to exceed 7.8m at the Grafton gauge – A Targeted Evacuation of Grafton *excluding* the high areas of South Grafton.

e. Predicted to exceed 8.0m at the Grafton gauge – A targeted Evacuation of *remaining* areas of Grafton.

Delivery of Evacuation Warnings and Evacuation Orders

3.18.13 The NSW SES will advise the community of the requirements to evacuate. The NSW SES will issue an **Evacuation Warning** when the intent of an NSW SES Incident Controller is to warn the community of the need to prepare for a possible evacuation.

3.18.14 The NSW SES will issue an **Evacuation Order** when the intent of the NSW SES Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.

3.18.15 The NSW SES Incident Controller will distribute Evacuation Warnings and Evacuation Orders to;

a. Sector/Division Command Centres (where established).

b. Clarence Valley Local Emergency Operations Centre.

c. Clarence Valley Council.

d. Coffs-Clarence Police Local Area Command.

e. Clarence Valley Zone Rural Fire Service Control Centre.

f. Radio Stations.

g. Other local agencies and specified individuals.

3.18.16 The NSW SES Operational Area Commander will distribute Evacuation Warnings and Evacuation Orders to;

a. The NSW SES State Operations Centre.

b. The NSW SES Incident Controller.

c. Affected communities via dial-out warning systems where installed or applicable.

d. Relevant media outlets and agencies.

3.18.17 Evacuation Warnings and Evacuation Orders may be delivered through;

a. Radio and television stations.

b. Doorknocking by emergency service personnel.

c. Public address systems (fixed or mobile).

d. Telephony-based systems (including Emergency Alert, SMS and landline).

e. Two-way Radio.

f. In NSW SES Clarence Nambucca Flood Bulletins.

g. Social Media.

3.18.18 The Standard Emergency Warning Signal (SEWS) may be used to precede all Evacuation Orders broadcast on Radio Stations.

3.18.19 Sector Commanders, where established, will distribute Evacuation Orders via Emergency Service personnel in doorknock teams to areas under threat of inundation.

3.18.20 Doorknock teams will work at the direction of;

a. The Sector Commander if a Sector Command Centre is established.

b. The relevant Division Commander where a Division Command Centre has not been established.

3.18.21 Field teams conducting doorknocks will record and report back the following information to their Sector Commander/Division Commander/ Incident Controller;

a. Addresses and locations of houses doorknocked and/or evacuated.

b. The number of occupants.

c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).

d. Details of residents who refuse to comply with the Evacuation Order.

3.18.22 Refusal to evacuate. Field teams should not waste time dealing with people who are reluctant or refuse to comply with any Evacuation Order. These cases are to be referred to the NSW Police Force.

Withdrawal

3.18.23 Evacuations will generally be carried out in stages starting from the lowest areas, low flood islands and low trapped perimeters; and progressively from higher areas.

3.18.24 The most desirable method of evacuation is via road using private transport. This may be supplemented by buses for car-less people. However, other means of evacuation may also be used if available and as necessary (e.g. by foot, rail, air).

3.18.25 Evacuees who require emergency accommodation or disaster welfare assistance will be directed to designated evacuation centres. Evacuees who have made their own accommodation arrangements will not be directed to evacuation centres. It is not possible to determine in advance how many will fall into this category.

3.18.26 Evacuees will:

a. Move under local traffic arrangements from the relevant Sectors/Community via managed evacuation routes;

b. Continue along the suburban/regional/rural road network to allocated Evacuation Centres.

3.18.27 **Health Services**. The Health Services Functional Area will coordinate the evacuation of hospitals, health centres and aged care facilities (including nursing homes).

3.18.28 **Schools.** School administration offices (Department of Education, Catholic Education Office and Private Schools) will coordinate the evacuation of schools if not already closed.

3.18.29 If there is sufficient time between the start of response operations and the evacuation of communities, the NSW SES Operational Area Commander will discuss the temporary closure of appropriate schools with the Regional Director, North Coast Region, Department of Education. This will enable pupils to stay at home or be returned home so they can be evacuated (if required) with their families.

3.18.30 Note that in the Clarence Valley LGA, school principals may close some schools affected by flooding in the early stages of flooding.

3.18.31 **Caravan parks**. When an evacuation order is given occupiers of movable dwellings should:

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.

3.18.32 Where possible, 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.

3.18.33 Caravan park managers will ensure that their caravan park is capable of being evacuated in a timely and safe manner.

3.18.34 Advise the NSW SES Clarence Valley Local Controller of:

a. The number of people requiring transport.

b. Details of any medical evacuations required.

c. Whether additional assistance is required to effect the evacuation.

3.18.35 Check that all residents and visitors are accounted for.

3.18.36 Inform the NSW SES Clarence Valley Local Controller when the evacuation of the caravan park has been completed.

3.18.37 Provide the NSW SES Clarence Valley Local Controller with a register of people that have been evacuated.

3.18.38 **Assistance Animals, Pets and Companion Animals of Evacuees:** Assistance animals (guide dogs, hearing assistance animals, etc.) will remain in the care of their owners throughout the evacuation. This includes transport and access into evacuation centres etc.

Where possible owners should take their companion animals with them when they are asked to evacuate. Due to safety restrictions, it may not be possible to allow companion animals to accompany their owners when being transported via aircraft or flood rescue boat. In such circumstances Agriculture and Animal Services will coordinate separate arrangements for evacuation and care of companion animals.

3.18.39 **Transport and storage:** Transport and storage of furniture from flood and/or coastal erosion threatened properties will be arranged as time and resources permit.

3.18.40 **Security:** The NSW Police Force will coordinate the provision of overall security for evacuated areas.

3.18.41 The NSW SES Incident Controller is to provide the following reports to the NSW SES Clarence Nambucca Region Headquarters:

a. Advice of commencement of the evacuation of each Sector,

b. Half-hourly progress reports (by Sectors) during evacuations,

c. Advice of completion of the evacuation of each Sector.

3.18.42 **Assembly areas:** An assembly area is a designated location used for the assembly of emergency-affected persons before they move to temporary accommodation or a nominated evacuation centre. As such these areas do not provide welfare assistance nor are they used for long term sheltering or provision of meals. An assembly area may also be a prearranged, strategically placed area, where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency.

Shelter

3.18.43 **Evacuation Centres:** Evacuees will be advised to go to friends or relatives, or else be taken to the nearest accessible evacuation centre, which may initially

be established at the direction of the NSW SES Incident Controller, but managed as soon as possible by Welfare Services.

3.18.44 The following locations are suitable for use as flood evacuation centres:

a. South Grafton High School
b. Brooms Head Bowling Club
c. Wooli Bowling & Recreation Club
d. Yamba Bowling & Recreation Club
e. Glenreagh School of Arts
f. Iluka Community Hall
g. Southgate Community Hall
h. Maclean Showground
i. Copmanhurst Hall, Copmanhurst
j. Lawrence Primary School, Lawrence
k. Plantation Motel, 2 Sheehys Lane Tyndale

3.18.45 **Registration:** The NSW Police Force will facilitate the requirement of Disaster Victim Registration for people evacuated to designated evacuation centres.

3.18.46 **Animal Shelter:** Facilities to hold and care for companion animals of evacuees will be coordinated by Agriculture and Animal Services if required. If required, Agriculture and Animal Services will also coordinate refuge areas for livestock (e.g. horses) where feasible.

Return

3.18.47 The NSW SES Incident Controller will advise when return to evacuated areas is safe after flood waters have receded and reliable access is available.

3.18.48 The NSW SES Incident Controller will determine when it is safe for evacuees to return to their homes in consultation with:

a. The Recovery Coordinating Committee (if established)
b. Welfare Services Functional Area Coordinator (welfare of evacuees)
c. Engineering Services Functional Area Co-ordinator (safety of buildings, structural integrity of levees/dams)
d. Health Service Functional Area Coordinator (public health)
e. Transport Services Functional Areas Coordinator (arrangement of transport)
f. The Clarence Valley LEOCON
g. The Clarence Valley Council
h. NSW SES Operational Area Commander

i. Other appropriate agencies/functional areas as required (mitigation and advice regarding identified risks resulting from the flood and/or coastal erosion event).

3.18.49 Once it is considered safe to do so, the NSW SES Incident Controller will authorise the return of evacuees.

3.18.50 The return will be controlled by the NSW SES Incident Controller and may be conducted, at their request, by the Recovery Coordinator.

3.19 INITIAL EVACUATIONS

3.19.1 A number of evacuations are required during the relatively frequent floods of Minor and Moderate classification.

3.19.2 Specific evacuation arrangements for each Sector/Community are detailed in Volume 3.

3.20 MANAGING RESUPPLY OPERATIONS

3.20.1 The NSW SES is responsible for the coordination of the resupply of isolated communities and properties.

3.20.2 If isolation is expected to occur, residents should be encouraged to consider their needs and suitability for an unknown period of isolation.

3.20.3 If properties/communities are going to remain in locations expected to become isolated, households/retailers should be encouraged to stock up on essential supplies.

3.20.4 Where practicable, once supplies are delivered to the NSW SES designated loading point, the NSW SES Incident Controller will arrange for the delivery of essential foodstuffs, fuels or urgent medical supplies required by an isolated property or community.

3.20.5 All reasonable effects will be made to deliver supplies, however where necessary the NSW SES will prioritise the delivery of items.

Resupply of Isolated Towns and Villages

Strategy

3.20.6 Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.

Actions

3.20.7 The NSW SES is responsible for the coordination of the resupply of isolated communities.

3.20.8 If flood predictions indicate that areas are likely to become isolated, the NSW SES Incident Controller should advise retailers that they should stock up.

3.20.9 When isolation occurs, retailers will be expected to place orders with suppliers where they have a line of credit and to instruct those suppliers to

package their goods and deliver them to loading points designated by the NSW SES.

3.20.10 The NSW SES is prepared to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

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

Resupply of Isolated Properties

Strategy

3.20.12 Ensure supplies are maintained to properties by coordinating the resupply of properties which have become isolated as a consequence of flooding.

Actions

3.20.13 The resupply of isolated properties is a common requirement during floods and coordination can be difficult because requests can emanate from a variety of sources. Isolated properties may call their suppliers direct, place their orders through their own social networks or contact the NSW SES.

3.20.14 The principles to be applied when planning for the resupply of isolated properties are;

a. The NSW SES will coordinate resupply and establish a schedule.

b. Some isolated households will not have the ability to purchase essential grocery items due to financial hardship. If an isolated household seeks resupply from the NSW SES and claims to be, or is considered to be, in dire circumstances, he/she is to be referred to Welfare Services for assessment of eligibility. Where financial eligibility criteria are met, Welfare Services will assist with the purchase of essential grocery items. Welfare Services will deliver the essential grocery items to the NSW SES designated loading point for transport.

c. Local suppliers will liaise with the NSW SES regarding delivery of resupply items to the designated loading point.

d. Local suppliers are responsible for packaging resupply items for delivery.

3.20.15 A flowchart illustrating the Resupply process is shown in Attachment 1. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes.

PART 4 - RECOVERY

4.1 RECOVERY COORDINATION AT THE LOCAL LEVEL

4.1.1 The NSW SES Clarence Valley Local Controller will ensure that planning for long-term recovery operations begins at the earliest opportunity, initially through briefing the Local Emergency Management Committee (LEMC). As soon as possible the LEMC will meet to discuss recovery implications including the need for a Local Recovery Committee. The LEMC will consider any impact assessment in determining the need for recovery arrangements. This is conveyed in the first instance to the State Emergency Operations Controller (SEOCON) for confirmation with the State Emergency Recovery Controller (SERCON).

4.1.2 Once the need for recovery has been identified, the SERCON, in consultation with the SEOCON, may recommend the appointment of a Local Recovery Coordinator and nominate an appropriate candidate to the Minister for Emergency Services.

4.1.3 The SERCON may send a representative to the LEMC and subsequent recovery meetings to provide expert recovery advice and guidance.

4.1.4 The NSW SES Clarence Valley Local Controller and Local Emergency Operations Controller (LEOCON) attend recovery meetings to provide an overview of the emergency response operation.

4.1.5 The NSW SES Operational Area Commander, the Regional Emergency Management Officer and appropriate Regional Functional Area Coordinators will be invited to the initial local meeting and to subsequent meetings as required.

4.1.6 The recovery committee will:

a. Develop and maintain a Recovery Action Plan with an agreed exit strategy.

b. Monitor and coordinate the activities of agencies with responsibility for the delivery of services during recovery.

c. Ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of recovery objectives and strategies and are informed of progress made.

d. Provide the SERCON with an end of recovery report.

e. Ensure the recovery is in line with the National Principles of Disaster Recovery and the NSW tenets.

4.2 RECOVERY COORDINATION AT THE REGION AND STATE LEVEL

4.2.1 In the event that an emergency affects several local areas, a Region Emergency Management Committee (REMC) will meet to discuss recovery

implications including the need for a Region Recovery Committee. This is conveyed in the first instance to the SEOCON for confirmation with the SERCON.

4.2.2 In the event of an emergency which affects multiple regions, or is of state or national consequence, or where complex, long term recovery and reconstruction is required, it may be necessary to establish a State Recovery Committee and the appointment of a State Recovery Coordinator.

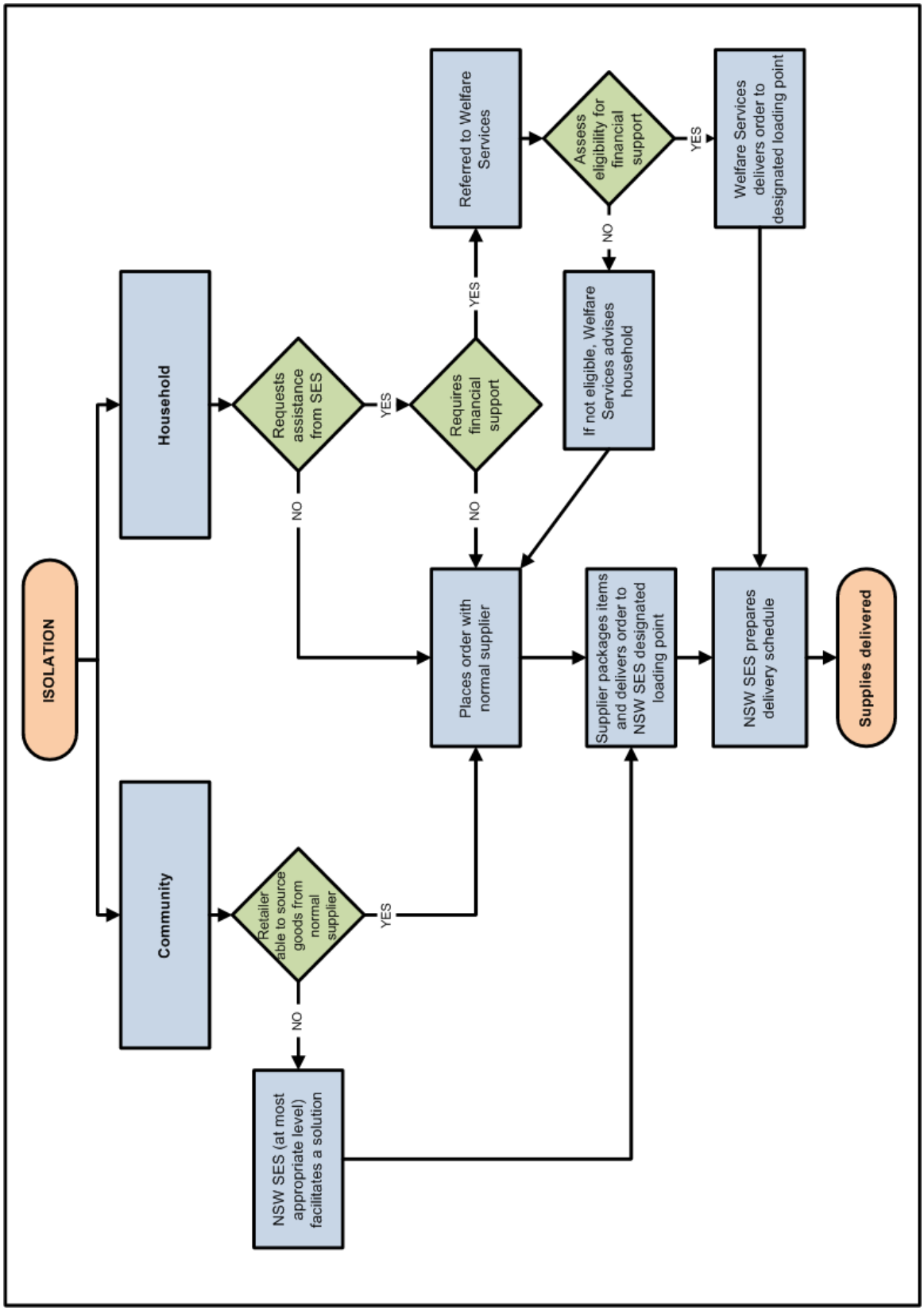
4.3 ARRANGEMENTS FOR DEBRIEFS / AFTER ACTION REVIEWS

4.3.1 As soon as possible after flooding has abated, the NSW SES Clarence Valley Local Controller will advise participating organisations of details of response operation after action review arrangements.

4.3.2 The NSW SES Clarence Valley Local Controller will ensure that adequate arrangements are in place to record details of the after action review and each item requiring further action is delegated to an organisation or individual to implement.

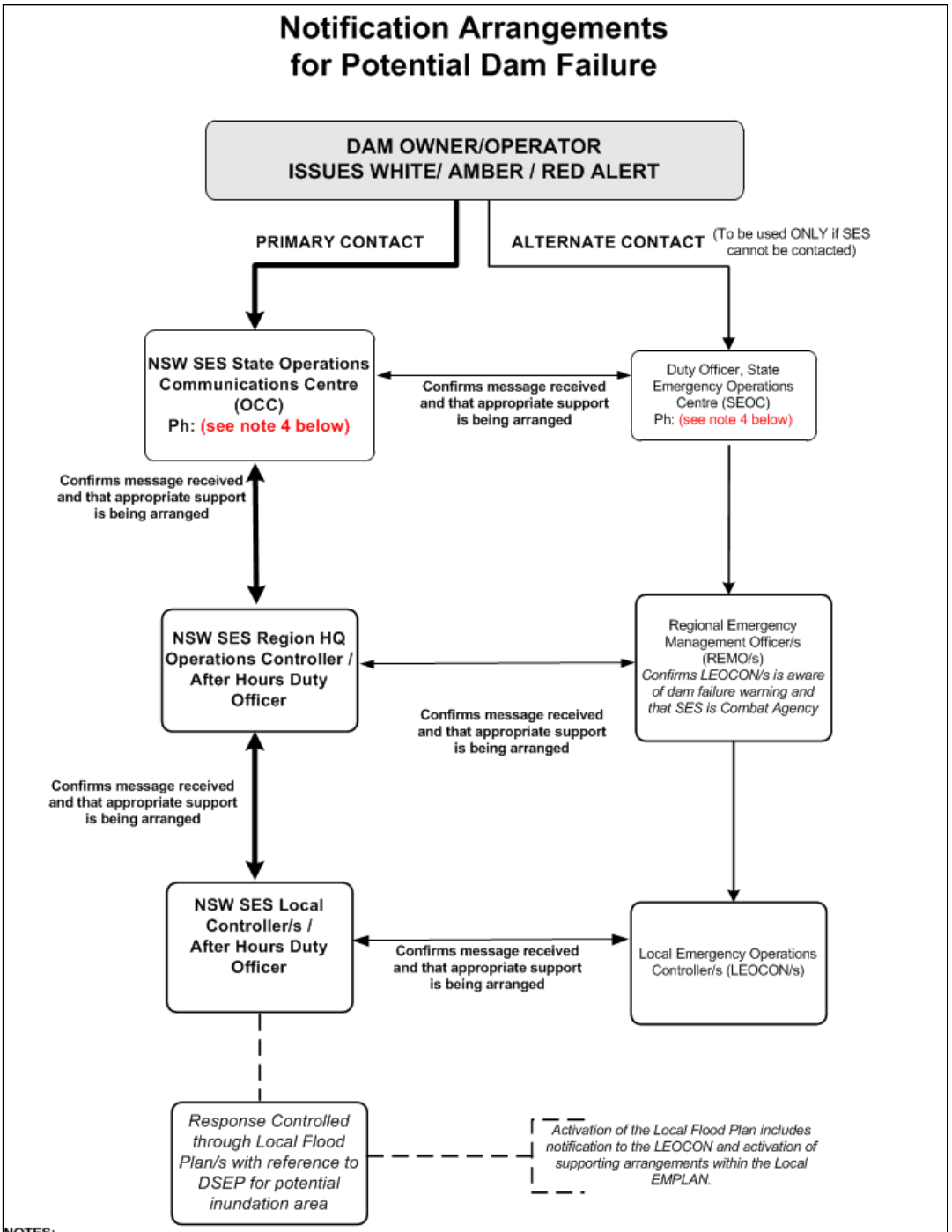
4.3.3 Follow-up to ensure the satisfactory completion of these actions will be undertaken by the Clarence Valley Local Emergency Management Committee.

ATTACHMENT 1 - RESUPPLY FLOWCHART



Please Note: **The chart outlines the resupply process, but does not encompass all potential situations and outcomes.**

ATTACHMENT 2 - DAM FAILURE ALERT NOTIFICATION ARRANGEMENTS FLOWCHART



NOTES:

1. Dam owners should only contact the SEOC if the SES State Operations Communications Centre (OCC) cannot be contacted.
2. The first priority for notification is to contact the next SES HQ or the next level of EOC down the flowchart. The second notification should always be across the flow chart to confirm the message is received. If the first priority notification fails or is not picked up for any reason, the second priority notification should be made before any further attempts to contact the first priority (this is why an alternate or backup system of contacts is in place).
3. The triple zero (000) number for emergency services should not be used unless contact cannot be made with SES or the SEOC, as it is likely the triple zero (000) operators will have difficulty dealing with the very unusual case of potential or actual dam failure.
4. Dam owners must contact the SES State Headquarters during the preparation of the DSEP to obtain the appropriate emergency contact numbers.

ATTACHMENT 3 - CLARENCE VALLEY LGA MAP

Map publication prepared by the NSW State Emergency Service
Geospatial Intelligence Branch
Datum/Proj: GDA94 / not projected
Production Date: 24/11/2016

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NSW STATE EMERGENCY SERVICE

HAZARD AND RISK IN CLARENCE VALLEY

Volume 2 of the Clarence Valley Local Flood Plan

Last Update: August 2017

FloodSafe

AUTHORISATION

The Hazard and Risk in Clarence Valley 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

Manager Emergency Risk Management

Date: 2-8-17

Approved

NSW SES Clarence Nambucca Region Controller

Date: 2 AUG 2017

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VERSION LIST

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Clarence Valley Local Flood Plan	June 2012

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

The Clarence Valley Local Controller

NSW State Emergency Service

26 Induna Street, SOUTH GRAFTON NSW 2460

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. The Clarence Valley Local Government Area (LGA) is located in the Northern Rivers region of New South Wales, about 600 kilometres (km) north of Sydney and 300 km south of Brisbane. The LGA is bounded by the Kyogle and Richmond Valley Council areas in the north, the Coral Sea in the east, Coffs Harbour City and Bellingen Shire in the south and Glen Innes Severn Council area, Guyra Shire and Tenterfield Shire in the west (1).

b. The LGA includes numerous rural localities and the townships and villages including Alice, Angourie, Ashby, Baryulgil, Braunstone, Brooms Head, Clouds Creek, Coaldale, Copmanhurst, Coutts Crossing, Cowper, Dalmorton, Diggers Camp, Dundurrabin, Glenreagh, Grafton, Gulmarrad, Iluka, Jackadgery, Junction Hill, Lawrence, Maclean, Minnie Water, Newton Boyd, Nymboida, Palmers Island, Ramornie, Sandon, South Grafton, Southgate, Townsend, Tucabia, Ulmarra, Waterview Heights, Wooli, Wooloweyah, Woombah and Yamba (1).

c. The landscape is predominantly rural, with expanding residential areas and some industrial and commercial land uses. The LGA has a total land area of 10,440 square km, with approximately 27% of the LGA is National Parks, Nature Reserves or environmental management (1).

d. Much of the rural area is used for forestry, agriculture and grazing, including beef cattle and sugarcane growing, as well as fishing. In more recent years tourism has become a major industry, especially along the coast.

e. Settlement is based around the main town of Grafton and the townships of Iluka, Maclean and Yamba, with many small villages and localities along the coast and inland (1).

f. The Clarence Valley has a humid subtropical climate with hot, wet and humid summers, and mild, drier winters. Rainfall is lower inland of the LGA compared to on the coast. There is an annual average rainfall of up to 1,465 millimetres (mm) in coastal centres such as Yamba and 975 mm at Grafton (1).

g. The Clarence Valley LGA estimated resident population for 2014 is 51,003. Table 12 provides more detail regarding the specific areas of the Clarence Valley and the population numbers recorded in the 2011 Census.

h. The Valley is at the convergence of three major highways and the north-south rail network. The Clarence has its own regional airport and seaport. The Pacific Highway is the key road transport network linking the Clarence Valley north to Queensland and south to Sydney. The Summerland Way is an inland highway network that

provides important north-south connectivity and is an alternative highway route between Brisbane, Casino, Grafton and Coffs Harbour. The Gwydir Highway is an east-west corridor that links the inland plains to the Clarence via the New England region. Owned and operated by Council, the Clarence Valley Regional Airport located 17 km south of Grafton along the Pacific Highway (1).

1.2 LANDFORMS AND RIVER SYSTEMS

Clarence River Valley

a. The Clarence Valley Council area is part of the Clarence River catchment. The Clarence River is the largest coastal river in New South Wales in terms of both catchment area and discharge. The headwaters of the Clarence River system lie outside the Council area to the north, west and south. The Clarence River enters the Clarence Valley Council area between Tabulam and Cleveland Crossing, flowing in a southerly direction. It is joined by numerous creeks and streams draining the Great Dividing and New England ranges to the west (the Ewingar, Nogrigar, Washpool and Coombadjha creeks and the Mann River) and the Richmond Range to the east (the Dulgigin, Kungarrabar, Deep, Josephs, Fourteen Mile and Dumbudgery creeks). In these western and northern areas of the Council area, the land is rugged and forest covered and the watercourses are both fast-flowing and quick to rise (2). The catchment is comprised of four sections (see Map 1):

   i. The Upper Clarence section, which drains the area from the Queensland border to the junction of the Clarence and Mann rivers. In this section the main streams are the Maryland, Bookookoorara, Booboo Booboo, Cataract and Timbarra (Rocky) Rivers and the Washpool, Koreelah and Tooloom Creeks which drain the Great Dividing Range to the north and west, and numerous small creeks draining the Richmond Range to the east (2).

   ii. The Mann River section, which drains the New England Tablelands and the Dorrigo Plateau to the south-west and south of the Clarence Valley Council area. The major tributaries of the Mann River are the Henry, Nymboida, Sara, Aberfoyle, Guy Fawkes and Boyd Rivers (2).

      - The Nymboida River system drains the New England Tablelands and the Dorrigo Plateau to the west and south of the Local Government Area. The principal tributaries of the Nymboida are the Mann, Henry, Boyd and Guy Fawkes rivers, each of which forms part of the Local Government Area's western boundary, and the Mitchell, Sara, Aberfoyle, Blicks and Little Nymboida rivers. The Nymboida River proper flows in a northerly direction to its confluence with the Mann River and Jackadgery Creek near Carnham. Most of the tributaries of the Nymboida join it from the west. Almost all of the Nymboida River's catchment area is rugged,

deeply-dissected and forest-covered. There are few areas of floodplain development (2).

- Below its confluence with the Mann River the Clarence River flows in a south-easterly direction towards the village of Copmanhurst. On this stretch the principal tributaries are the Gorden Brook and the Pulganbar, Smiths, Stockyard and Whiteman creeks. These streams drain the southern portion of the Richmond Range. Below Copmanhurst the Orara River joins the Clarence from the south (2).

iii. The Orara River section, which flows northward through a long, narrow valley drains parts of the Dorrigo Plateau and the Coastal Range. The headwaters are hilly but along its course the river traverses areas of relatively flat country interspersed by sections in which it is contained by steep banks. A number of major tributaries drain into the Orara River Basin, including Urumbillum River, Mirum Creek and Fridays Creek, discharging to the Orara River in Upper Orara; Wongiwomble Creek discharging to the Orara River near Karangi; Nana and Coldwater Creek discharging to the Orara River near Nana Glen; Kings and Finberg Creek discharging to Bucca Creek upstream of Nana Glen; Glenreagh Creek; and Tallawudjah creek discharging to Orara River near Glenreagh (3).

iv. The Lower Clarence section, begins at the village of Copmanhurst and marks the upper limit of tidal influence. Almost all this floodplain land lies downstream of Grafton. Below the villages, the valley gradually broadens into a wide, swampy plain. On this section Sportsmans Creek, Swan Creek, Shark Creek and Coldstream Rivers enters the Clarence River. Lesser watercourses include Bayldons, Alumy, Deep Gully, Bunyip, Warragai and Harrisons Creeks (2). The major tributaries include:

- Coldstream Basin, which drains the area to the east of Grafton, around Tucabia and Tyndale, which is approximately 160 square km (2).
- Shark Creek Basin, which covers the area between Tyndale and Maclean along Shark Creek is known as Shark Creek Basin and is approximately 30 square km. North and east of Maclean, the floodplain extends north across Harwood and Chatsworth Islands and south of the river around James Creek and Gulmarrad towards Lake Wooloweyah (2).

Coastal Rivers

b. Some minor coastal rivers rise on the eastern side of the coast range and flow directly to the Tasman Sea (2).

c. The Wooli River, with its main tributary the Bookram Creek, drains an area of about 200 square km. Tidal influence extends about 15 km upstream. The lower reaches are generally swampy (2).

d. Flood drainage on the Wooli River can be impeded by storm surge conditions produced by low pressure systems centred off the coast (2).

e. The Sandon River and its tributary the Toumbaal Creek drain an area of mostly National Park and State Forest (2).

1.3 STORAGE DAMS

a. Dam locations are shown on the River Basin Map.

Table 1: Prescribed Dams in Clarence Valley LGA; summary of information about each storage.

Shannon Creek Dam (4)	
Owner / Operator	Clarence Valley Council
Description of Dam	Shannon Creek Dam forms part of the Clarence Valley and Coffs Harbour Regional Water Supply scheme. The Dam consists of a main embankment, a spillway and downstream valve house and pump station. The main earth and rock fill embankment is a 44 m high, and 405m long, with the spillway cutting through the left abutment. The spillway is an uncontrolled concrete lined structure with a concrete ogee crest. The Dam crest level is RL 91.65 m AHD. The storage capacity of the Dam at FSL (RL 83.27 m AHD) is 30,000 ML. The catchment area is approximately 37.5 square km.
Location	The Shannon Creek Dam Site is located 9 km due west of the township of Coutts Crossing, on Shannon Creek, 14.5 km upstream of the Orara River junction. It lies within the Clarence Valley LGA and Clarence River Basin.
Communities Downstream	Along Shannon Creek and the Orara River, there are several bridges and houses, as well as a number of developed areas along the banks of the Clarence River.
Monitoring System	Automatic rain gauges, water level recorder, piezometers, seepage weir, settlement survey markers, visual inspections.
Warning System	There is a SCADA system with pre-set alert levels. This is no additional alert system to warn downstream residents.
Other	

Rushforth Road 100ML Reservoir (5)	
Owner / Operator	Clarence Valley Council
Description of Dam	Rushforth Road Reservoir is a 8.5m high raw water reservoir with a storage capacity of 100ML.
Location	Located in South Grafton.
Communities Downstream	Golf Course and former abattoir are downstream, however impacts are downstream.
Monitoring System	Telemetry and visual monitoring and inspections.
Warning System	Telephony-based.
Other	n/a

Other Major Water Storages

b. Lake Hiawatha and Minnie Water are located approximately 30 km east of Grafton and approximately 5 km north of Wooli. These two adjoining lakes are dune contact freshwater lakes. That is, they are located in depressions in the country rock but are in contact with a coastal dune. The lakes are 500 m apart and in times of extreme flooding they become joined and flow into the Wooli River. Lake Hiawatha is clear and sandy, while Minnie Water is turbid due to high organic matter content (6).

1.4 WEATHER SYSTEMS AND FLOODING

a. The heavy rain which produces floods in the Clarence Valley Council area tends to come from the following kinds of weather system:

i. Monsoonal low-pressure systems moving across the Great Dividing Range from northern Australia, usually during the summer and autumn months. These systems are indicated on weather maps as elongated low-pressure troughs stretching from the Northern Territory to the north coast of NSW, and flooding from them usually originates on the upper Clarence and Mann Rivers (2).

ii. Rain depressions originating as tropical cyclones in the Gulf of Carpentaria or the Coral Sea and moving southwards. The flood of January 1974 was of this type, the 'tail' of ex-tropical cyclone Wanda causing heavy falls over south-eastern Queensland and north-eastern NSW. Two months later, the March 1974 flood resulted from a rain depression which had originated as Tropical Cyclone Zoe. Such depressions may be associated with storm surge conditions (temporarily elevated sea levels and large waves) which retard drainage and therefore worsen the effects of flooding at and near the coast (2).

iii. East Coast low-pressure systems which travel along the coast, usually during the cooler months and direct moist on-shore winds over the Clarence River basin. Orographic uplift of these air masses brings heavy rain over the Coast Range and the higher country to the west of Grafton. The May 1996 flood on the Clarence River was of this origin. Such events are normally associated with lower-river floods rather than floods originating in the western uplands sections of the catchment. They may also produce storm surge conditions which retard the draining of flood waters (2).

iv. High-intensity, short-duration convective thunderstorms occur frequently over the valley, especially during the summer months. The rain from such storms may cause village drainage systems or minor creeks to surcharge, creating short-duration local ponding of low-lying areas. No rise in the Clarence River or other main streams is likely from such events (2).

b. Rains from the first three types of weather systems can persist for some days, especially in the case of east-coast low pressure systems which can cause heavy rain over periods of three to five days. Sometimes, as in May 1996, there may be two or more separate rain events a few days apart, causing floods with multiple peaks on the Clarence River (2).

c. Very heavy rainfalls, in excess of 225 mm in 24 hours and more than 40 mm over the course of an event, are quite common in the Clarence River catchment. Dorrigo, in the far south of the catchment, has a recorded 24-hour rainfall of 809 mm and monthly total of 1395 mm and an average annual precipitation of nearly 2000 mm (2).

d. The most severe floods in the valley are generally the result of the passage of degraded ex-tropical cyclones from the north during summer and autumn or east coast low pressure systems occurring during autumn and winter. When depressions such as these are characterised by very low central pressures, raised sea levels (storm surges) can occur. This exacerbates flooding when sea waters invade coastal areas and when flows in the river are retarded (2).

e. North-eastern NSW experiences a distinct wet period between December and April, and more than two thirds of the recorded floods on the Clarence River have occurred during the summer and autumn months from January to May. The spring and early summer months are relatively dry and floods are infrequent during this time of year. No floods above the 'major flood' level of 5.4 m at Grafton have been recorded in the September-December months. Severe flooding has, however, occurred in the early winter months of June and July (2).

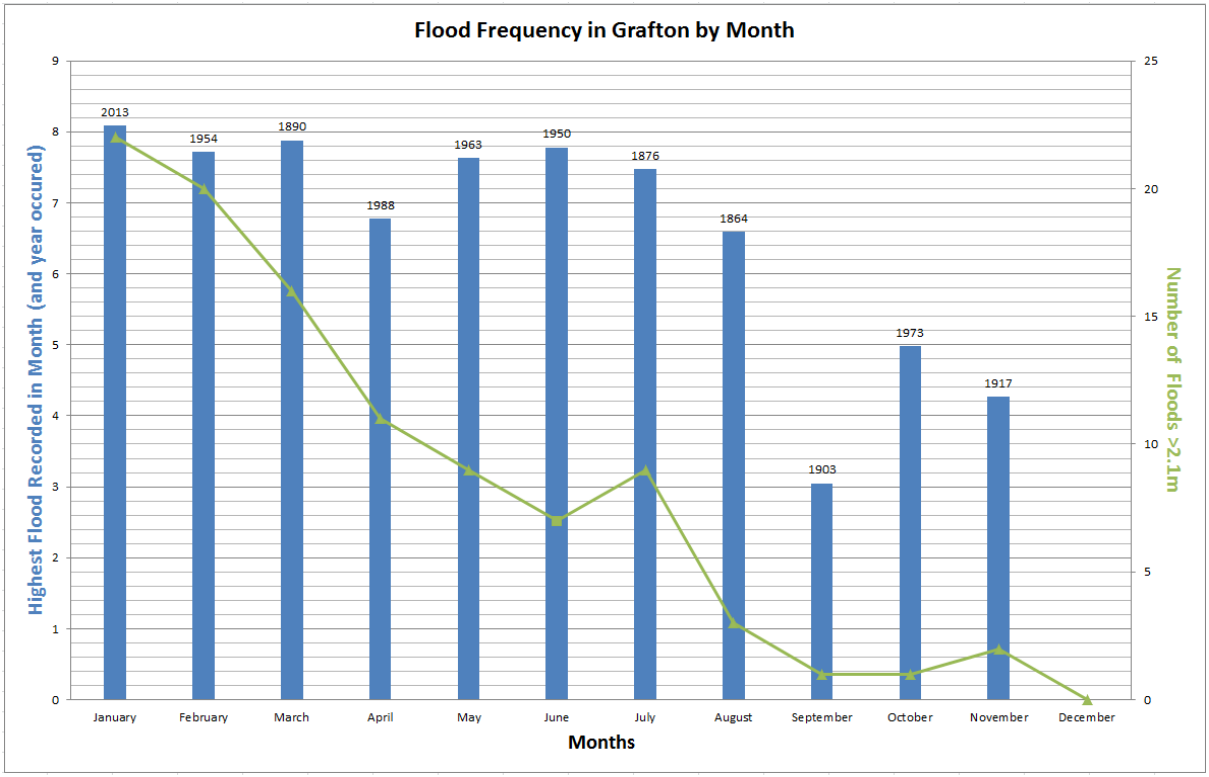


Figure 1: Monthly Distribution of Major Floods in Grafton (7)

1.5 CHARACTERISTICS OF FLOODING

a. Flooding often occurs as a result of rain which has fallen outside the Council area, and significant contributions to main-river flooding can be made by any of the upper sections of the Clarence River catchment (2).

b. Upstream of Grafton, flooding is usually confined to very small areas of floodplain in the immediate vicinity of stream channels and lasts for relatively short periods (2).

c. In the vicinity and downstream of Grafton, including the Carrs Island and Bakers Swamp areas, Southgate, Lower Southgate and the Everlasting Swamp, extensive areas of flat, swampy ground are liable to inundation when the Clarence River breaks its banks. This is the most significant flood regime within the area. The flooding is at its worst when backwater flow fills Bakers Swamp from the east, though local rain may also cause problems in this area. Flooding in the area can also be exacerbated when flood drainage is retarded, for example when oceanic storm surge conditions exist along the coast (2).

d. Maclean Area: Above Palmers Island, the severity of floodplain inundation is controlled primarily by the magnitude of Clarence River flows from catchments above Grafton. When flooding occurs within the Local Government Area, natural riverside levees give partial protection to low-lying alluvial areas behind them. Backwater flows up tributary streams spill into the swamps behind the levees,

eventually creating flooding of usually dry land. Inundation periods can last for some weeks, the natural levees acting to inhibit drainage (2).

e. Near the coast, unusually high tides can produce inundation of land which is usually dry. Thunderstorm activity, especially when it occurs in conjunction with such tides, can produce significant local ponding in Iluka and Yamba (2).

f. Between Palmers Island and the river's mouth there is an increasing influence of ocean storm tide conditions and peak flood levels at Yamba are dictated almost entirely by ocean storm tides. Storm activity over and off the coastline normally brings flood-producing rains over the land mass, with peak catchment runoff flows occurring sometime after the storm activity itself (2).

g. Refer to the River Basin Schematic at the end of this Volume.

Peak height flow times

h. Partly because of variations in flood levels on different tributary streams within the catchment, travel times of flood peaks can vary significantly from flood to flood. The times listed below need to be regarded, therefore, as approximations only. Particularly in periods of very severe flooding, it should be noted that flow times may be shorter than shown here. Equally, situations in which large volumes of water suddenly enter a low-flowing river tend to produce much faster flows than situations in which the inflow is gradual. Indicative flood travel times recorded are shown in Table 2 and Table 3 below (2).

Table 2: Indicative Flow Travel Time for the Clarence River for Grafton and Maclean (2)

Between Gauges	Travel Time
Tabulam to Grafton	16-20 hours
Towgan Grange to Grafton	6 - 14 hours
Lilydale to Grafton	4-13 hours
Glenreagh to Grafton	12 - 18 hours
Grafton to Ulmarra	2 -3 hours
Grafton to Maclean	6 - 24 hours

i. Flow times from Grafton to Maclean can be very variable, depending largely on ocean conditions and tidal influences. Times as far apart as 6 and 24 hours have been recorded (2).

Table 3: Indicative Flow Travel Time for the Clarence River for Tabulam to Baryulgil (2)

Locations	Travel Time
Tabulam to Baryulgil	7 hours
Nymboida to Buccarumbi (Nymboida River)	2 hours
Buccarumbi to Jackadgery (Nymboida and Mann Rivers)	4 hours
Jackadgery to Towgan Grange (Mann and Clarence Rivers)	12 hours
Baryulgil to Towgan Grange	7 hours
Towgan Grange to Copmanhurst	4 hours
Glenreagh to Coutts Crossing (Orana River)	10 hours
Coutts Crossing to Grafton (Orara and Clarence Rivers)	4 hours
Copmanhurst to Grafton	4 hours
Grafton to Ulmarra	3 hours
Ulmarra to Brushgrove	3 hours

Flood design heights

j. Gauge heights for various gauges along the Clarence River are shown for a range of design flood levels in Table 4.

Table 4: Clarence River design flood levels (8) (9)

Predicted Flood Frequency	Grafton Gauge Height (m)	Maclean Gauge Height (m)	Wooli Gauge Height (m)	Ulmarra Gauge Height (m)	Brushgrove Gauge Height (m)	Lawrence Gauge Height (m)	Glenreagh Gauge Height (m)	Iluka Gauge Height (m)
20% AEP	6.1	2.4	-	5.0	4.2	-	11.97	1.1
5% AEP	7.9	3.1	2.28	6.1	5.1	-	14.61	2.0
2% AEP	8.2	3.4	-	6.2	5.5	-	-	2.2
1% AEP	8.3	3.6	2.75	6.4	5.8	5.87	15.63	2.5
0.5% AEP	8.42	3.94	-	-	-	-	17.83	-
Extreme (e.g. 1.53 x 1% AEP)	9.7	5.1	4.44	8.4	8.0	8.16	19.38	3.5

1.6 FLOOD HISTORY

a. Numerous flood events, some of them very severe, have been recorded at Grafton since records were first kept in 1839. Floods which have exceeded the present 'major flood' level (5.4 m at the Prince Street gauge are shown in Table 5. Some of the

values are approximations, but the records since 1945 are considered to be accurate. These are compared to Copmanhurst and Ulmarra gauges (2).

b. Table 5 highlights the irregularity of serious flood events on the lower Clarence River. Several bad floods may occur in a short period of time, as was the case in the periods 1887-93, 1946-54 and 1963-76, but equally there may be long periods in which few if any serious floods are experienced (for example, between 1893 and 1945). The same irregularity applies for floods of lesser significance (2).

c. On average, however, the major flood level has been reached at Grafton about once every two years over the past half century. This can be taken as roughly indicative of the frequency of significant flooding in areas below the village of Copmanhurst. At the village, a flood reaching or exceeding 20.0 m occurs, on average, once every 10-15 years (2).

Grafton

d. The worst flood ever recorded in the Clarence Valley Council area since the beginning of European settlement was the flood of March 1890, when flood waters stretched from Grafton to Junction Hill and covered the whole of the Southgate-Everlasting Swamp area. This flood occurred prior to the levee being built, and would be significantly different if this flood were to occur today.

e. The highest flood (i.e. higher than 1890) was recorded in January 2013, reaching 8.08 m at the Grafton gauge. The consequences of this flood in Grafton were much less than that of 1890 due to the protection of the town by the levee. If this flood was to occur today it would reach approximately 8.4 m (10).

f. The flood of March 2001 was the fifth highest recorded at Grafton (2).

Table 5: Flood history for Grafton Prince Street gauge 204904 – floods above Major (5.4 m)

Date	Peak Height (m)
01/01/1839	5.79
04/05/1848	6.11
21/02/1857	5.50
10/06/1857	6.34
15/02/1863	6.95
19/03/1864	6.34
09/08/1864	6.59
29/04/1867	6.23
17/07/1876	7.48
23/01/1887	7.83
19/07/1889	6.89
04/02/1890	5.45
13/03/1890	7.89
29/03/1890	6.08
04/04/1892	6.64

Date	Peak Height (m)
12/02/1893	7.00
18/02/1893	7.73
12/06/1893	7.20
20/02/1928	6.74
12/06/1945	6.41
26/03/1946	7.10
16/06/1948	7.17
25/06/1950	7.78
22/02/1954	7.73
14/07/1954	5.90
29/03/1955	5.83
19/02/1956	6.97
23/01/1959	6.74
19/02/1959	6.03
08/04/1962	5.65
12/07/1962	5.65
02/01/1963	5.70
09/05/1963	7.63
14/06/1967	7.61
13/01/1968	6.23
27/01/1974	6.67
11/03/1974	6.78
13/03/1974	7.33
12/02/1976	7.27
10/05/1980	6.33
07/04/1988	6.78
03/04/1989	6.54
27/04/1989	6.08
04/05/1996	5.89
07/05/1996	7.07
03/02/2001	6.71
11/03/2001	7.75
23/05/2009	7.40
12/01/2011	7.64
27/01/2012	5.53
29/01/2013	8.08
24/02/2013	6.27

Ulmarra

g. On average the record of the past 50 years suggests that a flood reaching or exceeding the ‘major flood’ level of 4.9 m at Ulmarra occurs once every three or four years. Floods exceeding the ‘minor flood’ level of 2.1 m at Ulmarra occur, on average, every one or two years (2).

h. The worst floods ever recorded at Ulmarra since the beginning of European settlement were the floods of 2013, 2011, 1950, 1967 and 1890 (2).

Table 6: Flood history for Ulmarra gauge 204905 – floods above Major (4.9m)

Date	Peak Height (m)
17/06/1948	5.57
25/06/1950	5.95
22/02/1954	5.87
19/02/1956	5.31
23/01/1959	5.31
09/05/1963	5.85
14/06/1967	5.95
27/01/1974	5.16
13/03/1974	5.80
12/02/1976	5.63
10/05/1980	4.96
08/04/1988	5.42
03/04/1989	5.22
27/04/1989	4.96
07/05/1996	5.70
03/02/2001	5.30
11/03/2001	6.15
23/05/2009	5.77
12/01/2011	5.98
29/01/2013	6.29

Glenreagh

i. In March/April 2009, the second highest flood level recorded since the start of the Glenreagh Gauge (1972), was recorded in the Orara Valley. While this event was significant in many respects, anecdotal evidence, through discussions with local residents, note that the 1950 flood was significantly larger than the 2009 event. One of the largest floods in the valley occurred on 24 June 1950, when 502 mm was recorded at the Aurania rainfall gauge in a single day and 916 mm fell from 18 to 25 June (3). Floods that are recorded as reaching heights above the major flood level height at the Glenreagh gauge include:

Table 7: Glenreagh (Orara River) historical flood heights

Date	Height
June 45	10.97
June 50	11.43
February 54	10.67
April 62	10.67
March 74	11.43

Table 8: Flood history for Glenreagh (DWR TM) gauge 204906 – floods above Major (13.0m)

Date	Peak Height (m)
11/03/1974	13.24
23/02/2013	13.09

Coutts Crossing

j. Below is a list of flood peaks recorded on the Orara River at Coutts Crossing since 1950, for floods exceeding the current 'moderate flood' threshold of 9.0 m, and major floods are represented in bold. The information for Coutts Crossing however, is incomplete, with some floods during the 1970s having been excluded from the record (2).

Table 9: Coutts Crossing gauge (204909) historical flood heights, with major flood level at 12.0m

DATE	HEIGHT
June 50	11.59
November 54	9.91
May 55	11.02
February 56	9.61
March 56	9.74
May 56	10.52
January 59	11.28
February 59	10.35
March 59	9.20
November 59	9.00
8 April 62	**12.22**
July 62	10.83
January 63	9.07
April 63	11.85
May 63	11.39
1 March 74	**14.90**
May 80	11.10
May 96	10.90
May 96	10.44
May 09	11.46
January 11	10.00
January 13	10.85

Other locations

k. The following tables summarise the peak heights on the Clarence River at Copmanhurst (upstream of Grafton) and Maclean (downstream of Grafton), where there is a long history of flooding.

Table 10: Flood history for Maclean gauge 204410 – floods above Major (2.5m)

Date	Peak Height (m)
13/03/1890	3.54
17/06/1948	2.82
26/06/1950	3.20
22/02/1954	3.04
20/02/1956	2.59
24/01/1959	2.51
09/05/1963	3.10
15/06/1967	3.36
28/01/1974	2.59
12/03/1974	3.03
14/03/1974	3.41
12/02/1976	2.77
08/04/1988	2.80
04/04/1989	2.72
28/04/1989	2.53
06/05/1996	2.57
07/05/1996	2.96
08/05/1996	3.00
04/02/2001	2.63
11/03/2001	3.26
23/05/2009	3.15
13/01/2011	2.98
30/01/2013	3.10

Table 11: Flood history for Copmanhurst gauge 204903 – floods above Major (18.0m)

Date	Peak Height (m)
08/07/1876	22.86
16/01/1887	25.60
10/07/1889	18.90
13/03/1890	22.56
23/07/1921	20.10
05/03/1946	20.12
16/06/1948	19.74
24/06/1950	21.54
21/02/1954	21.77
19/02/1956	19.00
23/01/1959	18.59
09/05/1963	21.03
14/06/1967	20.09
13/03/1974	18.62
11/02/1976	20.70
07/05/1996	18.00
10/03/2001	20.55
29/01/2013	22.76

1.7 FLOOD MITIGATION SYSTEMS

a. Levee locations are shown on the Town Maps at the end of this Volume.

b. Clarence Valley Council area has a number of mitigation works in place that aid in reducing the severity of flooding. These are explained under the headings Levees and Other Mitigation Systems and separated into their specific areas (2). It is important to note that levees are susceptible to failure for a variety of reasons, with identified historical occurrences of pipe and floodgate failures, slumping and sand boils.

c. Levees in Grafton and South Grafton may cause normal flood levels to be slightly higher in the Copmanhurst area upstream of Grafton. Downstream levels will be slightly lower (2). Further details are available in each community in Section 2 of this Volume 2 of the local flood plan.

Other flood mitigation works

d. Rural flood mitigation works in the council area are confined to drainage works, floodgates and minor levees in the Southgate area and the Everlasting Swamp. These have reduced the frequency of flooding and sped up the after-flood drainage but they are not designed to keep out all floods. Large areas still experience inundation, as happened in 1996, 2001 and 2011 (2).

e. There are no significant flood mitigation works on the Orara River or on the minor coastal streams, except for training walls at the mouth of the Wooli River (2).

1.8 EXTREME FLOODING

a. Floods larger than those experienced by the present residents of Grafton and the Clarence Valley should be regarded as inevitable (2).

b. At Grafton, the extreme flood is simulated to be 9.7 m at the Prince Street gauge (2). It is expected that in such a flood, the flood would discharge approximately 20,000 cubic m per second (2).

c. The extreme flood in Grafton, Maclean, Copmanhurst and Ulmarra areas would cause severe flooding in the town as well as on the islands, in the villages and in the rural areas (2). Major overtopping of the all levees would occur and the velocity and depth of flood water would be very high (2).

d. Extreme flood heights for the Maclean and Ulmarra gauges are 5.1 m and 8.4 m respectively. Major overtopping of the all levees would occur and the velocity of flood water would be very high (8).

1.9 COASTAL EROSION

a. The most severe problems of coastal erosion occur as a result of oceanic storm conditions associated with the passage of ex-tropical cyclones and east coast low-pressure systems. These storms may cause temporary sea level rises with large associated waves. The worst erosion is likely when severe weather conditions occur in conjunction with unusually high tides (2).

b. The following locations have property at risk of coastal erosion and are shown on the river basin map.

   i. Wooli

Wooli

c. Undercutting of dunes on their seaward sides can occur at Wooli threatening the collapse of dwellings and other buildings. There is also potential for the sea to break through of the dunes, causing flooding and isolation of property on the landward side of the dunes (2).

d. Storm activity is sometimes accompanied by heavy rain, causing flooding on the Wooli River behind the sand dunes. This flooding can be exacerbated by an elevated sea level preventing the escape of flood waters to the sea (2).

e. The whole village of Wooli is at risk from erosion and/or associated flooding. Several hundred dwellings, two caravan parks and a small number of commercial buildings are at risk (2).

f. Wooli Beach suffered severe storm damage in 1954, 1974, 1996 and 2009. More recent erosion events have eroded the frontal dune leaving a high, steep escarpment along much of the beachfront (2).

g. The steep escarpment remains unstable and has continued to recede due to slumping (2).

h. A review of coastline hazard lines for Wooli (11) has identified that 44 lots are located in the zone of wave impact for a severe storm (although a few dwellings on these lots are located landward of the immediate impact line). These beachfront properties are all located south of the boat ramp on South Terrace and the Wooli Bowling Club (2).

i. Approximately 20 beachfront dwellings located within the ‘zone of reduced foundation capacity’ (less than 18 m from the dune crest) have also been identified as susceptible to structural damage due to the reduced bearing capacity of sand in this zone. Of the 20 properties, the nine most at risk were located around 13 to 14 m from the dune crest (12).

Other areas

j. Known coastal erosion threats in the Clarence Valley are at Woody Bay, Yamba Headland and Brooms Head Beach; however these have not been identified as hot spots.

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

a. Clarence Valley Council area is made up of a number of communities that can be affected in a flood. These include:

1. **Grafton** – Alumy Creek, Carrs Creek, Carrs Island, Carrs Peninsula, Eatonsville, Great Marlow, Junction Hill, North Grafton, Seelands, South Grafton, Southampton, Waterview and Waterview Heights.
2. **Copmanhurst** - Barretts Creek, Coaldale, Copmanhurst, Fine Flower, Gordonbrook, Koolkhan, Moleville Creek, Mountain View, Trenayr.
3. **Lawrence** - Ashby, Ashby Heights, Ashby Island, Chatsworth, Lawrence, Southgate, Lower Southgate, Tullymorgan and Woodford Island.
4. **Ulmarra** - Clarenza, Calliope, Coldstream, Gillett's Ridge, Swan Creek, Tucabia and Ulmarra.
5. **Brushgrove** - Brushgrove, Cowper, Tyndale, and Lower Coldstream.
6. **Maclean** - Maclean, and Taloumbi, it also includes the villages of Chatsworth, Harwood, Ilarwill, South Arm, Ashby, Shark Creek and extensive rural areas.
7. **Iluka** - Iluka, Mororo, The Freshwater, Woody Head, Goodwood and Woombah.
8. **Yamba** - Yamba, Angourie, Wooloweyah and Palmers Island.
9. **Sandon** - Bookram, Brooms Head, Sandon and Sandon River Village.
10. **Wooli-Minnie Water** - Calamia, Diggers Camp, Minnie Water, Pillar Valley, Sandy Crossing and Wooli.
11. **Cangai** - Cangai, Carnham, Coombadjha, and Jackadgery.
12. **Coutts Crossing** - Blaxlands, Flat/Creek, Billy's Creek, Braunstone, Buccarumbi, Chambigne, Clouds Creek ,Coutts Crossing, , Dundurrabin, Elland, Kangaroo Creek, Lanitza, Levenstrath, Lower Kangaroo Creek, McPherson Crossing, Middle Creek, Moonpar, Nymboida, Shannondale, Towallum, and Tyringham.
13. **Glenreagh** - Glenreagh, Kremnos, Kungala and Wells Crossing.

b. Table 12, shows the 2011 Census 'usual resident' counts for key statistics for the Clarence Valley Local Government Area. Note these vary slightly from the Sector areas due to census data availability.

Table 12: Census of Housing and Population data (2011)

Census Description	LGA	Grafton	Copmanhurst	Lawrence	Ulmarra
Total Persons	**49,665**	**20,289**	**483**	**1,385**	**841**
Aged 0-4 yrs	2,819	1,304	25	55	35
Aged 5-14 yrs	6,408	2,701	70	164	117
Aged 65 + yrs	10,563	4,040	75	326	175
Of Indigenous Origin	2,845	1,493	37	50	40
Who do not speak English well	65	18	0	6	0
Have a need for assistance (profound/severe disability)	3,791	1,601	39	97	71
Living alone (Total)	5,325	2,248	65	122	92
Living alone (Aged 65+)	2,462	1,082	23	55	43
Residing in caravans, cabins or houseboats or improvised dwellings	705	123	0	10	4
Occupied Private Dwellings (Households)	**19,259**	**7,740**	**197**	**565**	**321**
No Motor Vehicle	1,444	771	8	19	21
Caravan, cabin, houseboat or improvised dwell	448	73	0	10	4
Rented via State or Housing Authority	431	378	0	0	0
Rented via Housing Co-Op or Community Church Group	169	50	0	0	3
No Internet Connection	5,534	2,419	64	158	96
Unoccupied Private Dwellings	**3,384**	**752**	**39**	**71**	**33**
Average persons per occup dwelling	**2.4**	**2.4**	**2.3**	**2.4**	**2.5**
Average vehicles per occup dwelling	**1.6**	**1.6**	**1.7**	**1.8**	**1.8**

Census Description	Brushgrove	Maclean	Iluka	Yamba	Wooli
Total Persons	**334**	**4,131**	**1,884**	**6,088**	**755**
Aged 0-4 yrs	18	213	96	282	37
Aged 5-14 yrs	38	494	173	590	88
Aged 65 + yrs	108	1,171	628	1,942	164
Of Indigenous Origin	12	288	58	279	14
Who do not speak English well	0	0	0	3	3
Have a need for assistance (profound/severe disability)	-	376	179	492	73
Living alone (Total)	35	483	289	779	127
Living alone (Aged 65+)	17	247	170	433	53
Residing in caravans, cabins or houseboats or improvised dwellings	0	19	100	74	51
Occupied Private Dwellings (Households)	**133**	**1,627**	**847**	**2,584**	**331**
No Motor Vehicle	5	158	71	211	22
Caravan, cabin, houseboat or improvised dwell	0	18	69	46	44
Rented via State or Housing Authority	0	29	0	23	5
Rented via Housing Co-Op or Community Church Group	0	57	10	41	3
No Internet Connection	37	486	314	726	112
Unoccupied Private Dwellings	**13**	**207**	**360**	**759**	**200**
Average persons per occup dwelling	**2.5**	**2.3**	**2.2**	**2.2**	**2.0**
Average vehicles per occup dwelling	**1.8**	**1.5**	**1.5**	**1.4**	**1.5**

Census Description	Cangai	Coutts Crossing	Glenreagh
Total Persons	**182**	**798**	**859**
Aged 0-4 yrs	7	67	58
Aged 5-14 yrs	27	128	150
Aged 65 + yrs	18	110	111
Of Indigenous Origin	18	35	56
Who do not speak English well	0	0	3
Have a need for assistance (profound/severe disability)	-	58	64
Living alone (Total)	15	58	57
Living alone (Aged 65+)	7	15	23
Residing in caravans, cabins or houseboats or improvised dwellings	0	3	23
Occupied Private Dwellings (Households)	**59**	**279**	**297**
No Motor Vehicle	4	8	18
Caravan, cabin, houseboat or improvised dwell	0	0	7
Rented via State or Housing Authority	0	0	3
Rented via Housing Co-Op or Community Church Group	0	0	3
No Internet Connection	**18**	67	71
Unoccupied Private Dwellings	**26**	**17**	**39**
Average persons per occup dwelling	**2.7**	**2.8**	**2.8**
Average vehicles per occup dwelling	**1.9**	**1.9**	**1.7**

Census Description	Angourie	Brooms Head	Gulmarrad	Tucabia	Waterview Heights	Woolowey ah
Total Persons	**185**	**201**	**1,647**	**621**	**1,113**	**410**
Aged 0-4 yrs	6	3	75	34	56	16
Aged 5-14 yrs	20	19	280	77	189	65
Aged 65 + yrs	27	72	268	83	181	22
Of Indigenous Origin	4	6	31	44	31	6
Who do not speak English well	0	0	0	0	0	0
Have a need for assistance (profound/severe disability)	6	16	92	38	65	9
Living alone (Total)	26	33	63	60	52	34
Living alone (Aged 65+)	6	21	28	22	26	12
Residing in caravans, cabins or houseboats or improvised dwellings	0	32	3	11	13	0
Occupied Private Dwellings (Households)	**72**	**89**	**566**	**217**	**381**	**149**
No Motor Vehicle	3	11	7	17	4	4
Caravan, cabin, houseboat or improvised dwell	0	23	0	7	0	0
Rented via State or Housing Authority	0	0	0	0	0	0
Rented via Housing Co-Op or Community Church Group	0	0	0	0	0	0
No Internet Connection	13	46	95	56	63	21
Unoccupied Private Dwellings	**57**	**97**	**69**	**36**	**15**	**27**
Average persons per occup dwelling	**2.2**	**1.0**	**2.8**	**2.5**	**2.9**	**2.5**
Average vehicles per occup dwelling	**1.6**	**1.4**	**2.1**	**1.7**	**2.1**	**1.7**

SPECIFIC RISK AREAS - FLOOD

Clarence River Valley

2.2 GRAFTON AND SOUTH GRAFTON

2.2.1 Community Overview

a. Grafton is the main urban centre in the Clarence Valley, located on the Clarence River.

b. The population of Grafton is over 10 000 and South Grafton is over 6000 (13).

c. **Grafton** has 18.9% of the population under 15 years of age and 21.5 % over 65. It has 6.2% indigenous population.

d. **South Grafton** has 21% of the population under 15 years of age and 18.6% over 65. It has 11.6% indigenous population.

e. **Junction Hill** is located 10 km north of Grafton on the Clarence River on Summerland Way. The population of Junction Hill is over 1170 (13). It has 15.1% of the population under 15 years of age and 22.1% over 65. It has 2% indigenous population.

f. A summary of demographics is shown in Table 12.

2.2.2 Characteristics of flooding

a. Grafton can expect three different kinds of flood regimes, which will have very different impacts on the community. These are:

   i. Outside-levee floods: these will occur frequently, probably in most years. They will affect farm properties, a small number of dwellings, and some business premises and recreational facilities (2).

   ii. Stormwater ponding within urban areas: these can be expected to occur less frequently but will affect low-lying areas within Grafton and South Grafton, usually for only short periods of time unless the Clarence River is in flood at the same time. Stormwater flooding can flood areas of Grafton as happened during the flood of March 1974 when several houses experienced over-floor inundation. Large areas to the south-east of Queen Street can experience inundation as a result of a severe storm, as can properties along the banks of Alumy Creek. Parts of the Central Business District can be affected, including the Crossroads at the intersection of Bent Street and Ryan Street, however, the extent and depth of inundation from an extreme storm would be less than would occur from a levee-overtopping flood (NSW State Emergency Service, 2012).

iii. Levee-Overtopping and/or breaching floods: these will be rare but may have devastating impacts and will require large-scale evacuations (2).

iv. Flooding of Susan Island and the Clarenza area occurs in most floods and backwater flow up Cowans Creek can cause flooding of the South Grafton Common (2).

2.2.3 Flood Behaviour

a. Refer to section 1.5, as well as Table 15 and Table 16 for further information on the levee.

b. Alipou Basin can be flooded due to slowing of drainage of localised rainfall when Clarence River has elevated flood levels. It can also be flooded when the Alipou Basin Levee is overtopped (2).

c. Flood velocities in Alipou Basin are generally less than 1.5 m/s with the average overbank velocities of 0.5 square m/s. Higher velocities would be expected with the overtopping of the Clarenza, Heber Street and Alipou Basin Levees (2).

2.2.4 Classification of Floodplain

a. North Grafton is a low flood island during an extreme flood.

b. South Grafton has rising road access to South Grafton Hill.

2.2.5 Inundation

a. This area utilises the Grafton (Prince Street) gauge.

b. North Grafton and South Grafton utilise the Prince Street warning gauge (10).

c. At 7.07 m two houses on Carrs Island are at risk of flooding (previously evacuated in May 1996) (14).

d. At 7.75 m houses outside the levee flood (two in Fitzroy Street and three in Butter Lane, one in Alipou Creek) (14).

e. Refer to Table 15 and Table 16 for levee overtopping consequences and sequence, from around 8 m.

North Grafton

f. Virtually all of Grafton north of the river (approximately 4,130 properties and about 10,370 people) is protected by levees and there is little property exposure in most floods. In a flood slightly more severe than the record flood of 1890 (7.89 m), minor overtopping and levee erosion would begin along the southern reaches of the Ulster Lodge Levee between Pound Street and Dobie Street and inundation would occur in the Dovedale area (2).

g. In a flood resulting in the overtopping of the Grafton Levee, up to 70 dwellings could be affected in the Back Lane, Carr Street, Marlow Street, Summerland Way and Lawrence Road areas between Grafton and Junction Hill. The Gateway Village Caravan Park on the Summerland Way could also be flooded. Bakers Swamp could be filled and the Summerland Way closed. Evacuations would be necessary from all these areas (2).

h. Such a flood would also be expected to result in the closure of most roads around Grafton and on the floodplain downstream around Southgate and beyond. Telephone, water supply, power and sewerage services would almost certainly fail and it is possible that large numbers of Grafton would be affected (2).

i. If flow in the river was sufficient to cause levels to continue to rise, overtopping would soon occur along much of the Alice Street Levee (between Turf and Clarence Streets) and eventually along the entire length of the levees including the Pine Street Levee north of North Street. Inundation would continue in Dovedale, where depths of more than three m would be experienced at some locations. It would also spread to the north and west causing inundation of the Central Business District and large numbers of residential properties (2).

j. Eventually most of Grafton, including Westlawn, would be inundated, though to lesser depths in most areas than in Dovedale. Most of the land between Carr and North Streets and Junction Hill would also be under water (2).

k. Complete inundation of Grafton could occur if overtopping conditions were maintained for as little as ten hours. Complete inundation could occur more quickly (perhaps in as little as four to five hours) in more severe flood events reaching greater heights (2).

South Grafton

l. Around 7 m, four dwellings outside the Heber Street Levee can be flooded in Butters Lane and along the Pacific Highway. A caravan park (Glenwood) is also flood liable, as are some business and recreational premises (2).

m. A flood exceeding 7.9 m on the Prince Street gauge would cause minor overtopping of the Heber Street Levee. There would be major overtopping between 7.9 and 8.3 m and approximately 600 properties (1800 occupants) would experience flooding and would have to evacuate. Under such conditions, the Wilsons Hill ('South Grafton Hill') island would still exist (2).

Table 13: Estimated number of properties inundated above floor level and over ground in Grafton related to the Prince Street gauge (15)

Grafton Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Grafton	No. Properties with Over-ground Flooding
7.9 (5% AEP)	n/a	300	n/a
8.3 (1% AEP)	n/a	3900	n/a
9.7 (Extreme)	n/a	4600	n/a

2.2.6 Isolation

a. Junction Hill can be cut off from road access to Grafton as a result of prolonged periods of extremely heavy rainfall. Road cuts can occur due to overflows in the un-named drain north of Butterfactory Lane, and in extreme events the Koolkhan and Deep Gully Creeks. Flood free access is available to the north of the town via the Summerland Way (10).

b. At 4.4 m Carrs Island Bridge is flooded, isolating 5 houses on Cars Island (14).

c. At 5.8 m water fills a dip in the road in Butters Lane, just outside the Heber Street levee, isolating three houses (14).

d. 5.9 m, the highway closes north of Grafton with a high level by-pass available via Centenary Drive, Clarenza (14).

e. At 7.9 m seventy houses and some other buildings in the Back Lane, Carr Street, Summerland Way and Lawrence Road areas could be isolated, along with the Gateway Caravan Park (14).

f. The following table summarises the timeframes available in various events before evacuation routes are cut (post levee overtopping, noting that Grafton levee overtopping is approximately 16 hours in a 1-2% AEP flood, and 11.7m in an extreme flood. South Grafton levee is estimated to overtop in 16.7 hours in a 2% AEP event, 16.5 in a 1% AEP and 12.2 in an extreme event (16).

Table 14: Time (hours) for evacuation routes to be cut after levee overtopping in a range of design flood events (16).

Sector	Evacuation route	Time (hours) after levee overtopping to evacuation route cut		
		8.2m AHD (2% AEP)	8.3m AHD (1% AEP)	9.7m AHD (extreme)
Sector A	Clarence Street (between Fitzroy and Pound Street)	Not inundated	4.8	4.0
	Clarence Street (between Pound and Hoof Street)	4.0	3.2	3.2
	Fitzroy Street	2.5	1.9	2.0
	Pound Street	3.0	2.3	2.5
	Prince Street (between Fitzroy and Pound Street)	5.8	4.3	3.6
	Prince Street (between Pound and Oliver Street)	5.6	4.1	3.5
	Prince Street (between Oliver and Dobie Street)	5.8	4.6	4.4
	Prince Street (between Dobie and Hoof Street)	6.2	5.0	4.6
Sector B	Oliver Street	6.2	4.5	4.0
	Dobie Street	7.1	5.7	5.0
	Turf Street	17.6	13.2	6.8
Sector C	Cranworth Street	10.8	9.6	7.4
Sector D (South Grafton)	Grafton Bridge southern approach	Not inundated	14.5	18.3
	Bent Street	Not inundated	11.1	6.6

a. The figure below summarises the warning time available for various design flood events prior to levee overtopping and evacuation routes are cut.

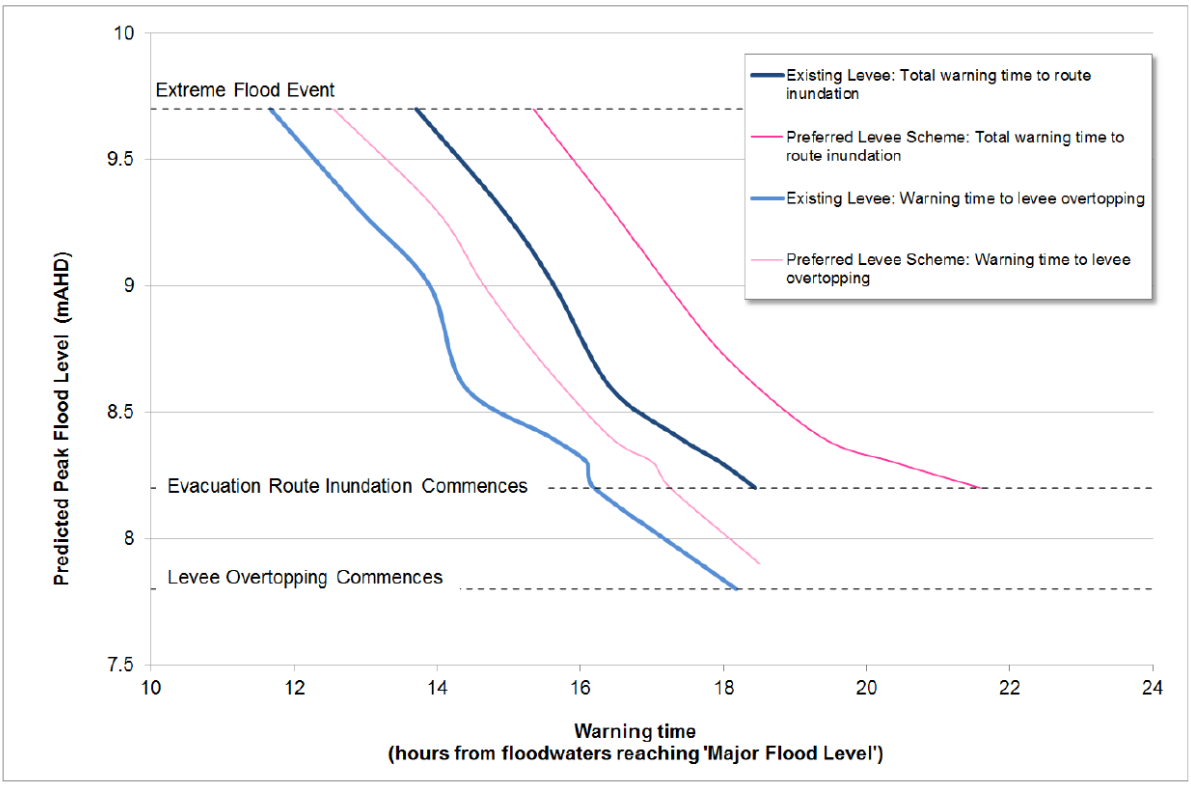


Figure 2: Warning time available (hours) for various design flood events prior to levee overtopping and evacuation routes are cut (16).

2.2.7 Flood Mitigation Systems

a. **North Grafton.** The existing levees at North Grafton consist of a combination of compacted fill embankments and concrete retaining walls. There are seven sections comprising 21 km around Grafton, protecting more than 3500 properties including residential and commercial areas and key infrastructure. In 2013 the levee was considered to be in a reasonable condition, with the exception of issues such as trees, erosion, drainage pipes and closure mechanisms. It was originally constructed in 1972 based on the 1890 and 1967 flood events. Since then, additional areas were added such as Dovedale. The current accepted safe flood height by council is 7.9-8.0 m at the Prince Street gauge, however the freeboard level is not known (17). Details for each section of the levee is summarised in Table 15. In a 2% AEP flood (8.2 m) there is an estimated 16 hours prior to the levee overtopping, between Bacon and Powell Street. In an extreme event (9.7 m) this is estimated to decrease to 11.7 hours (16).

b. **South Grafton.** The existing levees at South Grafton consist of a combination of compacted fill embankments and concrete levees. There are eight sections comprising 17 km around South Grafton and south of the Clarence River, protecting approximately 921 properties. Overtopping of the South Grafton Levee initiates west of the Gwydir Highway on the Waterview levee between Waterview and Seelands drain floodgates. The levee flood design was based on the 1890 and 1967 flood

events, and was built in 1997, with the capacity of around a 2% AEP flood (7.9-8.3 m). Current freeboard is unknown, however the current accepted safe flood height by Council is 8.2 m (18; 10; 19). The levee system was determined to be in a sound condition by the Town Levee Audit conducted by the NSW Department of Public Works in 2014, apart from Westlawn levee in North Grafton and Urban and Heber Street levees in South Grafton which show evidence of localised erosion and slips, slumping, cracking and scouring which will affect the heights to which the levees are overtopped or breached (2). Details for each section of the levee is summarised in Table 16. South Grafton levee is estimated to overtop in 16.7 hours in a 2% AEP event, 16.5 in a 1% AEP and 12.2 in an extreme event (16).

2.2.8 Dams

a. Refer to Section 1.3.

2.2.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.2.10 Other Considerations

a. Historically rates of evacuation in Grafton are low.

b. Grafton has three peak seasons with potential for a 10% population increase:

   i. July Race Carnival – early July

   ii. Jacaranda Festival – late October / early November

   iii. Bridge to Bridge Ski Race – October long weekend.

Table 15: Levees in North Grafton; summary of information, from left to right in order of overtopping. All levees are part of a system owned by Clarence Valley Council, parallel to the Clarence River (17).

South Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
Location	A rural earthen levee extends in a south easterly direction for about 1.7 km to the eastern end of North Street, east of Grafton towards Great Marlow Road.	Joins the Westlawn levee to the north of Grafton.	Located at the end of North Street and hugs the Clarence River for 3.1 km up to Grafton Bridge and then runs in a north-westerly direction for about 1.5 km to the south west end of Queen Street. It is the concrete section of the levee.	Begins at the south west end of Queen Street and runs in a north-north westerly direction for 1.4 km to where the levee ends.	Begins slightly south of North Street and runs alongside Pine Street along the Clarence River.	Starts at the North West end of Butterfactory Lane and runs along Alumy Creek in a northerly direction for 1.5 km, where it extends west for another 0.3 km.	Runs from the north end of Queen Street (approximately 0.5 km north of North Street) in an easterly direction for about 1.1 km where it joins the Great Marlow Levee.
Overtopping Height	Approximately 5.45 m	Approximately 8.0 m	8.0 m The urbanised portions of the council area have a levee crest height at approximately the level of the 5% AEP event, which is 7.9 m.	8.2 m	8.3 m	8.3 m	8.3 m
Location and sequence of inundation	n/a	n/a	Overtopping initiates at Fry Street and Kirchner Street on Grafton Street	The height of the low point of the levee is between 8.1 and 8.4 m AHD where the levee is	Flood waters ponds behind the North Coast Railway line north of Grafton and	n/a	n/a

South Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
			around 7.9 m – properties are at risk including Summerland Way, between Grafton and Junction Hill, east of Clarence and north of Oliver Street. In a 5% AEP (7.9 m on the Prince Street gauge) event there is approximately 15.5 hours to overtopping. In a 5% AEP event (7.9 m on the Prince Street gauge) there is only minimal overtopping at the low points on the levee. In a 2% AEP event (8.2 m Prince Street) and a 1% (8.3 m Prince Street gauge) there is approximately 14 and 13.5 hours	located at the end of Turf Street. This is a similar height to the 5% AEP at that point (Prince Street Gauge; 7.9 m).	then overtops at 8.26 m. The flood water from the Clarence River flows east and fills low land north of Grafton		

South Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
			from the major flood level until there is major overtopping at low points on the levee respectively.				
Consequences of levee overtopping or failure	Fills the rural area and heads towards Southgate Village, resulting in inundation of the village.	Overtopping of this levee results in rural land inundation and the flooding is subsequently prevented from entering North Grafton by the Westlawn Levee	Inundation of up to 3500 properties, including Alice Street levee.	Inundates CBD area, up to 3500 properties, including the Grafton levee.	Water fills Carrs Creek/Bakers Street area causing flooding in the northern areas of the town in Westlawn and cutting of the town between Junction Hill and Grafton.	Flows enter Alumy Creek and also head to the west filling low lands north of Grafton. Fills Alumy Creek and may head west filling low lying land north of Grafton.	Flows enter Alumy Creek and also head to the west filling low lands north of Grafton.

Table 16: Levees in South Grafton; summary of information, from left to right in order of overtopping. All levees are part of a system owned by Clarence Valley Council

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
Location	A low level levee that joins Alipou Basin Levee and Clarenza Levee to the east.	Located north of Alipou Creek and runs to the Clarence River from the Pacific Highway in an east-west direction. Here	Joins the Clarenza Levee in the north, bordering the Clarence River and runs to the south west towards the	Begins north east of Freemans Rd close to Clarence River and borders the Clarence River for	Starts at the Grafton Bridge and runs 0.9 km in a south-south easterly direction and ends about 0.2 km from the	Connects the Waterview Levee to the Urban Levee and begins at the junction of McLennan's Lane and	Earth levee that joins South Grafton Urban half way through the South Grafton Bowling Club and houses	Begins about 1.8 km west of the Grafton Bridge at Minden Street (near the Gwydir Highway) and

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
		it joins to the Alipou Basin Levee and Swan Creek Levee.	Grafton Bridge where it ends and the Heber Street Levee begins. Alipou Creek traverses the levee about half way along.	approximately 5.5-6.0 km to McLennan's Lane and Cowans Creek.	Pacific Highway.	Cowans Creek. It runs across the Gwydir Highway and finishes near Minden Street.	along Riverside Drive.	runs easterly along the Clarence River to the Grafton Bridge.
Overtopping Height	Approximately 6.2 m	This overtops around 5.4-6 m, inundating rural land between Clarenza and Heber Streets.	Approximately 5.45 – 6.0 m	8.1 m	8.2 m The crest levee low point height for the Heber Street Levee is above the 5% AEP level of 7.9 m at the Prince Street gauge but below the 2% AEP (8.3 m on the Prince Street gauge).	8.2 - 8.5 m at the end adjacent to the Gwydir Highway.	After 8.3 m	8.3 m
Known low points	n/a	n/a	n/a	The levee low point is approximately 1.5 km west of the start of the levee, at approximately 8.6 m. This is equivalent to slightly below the 5% AEP	The height of the levee has two main low points at 7.6 m AHD closer to Grafton Bridge and 7.8 m AHD near Heber Street/Pacific Highway (NSW State	The levee low point is at a height of 8.21 m AHD at the end of James Street, slightly higher than the 5% AEP (NSW State Emergency Service, 2012).	n/a	The height of the low point of the levee is 8.4 m AHD where the levee begins near Minden Street. This is above the 5% AEP which is 8.2 m AHD (equivalent to

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
				level of 7.9 m at the Grafton (Prince Street) gauge (NSW State Emergency Service, 2012).	Emergency Service, 2012).			7.9 m at the Prince Street gauge), but lower than the 2% AEP which is 8.5 m AHD at that point (and equivalent to 8.3 m at the Prince Street gauge) (NSW State Emergency Service, 2012).
Location and sequence of inundation and consequence of overtopping or failure	Inundates rural areas south of Ulmarra	When a flood level of about 5.4 m is reached at the Prince Street gauge, water flows over the Clarenza Levee and backs up towards South Grafton causing inundation of the Pacific Highway east of the Heber Street Levee. Rural land between the	Impacts rural properties and the Pacific Highway	Overtopping occurs on the levee in the rural areas initially to fill in 'The Common' through Cowans Swamp around Friars Lane. This did not occur in 2013 due to the speed of the rate of rise (1 metre a second). At 7.9 m Prince Street gauge there is	Significant overtopping of Heber St Levee would cause approximately 600 properties (1800 residents). In a 1% AEP event (8.3 m at Prince Street) there is approximately 15.5 hours from the time the flood level reaches approximately 6	Impacts rural properties behind the levee and fills in 'The Common' in South Grafton and comes in through Vere Street.	n/a	n/a

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
		Clarenza and Heber Street levees becomes inundated. Several houses are also located in this area but they do not start to have over-floor flooding until 7.0m.		overtopping of approximately 5% of the South Grafton levee system occurs, causing a small amount of flooding with little impact on residential properties. In a 1% AEP event there is approximately 14 hours from the major flood level until there is major overtopping at low points on the Waterview levee around Friars Lane, which is slightly North of McLennans Lane; 18 hours until there is major overtopping at low points on the Waterview	m on the Prince Street gauge until there is minor overtopping at low points on the Heber Street levee between Iolanthe Street and the Pacific Highway (NSW State Emergency Service, 2012).			

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
				levee near the Sunset Caravan Park and James Street. The velocity of flood water is very high and can be up to 3 square m/s; and 20.5 hours until there is major overtopping at low points on the Waterview levee near Skinner Street, and the velocity of flood water can be up to 0.3 square.				
Deficiencies	-	-	-	Erosion and trees and shrubs	-	Erosion and trees and shrubs	Flood gates leaking or damage	-

2.3 COPMANHURST, BARYULGIL AND MALABUGILMAH

2.3.1 Community Overview

a. **Copmanhurst** is located on the Clarence River, approximately 40 km upstream of Grafton. The population of Copmanhurst is over 483 (13). It has 18.9% of the population under 15 years of age and 21.5 % over 65. It has 6.2% indigenous population. A summary of demographics is shown in Table 12.

b. **Baryulgil** is located on Josephs Creek, near the Clarence River, in the Hinterland north-west of Copmanhurst. The population of Baryulgil is around 250 (13). It has 19.4% of the population under 15 years of age and 11.5% over 65. It has 35% indigenous population.

c. **Malabugilmah** is an aboriginal settlement, on the range to north Baryulgil near the Clarence River and Bugilbah Creek. The population of Malabugilmah is over 100 (13). It has 33% of the population under 15 years of age and 6.6% over 65.

2.3.2 Characteristics of Flooding

a. Flooding occurs from riverine flooding of the Clarence River and smaller creeks such as Josephs Creek Bugilbah, as well as overland flooding from intense rainfall.

b. Farm operations are disrupted and floods can cut off numerous rural properties (2).

2.3.3 Flood Behaviour

a. Refer to section 1.5.

2.3.4 Classification of Floodplain

a. High Flood Island.

2.3.5 Inundation

a. This area utilises the Copmanhurst gauge.

b. Around 5 houses are in a low-lying area of the village of Copmanhurst, in Grafton Street and Clarence Way and may become flooded (20.5 m and above on the Copmanhurst gauge) (2). Some of these were flooded up to the ceiling in January 2013 (22.76 m at Copmanhurst).

c. Many farms are affected by the inundation of low lying areas, including those in the Copmanhurst and Whiporie area (2).

Table 17: Estimated number of properties inundated above floor level and over ground in these communities related to the Grafton gauge as relevant (15)

Grafton Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
5% AEP	n/a	2	n/a
1% AEP	n/a	5	n/a
Extreme flood	n/a	10	n/a

2.3.6 Isolation

a. The villages of Baryulgil, Malabugilmah and Copmanhurst are also prone to isolation, usually early in a flood event on the Clarence River. Upper Copmanhurst and Fineflower are isolated as Clarence Way floods (13.8 m at Copmanhurst) (14).

b. Copmanhurst and Coledale are isolated at 15.1 m on the Copmanhurst gauge, consisting of 3451 residents (14).

c. The rugged country in the western part of the Clarence Valley Council contains several camping areas in which people can be stranded during floods. Except in very serious floods isolation tends to be short-term of up to three days and most people in the area are self-sufficient for this period of isolation (2).

d. Whiporie can be cut off from all ground access during severe floods. Isolation tends to be short-term of up to three days and most people in the area are self-sufficient for this period of isolation (2).

e. A large number of road closures occurs in this area including (14):

   i. Lilydale Road (2.9 m at Copmanhurst)

   ii. Rogans Bridge (6.0 m at Copmanhurst) – 11 km east of Copmanhurst

   iii. Whiteman Creek (8.0 m at Copmanhurst) – 6 km east of Copmanhurst

   iv. Clarence Way at Eaton Creek (13.3 m at Copmanhurst)

   v. Clarence Way at Chaselings Gully (14.4 m at Copmanhurst)

2.3.7 Flood Mitigation Systems

a. No known flood mitigation systems in Copmanhurst.

2.3.8 Dams

a. There are no known consequences of dam failure in Copmanhurst.

2.3.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.3.10 Other Considerations

a. Copmanhurst has two peak seasons with potential population increase of more than 10%:

   i. Camp draft September.

   ii. Summer School Holidays - Public Lands within remote areas of this sector are utilized by campers.

2.4 LAWRENCE, ASHBY AND SOUTHGATE AREAS

2.4.1 Community Overview

a. **Lawrence** is located on the north bank of the Clarence River at the junction with Sportsmans Creek, approximately half way between Brushgrove and Maclean (2). The population of Lawrence is around 1050 (13). It has 16.3% of the population under 15 years of age and 24.3% over 65. It has 3% indigenous population. A summary of demographics is shown in Table 12.

b. **Southgate** is located opposite Ulmarra, on the northern floodplain of the Clarence River (2). The population of Southgate is around 175 (13). It has 16.5% of the population under 15 years of age and 13.1% over 65. It has 6.2% indigenous population.

c. **Ashby** is located opposite Maclean on the north bank of the Clarence River (2). The population of Ashby is around 350 (13). It has 17.2% of the population under 15 years of age and 23.2% over 65. It has 2.3% indigenous population.

2.4.2 Characteristics of flooding

a. Flooding can occur from riverine flooding from Clarence River and Sportsman Creek, as well as overland flooding from intense rainfall.

2.4.3 Flood Behaviour

a. Refer to section 1.5.

2.4.4 Classification of Floodplain

a. The low lying areas of Lawrence have rising road access to a High Flood Island.

b. Southgate has rising road access until the Lawrence Road is flooded, thereafter becoming a low flood island.

2.4.5 Inundation

a. This area utilises the Lawrence, Grafton and Maclean gauges.

b. **Lawrence** - At 4.4 m on the Lawrence gauge, Lawrence Store, the Hall and several houses on Bridge Street, Lawrence are flooded (14). Nine houses on Kings Creek Road are inundated by 4.45 m. At 4.65 m, 12 houses are flooded above floor.

c. At 3.26 m on the Maclean gauge 11 houses are inundated in Falconers Lane, Bridge Street, Richmond Street and Grafton Street.

d. There are 20 residential and 8 non-residential buildings that have floor levels below the 1% AEP, and up to 70 at the 1% AEP (Lawrence gauge 5.34 m, Brushgrove gauge 5.8 m) (2). Further details are available in Table 18.

e. At 7.75 m on the Grafton gauge houses outside the levee flood with 6 at Southgate (14).

f. The majority of **Southgate** would be inundated in a 1% AEP flood event, and the entire area would be inundated in a PMF. In a 1% AEP flood event there are 17 properties in Southgate flooded, along Lawrence Road and on the outskirts of town (10). Further details are available in Table 18.

g. **Ashby -** One house is possibly inundated in a 1% AEP event (3.6 m Maclean gauge) (2). Further details are available in Table 18.

h. Flooding of rural properties also occurs in the Southgate and Lower Southgate areas.

Table 18: Estimated number of properties inundated above floor level and over ground in Lawrence related to the Lawrence gauge (15)

Lawrence Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Lawrence	No. Properties with Over floor Flooding in Southgate	No. Properties with Over floor Flooding in Ashby
5% AEP	n/a	5	5	n/a
1% AEP (Approximately 5.87)	n/a	70	15	1
Extreme flood (Approximately 8.16)	n/a	80	25	n/a

2.4.6 Isolation

a. **Southgate -** At 5.45 m (on the Grafton gauge or equivalent) Lawrence Road floods isolating Southgate and Great Marlow rural properties. In a 1% AEP flood event there are high flood islands to the north that are identified in a PMF, which can be accessed via School Lane. Except in extreme floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation. Some elderly and infirm people could be isolated (2).

b. **Ashby -** The majority of land is above the PMF, however the town can become isolated during major floods. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2).

c. At 2.5 m (Lawrence gauge) Rutland Street is flooded between the Post Office and Richmond Street in the CBD, an alternative route is available (14).

d. At 2.6 m (Lawrence gauge), Lawrence Road cuts at a number of locations isolating around 30 rural houses between Grafton and Lawrence (14).

e. At 3.15 m (Lawrence gauge) 18 houses isolated in Lawrence Street, including the shop, tavern, service station and the hall (14).

f. Mantons Road is flooded, isolating 18 houses at 3.26 m at Lawrence gauge.

g. **Lawrence** Ferry usually closes at 1.5 m on the Maclean gauge, affecting school students.

2.4.7 Flood Mitigation Systems

a. No known flood mitigation systems in Lawrence.

2.4.8 Dams

a. No known dam failure consequences in Lawrence.

2.4.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.4.10 Other Considerations

a. No additional considerations have been identified.

2.5 ULMARRA, TUCABIA, GILLETTS RIDGE

2.5.1 Community Overview

a. **Ulmarra** is located on the southern bank of Clarence River to the east of Grafton. The population of Ulmarra is around 784 (13). It has 17.5% of the population under 15 years of age and 21.8% over 65. It has 5.3% indigenous population. A summary of demographics is shown in Table 12.

b. **Tucabia** is located on the eastern side of the Coldstream River, to the east of Ulmarra. Tucabia The population of Tucabia is around 290 (13). It has 16.6% of the population under 15 years of age and 12.8% over 65. It has 5.9% indigenous population.

c. **Gilletts Ridge** is a small rural area with livestock and grain farming. It is located on the Coldstream River, opposite Tucabia.

2.5.2 Characteristics of flooding

a. Flooding can occur from riverine flooding from Clarence River and Coldstream River, as well as overland flooding from intense rainfall.

2.5.3 Flood Behaviour

a. Refer to section 1.5.

2.5.4 Classification of Floodplain

a. Low flood island.

b. Tucabia and Gilletts Ridge have Rising Road Access.

2.5.5 Inundation

a. This area utilises the Ulmarra and Grafton gauges.

b. Water from Swan Creek starts to inundate rural areas south of Ulmarra at 6.2 m on the Grafton gauge (14).

c. Water enters Southgate village roads at 6.7 m on the Grafton gauge (14).

d. **Ulmarra** has levee protection, but the eastern and southern portions of the town are not protected by this structure. Backwater inundation occurs in significant floods, with one commercial premises inundated at 6.15 m on the Ulmarra gauge (2). At 6.29 m the entire levee overtops, inundating the town including River Street, Coldstream Street, George Street, King Street, Goddger Lane, Pacific Highway and Lynhaven Crescent.

e. In Ulmarra Rathgar Lodge, a retirement home accommodating up to 25 high dependency elderly people, must be evacuated before flood waters are likely to enter the village (at 5.5 m on the Ulmarra gauge) (2).

f. During, very severe flood events (5.9 m on the Ulmarra gauge), flood waters can overtop the Ulmarra Town Levee necessitating the evacuation properties in and around Ulmarra (660 properties). This occurred in the March 2001, May 2009 and January 2011 floods. During these events, most of the roads in the town experienced shallow inundation and the septic systems became unserviceable, posing a serious health hazard (2).

g. **Gilletts Ridge -** Most farm dwellings on the lower Clarence floodplain are on mounds but evacuations are necessary in some floods. In 1996, there were evacuations from the Gilletts Ridge. In an extreme event (8.4 m on the Ulmarra gauge) it may be necessary to evacuate the residents of scores of houses from the floodplain east to the Pillar Range and Pine Bush State Forest and south to the Glenugie State Forest (2).

h. **Tucabia -** Tucabia is located on the east bank of the Coldstream and can be affected in a PMF, but the properties are generally only affected in a 1% AEP flood event but can be isolated, with similar isolation periods and arrangements for resupply as Gilletts Ridge (2).

Table 19: Estimated number of properties inundated above floor level and over ground in Ulmarra related to the Ulmarra gauge (10; 15)

Ulmarra Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Ulmarra	No. Properties with Over-ground Flooding in Tucabia	No. Properties with Over-ground Flooding in Gilletts Ridge
5% AEP	n/a	20	5	n/a
1% AEP	n/a	80	50	n/a
Extreme	n/a	>100	70	n/a

2.5.6 Isolation

a. Floodwaters enter Ulmarra from the south east at 5.4 m on the Ulmarra gauge, with floodwaters flowing over the Pacific Highway 5.5 m on the Ulmarra gauge closing the evacuation route (14). The Pacific Highway on the northern side of Ulmarra is cut at 5.7 m, isolating Ulmarra from Maclean. The depth of this water at 6.05 m on the Ulmarra gauge has been observed to be 0.5 m (14).

b. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area would require resupply by flood boat or helicopter operations to farm properties, to the villages of Tucabia and Pillar Valley and to people living in the hills to the east of the Coldstream River. Fodder drops to farm animals may also be necessary (2).

c. At 4.7 m on the Ulmarra gauge (3 m on the Tucabia gauge), most roads in the Coldstream area are flooded from back up flooding of the Coldstream River, isolating Tucabia, including Possum Hole Lane, Sherrys Lane, Coldstream Road, Gilletts Ridge Road, Wingfields Swamp, Old Coldstream Road and Deep Creek Road. **Tucabia** can be affected in a PMF, but the properties are generally only affected in a 1% AEP flood event but can be isolated, with similar isolation periods and arrangements for resupply as Gilletts Ridge (2).

2.5.7 Flood Mitigation Systems

Table 20: Levees in Ulmarra; summary of information

Ulmarra Levee	
Location	Ulmarra, behind residential areas and along the Pacific Highway.
Type of Levee (ring etc.)	Levee system of a combination of earth-fill (4.7 km) embankment and concrete retaining wall (0.7 km). There are no spillways. Crest width varies between 1-4 m. The levee was constructed in 1978.
Owner	Clarence Valley Council, with Roads and Maritime Services having constructed 1.3 km during roadworks on the Pacific Highway.
Design Height and freeboard	RL 6 m AHD, including a freeboard allowance. Current estimate safe operating level is 5.5 m at Ulmarra gauge (20).
Overtopping Height	5.8-6.0 m on the Ulmarra gauge
No. of properties protected	Residential and commercial areas (660 properties)
Known low points	Near River Street
Location and sequence of inundation	Floods above the crest height of the levee at Ulmarra would flow directly out of the river and through the town at high velocity. Backwater flooding from the east and south of the town still occurs in floods below the levee-overtopping level, as happened in 1996 (2).
Consequences of levee overtopping or failure	When the levee overtops it flows through the town crossing the Pacific Highway to a residential area to the east of the Highway, which is also flooded from Coldstream River backing up.
Deficiencies	In a reasonable condition in 2015, however a number of issues including issues with the existing flood gates, trees and shrubs, pump systems and outlets, temporary structure on levee batter and erosion (20).

2.5.8 Dams

a. No known dam failure consequences in Ulmarra.

2.5.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.5.10 Other Considerations

a. No additional considerations have been identified.

2.6 BRUSHGROVE, TYNDALE AND COWPER

2.6.1 Community Overview

a. **Brushgrove** is a rural village located on the southern tip of Woodford Island in the Clarence River floodplain, consisting of predominantly sugar cane farmland. There are around 62 residential and 5 commercial properties in Brushgrove (2). The population of Brushgrove is around 330 (13). It has 17% of the population under 15 years of age and 19.1% over 65. It has 3.6% indigenous population.

b. **Cowper** is a small locality located to the south of Brushgrove on the South Arm of the Clarence River (2).

c. **Tyndale** is located on the Pacific Highway halfway between Cowper and Maclean. There are 24 residential properties and a number of businesses in the village (2). The population of Tyndale is around 330 (13). It has 17.7% of the population under 15 years of age and 15.3% over 65. It has 8.4% indigenous population.

d. A summary of demographics is shown in Table 12.

2.6.2 Characteristics of flooding

a. Flooding occurs from riverine flooding from Clarence River and the South Arm.

2.6.3 Flood Behaviour

a. Refer to section 1.5.

2.6.4 Classification of Floodplain

a. Brushgrove and Cowper are low flood islands.

b. Tyndale is a high flood island.

2.6.5 Inundation

a. This area uses the Brushgrove, Ulmarra, Cowper and Maclean gauges.

b. **Brushgrove** - The natural levee facing the Clarence River is overtopped in a 5% AEP flood event (Ulmarra gauge, 6.07 m and Brushgrove 5.15 m) flooding most of the village, leaving only the high ground adjacent to the South Arm flood free (2). Most of the properties have floor levels above the 1% AEP flood event level (Brushgrove, 5.8 m), but in an event of this magnitude there would likely to be in excess of 2 m of water under some properties, as many of the homes in Brushgrove are raised. During these events, most of the roads in the town experienced shallow inundation and the septic systems became unserviceable, posing a serious health hazard (2).

c. Three houses in Brushgrove and Brushgrove hotel are inundated at 4.3 m on the Brushgrove gauge (14).

d. In Clarence Street, Brushgrove the Police Station and around 4 houses are flooded at 4.9 m on the Brushgrove gauge (14). From 5.3 m additional houses in Clarence Street, Donaldson Street, Inmon Lane and River Street become progressively flooded (14).

e. At 3.26 m on the Maclean gauge 25 properties in Brushgrove are flooded in Donaldson Street, Clarence Street, South Arm Road, Woodford Street, River Street and Weir Road.

f. **Cowper** – At 3.26 m on the Maclean gauge 2 properties are flooded on the Pacific Highway. There are 23 properties in Cowper of which 17 are known to have flood levels below the 1% AEP flood level (5.92 m Cowper gauge) and would require evacuation (2). Much of Cowper area will be inundated in a 20% AEP flood (4.01 m Cowper gauge) and floodwater will surround the majority of dwellings in a 5% AEP flood (5.10 m Cowper gauge) (2).

g. **Tyndale** - At 3.26 m on the Maclean gauge one house is flooded on the Pacific Highway.

h. Most farm dwellings on the lower Clarence floodplain are on mounds but evacuations are necessary in some floods. In 1996, there were evacuations from Cowper areas. In an extreme event it may be necessary to evacuate the residents off the floodplain east to the Pillar Range and Pine Bush State Forest and south to the Glenugie State Forest (2).

Table 21: Estimated number of properties inundated above floor level and over ground in Brushgrove related to the Brushgrove gauge (21)

Brushgrove Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over-floor Flooding in Brushgrove	No. Properties with Over-ground Flooding in Brushgrove	No. Properties with Over-floor Flooding in Cowper	No. Properties with Over-ground Flooding in Cowper
20% AEP (4.2 m)	n/a	0	46	n/a	n/a
5% AEP	1-2 m in village	7	60	n/a	n/a
1% AEP (5.8 m)	n/a	32	85	17	n/a
Extreme (8.0 m)	n/a	85	86	n/a	n/a

2.6.6 Isolation

a. Access roads are lost in and out of **Brushgrove** at 3.9 m at Brushgrove gauge, and evacuation needs to happen before this height is reached (2).

b. The majority of land at **Tyndale** is above the PMF but can be isolated. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2).

2.6.7 Flood Mitigation Systems

a. **Brushgrove.** A short informal levee protects some properties at Brushgrove from flooding direct from the Clarence River, but will not keep out severe floods (2).

2.6.8 Dams

a. No known dam failure consequences in Brushgrove.

2.6.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.6.10 Other Considerations

a. No additional consequences have been identified.

2.7 MACLEAN, ILARWIL, TOWNSEND, HARWOOD AND CHATSWORTH

2.7.1 Community Overview

a. **Maclean** is located on the southern bank of the Clarence River, immediately downstream of its confluence with South Arm. The population of Maclean is around 2600 (13). It has 15.9% of the population under 15 years of age and 31.9% over 65. It has 7.5% indigenous population. A high proportion of the population in these areas is elderly and car ownership is low.

b. **Ilarwill** is located upstream of Maclean on the south bank of the Clarence River (2). The population of Ilarwill is around 213 (13). It has 13.5% of the population under 15 years of age and 21.9% over 65. It has 6.5% indigenous population.

c. **Townsend** is located south east of Maclean on the South Arm of the Clarence River (2). The population of Townsend is around 817 (13). It has 22.2% of the population under 15 years of age and 21.5% over 65. It has 9.2% indigenous population. Much of the town is above the PMF.

d. **Harwood** is an island on the north bank of the Clarence River, predominantly sugar cane farming. The population of Harwood is around 360 (13). It has 17.4% of the population under 15 years of age and 19.7% over 65. It has 3.1% indigenous population. In Harwood there are 61 properties, 17 businesses and a sugar mill.

e. **Chatsworth** is located on a ridge of higher land adjacent to the North Arm of the Clarence River and is predominantly sugar cane farmland (2). The population of Chatsworth is around 215 (13). It has 23.1% of the population under 15 years of age and 24.5% over 65. It has no indigenous population.

f. **Warregah Island** is located between North Arm and Back Channel, with 9 houses.

g. A summary of demographics is shown in Table 12.

2.7.2 Characteristics of flooding

a. Flooding can occur from riverine flooding of Clarence River, South Arm and North Arm, as well as overland flooding from intense rainfall.

2.7.3 Flood Behaviour

a. Refer to section 1.5.

2.7.4 Classification of Floodplain

a. Maclean has rising road access between 2.5 and 2.7 m, thereafter becoming a high flood island with the levee overtopping heights at 3.3-3.4 m.

b. Chatsworth and Harwood are low flood islands.

c. Ilarwill and Townsend are high flood islands.

2.7.5 Inundation

a. This area utilises the Maclean gauge.

b. **Maclean -** Maclean has a levee which protects the CBD and residential areas along the Clarence River on the town's western edge, but these areas (100 properties including nursing home and CBD) would be inundated if the levee were to fail or be overtopped (above 3.4 m on the Maclean gauge (16)). Refer to Table 22. The caravan parks within the town are flood liable (2). At 3.26 m on the Maclean gauge 4 houses are flooded at Shark Creek on Omars Lane and Shark Creek Road; 2 properties are flooded on the Pacific Highway and Yamba Road.

c. There are around 365 residential properties and 100 business premises in this area and many of them would have over-floor inundation in a flood between the 5% AEP (3.1 m on the Maclean gauge) and 2% AEP flood (3.57 m on the Maclean gauge). The 1% AEP flood is 3.6 m on the Maclean gauge) and major overtopping of the levee would cause further inundation to these properties (2).

d. **Harwood -** Many of the homes in Harwood are raised homes, however much of the land in Harwood will be inundated in a 20% AEP flood (2.05 m Harwood gauge, 2.41 m Maclean gauge), and floodwater will surround the majority of dwellings in a 5% AEP flood (3.1 m Maclean gauge) (2). Inundation of dwellings starts as early as 1.9 m on the Maclean gauge. Up to 15 houses are flooded from 2.5 m on the Maclean gauge (14). At 3.26 m on the Maclean gauge 4 are flooded in Martins Point Road, Morpeth Street and Cannons Lane. Fifteen (15) non-residential buildings and 35 residential properties in Harwood are below the 1% AEP flood level (Harwood gauge 3.23 m, Maclean gauge 3.6 m) (2).

e. **Chatsworth -** There are approximately 40 properties in Chatsworth of which 11 are below the 1% AEP flood level (3.19 m Chatsworth gauge, 3.6 m Maclean gauge). Much of Chatsworth Island will be inundated in a 20% AEP flood and floodwater will surround the majority of dwellings in a 5% AEP flood (2). Further details are available in Table 18.

f. Extensive flooding of the islands and Ilarwill occurs at 3 m (14).

Table 22: Estimated number of properties inundated above floor level and over ground in Maclean related to the Maclean gauge

Maclean Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Maclean	No. Properties with Over floor flooding in Harwood	No. Properties with Over floor flooding in Chatsworth
5% AEP (3.1 m)	n/a	0	20	5
1% AEP (3.6 m)	n/a	400	100	25
Extreme flood (5.1 m)	n/a	420	100	30

2.7.6 Isolation

a. **Maclean -** The nursing home in Maclean (Mareeba) has been raised above 1% AEP and will be isolated in an event of this magnitude (2). Maclean can be isolated during periods of flooding (2). At 2.3 m on the Maclean gauge, the southern end of Maclean is cut at Ferry Park, preventing access south to Grafton (14).

b. The figure below summarises the warning time available for various design flood events prior to levee overtopping and evacuation routes are cut in Maclean (with the levee overtopping at 3.4 m (16).

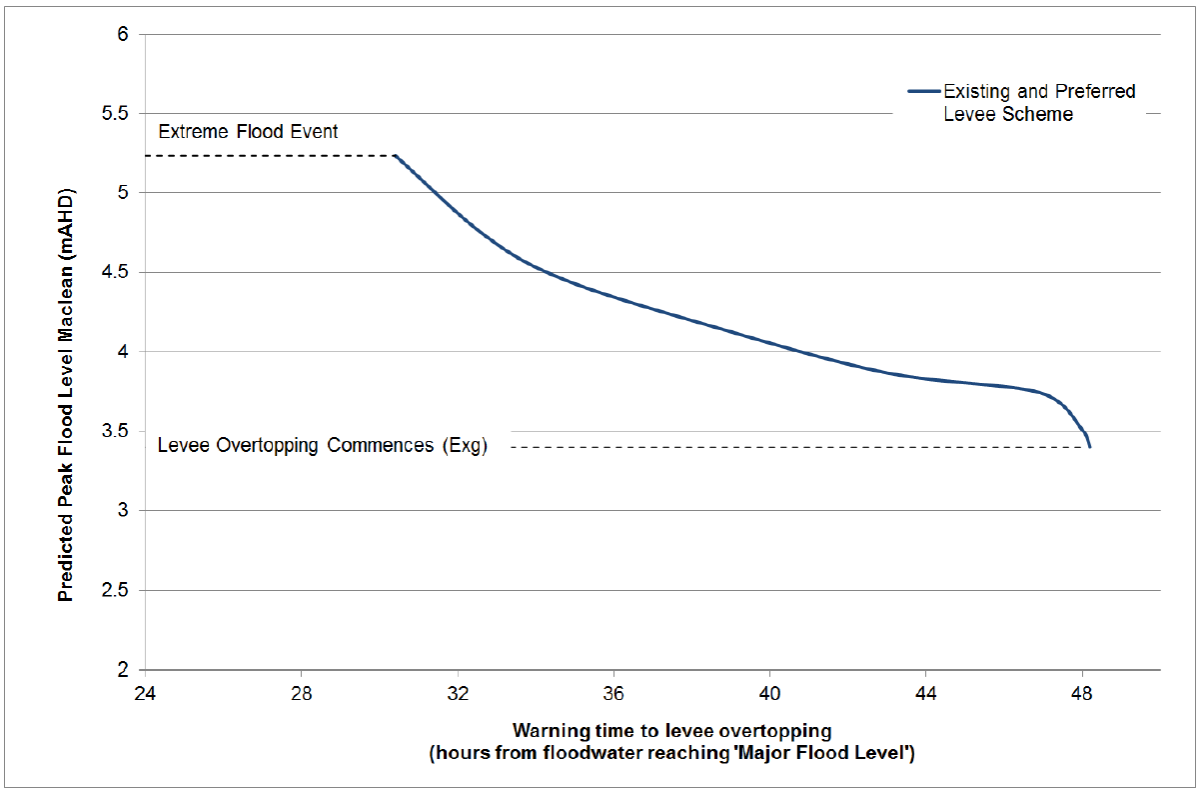


Figure 3: Warning time available (hours) for various design flood events prior to levee overtopping and evacuation routes are cut in Maclean (16).

c. **Ilarwill -** The majority of Ilarwill is located above the extreme flood level and becomes isolated in a major flood event. Except in very serious floods isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2). The Ilarwill levee overtops at 2 m on the Maclean gauge flooding Lawrence Road and isolating Ilarwill (14), 23 houses between Maclean and Yamba are also isolated. Numerous houses on Woodford Island are isolated at 3.04 m on the Maclean gauge (14). At 3.26 m on the Maclean gauge 10 houses are flooded in Lawrence Road, Woodford Dale Road and Roberts Creek Road.

d. **Townsend -** 13 residential properties and 4 businesses on the south side of Diamond and Jubilee Streets have flood water surrounding their properties in a 1% AEP event. Except in very serious floods isolation tends to be short-term of up to three to five

days and most people in the area are self-sufficient for this period of isolation (2). The Pacific Highway in this location is flooded at 2.76 m on the Maclean gauge, flowing towards Townsend.

e. **Harwood -** Access to the island cuts early and the village becomes isolated, and so evacuation would need to occur before road access to and from Harwood is cut around 2.2 m on the Maclean gauge (2). Martins Point Road floods around 1.9 m on the Maclean gauge, with the north end of Harwood Village flooded by 1.95 m isolating properties in Cannon Lane.

f. **Chatsworth -** Access to Chatsworth island cuts early and the village becomes isolated (Pacific Highway closure 2.2 m on the Maclean gauge). Except in very serious floods isolation tends to be short-term of up to two days and most people in the area are self-sufficient for this period of isolation (2).

g. **Warregah Island** can become isolated, when the bridge approaches flood.

2.7.7 Flood Mitigation Systems

Table 23: Levees in Maclean; summary of information

Maclean Levee	
Location	Maclean, running parallel to the Clarence River terminating on higher ground at either end of Maclean adjacent to private property and parklands and road easements.
Type of Levee (ring etc.)	Single levee, with a total length of 3.7 km. Part-concrete retaining wall (1 km), part-earthen levee that is grassed (2.7 km) with no spillway. Constructed in 1975. Upgrade and maintenance was complete in 2007.
Owner	Clarence Valley Council
Design Height and freeboard	Design height is estimated to be 3.3 m on the Maclean gauge. The Maclean levee has an average crest height of approximately 3.5 m on the Maclean gauge (NSW State Emergency Service, 2012). Freeboard is unknown.
Overtopping Height	Modelling suggests the Maclean Levee is overtopped around 3.4 m (16). In the simulated 2% AEP flood event the levee is overtopped near the end of Bakers Lane and near Hogues Lane. Velocities are less than 0.1 square m per second (NSW State Emergency Service, 2012). It is estimated to take 48 hours in a 2% AEP (3.5 m), 46.9 hours in a 1% AEP (3.7 m)and 30.4 hours in an extreme event (5.2 m) to overtop (16).
No. of properties protected	Low-lying parts of Maclean, including the Central Business District and nearby residential areas and nursing homes. Crest height of 3.3 m on the Maclean gauge. Floods in 1967 and

	1974 exceeded this level, as did the flood of 1890 and possibly other events in the nineteenth century. The levee is designed to keep out floods only up to about the 30% AEP flood and will be overtopped in larger events (NSW State Emergency Service, 2012).
Known low points	Levee low points at the end of Bakers Lane and near Hogues Lane (low points are 250 m either side of Hogues Lane).
Location and sequence of inundation	The first areas to be overtopped are the rural areas to the north of Maclean, with water travelling south towards Maclean through sporting fields and parklands into urban areas. In the 1% AEP flood event (3.6 m on the Maclean gauge) the levee is overtopped near the levee low points at the end of Bakers Lane and near Hogues Lane. In this event approximately 89% of the levee is overtopped.
Consequences of levee overtopping or failure	If the levee is overtopped (from approximately 3.3 -3.4m on the Maclean gauge at the low points), the low-lying land on the western side of the town would be flooded (NSW State Emergency Service, 2012). If floodwaters continue to rise the levee will begin to overtop north of Stanley Street, inundating the River Street evacuation route Major overtopping of the levee occurs in a 1% AEP flood and above, resulting in 310 and 330 properties flooded above floor in a 1% and an extreme event respectively. The flood water velocity can be up to 0.30 square m per second between Central and Union Streets (the grass area west of the Maclean District Hospital), but the average velocity is generally less than 0.1 square m per second (NSW State Emergency Service, 2012).
Deficiencies	Generally good condition as at 2015; however, a number of issues have been identified including a steep batter, trees and shrubs, permanent structure on levee (22).

2.7.8 Dams

a. No known consequences of dam failure in Maclean.

2.7.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.7.10 Other Considerations

a. The Highland Gathering Festival is held in the Easter School Holidays at the Showgrounds, with an increase of more than 10% of the population.

2.8 ILUKA AND WOOMBAH

2.8.1 Community Overview

a. **Iluka** is on the northern bank of the Clarence River opposite Yamba, at the river mouth. The population of Iluka is around 1700 (13). It is an aged population with 13% of the population under 15 years of age, 35.3% over 65 and 3.9% is over 85. It has 2.8% indigenous population.

b. **Woombah** is on the north side of the Clarence River, north east of Iluka and approximately 8 km upstream from the ocean (2). The population of Woombah is around 745 (13). It has 15.5% of the population under 15 years of age and 23.6% over 65. It has 2% indigenous population.

c. A summary of demographics is shown in Table 12.

2.8.2 Characteristics of Flooding

a. The effects on the towns and outlying areas in this sector are very much dependent on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding (2).

b. This area is subject to flooding either from elevated ocean levels, rain and waves or from the river.

2.8.3 Flood Behaviour

a. Refer to section 1.5.

2.8.4 Classification of Floodplain

a. Iluka becomes a high flood island following the flooding of access roads at 2.1 m.

b. Woombah is a high flood island following the closure of Clover Leaf/Harwood Bridge (2.1 m on the Maclean gauge).

2.8.5 Inundation

a. This area utilises the Maclean gauge.

b. Iluka contains a caravan park (The Anchorage Holiday Park) and 20 properties on low-lying land (2). The main areas subject to inundation are between Conrad Close in the north and Spencer Street in the south. The following streets have properties affected by Clarence River flooding: Marandowie Street, Conrad Close, Melville Street, Hemmingway Place, Loxton Avenue, Duke Street, Gundaroo Close, Riverview Street, Cave Street and Spenser Street.

c. **Woombah -** The eastern end of the village is below the 1% AEP flood level of 3.6 m (Maclean gauge) (2).

d. **Goodwood Island -** A caravan park on Goodwood Island (Browns Rocks) is on low-lying land and is subject to flooding in flood events around 2m at the Maclean gauge. Evacuation of the caravan park (to Woombah Village) is required (2).

Table 24: Estimated number of properties inundated above floor level and over ground in Iluka related to the Maclean gauge

Maclean Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
5% AEP (3.1 m)	n/a	0	n/a
1% AEP (3.6 m)	n/a	130	n/a
Extreme flood (5.1 m)	n/a	470	n/a

2.8.6 Isolation

a. **Iluka -** Some roads within Iluka can also be cut by flood waters, and access can be cut necessitating large-scale resupply by boat or air (2).

b. Iluka Road is closed at 2.1 m (Maclean gauge) isolating Iluka in larger floods for periods up to five days; but this is dependent on tidal influences and could be longer (2).

c. **Woombah -** Woombah can become isolated when the Pacific Highways closes at the Clover Leaf/Harwood Bridge (2.1 m on the Maclean gauge) for periods up to five days; but this is dependent on tidal influences and could be longer (2).

2.8.7 Flood Mitigation Systems

a. **Iluka.** There are a series of levees at Iluka, referred to as the Marandowie Drive Concrete Levee and Anchorage Caravan Park Levee protecting one area and the Duke Street Levee protecting another area. The system of levees protects 225 properties from flooding direct from the Clarence River, but will not keep out severe floods (2). Wave run up is likely to affect the levee, with the levee low point at 1.9 m (5% AEP event).

2.8.8 Dams

a. No known consequences of dam failure in Iluka.

2.8.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.8.10 Other Considerations

a. Iluka has four peak seasons with a potential population increase of more than 10%:

   i. School Holidays Tourist Influx Late Dec/Jan

ii. School Holidays Tourist Influx April

iii. School Holidays Tourist Influx July

iv. School Holidays Tourist Influx Sep/ Oct

2.9 YAMBA AND PALMERS ISLAND

2.9.1 Community Overview

a. **Yamba** is located at the mouth of the Clarence River on the coast, on the southern bank. The population of Yamba is around 6070 (13). It has 14.2% of the population under 15 years of age and 32% over 65, making it an aged community. It has 4.8% indigenous population.

b. **Palmers Island** is located 6 km up the Clarence River from Yamba (2), with a large tourist population including caravans. The population of Palmers Island is around 476 (13). It has 22.4% of the population under 15 years of age and 18.2% over 65. It has 0.6% indigenous population.

c. A summary of demographics is shown in Table 12.

2.9.2 Characteristics of Flooding

a. Flooding occurs due to riverine flooding from Clarence River, tides and overland flooding from intense rainfall.

2.9.3 Flood Behaviour

a. Refer to section 1.5.

b. Yamba is heavily influenced by tides, with Yamba gauge a tide gauge.

2.9.4 Classification of Floodplain

a. Yamba is a high flood island.

b. Palmers Island is a low flood island.

2.9.5 Inundation

a. Yamba and Palmers Island utilise the Maclean and Yamba gauges.

b. In **Palmers Island** most of the land on the island is flood liable and in severe floods some islands are completely submerged. At 3.26 m on the Maclean gauge 9 properties and 2 caravan parks are flooded in Yamba Road, River Street, Carrington Street, Dalley Street and McConnells Street. In a 5% AEP flood event all on Palmers Island would be surrounded by flood water (Maclean gauge 3.1 m). Fifty Four (54) properties are located within the Palmers Island Village and up to 30 would be inundated over floor in a 1% AEP flood event (Maclean gauge 3.6 m) (2).

c. In Yamba, inundation can occur from 2.4 m on the Yamba gauge dependant on the tides. Streets affected include the Halyard, Telopea Street, Melalueca Drive, Wooli Street, Carrs Drive, Yamba Plaza, Endeavour Street, Deering Street, Golding Street, Cook Street and Shores Drive (14).

d. Estimates from Clarence Valley Council indicate that up to 1000 properties may be flooded in a 1% AEP flood (3.6 m on the Maclean gauge) in Yamba and 2400 in an extreme event (5.1 m on the Maclean gauge).

e. Rural land along the Clarence River and around The Broadwater and Wooloweyah Lagoon can also be inundated and substantial numbers of rural properties can be cut off from normal means of supply, but are not flooded over floor. Few rural residents are elderly and generally have access to transport (2).

Table 25: Estimated number of properties inundated above floor level and over ground in Yamba and Palmers Island related to the Maclean gauge (15)

Maclean Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Yamba	No. Properties with Over floor Flooding in Palmers Island
5% AEP (3.1 m)	n/a	0	5
1% AEP (3.6 m)	n/a	1000	30
Extreme (5.1 m)	n/a	2400	60

2.9.6 Isolation

a. **Crystal Waters -** Roads within the Crystal Waters area of Yamba can be cut by flood waters, and several residential and commercial properties can be inundated in severe floods. The Crystal Waters area is a recently-developed area of Yamba that has been reclaimed from a swamp, as such uncertainty exists about the effects of a combination of a severe flood and storm surge conditions in this area (2).

b. **Yamba and Palmers Island -** Access to the island cuts early and the village becomes isolated, evacuation needs to occur before road access to and from Yamba is cut at the Pacific Highway at Clover Leaf/Harwood Bridge (2.1 m on the Maclean gauge) (2). At 2.4 m at Maclean, Yamba is completely isolated.

c. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2)

d. Three caravan parks on Palmers Island are flood prone and the caravans need to be relocated before the road closes at (2.1 m on the Maclean gauge) (2).

e. **Rural areas -** Rural land along the Clarence River and around The Broadwater and Wooloweyah Lagoon can also be inundated and substantial numbers of rural properties can be cut off from normal means of supply, but are not flooded over floor. Few rural residents are elderly and generally have access to transport. Most people in the area are self-sufficient for this period of isolation (2).

2.9.7 Flood Mitigation Systems

a. No known flood mitigation systems in Yamba.

b. Property situated on the western side of Palmers Island has been troubled by river-bank erosion since at least the mid-1960s. Rock protection proved to be ineffective in addressing the problem (10).

2.9.8 Dams

a. No known dam failure consequences in Yamba.

2.9.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.9.10 Other Considerations

a. Yamba “Rod Run” is a vintage car event held every year in November.

b. Yamba has four peak seasons with a potential population increase of more than 100%:

   i. School Holidays Tourist Influx Late December/January

   ii. School Holidays Tourist Influx April

   iii. School Holidays Tourist Influx July

   iv. School Holidays Tourist Influx September/ October

2.10 SANDON AND BROOMS HEAD

2.10.1 Community Overview

a. **Sandon** is located to the south of Yamba, either side of Sandon River. The access routes are long through national park to the south or north through Brooms Head. The population of Sandon is around 6, with a median age of 82 years (13). There are about 35 properties in Sandon and the majority of properties are vacation houses (2). There are no additional facilities in this location.

b. **Brooms Head** is located off Brooms Head Road south of Yamba on the coast. The population of Brooms Head is around 195 (13). It has 10.4% of the population under 15 years of age and 36.3% over 65, making it an aged community. It has 2.1% indigenous population.

c. A summary of demographics is shown in Table 12.

2.10.2 Characteristics of flooding

a. Flooding occurs from the Sandon River in Sandon. Both areas are susceptible to coastal inundation.

2.10.3 Flood Behaviour

a. Refer to section 1.5.

2.10.4 Classification of Floodplain

a. Sandon is a high flood island.

b. Brooms Head is a high flood island.

2.10.5 Inundation

a. No flood warning gauge for this area.

b. Parts of the caravan park at Sandon can be flooded by storm surge flooding (2).

c. There are approximately 100 properties in Brooms Head, but these are generally not affected by flooding (2). However, parts of the caravan park at Brooms Head can be flooded by storm surge flooding (2). There are approximately 14 residential properties and a caravan park in Brooms Head susceptible to coastal erosion/inundation (23).

2.10.6 Isolation

a. During storm surge/large tidal events Sandon River Road closes isolating **Sandon**. Most people in the area are self-sufficient for this period of isolation (2). Except in extreme floods, isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2).

b. The main access road out of **Brooms Head** is Brooms Head Road to Maclean, which can close during flooding (2).

2.10.7 Flood Mitigation Systems

a. No known flood mitigation systems in Sandon.

2.10.8 Dams

a. No known dam failure consequences in Sandon.

2.10.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.10.10 Other Considerations

a. Brooms Head and Sandon have 4 peak seasons with potential for a population increase of more than 10%:

   i. School Holidays Dec/Jan

   ii. School Holidays April

   iii. School Holidays July

   iv. School Holidays Sept/Oct

b. The majority of holiday makers in this sector are campers.

2.11 WOOLI-MINNIE WATER

2.11.1 Community Overview

a. **Wooli** is located on the coast half way between Sandon and Corindi Beach, on the Wooli Wooli River and on Wooli Road. The population of Wooli is around 493 (13). It has 16.4% of the population under 15 years of age and 28.8% over 65, making it an aged community. It has 1.8% indigenous population. Wooli has a high proportion of retirees, with many of the residents elderly and infirm (2).

b. **Minnie Water** is located to the north of Wooli on the coast, surrounded by Yuraygir National Park. The population of Minnie Water is around 189 (13). It has 11.5% of the population under 15 years of age and 26% over 65. It has 3.7% indigenous population.

c. A summary of demographics is shown in Table 12.

2.11.2 Characteristics of flooding

a. Flooding occurs from the Wooli Wooli River in Wooli. Both areas are susceptible to coastal inundation and erosion, particularly Wooli.

2.11.3 Flood Behaviour

a. Refer to section 1.5.

b. This area is heavily influenced by tides.

2.11.4 Classification of Floodplain

a. Wooli becomes a high flood island following the closure of Wooli Road, thereafter becoming a low flood island.

b. Minnie Water is a high flood island.

2.11.5 Inundation

a. Wooli utilises the Wooli gauge.

b. The South Solitary Islands Caravan Park floods at 1.5 m on the Wooli gauge, dependant on tides.

c. At 2.68 m on the Wooli gauge (1% AEP) flooding of residential areas including Wooli Council Caravan Park, Riverside Drive, Firth Lane, Durlington Lane, O'Keefe Lane, Braithewaite Lane, Scope Street, Cyril Ellem Place, Olen Close and North Street. In an extreme flood (4.5 m on the Wooli gauge) 245 residents premises are affected, with 226 flooded over floor.

d. Floods up to the level of the 5% AEP event (2.28 m on the Wooli River gauge; roughly the height reached in 1954 and 1974) are largely confined to the main channel with

some minor flooding in the Carraboi Street, Cyril Ellem Place and Olen Close areas and over floor flooding in the northern caravan park (Solitary Islands Caravan Park) (2).

e. Floods up to the level of the 1% AEP event (2.75 m on the Wooli River gauge) properties in Carraboi Street, Cyril Ellem Place, Olen Close, Firth Lane, Durlington Lane, O'Keefe Lane, Braithwaite Lane, Scope Street and North Street will be surrounded by flood water. This is estimated to be approximately 100 properties (2).

f. In an extreme event Wooli can be cut into two by the closure of Main Street near the intersection of Riverside Drive (4.44 m on the Wooli gauge). Evacuation of properties in low lying areas in the North of Wooli will need to occur before this closure (226 properties). Almost all of the houses are of only one storey (2). Over floor flooding would occur in the properties in Carraboi Street, Cyril Ellem Place, Olen Close, Firth Lane, Durlington Lane, O'Keefe Lane, Braithwaite Lane, Scope Street and North Street and in the northern caravan park (Solitary Islands Caravan Park). This is estimated to be around 226 properties (2).

g. In the extreme event on the South side of Wooli, lower areas of the southern caravan park (Wooli Council Caravan Park) would be inundated and the low-lying portions of Riverside Drive (2). Depths over individual floors could be as much as 2.5 m and structural damage would be expected despite the fact that velocities would not be high (2).

h. The section of Wooli beach in front of the Wooli village has been declared a 'coastal erosion hotspot', which could potentially impact 6 properties (24).

Table 26: Estimated number of properties inundated above floor level and over ground in Wooli related to the Wooli gauge (15)

Wooli Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
5% AEP (2.28 m)	n/a	n/a	n/a
1% AEP (2.75 m)	n/a	100	n/a
Extreme	>2.5	226	n/a

2.11.6 Isolation

a. In **Minnie Water** (approximately 200 properties) and **Wooli** (600 properties) becomes isolated when Wooli Road closes at Sandy Crossing with localised heavy rainfall. This road is closed during flood events at Lake Hiawatha, by 2.55 m on the Wooli gauge. In large floods isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2).

b. In very severe events, the same may be true of Sandon (2).

2.11.7 Flood Mitigation Systems

a. No known flood mitigation systems in Wooli; however it is a coastal erosion hot spot with some temporary works such as geotextile bags along the river.

2.11.8 Dams

a. No known consequences of dam failure.

2.11.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.11.10 Other Considerations

a. Wooli and Minnie Waters has four peak seasons with potential for a 10% population increase:

   i. School Holidays Tourist Influx Late Dec/Jan

   ii. School Holidays Tourist Influx April

   iii. School Holidays Tourist Influx July

   iv. School Holidays Tourist Influx Sep/ Oct

2.12 CANGAI

2.12.1 Community Overview

a. **Cangai** is located on the Mann River in the ranges to the west of Grafton. The population of Cangai is around 182 (13), predominantly rural and livestock farms. It has 20.7% of the population under 15 years of age and 9.2% over 65. It has 9.9% indigenous population.

2.12.2 Characteristics of flooding

a. Flooding occurs from the Mann River and tributaries, as well as overland flooding from intense rainfall.

2.12.3 Flood Behaviour

a. Refer to section 1.5.

2.12.4 Classification of Floodplain

a. High flood island.

2.12.5 Inundation

a. No known dwelling inundation.

b. No warning gauges in the area.

2.12.6 Isolation

a. Some properties can become isolated when the Baryulgil Rd closes (1.5m Baryulgil gauge) (2).

b. The Cangai Road Bridge can close at 5.72 (Jackadgery gauge) cutting access to Grafton and isolating approximately 220 properties (500 residents) in the area including the localities of Cangai Baryulgil, Jackadgery, Coombadjha and Carnham (2).

c. There are potentially other road closures due to land slips (e.g. Gwydir Highway) which may also isolate properties in the area (2).

d. Isolation tends to be short-term of up to five days and 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 (2).

2.12.7 Flood Mitigation Systems

a. No known flood mitigation systems in Cangai.

2.12.8 Dams

a. No known dam failure consequences in Cangai.

2.12.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.12.10 Other Considerations

a. Cangai has one peak season with potential population increase of more than 10%:

   i. Summer School Holidays - Public Lands within remote areas of this sector are utilized by campers.

2.13 COUTTS CROSSING

2.13.1 Community Overview

a. **Coutts Crossing** is located on the Orara River to the south of Grafton, predominantly livestock farming. The population of Coutts Crossing is around 1040 (13). It has 22.8% of the population under 15 years of age and 13.3% over 65. It has 4.9% indigenous population.

b. A summary of demographics is shown in Table 12.

2.13.2 Characteristics of flooding

a. Coutts Crossing area is susceptible to riverine flooding from the Orara River tributaries and overland flooding.

2.13.3 Flood Behaviour

a. Refer to section 1.5.

2.13.4 Classification of Floodplain

a. A series of high flood islands.

2.13.5 Inundation

a. Floods can cause considerable damage to fences and pastures as well as causing stock losses. A small river rise of as little as two m on the Orara River can result in a need for farmers to shift pumps and move cattle to higher ground (2).

2.13.6 Isolation

a. Coutts Crossing (approximately 1000 properties) contains many rural properties which become isolated with progressive road closures from 3.2 m – 7 m (Nymboida River gauge) and 6.6 m – 10 m (Orara (Coutts Crossing) gauge) (2).

b. At 6.6 m on the Coutts Crossing gauge, 30 properties in the Middle Creek area is isolated (14).

c. At 7.1 m on the Coutts Crossing gauge, 70 properties in the Lower Kangaroo Creek area are isolated (14).

d. At 7.4 m on the Coutts Crossing gauge, 12 properties at Fiddlers Creek are isolated (14).

e. At 7.9 m on the Coutts Crossing gauge 20 properties in Shannondale are isolated (14).

f. At 8.5 m on the Coutts Crossing gauge 15 properties at Levenstrath are isolated (14).

g. At 10 m on the Coutts Crossing gauge 6 properties in Braunston are isolated (14).

h. Isolation tends to be short-term of up to five days, except in prolonged floods and most people in the area will need resupply, if any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (2).

2.13.7 Flood Mitigation Systems

a. No known flood mitigation systems have been identified in Coutts Crossing.

2.13.8 Dams

a. No known dam failure consequences in Coutts Crossing.

2.13.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.13.10 Other Considerations

a. No additional considerations have been identified.

2.14 GLENREAGH

2.14.1 Community Overview

a. **Glenreagh** is a small town near the southern boundary of the Clarence Valley on the Orara River, a tributary of the Clarence River. The population of Glenreagh is 859 (13), made up of 24% under 15 years and 13% over 65. It has 7% aboriginal population.

b. This area is predominantly rural, with villages of Karangi, Coramba and Nana Glen nearby.

c. A summary of demographics is shown in Table 12.

2.14.2 Characteristics of flooding

a. The Glenreagh area is susceptible to riverine flooding from the Orara River and Bucca Bucca Creek catchments and overland flooding. These catchments flow in a general north west direction (3).

b. Floodwaters have been known to rise quickly (3).

2.14.3 Flood Behaviour

a. In the 20% and 5% AEP events, flood flows are expected to surcharge the Orara River and Tallawudjah Creek channels, and spill onto the floodplain (3). Flood velocities are generally below 2 m/s, in the 20% and 5% AEP flood events in the flood plains. However in creeks which are steep and confined, flood velocities greater than 2 m/s could be expected. For example the areas upstream of the Glenreagh Gauge and downstream of the Glenreagh Bridge have narrow creek channels and elevated flood velocities would be expected in these locations (3).

b. In the 1% AEP event, large areas of the floodplain would be expected to have flood velocities below 2 m/s. However flood velocities within many of the creek channels would be expected to be in excess of 2 m/s (3).

c. In a PMF flood levels are expected to be approximately 3 to 4 m deeper than the 1% AEP. This would result in significant and widespread flooding (3).

d. Many of the tributaries, which are generally steep in grade, exhibit flood velocities in excess of 2 m/s (3).

e. The majority of the Orara River and Tallawudjah Creek 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; and 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 (3).

2.14.4 Classification of Floodplain

a. High flood island up to and including the PMF.

2.14.5 Inundation

a. Glenreagh utilises the Glenreagh and Karangi stream gauges. The Glenreagh telemetered gauge has a predictive service from the Bureau of Meteorology (transferred from the manual gauge in 2016). The telemetered gauge is upstream of the town and shows a different height during floods to the manual gauge in town. This can cause confusion during floods, where the manual reading is observed, which varies from the height reported by the Bureau.

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

c. In a 20% and 5% AEP, properties to the north of Glenreagh, in the vicinity of the confluence of Tallawudjah Creek and the Orara River would be expected to be at risk, the majority of Glenreagh would largely be unaffected by flood waters (3).

d. In a 1% AEP, flood waters are expected to inundate large areas of the floodplain on the Orara River, Tallawudjah Creek and associated tributaries. Flood waters are expected to inundate properties north of Connell Street, Glenreagh and in the vicinity of the Tallawudjah Creek Road intersection. Flooding is also expected along Kookaburra Drive and Lorikeet Place in the vicinity of the railway line to the east of Glenreagh. This is estimated to be around 30 properties (3).

2.14.6 Isolation

a. A large number of rural properties are expected to be isolated by flood waters across all catchments.

b. Glenreagh, including Braunstone-Mulquinney's Road and Kungala (approximately 550 properties in total) contains many rural properties and during floods there is progressive road closures in the area from 5.8 m (Glenreagh gauge) – Orara Way at the Bluff Bridge, until the closure of the last access out of Glenreagh (1.6 km east of Glenreagh at Glenreagh Creek) at 7.6 m (Glenreagh gauge) cutting access to Coffs Harbour, isolating Glenreagh (2).

c. At 5.8 m on the Glenreagh TM gauge 150 properties in Kremnos and Kungala are isolated. Bluff Bridge on Orara Way closes, preventing access to Grafton (14).

d. At 9.75 m on the Glenreagh TM gauge Glenreagh town is isolated, from Orara Way flooding 1.6 km south of Glenreagh (14).

e. While flood waters can recede quickly, isolation remains for up to five days. In prolonged floods and most people in the area 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 (2).

f. Rural landowners can be cut off when local roads are closed by flood waters. Floods can cause considerable damage to fences and pastures as well as causing stock losses (2).

g. In a 20% and 5% AEP number of bridges and roads are expected to be inundated. This includes (3):

   i. Orara Way near Lurlocks Road flooded by 3 m in a 20% AEP event.

   ii. Orara Way near Shipmans Road flooded by 0.5 m in a 5% AEP event.

   iii. Glenreagh Bridge flooded by 2 m in a 20% AEP event.

   iv. Tallawudjah Creek Bridge flooded by 0.3 m in a 20% AEP event.

   v. Orara Way north of Tallawudjah Creek Bridge flooded by 3 m in a 20% AEP event.

2.14.7 Flood Mitigation Systems

a. No known flood mitigation systems have been identified in Glenreagh.

2.14.8 Dams

a. No known dam failure consequences in Glenreagh.

2.14.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.14.10 Other Considerations

a. No additional considerations have been identified.

2.15 NYMBOIDA

2.15.1 Community Overview

a. **Nymboida** is located in the Hinterland on the Nymboida River, to the south west of Grafton. The population of Nymboida is around 300 (13). It has 18.7% of the population under 15 years of age and 12.4% over 65. It has 4% indigenous population.

b. There are two camping reserves located along the Nymboida River that are considered to be at risk during flood events. They are Black Mountain Reserve and Cartmill Park located at Nymboida. Both reserves are only available to canoeists for camping (2).

c. Camping also occurs along the Clarence River at Winegrove on the Lilydale reserve, Alice, Buccarumbi and at the Cangai Recreation reserve (Cangai Bridge and Cangai Broadwater) (2).

d. Camping at these locations is informal and is not authorised or unauthorised (2).

2.15.2 Characteristics of flooding

a. Flooding occurs from the Nymboida River and tributary Creeks, as well as overland flow during intense rainfall.

2.15.3 Flood Behaviour

a. Refer to section 1.5.

2.15.4 Classification of Floodplain

a. High flood islands.

2.15.5 Inundation

a. No known dwelling inundation.

2.15.6 Isolation

a. No known isolation.

2.15.7 Flood Mitigation Systems

a. No known flood mitigation systems.

2.15.8 Dams

a. No known dam failure consequences.

2.15.9 At Risk Facilities

a. The facilities that are at risk of flooding and/or isolation within the Clarence Valley LGA including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.15.10 Other Considerations

a. No additional considerations have been identified.

ROAD CLOSURES AND ISOLATED COMMUNITIES

2.16 ROAD CLOSURES

a. Table 27 lists roads liable to flooding in the Clarence Valley LGA.

Table 27: Roads liable to flooding in Clarence Valley LGA (19).

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
Clarence Street	Between Fitzroy and Pound Streets	** Sub Sector A	N/a	8.2-8.3m (Prince Street gauge)	4.0-4.8 hours
Clarence Street	Between Pound and Hoof Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	3.2.2-4 hours
Fitzroy Street	Between Prince and Clarence Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	2.0-2.5 hours
Pound Street	Between Prince and Clarence Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	2.5-3.0 hours
Prince Street	Between Fitzroy and Pound Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	3.6-5.8 hours
Prince Street	Between Pound and Oliver Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	3.5-5.6 hours
Prince Street	Between Oliver and Dobie Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	4.4-5.8 hours
Prince Street	Between Dobie and Hoof Streets	** Sub Sector A	N/a	8.0-8.2m (Prince Street gauge)	4.6-6.2 hours
Oliver Street	Between Queen and King Streets	** Sub Sector B	N/a	8.0-8.2m (Prince Street gauge)	4.0-6.2 hours
Dobie Street	Between Prince and Queen Streets	** Sub Sector B	N/a	8.0-8.2m (Prince Street gauge)	5.0-7.1 hours
Turf Street	Corner of Hoof Street	** Sub Sector B	N/a	8.0-8.2m (Prince Street gauge)	6.8-17.6 hours
Cranworth Street	Between North and Hoof Streets	** Sub Sector C	N/a	8.0-8.2m (Prince Street gauge)	7.4-10.8 hours
Bent Street	Between Queen and King Streets	**	N/a	8.2-8.3m (Prince Street	6.6-11.1 hours

[1] The timeframes assume 2% flood and extreme flood (8.2m and 9.7m respectively) ***rate of rise

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
		South Grafton		gauge)	
Summerland Way (MR83)	Deep Gully Creeks between Grafton and Junction Hill, at various locations between Junction Hill and Whiporie	Closure of this road is not a frequent occurrence but will prevent access to Casino	No	Levee overtopping at Grafton Prince Street Gauge 8.34m. Other locations nominated along road are affected by significant local rainfall.	
Grafton-Coaldale-Baryulgil Road	Whiteman Creek	Access from Baryulgil to Grafton.	Clarence Way if not affected by flooding.	Area affected by significant local rainfall.	
Clarence Way (MR150)	Double Swamp Creek, Moleville Creek and Chaselings Gully.	Access to Grafton is cut from Copmanhurst.	No	Road cut at 8.0m on Copmanhurst Gauge.	
Rogans Bridge Rd (Grafton-Copmanhurst) via Seelands at Rogans Bridge	Rogans Bridge	Access to Grafton is cut from Copmanhurst	Clarence Way if not affected by flooding.	Road cut at 6.0m on the Copmanhurst Gauge.	
Lawrence Rd (MR152)	Sportsman's Creek Bridge	Access from Lawrence to Grafton.	Pringles Way via Summerland Way	Road cut at 2.5m on the Lawrence Gauge.	
Orara Way Grafton to Coffs Harbour	Bluff Bridge	Access to Grafton from Glenreagh	Pacific Highway	Road Cut at 5.8m on Glenreagh Gauge.	
Pacific Highway (SH10)	Ballina to Maclean at Harwood Bridge	Closure may last for some days as in 1996, 2001 and 2011	No	Highway cut at the 2.1m on the Maclean Gauge.	
	Maclean to Grafton at Shark Creek	Access to Grafton	No	Highway cut at 2.0m on the Maclean Gauge.	
	Ulmarra to Grafton	Swan Creek	No	Highway cut at 5.5m on the Ulmarra Gauge.	
	Grafton-Coffs Harbour	This road can be closed at Alipou Creek (South Grafton	A high-level bypass is available at Lilypool Road.	Highway cut at 5.4m on the Grafton Prince Street Gauge.	

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
	Ballina to Grafton	Access from Queensland Northern Rivers to Sydney	Summerland Way (MR83) and Bruxner Highway (SH16);	Highway cut at 5.4m on the Grafton Prince Street Gauge	
Grafton to Nymboida on Armidale Road	3 bridges south of Coutts Crossing	No through traffic to Grafton	No	Area affected by significant local rainfall.	
Maclean-Yamba road	Harwood Bridge, Palmers Island Bridge and Oyster Channel	Access from Yamba to Maclean and Grafton.	No	Yamba Road cut at Cloverleaf Harwood Bridge at 2.1m.	
Iluka road	Esk River	Access from Iluka to Ballina/Grafton		Road cut at 2.1m on Maclean Gauge	
Eight Mile Lane (to Wooli via Airport road)	Sandy Crossing	Access from Wooli to Airport.	Wooli / Tucabia Road	Local significant Rainfall in excess of 100mm+	
Wooli Road (Ulmarra to Wooli via Tucabia and Pillar Valley)	Whites Bridge	Access Ulmarra to Wooli	No	Local significant Rainfall in excess of 100mm+.	

2.17 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

a. Table 28 lists communities liable to isolation and potential periods of isolation. Information presented here is based on historical and design events and does not reflect the duration of isolation expected in larger and extreme events.

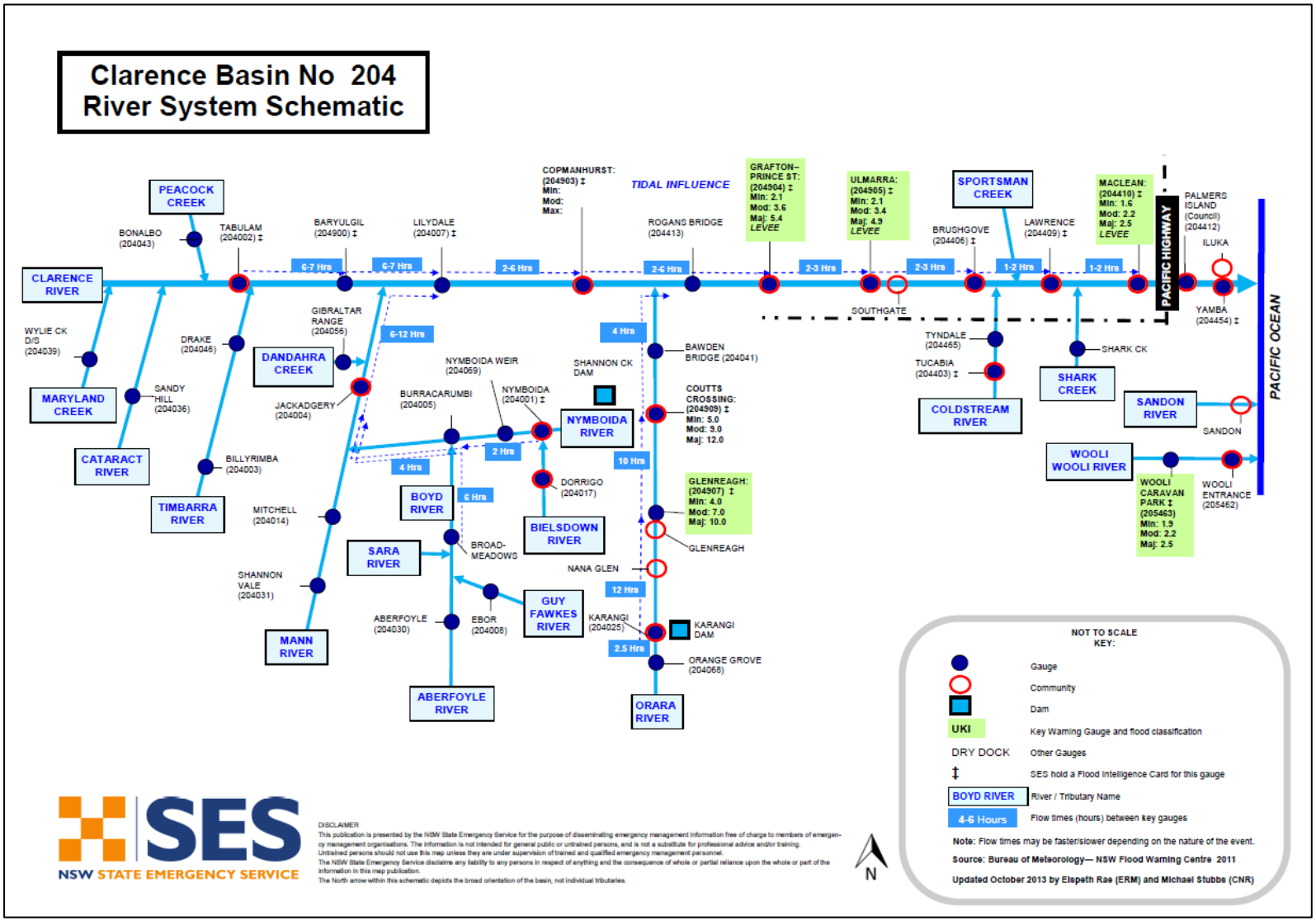
Table 28: Potential Periods of Isolation for communities in the Clarence Valley LGA during a Major flood.

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	Approximate period isolation	Days								NOTES
				1	2	3	4	5	6	7	8	
Copmanhurst Sector	1400 properties	High flood island	3- 5 days									Resupply to local service station and hotel (Junction Hill) and general store at Copmanhurst
Lawrence Sector	1100 properties	High flood island	3- 5 days									Resupply to Lawrence general store.
Ulmarra Sector	50 (Tucabia); 4 (Bostock); 2 (Gilletts Ridge) properties	High flood island	3-5 days									Resupplied to Tucabia general store; Remainder of resupply to individual properties
Brushgrove Sector	25 properties (Tyndale); Other rural properties	High flood island	3-5 days									Resupply to Tyndale service station; Some resupply to individual properties
Maclean Sector	2300 properties	High flood island	2-4 days									Resupply to Maclean Base hospital and Spa supermarket; local bakery
Iluka Sector	1100 properties	High flood island	3-5 days									Resupply to local stores by boat from Yamba.
Yamba Sector	3000 properties	High flood island	3-5 days									Resupply supermarkets.
Wooli – Minnie Water Sector	750 properties	High flood islands	3-5 days									Resupply to local stores in Minnie Waters and Wooli.
Coutts Crossing Sector	220 properties including: Middle Creek (30	High flood islands	3-5 days									Resupplied by flood boat to central location

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	Approximate period isolation	Days								NOTES
				1	2	3	4	5	6	7	8	
	properties); Kangaroo Creek(70 properties); Mulquinney's (12 properties); Shannondale (20 properties); Levenstrath (15 properties); Braunstone (6 properties); Buccarumbi (40 properties); Copes Creek (6 properties); Pollocks Bridge (20 properties)											
Cangai Sector	220 properties	high flood island	2 – 8 days									Potential resupply to individual properties on request.

Note: Periods of isolation are a guide only. Liaison with the Local Controller and communities/residents involved is essential during periods of potential and actual isolation.

ANNEX 1: CLARENCE RIVER BASIN SCHEMATIC



ANNEX 2: FACILITIES AT RISK OF FLOODING AND/OR ISOLATION

Clarence River Valley

Facility Name	Street	Suburb	Comment
Schools			
Grafton High	Oliver and Mary Streets	Grafton	Approximately 978 students and 91 teachers
Grafton Public	Queen Street	Grafton	Approximately 724 students and 65 teachers
St Marys Primary	Turf Street, Westlawn	Grafton	Approximately 173 students and 16 teachers
Westlawn Public	North Street	Grafton	Approximately 438 students and 25 teachers
South Grafton Public	Vere Street	South Grafton	Approximately 600 students and 40 teachers
Clarence Valley ANGLICAN (Junior School)	Victoria Street	Grafton	Approximately 171 students and 22 teachers
Cowper	Clarence and Samuel Streets	Cowper	Approximately 17 students and 2 teachers
Ulmarra	Pacific Hwy	Ulmarra	Approximately 68 students and 13 teachers
Harwood Island	Morpeth Street	Harwood	Approximately 62 students and 8 teachers
Tucabia	Mookin Street	Tucabia	Approximately 70 students and 8 teachers
Chatsworth Island Public School	Chatsworth Island Rd	Chatsworth	
Iluka Public School	Charles St	Iluka	
Palmers Island Public School	Maclean-Yamba Rd	Palmers Island	
St James' Primary School	Carrs Drive	Yamba	
Woodford Dale Public School	Woodford Dale	Woodford Island	
Yamba Public School	Angourie Rd	Yamba	
Maclean High School	Woombah Street	Maclean	
South Grafton High School	Tyson St	South Grafton	
TAFE NSW - North Coast Institute Grafton Campus	Clarence Street	Grafton	
TAFE NSW - North Coast Institute Maclean Campus	Wombah Street	Maclean	

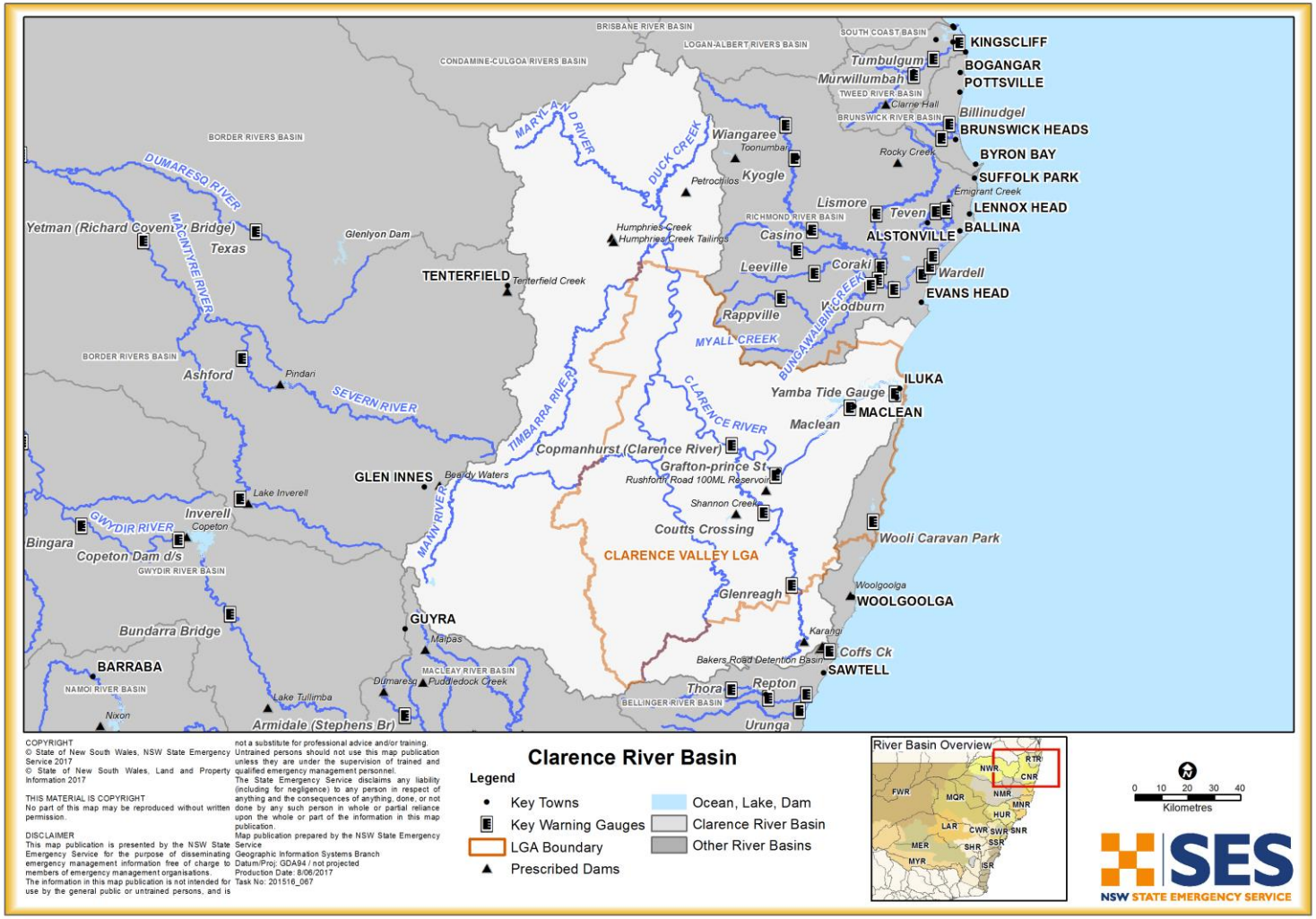
Facility Name	Street	Suburb	Comment
Child Care Centres			
South Grafton Multi-Purpose Childcare Centre	Cnr Skinner and Spring Streets	South Grafton	Approximately 60 students and 9 teachers
Bright Sparks Child Development Centre	Bacon Street	Grafton	Approximately 50 students and 5 teachers
Blinky's Children's Centre	Cranworth Street	Grafton	Approximately 29 students and 5 teachers
Jack And Jill	Prince Street		Approximately 25 students and 5 teachers
Westlawn Pre-School	Milton Street	Grafton	Approximately 24 students and 4 teachers
Abc	Duke Street		Approximately 80 students and 20 teachers
Nuture One	Arthur Street		Approximately 71 students and 14 teachers
Arthur Street Children's Centre	Arthur Street	Grafton	
Clarence Family Day Care	Turf Street	Grafton	
Clarence Valley Anglican School - After School Care	Victoria Street	Grafton	
Coldstream Community Preschool	Clarence Street	Tucabia	
Coldstream Community Pre-School	Clarence Street	Tucabia	
Community OOSH Services South Grafton	South Grafton Public School, Vere Street	South Grafton	
Community OOSH Services Westlawn	Westlawn Public School, North Street	Grafton	
Goodstart Early Learning Grafton	Duke Street	Grafton	
Gummyaney Aboriginal Corporation	Pound Street	Grafton	
Iluka Pre-School	Micalo Street	Iluka	
Jacaranda Pre-School Kindergarten	Kelly Street	Grafton South	
Kangabunnabys Childcare Centre	Providence Court	Yamba	
South Grafton Out of School Hours Care (South Grafton Multipurpose Childcare	Corner Spring and Skinner Streets	South Grafton	
St James Outside Hours Care	St James School, Lot 1 Carrs Drive	Yamba	

Facility Name	Street	Suburb	Comment
Uniting care Jack and Jill Preschool	Bacon Street	Grafton	
Willy Wagtails Kindergarten	Shores Drive	Yamba	
Yamba Preschool	Phoenix Cl	Yamba	
Yamba Vacation Care - Wooli Street	Wooli Street Hall, Wooli Street	Yamba	
Facilities for the aged and/or infirm			
Clarence Nursing House	Crown Street	Grafton	Approximately 64 in care and 23 carers
Clarence Village	Turf Street	Grafton	Approximately 73 in care and 2 carers
St Catherines Villas	North Street	Grafton	Approximately 63 in care and 15 carers
Dougherty Villas	Arthur Street	Grafton	Approximately 54 in care and 13 carers
Clarence Village	Queen Street	Grafton	Approximately 45 in care and 2 carers
Grafton Aged Care	Bent Street	South Grafton	Approximately 64 in care and 23 carers
Caroona Yamba	Freeburn Street	Yamba	Approximately 85 in care and 20 carers
Beth Haven Village		Iluka	
Palm Lake Residential Resort Yamba		Yamba	
Rathgar Lodge		Ulmarra	Approximately 32 in care and 19 carers
The Whiddon Group Maclean		Maclean	
Grafton Base Hospital	Arthur Street	Grafton	
Maclean District Hospital	Union Street	Maclean	
Justice Health - Grafton Health Centre	Hoof Street	Grafton	
Clarence Valley Transitional Aged Care Service	Aruma	Grafton	
Far North Coast Disability and Aged Consortium	River Street	Maclean	
Mareeba Aged Care	Rannoch Avenue	Maclean	
Rathgar Lodge	Lynhaven Crescent	Ulmarra	
St Francis Aged Care	Arthur Street	Grafton	

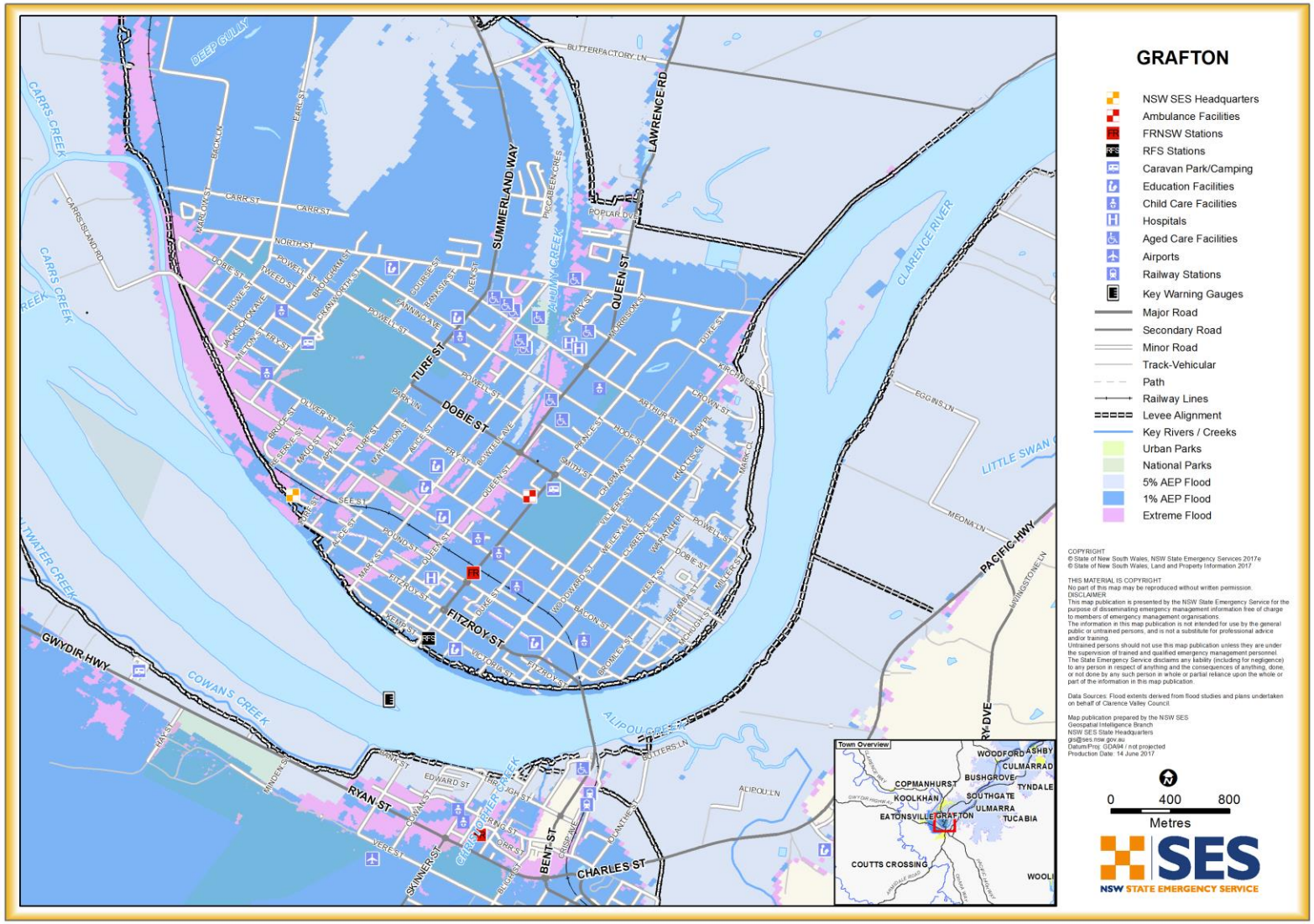
Facility Name	Street	Suburb	Comment
The Whiddon Group-Grafton	Crown Street	Grafton	
The Whiddon Group-Maclean	Union Street	Maclean	
Utilities and infrastructure			
Grafton Airport			The Grafton airport is flood free, but road access to it can be cut during very serious flooding and, briefly, from local creek flooding (2).
Clarenza Sewage Treatment Plant	Clarenza Road	Clarenza	
Iluka Sewage Treatment Plant	Henry Searle Drive	Iluka	
North Grafton Sewage Treatment Plant	Duke Street	Grafton	
Grafton Telephone Exchange	King Street	Grafton	
Iluka Telephone Exchange	Charles Street	Iluka	
Junction Hill Telephone Exchange	Casino Road	Junction Hill	
Maclean Telephone Exchange	Corner River Street & McNaughton Place	Maclean	
Ulmarra Telephone Exchange	Coldstream Street	Ulmarra	
Yamba Telephone Exchange	Bent Street	Yamba	
Coutts Crossing regulator	McPhersons Crossing	Coutts Crossing	Can be difficult to access during times of flood.
Camping Ground / Caravan Parks			
Glenwood Tourist Park	71 Heber Street	South Grafton	Inundation of low-lying areas of park commence at 5.70m Majority sites permanent residents and overnight travellers.
Sunset Caravan Park	302 Gwydir Highway	South Grafton	Inundation may occur at levee overtopping at 8.2m. Majority sites permanent residents and overnight travellers.
The Gateway Village Holliday Park	598 Summerland Way	Grafton	Evacuation would be required on levee overtopping at 8.2m.
Grafton Showground	Prince Street	Grafton	Evacuation would be required on levee overtopping at 8.2m.
Big River Caravan & Ski Lodge	166 Ski Lodge Road	Seelands	Isolation occurs at the beginning of moderate level. No inundation of park occurs.
Browns Rocks Caravan Park	391 Goodwood Island Road	Goodwood Island	Caravan Park is advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence.
Anchorage Holiday Park	Marandowie Drive	Iluka	Evacuation would be required at 2.4m on Maclean gauge coinciding with

Facility Name	Street	Suburb	Comment
			a high tide.
Yamba Waters Holiday Park	36 Golding Street	Yamba	Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February
Solitary Islands Marine Park Resort	383 North Street	Wooli	Evacuation may be required at 1.5m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by Tidal conditions. Peak season during school holidays.
Wooli Caravan Park	25 Riverside Drive	Wooli	Evacuation may be required at 2.75m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by tidal conditions. Peak season during school holidays.
Grafton Greyhound Reserve Trust	Cranworth Street	Grafton	Inundation may occur at levee overtopping at 8.2m. Majority sites permanent residents and overnight travellers.
Maclean Riverside Caravan Park	115 River Street	Maclean	Inundation may occur at levee overtopping at 3.3m. Majority sites permanent residents and overnight travellers.
Brooms Head Caravan Park	Ocean Road	Brooms Head	Caravan Park not affected by Riverine flooding but will be affected by storm surge and large ocean seas.
Calypso Holiday Park	14 Harbour Street	Yamba	Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February
Blue Dolphin Holiday Park	Yamba Road	Yamba	Caravan park is affected by tidal conditions Evacuations may occur due to King Tides. Peak season December to February
Salt Water Big 4 Yamba Clarence Coast Resort	286 O'Keefe's Lane	Palmers Island	Caravan Park is advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December to February
Fishing Haven Caravan Park	35 River Street	Palmers Island	Caravan Park is advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December to February

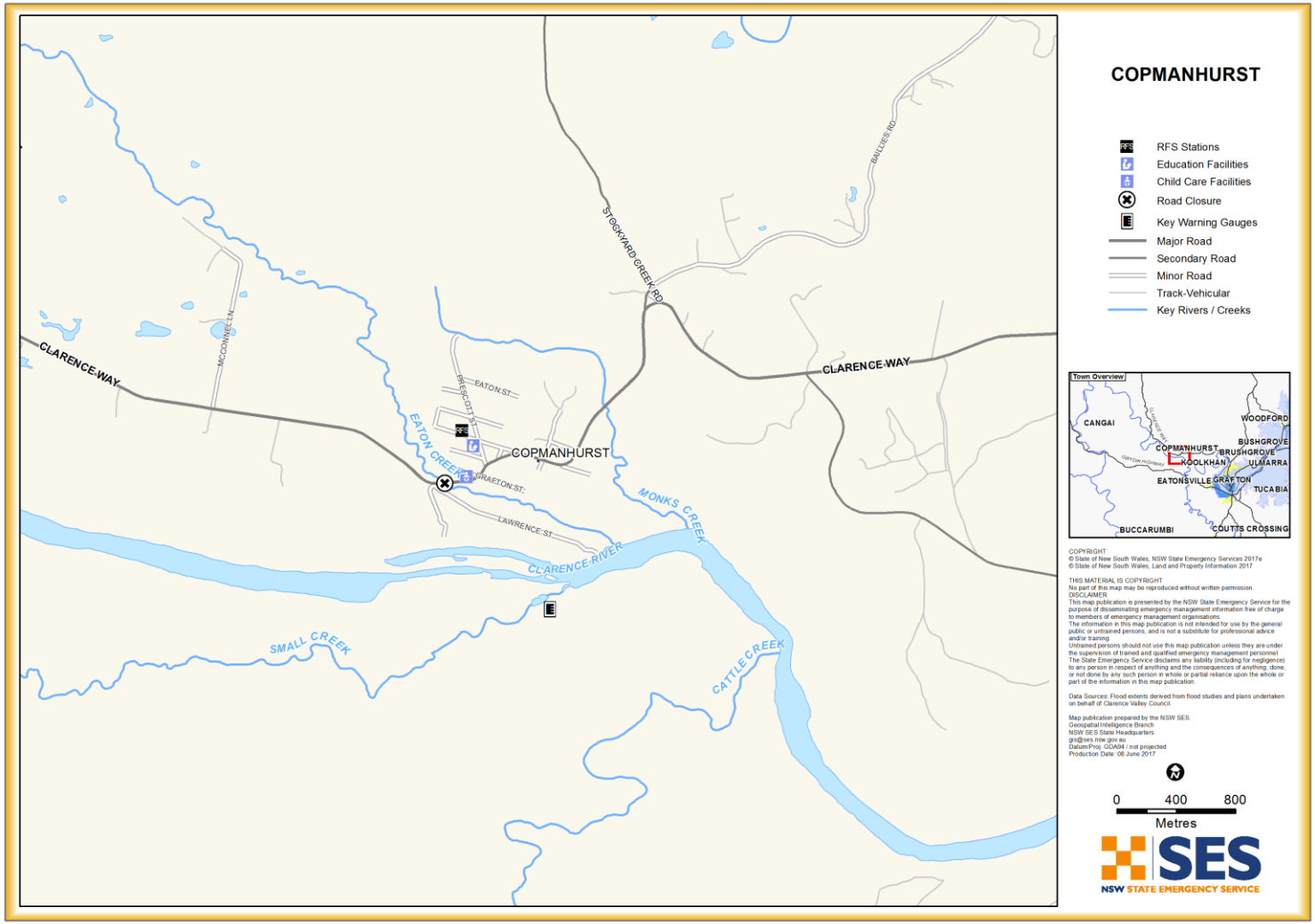
MAP 1: CLARENCE RIVER BASIN



MAP 2: GRAFTON TOWN MAP



MAP 3: COPMANHURST TOWN MAP



Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

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Geospatial Intelligence Branch
NSW SES State Headquarters
gis@ses.nsw.gov.au
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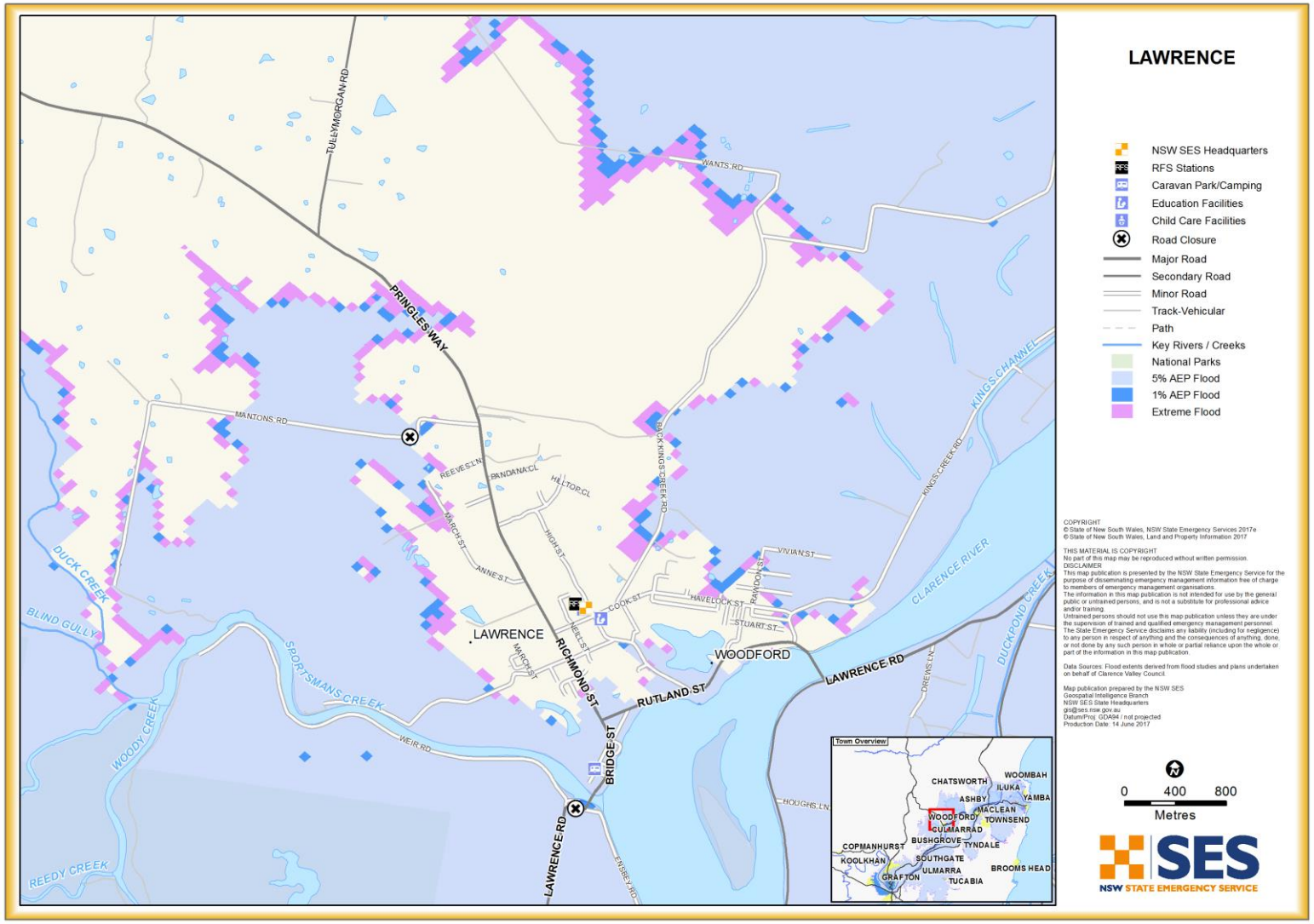
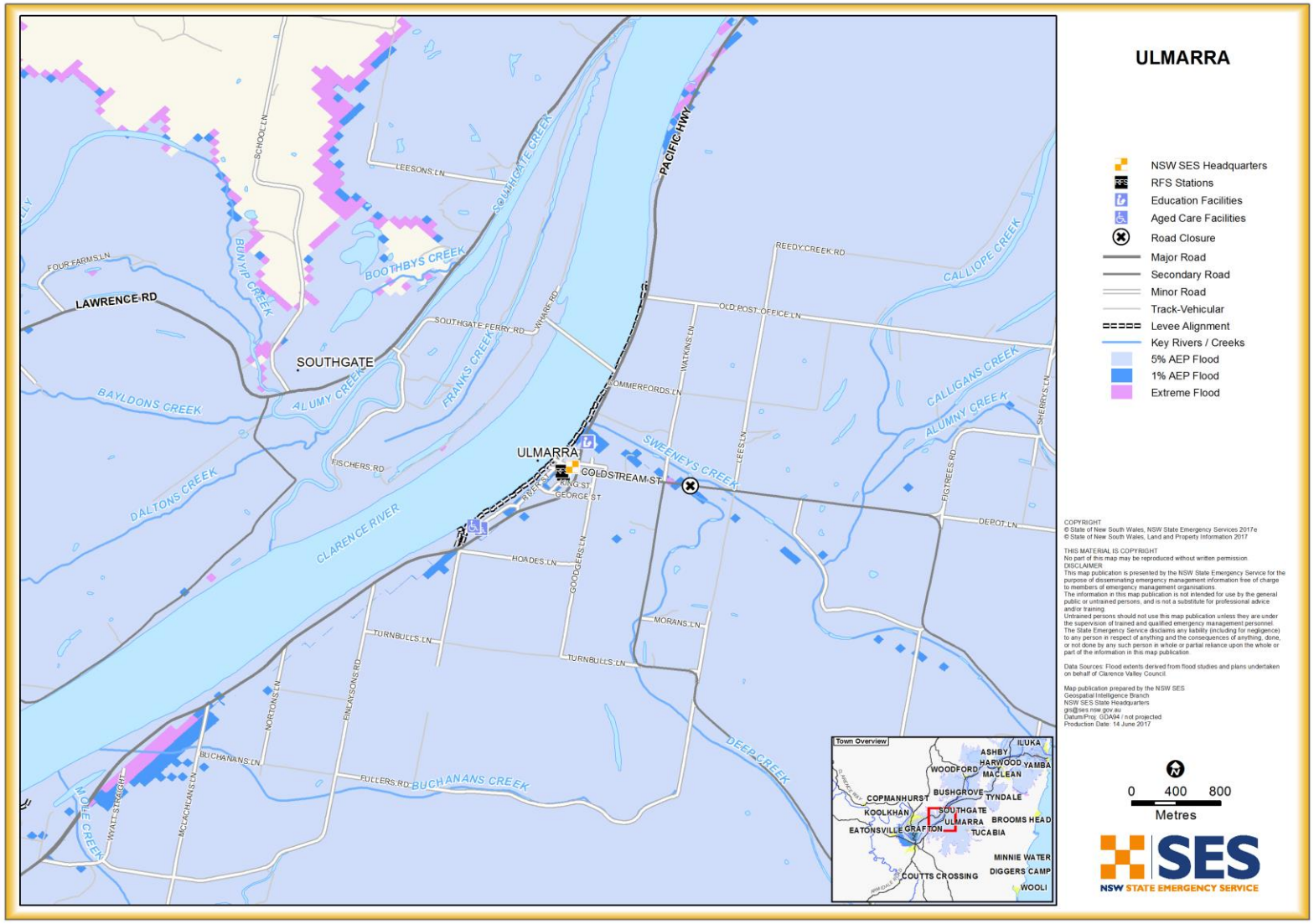
Production Date: 06 June 2017

MAP 4: LAWRENCE TOWN MAP



MAP 5: ULMARRA TOWN MAP



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Datum/Proj: GDA94 / not projected
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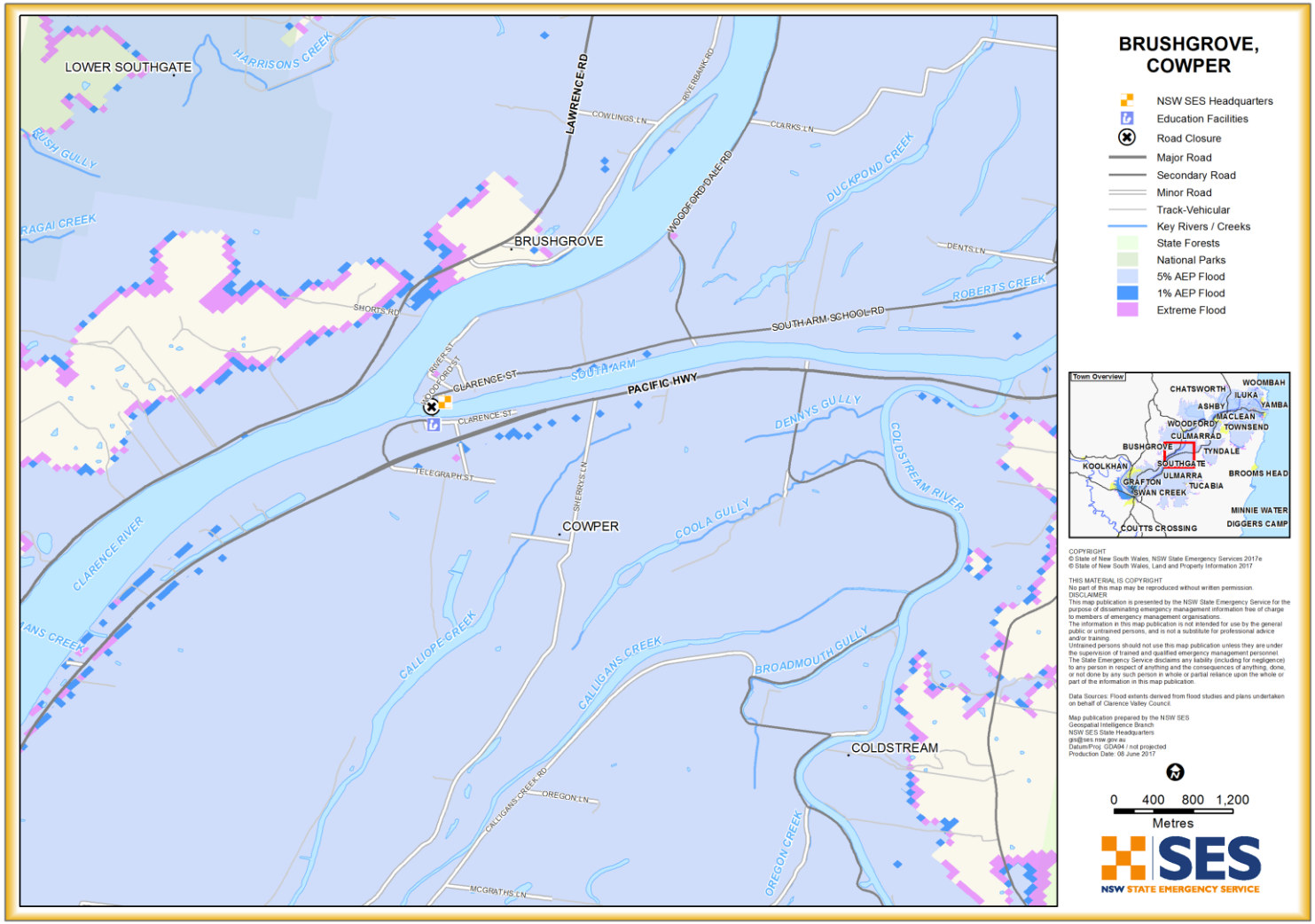
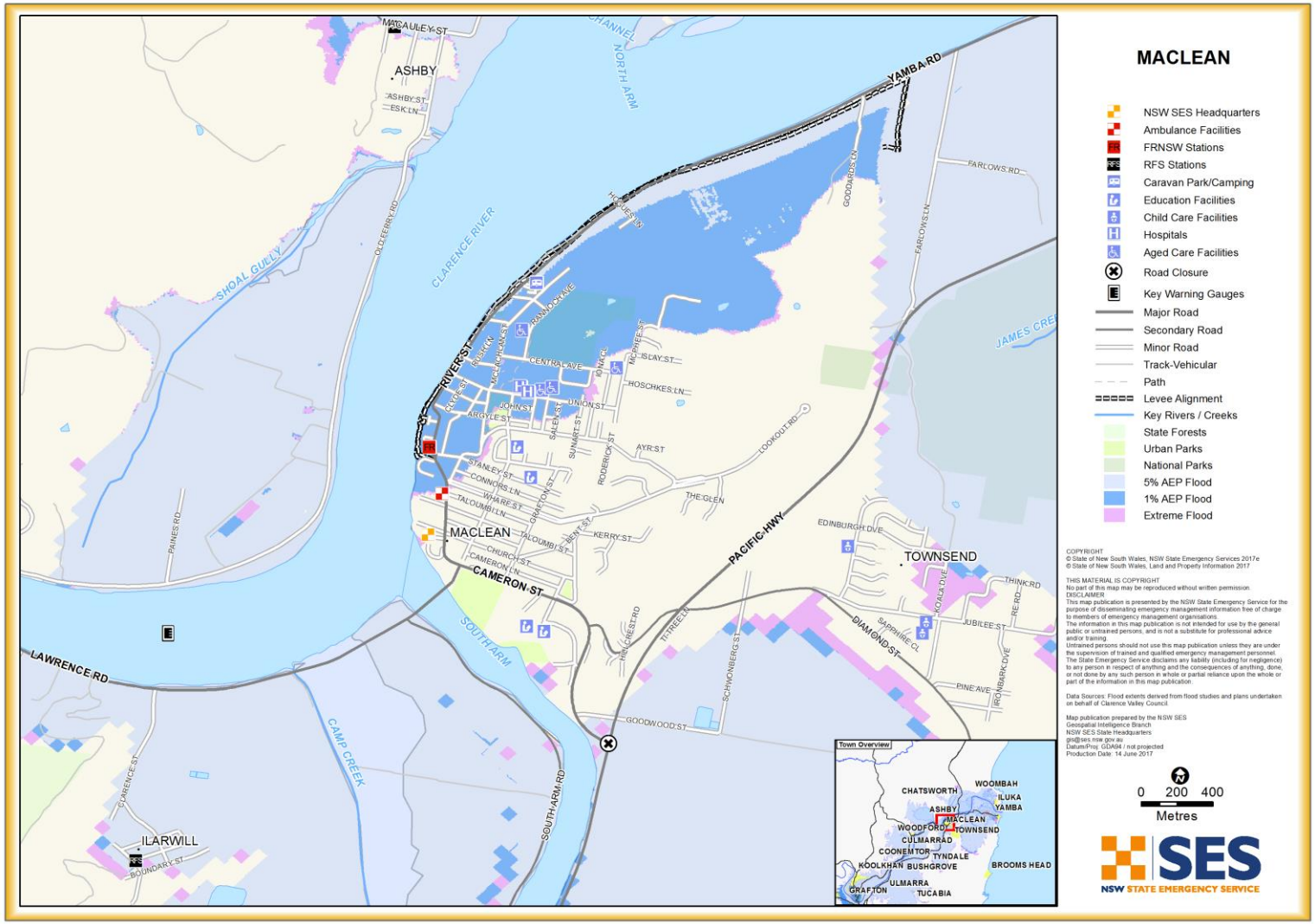
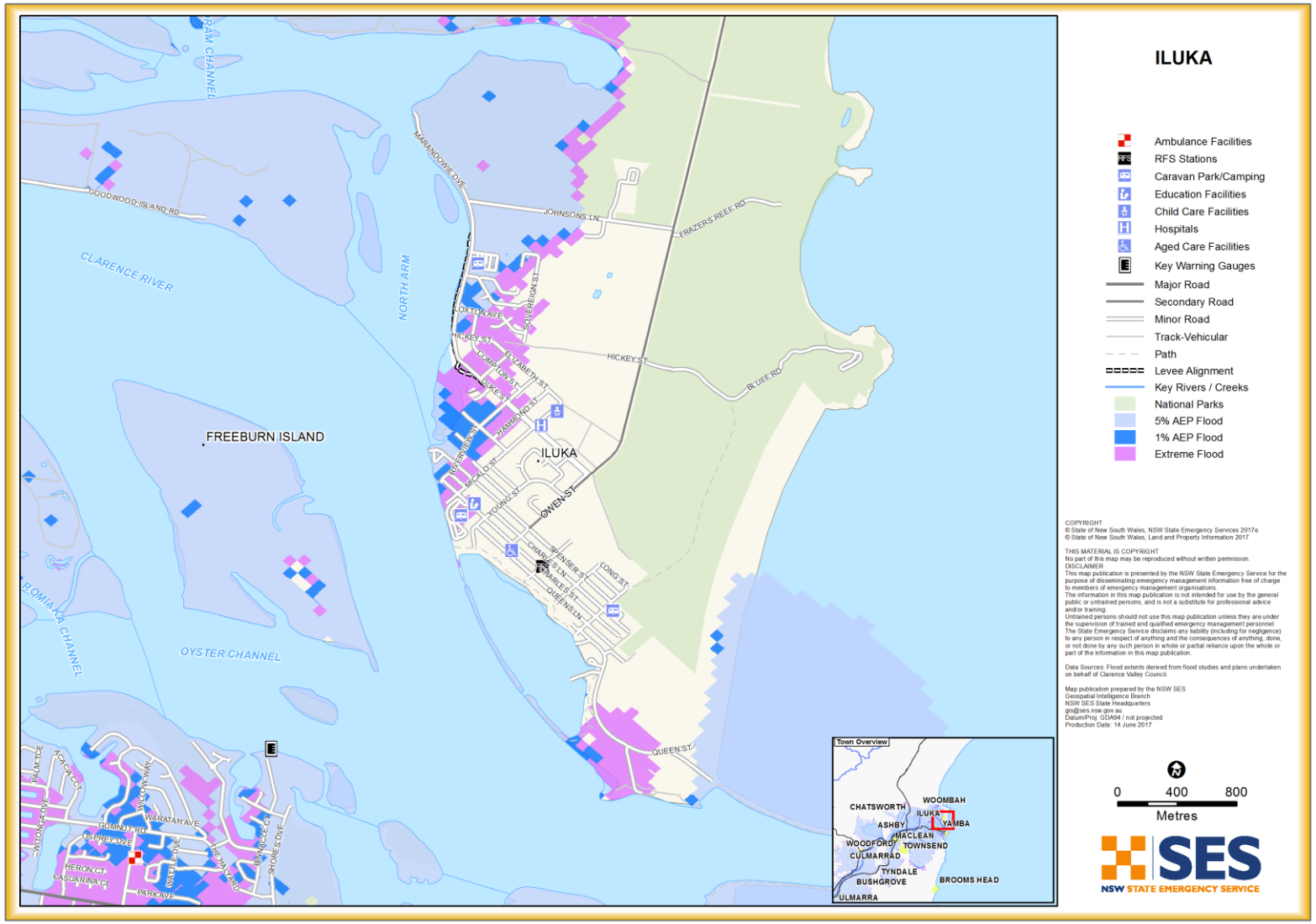
MAP 6: BRUSHGROVE TOWN MAP



MAP 7: MACLEAN TOWN MAP



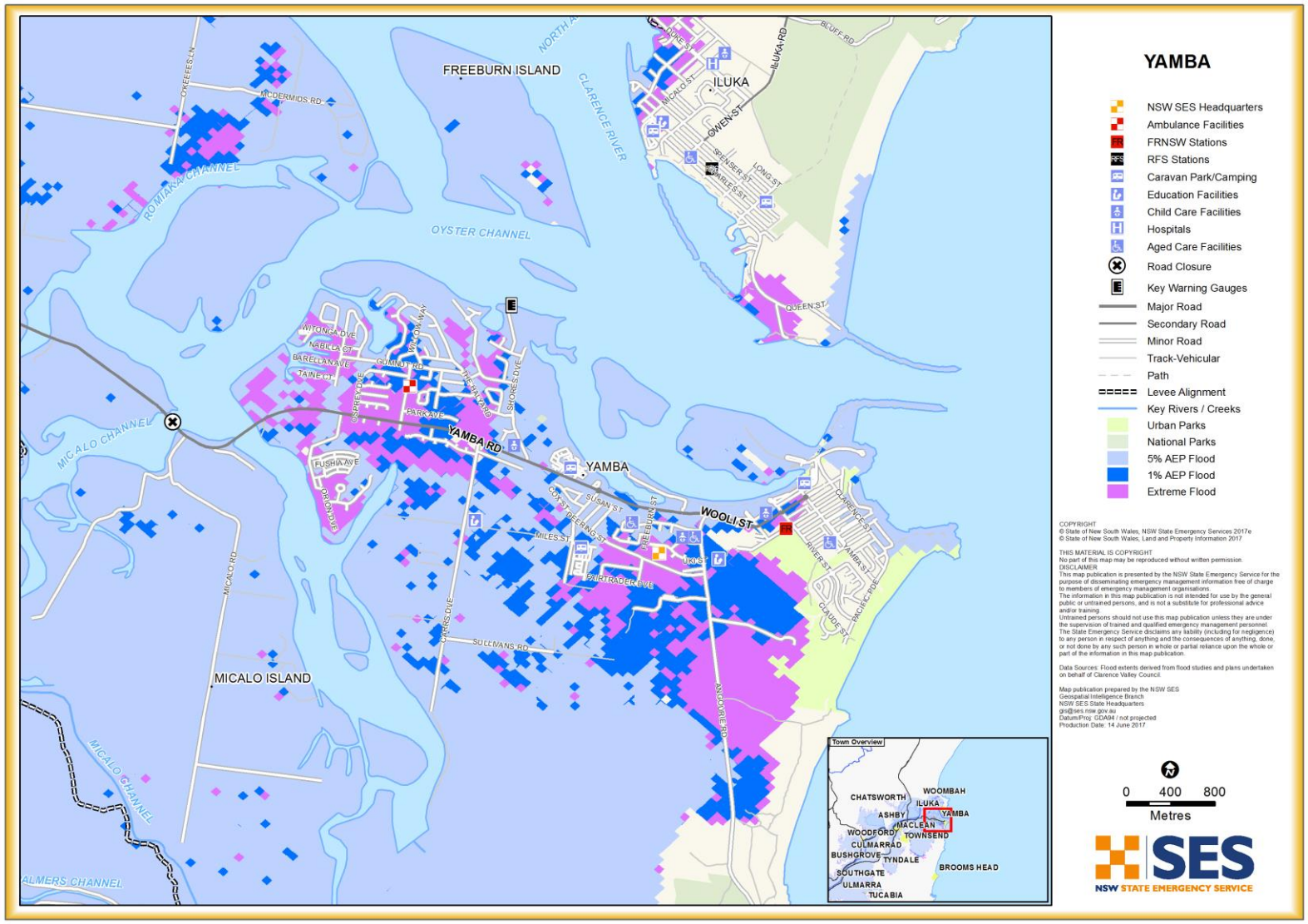
MAP 8: ILUKA TOWN MAP



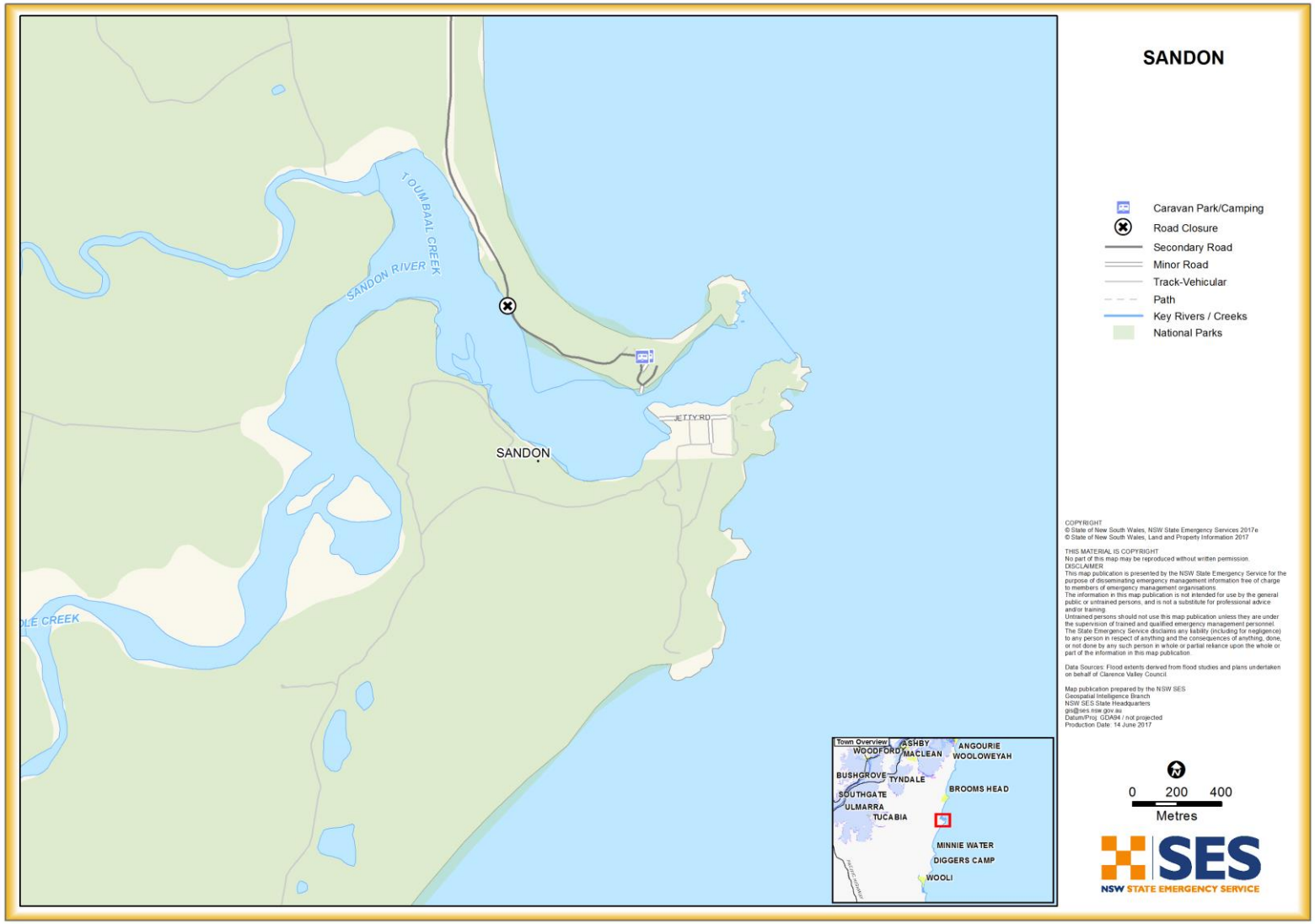
Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

Map publication prepared by the NSW SES
Geospatial Intelligence Branch
NSW SES State Headquarters
gis@ses.nsw.gov.au
Datum/Proj: GDA94 / not projected
Production Date: 14 June 2017

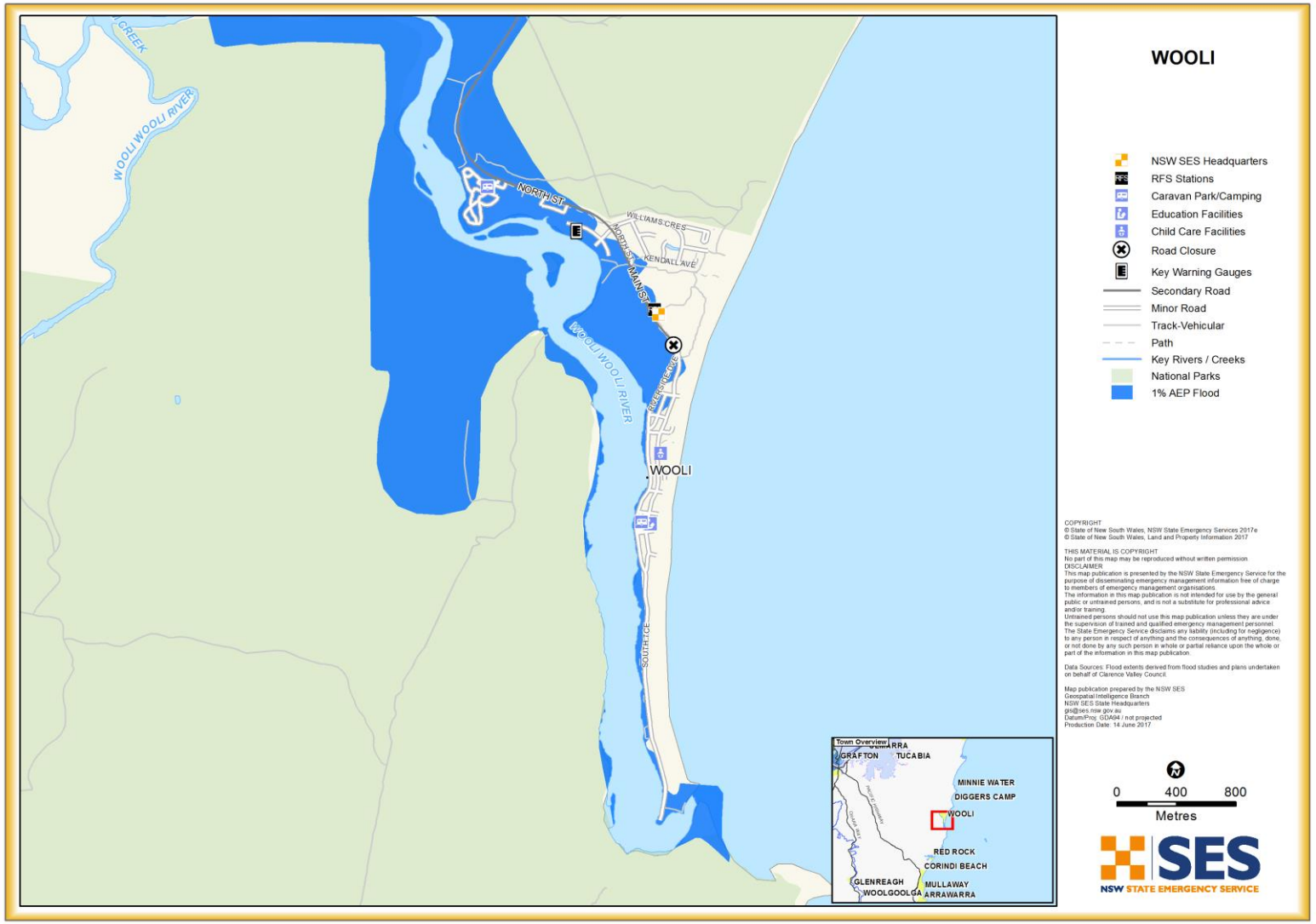
MAP 9: YAMBA TOWN MAP



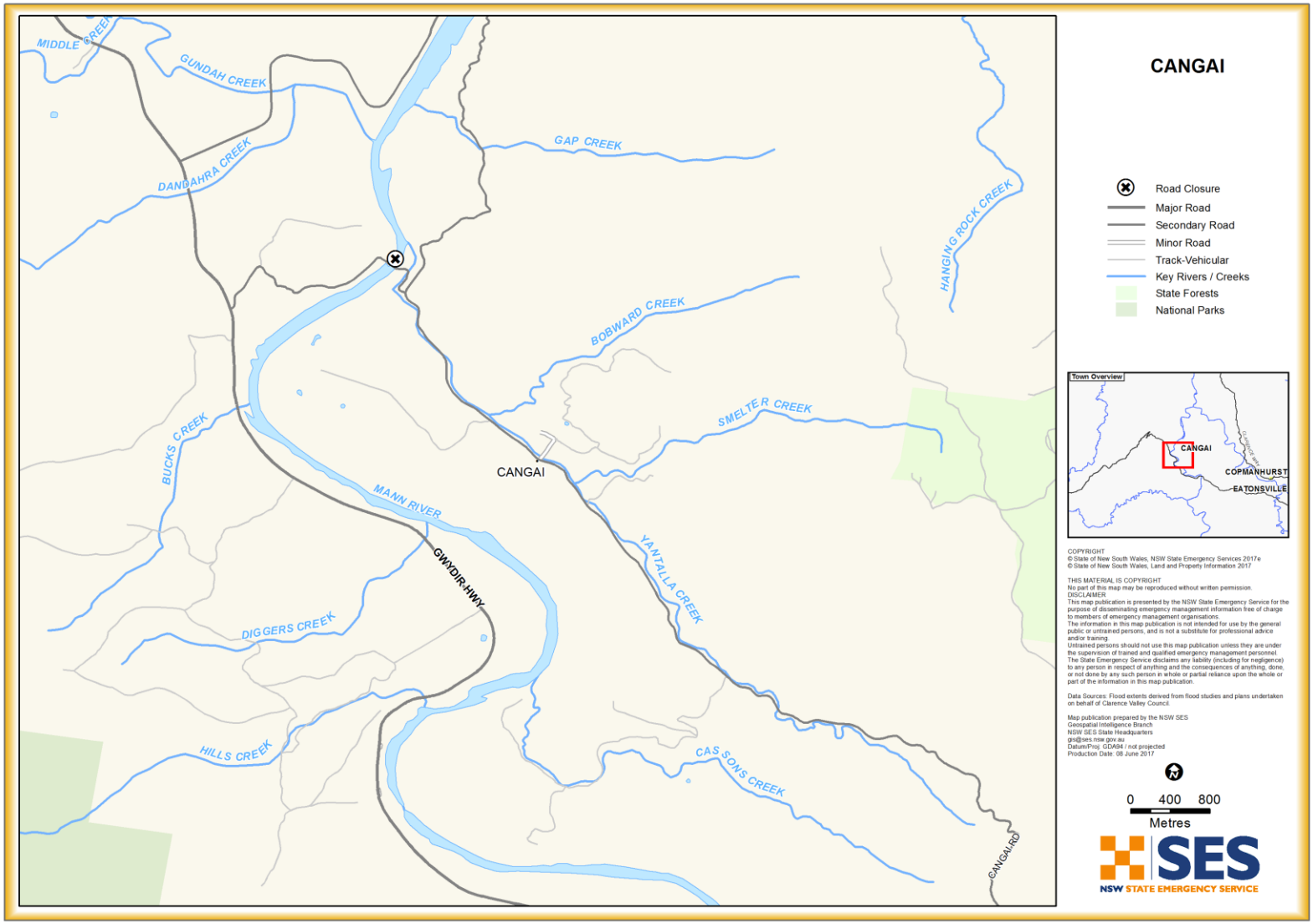
MAP 10: SANDON TOWN MAP



MAP 11: WOOLI-MINNIE WATER TOWN MAP



MAP 12: CANGAI TOWN MAP



Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

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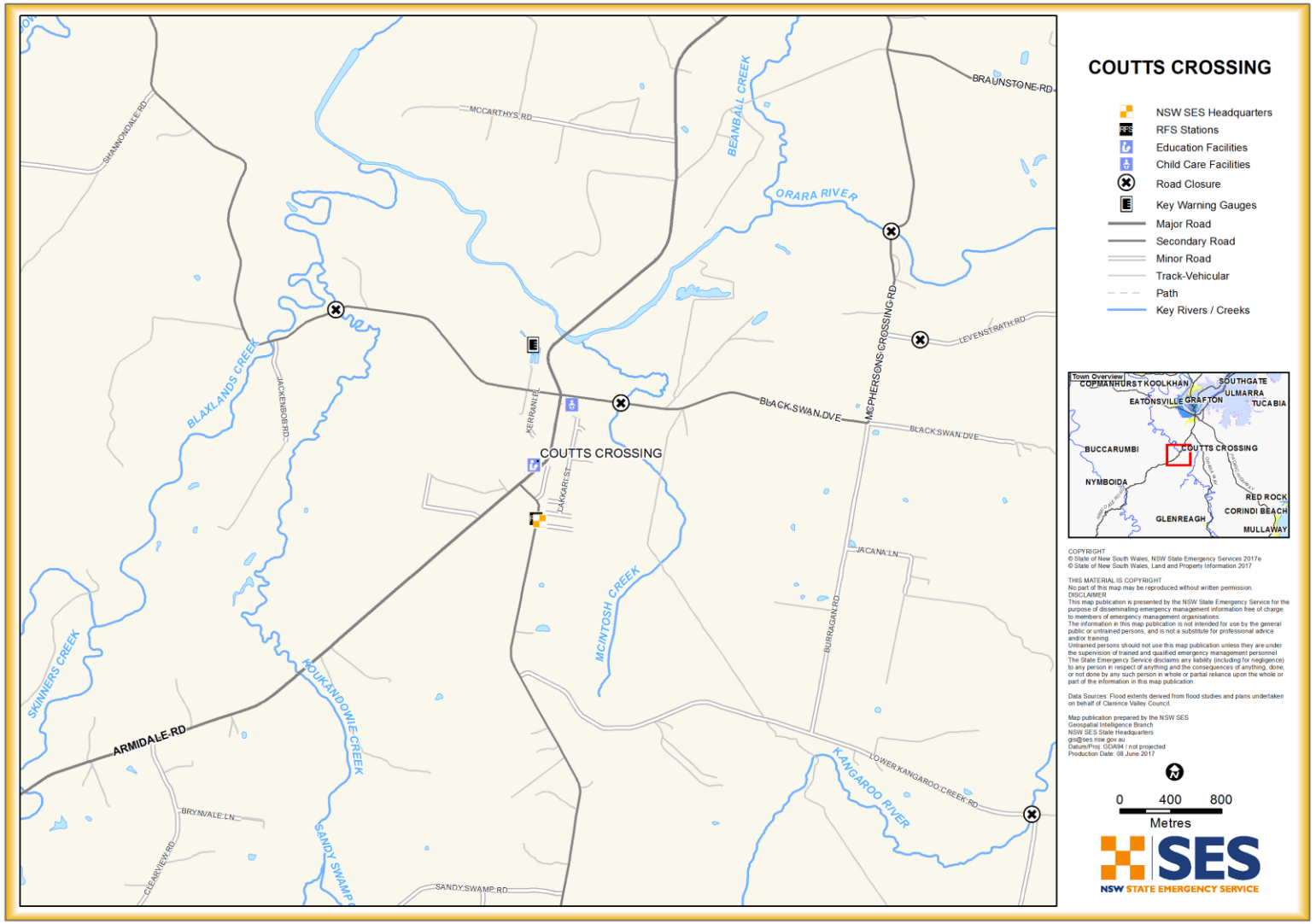
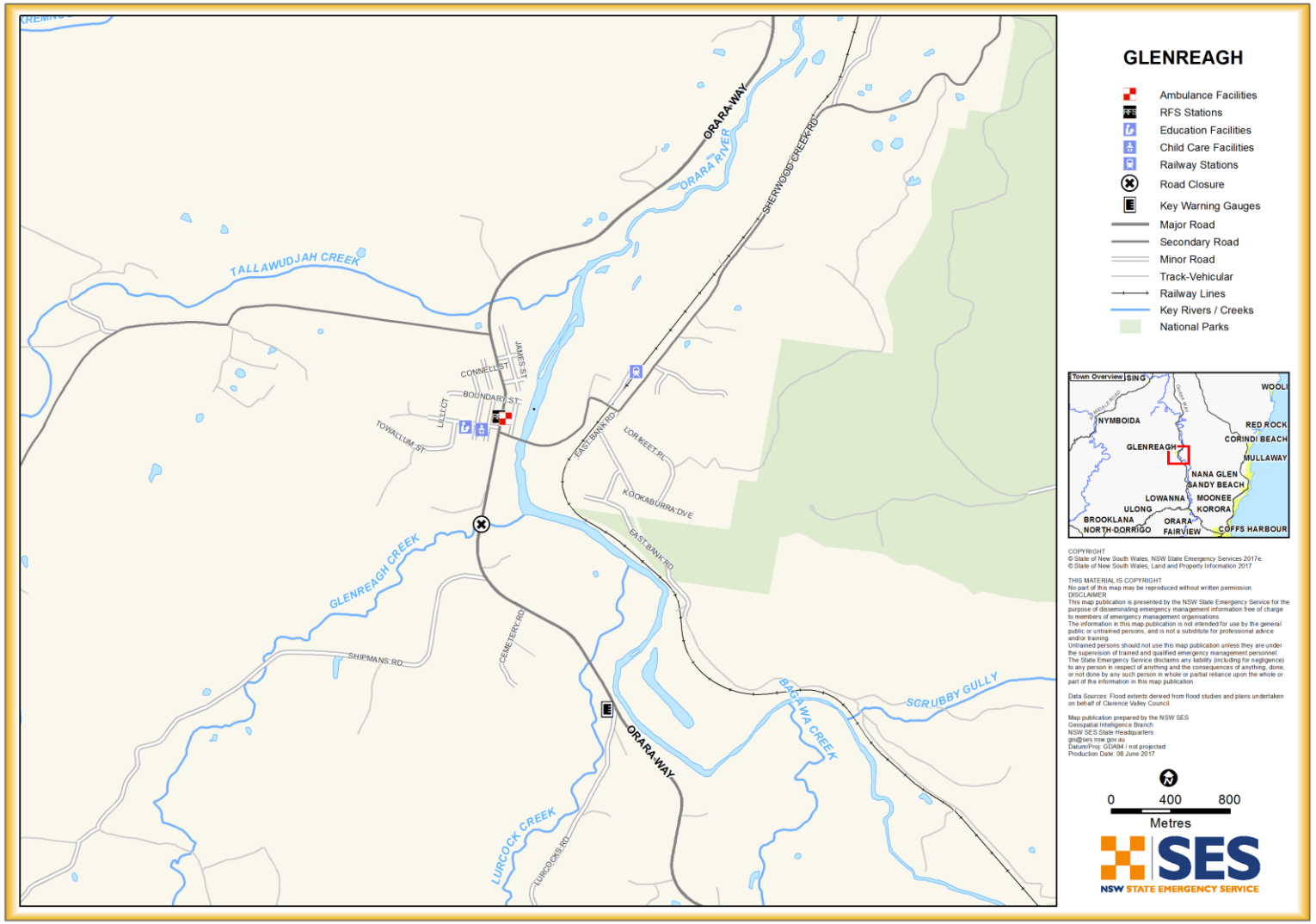
gis@ses.nsw.gov.au
Datum/Proj: GDA84 / not projected
Production Date: 08 June 2017

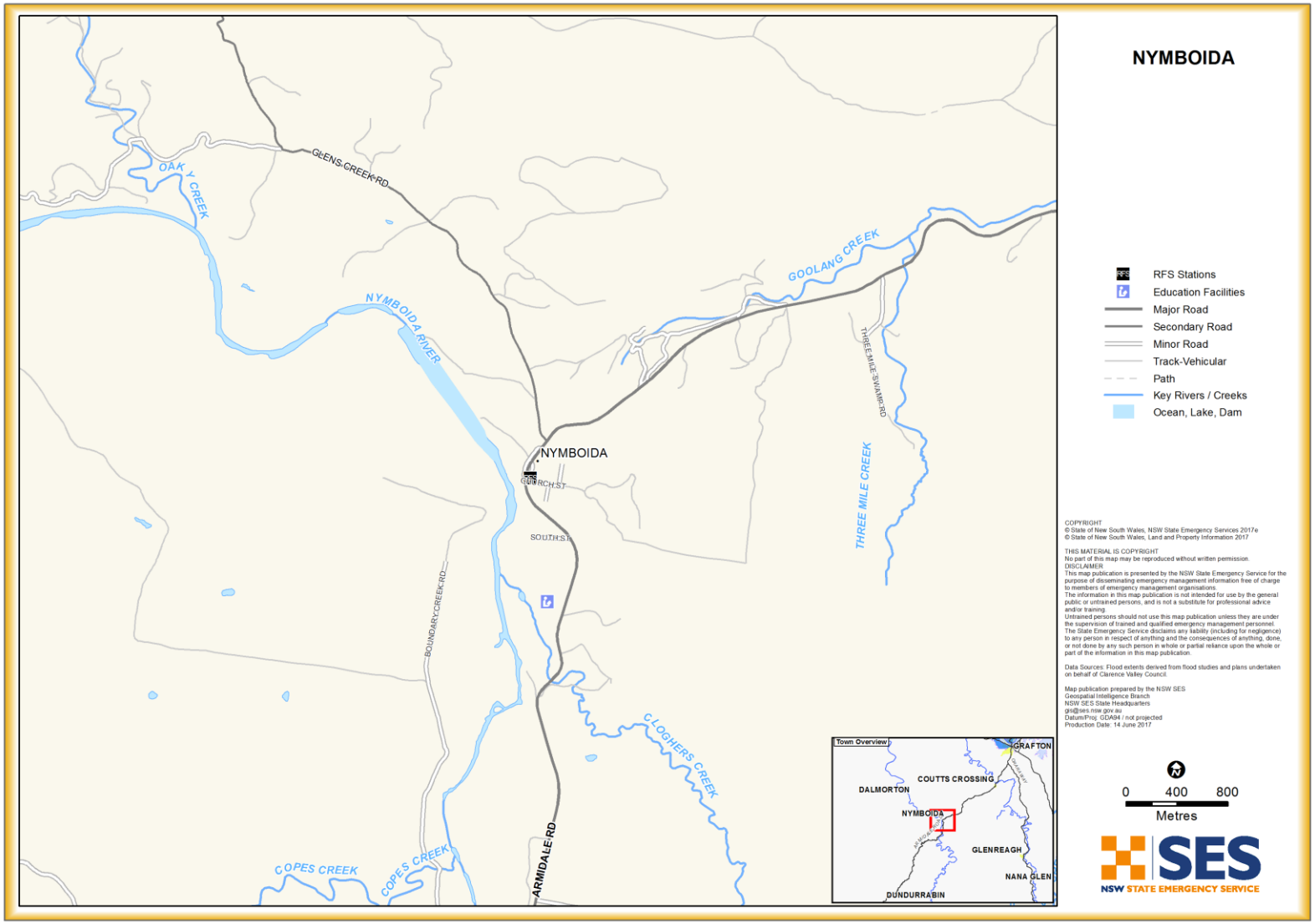
MAP 13: COUTTS CROSSING TOWN MAP



MAP 14: GLENREAGH TOWN MAP



MAP 15: NYMBOIDA TOWN MAP



Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

Map publication prepared by the NSW SES
Geospatial Intelligence Branch
NSW SES State Headquarters
gni@ses.nsw.gov.au
Datum/Proj: GDA94 / not projected
Production Date: 14 June 2017

LIST OF REFERENCES

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3. **GHD.** *Glenreagh Flood Study.* s.l. : Clarence Valley Council, 2013.

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15. **McAndrew, K.** *The number of premises with floor levels below design floods.* s.l. : Clarence Valley Council, 2016.

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18. —. *Visual Audit of South Grafton Levee.* 2015.

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24. —. *Draft - Wolli Emergency Action Sub Plan.* 2012.

SES RESPONSE ARRANGEMENTS FOR CLARENCE VALLEY

Volume 3 of the Clarence Valley Local Flood Plan

CONTENTS

VERSION LIST

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

Description	Date
Clarence Valley Local Flood Plan	2012

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

The Clarence Valley Local Controller

NSW State Emergency Service

26 Induna Street GRAFTON NSW 2460

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

Amendment Number	Description	Updated by	Date

CLARENCE VALLEY: FLOOD WARNING SYSTEMS AND ARRANGEMENTS

Volume 3, Chapter 1 of the Clarence Valley Local Flood Plan

(NSW SES Response Arrangements for Clarence Valley)

Last Update: August 2017

AUTHORISATION

Clarence Valley: Flood Warning Systems and Arrangements has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

Approved

Manager Emergency Risk Management

Date: 2-8-17

Approved

NSW SES Clarence Nambucca Region Controller

Date: 2 AUG 2017

Tabled at LEMC Date: 3 July 2017

Document Issue: 3.1-07042014

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1. GAUGES MONITORED BY THE NSW SES CLARENCE VALLEY UNIT HEADQUARTERS

Table 1: Gauges monitored by the NSW SES Clarence Valley Unit Headquarters

Gauge Name	Type	AWRC No.	Bureau Gauge No.	Stream	Flood level classification in metres			Special Reading Arrangements	Owner
					MIN	MOD	MAJ		
Nymboida ‡	Telemeter	204001	059124	Nymboida					NOW
Tabulam	Telemeter	204002	-	Clarence					NOW
Tucabia ‡	Telemeter	204403	-	Coldstream					CRCC
Jackadgery	Telemeter	204004	057113	Mann					NOW
Brushgrove ‡	Telemeter	204406	558027	Clarence					MHL
Lilydale	Telemeter	204007	557005	Clarence					NOW
Lawrence ‡	Telemeter	**204409**	-	Clarence					MHL
Maclean * ‡	Telemeter	204410	558022	Clarence	1.6	2.5	3.3		NOW
Rogan's Bridge (Sheathers †)	Telemeter	204413	-	Clarence					CVC
Rogan's Bridge †	Telemeter	204414	558055	Clarence					MHL
Broadmeadow	Telemeter	204015	057116	Boyd					NOW
Baryulgil ‡	Manual	204900	057114	Clarence					NOW
Copmanhurst ‡	Manual	**204903**	-	Clarence					BOM
Grafton (Prince St)* † ‡	Telemeter	204400	058178	Clarence	2.1	3.6	5.4		CVC
Ulmarra * ‡	Telemeter	204480	058188	Clarence	2.1	3.4	4.9		MHL
Glenreagh ‡	Telemeter	204906	559066	Orara	5	9	13		NOW
Glenreagh ‡	Manual	204907	-	Orara	4	7	10		BOM
Coutts Crossing	Manual	**204999**	-	Orara	5.0	9.0	12.0		CVC

Gauge Name	Type	AWRC No.	Bureau Gauge No.	Stream	Flood level classification in metres			Special Reading Arrangements	Owner
					MIN	MOD	MAJ		
‡									
Wooli (Northern Caravan Park)	Telemeter	205463	558060	Wooli					MHL
Wooli (River Entrance)	Telemeter	205462	559044	Wooli					MHL
Tyndale	Telemeter	204465	-						MHL
Palmers Channel H.P Marsh (Yamba)	Telemeter	204426	-	Palmers Channel					MHL
Yamba (entrance)	Telemeter	204451	558062	Oyster Channel					MHL
Palmers Island	Manual	204412	-	Clarence					CVC

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 (‡)

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

The NSW SES Clarence Nambucca Region Headquarters distributes NSW SES Flood Bulletins, NSW SES Evacuation Warnings and NSW SES Evacuation Orders to the following regional media outlets and agencies:

Television Stations:

Station	Location
Prime TV	Grafton
NBN TV	Coffs Harbour

Radio Stations:

Station	Location	Frequency	Modulation
2GF	Grafton	104.7	FM
2GF	Grafton	103.9	FM
2GF	Grafton	1206	AM
1031 Life FM	Grafton	103.1	FM
ABC Radio	Lismore	738	AM
2TLC	Yamba	100.3	FM

Newspapers:

Name	Location
The Daily Examiner	Grafton
Coastal Views	Maclean
Clarence Review	Yamba

Other Agencies:

Flood Bulletins are issued to agencies/organisations if requested.

CLARENCE VALLEY: NSW SES LOCALITY RESPONSE ARRANGEMENTS

Volume 3, Chapter 2 of the Clarence Valley Local Flood Plan

(NSW SES Response Arrangements for Clarence Valley)

Last Update: August 2017

AUTHORISATION

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

Approved

Manager Emergency Risk Management

Date: 2-8-17

Approved

NSW SES Clarence Nambucca Region Controller

Date: 2 AUG 2017

Tabled at LEMC Date: 3 July 2017

Document Issue: V3.2-07042014

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SECTOR OVERVIEW

Table 1: Overview of Sectors in the Clarence Valley LGA.

Sector Name	Community	Sector Basis	Total properties	Properties potentially at risk
Sector 1	Grafton and South Grafton	North Grafton is a low flood island during an extreme flood. South Grafton has rising road access to South Grafton Hill.	7050	4600 properties are at risk of over floor flooding in Grafton. Areas within Grafton are at risk of isolation. Junction Hill is at risk of isolation from Grafton, with access to the north.
Sector 2	Copmanhurst, Baryulgil and Malabugilmah	High flood island.	236	At risk of isolation. 10 properties at risk of over floor flooding in Copmanhurst.
Sector 3	Lawrence, Ashby and Southgate	Lawrence has rising road access to a high flood island. Southgate has rising road access until the Lawrence Road is flooded, thereafter becoming a low flood island.	636	80 properties at risk of over floor flooding in Lawrence. 25 properties at risk of over floor flooding in Southgate. At least 1 property at risk of flooding in Ashby. Southgate and Ashby at risk of isolation.
Sector 4	Ulmarra, Tucabia and Gilletts Ridge	Ulmarra is Low flood island Tucabia and Gilletts Ridge have rising road access.	354	70 properties at risk of over floor flooding in Tucabia. More than 100 properties at risk of over floor flooding in Ulmarra. Villages also at risk of isolation.
Sector 5	Brushgrove, Tyndale and Cowper	Brushgrove and Cowper are low flood islands. Tyndale is a high flood island.	146	85 properties at risk of over floor flooding in Brushgrove. More than 17 properties at risk of over floor flooding

Sector Name	Community	Sector Basis	Total properties	Properties potentially at risk
				in Cowper Tyndale is at risk of isolation
Sector 6	Maclean, Ilarwill, Townsend, Harwood and Chatsworth	Maclean has rising road access between 2.5 and 2.7 metres (m), thereafter becoming a high flood island with the levee overtopping heights at 3.3-3.4 m. Chatsworth and Harwood are low flood islands. Ilarwill and Townsend are high flood islands.	1834	420 properties at risk of over floor flooding in Maclean. 100 properties at risk of over floor flooding in Harwood. 30 properties at risk of over floor flooding in Chatsworth. All areas at risk of isolation.
Sector 7	Iluka and Woombah	Iluka and Woombah become a high flood island following the flooding of access roads at 2.1 m (Maclean gauge).	1207	470 properties at risk of over floor flooding. Also at risk of isolation.
Sector 8	Yamba and Palmers Island	Yamba is a high flood island Palmers Island is a low flood island.	3735	Palmers Island is at risk of isolation and 60 houses with over floor flooding. Up to 2400 at risk of inundation
Sector 9	Sandon and Brooms Head	Sandon is a high flood island. Brooms Head is a high flood island.	219	At risk of isolation. At risk of storm surge and coastal erosion and inundation.
Sector 10	Wooli and Minnie Water	Both are a high flood island, and then Wooli becomes a low flood island.	531	At risk of isolation. 226 properties at risk of over floor flooding in Wooli, as well as coastal erosion and inundation.
Sector 11	Cangai	High flood island.	99	At risk of isolation.
Sector 12	Coutts Crossing	High flood island.	406	At risk of isolation.
Sector 13	Glenreagh	High flood island.	346	Approximately 30 at risk of over floor flooding. Remainder at risk of isolation.

1. GRAFTON SECTOR

1.1. GRAFTON SECTOR

See Map Attached

Sector Description	This sector covers Alumy Creek, Carrs Creek, Carrs Island, Carrs Peninsula, Eatonsville, Great Marlow, Junction Hill, North Grafton, Seelands, South Grafton, Southampton, Waterview and Waterview Heights. Areas of this sector are protected by a system of levees which will over top at different heights.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	North Grafton is a low flood island during extreme floods. South Grafton is classified as rising road access to South Grafton Hill.		
At risk properties	North Grafton 3748 South Grafton 921	**Total number of properties**	North Grafton 4350 South Grafton 2700
Population	North Grafton 10205 (2011 Census)	South Grafton 6392 (2011 Census)	
Sector Control	The Grafton Unit Controller will 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: Prince Street (204904)	Minor: 2.10 m	Moderate: 3.60 m	Major: 5.40 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at South Grafton High School auditorium (Tyson Street), where evacuees are able to gather while flood situation is monitored. • Where a major levee overtopping and/or failure occurs, evacuees will either remain at the South Grafton High School or be transported to Coffs Harbour.		
Key Risks / Consequences	• Overtopping and/or failure of Grafton and/or South Grafton levees resulting in inundation behind the levees. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • 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 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. • Monitoring integrity of existing levee system. • Control of surface water inside levee.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection below 1% Annual Exceedance Probability (AEP) flood height of 8.3 m on the Prince Street gauge. • Grafton's potable water supply reservoir is located on high ground 5 kilometres (km) south of Grafton above the Probable Maximum Flood (PMF). • Country Energy substation on the western end of North Street is also flood free below the 1% flood height (Prince Street gauge 8.3 m). • Selected sewer pump stations will be switched off upon levee overtopping • The Telstra exchange for Grafton is located on Pound Street, between Prince and Queen Streets. This exchange is powered by mains electricity. If electricity was lost during a flood then the generator (located above PMF height) will automatically start. The generator will last between 24-48 hours before refuelling is required.
Evacuation Triggers	There are four key scenarios for evacuation triggers based on Bureau of Meteorology flood height predictions at the Prince Street gauge: **1. Prediction to reach or exceed 4.4 m** Carrs Island Bridge closes isolating residents on island (approximately 5 properties). **2. Prediction to reach or exceed 5.4 m** Flood waters enter Alipou Creek area starting to pond around rural properties (Approximately 5 properties). Pacific Highway closes at Alipou Creek. Alternate route high level bypass Via Centenary Drive and Lilypool Road. **3. Prediction to reach or exceed 5.7 m** Lawrence Road and Great Marlow Road cut near Butterfactory Lane isolating properties in the Alumy Creek and surrounding areas (approximately 30 properties). Water enters low lying areas of Glenwood Tourist Park. **4. Prediction to reach or exceed 7.8 m or greater** Targeted Evacuation Warning issued for Grafton Sub Sector A including owners of livestock to relocate livestock outside of the impact area.

	5. Prediction to reach or exceed 7.9 to 8.0 m Based on monitoring and assessment of levee condition, A Targeted Evacuation Order will be issued for Sub Sector A Dovedale and surrounds (area bordered by Clarence Street, Bacon Street, Prince Street and the Clarence River) and other low lying areas. Another 70 houses and some other buildings in the Back Lane, Carr Street, Summerland Way and Lawrence Road areas could be isolated, along with the Gateway Caravan Park. Targeted Evacuation Warning issued for Grafton Sub Sectors B,C,D **6. Prediction to reach or exceed 8.2 m or greater** Targeted Evacuation Order issued for Sub Sectors B, C, D and all low lying areas in North and South Grafton.
Sequencing of evacuation	**For Prediction 5**, the areas of Dovedale and surrounds in Sub Sector A will be systematically evacuated. **For Prediction 6**, North Grafton will be divided into Sub Sectors B and C, while South Grafton becomes Sub Sector D. Evacuation will commence with Sub Sector B, Sub Sectors C and D will follow. **Grafton:** Order for Sub Sectors is A, B, then C. • Sub Sector A: Clarence Street, Bacon Street, Prince Street including Dovedale and surrounds, • Sub Sector B: west of Clarence Street, Bacon Street, and Prince Street to Turf Street. • Sub Sector C: west of Turf Street, including Westlawn, and Back Lane, Carr Street, Marlow Street, and Summerland Way to Junction Hill. Given the estimated 3800 properties at risk in North Grafton, single evacuation route capacity of 600 cars per hour (1.4 cars per household results) and doorknock time of 12 houses an hour per team, 35 teams would warn 420 houses an hour (creating approximately 588 cars per hour). Therefore 35 teams would result in a *doorknock* time of 9 hours for North Grafton, with an additional warning lag factor of an hour and a warning acceptance factor of an hour. **South Grafton:** • Sub Sector D: Low–lying areas of South Grafton including Bent, Ryan, Cowan, Abbott, Spring, Through, Skinner, Wharf, Armidale, Beetson, Bligh, Edward, James, Kelly, Kennedy, New, Orr and Vere Streets) Evacuation will occur simultaneous to Sub Sector A.

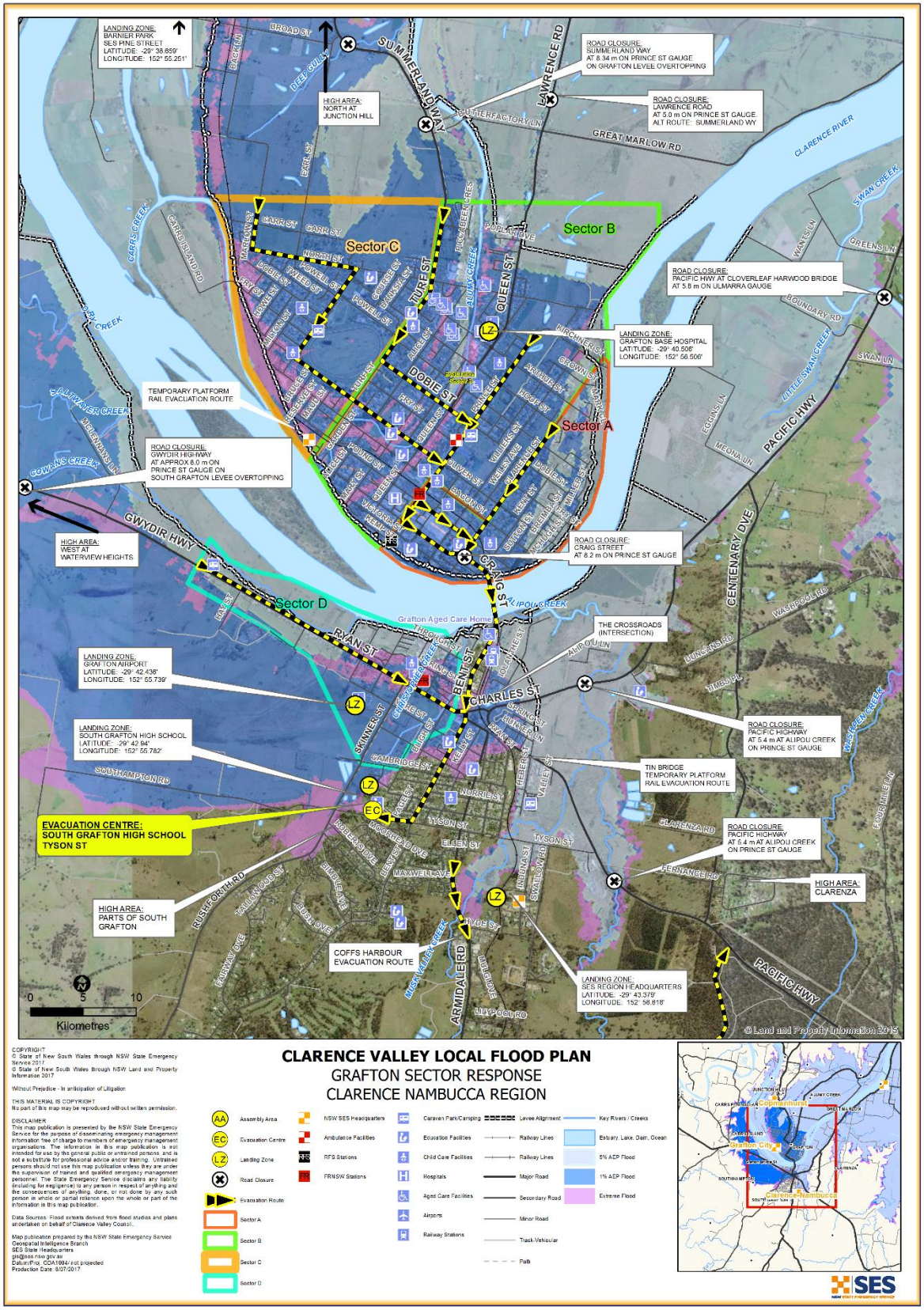
	Given the estimated 600 properties at risk in South Grafton, single evacuation route capacity of 600 cars per hour (1.4 cars per household results) and doorknock time of 12 houses an hour per team, 35 teams would warn 420 houses an hour (creating approximately 588 cars per hour). Therefore 35 teams would result in a *doorknock* time of 1.4 hours for South Grafton, with an additional warning lag factor of an hour and a warning acceptance factor of an hour. Evacuation of vulnerable facilities (e.g. aged care facilities, schools, child care facilities) will require higher priority.
Evacuation Routes	**Sub Sector A:** Clarence Street, Bent Street and Tyson Street. **Sub Sector B:** **Route 1** Dobie Street, Prince Street, Pound Street, Clarence Street, Bent Street, and Tyson Street. **Route 2** Oliver Street, Prince Street, Fitzroy Street, Craig Street, Bent Street and Tyson Street. **Sub Sector C:** **Route 1** Marlow Street, North Street, Cranworth Street, Oliver Street, Prince Street, Pound Street, Clarence Street, Bent Street, and Tyson Street. **Route 2** Turf Street, Dobie Street, Prince Street, Fitzroy Street, Craig Street, Bent Street, and Tyson Street. **Sub Sector D:** Bent Street, Tyson Street. See attached map. It is likely that the Pacific Highway south to Coffs Harbour will remain open to high level clearance vehicles, via Lilypool Road.
Evacuation Route Closures	Road closures affecting the sequenced evacuation of sectors A,B,C,D: • There is variability when local roads inside the Grafton levee will close, the closure will be dependent on local rainfall conditions. The time available after overtopping has been estimated and is summarised in Volume 2, Section 2.2.6. • Craig Street approach to the Grafton Bridge closes (8.25 m Prince Street gauge). • The Cross Roads South Grafton remain open beyond the 1% flood height of (8.3 m at the Prince Street gauge). • The Railway line is immune to a possible maximum flood height (PMF). Other known road closures include: • Pacific Highway Closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Lawrence Road Closes (5.0 m Prince Street gauge). Alternate route Summerland Way.

	• Orara Way Closes at Bluff Bridge at (5.8 m on the Glenreagh gauge). Alternate route Pacific Highway. Other roads where closure is dependent on local rainfall and events (e.g. landslips) include : • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Prince Street gauge). • Gwydir Highway (road susceptible to land slippage) • Armidale Road.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • Public transport to the Assembly Area on South Grafton Hill will be available to members of the community without private vehicles. An estimate of 10% of evacuees will not have private transport (20 Buses are estimated for transport). Agreements to be in place with private bus operators. • Buses could also operate around South Hill picking people up from their parked cars to take them to assembly area or evacuation centre. Car parking capability unlimited. • Grafton bridge will be closed by Police to North bound traffic ensuring maximum expedience of traffic flow over the bridge and access for emergency vehicles. • If the Cross Roads South Grafton are cut, railway transport becomes the main method of evacuation. Evacuation access to the railway is via the Grafton Railway Yard platform and the South Grafton Railway station. A temporary platform can be erected at the corner of Federation and Ryan street, (the Tin Bridge) South Grafton for an evacuation route up George Street to Bent Street and onto South Grafton High School.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas such as South Hill, Clarenza, Junction Hill or Waterview Heights. Note some of these areas may become isolated with further river rises. • Where this is not possible the nominated assembly area is the South Grafton High School Auditorium, Tyson Street. This can be used as an assembly point in the short term, but could also double as an evacuation centre should the need arise. • There are a number of other schools and buildings located in flood free areas in South Grafton and Clarenza which are available for use as Assembly Area/Evacuation Centres. These schools will be nominated by Family and Community Services as the need arises.
Large scale evacuations	In the event that evacuee numbers exceed the South Grafton evacuation centre capacity, evacuees will either be transported to alternative evacuation centres or transported by bus, rail or private transport to Coffs Harbour.
Rescue	The Grafton and Copmanhurst NSW SES Units will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.

Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Grafton Base Hospital and Grafton Correctional Centre will be resupplied if required. The hospital floor begins to be inundated when flood waters exceed 9 m on Prince Street gauge.
Aircraft Management	Helicopter Landing Zones • Grafton Airport (S29° 45' 30.56", E153° 1' 45.45") • Junction Hill (S29° 38' 37.43", E 152° 55' 12.73") • SES Region Headquarters (S29° 43' 24.53", E 152° 56' 37.78") • Grafton Base Hospital (S29° 40' 31.89", E 152° 56' 27.66")

Other	Special considerations relating to the evacuation:
	• Closure of schools - coordinated through the Department of Education and Training.
	• Closure of licensed premises. All hotels and licensed clubs will be closed.
	• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.
	• The Grafton Base Hospital will only be evacuated in extreme circumstances. Current floor height 9 m AHD.
	• Rail Transport. Suspension of normal transport Operations through Grafton would be required, in anticipation of the deployment of rail Operations to assist with evacuees.
	• Security. Police patrols to be established to maintain law and order after evacuation has occurred.
	• The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible.
	• Grafton has three peak seasons with potential for a 10% population increase:
	  • July Race Carnival – early July.
	  • Jacaranda Festival – late October / early November.
	  • Bridge to Bridge Ski Race – October long weekend.
	
	These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

1.2. GRAFTON SECTOR MAP



2. COPMANHURST SECTOR

2.1. COPMANHURST SECTOR

See Map Attached

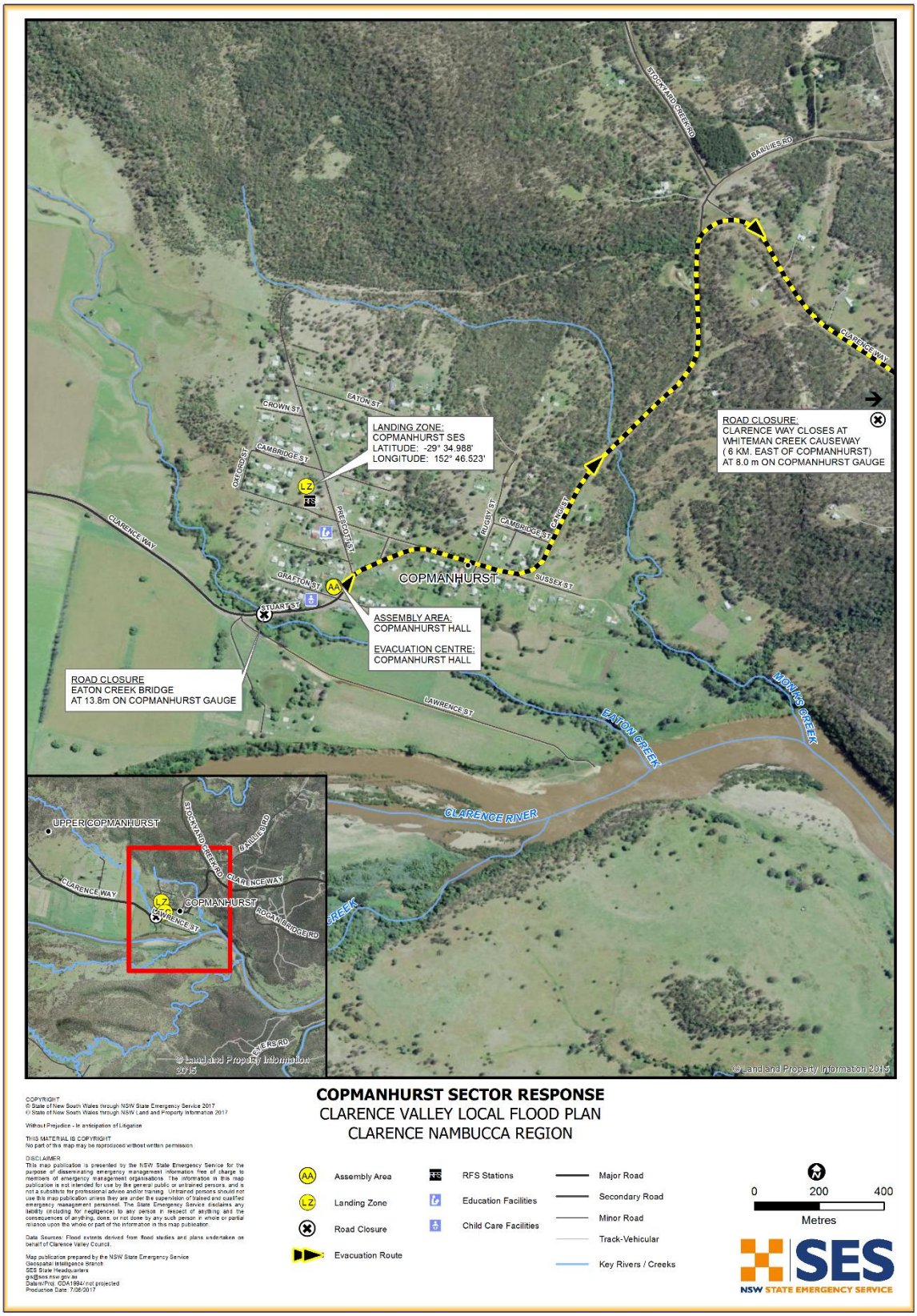
Sector Description	This sector covers Barretts Creek, Coaldale, Copmanhurst, Fine Flower, Gordonbrook, Koolkhan, Moleville Creek, Mountain View, and Trenayr.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties	10	**Total number of properties**	236 (2011 Census)
Population	487 (2011 Census)		
Sector Control	The Copmanhurst Unit Controller will control evacuations in this sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauge Name: Copmanhurst (204903)	Minor: -	Moderate: -	Major: -
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Copmanhurst Hall Stuart Street, Copmanhurst 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 isolation of hundreds of people for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
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 Triggers	The Bureau of Meteorology does not provide predictions for the Copmanhurst gauge, however the predicted flood levels at the Lilydale gauge (204007) provides a historical indicative height of the impacts likely to be seen in Copmanhurst. **Copmanhurst gauge (204903)** 1. **Reach and/or exceed 8.0 m (historical equivalent height to reach/or exceed 2.7 m on the Grafton Prince Street gauge (access to Grafton is lost):** Clarence Way closes at Whiteman Creek causeway, approximately 6km east of Copmanhurst Access to Grafton lost (main access to supplies). 2. **Reach and/or exceed 13.3 m (historical equivalent height to reach/or exceed 4.4 m on the Grafton Prince Street gauge (isolation):** Clarence Way closes due to back waters from Clarence river at Eton Creek western edge of Copmanhurst. Localities of Upper Copmanhurst and Fine flower isolated. 3. **Reach and/or exceed 15.1 m (historical equivalent height to reach/or exceed 5 m on the Grafton Prince Street gauge:** Clarence way closed at Double Swamp, 7 km north of Junction Hill. The village of Copmanhurst and Coaldale now isolated. 4. **Reach and/or exceed 20 m (historical equivalent height to reach/or exceed 6.7 m on the Grafton Prince Street gauge:** Two houses in Copmanhurst village experience over-floor inundation at 20 Grafton Street Copmanhurst.
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	• The local Evacuation Routes will be chosen in consideration of current road conditions. These routes will direct residents to the local assembly area/evacuation centre in the town. See attached map.
Evacuation Route Closures	Every flood in the Grafton area is different and thus road conditions are unpredictable. Common road closures include: • Rogan's Bridge closes cutting access to Waterview Heights. Alternative routes available. (6.0 m Copmanhurst gauge). • Clarence Way closes at Whiteman Creek causeway (8.0 m Copmanhurst gauge), approximately 6 km east of Copmanhurst. • Clarence Way closes at Chaselings Gully, approximately 10 km

	east of Copmanhurst. (14.4 m Copmanhurst gauge). • Clarence Way closed at Moleville Creek (15.8 m Copmanhurst gauge). Other roads where closure is dependent on local rainfall and events (e.g. landslips) include : • Pacific Highway Closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Summerland Way closes on Grafton levee overtopping at (8.3m on the Prince Street gauge).
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• Copmanhurst Community Hall Stuart Street, Copmanhurst
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	The Copmanhurst NSW SES Units will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • Resupply to the Copmanhurst Local Store and Copmanhurst Hotel, will mean residents in these areas will have access to basic food supplies.
Aircraft Management	**Helicopter Landing Points.** • Copmanhurst NSW SES Unit Headquarters Prescott Street Copmanhurst (S29°34'98.8", E152°46'52.3")

Other	Special considerations relating to the evacuation:
	• Closure of schools – coordinated through the Department of Education and Training.
	• Closure of licensed premises. All hotels and licensed clubs will be closed if required.
	• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.
	• Security. Police patrols to be established to maintain law and order after evacuation has occurred.
	• The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible.
	• Copmanhurst has two peak seasons with potential population increase of more than 10%:
	  • Camp draft September.
	  • Summer school holidays – Public lands within remote areas of this sector are utilized by campers.
	
	These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

2.2. COPMANHURST SECTOR MAP



3. LAWRENCE SECTOR

3.1. LAWRENCE SECTOR

See Map Attached

Sector Description	This sector covers: Ashby, Ashby Heights, Ashby Island, Chatsworth, Lawrence, Southgate, Lower Southgate, Tullymorgan and Woodford Island.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Rising road access to a high flood island for Lawrence. Southgate has rising road access and then becomes a low flood island.		
At risk properties	106 dwellings including 3 businesses	**Total number of properties**	636 (2011 Census)
Population	1385 (2011 Census)		
Sector Control	The Lawrence Unit Controller will control evacuations in this sector. The Maclean Unit Controller will assist with evacuations in Ashby, Ashby Heights, Ashby Island, Chatsworth and the North half of Woodford Island. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauges **Name:** **Lawrence (204409)** **Grafton Prince Street (204904)**	Minor:- Minor: 2.10m	Moderate:- Moderate:3.60m	Major:- Major:5.40m
General Strategy	Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at Lawrence Primary School High Street, Lawrence where evacuees are able to gather while flood situation is monitored. • Establishment of an Assembly Area/Evacuation Centre at Southgate Village Hall School Lane Southgate where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watches • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation areas • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		

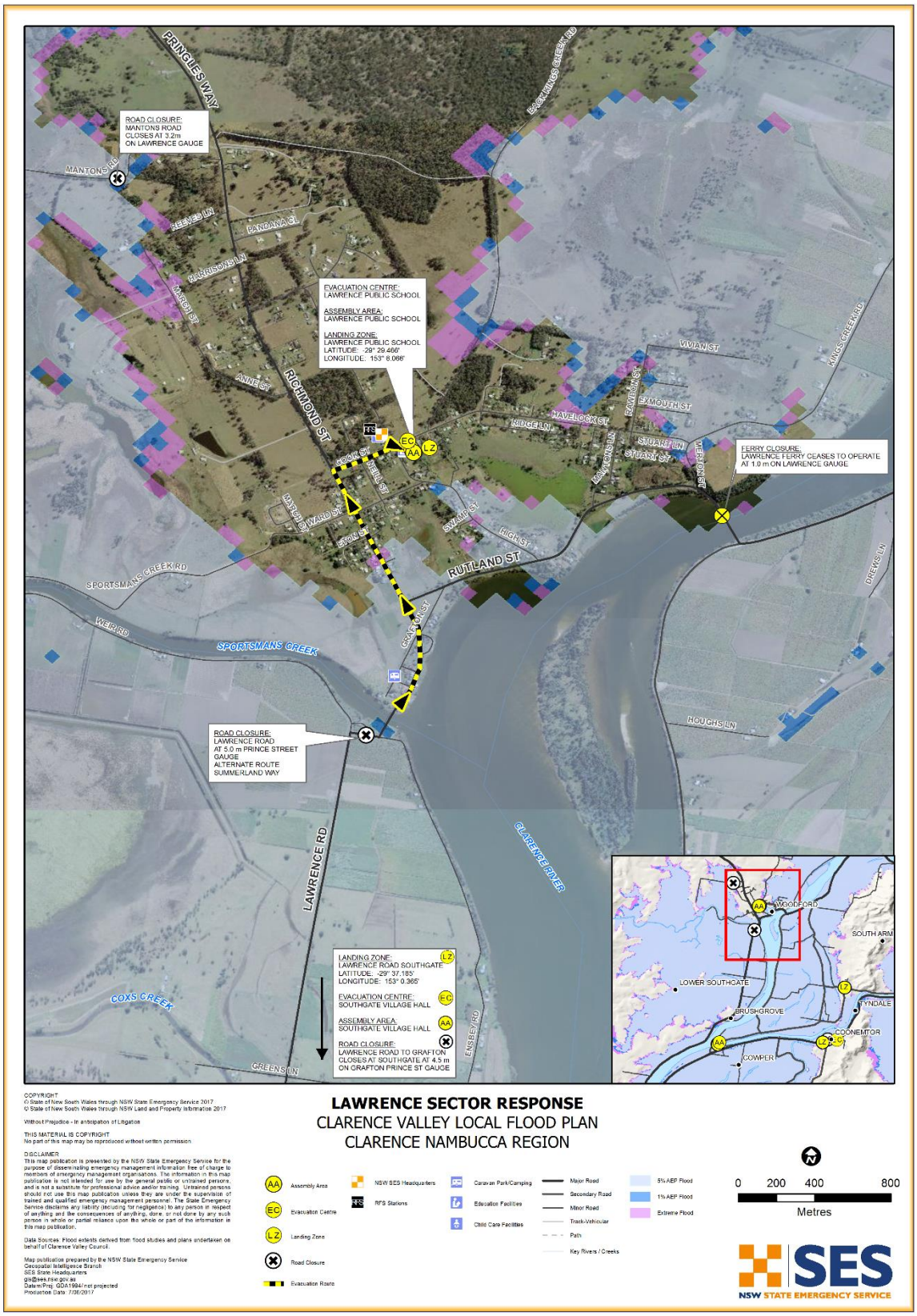
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock. • Relocation of farm machinery and valuable goods • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • Sewer system only in township of Lawrence, most of sector is on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan address procedures for sewerage system.
Evacuation Triggers	The effect of flooding on the town and outlying areas in this sector could be dependent on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the Grafton (Prince Street gauge) in reference to **Lawrence gauge (204409)** are**:** 1. **Prediction to reach and/or exceed 1.0 m (Grafton Prince Street gauge historical equivalent height 1.70 m;** Access to Maclean/Brushgrove lost: Lawrence Ferry ceases to operate. Access to Pacific Highway via Maclean is affected. 2. **Prediction to reach and/or exceed 2.0 m (Grafton Prince Street gauge historical equivalent height 3.40 m):** Flood waters begin to encroach on top end of Weir Road, approximately 10 houses isolated. Water crosses low spots on Kings Creek Road isolating several rural properties. 3. **Prediction to reach and/or exceed 2.5 m (Grafton Prince Street gauge historical equivalent height 4.25 m):** Targeted Evacuation Warning issued for some Lawrence Residents living in low lying areas. Flood waters enter the village. Rutland Street between Post Office Lane and Richmond Street cut. Grafton – Lawrence Road cut at Boothby's Bridge and Shorts Lane, approximately 30 houses isolated along the road for up to a week. 4. **Prediction to reach and/or exceed 3.0 m (Grafton Prince Street gauge historical equivalent height 5.10 m):** River Bank Road cut, approximately 15 houses isolated. 5. **Prediction to reach and/or exceed 3.1 m (Grafton Prince Street gauge historical equivalent height 5.27 m):** Evacuation Order needs to be issued a minimum of 7.5 hours

	before this height (3.1m) is reached and will be issued to Lawrence Residents living in low lying areas (approximately 10). Water over Road Bridge and Richmond Street approximately 18 houses isolated including the local store, hall and Lawrence Tavern. 6. **Prediction to reach and/or exceed 3.2 m (Grafton Prince Street gauge historical equivalent height 5.44 m)** Mantons Road cut, approximately 18 houses isolated. 7. **Prediction to reach and/or exceed 4.2 m (evacuation) (Grafton Prince Street gauge historical equivalent height 7.14 m)** Over floor flooding may occur in Weir Street. 8. **Prediction to reach and/or exceed 4.4 m (evacuation) (Grafton Prince Street gauge historical equivalent height 7.48 m)** Water enters the Lawrence store, the hall, the Tavern, on Bridge Street, and several houses in Lawrence. 9. **Prediction to reach and/or exceed 4.6 m (Evacuation) (Grafton Prince Street gauge historical equivalent height 7.82 m)** Inundation of homes on Sportsman Creek and Kings Creek Rd. NB. If the Bureau issues a flood warning to **reach and/or exceed 7.82 m** on the Grafton (Prince St) gauge, evacuation will need to be considered for all of the above areas in Lawrence. **<u>Southgate area</u>** The four key evacuation triggers based on Bureau of Meteorology flood warning predictions at the Grafton Prince Street gauge (204904) include: 10. **Prediction to reach and/or exceed 4.5 m** Evacuation Warning issued for Southgate Residents living in low lying areas. Low Lying areas of farmland in Southgate start to become inundated. 11. **Prediction to reach and/or exceed 5.4 m** Evacuation Order issued for Southgate Residents living in low lying areas. Isolation of properties begins when the Grafton- Lawrence road closes. 12. **Prediction to reach and/or exceed 6.1 m** Over-floor inundation commences for residences on the Grafton – Lawrence Road.

	13. Prediction to reach and/or exceed 7.7 m Over-floor flooding commences in Southgate village, approximately 6 houses. NB. If the Bureau issues a flood warning to reach and/or exceed 7.7 m on the Grafton (Prince Street) gauge, evacuation will need to be considered for all of the above areas in Southgate due to over-floor flooding.
Sequencing of evacuation	• Evacuation of residents in low lying properties in Lawrence Village. • Evacuation of residents in low lying properties in Southgate. • Outside the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	• Properties around Lawrence: Pringles Way to Summerland Way and then onto either Grafton or Casino. • Properties around Southgate: Meet at Assembly Area/Evacuation Centre Southgate Village Hall
Evacuation Route Closures	Road closures affecting the evacuation: • The Bluff Point Ferry ceases to operate (1.0 m Lawrence gauge). • Grafton – Lawrence Road closes (5.0m on the Prince Street gauge). Alternate route Summerland Way. • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Prince Street gauge).
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Lawrence. • Primarily self-evacuation by private transport to Southgate Hall. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• The Lawrence Primary School Cook Street Lawrence • Southgate Village Hall School Lane Southgate
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	The Lawrence NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system. The local stores will be supplied by boat from Maclean, if required.
Aircraft Management	Helicopter Landing Zones • Lawrence Primary School (S29°29’ 31.6”, E153°06’0.06”) • Lawrence Road Southgate (S29° 37' 11.12”, E153° 0' 21.91”)
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of

	Education and Training. • Closure of licensed premises. The hotel 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 and helicopters to monitor safety of individuals, where feasible. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

3.2. LAWRENCE SECTOR MAP



Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

Map publication prepared by the NSW State Emergency Service
Geospatial Intelligence Branch
SES State Headquarters
gis@ses.nsw.gov.au
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4. ULMARRA SECTOR

This annex provides further detail of the planned response strategies within Ulmarra Sector.

4.1. ULMARRA SECTOR

See Map Attached

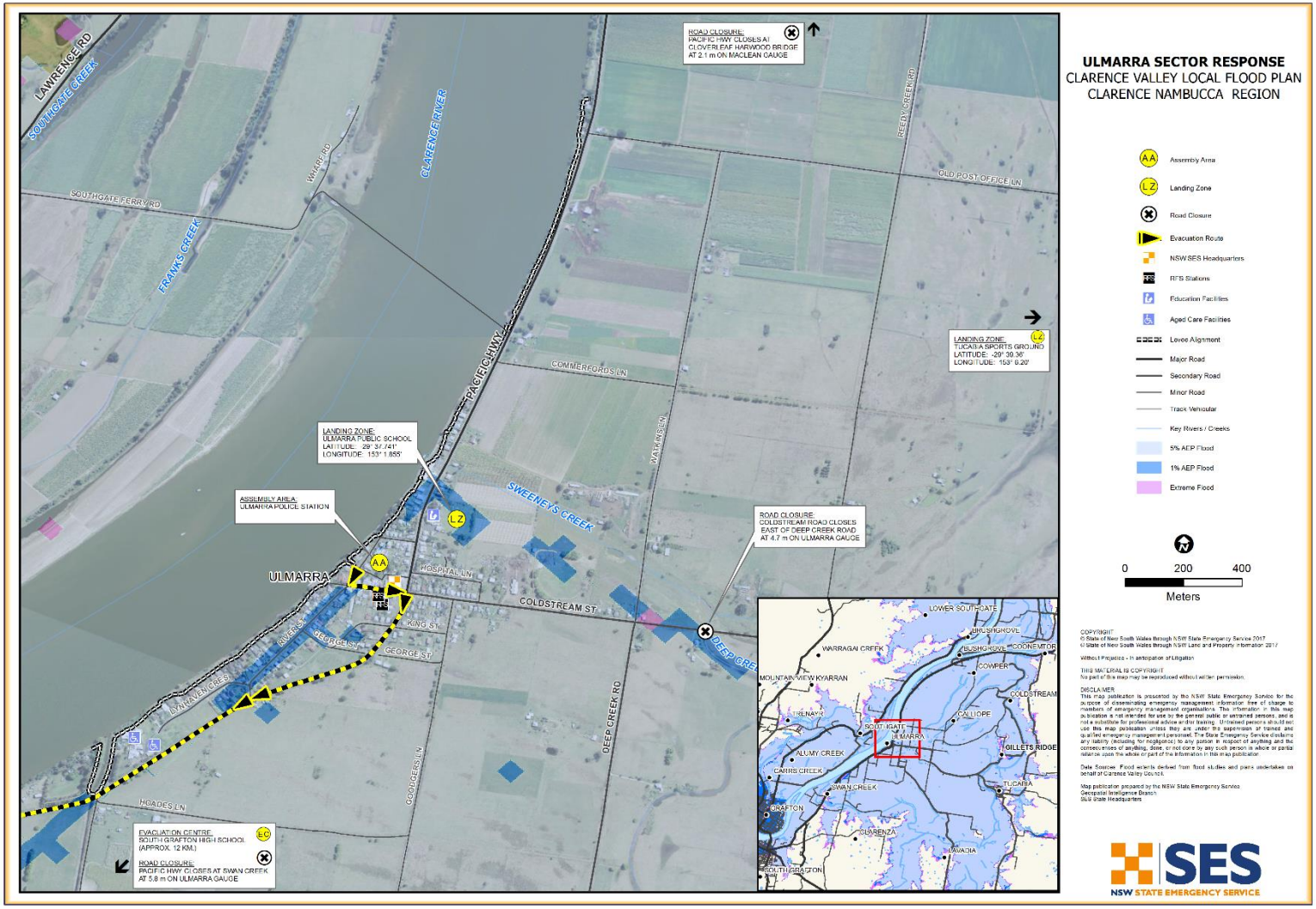
Sector Description	This sector covers the villages of Clarenza, Calliope, Coldstream, Gillett's Ridge, Swan Creek, Tucabia and Ulmarra.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Ulmarra is a low flood island (partially protected by a levee). Tucabia and Gilletts Ridge have rising road access.		
At risk properties	170	**Total number of properties**	354 (2011 Census)
Population	841 (2011 Census)		
Sector Control	The Ulmarra Unit Controller will control evacuations in this sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauge Name: Ulmarra (204905)	Minor: 2.10 m	Moderate: 3.40 m	Major: 4.90 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Ulmarra Police Station where evacuees are able to gather while flood situation is monitored. • If there is potential for major levee overtopping and/or failure, evacuees will be transported to the South Grafton High School Tyson Street South Grafton.		
Key Risks / Consequences	• Overtopping and/or failure of Ulmarra levee resulting in inundation behind the levee. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of identified properties requiring evacuation • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		

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. • Monitoring integrity of existing levee system. • Control of surface water inside levee.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.
Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Ulmarra gauge (204905)** **1. Prediction to reach and/or exceed 1.0 m** Ulmarra Ferry ceases to operate. **2. Prediction to reach and/or exceed 2.4 to 3.2 m** Tucabia – Tyndale Road will close in several locations including Chaffin Swamp 2km East of Tucabia and Champion Creek 4 km north of Tucabia. Bostock and Somerville Road may also cut isolating (approximately 20 families) **3. Prediction to reach and/or exceed 4.7 m** Most roads in the Coldstream area are closed from the Coldstream River. Tucabia isolated (population 287). **4. Prediction to reach and/or exceed 5.0 m** Evacuation Warning issued for Ulmarra residents living behind the levee system and residents in low lying areas to prepare to relocate outside of the impact area. **5. Prediction to reach and/or exceed 5.5 m** Evacuation Order issued for Ulmarra residents living behind the levee system and residents in low lying areas to prepare to relocate outside of the impact area. Evacuation of residents from Rathgar Lodge needs to be carried out before this height is reached. Water breaks across the Pacific Highway at the Ulmarra Ferry Approach, unless sandbagged. Eastern and southern parts of Ulmarra residential area are inundated by backwaters. **6. Prediction to reach and/or exceed 5.8 m** Pacific Highway closes at Swan Creek. No access to Grafton. **7. Prediction to reach and/or exceed 5.9 m** Ulmarra Levee overtopping is predicted. NB. If the Bureau issues a flood warning to **reach and/or**

	exceed 5.9 m on the **Ulmarra gauge**, evacuation will need to be considered for all of the above areas in Ulmarra due to over-flood flooding.
Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	**Route 1** Pacific Highway to the South, then turn left Centenary Drive, left Pacific Highway, right Old Lilypool Road, right Swallow Road, left Lilypool Road, right Armidale Road, left Tyson Street (able to use High Clearance Vehicles). **Route 2** In the event that the Highway has already closed Evacuees will be transported by Flood boat from Ulmarra boat ramp, to Fry Street or to Butter Lane at Heber Street Levee then bus to South Grafton Hill. See attached map. It is likely that the Pacific Highway south to Coffs Harbour will remain open to high level clearance vehicles.
Evacuation Route Closures	Road closures which may affect evacuations: • Pacific Highway Closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Pacific Highway at Swan Creek Closes (at 5.8m Ulmarra gauge). • Pacific Highway at Ulmarra Ferry Closes, unless sandbagged (at 5.7 m Ulmarra gauge). • Pacific Highway closes (4.2 m Brushgrove gauge) at Tyndale just north of Tucabia-Tyndale Road. • Pacific Highway closed at Ferry Park, Maclean (2.5 m Maclean gauge). • Pacific Highway closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km North of Maclean). Other known road closures: • The Cross Roads South Grafton remain open beyond the 1% flood height of (8.3 m at the Prince Street gauge). • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Prince Street gauge). Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Gwydir Highway (road susceptible to land slippage). • Armidale Road.

Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Public transport from the Assembly Area to South Grafton High School will be available to members of the community without private vehicles. An estimate of 5% of evacuees will not have private transport (3 Buses are estimated for transport). Agreements to be in place with private bus operators.
Evacuation Centre/Assembly Point	The nominated assembly area is the Ulmarra Police Station before being transported to South Grafton High School Auditorium, Tyson Street, South Grafton.
Large scale evacuations	In the event that evacuee numbers exceed the South Grafton High School, other evacuation centres will be nominated when required.
Rescue	The Ulmarra NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	Resupply will be provided by the NSW SES through the 132 500 call out system.
Aircraft Management	Helicopter Landing Zones • Ulmarra Primary School Oval. (S29° 37' 74.1" E153° 1' 85.5") • Tucabia Cricket Ground (S29° 39' 36.0" E153° 6' 20.0") • Gillett's Ridge (S29° 38' 03.6" E153° 06' 62.4")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Closure of licensed premises. The Ulmarra hotel will be closed for trading. • Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

4.2. ULMARRA SECTOR MAP



5. BRUSHGROVE SECTOR

5.1. BRUSHGROVE SECTOR

See Map Attached

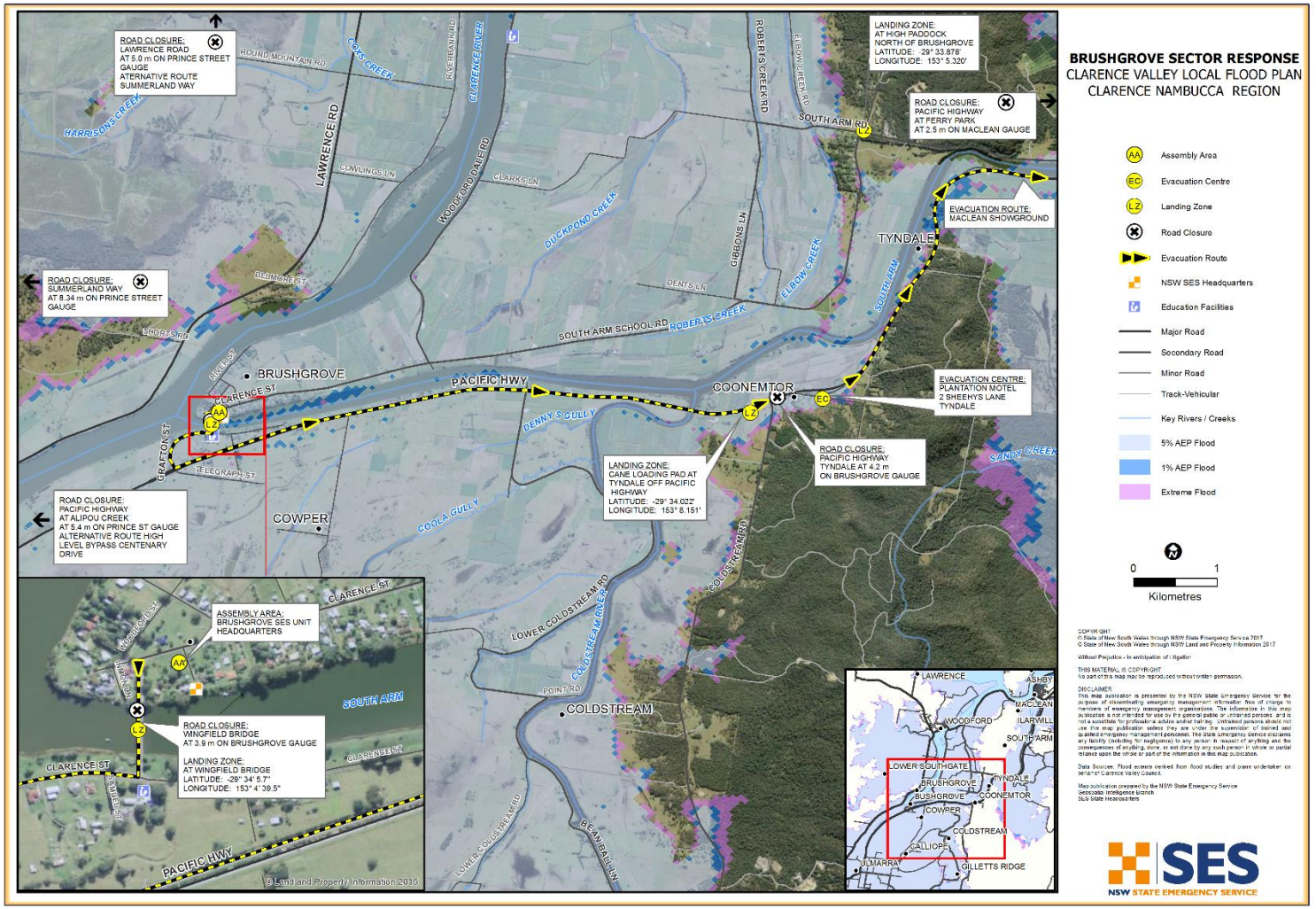
Sector Description	This sector covers Brushgrove, Cowper, Tyndale, and Lower Coldstream.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Brushgrove and Cowper are low flood islands. Tyndale is a high flood island.		
At risk properties	102 14 below the 1% AEP	**Total number of properties**	146 (2011 Census)
Population	334 (2011 Census)		
Sector Control	The Lawrence Unit Controller will 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 RFS volunteers.		
Key Warning Gauge Name Brushgrove (204406) and (Grafton Prince street gauge historical equivalent height)	Minor: -	Moderate: -	Major: No classification, 1% AEP is 5.8 m (Brushgrove gauge)
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Brushgrove NSW SES Unit (Clarence Street), where evacuees are able to gather while flood situation is monitored. • If extreme flooding is likely to occur, affected residents will be transported to the Assembly Area/Evacuation Centre at The Plantation Motel, 2 Sheehys Lane, Tyndale or Maclean Assembly Area/Evacuation Centre Maclean Showground Cameron Street Maclean.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		

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 Triggers	Local warnings commence when there is a prediction of 5.0 m on the Grafton Prince Street gauge (204404). The key evacuation triggers based on Bureau of Meteorology flood height predictions at the Grafton Prince Street gauge (204404). In reference to **Brushgrove gauge (204406)**: 1. **Prediction of 3.7 m (Grafton Prince Street gauge historical equivalent height: reach and/or exceed 5.0 m)** Targeted Evacuation Warning issued for Brushgrove and Cowper Residents living in low lying areas. 2. **Prediction of 3.9 m (Grafton Prince Street gauge historical equivalent height: to reach and/or exceed 6.0 m)** Targeted Evacuation Order issued for Brushgrove and Cowper Residents living in low lying areas. The approach at the Wingfield Bridge is cover by flood waters. 3. **Prediction of 4.2 m (Grafton Prince Street gauge historical equivalent height: to reach and/or exceed 7.2 m)** Flood waters can enter the island from the Main Arm overtopping or by backing up a drainage channel that links in the common. Floods of this size correspond to roughly 5.3m on the Grafton Prince Street gauge about six hours earlier and 4.3m at Ulmarra about three hours earlier. 4. **Prediction of 4.3 to 5.5 m (Grafton Prince Street gauge historical equivalent height: to reach and/or exceed 7.9 m)** 3 Houses along Donaldson Street, 7 houses in Clarence Street, 3 houses in River Street, 2 along Inmon Lane start to experience over floor flooding. The town of Cowper will be inundated. Remaining houses in Brushgrove have main living floor level above 5.9m on the Brushgrove gauge but access out of Brushgrove will be lost before this height.
Sequencing of evacuation	• Evacuation of residents in low lying properties along River Street, Donaldson Street, Inmon Street and Clarence Street. • Outside of the identified sequenced evacuation areas, a

	number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	• Early activation will allow residents to travel north or south to friends and family at private residences. • Early activation will also enable residents to travel along the Pacific Highway to the Plantation Motel in Tyndale. • Following closure of the approach to Wingfield Bridge, residents will be transported from NSW SES Brushgrove headquarters to Cowper boat ramp, or another appropriate location determined at that time, by boat, then travel by road to the Plantation Motel in Tyndale. • Closure of the Pacific Highway at Tyndale (closure of highway at 4.2 m on the Maclean gauge) will require the final movement of residents north of the Coldstream River by boat. Highway is closed approximately 200m from the assembly area/evacuation centre. See attached Map
Evacuation Route Closures	Road closures affecting the evacuation : • Pacific Highway closes at (4.2 m Brushgrove gauge) Tyndale just north of Tucabia-Tyndale Road. • Pacific Highway closes at (5.5 m Ulmarra gauge) south of Ulmarra at Swan Creek. • Pacific Highway closes (5.4 m Grafton Prince Street gauge) at Alipou Creek, alternate route high level bypass Centenary Drive. • Pacific Highway closed at Ferry Park, Maclean (2.5 m Maclean gauge) • Pacific Highway closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5km north of Maclean).
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Transport by road from Brushgrove NSW SES Unit to The Plantation Hotel, Tyndale.
Evacuation Centre/Assembly Point	• Brushgrove NSW SES Unit (Assembly Area only) • The Plantation Motel 2 Sheehy's Lane Tyndale • Maclean Showground Cameron Street Maclean
Large scale evacuations	• In the event that evacuee numbers exceed The Plantation Motel, 2 Sheehy's Lane, Tyndale, evacuees will be transported to an alternative assembly area/evacuation centre at Maclean.
Rescue	The Brushgrove NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.

Resupply	Resupply will be provided by the NSW SES through the 132500 call out system.
Aircraft Management	Helicopter Landing Zones • Wingfield Bridge (S29°34'05.7" E153° 04'39.5") • High Paddock to the north of Brushgrove (S29°32'19.7" E153°08'88.8") • Cane loading pad at Tyndale beside Pacific Highway (S29°33'60.5" E153°08'94")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Closure of licensed premises. All hotels will be closed. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

5.2. BRUSHGROVE SECTOR MAP



6. MACLEAN SECTOR

6.1. MACLEAN SECTOR

See Map Attached

Sector Description	This sector covers the towns of Maclean, and Taloumbi, it also includes the villages of Chatsworth, Harwood, Ilarwill, South Arm, Ashby, Shark Creek and extensive rural areas.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Maclean has rising road access between 2.5 and 2.7 m, thereafter becoming a high flood island with the levee overtopping heights at 3.3-3.4 m. Chatsworth, Harwood and Warregah are low flood islands. Ilarwill and Townsend are high flood islands.		
At risk properties	550 dwellings, including 102 commercial	**Total number of properties**	1834 (2011 Census)
Population	4131 (2011 Census)		
Sector Control	The Maclean Unit Controller will 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 RFS volunteers.		
Key Warning Gauge Name: Maclean(204410)	Minor: 1.60 m	Moderate: 2.20 m	Major: 2.50 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at the Maclean Showground Cameron Street, Maclean, where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Overtopping and/or failure of Maclean levee resulting in inundation behind the levees. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watches • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		

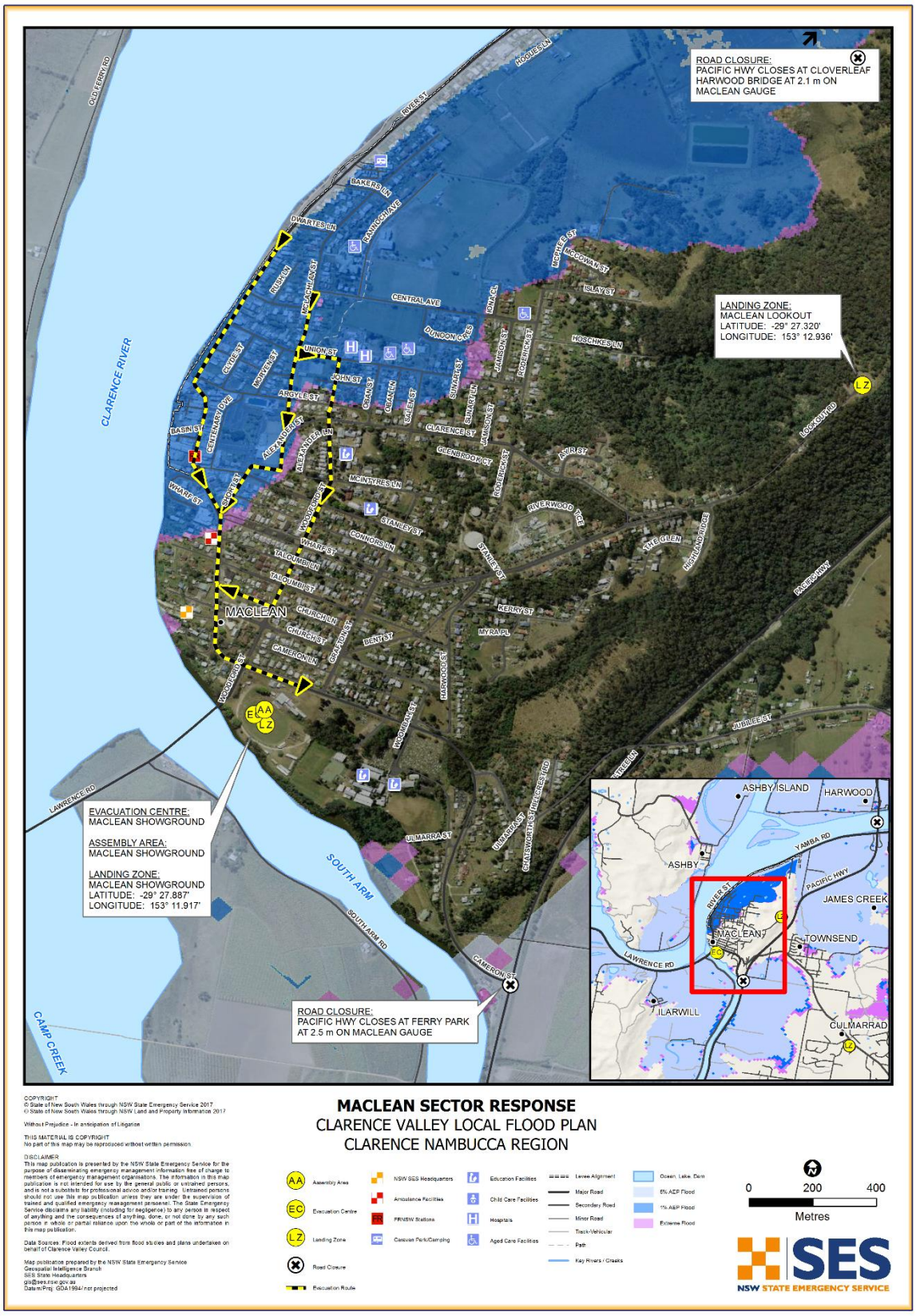
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock. • Relocation of farm machinery and valuable goods • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need. • Monitoring integrity of dwellings surrounded by flood waters. • Monitoring integrity of existing levee system. • Control of surface water inside levee.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection • Sewer system in urban areas of sector in Maclean, Townsend, Ilarwill, rural areas of sector are on septic tank. Evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan addresses procedures for sewerage system.
Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Maclean gauge (204410):** **1. Prediction to reach and/or exceed 1.5 m** Advise schools of possible Lawrence Ferry closure affecting students returning home. **2. Prediction of between 2.5m to 2.7m (Isolation)** Targeted evacuation Warning/Order for residents in Harwood. The town of Maclean becomes progressively isolated by flood waters. The village of Harwood is totally flooded, most houses in this area are raised preventing over floor flooding. **3. Prediction to reach and/or exceed 3.0 m** Evacuation Warning issued for Maclean residents living behind the levee system to prepare to relocate outside of the impact area. Extensive flooding of Chatsworth, Harwood and Warregah Islands. Evacuations of low-lying houses may be necessary. **4. Prediction to reach 3.3 m** At 3.3m the levee design height is thought to be exceeded and it likely that the low points in the levee will begin to be overtopped. Based on monitoring and assessment of levee condition, consideration of targeted Evacuation Order of : Argyle Street, (13 houses 1 business) Bakers Lane, (4 houses) Bank Lane, (1 house 1 business) Basin Street, (1 business) Cameron Street, (6 houses) Centenary Drive, (15 businesses) Central Avenue, (14 houses) Church Street, (3 houses 1 business)

	Clyde Street, (9 houses, 2 businesses) Diamond Street, (17 houses)** Dunoon Crescent, (18 houses) Dwartes Lane, (1 house) Emerald Street, (8 houses)** Houghs Lane, (10 houses) Howard Street, (12 houses) Iona Close, (9 houses) John Street, (5 houses) Jubilee Street, (10 houses) McLachlan Street, (84 houses, 3 businesses) McNaughton Place, (2 houses, 4 businesses) Morven Street, (17 houses) Rannoch Ave, (13 houses, 1 business) River Street, (70 houses) River Street, Shops, (66 businesses) Rush Lane, (8 houses) Sapphire Close, (17 houses)** Stanley Street, (1 house, 5 businesses) Taloumbi Street, (12 houses) Union Street, (8 houses, 2 businesses) and other low lying areas. ** Isolation only not flooded over-floor. **5. Prediction to exceed 3.3 m** Evacuation Order issued for all impacted residences mentioned above to commence evacuation (overtopping likely to commence at 3.4 m). Note: 1% AEP in Maclean is 3.6 m (Maclean gauge)
Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	**Option 1:** River Street to Cameron Street. **Option** 2: McLachlan Street, Short Street, River Street, then Cameron Street. **Option 3:** McLachlan Street, Union Street, Woodford Street, Church Street, River Street, then Cameron Street. See attached map.

Evacuation Route Closures	Road closures affecting the evacuation: • The closure of local roads will be dependent on local rainfall conditions. • Known streets affected once overtopping has commenced are shown in the "EVACUATION TRIGGER SECTION" of annexure. • Pacific Highway closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km north of Maclean). • Pacific Highway closed at Ferry Park, Maclean (2.5 m Maclean gauge). Other known road closures: • Pacific Highway closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Public transport will be available to transport the public without private transport to the Evacuation Centre/Assembly Area at the Maclean Showground. • Car parking capability on the Maclean Hill is unlimited. • Other outlying areas such as Chatsworth, Harwood, Goodwood, and Warregah islands may require evacuating on a case by case basis and can be transported by boat to the Assembly Area/Evacuation Centre at the Maclean Show Ground.
Evacuation Centre/Assembly Point	• Maclean Showground buildings, Cameron Street, Maclean.
Large scale evacuations	In the event that large scale evacuations are required residents will be transported to where an Assembly Area/evacuation centre will be established. The following stages will occur; • **Stage 1:** Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. • **Stage 2:** Evacuation of all people not required for emergency Operations • **Stage 3:** Evacuation of emergency personnel by flood boat.
Rescue	The Maclean NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Maclean Base Hospital, Spar Supermarket, Local Bakery and Fruit & Vegetable Store will be resupplied if required. This

	will ensure residents are continually provided with essential food items.
Aircraft Management	Helicopter Landing Zones • Maclean Showground (S29°27'88.7", E153°11'91.7") • Maclean Lookout (S29°27'32.0", E153°12'93.6") • Gulmarrad Public School oval for larger helicopters (S 29°29'98.2", E153°14'16.6")
Other	Special considerations relating to the evacuation: • Closure of schools – coordinated through the Department of Education and Training. • Closure of licensed premises. All hotels and licensed clubs will be closed if affected. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. • Maclean has one peak season with potential population increase of more than 10% - Highland Gathering – Easter long weekend. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

6.2. MACLEAN SECTOR MAP



7. ILUKA SECTOR

7.1. ILUKA SECTOR

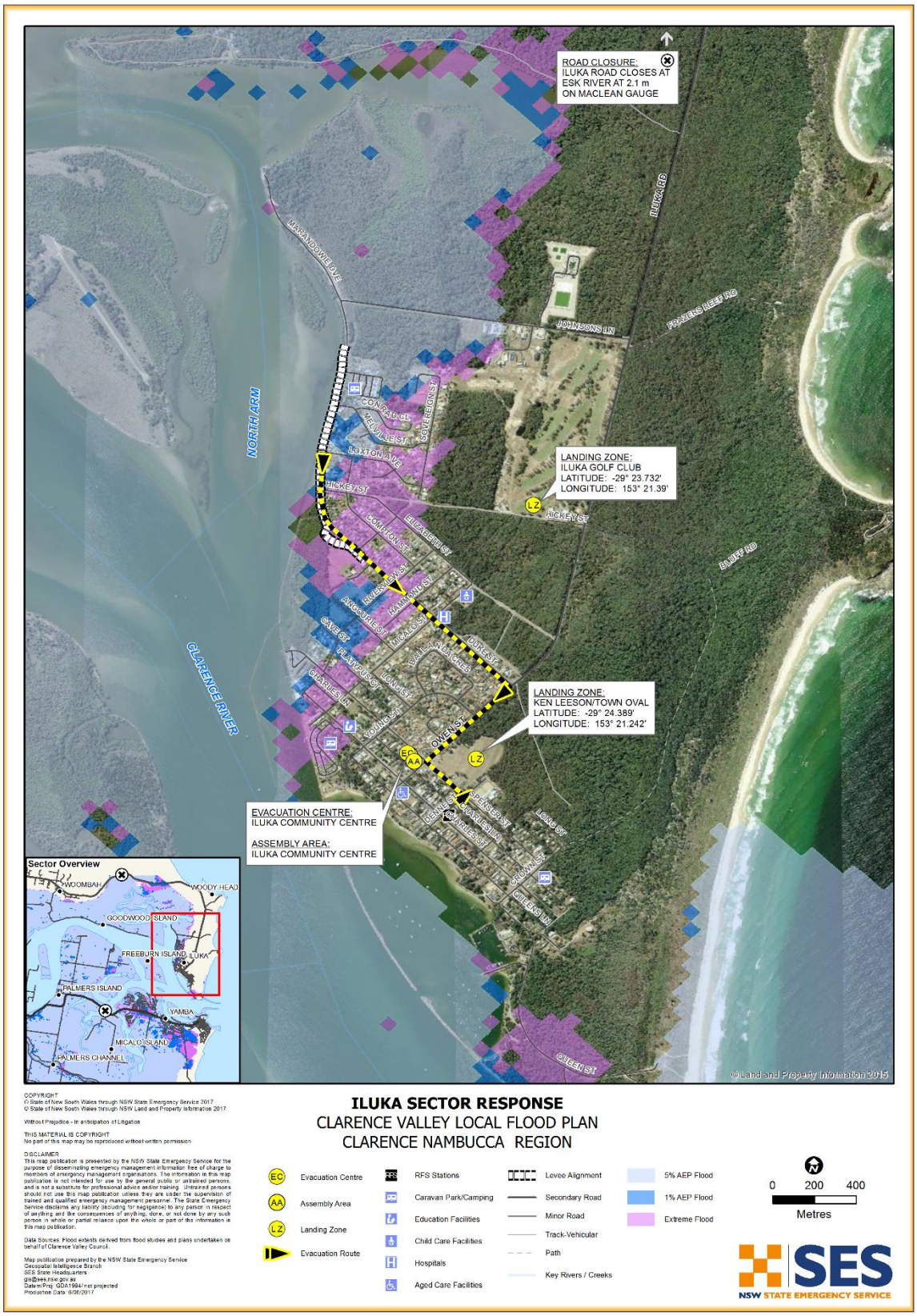
See Map Attached

Sector Description	This sector covers, Iluka, Mororo, The Freshwater, Woody Head, Goodwood and Woombah.		
Hazard	Clarence River riverine flooding		
Flood Affect Classification	Iluka and Woombah become a high flood islands following the flooding of access roads at 2.1 m on the Maclean gauge.		
At risk properties	20 residential Iluka 470 Woombah isolation. 2 Caravan Parks.	**Total number of properties**	1207 (2011 Census)
Population	1884 (2011 Census)		
Sector Control	The Yamba Unit Controller will 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 RFS volunteers.		
Key Warning Gauge Name: Maclean(204410)	Minor: 1.60 m	Moderate: 2.20 m	Major:2.50 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Iluka Community Hall 54 Spencer Street, Iluka, 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 isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watches • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
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. • Sewer system under construction for township of Iluka.		

	Expected completion 2013, most of sector is on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan address procedures for sewerage treatment plant. • Need to check with Kieran on RL for location reservoir.
Evacuation Triggers	The effects on the towns and outlying areas in this sector are very much dependent on **tidal influences**. Tidal levels will need to be identified at the onset of main Clarence River flooding. **Maclean gauge (204410):** **1. Prediction to reach and/or exceed 2.0 m** Local Warnings will commence, including notification to: • The Anchorage Holiday Park Iluka • Browns Rocks Caravan Park Goodwood Island **2. Prediction to reach and/or exceed 2.1 m (isolation)** The Iluka Road at the Esk River may be cut, causing isolation of the town. Based on monitoring and assessment known locations of flooding are: Marandowie Drive, Melville Street, Sovereign Street and Conrad Close. **3. Prediction to reach and/or exceed 2.4 m** Targeted Evacuation Order of a number of houses around town may be considered. **4. Prediction to reach and/or exceed 3.6 m (isolation)** The village of Woombah may become isolated; however land is above the PMF.
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.
Evacuation Routes	• The local Evacuation Routes will be chosen in consideration of current road conditions. These routes will direct residents to the local Assembly Area/evacuation centres in the town. See Attached Map
Evacuation Route Closures	Road closures which may affect the isolation of the town: • The closure of local roads will be dependent on local rainfall and tidal conditions. • The only route in and out of Iluka is the Iluka Road which can be cut at the Esk River (2.1 m Maclean gauge 204410). • Pacific Highway closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km north of Maclean). • Pacific Highway closed at Ferry Park, Maclean (2.5 m Maclean gauge).

	Other known road closures: • Pacific Highway Closes (5.4m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• Iluka Community Hall 54 Spencer Street, Iluka.
Large scale evacuations	• If large scale evacuations are likely, additional sites will be identified as an Assembly Area/evacuation centres to accommodate residents of Iluka, Woody Head and any outlying areas.
Rescue	The Yamba NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The local stores will be supplied by boat from Yamba, if required.
Aircraft Management	Helicopter Landing Zones: • The Golf Course (S29° 23' 73.2" E153° 21'39.0") • The Town Oval (S29° 24' 38.9" E153° 21'24.2")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • 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 and helicopters to monitor safety of individuals, where feasible. Iluka has four peak seasons with a potential population increase of more than 10%: • School holidays tourist influx late December/January • School holidays tourist influx April • School holidays tourist influx July • School holidays tourist influx September/ October These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

7.2. ILUKA SECTOR MAP



Map publication prepared by the NSW State Emergency Service
Geospatial Intelligence Branch
SES State Headquarters
gis@ses.nsw.gov.au
Datum/Proj: GDA1994 / not projected
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8. YAMBA SECTOR

8.1. YAMBA SECTOR

See Map Attached

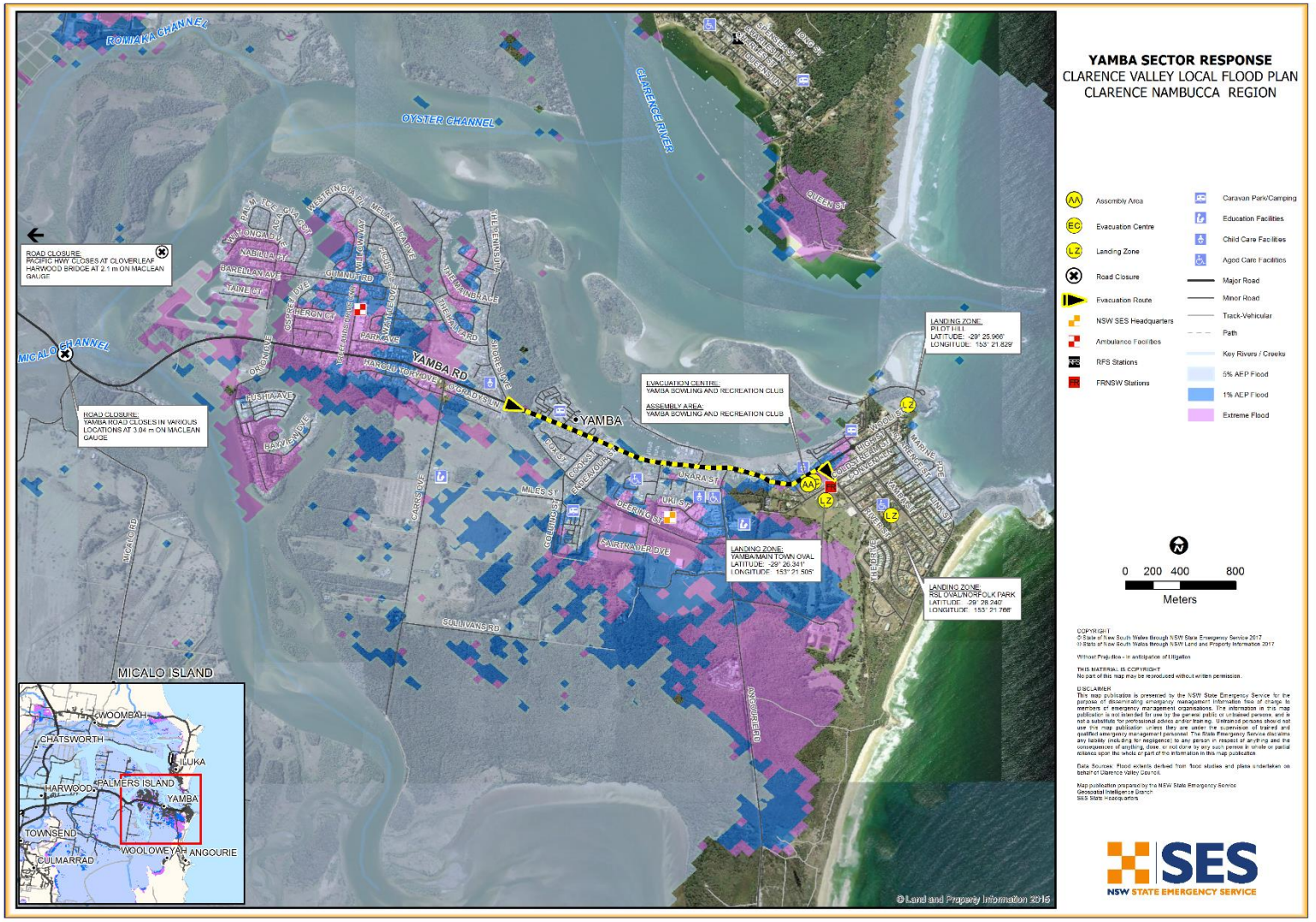
Sector Description	This sector covers Yamba, Angourie, Wooloweyah and Palmers Island		
Hazard	Clarence River riverine flooding		
Flood Affect Classification	Yamba is a high flood island. Palmers Island is a low flood island.		
At risk properties	2400 properties at risk of over floor flooding in an extreme flood. At least 54 Palmers Island. 150 Yamba Road & Crystal Waters area. 3 Caravan Parks.	**Total number of properties**	3735 (Census 2011)
Population	6074 (Census 2011)		
Sector Control	The Yamba Unit Controller will control evacuations in this sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauge Name: Maclean(204410)	Minor:1.60 m	Moderate: 2.20 m	Major: 2.50 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Yamba Bowling Club Wooli Street Yamba, where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watches • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
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. • Sewer system in Urban areas of sector in Yamba, Angourie, Wooloweyah, all other areas of sector are on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan address procedures for sewerage system.
Evacuation Triggers	The effect of flooding on the town and outlying areas in this sector is very much dependant on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Maclean gauge (204410):** **1. Prediction to reach and/or exceed 2.1 m** Local Warnings will commence, including notification to Caravan Parks and low lying houses. Yamba becomes isolated at the Cloverleaf and also the intersection of Yamba Road and Palmers Channel South Bank Road, depending on tidal conditions (760 Yamba Road). Palmers Island begins to experience flooding. **2. Prediction to reach and/or exceed 2.4 m** Low lying areas of Shores Drive, the Halyard and 4 houses on Yamba Drive near Coles are subject to flooding. Other areas affected are Golding Street, Cook Street, and Endeavour Street, Deering Street. **3. Prediction to reach and/or exceed 3.6 m** Targeted Evacuation Warning/ Order to be considered for Palmers Island and targeted area of Yamba based on local conditions. A 1% AEP flood event at Palmers Island village would see 54 properties affected and 10 would have over floor flooding. 1% AEP flood event is 3.23 m (Harwood gauge) and 3.6 m (Maclean gauge).
Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Family and Community Services.

Evacuation Routes	• Residents wishing to leave Yamba need to do so before a height of 2.1 m is reached on the Maclean gauge (204410) • Local roads around Yamba will open and close, depending on local rainfall and tidal conditions. See attached map.
Evacuation Route Closures	Road closures which may affect the isolation of the town: • The closure of local roads will be dependent on local rainfall and tidal conditions. • Yamba Road closes at (2.1m Maclean gauge 204410) • Pacific Highway closes (2.1m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5km north of Maclean). • Pacific Highway closed at Ferry Park, Maclean (2.5m Maclean gauge) Other known road closures: • Pacific Highway Closes (5.4m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Other outlying areas such as Palmers Island and Palmers Channel may require evacuating on a case by case basis and can be transported by boat to the Assembly Area/Evacuation Centre at the Yamba Bowling Club.
Evacuation Centre/Assembly Point	• Yamba Bowling Club, Wooli Street, Yamba
Large scale evacuations	In the event that large scale evacuations are required residents will be transported to where an Assembly Area/evacuation centre will be established. The following stages will occur; • **Stage 1:** Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. • **Stage 2:** Evacuation of all people not required for emergency Operations • **Stage 3:** Evacuation of emergency personnel by flood boat.
Rescue	The Yamba NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Coles supermarket will be resupplied if required; this will ensure that Yamba residents are continually provided with

	essential food items.
Aircraft Management	Helicopter Landing Zones • Pilot Hill (S29° 25' 96.6", E153° 21' 82.9") • RSL Sub Branch Oval (S29° 26' 24.0", E153° 21' 76.6") • Main Town Oval, Coldstream Street (S29° 26' 34.1", E153° 21' 50.5")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. Yamba has four peak seasons with a potential population increase of more than 10%: • School holidays tourist influx late December/January. • School holidays tourist influx April • School holidays tourist influx July • School holidays tourist influx September/ October These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

8.2. YAMBA SECTOR MAP



9. SANDON SECTOR

9.1. SANDON SECTOR

See Map Attached

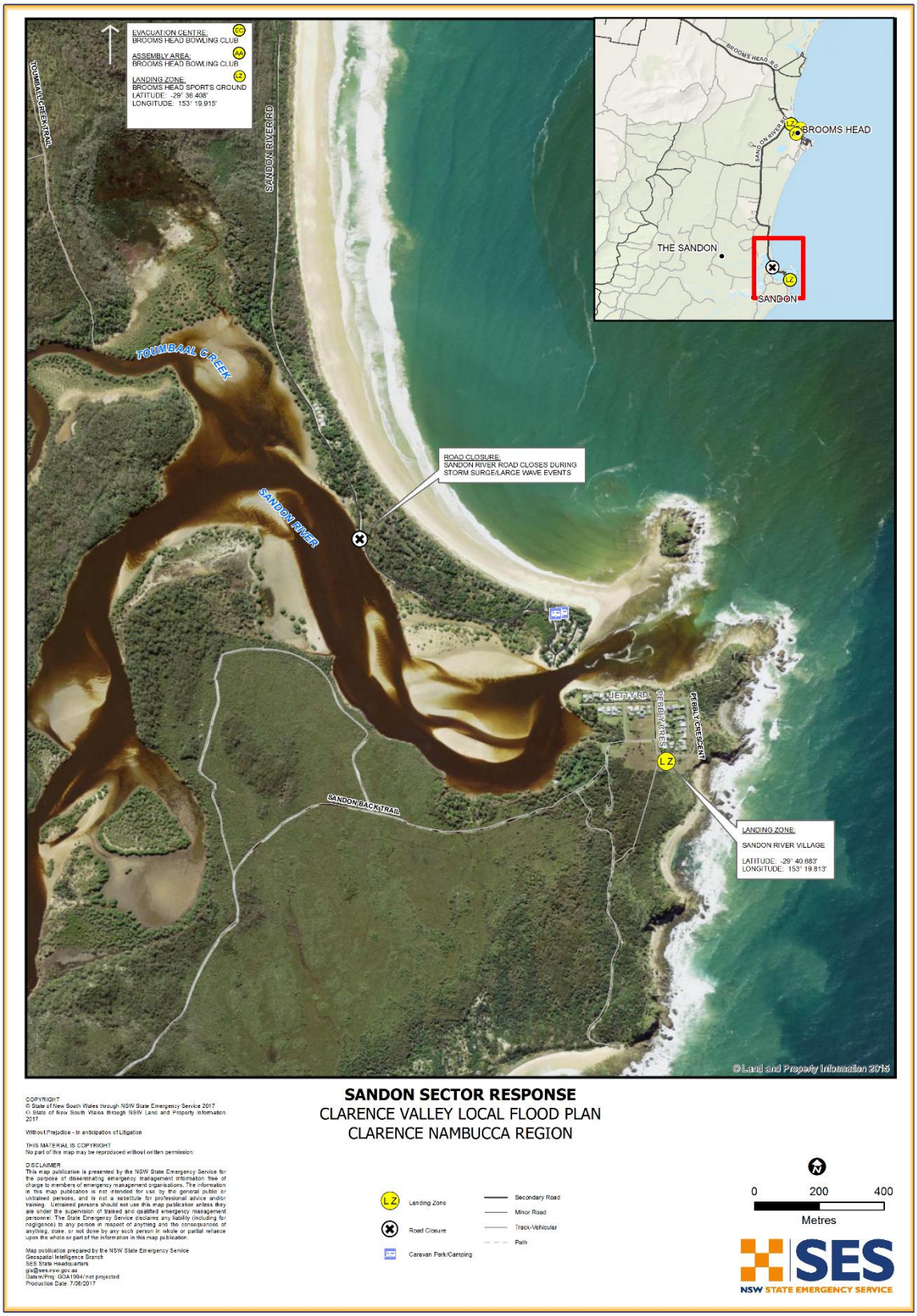
Sector Description	This sector covers Bookram, Brooms Head, Sandon and Sandon River Village.		
Hazard	Flooding by ocean influences and riverine and overland flooding causing isolation.		
Flood Affect Classification	High flood island.		
At risk properties	Isolation of all	**Total number of properties**	219 (Census 2011)
Population	195 (Census 2011)		
Sector Control	The Maclean Unit Controller will control evacuations North of Sandon. Sandon River Village remains under the control of the Yuraygir Unit Controller The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW RFS volunteers.		
NO Key Warning Gauge	-	-	-
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Brooms Head Bowling Club, 30 - 36 Ocean Road, Brooms Head where evacuees are able to gather while flood situation is monitored. • Establishment of an Assembly Area at Sandon River Village RFS/ Library Building to accommodate village residents.		
Key Risks / Consequences	• Potential loss of life from tidal surges and large ocean seas. • Potential isolation of more than 200 people estimated to be for a number of days.		
Information and Warnings	• Storm Surge Warning • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
Property Protection	**Specific property protection measures:** • Monitoring integrity of dwellings affect by ocean influences.		
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection		
Evacuation Triggers	• There is no river height gauge on the Sandon River. The river is tidal with a small catchment area. A river level 1.2 m over high tide can cover access road to Sandon from the north. • Storm surge/large wave events may impact areas within this sector.		

Sequencing of evacuation	**Sandon** • 35 houses in Sandon village will require door knocking. **North Sandon** • A potential for 40 camp sites and 12 occasionally occupied houses at Sandon River camping ground will require door knocking in the event of possible flooding. **Brooms Head** • Low lying parts of Brooms Head Caravan Park may require door knocking. • Low lying houses at Ocean Street may require assistance in Storm Surge/Large Wave events.
Evacuation Routes	• Brooms Head Road to Maclean. • Sandon River Village has access via main inland track to Minnie Water. See attached map.
Evacuation Route Closures	• 1.2 m flood height over the high tide can close Sandon River Road. • Main beach track used to travel to Minnie Water may not be passable during high tides or storm surge events.
Method of Evacuation	• Affected residents may be transported by helicopter in the event of road closures.
Evacuation Centre/Assembly Point	• Brooms Head Bowling Club 30-36 Ocean Road, Broom Head • Sandon River Village RFS/ Library Building.
Large scale evacuations	• It is not anticipated that large scale evacuations could occur with limited residents affected in this sector.
Rescue	The Maclean NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Brooms Head local store will be resupplied if required, where residents can access essential food supplies for the period of isolation.
Aircraft Management	Helicopter Landing Zones • Brooms Head Sports Ground (S29° 38’ 40.8”, E 153° 19’ 91.5”) • Sandon River Village (S29° 40’ 41.0”, E153° 19’ 46.3”)

Other	Special considerations relating to the evacuation:
	• Security. Police patrols to be established to maintain law and order after evacuation has occurred.
	• The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible.
	• Brooms Head and Sandon have four peak seasons with potential for a population increase of more than 100%:
	  ○ School holidays December/January
	  ○ School holidays April
	  ○ School holidays July

	○ School holidays September/October • The majority of holiday makers in this sector are campers. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

9.2. SANDON SECTOR MAP



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SES State Headquarters
gis@ses.nsw.gov.au
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10. WOOLI-MINNIE WATER SECTOR

10.1. WOOLI MINNIE SECTOR

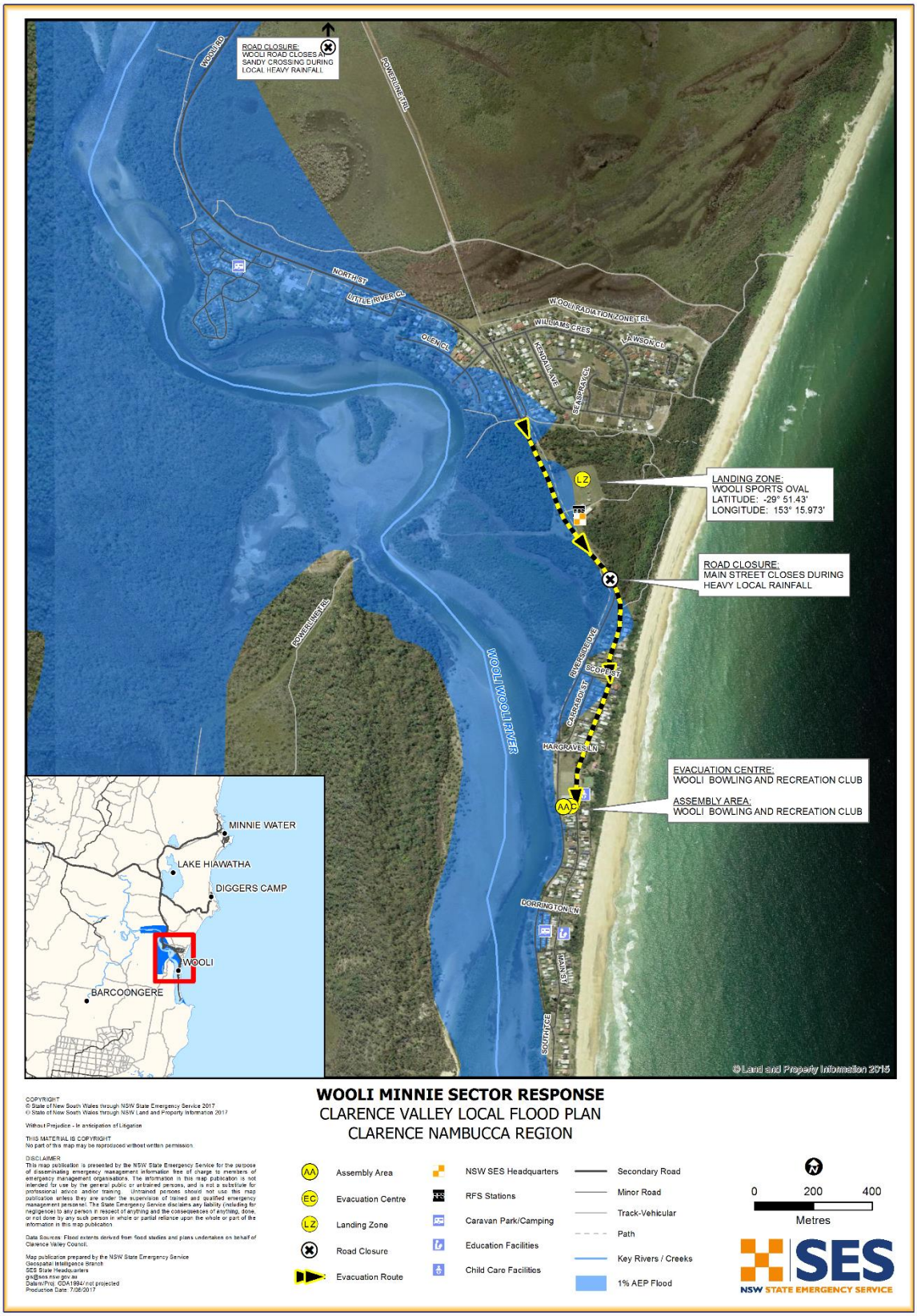
See Map Attached

Sector Description	This sector covers Calamia, Diggers Camp, Minnie Water, Pillar Valley, Sandy Crossing and Wooli.		
Hazard	Riverine flooding on the Wooli and Coldstream Rivers.		
Flood Affect Classification	High flood islands, with Wooli becoming a low flood island.		
At risk properties	226 at risk of inundation. All at risk of isolation.	**Total number of properties**	531 (Census 2011)
Population	755 (Census 2011)		
Sector Control	The Wooli - Yuraygir Unit Controller will 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 RFS volunteers.		
Key Warning Gauge Name: Wooli (205463)	Minor: -	Moderate: -	Major-
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Wooli Bowling Club, Main Street, Wooli 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 isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
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 Triggers	The effects of flooding on the town and outlying areas in this sector is very much dependent on tidal influences. Tidal levels will need to be identified at the onset of Wooli River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Wooli (Resort) River gauge (205463):** 1. **Prediction to reach and/or exceed 1.5 m** Evacuations will be considered when the predicted height of the Wooli River (Resort) gauge at The Solitary Islands Marine Park reaches 1.5 m. 100 mm of rain and Lake Hiawatha can commence over flowing into the swamp behind village. Water becomes visible behind Williams Crescent. When this occurs Sandy Crossing and White Bridge may be cut. Large swells, king tides and heavy rain affect low lying areas along Riverside Drive from forks in road to Wooli Oyster supply with no.11 Carraboi Street lowest dwelling. Houses 154 and 156 Main Street over floor flooding from storm water during heavy rain.
Sequencing of evacuation	The following stages will occur; **Stage 1** • Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. **Stage 2** • Evacuation of all people not required for emergency Operations • Use of RFS trucks, at Wooli and Pillar Valley, Hotel bus, Bowling Club bus and Wooli Freight Service truck used to evacuate people from the village.
Evacuation Routes	• Local roads around Wooli will open and close, depending on local rainfall and tidal conditions. • Evacuation route for Wooli is travel along Riverside Drive until you come to the Bowling Club. Alternately if this road is underwater travel along Main Street turn right at Bowling Club into Riverside Drive and on to Bowling Club.
Evacuation Route Closures	Local and heavy rainfall close roads • If Eight Mile Lane closes at Sandy Crossing, the towns of Wooli, Minnie Water and Diggers Camp will be isolated. This situation occurs quite regularly and the residents are aware of this The Eight Mile Lane to the Pacific highway may close at Sandy crossing. • White Bridge on Wooli Road to Tucabia • The towns are often isolated from local storm events as well. Other known road closures include: • Firth Heinz Road Pillar Valley

	• Diggers Camp Road. • Eight Mile Lane at Sandy Crossing closes • White Bridge closes. • Pacific Highway Closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• When flooding is expected the NSW SES, RFS and other Emergency Services will conduct a door knock of the areas to be effected. • Known affected locations are: Riverside Drive, Wooli Road, Olen Close, Little River Close, Main Street
Evacuation Centre/Assembly Point	• Wooli Bowling Club Main Street Wooli (Assembly point)
Large scale evacuations	• If large scale evacuations are likely, the Wooli Community will be directed to the Wooli Bowling Club (Assembly Area), to register and be advised which evacuation centre is open to accommodate the residents.
Rescue	The Wooli - Yuraygir NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Local Stores in Wooli and Minnie Water will be resupplied if required; this will ensure that local residents are continually provided with essential food items. NSW SES informs shops of when the boat will be working at Sandy Crossing.
Aircraft Management	Helicopter Landing Zones • Wooli Sports Oval next to Yuraygir NSW SES building (S29° 30' 52.596" E153° 9' 35.2794")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • 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 and helicopters to monitor safety of individuals, where feasible. • Wooli and Minnie Waters has four peak seasons with potential for a 10% population increase: o School holidays tourist influx late December/January o School holidays tourist influx April o School holidays tourist influx July o School holidays tourist influx September/ October These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

10.2. WOOLI AND MINNIE WATER SECTOR MAP



11. CANGAI SECTOR

11.1. CANGAI SECTOR

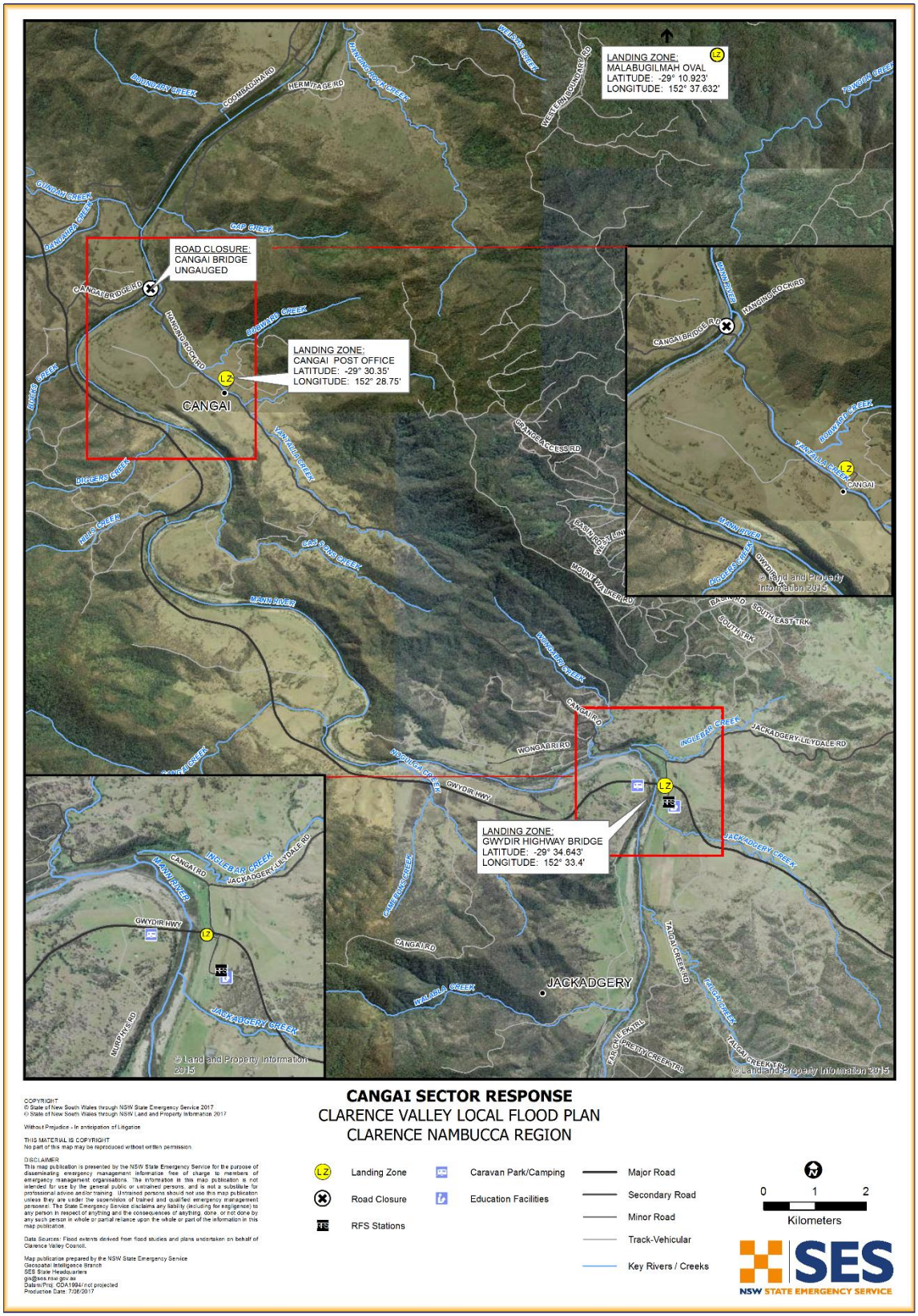
See Map Attached

Sector Description	This sector covers Cangai, Carnham, Coombadjha, and Jackadgery.		
Hazard	Clarence River and Mann River riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties	All at risk of isolation.	**Total number of properties**	99 (Census 2011)
Population	182 (Census 2011)		
Sector Control	The Copmanhurst Unit Controller will control evacuations in this sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauges **Name: Baryulgil (204900)** **Jackadgery (204004)** **Tabulam (204002)**	Minor: -	Moderate: -	Major: -
General Strategy	• Evacuation 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 a number of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
Property Protection	**Specific property protection measures:** • Properties are not directly affected by flooding in this sector. • Residents are encouraged to remain in their houses.		
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage or reticulated water supply.		
Evacuation Triggers	The key evacuation triggers based on the **historical equivalent height** flood height at the Tabulam gauge (204002): 1. **Reach and/or exceed 1.5 m: Baryulgil gauge (204900); (historical equivalent height to reach and/or exceed 2.5m** at the **Tabulam gauge (204002)**; with flow time between gauges of three hours) The Baryulgil Crossing can be cut causing some property isolations.		

	2. **Reach and/or exceed 5.72 m: Jackadgery gauge (204004); (historical equivalent height to reach and/or exceed 6.72 m** at the **Tabulam gauge** with flow time between gauges of 10-12 hours) The Cangai Road Bridge can be cut causing isolation from Grafton.
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 Family and Community Services.
Evacuation Routes	• Gwydir Highway west to Glen Innes (caution - road is subject to land slippage). • Gwydir Highway east to Grafton (caution - road is subject to land slippage). • Clarence Way. See attached map.
Evacuation Route Closures	**Road closures affecting the isolation of residents in this sector:** • There is uncertainty when local roads around the Cangai area will close, the closure will be dependent on local rainfall conditions. Other known road closures include: • Clarence Way closes at Whiteman Creek causeway(8.0m Copmanhurst gauge), approximately 6km east of Copmanhurst • Gwydir Highway to Grafton (road susceptible to land slippage) Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Prince Street gauge). • Armidale Road • Old Glen Innes Road • Carnham Road • Dandahra Road
Method of Evacuation	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	No formal evacuation centre or assembly point in place. If required locations will be determined at the time. These could include: • Mann River Caravan Park (20 sites available to service areas of Cangai and outlying areas of Coombadjha. • Baryulgil Primary School can service remaining outlying areas.
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	The Copmanhurst NSW SES Units will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.

Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • Local store "The Mann River Caravan Park" will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • Cangai Post Office (S29° 30' 30.1", E152° 28' 45.2") • Car park at the Gwydir highway bridge over the Mann River (S29° 34' 38.6", E152° 33' 24.0") • Malabugilmah Oval (S29° 10' 55.4", E152° 37' 37.9")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The NSW SES may use helicopters to monitor safety of individuals, where feasible. • Cangai has one peak season with potential population increase of more than 10%: o Summer school holidays - Public lands within remote areas of this sector are utilized by campers. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

11.2. CANGAI SECTOR MAP



Data Sources: Flood extents derived from flood studies and plans undertaken on behalf of Clarence Valley Council.

Map publication prepared by the NSW State Emergency Service
Geospatial Intelligence Branch
SES State Headquarters
gis@ses.nsw.gov.au
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CANGAI SECTOR RESPONSE
CLARENCE VALLEY LOCAL FLOOD PLAN
CLARENCE NAMBUCCA REGION

Landing Zone
Road Closure
RFS Stations
Caravan Park/Camping
Education Facilities
Major Road
Secondary Road
Minor Road
Track-Vehicular
Key Rivers / Creeks

0 1 2
Kilometers

SES
NSW STATE EMERGENCY SERVICE

12. COUTTS CROSSING SECTOR

12.1. COUTTS CROSSING SECTOR

See Map Attached

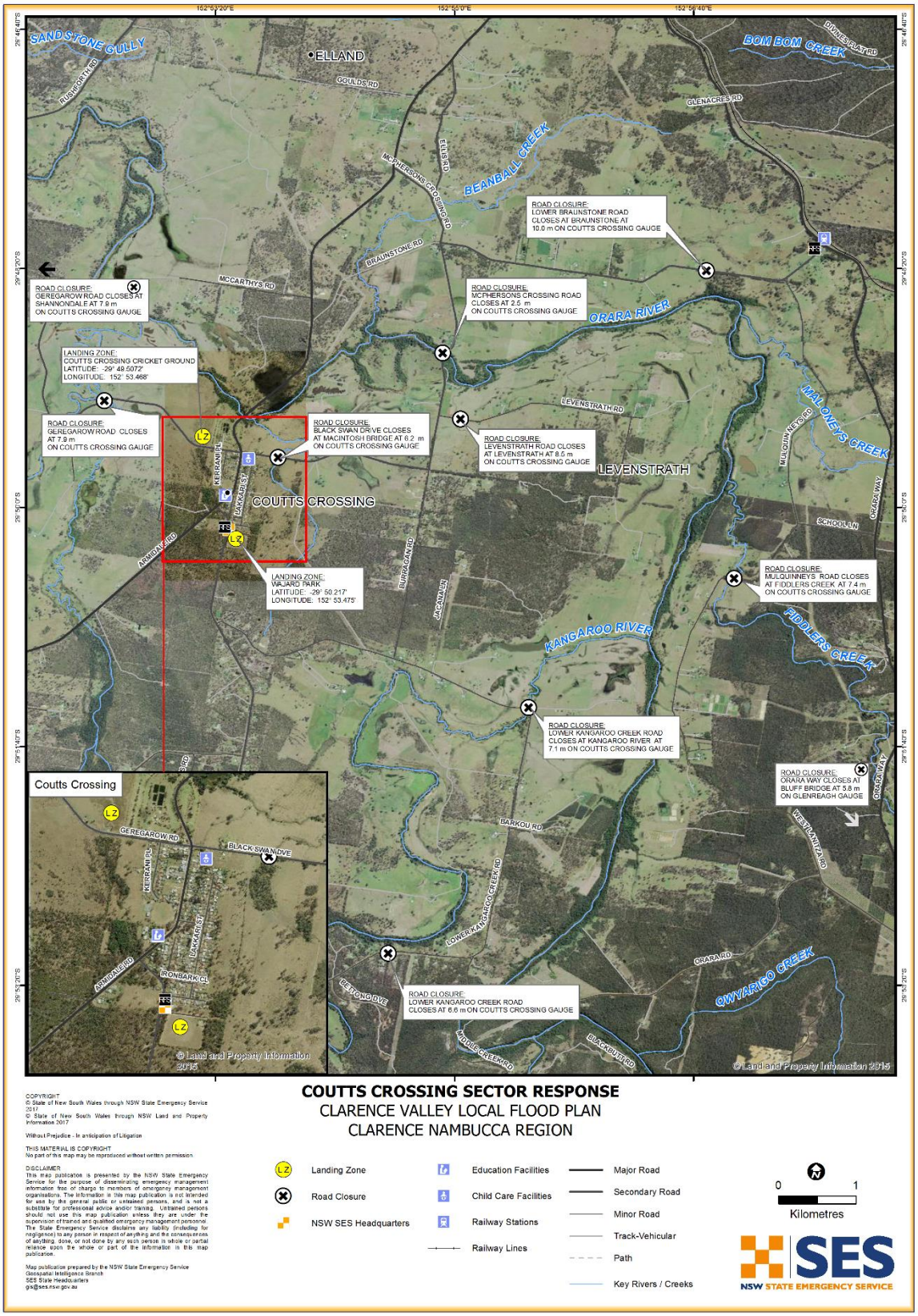
Sector Description	This sector covers Blaxlands, Flat/Creek, Billy's Creek, Braunstone, Buccarumbi, Chambigne, Clouds Creek, Coutts Crossing, Dundurrabin, Elland, Kangaroo Creek, Lanitza, Levenstrath, Lower Kangaroo Creek, McPherson Crossing, Middle Creek, Moonpar, Nymboida, Shannondale, Towallum, and Tyringham.		
Hazard	Orara River and Nymboida riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties	All at risk of isolation.	**Total number of properties**	406 (Census 2011)
Population	1040 (Census 2011)		
Sector Control	The Nymboida Unit Controller will 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 RFS volunteers.		
Key Warning Gauge:	Minor: 5.00 m	Moderate: 9.00 m	Major: 12.00 m
Coutts Crossing (204999) **Nymboida (204001)**	Minor: -	Moderate: -	Major: -
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • SEWS		
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.		

	• Sewer system only in township of Coutts Crossing, most of sector is on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Flood Procedures Manual addresses procedures for sewerage treatment plant.
Evacuation/Isolation Triggers	**Nymboida River area** There are no upstream river gauges that have warnings relative to the **Nymboida River gauge (204001).** Local rainfall gauges can provide an indication of the likely affects in relation to the Nymboida gauge. The following trigger heights related to the Nymboida gauge indicate the point when the communities will be isolated: 1. **reach and/or exceed 3.2 m** Families in the Buccarumbi Area become isolated (approximately 40 families). 2. **reach and/or exceed 4.0 m** Water backs up Copes Creek closing Boundary Road isolating approximately 6 families. 3. **reach and/or exceed 7.0 m** Pollock's Bridge on Leighton's Range Road may be cut at Pollock's Bridge causing isolation to residents (approximately 20 Families). **Orara River (Coutts Crossing area)** The key evacuation triggers below are based on **Flood warnings provided for the Coutts Crossing gauge (204999). Bureau of Meteorology Warnings are provided after the flood peaks at the Glenreagh gauge (204907), allowing approximately 18-24 hours warning time.** 1. **Prediction to reach and/or exceed 6.6 m on the Coutts Crossing gauge (204999)** Middle Creek Road will close isolating the Middle Creek and Kangaroo Creek areas (approximately 30 families). 2. **Prediction to reach and/or exceed 7.1 m on the Coutts Crossing gauge (204999)** The Lower Kangaroo Creek Road may be cut causing isolation to residents in the Lower Kangaroo Creek area (approximately 70 families). 3. **Prediction to reach and/or exceed 7.4 m on the Coutts Crossing gauge (204999)** Mulquinney's Road may close causing isolation in the Fiddlers Creek area past School Lane (approximately 12 families). 4. **Prediction to reach and/or exceed 7.9 m on the Coutts Crossing gauge (204999)** Geregarow Road may close causing isolation in the

	Shannondale area (approximately 20 families). **5. Prediction to reach and/or exceed 8.5 m on the Coutts Crossing gauge (204999)** Levenstrath Road will close causing isolation in the Levenstrath area (approximately 15 families). **6. Prediction to reach and/or exceed 10.0 m on the Coutts Crossing gauge (204999)** Lower Braunstone Road may close causing isolation in the Braunstone area (approximately 6 families).
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case basis in conjunction with Family and Community Services.
Evacuation Routes	• Armidale Road is normally open to Grafton or Dorrigo (However local flash flooding could impact this route for short periods of time).
Evacuation Route Closures	Road closures affecting the isolation/evacuation of residents in this sector: • There is uncertainty when local roads around the Coutts Crossing area will close, the closure will be dependent on local rainfall conditions. Other known road closures include: • Pacific Highway Closes (5.4m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Orara Way Closes at Bluff Bridge at (5.8 m on the Glenreagh gauge) • Closure may also occur on low lying parts of the Orara Way between School Lane at Braunstone and Parker Road at Wells Crossing. Alternate route Pacific Hwy.
Method of Evacuation	• Property owners are recommended to remain at their properties. • Primarily self-evacuation by private transport before road closures. • In the event of residents on isolated properties requiring evacuation. The arrangements will be made by the NSW SES dependant on conditions at that time. Options to evacuate residents will be by flood boat or helicopter.
Evacuation Centre/Assembly Point	• People are encouraged to stay with friends/relatives outside the affected areas.
Large scale evacuations	• No Large scale evacuations are anticipated for this sector.
Rescue	The Nymboida NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.

Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Local Stores in this sector will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • Oval adjacent to Nymboida NSW SES Unit at Coutts Crossing 'Wajard Park' (S29°.50'.20.7", E152°.53'.47.3") • Coutts Crossing Cricket Oval (S 29°.49'. 50.72", E152°. 53'. 24.68")
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. These arrangements will stay in place until the 'ALL CLEAR' is provided by the NSW SES to residents to return to their premises.

12.2. COUTTS CROSSING SECTOR MAP



Map publication prepared by the NSW State Emergency Service
Geospatial Intelligence Branch
SES State Headquarters
gis@ses.nsw.gov.au

13. GLENREAGH SECTOR

13.1. GLENREAGH SECTOR

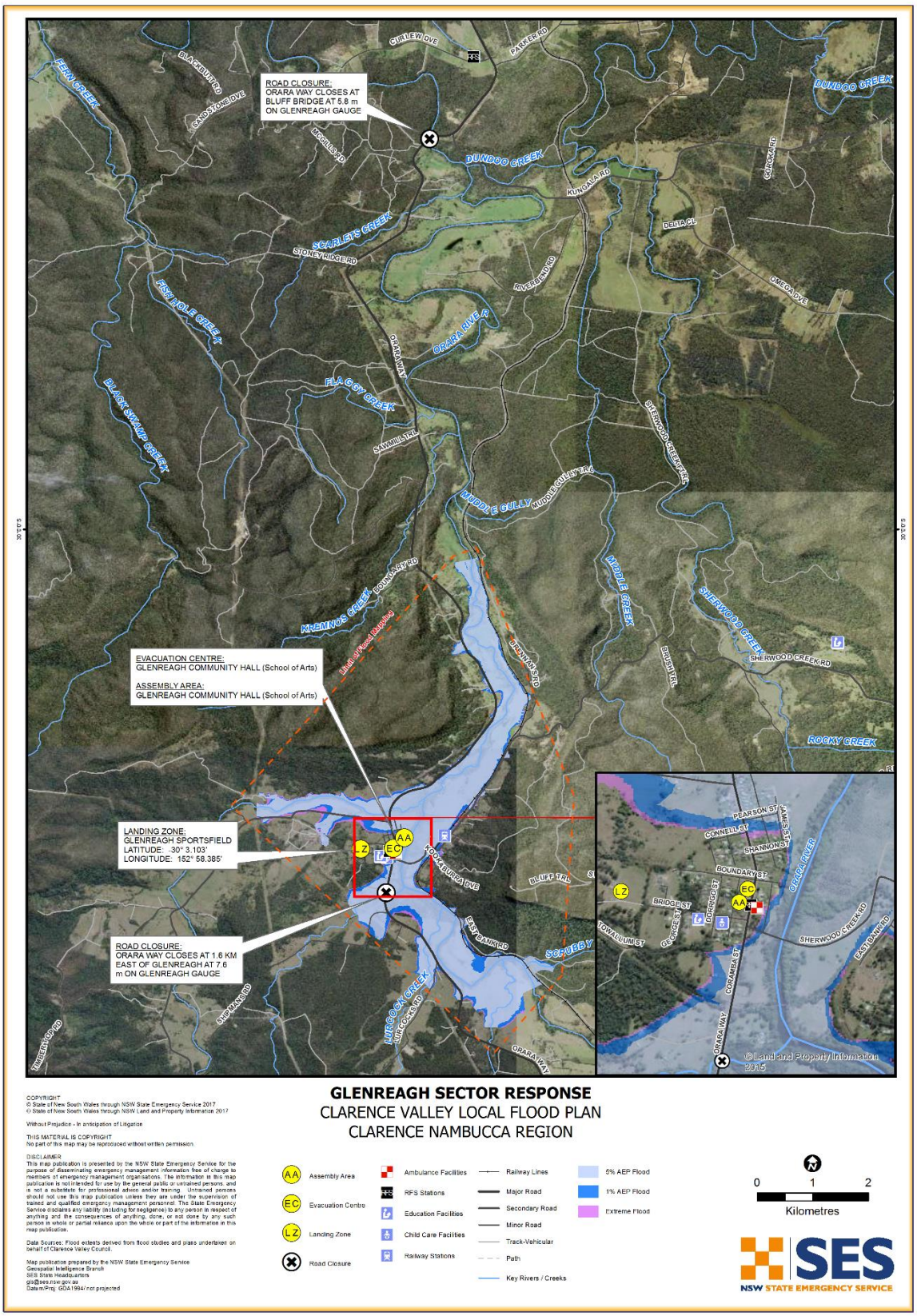
See Map Attached

Sector Description	This sector covers Glenreagh, Kremnos, Kungala and Wells Crossing.		
Hazard	Orara riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties	30 at risk of over floor inundation. All at risk of isolation.	**Total number of properties**	346 (Census 2011)
Population	862 (Census 2011)		
Sector Control	The Corindi Unit Controller will control evacuations in this sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and RFS volunteers.		
Key Warning Gauge Name: Glenreagh (204907)	Minor: 5.00 m	Moderate: 9.00 m	Major: 12.00 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people. • In extreme events Glenreagh Community Hall (School of Arts), 62 Coramba Street, Glenreagh will form the Assembly Area/Evacuation Centre.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Bulletins • Evacuation Warning • Evacuation Order • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert • SEWS (SMS, Landlines)		
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/Isolation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Glenreagh gauge (204907) are**: **1. Prediction to reach and/or exceed 5.8 m** The Bluff Bridge will close on the Orara Way preventing residents in Glenreagh, Kremnos and Kungala access to Grafton. Kungala Road is closed at Dundoo Creek and Sherwood Creek. Alternate Access to Grafton via Bucca Road may also be cut by the Orara River at Nana Glen. **2. Prediction to reach and/or exceed 7.6 m** Orara Way closed 1.6km east of Glenreagh at Glenreagh Creek cutting access to Coffs Harbour. **3. Prediction to reach and/or exceed 13.24 m** Major Riverine flooding on the Orara River will occur but not expected to involve over floor flooding this sector. Evacuations may need to be undertaken due to long periods of isolation or medical conditions.
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of isolation. The evacuation tasks will only involve a small number of people these properties would be dealt with on a single case by case basis in conjunction with Family and Community Services.
Evacuation Routes	• All roads within this sector are expected to be flood affected. • Transport in and out of this sector will be by Rail or Helicopter only.
Evacuation Route Closures	Road closures affecting the isolation/evacuation of residents in this sector: • The closure of local roads will be dependent on local rainfall conditions. • Orara Way closes at Bluff Bridge at 5.8 m on the Glenreagh gauge. Other known road closures include: • Pacific Highway Closes (5.4 m Prince Street gauge) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Summerland Way closes as Grafton levee overtopping at 8.3m on the Prince Street gauge. Other roads where closure is dependent on local rainfall and events (e.g. landslips) include : • Gwydir Highway (road susceptible to land slippage) • Armidale Road (road closes intermittently with local flooding) • Bucca Road Nana Glen (road closes intermittently with local flooding)
Method of Evacuation	• Property owners are recommended to remain at their properties. • Primarily self-evacuation by private transport before road

	closures. • In the event of residents on isolated properties requiring evacuation, the arrangements will be made by the NSW SES dependent on conditions at that time. Options to evacuate residents will be by flood boat or helicopter.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in the Glenreagh sector. • Glenreagh Community Hall (School of Arts) 62 Coramba Street Glenreagh
Large scale evacuations	• Large scale evacuations would be unlikely in this sector.
Rescue	The Corindi NSW SES Unit will undertake all Flood Rescue Operations as per the Flood Rescue Operations Policy.
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The local stores in this sector will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • The Glenreagh Public Recreation Reserve in Bridge Street (S30° 03' 10.6, E152° 58' 40.7) • The Glenreagh Railway Station (S30˚ 02’ 58.55” E152˚ 59’ 12.5”)
Other	Special considerations relating to the evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats and helicopters to monitor safety of individuals, where feasible. These arrangements will stay in place until the ‘ALL CLEAR’ is provided by the NSW SES to residents to return to their premises.

13.2. GLENREAGH SECTOR MAP



CLARENCE VALLEY NSW SES
CARAVAN PARK ARRANGEMENTS

Volume 3, Chapter 4 of the Clarence Valley Local Flood Plan

(NSW SES Response Arrangements for Clarence Valley)

Last Update: August 2017

AUTHORISATION

The Clarence Valley NSW SES Caravan Park Arrangements have been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

Approved

Manager Emergency Risk Management

Date: 2-8-17

Approved

NSW SES Clarence Nambucca Region Controller

Date: 2 Aug 2017

Tabled at LEMC Date: 3 July 2017

Document Issue: V3.3-21102014

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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 are flood liable:

a. Glenwood Tourist Park 71 Heber Street South Grafton

b. Sunset Caravan Park 302 Gwydir Highway South Grafton

c. The Gateway Village Holliday Park 598 Summerland Way

d. GraftonGrafton Showground Prince Street Grafton

e. Big River Caravan & 166 Seelands Road Seelands

f. Browns Rocks Caravan Park 391 Goodwood Island Road Goodwood Island

g. Anchorage Holiday Park Marandowie Drive Iluka

h. Yamba Waters Holiday Park 36 Golding Street Yamba

i. Solitary Islands Marine Park Resort 383 North Street Wooli

j. Wooli Caravan Park 25 Riverside Drive Wooli

k. Grafton Greyhound Reserve Trust Cranworth Street Grafton

l. Maclean Riverside Caravan Park 115 River Street Maclean

m. Brooms Head Caravan Park Ocean Road Brooms Head

n. Calypso Holiday Park 14 Harbour Street Yamba

o. Blue Dolphin Holiday Park Yamba Road Yamba

p. Salt Water Big 4 Yamba Clarence Coast Resort 286 Okeefes Lane Palmers Island

q. Fishing Haven Caravan Park 35 River Street Palmers Island]

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 Clarence Valley Local Controller will ensure that the managers of caravan parks are advised of Flood Information (described in Volume 1 of the Clarence Valley Local Flood Plan).

1.3 EVACUATION OF OCCUPANTS AND RELOCATION OF MOVEABLE DWELLINGS

1.3.1 When an evacuation order 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 Clarence Valley Local Controller 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 Clarence Valley Local Controller when the evacuation of the caravan park has been completed.

f. Provide the NSW SES Clarence Valley Local Controller with a register of people that have been evacuated.

1.4 RETURN OF OCCUPANTS AND MOVEABLE DWELLINGS

1.4.1 The NSW SES Clarence Valley Local Controller, 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
Big River Caravan & Ski Lodge	166 Ski Lodge Road	Seelands	126	Isolation occurs at the beginning of moderate level. No inundation of park occurs.	Ski Lodge Road to Seelands Hall Road to Rogans Bridge Road	Access closes at Seelands Hall Road at moderate flood level.	South Hampton RFS Rogans Bridge Road Waterview Heights	South Grafton High School	Peak seasons over Christmas and Easter school holidays
Sunset Caravan Park	302 Gwydir Highway	South Grafton	76	Inundation may occur at levee overtopping at 8.2m. Majority sites permanent residents and overnight travellers.	Gwyder Hwy to Ryan Street to Bent Street	8.36m at the Cross Roads Gwydir Hwy and Bent street.	South Grafton Hill	South Grafton High School	Permanent Residences.
Glenwood Tourist Park	71 Heber Street	South Grafton	125	Inundation of low-lying areas of park commence at 5.70m Majority sites	Pacific Hwy to Ryan Street to Bent Street	5.4m Pacific Hwy Alipou Creek, Alt route high level bypass Centenary Drive	South Grafton Hill	South Grafton High School	Peak seasons over Christmas and Easter school holidays

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
				permanent residents and overnight travellers.					
The Gateway Village Holliday Park	598 Summerland Way	Grafton	208	Evacuation would be required on levee overtopping at 8.2m.	Summerland Way to Dobie Street to Villers Street to Fitzroy Street to Bent Street	Access closes at Fitzroy and Carr Street at 8.24m	South Grafton Hill	South Grafton High School	Permanent Residences.
Grafton Showground	Prince Street	Grafton	40	Evacuation would be required on levee overtopping at 8.2m.	Dobie Street to Villers Street to Fitzroy Street to Bent Street	Access closes at Fitzroy and Carr Street at 8.24m	South Grafton Hill	South Grafton High School	Peak seasons over Christmas and Easter school holidays
Grafton Greyhound Reserve Trust	Cranworth Street	Grafton	82	Inundation may occur at levee overtopping at 8.2m. Majority sites permanent residents and overnight	Powell Street to Hoof Street to Dobie Street to Villers Street to Fitzroy Street to Bent Street	Access closes at Fitzroy and Carr Street at 8.24m	South Grafton Hill	South Grafton High School	Peak seasons over Christmas and Easter school holidays

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
				travellers.					
Solitary Islands Marine Park Resort	383 North Street	Wooli	179	Evacuation may be required at 1.5m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by Tidal conditions. Peak season during school holidays.	Dwelling Location: Wooli Road to Minnie Waters Road Evacuation Location: Wooli Road	Isolation occurs at Sandy Crossing when significant rain event of 100mm+.	MInni Waters Caravan Park	Wooli Bowling & recreation Club	Peak seasons over Christmas and Easter school holidays
Wooli Caravan Park	25 Riverside Drive	Wooli	64	Evacuation may be required at 2.75m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by tidal conditions. Peak season during	Main Street	Isolation occurs at Sandy Crossing when significant rain event of 100mm+.	Wooli Public School	Wooli Bowling & Recreation Club	Peak seasons over Christmas and Easter school holidays

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
				school holidays.					
Maclean Riverside Caravan Park	115 River Street	Maclean	34	Inundation may occur at levee overtopping at 3.3m. Majority sites permanent residents and overnight travellers.	River Street to Cameron Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m and at Ferry Park at 2.5m on the Maclean Gauge	Maclean Showground	Maclean Showground	Peak seasons over Christmas and Easter school holidays
Browns Rocks Caravan Park	391 Goodwood Island Road	Browns Rocks	30	Caravan Park is advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence.	Goodwood Island Road to Midlle Street to Iluka Road Duke Street to Owen street to Spenser Street	Isolation may occur at 2.5m on the Maclean Gauge	Bimbimbi Caravan Park	Iluka Community Hall	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Fishing Haven	35 River Street	Palmers Island	54	Caravan Park is	Yamba Road to Wooli	Access closes at 2.1m on	Yamba Hill	Yamba Bowling &	Early notification by

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Caravan Park				advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December to February	Street	Yamba Road to Maclean		Recreation Centre	Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Salt Water Big 4 Yamba Clarence Coast Resort	286 Okeefes Lane	Palmers Island	64	Caravan Park is advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December	Yamba Road to Wooli Street	Access closes at 2.1m on Yamba Road to Maclean	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
				to February					
Yamba Waters Holiday Park	36 Golding Street	Yamba	217	Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February	Golding Street to Yamba Road to Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m on the Maclean Gauge	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Calypso Holiday Park	14 Harbour Street	Yamba	179	Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February	Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m on the Maclean Gauge	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Blue Dolphin Holiday Park	Yamba Road	Yamba	250	Caravan park is affected by tidal conditions	Yamba Road to Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
				Evacuations may occur due to King Tides. Peak season December to February		2.1m on the Maclean Gauge			vacate the region before isolation occurs. Which could be up to 7days.
Anchorage Holiday Park	Marandowie Drive	Iluka	116	Evacuation would be required at 2.4m on MacLean gauge coinciding with a high tide.	Marondowie Drive to Duke Street to Owen street to Spenser Street	Isolation may occur at 2.1m on the Iluka road at the Esk River.	Iluka Community Hall	Iluka Community Hall	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.

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
				[Coastal erosion and/or inundation]	[Describe evacuation route]	[height related to gauge if possible]	[Where relocatable moveable dwellings should be moved to]	[Where people should go if there is an evacuation order issued]	[Peak seasons, classification eg low flood island]
Brooms Head Caravan Park	Ocean Road	Brooms Head	269	Caravan Park not affected by Riverine Flooding but will be affected by Storm Surge and large ocean seas.	Isolation may occur on Brooms Head at Taloumbi due to local flooding.				
Wooli Caravan Park	25 Riverside Drive	Wooli	64	Evacuation may be required at 2.75m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by tidal conditions.	Isolation occurs at Sandy Crossing when significant rain event of 100mm+.				

				Peak season during school holidays.					

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.