

**Tweed Shire**

# Local Flood Emergency Sub Plan



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# **TWEED SHIRE FLOOD EMERGENCY SUB PLAN**

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

**Volume 1 of the Tweed Shire Flood Emergency Sub Plan**

Endorsed by the Tweed Byron Local Emergency Management Committee

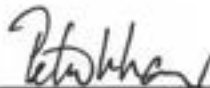
Endorsed Date 10<sup>th</sup> May 2023

## AUTHORISATION

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

### Authorised

Signature:



NSW SES Local ~~Unit~~ Commander

Print Name:

PETER MAIR

Date:

10 MAY 2023

### Endorsed

Signature:



Chair, Local Emergency Management Committee

Print Name:

DOREEN HARWOOD

Date:

17 MAY 2023

## VERSION HISTORY

Version Number	Description	Date
2	Tweed Shire Flood Emergency Plan	May 2014
1	Tweed Shire Local Flood Plan	November 2008

## AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

Manager Emergency Planning  
NSW State Emergency Service  
PO Box 6126, Wollongong NSW 2500  
[nswses.communityplanning@ses.nsw.gov.au](mailto:nswses.communityplanning@ses.nsw.gov.au)

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



## DISTRIBUTION LIST

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# 1 OUTLINE AND SCOPE

## 1.1 PURPOSE

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

## 1.2 AUTHORITY

- 1.2.1 This plan is written and issued under the authority of the [State Emergency and Rescue Management Act 1989 \(NSW\)](#) ('SERM Act'), the [State Emergency Service Act 1989 \(NSW\)](#) ('SES Act') and the NSW State Emergency Management Plan (EMPLAN).
- 1.2.2 This plan is a sub plan to the Tweed Byron Local Emergency Management Plan (EMPLAN) and is endorsed by the Tweed Byron Local Emergency Management Committee (LEMC).

## 1.3 ACTIVATION

- 1.3.1 This plan does not require activation. The arrangements set out in this plan are always active.
- 1.3.2 The Tweed Byron Emergency Management Plan (EMPLAN) is active at all times in anticipation of the need to coordinate support and resources requested by Combat Agencies, including the NSW State Emergency Service (NSW SES).

## 1.4 SCOPE

- 1.4.1 The area covered by this plan is the Tweed Shire LGA. The Tweed Shire LGA and its principal towns, villages, rivers and creeks are shown in Appendix A.
- 1.4.2 The Council area is in the NSW SES North Eastern Zone and for emergency management purposes, is part of the North Coast Emergency Management Region.
- 1.4.3 The plan sets out the local emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Tweed LGA.
- 1.4.4 In this plan a flood is defined as a relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences.
- 1.4.5 The arrangements for dealing with episodes of coastal erosion by severe weather, are described in the NSW State Storm Sub Plan.
- 1.4.6 The arrangements for the emergency management of tsunami are dealt with in the NSW State Tsunami Emergency Sub Plan.
- 1.4.7 This plan outlines the local level arrangements for the management of downstream consequences of flooding due to dam failure, in line with the Dam Emergency Plan.

## **1.5 GOALS**

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

- a. Protection and preservation of life.
- b. Establishment and operation of flood warning systems.
- c. Issuing of community information and community warnings.
- d. Coordination of evacuation and welfare of affected communities.
- e. Protection of critical infrastructure and community assets essential to community survival during an emergency incident.
- f. Protection of residential property.
- g. Protection of assets and infrastructure that support individual and community financial sustainability and aid assisting a community to recover from an incident.
- h. Protection of the environment and conservation values considering the cultural, biodiversity and social values of the environment.

## **1.6 KEY PRINCIPLES**

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

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

## **1.7 ROLES AND RESPONSIBILITIES**

1.7.1 General responsibilities of Emergency Service Organisations and functional areas are set out in the NSW State EMPLAN and NSW State Flood Sub Plan.

1.7.2 Specific roles and responsibilities for Agencies, Functional Areas and Organisations in relation to flooding within Tweed Shire are detailed within this plan, Appendix B and Appendix C.

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

- a. NSW SES Incident Controller (for local or zone level responsibilities during response operations).
- b. NSW SES Zone Duty Commander (for regional level responsibilities outside of response operations).

## **1.8 PLAN MAINTENANCE AND REVIEW**

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

- a. Ensuring that all supporting Emergency Services and Functional Areas, Organisations and officers mentioned in it are aware of their roles and responsibilities.
- b. Conduct a minimum of one exercise every five years or within two years of the plan being reviewed.

- c. Reviewing the contents of the plan:
  - When there are changes which alter agreed plan arrangements.
  - When changes to land use strategic plans and policies increase the population at risk.
  - After a flood including recommendations from after action reviews, reports, or inquiries.
  - As determined by the NSW SES Commissioner.
- d. The plan is to be reviewed no less frequently than every five years or after a significant flood event.

## 1.9 SUPPLEMENTARY DOCUMENTS

- 1.9.1 Supplementary and supporting material of the Local Flood Emergency Sub Plan is maintained on the NSW SES website at: <https://www.ses.nsw.gov.au/about-us/flood-storm-and-tsunami-plans/> including:
- a. Flood Plan Glossary.
  - b. NSW SES Dam Failure Notification Flowchart.
  - c. NSW SES Resupply Flowchart.

## 2 OVERVIEW OF NSW FLOOD HAZARD AND RISK

### 2.1 THE FLOOD THREAT

- 2.1.1 NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Tweed LGA.
- 2.1.2 Declared dams in or upstream of the Tweed LGA.

Dam Name	Owner	High Risk Dam
Clarrie Hall Dam	Tweed Shire Council	No
Korrumbyn Creek Dam	National Parks and Wildlife Service	No

## 3 PREVENTION/ MITIGATION

### 3.1 INTRODUCTION

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

### 3.2 LAND USE PLANNING

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

**Actions:**

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

### **3.3 FLOODPLAIN RISK MANAGEMENT**

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

**Actions:**

- a. NSW SES will provide coordinated and consistent emergency management advice to councils and other agencies in relation to the management of land that is subject to flooding or coastal inundation.
- b. NSW SES will provide advice, support, technical resources and training for NSW SES representatives to contribute effectively on local Floodplain Management Committees.

## **4 PREPARATION**

### **4.1 INTRODUCTION**

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

### **4.2 FLOOD EMERGENCY PLANNING**

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

**Actions:**

- a. Develop and review this NSW SES Local Flood Emergency Sub Plan as required. Local Flood Emergency Sub Plans outline the specific arrangements for management of flood events within an LGA, and may include cross boundary arrangements.
  - b. Review plans as per Section 1.8.
- 4.2.2 Local EMPLAN Consequence Management Guides (CMG's) for flood are not required for communities covered by NSW SES Local Flood Emergency Sub Plans however may be utilised in place of Local Flood Emergency Sub Plan if agreed to by NSW SES.

### **4.3 FLOOD INTELLIGENCE SYSTEMS**

4.3.1 **Strategy:** NSW SES develop and maintain a flood intelligence system to identify

flood behaviour, its impact on the community and required response actions.

**Actions:**

- a. Gather and assess flood information for the full range of flood types and severities.
- b. Collect, collate, and assess information on the characteristics of communities at risk and the potential effects of flooding on communities at risk.
- c. Share flood intelligence information with supporting agencies.

## **4.4 DEVELOPMENT OF WARNING SYSTEMS**

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

**Actions:**

- a. All levels of government work in partnership to develop and maintain flood warning infrastructure.
- b. NSW SES maintains a list of the requirements for flood warnings for flood gauges in NSW (including flood classifications, warning times required and key statistics) and can be found in the supplementary document to the NSW State Flood Plan (see Section 1.9).
- c. NSW SES will recommend new warning services and changes to warning alert levels for gauges to the NSW and ACT Flood Warning Consultative Committee.
- d. The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required.
- e. Dam Owners will provide Dam Emergency Plans (where required) and consult with NSW SES on alert levels and messaging. Alert level definitions are listed in Dam Emergency Plans.
- f. NSW SES maintains a dedicated dam failure hotline and procedures to ensure priority dissemination of dam failure warnings.
- g. NSW SES develops and maintains warning and flood information products by:
  - Utilising flood intelligence data.
  - Developing warning and flood information products.
  - Continuously reviewing warning and flood information products.
  - Consulting with affected communities, key stakeholders, Dam Safety NSW and the NSW and ACT Flood Warning Consultative Committee, and maintains Operational Readiness.
  - Participating in the development of public information and warning systems.
- h. Gauge owners adequately maintain flood warning gauges and systems, including those identified in the 'Service Level Specification' maintained by the Bureau of Meteorology and those identified in the 'Provision and Requirements for Flood Warning in New South Wales' maintained by NSW SES.

## 4.5 BRIEFING, TRAINING AND EXERCISING

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

**Actions:**

- a. NSW SES will consult stakeholders throughout the development of plans.
- b. NSW SES will inform stakeholders of content changes after revisions.
- c. NSW SES will ensure their facilities and resources are maintained and operationally ready.
- d. NSW SES will train personnel for their expected flood operation roles.
- e. NSW SES will regularly brief stakeholders on the exercise arrangements contained in the NSW Flood Emergency Sub Plan.

## 4.6 COMMUNITY RESILIENCE TO FLOODING

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

**Actions:**

- a. Ensure ongoing recruitment and training of a diverse range of volunteers.
- b. Ensure pre-planning to facilitate the management of spontaneous volunteers and community members during a flood.

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

**Actions:**

- a. Partners with and engage communities to understand and manage the risks associated with floods, including providing business continuity guidance (NSW SES Business FloodSafe), family preparedness (NSW SES Home FloodSafe) and other engagement strategies.
- b. NSW SES will collate, assess and disseminate flood information to the community.
- c. Collaborate with individuals, businesses, government agencies and communities when developing flood intelligence, preparedness and response information.
- d. Plan for floods collaboratively with communities through community and stakeholder participation and engagement.
- e. Collaborate with community sector and recognise the needs of individuals within communities who have an increased susceptibility during floods.

# 5 RESPONSE



## 5.1 INTRODUCTION

5.1.1 Flood response operations will begin:

- a. On receipt of a Bureau of Meteorology Severe Weather Warning or Thunderstorm Warning that includes heavy rain or storm surge; or
- b. On the receipt of a Bureau of Meteorology Flood Watch or Flood Warning; or
- c. On receipt of warnings for flash flood; or
- d. On receipt of a dam failure alert; or
- e. When other evidence leads to an expectation of flooding.

## 5.2 INCIDENT MANAGEMENT ARRANGEMENTS

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

**Actions:**

- a. NSW SES uses the Australasian Inter-service Incident Management System (AIIMS) to manage the flood response.
- b. Control of flood response will be at the lowest effective level and may be scaled to suit the incident.
- c. NSW SES State Controller (or delegate) will appoint Incident Controllers and establish Incident Control Centres (see NSW SES facilities on map in Appendix A).
- d. NSW SES Incident Controller, in consultation with participating supporting Emergency Services and Functional Areas will determine the appropriate breakdown of an Area of Operations into Divisions and/or Sectors in accordance with the principles of AIIMS.

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

**Actions:**

- a. NSW SES will operate Incident Control Centre(s) as required.
- b. NSW SES Incident Control Centre(s) will:
  - Control resources from NSW SES and coordinate resources of supporting Emergency Services and Functional Areas.
  - Manage Request for Assistance (RFA) tasking and ensure they are actioned in a timely manner.
  - Undertake response planning and determine future resourcing requirements.
  - Coordinate information flow, including warnings, public information and social media.

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

**Actions:**

- a. Supporting Emergency Services and Functional Areas should provide Liaison Officers to NSW SES Incident Control Centre(s) and/or Emergency Operation Centres as required.
- b. NSW SES will provide Liaison Officer(s) to Emergency Operations Centres as required.
- c. Where possible Emergency Operation Centres to be co-located with NSW SES Incident Control Centres for Flood Emergency Response.

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

**Actions:**

- a. The NSW SES Incident Controller will notify agencies of potential access issues between locations, for the consideration of pre-deploying of resources.
- b. NSW SES may request resources and logistics support directly from a supporting emergency service or functional area.
- c. Wherever possible, supporting organisations are to provide their own logistic support in consultation with NSW SES where appropriate.
- d. The NSW SES Incident Controller will control air support operations and may utilise supporting agencies in the management of aircraft.

### 5.3 USE OF INFORMATION AND COLLECTION OF INTELLIGENCE

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

**Actions:**

- a. Information relating to the consequences of flooding, response strategies, situational awareness and operational updates will be distributed by NSW SES to supporting Emergency Services and Functional Areas listed under this Plan.
- b. All supporting Emergency Services, Functional Areas and Council will accurately record and report information relevant to their activities and any real time flood information (including road closure information) to the NSW SES Incident Controller. This may be in the form of a combined Emergency Operations Centre (EOC) report, or direct from agencies where an EOC has not been established.
- c. NSW SES may establish and operate a Joint Intelligence Unit to coordinate the collection, collation, interpretation, mapping, actioning and dissemination of information.
- d. Reconnaissance, mapping, damage assessments, intelligence validation and post flood evaluation will be coordinated by NSW SES. This may occur post impact and continue into the recovery phase.
- e. NSW SES may request Engineering Functional Area to assist with the gathering of flood intelligence including (but not limited to) maximum flood extents, peak flood heights, recording major flood damage at key high velocity locations and preparation of After-Flood Reports.

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

making.

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

## 5.4 PROVISION OF INFORMATION AND WARNINGS TO THE COMMUNITY

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

### **Actions:**

- a. The Bureau of Meteorology issues public weather and flood warning products before and during a flood. These may include:
  - Severe Thunderstorm Warnings - Broad-based - issued for the entire Australian State or territories affected highlighting broad areas where severe storms may occur within the next 3 hours.
  - Severe Weather Warnings with reference to heavy rainfall and/or storm surge.
  - Flood Watches.
  - Flood Warnings.
- b. Dam Owners will utilise the Dam Emergency Plan to provide warnings and information to NSW SES and communities (where appropriate).
- c. NSW SES Incident Controllers will issue the following NSW SES Flood Warnings aligning to the Australian Warning System:
  - Advice;
  - Watch and Act; and
  - Emergency Warning.
- d. NSW SES liaises with the Bureau of Meteorology to discuss the development of flood warnings as required.
- e. NSW SES provides alerts and deliver flood information to affected communities using a combination of public information.
- f. NSW SES may request supporting agencies redistribute NSW SES alerts and information, including through the provision of doorknocking teams.
- g. Road closure information will be provided to the community through the following agencies/methods:
  - Local Government Council websites/Emergency Dashboards.
  - Transport for NSW 'Live Traffic' website: [www.livetraffic.com](http://www.livetraffic.com) or 'Transport InfoLine': 131 500. VMS messaging on roadways may also be used to advise motorists.
- h. The Public Information and Inquiry Centre will be established by NSW Police Force where required to provide information regarding evacuees and emergency information. Contact details will be broadcast once the centre is established.

- i. The Disaster Welfare Assistance Line will be established by Disaster Welfare Services where required to provide information on welfare services and assistance. Assistance line contact details will be broadcast once Disaster Welfare Services commence.

## 5.5 PROTECTION OF PROPERTY

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

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

- a. The protection of properties including critical infrastructure through flood protection systems (e.g. sandbagging) to minimise entry of water into buildings.
- b. The raising or moving of household furniture and commercial stock/equipment.

## 5.6 ROAD AND TRAFFIC CONTROL

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

**Actions:**

- a. Tweed Shire Council will coordinate the closure and reopening of council managed roads once inspections have been carried out by the relevant authority.
- b. Transport for NSW will coordinate the closure and reopening of the state road network.
- c. NSW Police Force may close and re-open roads but will normally only do so (if the Tweed Shire Council or Transport for NSW have not already acted) and if public safety requires such action.
- d. NSW SES will assist with erecting road closure signs and barriers when time and resources permit.

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

- a. The NSW SES Incident Controller may direct the imposition of traffic control measures into flood affected areas in accordance with the provisions of the *State Emergency Service Act, 1989* and the *State Emergency Rescue Management Act, 1989*.
- b. The NSW SES Incident Controller may request the Local Emergency Operations Controller provide suitable personnel to assist with traffic coordination.

## 5.7 PROTECTION OF ESSENTIAL SERVICES

5.7.1 Arrangements for the protection of local assets are outlined in the Local and Regional EMPLANS. In addition, Local and Region EMPLAN's contain infrastructure inventories.

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

**Actions:**

- a. Transport Services Functional Area is to coordinate the provision of information about the assessment and restoration of transport network infrastructure.
- b. Energy and Utility Services Functional Area is to coordinate the assessment and restoration of essential energy and utility services (not including telecommunications).
- c. Telecommunications Services Functional Area is to coordinate the assessment and restoration of telecommunications and the Public Safety Network.
- d. Engineering Services Functional Area is to coordinate the:
  - Assessment and restoration of critical public buildings for example hospitals.
  - Assessment and operation of flood protection levees.
  - Protection of property.
  - Construction and repair of levees.
  - Dam safety assessment and dam stability.
  - Water supply and sewerage operations.
  - Other critical infrastructure.
- e. Functional Areas and Council will keep NSW SES informed of the status of utilities and infrastructure.

**5.8 EVACUATION**

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

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

**Actions:**

- a. Evacuations will take place when there is a risk to public safety. Circumstances may include:
  - Evacuation of people when their homes or businesses are likely to flood.
  - Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.
  - Evacuation of people where essential energy and/or utility services are likely to fail or where buildings have been or may be made uninhabitable.
- b. NSW SES will consider the following in evacuation decisions:
  - Duration of evacuation.
  - Characteristics of the community.
  - Numbers requiring evacuation.
  - Availability of evacuation routes and transport.

- The ability for existing levees or other flood protection works to fulfil their intended function.
  - Time available for evacuation.
  - Evacuee management requirements.
  - Resources and delivery of evacuation information.
  - Length of isolation.
- c. NSW SES Incident Controllers, planning and intelligence officers will carefully consider the risks involved in conducting evacuations.
  - d. All evacuation decisions will be made as per the current NSW SES policies and procedures, and consistent with the NSW Evacuation Management Guidelines.
  - e. Potential Evacuation Centres are located in the Local EMPLAN.
  - f. NSW Police Force will coordinate the provision of overall security for evacuated areas.

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

- a. NSW SES will control and coordinate the evacuation of affected communities.
- b. NSW SES Commissioner (or delegate) will warn communities to prepare for a possible evacuation, where circumstances allow such lead time.
- c. NSW SES Commissioner (or delegate) will order any necessary evacuations and provide information to the community about when and how to evacuate.
- d. Support to evacuation operations may be requested from other Emergency Services and supporting Agencies using arrangements in the local EMPLAN and supporting plans.
- e. Health Services Functional Area will coordinate the evacuation of hospitals, health centres and aged care facilities (including nursing homes) in consultation with NSW SES and Welfare Services.
- f. School administration offices (Government and Private) will coordinate the evacuation of schools in consultation with NSW SES and Welfare Services, if not already closed.
- g. Caravan Park proprietors will inform the NSW SES Incident Controller when caravan park evacuations have been completed.
- h. People who are reluctant or refuse to comply with any Emergency Warning will be referred to NSW Police Force.

## 5.9 EVACUEE MANAGEMENT AND WELFARE

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

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

**Actions:**

- a. NSW SES will provide initial welfare for evacuees where required but will hand the responsibility over to the Welfare Services Functional Area as soon as possible. NSW SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.
- b. Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the Welfare Services Functional Area Supporting Plan.
- c. Schools Administration (Government and Private) will manage the safety of students directly affected by flooding and will work with NSW SES in the temporary closure of schools and will coordinate with NSW SES, Transport and Welfare Services in the management of school evacuees.
- d. Disaster Victim Registration will be controlled and coordinated by NSW Police Force with the assistance of NSW SES and Welfare Services Functional Area.
- e. NSW SES will provide details of all residents assisted in evacuations to the Welfare Services Functional Area as early as possible.
- f. Where the expected remaining number of evacuees and the duration of evacuation is assessed to be beyond the capability and capacity of the established evacuation centre arrangements the SEOCAN may establish Major Evacuation Centres or Mass Care facilities.
- g. The decision to establish Major Evacuation Centres or Mass Care Facilities will be made by NSW SES and SEOCAN in consultation with members of the State Emergency Management Committee.

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

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

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

**Actions:**

- a. Agriculture and Animal Services Functional Area will coordinate the welfare of livestock, pets, companion animals and wildlife including support to primary producers, animal holding establishments and community members.
- b. Agriculture and Animal Services Functional Area role will coordinate the evacuation, emergency care of animals and assessment, humane destruction and disposal of affected animals, and supply of emergency fodder, water and aerial support where necessary.

## 5.10 FLOOD RESCUE

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

**Actions:**

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

acceptable.

- b. Flood rescue operations will be conducted in accordance with the State Rescue Board NSW State Rescue Policy which sets out the framework, governance, responsibilities and requirements for the management and conduct of flood rescue in NSW.
- c. NSW SES may request other supporting Emergency Services to undertake flood rescues on behalf of NSW SES. Agencies must be authorised/accredited to undertake flood rescue operations in accordance with State Rescue Board requirements, as prescribed by NSW SES. Supporting Emergency Services must supply information regarding rescues performed to NSW SES. Notification arrangements with NSW Police Force are outlined in the State Rescue Board NSW State Rescue Policy.
- d. Rescue agencies will conduct rescue of domestic small and large animals as per the State Rescue Board NSW State Rescue Policy (and may include Large Animal Rescue of family horses and cows at a residence or property). The rescue of livestock (which includes commercial animals found on farming and breeding enterprises) will be coordinated through Animal and Agriculture Services Functional Area.

## 5.11 RESUPPLY

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

**Actions:**

- a. NSW SES will advise communities and businesses if flood predictions indicate that areas are likely to become isolated, and indicative timeframes where possible.
- b. Retailers should be advised to ensure sufficient stock is available for the duration of the flood.
- c. When isolation occurs, NSW SES will establish loading points where retailers can instruct suppliers to deliver goods.
- d. NSW SES will endeavour to support the delivery of mail to isolated communities but may not be able to do so according to normal Australia Post timetables.
- e. NSW SES will assist hospitals with resupply of linen and other consumables where able.
- f. NSW SES may request resupply assistance from supporting agencies.
- g. NSW SES may conduct resupply operations as per the designated resupply plan for the event.
- h. Where additional supplies are required Engineering Functional Area be requested to coordinate the supply of goods and services in response to and recovery from the emergency.

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

**Actions:**



- a. When requested, NSW SES will establish a resupply schedule and coordinate the resupply for isolated rural properties.
- b. NSW SES will provide local suppliers with designated loading points. Resupply items are to be packaged by the supplier.
- c. Isolated households unable to afford resupply items will be referred to the Welfare Services Functional Area for assistance.

## 5.12 RETURN

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

**Actions:**

- a. NSW SES Incident Controller will determine when it is safe to progressively return in consultation with the relevant Emergency Operations Controller and supporting agencies considering the ongoing risk to public safety.
- b. NSW SES Incident Controller will specify the level of access to affected communities as the following:
  - Not suitable for access; or
  - Limited access by Emergency Services and response Agencies; or
  - Limited access by residents and/or business operators; or
  - Full access.
- c. NSW SES Incident Controller will issue an Advice Warning advising “Reduced Threat: Return with Caution” when the immediate danger to life and property has passed for areas.
- d. NSW SES will facilitate the return of evacuees to their homes.

## 5.13 END OF RESPONSE OPERATIONS

5.13.1 **Strategy:** Conclude response operations.

**Actions:**

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

## 5.14 POST IMPACT ACTIONS

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

**Actions:**

- a. NSW SES will continue to engage with communities after significant floods through convening one or more community forums, workshops or other opportunities to provide communities a chance to provide feedback, address any concerns and provide input into the recovery process. These will typically include other agencies such as the Bureau of Meteorology, Welfare Services and Tweed Shire Council representatives.
- b. NSW SES will conduct After Action Reviews, at the conclusion of response operations, which will involve all stakeholders. Findings will be shared and incorporated into improved disaster resilience planning.
- c. NSW SES will provide information and data throughout the emergency response to inform community recovery. A report will be developed at the request of the SERCON at the conclusion of the response within an area. Should a response summary report be required it will include the following:
  - The emergency action plan in place at conclusion of the response emphasising any continuing activities including community meetings/ engagement activities.
  - Resources allocated to the emergency response and associated exit strategies.
  - Details of any areas or situations with potential to re-escalate the emergency.
  - A recommendation for the conclusion of NSW SES as lead agency to transition to NSW Reconstruction Authority as the lead agency for Recovery.
  - Any actions that are incomplete or outstanding.
  - Damage Assessment Data and Information obtained throughout the response phase which will further support the long-term recovery of communities.
- d. NSW SES will undertake/coordinate a comprehensive review of intelligence and plans following significant flood events.

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

**Actions:** NSW SES works with relevant stakeholders and Tweed Shire Council on post flood data collection analysis including review of flood intelligence where necessary.

## 6 RECOVERY OPERATIONS

### 6.1 INTRODUCTION

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

6.1.2 Recovery operations will be initiated and conducted as outlined in the NSW State EMPLAN and as further detailed in the NSW Recovery Supporting Plan. The Tweed Byron Local Recovery Plan provides a framework for the management and coordination of local recovery operations.

## 6.2 NSW SES RECOVERY ROLE

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

### **Actions:**

- a. NSW SES will provide representation to Recovery Committees as required and may have an ongoing role in the Recovery phase.
- b. NSW SES roles on Recovery Committees may include providing information about any continuing response, guidance on mitigation strategies and general advice and assistance to the committee as a subject matter specialist and/or expert.
- c. NSW SES will provide information to NSW Reconstruction Authority to support applications to Treasury for Natural Disaster Relief and Recovery Arrangements.
- d. NSW SES, in conjunction with a Recovery Committee, will provide a service to support the information needs of a community immediately following a flood.
- e. NSW SES and where required supporting agencies will assist with clean-up operations after floods, where possible when resources and personnel permit.
- f. NSW SES may coordinate immediate relief in collaboration with the SEOCAN and SERCON.

## 7 ABBREVIATIONS

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

## 8 GLOSSARY

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

Readers should refer to EMPLAN Annex 9 – Definitions.

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

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

# 9 Appendix A – Map of Tweed Shire LGA Area



## 10 Appendix B – Roles and Responsibilities

AGENCY	RESPONSIBILITIES
NSW State Emergency Service	NSW SES is the designated Combat Agency for floods, storms and tsunami and controls response operations. NSW SES roles and responsibilities in relation to floods are outlined in the <a href="#">NSW State Flood Emergency Sub Plan</a> .

AGENCY	RESPONSIBILITIES
Agriculture and Animal Services Functional Area	The roles and responsibilities for Agriculture and Animal Services are outlined in the Agriculture and Animal Services Supporting Plan and NSW State Flood Plan.
Australian Government Bureau of Meteorology	The roles and responsibilities for the Australian Government Bureau of Meteorology are outlined in the NSW State Flood Plan.
Tweed Shire Council	<p><b>Preparedness</b></p> <ul style="list-style-type: none"> <li>• Establish and maintain floodplain and risk management committee and the Tweed Coast and Waterways Committee and ensure that key agencies are represented.</li> <li>• Develop and implement floodplain risk management plans in accordance with the NSW Government’s Flood Prone Land Policy and the Floodplain Development Manual.</li> <li>• Provide available levee studies, flood studies and floodplain management studies to NSW SES.</li> <li>• Maintain Dam Emergency Plan for the Clarrie Hall Dam and provide a copy to NSW SES.</li> <li>• Provide information on the consequences of dam failure to NSW SES for incorporation into planning and flood intelligence.</li> <li>• Coordinate the development of warning services for catchments prone to flash flooding (small catchments), where appropriate.</li> <li>• Maintain council-owned flood warning networks and flood mitigation works.</li> <li>• Participate in NSW SES-led flood emergency planning meetings, to assist in the preparation of Flood Sub Plans.</li> <li>• Contribute to community engagement activities.</li> </ul> <p><b>Response</b></p> <ul style="list-style-type: none"> <li>• Subject to the availability of council resources, assist NSW SES with flood operations including:</li> </ul>

AGENCY	RESPONSIBILITIES
	<ul style="list-style-type: none"> <li>– Traffic management on council managed roads.</li> <li>– Provision of assistance to NSW SES.</li> <li>– Property protection and sandbagging of Council owned facilities.</li> <li>– Assist with the removal of caravans from Council managed caravan parks.</li> <li>– Warning of residents and other people in flood liable areas.</li> <li>– Technical advice on the impacts of flooding.</li> <li>– Close and reopen council roads (and other roads nominated by agreement with Transport for NSW) and advise NSW SES, NSW Police Force and people who contact the council for road information.</li> <li>– Assist NSW SES to provide sandbag filling facilities to residents and businesses in areas where flooding is expected.</li> </ul> <ul style="list-style-type: none"> <li>• Assist with making facilities available for domestic pets and companion animals of evacuees during evacuations.</li> <li>• Maintain and operate established flash flood warning systems.</li> <li>• Operate established flood mitigation works including critical structures such as flood pumps, flood gates and levees and advise NSW SES regarding their operation.</li> <li>• Manage and protect council-owned infrastructure facilities during floods.</li> <li>• Provide advice to NSW SES and the Health Services Functional Area during floods about key council managed infrastructure such as sewerage treatment and water supply.</li> <li>• Advise the Environmental Protection Authority of any sewerage overflow caused by flooding.</li> <li>• Manage the disruption to water supply and sewage services.</li> <li>• Work with NSW SES and NSW Department of Planning and Environment to collect flood related data during and after flood events.</li> </ul> <p><b>Recovery</b></p> <ul style="list-style-type: none"> <li>• Provide for the management of health hazards associated with flooding including removing debris and waste from public lands under the care and control of Council.</li> <li>• Ensure all Council owned, and managed facilities are fit and safe for reoccupation and assess any need for demolition.</li> <li>• Provide services, assistance and advice to State Government in accordance with the State Recovery Plan.</li> </ul>

AGENCY	RESPONSIBILITIES
<b>Caravan Park Proprietor(s)</b>	<ul style="list-style-type: none"> <li>• Prepare a flood emergency plan for the Caravan Park.</li> <li>• Ensure that owners and occupiers of movable dwellings are aware that the caravan park is flood liable by providing a written notice to occupiers taking up residence and displaying this notice and emergency management arrangement within the park.</li> <li>• Ensure that owners and occupiers of movable dwellings are aware that if they are expecting to be absent for extended periods, they should: <ul style="list-style-type: none"> <li>– Provide the manager of the caravan park with a contact address and telephone number in case of an emergency.</li> <li>– 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).</li> </ul> </li> <li>• Ensure that occupiers are informed of Flood Information. At this time, occupiers should be advised to: <ul style="list-style-type: none"> <li>– Ensure that they have spare batteries for their radios.</li> <li>– Listen to a local radio station for updated flood information.</li> <li>– Prepare for evacuation and movable dwelling (cabins) relocation.</li> </ul> </li> <li>• Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation when flooding occurs.</li> <li>• Assist with the evacuation of people when floods are rising and their return when flood waters have subsided.</li> <li>• Inform NSW SES of the progress of evacuation and/or movable dwellings relocation operations and of any need for assistance in the conduct of these tasks.</li> </ul>
<b>Childcare Centres and Preschools</b>	<ul style="list-style-type: none"> <li>• When notified of possible flooding or isolation, childcare centres and preschools should. <ul style="list-style-type: none"> <li>– Liaise with NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures.</li> <li>– Assist with coordinating the evacuation of preschools and childcare centres.</li> </ul> </li> </ul>
<b>Dams Safety NSW</b>	The roles and responsibilities for Dams Safety NSW (formerly NSW Dam Safety Committee) are outlined in the NSW State Flood Plan.



<b>AGENCY</b>	<b>RESPONSIBILITIES</b>
<b>Department of Defence</b>	Arrangements for Defence Assistance to the Civil Community are detailed within the State EMPLAN (section 448).
<b>Energy and Utilities Services Functional Area</b>	<p>The roles and responsibilities for Energy and Utilities Services are outlined in the Energy and Utility Services Supporting Plan (EUSPLAN).</p> <p>Roles and responsibilities in addition to the Supporting Plan are:</p> <ul style="list-style-type: none"> <li>• Assist NSW SES with identification of infrastructure at risk of flood damage where resources are available.</li> <li>• Facilitate local utility service distribution providers (electricity, gas, water, wastewater) to: <ul style="list-style-type: none"> <li>– Provide advice to NSW SES of any need to disconnect power/gas/water/wastewater supplies or of any timetable for reconnection.</li> <li>– Advise NSW SES of any hazards from utility services during flooding and coastal erosion/inundation.</li> <li>– Advise the public with regard to electrical hazards during flooding and coastal erosion/inundation, and to the availability or otherwise of the electricity supply.</li> <li>– Clear or make safe any hazard caused by power lines or electricity distribution equipment.</li> <li>– Reconnect customers’ electrical/ gas/ water/wastewater installations, when certified safe to do so and as conditions allow.</li> <li>– Assist NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.</li> </ul> </li> </ul>
<b>Engineering Services Functional Area</b>	The roles and responsibilities for Engineering Services are outlined in the Engineering Services Supporting Plan and NSW State Flood Plan.
<b>Environmental Services Functional Area</b>	The roles and responsibilities for Environmental Services are outlined in the Environmental Services (ENVIROPLAN) Supporting Plan.
<b>Floodplain Management Australia</b>	The roles and responsibilities for Floodplain Management Australia are outlined in the NSW State Flood Plan.
<b>Fire and Rescue NSW</b>	The roles and responsibilities for Fire and Rescue NSW are outlined in the NSW State Flood Plan.
<b>Forestry Corporation of NSW</b>	The roles and responsibilities for Forestry Corporation of NSW are outlined in the NSW State Flood Plan.



AGENCY	RESPONSIBILITIES
<b>Health Services Functional Area</b>	The roles and responsibilities for Health Services are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
<b>Local Emergency Operations Controller (LEOCON)</b>	<ul style="list-style-type: none"> <li>• Monitor flood operations.</li> <li>• If requested, coordinate support for the NSW SES Incident Controller.</li> </ul>
<b>Local Emergency Management Officer (LEMO)</b>	<ul style="list-style-type: none"> <li>• If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations.</li> </ul>
<b>Manly Hydraulics Laboratory (MHL)</b>	The roles and responsibilities for Manly Hydraulic Laboratory are outlined in the NSW State Flood Plan.
<b>Marine Rescue NSW</b>	The roles and responsibilities for Marine Rescue NSW are outlined in the NSW State Flood Plan.
<b>NSW Ambulance</b>	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
<b>NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission</b>	The roles and responsibilities for NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission are outlined in the NSW State Flood Plan.
<b>NSW Department of Planning and Environment (Environment and Heritage Group)</b>	The roles and responsibilities for NSW Department of Planning and Environment (Environment and Heritage Group) are outlined in the NSW State Flood Plan (referred to as DPIE EES).
<b>NSW Department of Planning and Environment (Water)</b>	The roles and responsibilities for NSW Department of Planning and Environment (Water) are outlined in the NSW State Flood Plan.
<b>NSW Food Authority</b>	The roles and responsibilities for NSW Food Authority are outlined in the Food Safety Emergency Sub Plan.
<b>NSW National Parks and Wildlife Services</b>	<p>The roles and responsibilities for NSW National Parks and Wildlife Services are outlined in the NSW State Flood Plan.</p> <p>Maintain Dam Emergency Plan for the Korrumbyn Creek Dam and provide a copy to NSW SES.</p>
<b>NSW Police Force</b>	The roles and responsibilities for NSW Police Force are outlined in the NSW State Flood Plan.
<b>NSW Rural Fire Service</b>	The roles and responsibilities for NSW Rural Fire Service are outlined in the NSW State Flood Plan.
<b>Public Information Services Functional Area</b>	The roles and responsibilities for Public Information Services are outlined in the Public Information Services Supporting Plan and NSW State Flood Plan.

<b>AGENCY</b>	<b>RESPONSIBILITIES</b>
<b>NSW Reconstruction Authority</b>	The roles and responsibilities for the NSW Reconstruction Authority are outlined in the NSW State Flood Plan.
<b>SEOCN/SEOC</b>	The roles and responsibilities for the SEOCN/SEOC are outlined in the NSW State Flood Plan.
<b>Surf Life Saving NSW</b>	The roles and responsibilities for Surf Life Saving NSW are outlined in the NSW State Flood Plan.
<b>Telecommunications Services Functional Area</b>	The roles and responsibilities for Telecommunications Services are outlined in the Telecommunications Services (TELCOPLAN) Supporting Plan.
<b>Transport for NSW (TfNSW)</b>	<ul style="list-style-type: none"> <li>• Transport for NSW (TfNSW) coordinates information on road conditions for Emergency Services access.</li> <li>• Transport for NSW (TfNSW) coordinates the management of the road network across all modes of transport.</li> <li>• Transport for NSW (TfNSW) in conjunction will assist NSW SES with the evacuation of at-risk communities by maintaining access and egress routes.</li> <li>• Assist NSW SES with the communication of flood warnings and information provision to the public through Live Traffic and Social Media according to the VMS protocols and procedures.</li> <li>• Assist NSW SES with identification of road infrastructure at risk of flooding.</li> </ul>
<b>Transport Services Functional Area</b>	The roles and responsibilities for Transport Services are outlined in the Transport Services Functional Area Supporting Plan and NSW State Flood Plan.
<b>VRA Rescue NSW</b>	The roles and responsibilities for VRA Rescue NSW are outlined in the NSW State Flood Plan.
<b>Water NSW</b>	The roles and responsibilities for Water NSW are outlined in the NSW State Flood Plan.
<b>Welfare Services Functional Area</b>	The roles and responsibilities for Welfare Services are outlined in the Welfare Services Functional Area Supporting Plan and NSW State Flood Plan.

## 11 Appendix C – Community Specific Roles and Responsibilities

<p><b>NSW SES Community Action Teams (CATs)</b></p> <p><b>Current CATs – Uki Tumbulgum</b></p>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>• Maintain awareness of land use and development in their local community that may become a flood hazard or be impacted by flooding and inform the SES Unit Commander of any concerns.</li> </ul> <p><b>Preparedness</b></p> <ul style="list-style-type: none"> <li>• Be involved in local emergency planning processes – set up communication links and phone trees.</li> <li>• Inform new residents of any flood threat and local procedures.</li> <li>• Act as the point of contact between the NSW SES and the community.</li> </ul> <p><b>Response</b></p> <ul style="list-style-type: none"> <li>• Inform local NSW SES about flood conditions and response needs. Where able, support community with low skill level tasks e.g. sandbagging, assisting the vulnerable and neighbours.</li> <li>• Disseminate flood information to local community, including flood and evacuation warnings.</li> </ul> <p><b>Recovery</b></p> <ul style="list-style-type: none"> <li>• Assist with community clean-up if required and able to do so.</li> <li>• Participate in After Action Reviews if required.</li> </ul>
<p><b>Community Resilience Networks</b></p>	<ul style="list-style-type: none"> <li>• The Council has a Community Resilience Network (CRN) that brings together local community organisations such as sporting clubs, community recreation and cultural groups, school groups, faith-based groups, Landcare groups, surf clubs and Progress Associations.</li> <li>• These act as a community reference connection to the Local Emergency Management Committee, contributing to emergency planning activities and the development of local Recovery Plans.</li> <li>• This enables community capabilities and resources to be incorporated into emergency and recovery planning and support an all-hazards approach to emergency preparedness.</li> <li>• During an emergency, the CRN also acts as a community reference network when a recovery committee is established, to facilitate collaboration between the committee and community services and assist with coordination of recovery initiatives.</li> </ul>

	<ul style="list-style-type: none"> <li>• They operate under the auspices of the Local Recovery Officer and are integral to the Local Recovery Sub-Plan.</li> <li>• Provide awareness of local hazards and risks.</li> <li>• Provide awareness of Emergency Management arrangements in NSW.</li> <li>• Conduct tabletop exercises to practice recovery processes.</li> <li>• Share recovery needs between communities and the formal recovery system if established.</li> </ul>
<p><b>Community Resilience Teams</b></p>	<ul style="list-style-type: none"> <li>• Community Resilience Teams (CRT's) are a Red Cross initiative. They form at a local level to prepare their communities before emergencies using the all-hazards approach, the PPRR model and local knowledge.</li> <li>• Emergency Service Organisations can use the CRT communication systems to convey warnings and obtain feedback from the community during an event.</li> <li>• This boosts resilience during an emergency and provides a platform to begin recovering after an emergency. Establishing telephone trees and street coordinators to create community and neighbourhood connections are strategies used to disseminate warnings and to collect information.</li> <li>• Some CRT's are formalised by Incorporation and have/are seeking funding for local resilience projects.</li> </ul>
<p><b>Community Members</b></p>	<p><b>Preparedness</b></p> <ul style="list-style-type: none"> <li>• Understand the potential risk and impact of flooding.</li> <li>• Prepare homes and property to reduce the impact of flooding.</li> <li>• Understand warnings and other triggers for action and the safest actions to take in a flood.</li> <li>• Households, institutions and businesses develop plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours.</li> <li>• Have an emergency kit.</li> <li>• Be involved in local emergency planning processes.</li> </ul> <p><b>Recovery</b></p> <ul style="list-style-type: none"> <li>• Assist with community clean-up if required and able to do so.</li> <li>• Participate in After Action Reviews if required.</li> </ul>

<p><b>Cross-border assistance arrangement</b></p>	<ul style="list-style-type: none"> <li>• A formal Cross-Border Sub Plan between the Tweed Byron LEMC and the City of Gold Coast Local Disaster Management Group to facilitate information sharing via Liaison Officers participating in each other's Local EOC's when established and as appropriate.</li> <li>• There is a governmental level agreement between NSW and Qld that establishes a cross border mutual aid zone that extends 50kms on each side of the NSW/Qld border. Requests for assistance are managed at the state level of each government department of agency.</li> </ul>
<p><b>Aboriginal organisations or groups</b></p>	<ul style="list-style-type: none"> <li>• Act as the point of contact between NSW SES and the Bundjalung community.</li> <li>• Disseminate flood information, including flood and evacuation warnings, to the Bundjalung community</li> </ul>

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# HAZARD AND RISK IN TWEED SHIRE

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**Volume 2 of the Tweed Shire Flood Emergency Sub Plan**

**Last Update: November 2023**

## AUTHORISATION

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

**Approved**

**Signature**



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*NSW SES Coordinator Planning*

Print Name: Michael Stubbs

Date: 7 November 2023

**Approved**

**Signature:**



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*NSW SES North Eastern Zone Commander*

Print Name: Joanna Jones

Date: 7 November 2023

**Date Tabled at LEMC**

8 November 2023

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## VERSION LIST

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

Description	Date
Tweed Valley Flood Emergency Sub Plan – Volume 2	2008

## AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

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

Amendment Number	Description	Updated by	Date
1	Sector boundary for Murwillumbah changed and updated design heights from Tweed Shire Flood Study 2023. Chinderah gauge AWRC number removed as per Bureau of Meteorology. Flood graphs updated with 2022 data.	Elena Palamara	23/08/24

Document Issue: Version 3-02052016

# 1 THE FLOOD AND COASTAL EROSION THREAT

## 1.1 OVERVIEW

- a. The Tweed Shire Local Government Area (LGA) is located in the Northern Rivers Region of New South Wales and is located adjacent to the NSW/QLD border and adjoins the NSW Shires of Byron, Lismore and Kyogle.
- b. The LGA is made up of a mix of urban and rural land. The Tweed Shire is a fast growing area of residential and rural-residential land use and encompasses large areas of coastline, national parks, wetland, forest as well as commercial, agricultural and industrial land use.
- c. Settlement is based around the north-east corner of the LGA in Tweed Heads and along the coastal fringe, from Kingscliff to Pottsville, with an urban centre inland at Murwillumbah. There are also several smaller townships and villages.
- d. The Tweed Shire has a humid, subtropical climate, with warm summers and mild, drier winters. Weather patterns are influenced by the mountain ranges which form a semi-circle around the valley, resulting in reliable rainfalls which are not often drought affected. Rainfall is heaviest between January through to March, with an annual mean rainfall of 1595mm (1).
- e. The Tweed Shire estimated resident population is 97,392 based on the latest census data from 2021. More detailed information on demographic information within the Tweed Shire can be found in Table 5.
- f. Main arterial roads in the shire are the Pacific Motorway, Tweed Coast Rd and Kyogle Rd. There is an airfield located at Murwillumbah which can accommodate up to twin propellor aircraft and can be open to use by general aviation. The Tweed Shire also houses part of the Gold Coast Airport, which is an Australian domestic and International Airport. The entrance to the airport is situated in Bilinga and the runway spans the Queensland-NSW border (1).
- g. There are two main River Basins within the Tweed Shire LGA. The majority of the LGA falls within the Tweed River Basin, with a portion of the south-east corner falling within the Brunswick River Basin. The Tweed Coastal Creeks Catchment is also contained within the LGA.
- h. The Tweed Shire is shown on Maps 1 and 2.

## 1.2 LANDFORMS AND RIVER SYSTEMS

### Tweed River Valley

- a. The Tweed Valley catchment has a complex, diverse topography, with steep, channelised valleys to wide deep floodplain areas and coastal estuaries. Within the Tweed Shire, it has a total catchment area of 1303km<sup>2</sup>. The catchment is bounded by the Border Ranges and Mebbin National Park to the west, the McPherson Range on the Queensland/New South Wales border to the north and the Nightcap, Mount Jerusalem and Mooball National Parks to the south. The catchment outlets to the ocean via the Tweed River between Point Danger and Fingal Head (2).
- b. The Tweed Valley consists of flat floodplain land of alluvial sediments, surrounded by higher ground of bedrock. The extensive floodplains form an important cane-growing area.
- c. The Tweed River is the main stream, which flows in a general north-easterly direction through the towns of Murwillumbah, Tweed Heads and past the villages of Condong, Tumbulgum, Chinderah and Fingal Head. The Tweed River originates near Mount Burrell and flows approximately 80km until it reaches the ocean at Tweed Heads. Significant tributaries of the Tweed River include:
  - i. Oxley River, which joins at Byangum, about 5 km upstream of Murwillumbah.
  - ii. Dunbible Creek, which joins upstream of Murwillumbah.
  - iii. Rous River, which joins at Tumbulgum.
  - iv. Terranora and Cobaki Broadwaters, which join 2 km upstream of the river mouth at Tweed Head via Terranora Inlet, along with Duroby, Tomewin Catchments and Ukerebagh Passage.
- d. The Tweed River floodplain commences near Murwillumbah and includes South Murwillumbah (Blacks Drain) to the east of the river. On the northern side of the river a large area of floodplain occurs between the Tweed and Rous Rivers (including the Dulgigan and Dungay areas) to Stotts Island and southeast to the Condong Range. Other floodplain areas are located between Stotts Island and Chinderah on the southern bank of the Tweed River.
- e. Inland of Tweed Heads are the Terranora and Cobaki Broadwaters which are fed by numerous local catchment creeks. These Broadwaters join together just west of Tweed Heads and meet with the Tweed River south of Tweed Heads prior to discharging to the ocean between Tweed Heads and Fingal Head. Breakwaters were constructed at the mouth of the river from 1962-1964 to control the entrance.

- f. The Tweed River is affected by tidal influence upstream of Murwillumbah at Bray Park Weir, with a tidal extent of approximately 30km. The Rous River is affected tidally to Boat Harbour at Nobbys Creek (3).

### Brunswick River Valley

- a. The South-Eastern corner of the Tweed Shire lies within the Brunswick River Basin.
- b. The Brunswick River begins in the Burringbar Ranges and drains an area of approximately 280km<sup>2</sup>.
- c. Within the Tweed Shire, there are minimal emergency management considerations associated with the Brunswick River Basin. Refer to the Byron Shire Flood Emergency Sub Plan for more detail on the Brunswick River Basin (4).

### Tweed Coastal Creeks

- g. The Tweed Coastal Creeks catchment area is approximately 255km<sup>2</sup>, and is bounded by Kingscliff to the north, and the Tweed-Byron Shire boundary to the south. The Coastal Creeks system is separate to the main Tweed River Basin, with catchment areas for each system described below.
- h. Coastal Creek catchments within the Tweed Shire include Cudgen, Cudgera, Mooball and Yelgun Creeks. These catchments are bisected by the Pacific Highway, with the upper catchments predominantly agricultural and forested land, whilst the lower part of the catchments area a mixture of agricultural land, sugar cane farms, forested and urban areas.
- i. The upper catchments are steep meaning that travel times of flood peaks are short. Towns including Burringbar, Mooball and Crabbes Creek are subject to flash flooding with high velocity flood flows. The flatter topography of the lower catchments can mean that drainage from rural areas including from within cane fields can be slow (5).
- j. **Cudgen Creek Catchment.** Cudgen Creek catchment is approximately 100km<sup>2</sup> in area and is bounded by the Burringbar Range to the west. It is approximately 20km long and drains to the ocean at Kingscliff. Towns within the Cudgen Creek catchment include Bogangar, Cabarita Beach, Tanglewood, Casuarina and Kingscliff. The main creeks in the Cudgen catchment include Cudgen, Reserve and Clothiers Creeks. Reserve and Clothiers Creek combine and flows into Cudgen Lake, which is located west of Bogangar.
- k. **Cudgera Creek Catchment.** Cudgera Creek catchment is approximately 34km<sup>2</sup> in area, 11km long, and drains to the ocean at Hastings Point. Townships within the Cudgera Creek catchment include Pottsville and Hastings Point, as well as the Seabreeze and Koala Beach Estates. The catchment is linked to the Cudgen Creek catchment to the north, with Christies Creek flowing into the Cudgera Creek floodplain downstream of

the Pacific Highway. To the south, the Cudgera catchment is linked to the Mooball Creek catchment via culverts underneath Pottsville Road.

- i. **Mooball Creek Catchment.** The Mooball Creek catchment is approximately 110km<sup>2</sup> in area and drains to the ocean at Pottsville. Townships within the Mooball Creek catchment include Burringbar, Mooball and Crabbes Creek upstream of the Pacific Highway, as well as Wooyung and Pottsville in the lower floodplain. The two main creeks within the Mooball catchment are Burringbar Creek and Crabbes Creek. Burringbar Creek and Crabbes Creek join to become Mooball Creek north of Wooyung. The Mooball Creek catchment is hydraulically linked to the Cudgera Creek catchment via culverts under Pottsville Road. The Mooball Creek catchment is also linked with the Yelgun Creek catchment, with both floodplains connecting hydraulically south of Wooyung in the corridor east of the old coastal dune system.
- m. **Yelgun Creek Catchment.** The Yelgun Creek catchment lies between the Mooball and Marshalls Creek catchments. The catchment is approximately 11km<sup>2</sup> in area and flows both south into Marshalls Creek and north into Mooball Creek through Billinudgel Nature Reserve. There are no major townships within the Yelgun Creek catchment. The Yelgun Creek catchment is linked to the Marshalls Creek catchment at North Ocean Shores via culverts at Kallaroo Circuit (6).

### 1.3 STORAGE DAMS

- a. Dam locations are shown on Map 1: Tweed River Basin.
- b. There are two prescribed Dams located within the Tweed LGA, Clarrie Hall Dam and Korrumbyn Creek Dam.
- c. Clarrie Hall Dam is located around 4km upstream of Uki. The location of Clarrie Hall Dam is shown on Map 1 and is further described in Section 2.2.8
- d. Korrumbyn Creek Dam is located 12km southwest of Murwillumbah within Wollumbin National Park (7). The location of Korrumbyn Creek Dam is shown on Map 1 and is further described in Section 2.2.8

**Table 1: Prescribed Dams in Tweed Shire LGA; summary of information about each storage.**

<b>Clarrie Hall Dam (8)</b>	
Owner / Operator	Tweed Shire Council
Description of Dam	Clarrie Hall Dam is a water supply dam built to augment the water supply to towns in the Tweed Shire Water Supply District. This dam consists of a 43m high concrete face rockfill structure with a crest length of 175m and width of 6.4m. The spillway is 23m wide and consists of a concrete lined chute with an ogee crest.  The storage capacity of the dam is 16,000 ML at full supply (61.5m AHD) and the catchment area is 60.2km <sup>2</sup> . The maximum flood level is at 70.4m AHD



Location	Located on Doon Doon Creek about 1.5km upstream from the confluence with the Tweed River, 15km south-west of Murwillumbah. It lies within the Tweed LGA and Tweed River Basin.
Communities Downstream	<p>Number of people at risk is approximately 482. The major population areas effected by dam failure will include Uki, Uki Village and below Uki from Smith Creek Rd and downstream to the Byangum Bridge.</p> <p>In a Sunny Day Dambreak, there may be approximately 172 inundated houses and 482 people at risk. The flood wave travel time from Clarrie Hall Dam to Uki is approximately 30 minutes, and to its downstream location at Tumbulgum is approximately 2 hours and 15 minutes.</p> <p>In a Dam Crest Failure without dambreak, there may be 401-478 inundated houses and 1122-1338 people at risk.</p> <p>In a Probable Maximum Flood (PMF) without Dambreak, there may be 476 inundated houses and 1332 people at risk.</p> <p>In a PMF with Dambreak, there may be 508 inundated houses and 1422 people at risk. The flood wave travel time from Clarrie Hall Dam to Uki is approximately 23minutes, and to its to the downstream location at Camden Haven is approximately 1 hour and 34 minutes (9).</p>
Monitoring System	Clarrie Hall Dam is monitored by a network of instrumentation comprising surface settlement points, seepage weir, continuous water storage monitoring, rainfall, spillway seepage monitoring and site inspections.
Warning System	The owner operates an Emergency Warning System and is required to inform SES immediately upon potential or actual dam failure.
Other	The dam spillway was upgraded in 2014 to allow it to pass the theoretical PMF without overtopping the parapet wall (dam crest).

Korumbyn Creek Dam (10)	
Owner / Operator	National Parks & Wildlife Service
Description of Dam	<p>Korumbyn Creek Dam is a fully silted dam.</p> <p>The 14.1m high dam is a thin concrete single arch with concrete gravity abutment on the left bank.</p> <p>The reservoir originally had a capacity of 27,300 m<sup>3</sup>, however an outlet blockage means it now stores an estimated 9,060 m<sup>3</sup> of sediment. It has an ungated spillway.</p>
Location	Korumbyn Creek Dam is located 12km southwest of Murwillumbah within Wollumbin National Park. Normal access to the dam is from Mount Warning Road, 4.2km from the intersection with Kyogle Rd.
Communities Downstream	<p><b>Communities Downstream:</b> Mount Warning Road, including a local carpark 200m downstream, Mt Warning Rainforest park, and three locations providing accommodation approximately 3900m downstream.</p> <p><b>Key Consequences:</b></p> <p>During a Sunny Day Failure, if silt outflow is modelled, there is no population at risk, if silt is assumed to be water, there may be approximately a 6 -11 population at risk, varying from low to high tourist season.</p>

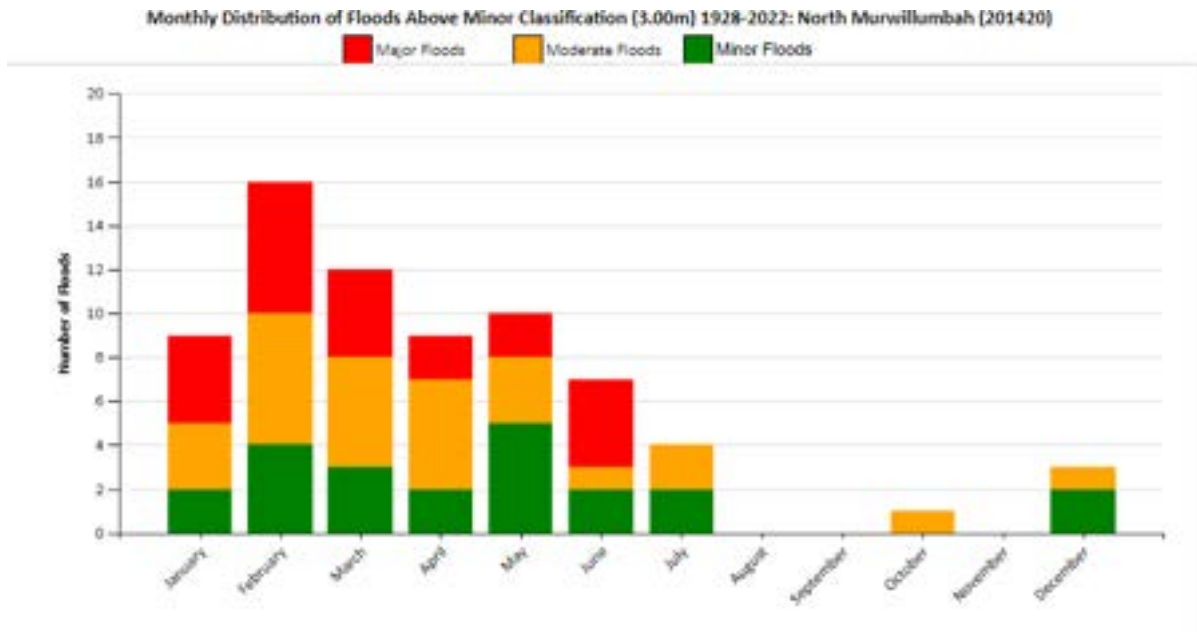
	During a Dambreak during Probable Maximum Precipitation Design Flood population at risk may be up to 55.9 during high season car park occupancy.
Monitoring System	No telemetered monitoring or alert system has been implemented for the dam. Alerts are linked to structural surveillance.
Warning System	No telemetered monitoring or alert system has been implemented for the dam. Alerts are linked to structural surveillance.
Other	The dam is currently silted to approximately the spillway crest level.

## 1.4 WEATHER SYSTEMS AND FLOODING

- a. Tropical cyclones originating near the equator (Pacific Basin) can move south and affect the Tweed Shire area. While it is rare for a cyclone to enter north-eastern NSW, those that approach southern QLD (Gladstone to Maroochydore) or which travel southwards past the coast of northern NSW may bring rain of sufficient intensity and duration as to cause flooding. There are also occasions when a heavy rain system advances well ahead of the cyclone.
- b. The most frequent origin of flooding is caused by the development of East Coast Lows close to the coast. Pressure systems fall below 980 hPa causing rain, increases in the wind strength, increases in the wave height, and increases in the storm surge.
- c. These depressions may develop at any time, but the flood rain events are most likely during that part of the year when sea surface temperatures are high, and the air is humid. As tropical cyclones can also be expected at this time, most flood events in the Tweed Valley occur in the first half of the year with a peak period of around February and March.
- d. The seasonal distribution of flooding is during the period November to July with the highest incidence during February, March and June. The predominance of flooding in late summer reflects the fact that the Tweed Valley is more affected by tropical cyclones than by winter depressions (6).
- e. Isolated heavy falls in the Tweed River catchment on one of the river arms is unlikely to cause a major flood, whereas similar rainfall on two arms may cause significant riverine flooding. Another influencing factor is soil moisture and rainfall producing run off "collection" water. Indicative flood producing rainfall levels are as follows:
  - i. 50-150mm over a period of 1-3 days usually results in river rises with nuisance to minor flooding (this range is more likely to be influenced by a wet catchment);
  - ii. 175-300mm over a period of 1-3 days usually results in moderate flooding
  - iii. 300-450mm over a period of 1-5 days usually results in major flooding (this is dependent on the time period that the rain falls - 25mm/hr with a wet catchment is likely to cause major flooding)

- iv. 500-700mm over a period of 1-3 days may result in extreme flooding such as the 1954, 2017 and 2022 flood events (11).

**Figure 1: Monthly Flood Distribution, North Murwillumbah Gauge**



**Figure 2: Monthly Flood Distribution, Tumbulgum Gauge**

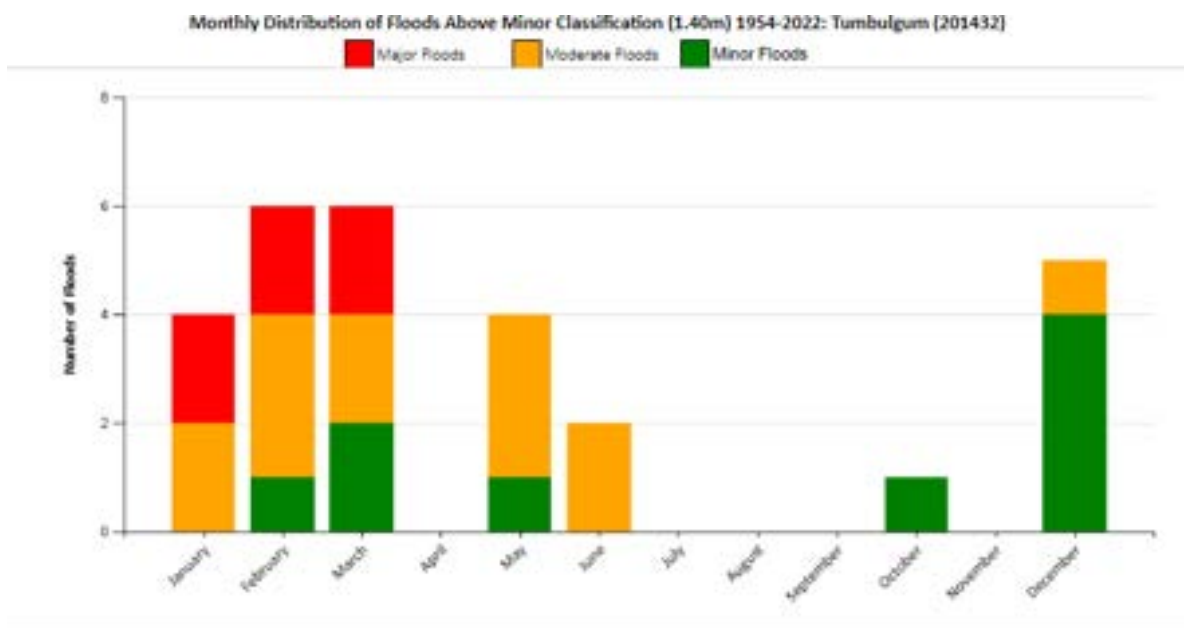
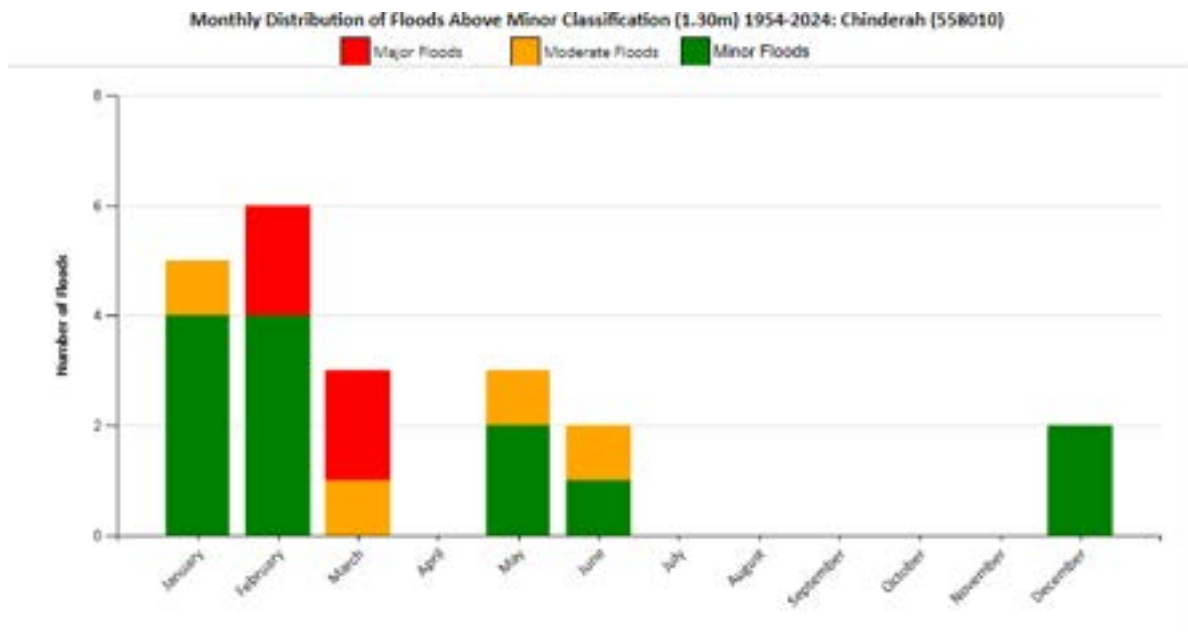


Figure 3: Monthly Flood Distribution, Chinderah Gauge



## 1.5 CHARACTERISTICS OF FLOODING

- a. The Tweed Valley catchment is diverse and complex, and can be impacted by riverine, overland, flash flooding and coastal flooding (2).
- b. The Tweed Valley is generally wide and flat with few structures that significantly control the hydraulics of the floodplain, with the exception of Murwillumbah.
- c. Flood depths and flows, particularly within the upper catchments can be of a dangerous magnitude, with quick flood rises and short warning times.

### Riverine / Catchment Flooding

- d. In smaller events water is modelled to flow from the Rous River to the Tweed River via Mayal Creek, which lies in the Chillingham and Murwillumbah sectors. The Tweed River will become the dominant flow as floodwater rises, and water will flow from the Tweed River to the Rous River.
- e. In larger events (in the magnitude of a 1% Annual Exceedance Probability (AEP) event), riverine or catchment flooding will be dominant along the Tweed River floodplain downstream to Shallow Bay, and in the Cobaki/Piggabeen Creek floodplains down to Terranora Creek. High flowpaths will exist in Bray Park, upstream of Murwillumbah, and from Blacks Drain to Condong Creek via the Murwillumbah airfield.

- f. In the mid-Tweed, large areas of floodplain convey high flow between the Tweed and Rous Rivers, and from Condong to Stotts Island.
- g. In the Lower Tweed, the valleys of the Broadwater tributaries described above will have high flows in a larger event (12).
- h. A system of levees protects Murwillumbah and South Tweed Heads up to certain design heights. If these levees are breached, overtopped, or fail, the communities behind them are at risk of inundation.
- i. Only major floods seriously affect the rural areas upstream of Byangum and Boat Harbour in the Tweed Valley. Local runoff may cause minor problems in some lower lands, but backwater from the main channels is very localised and would affect farmland only once in ten to twenty years. A disruption of access to areas however, is fairly frequent.
- j. Flooding in the Tweed Coastal Creeks can originate from heavy rainfall over the catchments, high tail water levels in the ocean due to storm surge or tidal conditions, and/or localised rainfall not being able to drain due to high creek levels or constrictions caused by flood drainage structures.
- k. The rural areas of the Tweed Coastal Creeks floodplains have no structural protection against inundation. Flooding of some of the lower areas occurs as often as once a year and some areas, particularly upstream of Cudgen Lake, suffer from slow drainage.
- l. Storm surge and abnormally high tides can contribute to catchment flooding by impeding the outflow of water from creeks and waterways to the ocean (3).

### Flash Flooding

- m. Townships within the steep upper catchments of the Tweed LGA are most at risk of high velocity flash flooding including:
  - i. The upper Tweed River townships of Uki and Chillingham as well as Tyalgum, Mt Burrell, Byrill Creek, Kunghur and Stokers Siding.
  - ii. Within the Tweed Coastal Catchments townships of Burringbar, Mooball and Crabbes Creek as well as the coastal fringe around Cudgen Lake, Tanglewood, Cabarita, Bogangar, Hastings Point and Pottsville.
  - iii. The small tributaries in the Bilambil and Terranora areas are prone to Flash Flooding (12).

### Storm Surge and Tidal Influences

- j. A storm surge could affect the Tweed River downstream of Chinderah (including South Tweed Heads) and the lower lying coastal areas of:
  - i. Fingal to Kingscliff
  - ii. Cabarita - Bogangar

- iii. Hastings Point
  - iv. Pottsville
  - v. Wooyung
- k. Storm surge inundation is modelled to dominate the lower Tweed River floodplain; from Shallow Bay to the mouth, and the Terranora Creek floodplain from the lower Bilambil / Duroby Creek floodplains down to Tweed Heads (2).

### Peak height flow times

- i. Indicative travel times for floodwaters to travel between locations within the Tweed River catchment are provided in Table 2. These are shown schematically in Annex 1. Travel times of flood peaks can vary significantly between floods, and therefore the times listed below should be regarded as approximations only.

**Table 2: Indicative Flow Travel Time for the Tweed River**

Locations	Travel Time
Chillingham to Kynnumboon Bridge	3.5 hours
Kynnumboon Bridge to Tumbulgum	2-3 hours
Tyalgum to Murwillumbah	3-6 hours
Uki to Murwillumbah	2-3.5 hours
Murwillumbah to Tumbulgum	1.5-3 hours
Tumbulgum to Chinderah (Barneys Point gauge)	3.5-4 hours
Chinderah (Barneys Point) to River mouth*	1.5-2 hours

- k. Table 3 outlines the design peak heights for select forecast gauge locations in the Tweed Catchment.

**Table 3: Tweed River Design Flood Heights (mAHD) (2)**

Gauge Location	20% AEP (m AHD)	5% AEP (m AHD)	1% AEP (m AHD)	0.20% AEP (m AHD)	PMF (m AHD)
Chinderah	1.36	1.81	2.73	3.50	7.12
Tumbulgum	2.72	3.32	4.02	4.54	8.53
North Murwillumbah	4.87	5.41	6.01	6.41	10.37

Murwillumbah Bridge	4.80	5.30	5.89	6.29	10.36
North Murwillumbah	4.87	5.41	6.01	6.41	10.37
Uki	19.09	20.94	21.59	22.08	29.17
Clarrie Hall Dam	63.63	65.62	66.5	66.86	68.77

## 1.6 FLOOD HISTORY

- a. Regular flooding occurs within the Tweed Shire LGA, with moderate and major flooding occurring on numerous occasions (12).
- b. **February 1954:** In 1954 a tropical cyclone passed over Northern NSW causing rainfall between 400mm and 900mm over a 72-hour period in the upper catchment area. The 1954 flood reached 6.05m at the Murwillumbah Gauge. High velocity floodwater caused significant damage to homes in South Murwillumbah and storm activity caused extensive damage in other areas of the LGA.
- c. **December 1972:** The Tweed River peaked in Murwillumbah at 4.6m (moderate flood) on 28 December 1972. Extensive inundation of property occurred along the floodplain of the river at Murwillumbah and Cane growers in the valley suffered substantial losses.
- d. **January 1974:** the remains of tropical cyclone “Wanda” and a moist north-easterly low-pressure system combined to cause major flooding in the Tweed Valley. The river peaked at 5.42m at Murwillumbah and a total of 100 people were evacuated from South Murwillumbah. All roads north were cut, either by major flooding on the Tweed River, or by swollen streams beyond the Gold Coast. The coastal town of Kingscliff became completely isolated and was threatened with serious food shortages. The gauge at Chinderah reached 2.4m AHD.
- e. **February 1974:** The effects of tropical cyclone “Pam” which was out to sea, moved along the coast from February 5 to 7, and together with unusually high tides, caused havoc along the north coast from Evans Head to Tweed Heads. Extreme erosion of the foreshores, as well as inundation of low-lying areas by seawater resulted in damage to many buildings and properties on two successive days. The storm surge was estimated at 0.61m and combined with very rough seas caused anxiety to coastal residents.
- f. **March 1974:** On March 10 the Tweed Valley experienced major flooding. Flooding resulted from heavy rainfall with a series of small intense depressions. In the 48hr period to March 11 recorded rainfall ranged between 400 – 600mm. The Tweed Valley experienced very serious and prolonged inundation with high commercial, domestic, and rural losses (3). The Tweed River at Murwillumbah (201420) reached a height of 5.82m. The commercial centre was inundated when water overtopped the levee, with some shops being flooded to a depth of 1.5–2m. Water up to 2.5m entered parts of

- the Tumbulgum and Chinderah (2.1m) areas. Approximately 1,000 persons from Murwillumbah and South Murwillumbah were evacuated. Murwillumbah was completely isolated with roads in the area badly scoured and potholed. Damage to homes and personal effects were estimated at over \$A1 million. The levee has since been upgraded in the early to mid-1990's (3).
- g. **March 1978:** The 1978 flood resulted from heavy rainfall occurring between March 17 and 19. Rainfall for the 48hrs to March 19 averaged 300 – 500mm. At Murwillumbah the Tweed River went within a few centimetres of breaking the levee bank at the western side of the river. The river peaked at 5.24m at Murwillumbah (201420) with the worst affected areas being east and south Murwillumbah.
  - h. **April 1989:** Rainfall in the area for the 48hrs to March 3 averaged 100-400mm. The intensity of the rain and sudden river rise caused extensive flooding of local areas with the Tweed River peaking at 5.6m at Murwillumbah. Several medical evacuations were carried out in the Murwillumbah area over the weekend and road closures resulted in the necessity of conducting food drops to isolated communities. An additional weather system brought further heavy rain to the catchment with new flood warnings issued on April 11. The river at Murwillumbah peaked at 3.76m (3).
  - i. **June 2005:** Flash flooding occurred in the Tweed coastal creeks, with approx. 500mm of rain falling in a 12hour period resulting in severe flash flooding for the majority of Tweed Heads CBD, West Tweed, South Tweed and Bilambil, with disruption to major roads including Dry Dock Road, Kennedy Drive, Machinery Drive and Minjungbal Drive. Over floor inundation occurred in the Machinery Drive industrial estate and the Tweed Police station was evacuated. The Tweed Heads Hospital, Fire and Ambulance Stations became isolated. Approximately 100 people, 8-9 houses from Pottsville, and 50 houses from Cabarita were evacuated due to inundation (13).
  - j. **December 2008:** Riverine and Flash Flooding occurred over the Tweed River catchment with 300mm total falling and a rate of 100mm/hr, resulting in the evacuation of South Murwillumbah. Flash flooding impacts were evident along the coastal creeks and upper Tweed villages including Chillingham with a number of flood rescues undertaken (13).
  - k. **January 2012:** An east coast low caused 550mm of rain to fall within the upper Tweed catchment over 3 days between 24-26 January. This resulted in a flood peak of 4.7m at Murwillumbah and minor flooding at Chinderah with a peak of 1.52m. Evacuations were conducted across the Tweed including South Murwillumbah, Tumbulgum, Condong, Fingal, South Tweed, Chinderah and parts of Kingscliff, and the emergency alert system was utilised for the first time in the region. The tide was low when the flood waters peaked at Chinderah and there was insignificant rainfall in the Cobaki Lakes area, so the main impacts were from the Tweed River.



- i. **January 2013:** Ex-cyclone Oswald brought widespread heavy rain, gale force winds and dangerous surf conditions, causing flooding and coastal erosion. The rainfall totals in the upper catchment over a five-day period from 26 January included 870mm in Couchy Creek, 803mm in Bald Mountain, 675mm at Clarrie Hall Dam, 642mm in Uki, 428mm in Murwillumbah, 252mm in Tumbulgum and in excess of 1027mm at Hopkins Creek. This resulted in moderate flooding in both Murwillumbah and Chinderah with peaks of 4.7m and 1.7m respectively.
- m. **March/April 2017:** Flooding in the area reached 6.2m at the Murwillumbah gauge (201420) leading to the overtopping of the levee in South Murwillumbah, and over-floor flooding in Condong and Tumbulgum. The flood peaked at a height of 2.3m at Chinderah (201426) resulting in flooding in low lying areas of Chinderah and Fingal Head. The towns of Burringbar, Mooball and Crabbes Creek experienced high velocity flash flooding whilst the rural township of Bilambil was flooded from Bilambil Creek. Approximately 2,100 houses were flooded (14).
- n. **February/March 2022:** During the 2022 flood The Tweed River experienced major flooding over February and March 2022, inundating properties throughout the catchment. River level gauges along the Tweed River recorded peak levels at 1.74m AHD at Dry Dock, 3m at Chinderah, 4.78m at Tumbulgum and 6.51m at North Murwillumbah (15). Notably, the estimated AEP of the 2022 event exceeded 0.2% in some parts of the catchment. The upper Tweed catchment was heavily impacted by landslips, which caused mass damage to road and communication infrastructure (16).

Table 4: Peak flood levels for major historical flood events in the Tweed Shire (2)

Year	Murwillumbah gauge height (m)	Uki gauge height (m)	Eungella gauge height (m)	Tyalgum gauge height (m)	Chillingham gauge height (m)	Tumbulgum gauge height (m)
February 1954	6.04	10.90	-	8.08	-	
March 1974	5.82	11.40	-	8.46	5.60	
April 1989	5.62	10.9	-	10.95	6.80	
January 2012	4.67	9.98	6.24	-	5.84	2.72
January 2013	4.68	9.34	6.4	-	5.95	3.29
March 2017	6.20	12.91	9.85	8.77	5.97	3.91
February 2020	3.81	9.2	6.28	5.92	5.09	
February 2022	6.51	12.92	7.83	7.07	6.50	4.78

## 1.7 FLOOD MITIGATION SYSTEMS

- a. There are seven levees within the Tweed Shire LGA;
  - i. East Murwillumbah Levee located between the Tweed River and Tumbulgum Rd and George St, Murwillumbah;
  - ii. Dorothy/William Street Levee located at Murwillumbah;
  - iii. Murwillumbah CBD Levee located at Commercial Road, Murwillumbah;
  - iv. South Murwillumbah Levee located along the eastern bank of the Tweed River.
  - v. Quarry River Road Levee protects a part section of the of the industrial area located west of Quarry Road (17).
  - vi. Tweed Heads South Levee located along the northern foreshore of Terranora Creek (3) (2).
  - vii. The Seabreeze Levee is situated along Cudgera Creek to protect the Seabreeze Estate at Pottsville
- b. Each levee is further described within Part 2 - Specific Risk Areas
- c. Levee locations will be shown on Maps 6, 10 and 16 once they have been uploaded into GIS.
- d. The areas downstream of Byangum and Boat Harbour are generally protected by rural levees. Upstream of Murwillumbah, local pooling occurs behind rural levees in areas of the floodplain between Murwillumbah, Byangum and Boat Harbour, which occurs about once a year. Overtopping of these rural levees from the Tweed River occurs once every two years on average.
- e. Additional flood mitigation measures including flood gates, backwater devices and the construction of drainage systems have also been undertaken within the catchment (2).
- f. There are no prescribed detention basins within the Tweed Shire (3).

## 1.8 EXTREME FLOODING

- a. The extent of the modelled Probable Maximum Flood (PMF) is significant within the Tweed Valley, with very high depths throughout some parts of the LGA. There are over 15,000 properties having some level of property flood inundation during a PMF event (2). Many more would be affected by isolation. Flood depths and flows would be high, and flood waters may rise quickly, with short warning periods, causing both extensive inundation and isolation (18).
- b. Within the Tweed Coastal Creeks there are up to 3,130 properties (8,347 people) are located within the PMF extent with 385 properties (1,557 people) at risk during a 1% AEP event. As with the Tweed River Valley, many locations can be flooded in relatively

frequent events with 79 properties (310 people) at risk during a 5% AEP flood event (6).

## **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. UKI TOWN MAP
- b. Whilst no areas in the Tweed Valley have been identified by the NSW Government as Coastal Hazard “Hot Spots,” there are still significant areas of the coastline where coastal processes may cause threat to property or recreation space, particularly in a severe oceanic storm event (19).
- c. Further detail regarding coastal erosion can be found in sections 2.17 to 2.21.

## 2 EFFECTS ON THE COMMUNITY

### 2.1 TWEED SHIRE COMMUNITY PROFILE

- a. In the 2021 census, approximately 97,392 people live in Tweed Shire with 26.5% of the population aged over 65 years and 16.5% under 15 years of age. It has an indigenous population of 4.4%.
- b. Table 5 shows the 2021 'usual resident' counts for key statistics within the Tweed Shire Local Government Area.
- c. Please note that key community statistics are also provided for each sector in sections 2.2 – 2.16.

**Table 5: Census of Population and Housing data (2021)**

Census Description	Tweed Shire LGA	Tweed Heads	Murwillumbah	Pottsville	Burringbar	Cudgen
<b>Total Persons</b>	<b>97392</b>	<b>9176</b>	<b>9,812</b>	<b>7209</b>	<b>878</b>	<b>952</b>
Aged 0-4 yrs.	4623	396	470	456	56	57
Aged 5-14 yrs.	11461	609	1291	1232	94	149
Aged 65 + yrs.	25881	3298	2430	1499	165	156
Of Indigenous Origin	4329	277	355	250	38	58
Who do not speak English well	269	53	34	12	4	4
Have a need for assistance (profound/severe disability)	7241	780	824	422	35	36
Living alone (Total)	10,812	1590	1150	504	65	47
Living alone (Aged 65+)	6356	970	617	271	25	23
Residing in caravans, cabins or houseboats or improvised dwellings	1006	9	28	58	0	0
<b>Occupied Private Dwellings (Households)</b>	<b>37602</b>	<b>4149</b>	<b>3757</b>	<b>2508</b>	<b>299</b>	<b>310</b>
No Motor Vehicle	2,181	446	256	57	3	8
Caravan, cabin, houseboat or improvised dwell	699	6	16	31	0	0
Rented via State or Housing Authority	812	6	127	18	0	5
Rented via Housing Co-Op or Community Church Group	242	6	36	3	0	0
<b>Unoccupied Private Dwellings</b>	<b>3892</b>	<b>679</b>	<b>273</b>	<b>223</b>	<b>39</b>	<b>12</b>
Average persons per occupied dwelling	2.4	2	2.4	2.7	2.6	2.9
Average vehicles per occupied dwelling	1.8	1.5	1.6	1.9	2.23	2.2

<b>Census Description</b>	<b>Hastings Point</b>	<b>Nunderi</b>	<b>Tumbulgum</b>	<b>Tyalgum</b>	<b>Uki</b>
<b>Total Persons</b>	<b>661</b>	<b>696</b>	<b>454</b>	<b>521</b>	<b>685</b>
Aged 0-4 yrs.	10	34	29	46	19
Aged 5-14 yrs.	33	73	68	69	99
Aged 65 + yrs.	367	171	64	103	16
Of Indigenous Origin	21	16	34	27	6
Who do not speak English well	0	0	0	0	0
Have a need for assistance (profound/severe disability)	56	40	18	37	37
Living alone (Total)	155	29	24	47	51
Living alone (Aged 65+)	105	9	7	22	25
Residing in caravans, cabins or houseboats or improvised dwellings	39	0	0	0	0
<b>Occupied Private Dwellings (Households)</b>	<b>330</b>	<b>240</b>	<b>156</b>	<b>184</b>	<b>226</b>
No Motor Vehicle	25	0	3	5	6
Caravan, cabin, houseboat or improvised dwell	22	0	0	0	0
Rented via State or Housing Authority	0	0	0	0	0
Rented via Housing Co-Op or Community Church Group	0	0	0	0	0
<b>Unoccupied Private Dwellings</b>	<b>80</b>	<b>10</b>	<b>11</b>	<b>13</b>	<b>29</b>
Average persons per occupied dwelling	1.7	2.7	2.6	2.5	2.5
Average vehicles per occupied dwelling	1.3	2.4	2.2	2.1	2

- d. For emergency management purposes, the Tweed Shire Council area has been broken up divided into 15 sectors which have been numerically ordered in the general direction of river flow. Each sector can experience significant flood threats and emergency response should not be considered in isolation of the other sectors.

Table 6: Sectors and Catchments

Sector	Name of Sector	GEMS ID	Major Catchment
1	Uki	46512	Upper Tweed
2	Tyalgum	46519	Upper Tweed
3	Chillingham	46518	Upper Tweed
4	Murwillumbah/ South Murwillumbah	46522	Middle Tweed
5	Tumbulgum / North Tumbulgum / Condong	46520	Middle Tweed
6	Chinderah/Kingscliff	46515	Lower Tweed
7	Banora Point	46521	Lower Tweed
8	Terranora	46523	Lower Tweed
9	Bilambil and Duroby	46517	Lower Tweed (Terranora Broadwater)
10	Tweed Heads South	46526	Lower Tweed (Junction Broadwaters and Tweed River)
11	Tweed Heads West	46516	Lower Tweed (Terranora Broadwater and Cobaki Broadwater)
12	Tweed Heads	46524	Lower Tweed (Junction Broadwaters, Tweed River and Ocean)
13	Fingal Head	46525	Lower Tweed River junction with Ocean
14	Bogangar/ Cabarita Beach / Hastings Point	46514	Tweed Coastal Creeks
15	Pottsville / Wooyung	46513	Tweed Coastal Creeks

## SPECIFIC RISK AREAS – FLOOD

### 2.2 UKI

#### 2.2.1 Community Overview

- a. The Uki Sector is located within the upper reaches of the Tweed River Catchment.
- b. The Uki sector includes the suburbs of Uki, Dum Dum, Dunbible, Stokers Siding, Smiths Creek, Chowan Creek, Rowlands Creek, Commissioners Creek, Doon Doon, Terragon, Midginbil, Kunghur Creek, Kunghur, Mount Burrell, Cedar Creek, Byrill Creek and part of Mount Warning.
- c. The major settlement is in the rural village of Uki, which is located on the southern bank of the Tweed River approximately 20km southwest of Murwillumbah along the Kyogle Road, upstream of the confluence with Smiths Creek. It has a population of 665 people living within 226 dwellings (20).
- d. Uki is shown on Map 3.

#### 2.2.2 Characteristics of flooding

- a. Uki can be affected by riverine flooding from the Tweed River, as well as flash flooding.

#### 2.2.3 Flood Behaviour

- a. The river has extremely high banks and there are limited local effects before 6.1 metres on the Uki gauge (201900 - 58617).
- b. Areas of Uki along the banks of the river can experience inundation and isolation during flood events, with rural areas experiencing isolation prior to this.

#### 2.2.4 Classification of Floodplain

- a. Townships in the Upper Tweed, including Uki, have Rising Road access out of the PMF extent into the hinterland (2).

#### 2.2.5 Inundation

- a. Gauges exist in the Uki sector at Uki (201900 - 58167), as well as Palmers Road (201015 - 558018), which is approximately 6.5km upstream, and can give an indication of likely flows to Uki (2).
- b. Floodwaters begin to breach the riverbanks at Uki above 6.1m on the Uki gauge.
- c. Around 20 properties in low lying parts of Uki can be progressively flooded from around 6.9m on the Uki gauge. This includes properties in:
  - i. Kyogle Road (near Old Convent Road)

- ii. Kyogle Road (river side)
  - iii. North Norco Street
  - iv. Meadow Place
  - v. Smiths Creek Road (3)
- d. The table below shows the number of properties experiencing over-ground flooding during select design flood events in the Uki sector. It should be noted this does not represent over-floor flooding.
- e. Within the sector, the greatest number of properties experiencing over ground flooding in the events modelled below are within the suburbs of Uki and Stokers Sliding.

**Table 7: Estimated number of properties inundated over ground in the Uki Sector related to select design flood events (2)**

Design Event (%AEP)	No. Properties with Over-ground Flooding
20% AEP	716
5% AEP	794
1% AEP	842
0.2% AEP	859
PMF	990

### 2.2.6 Isolation

- a. Areas and properties around Uki can become isolated when local roads are cut due to flash flooding or riverine flooding, as well as landslips affecting road access.
- b. Isolation of rural areas in the Uki sector may begin from approximately 1.5m at the Uki gauge (201900 - 58167), or 1.75m at the Palmers Rd gauge (201015 - 558018), when the Palmers Rd causeway can flood, causing short term isolation for approximately 9 rural properties and a local earth moving business. At 2m at the Uki gauge, local creek flooding can cause short term isolation for rural properties in Cedar Creek, Pretty Gully and Byrrell Creek.
- c. Access to Uki from Murwillumbah is cut when Smiths Creek Road and Roberts Bridge closes at around 6.9m on the Uki gauge.
- d. Dallis Park, of which lies between the Uki and Murwillumbah sectors, is isolated at around 6.9m on the Uki gauge when Rowlands Creek Road is closed. This affects 50-60 small acreage properties.
- e. The Mt Warning Rainforest Park, Mount Warning and several houses are isolated at around 6.9m on the Uki gauge when Dum Dum Bridge over the Tweed River is closed (21).



### **2.2.7 Flood Mitigation Systems**

- a. There are no known flood mitigation systems in Uki (3).

### **2.2.8 Dams**

- a. Clarrie Hall Dam lies 4km upstream of Uki and would impact Uki and surrounds in the event of a dam failure (9).
- b. The flood wave travel time from Clarrie Hall Dam to Uki is estimated to be approximately 30 minutes in a Sunny Day Dambreak, 21 minutes in a Dam Crest Failure Dambreak and 23 minutes in a PMF Dambreak (9).
- c. Korrumbyn Creek Dam lies within the Uki sector, with downstream areas located in Korrumbyn Creek Picnic area and carpark.
- d. See section 1.3 for further detail.

### **2.2.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### **2.2.10 Other Considerations**

- a. The entire village of Uki is a Heritage Conservation area which includes some historical sites (3).
- b. There are a significant number of people living in unrecorded multiple occupancy dwellings in the Uki area. Accurate statistics for the number of people and dwellings are not held and it is likely that telecommunications may be limited.

## 2.3 TYALGUM

### 2.3.1 Community Overview

- a. The Tyalgum sector is located in the upper reaches of the Tweed River catchment, along the Oxley River.
- b. It includes the areas of Tyalgum, Tyalgum Creek, Limpinwood, Back Creek, Brays Creek, Mebbin, Eungella, Pumpenbil and part of Mount Warning. The sector has a population of approximately 1063 people, with 22.3% aged 65 or over, and a 3.1% indigenous population.
- c. Main settlement in the area is focused around the rural village of Tyalgum, which is located in the Tweed hinterland on the western bank of Tyalgum Creek where it joins the Oxley River. It is approximately 24kms west of Murwillumbah, just northwest of Mount Warning on Tyalgum Road (3).
- d. The population of Tyalgum is 521, however of those, just 206 are located in the village area. The remainder of the population are scattered throughout the sector, with approximate populations of 129 in Tyalgum Creek, 234 in Limpinwood, 27 in Back Creek, 119 in Brays Creek and 350 in Eungella (20).
- e. Tyalgum is shown on Map 4.

### 2.3.2 Characteristics of Flooding

- a. Tyalgum is affected by flash flooding from Tyalgum Creek and the Oxley River.
- b. Localised overland flooding may also occur in this area as a result of heavy localised rainfall.

### 2.3.3 Flood Behaviour

- a. Flood velocities in Tyalgum can be high and are likely to be destructive in places (3).

### 2.3.4 Classification of Floodplain

- a. Tyalgum has Rising Road Access out of the PMF extent into the hinterland (2).

### 2.3.5 Inundation

- a. No Bureau of Meteorology warning or forecast gauge exists for the Tyalgum Sector, however there is a gauge at Tyalgum Bridge (558088) which may provide some indication of inundation.
- b. The table below shows the number of properties experiencing over-ground flooding during select design flood events in the Tyalgum sector. It should be noted this does not represent over-floor flooding.

- c. Within the sector, the greatest number of properties experiencing over ground flooding in the events modelled below are within the suburbs of Tyalgum, Limpinwood and Eungella.

**Table 8: Estimated number of properties inundated over ground in the Tyalgum Sector related to select design flood events (2).**

Design Event (%AEP)	No. Properties with Over-ground Flooding
20% AEP	359
5% AEP	425
1% AEP	466
0.2% AEP	472
PMF	540

### 2.3.6 Isolation

- a. The township can be isolated for up to 48 hours due to flooding when the EJ Batrim Bridge closes at 8.5m on the Tyalgum (558088) gauge.
- b. This area is also prone to landslip which could potentially isolate it for longer periods (3).

### 2.3.7 Flood Mitigation Systems

- a. There are no known flood mitigation system located in Tyalgum. (3)

### 2.3.8 Dams

- a. There are no dams located upstream of Tyalgum. (3)

### 2.3.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### 2.3.10 Other Considerations

- a. The water supply at Tyalgum is sourced from the weir pool on the Upper Oxley River, if compromised during a flood event this would impact on the town water supply.
- b. There are a significant number of people living off the grid in multiple occupancy dwellings in the Tyalgum area. Accurate statistics for the number of people and dwellings are not held and it is likely that telecommunications may be limited.

## 2.4 CHILLINGHAM

### 2.4.1 Community Overview

- a. The Chillingham sector includes the suburbs of Numinbah, Hopkins Creek, Zara, Upper Crystal Creek, Chillingam, Crystal Creek, North Arm, Nobbys Creek, Dungay, Kynnumboon, Tygalgah, Dulgiugan, Urliup, Tomewin, Glengarrie, Upper Duroby, Carool, Piggabeen and part of Cobaki.
- b. The total population of the Chillingham sector is approximately 1900. 19.6% are aged 65 or over, and 23.5% are aged 14 or under (20).
- c. Chillingham is shown on Map 5.

### 2.4.2 Characteristics of flooding

- a. Chillingham is considered to have a high potential for severe flash flooding with rapid onset water rises (3).

### 2.4.3 Flood Behaviour

- a. Rainfall in the upper catchment area, particularly the Bald Mountain area can significantly impact on the Chillingham village, with flash flooding often preceding riverine inundation. Rainfall gauges in Bald Mountain, Numinbah and Couchy Creek may provide an indication of rainfall in the catchment area.
- b. Over 350mm of rain fell in Bald Mountain area over a 24hr period in January 2008 which caused significant flash flooding at Chillingham (3).
- c. Areas in the Chillingham sector can be classified as flood storage during modelled events as frequent as a 5% AEP, particularly the Tygalgah area, which is also classified a H4-5 hazard, indicating high velocity flow and considered unsafe for people and vehicles. Areas situated along the Rous River, including parts of Kynnumboon and Nobbys Creek can also be high hazard flood ways or flood storage areas in events from the 5% AEP (2).
- d. Areas of the Chillingham sector which lie outside the flood extent may be indirectly affected due to closure of local and main access roads, causing them to become isolated.

### 2.4.4 Classification of Floodplain,

- a. Chillingham and Crystal Creek have flood free land outside of the PMF extent, allowing for evacuation from North Arm via Numinbah Road.
- b. The Chillingham sector can be further broken into down into subsector for floodplain classification, these classifications are as follows:

### 2.4.5 Inundation

- a. The Chillingham gauge (201008 - 058011) is located on the Rous River at Chillingham Bridge. Further downstream there are the Boat Harbour gauges (Boat Harbour - Nobbys Creek 201005 – 558077 and Boat Harbour- Rous River 201906 -058204) and the Kynnumboon gauge (201422 - 558051). However, these are not Bureau of Meteorology forecasting gauges. Rainfall gauges in the Bald Mountain, Couchy Creek and Numinbah areas may be utilised as described in section 2.4.3.
- b. The table below shows the number of properties experiencing over-ground flooding during select design flood events in the Chillingham sector. It should be noted this does not represent over-floor flooding.

**Table 9: Estimated number of properties inundated over ground in the Chillingham sector related to select design flood events (2).**

Design Event (%AEP)	No. Properties with Over-ground Flooding
20% AEP	762
5% AEP	804
1% AEP	826
0.2% AEP	841
PMF	951

### 2.4.6 Isolation

- a. This area can become isolated by road within 2-3 hours and can remain so for 2-3 days.
- b. Minor flooding closes most access roads with the North Arm Road and Numinbah Road cutting early in minor and flash flooding events. Aerial movement in the area is usually restricted in the early stages of a flood due to poor visibility and low cloud cover (3).
- c. Nobbys Creek Road may close at approximately 3m at the Boat Harbour (Nobbys Creek) gauge (201005 – 558077) which may cause isolation to properties along this road. At 4.5m Numinbah Rd is closed to the east and west of Boat Harbour Bridge, and North Arm Rd is closed, affecting access between Murwillumbah and Chillingham (22).

### 2.4.7 Flood Mitigation Systems

- a. There are no known flood mitigation systems located in Chillingham. (3)

### 2.4.8 Dams

- a. There are no dams upstream of Chillingham. (3)

### 2.4.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Valley LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

#### **2.4.10 Other Considerations**

- a. The possibility of debris banking up against the bridge makes it difficult to relate spot heights to the Chillingham gauge, consequently little flood intelligence exists.

## **2.5 MURWILLUMBAH, SOUTH MURWILLUMBAH AND BRAY PARK**

### **2.5.1 Community Overview**

- a. The Murwillumbah, South Murwillumbah and Bray Park sector includes the suburbs of Murwillumbah, Bray Park, South Murwillumbah and part of Byangum.
- b. Murwillumbah is situated on the Tweed River approximately 8km east of the junction of the Tweed and Oxley Rivers.
- c. Murwillumbah has a population of 9812 people living in 3757 dwellings,
- d. South Murwillumbah has a population of 1064 people living in 395 dwellings.
- e. Bray Park has a population of 822 people living in 296 dwellings (20).
- f. Murwillumbah, South Murwillumbah, and Bray Park are shown on Map 6.

### **2.5.2 Characteristics of flooding**

- a. Murwillumbah is primarily affected by riverine flooding from the Tweed River.
- b. The Murwillumbah township is surrounded by several waterways, the Tweed River, Mayal Creek, and the Rous River, with Lavender Creek draining through and discharging to the Tweed River under Commercial Rd.
- c. Murwillumbah CBD, East Murwillumbah, South Murwillumbah and Bray Park are protected by levees. The South Murwillumbah levee is lower in height and South Murwillumbah therefore floods more frequently.
- d. Behind the levee in the Murwillumbah CBD, Knox Park is subject to flash flooding, with Hartigan Street being the lowest point. The intersection of Nullum and Wollumbin St becomes impassable with alternate routes being available along Byangum Rd and Brisbane Street.
- e. Although the Rous River does not join the Tweed River until near Tumbulgum, flooding in this tributary can affect Murwillumbah from Mayal Creek, which connects the two rivers immediately downstream of Murwillumbah.
- f. Ponding can occur in the following locations:
  - i. Bray Park Basin east of Kyogle Road;
  - ii. Football fields Queensland Road;
  - iii. Knox Park Nullum Street;
  - iv. Football fields Willward Park;
  - v. South Murwillumbah Black's Drain;
  - vi. South Murwillumbah adjacent to Holland Road and Wardrop Street; and
  - vii. Condong Creek Wardrop Valley (3).

### 2.5.3 Flood Behaviour

- a. In Murwillumbah, the effects of flooding are varied. Much of Murwillumbah is initially protected from flooding by a number of levees, which provide varying levels of flood immunity, as discussed in section 2.5.7. However, levels of flooding behind each levee may also be impacted by the ability of the local stormwater system to drain under gravity to the river, which is impeded when river levels have risen (23).
- b. During Riverine flooding, floodways in Murwillumbah and South Murwillumbah are located adjacent to the main rivers and in the Dunbible Creek, South Murwillumbah and Bray Park basins (3).
- c. Bray Park initially acts as a storage basin, and once full, acts as a flow path. This may occur from approximately the 20% AEP flood and larger, with depths up to 6 metres and velocities up to 0.5 m/s in the 1% AEP flood event.
- d. Flood storage areas include parts of the Rous River floodplain, South Murwillumbah basin and Murwillumbah business centre.
- e. Inundation in the 1% AEP event in the CBD area is minimal, however widespread flooding occurs in the 0.2% AEP event after the levees are completely overtopped (2).
- f. South Murwillumbah is affected by flooding in small events with depths up to 4 metres in some low-lying areas (between Wardrop Street and Tweed Valley Way, and River Street) in the 20% AEP event. The South Murwillumbah levee provides some protection but begins to overtop when levels at the Murwillumbah Bridge gauge (201465 – 558067) reach approximately 4.8 m AHD.
- g. The airport acts as the major flow path from South Murwillumbah to Condong Creek during flood events Velocity-depth products are greater than 0.3 m<sup>2</sup>/s across much of South Murwillumbah during the 1% AEP flood event (2).

### 2.5.4 Classification of Floodplain

- a. The CBD is inundated in a PMF event but has Rising Road Access to the west. However, once people are evacuated to the west, there is no connection to other townships, and they become stranded.
- b. There is a portion of Murwillumbah which is a High Flood Island, north of Wollumbin Street bridge, that is not impacted in a PMF event but surrounded by water. This region is fully isolated as the roads out of the area are fully submerged.
- c. South Murwillumbah is fully impacted in the PMF event but has rising road access to the south/ south-east towards the border of the Tweed catchment (2).



### 2.5.5 Inundation

- a. This area utilises the North Murwillumbah gauge (201420 -58186) for Bureau of Meteorology flood forecasting purposes. Gauges also exist at Murwillumbah Bridge (201465 - 558067) and Bray Park Weir (201455 - 558065).
- b. Of note, the SES Murwillumbah Unit utilises the Murwillumbah Bridge gauge (201465 - 558067) as the North Murwillumbah gauge (201420 - 58186) has been noted to over-read by up to 30-40cm during major events (24).
- c. River levels at Uki provide early warning of possible effects at Murwillumbah. Readings of 5m at the Uki gauge (201900 - 058167) indicate possible significant flooding at Murwillumbah 2 to 3.5 hours later (21).
- d. **Murwillumbah:** Inundation behind the levees can occur in events as frequent as a 20% AEP, with the most susceptible area in the vicinity of Knox Park, as well as low lying sections of Proudfoots Lane and Williams St (25).
- e. At the peak of the 1% AEP flood event, inundation in Murwillumbah CBD is minimal with small patches near Princes Street, Princes Lane and King Street. There is a bit of inundation near the Dorothy Street levee near the Murwillumbah Leagues Club. Near the northern end of the Murwillumbah CBD levee near Mayal Creek there is a pocket of inundation behind the levee on Tumbulgum Road.
- f. In a 0.2% AEP event both the Dorothy Street Levee and the Murwillumbah CBD levee are completely overtopped leading to widespread flooding behind the levees (2).
- g. **South Murwillumbah** is predicted to be fully inundated during the 1% AEP event from both Tweed River breakout and local runoff. Peak depths are up to 5 metres in low lying areas, and up to 1.5 metres over Tweed Valley Way (Bray Street) (2).
- h. Initial overtopping of the South Murwillumbah levee occurs at Alma St, a known low point. Time to overtopping from onset of rainfall in a modelled flood event shows overtopping can occur from 32 hours in a more frequent event, in the vicinity of 20% AEP, to as little as 15 hours in 0.2% AEP event (17). These times are modelled results only and may vary in subsequent events.

**Table 10: Estimated number of properties inundated above floor level and over ground in Murwillumbah, South Murwillumbah and Bray Park related to select design flood events (2).**

Design Flood Event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	13	884
5% AEP	63	1348
1% AEP	186	1622
0.2% AEP	335	2007
PMF	1409	2700

### 2.5.6 Isolation

- a. The entire township of Murwillumbah becomes isolated in flood events. Tweed Valley Way closes at several locations, including between Tumbulgum and Murwillumbah when flood levels exceed 3.5 - 4.0m on the North Murwillumbah gauge (201420 - 58186) (3).
- b. Behind the CBD levee, major ponding at Knox Park will flood nearby Nullum St, with a number of surrounding roads becoming progressively inundated. This may isolate a significant number of properties between Knox Park and Commercial Rd in large floods (17).
- c. Behind the East Murwillumbah levee, modelling has predicted major access roadways, such as Murwillumbah St and Reynolds St, may become cut approximately 27 hours after the initial onset of rainfall in a 1% AEP event. The time to these streets becoming cut off is modelled to be shorter in events larger than a 1% AEP (25).
- d. Once inundation of South Murwillumbah occurs it would be isolated for at least 12 hours (>40 hours during a 0.2% AEP flood).
- e. Once inundation of South Murwillumbah occurs, it would typically take at least 3 days for the floodwater to recede across most of the area. During the 0.2% AEP flood, it could take more than 4 days for floodwaters to recede (17).

### 2.5.7 Flood Mitigation Systems

**Table 11: Levees in Murwillumbah summary of information**

<b>Murwillumbah CBD Levee (Commercial Road Levee)</b>	
Location	The Murwillumbah CBD Levee runs from the sports fields to the east of Murwillumbah High School towards the Tweed River. The levee then runs north along Commercial Rd continuing along Tumbulgum Rd to where it ties into high ground near the Murwillumbah YHA.
Type of Levee	Total length: 1.65km, being part grass covered earthen and part concrete wall (approx. 1.2km) with non-removable horizontal sliding flood gates.
Owner	Tweed Shire Council
Design Height and freeboard	Estimated to provide protection up to a 1% AEP event. Overtopping may occur at heights greater than 6.2m AHD on the North Murwillumbah gauge (201420 - 58186) and 5.8m AHD on the Murwillumbah Bridge gauge (201465 - 558067) (26).
Overtopping Height	The levee is predicted to commence overtopping once heights exceed 6.2m AHD on the North Murwillumbah gauge (201420 -58186). However minor overtopping has previously occurred at this height.
No. of properties protected	Murwillumbah CBD and residential properties to the west of Commercial Rd (3).
Known low points	Initial overtopping is predicted to occur near Murwillumbah High School sports fields and approximately 130m west of Commercial Rd.

Location and sequence of inundation	<p>Prior to overtopping backwater flooding within the levee may occur as a consequence of flooding along Lavender Creek.</p> <p>Initial overtopping is predicted to occur near Murwillumbah High School sports fields and approximately 130m west of Commercial Rd.</p> <p>Modelled events show overtopping may occur approximately 33hours after initial rainfall onset in a 1% AEP event, and 22 hours in a 0.2% AEP event.</p> <p>Once overtopping commences, water levels will rise quickly, peaking in 2.5-5 hours. These observations are based on design floods, and actual times may vary.</p> <p>It may take up to 4 days for the area behind the levee to fully drain post a 0.2% AEP peak (25).</p>
Consequences of levee overtopping or failure	Inundation of CBD and properties behind the levee. Note high ground is available in parts of Murwillumbah which is a High Flood Island (3).
Deficiencies	No known deficiencies.

#### East Murwillumbah Levee

Location	The East Murwillumbah Levee begins to the east of the Murwillumbah YHA backpackers between the Tweed River and Tumbulgum Rd. Once it reaches Mayal Ck it continues along the creek to the north and then west along George St.
Type of Levee	Total length: 1.3km with concrete wall (for approx. 275m) and earthen for the remainder.
Owner	Tweed Shire Council
Design Height and freeboard	Raised to the old 1% AEP flood level in 2006. Estimated to protect to approx. 0.2m below this level, which is equivalent to approximately 6.4m AHD on the North Murwillumbah gauge, with overtopping commencing at 6.5m.
Overtopping Height	During the 2017 flood event which reached 6.2m on North the Murwillumbah gauge (201420 - 58186) the East Murwillumbah levee experienced minor overtopping by about 300mm at the peak of the event (28). This is lower than the previously expected overtopping height of 6.5m AHD (3).
No. of properties protected	Residential properties in East Murwillumbah and the Essential Energy Electrical substation.
Known low points	The crest elevation drops to 5.1m AHD near Murwillumbah East Primary School (25).
Location and sequence of inundation	<p>Levee overtopping time in a 0.2% AEP flood event is estimated at 26.4 hours from the start of the rainfall event, with a 15.6 hour duration of overtopping. This is a guide only and cannot be used as exact timing.</p> <p>It is modelled that it would take approximately 24 hours for the area behind the levee to drain once it passes its peak stage in the 0.2% AEP event (25).</p>
Consequences of levee overtopping or failure	During a flood equivalent to a 0.2% AEP, the vast majority of properties behind this levee would be inundated (25).
Deficiencies	No known deficiencies.

<b>Dorothy Street Levee</b>	
Location	The Dorothy St – William St Levee surrounds the Murwillumbah Sewage Treatment Plant and extends east towards Murwillumbah St.
Type of Levee	Partial levee. The Dorothy Street Levee comprises a grassed earthen embankment.
Owner	Tweed Shire Council
Design Height and freeboard	The crest height is located at an elevation of 4.9m AHD and has been estimated to provide protection in excess of a 1% AEP event, or 4.8m AHD on the Kynnumboon gauge (201422 - 558051).
Overtopping Height	Overtopping height is estimated to be 4.8m AHD at the Kynnumboon gauge (201422 - 558051) (26).
No. of properties protected	Murwillumbah Sewage Treatment Plant and residential properties in the nearby area (13).
Location and sequence of inundation	The area behind the levee is not predicted to be exposed to significant flow velocities, as it is impacted by backwater inundation from the Rous River. A pump station is to be constructed in 2024 (29).
Consequences of levee overtopping or failure	During the 2017 flood event the Dorothy St Levee overtopped by about 300mm. This combined with significant local catchment flooding around Brothers Leagues Club filled this basin. The leagues club and several properties around William St were impacted by water (25).
Deficiencies	No known deficiencies.

<b>South Murwillumbah Levee</b>	
Location	The South Murwillumbah Levee is located between the Tweed River and River St on the eastern side of the river. It extends from Smith St to the western end of Prospero St.
Type of Levee	The levee is an earthen levee.
Owner	Tweed Shire Council
Design Height and freeboard	Originally designed to protect to approx. the 20% AEP flood but estimated to protect to approx. 0.6m below the 20% AEP event. The levee crest height varies from 4.8m AHD to 5.25m AHD.
Overtopping Height	Overtopping is expected to begin when the North Murwillumbah gauge (201420 - 58186) reaches approximately 4.85m AHD (27) (30).
No. of properties protected	South Murwillumbah commercial district and residential properties in South Murwillumbah. The South Murwillumbah levee protects about 150 houses and a population of about 400.
Known low points	A low point causes initial overtopping near Alma Street, at which point the levee has an elevation of approximately 4.4m AHD.
Location and sequence of inundation	Prior to the levee overtopping water will come across Budd Park and Alma Street into the industrial and then the urban area at approximately 3.2 metres on the North Murwillumbah gauge (201420 - 58186). The earthen section of

	<p>the levee 60m west of River St will then overtop, followed by a location 50m southwest of the southernmost tip of River St.</p> <p>Once overtopped, floodwaters move southwards towards Prospero St, and continue south. After the second location is overtopped west of River St, floodwaters move quickly inundating River Rd, and River St near Colin St.</p>
Consequences of levee overtopping or failure	<p>The basin behind the levee fills quickly once overtopping occurs, and all flood liable properties behind the levee would be inundated.</p> <p>River St would also be exposed to velocities over 1.5m/s, affecting a main evacuation route (17).</p>
Deficiencies	<p>In the March 2017 event, which reached 6.3m on the North Murwillumbah gauge (201420 - 58186), the South Murwillumbah levee overtopped by around 2m, flooding South Murwillumbah. River flows caused major scour on the river side of the levee. North of Colin St the levee breached when a large tree collapsed. Water flows through South Murwillumbah towards the storage basin behind the industrial estate were high velocity and caused significant damage to properties as well as eroding large sections of the railway embankment.</p> <p>Work has since been completed to restore the levee design protection level of 20% AEP.</p>

<b>Quarry Road Levee</b>	
Location	The Levee extends in a northerly direction from elevated ground near Airfield Avenue along the eastern edge of the Murwillumbah Airfield. The levee then “turns” east near Condong Creek and meets up with the higher ground formed by Quarry Road before continuing east along the southern edge of Condong Creek for an additional 350m where it joins higher ground.
Type of Levee	The levee is a grass lined earthen embankment.
Owner	Tweed Shire Council
Design Height and freeboard	The levee crest is generally located above 4.8m AHD. However, the levee crest varies along its length; near Airfield Avenue approximately 4.5m AHD (though adjoining terrain is typically above 5m AHD), between Airfield Road and Quarry Road 4.8m AHD and 5.1m AHD, and East of Quarry Road 5.1-5.3m AHD.
Overtopping Height	<p>It is noted that the ground surface elevations near Airfield Avenue are generally no greater than 4.7 m AHD. Accordingly, the southern end of the levee affords a lower level of protection relative to the northern end of the levee and is the likely location where overtopping would first occur (17).</p> <p>Levee predicted to overtop once South Murwillumbah basin fills up, approximately a few hours after the North Murwillumbah gauge (201420 - 58186) exceeds 5.0m and fills very quickly once overtopped (29).</p>
No. of properties protected	The levee protects part of the industrial area west of Quarry Rd, South Murwillumbah.
Known low points	Southern end of the levee.

Location and sequence of inundation	It is expected that the southern end of the levee along Airfield Avenue will overtop first (17). The levee has no spillways or pumps (29).
Consequences of levee overtopping or failure	This is primarily an industrial area and evacuation should be possible before the North Murwillumbah gauge (201420 - 58186) reaches 4.8m AHD.
Deficiencies	No known deficiencies.

- a. The Bray Park levee to the southwest of Murwillumbah on the banks of the Tweed River is an agricultural levee at the southern end of the Murwillumbah levee that was constructed to 0.5 metres above natural ground level to compensate for increased upstream levels caused by the increase of wall levees in the main part of the Murwillumbah levee. (3).
- b. During rainfall events, runoff is collected via a piped stormwater system and discharged to the Tweed and Rous Rivers through pipes under the levee system. The outlets are fitted with flood gates which close when river levels rise.
- c. There are two council operated pumping stations in Murwillumbah to assist with drainage to pump local runoff from the Lavender Creek and CBD sub catchments to the Tweed River. This is designed to occur when the floodgates prevent the stormwater system draining under gravity. These pumps are located at Lavender Creek, with pump capacity increasing as certain trigger levels are reached in a water sensor chamber, and at Wharf St which is activated once water level in its pit reaches 3.315m AHD and is discharged into the Tweed River (25) (31).

### 2.5.8 Dams

- a. Clarrie Hall Dam lies upstream, with the flood wave extent modelled to reach Murwillumbah (8), with a Sunny Day Dambreak also expected to reach high depths and velocity at the Byangum Bridge.
- b. Flood wave travel time to upstream of the Byangum bridge is modelled at 1 hour 27 minutes on a Sunny Day Dambreak and 45-48 minutes in a Dam Crest Failure Dambreak without and with a PMF (9).
- c. More information can be found in section 1.3.

### 2.5.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Valley LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

**2.5.10 Other Considerations**

- a. Most fuel stations in the Murwillumbah area are located on Tweed Valley Way, which is inundated in major flood events.
- b. The Tweed District water supply is a run-of-river supply augmented by released from Clarrie Hall Dam. Raw water is drawn from upstream of Bray Park Weir, which is a salt-water barrage in the Tweed River. The weir has a level of 1.23mAHD and if overtopped, raw water may be contaminated by salt-water resulting in water quality incidents, as occurred in 2017 (2).
- c. Events occurring in Murwillumbah may mean an increased number of visitors to the area include;
  - i. The Murwillumbah Show in November with anticipated attendance of 5000+ people.
  - ii. White Claw Christmas Day Race in December.
  - iii. Murwillumbah Art Trials in May, with anticipated attendance of 2000+ people.
  - iv. The Kinship Festival in May, with anticipated attendance of 3500+ people.
  - v. World Environment Day in June, with anticipated attendance of 1500 people.

## 2.6 TUMBULGUM AND CONDONG

### 2.6.1 Community Overview

- a. The Tumbulgum and Condong sector includes the suburbs of Condong, Tumbulgum,, Eviron, Nunderi, Kielvale, Fernvale, Wardop Valley, Palmvale, Reserve Creek, Nunderi, Farrants Hill, Stotts Creek, Clothiers Creek, Reserve Creek, and part of Cudgera Creek.
- b. The sector has a total population of approximately 2505, living in 981 dwellings. Main areas of settlement within the sector are in Tumbulgum and Condong.
- c. **Tumbulgum** is located 10km downstream of Murwillumbah on the eastern bank of the Tweed River. The village is opposite the confluence of the Rous River. Tumbulgum has a population of 454 people, with 382 of those living in the residential village area. Tumbulgum has a 7.5% Indigenous population, with 14% of the population 65 and over (20). The Tweed Valley Way runs along the eastern border of the village, generally separating the village from agricultural activities.
- d. **Condong** is located 4km downstream of Murwillumbah. The village has a population of 314 living in 115 dwellings. It has a 2.9% Indigenous population, with 19.4% of the population under 14 years of age, and 15.2% over 65 (20).
- e. Tumbulgum and Condong are shown on Map 7.

### 2.6.2 Characteristics of flooding

- a. Tumbulgum and Condong are affected by riverine flooding from the Tweed and Rous Rivers. They are also impacted by overland flooding through the neighbouring cane fields. Flooding in Tumbulgum is also tidally influenced (2).

### 2.6.3 Flood Behaviour

- a. **Tumbulgum:** Initial flooding within Tumbulgum is generally from overland flooding through the cane fields from the west behind the houses. This is followed by riverine flooding from the Tweed and Rous Rivers to the east.
- b. As the Rous River joins the Tweed River at Tumbulgum the amount of riverine flooding is highly dependent on whether or not both rivers are in flood at the same time. Whilst the Murwillumbah gauge is a good indicator of flooding at Tumbulgum, gauges within the Rous River also need to be monitored to understand the potential for additional flood inputs from this catchment.
- c. Tweed River flows between Murwillumbah and Tumbulgum range from 1-1.5 hours, and Rous River flows between Chillingham and Tumbulgum range from 6-16 hours.
- d. In events larger than approximately 3.82m at the Tumbulgum gauge (201432 - 558014), Tweed Valley Way and the floodplain to the south become high-flow floodways (with velocity-depth products above 0.3m<sup>2</sup>/s) (3).



- e. Indicative rainfall triggers over the catchments for flood events are described below. However, depending on location of rainfall and other conditions, these should be used as a guide only (32).
  - i. 50-150mm over 1-3 days may lead to minor flooding
  - ii. 75-300mm over 1-3 days may lead to moderate flooding
  - iii. 300-450mm over 1-5 days may lead to major flooding (32).
- f. **Condong:** Based on modelling of flood events, during a 5% event, areas of Condong directly alongside the river are classified as flood fringe or unaffected, with surrounding areas classified as flood storage. By a 1%, the majority of Condong is classified as flood storage, with areas around the Sugar Mill becoming floodway (2) .

#### 2.6.4 Classification of Floodplain

- a. For emergency management purposes, the Tumbulgum and Condong are largely Low Flood Islands, with some rising road access in the south of the sector.

#### 2.6.5 Inundation

- a. **Condong:** Parts of Condong may be inundated in smaller events including the 20% AEP flood, however there is expected to be little inundation of property. In the 1% AEP flood, most of Condong is inundated apart from a small area around Maria Ct and Carmen Place. Peak depths are up to 2 metres in low lying areas, and up to approximately 1 metre over Tweed Valley Way. However, most buildings are located on higher ground along Tweed Valley Way where depths are lower (2).
- b. **Tumbulgum:** This area utilises the Tumbulgum gauge (201432 - 558014) for Bureau of Meteorology flood forecasting, with the Murwillumbah gauge (201420 – 58186) also utilised for warning and intelligence purposes. As stated above, flooding in Tumbulgum is affected by flows from both the Tweed and Rous Rivers, so it is important to monitor upstream gauges for both the streams.
- c. Tumbulgum may be inundated by more frequent flood events including the 20% AEP flood, which is equivalent to approximately 2.73m AHD at the Tumbulgum gauge (201432 - 558014). At the peak of the 20% AEP flood event, most of the town is inundated apart from small areas of higher ground, with depths up to 1.5 metres in low lying areas. During the 1% AEP flood event, which is equivalent to 4.04m AHD at the Tumbulgum gauge, the whole town is inundated, with depths up to 3 metres in low lying areas. Velocities through town are small. In events larger than the 1% AEP flood event, Tweed Valley Way and the floodplain to the south become high flow areas (2).

**Table 12: Estimated number of properties inundated above floor level and over ground in Tumbulgum and Condong Sector related to select design heights (2).**

Design Event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	9	689
5% AEP	21	761
1% AEP	66	844
0.2% AEP	127	867
PMF	460	1011

### 2.6.6 Isolation

- a. Access roads to both Condong and Tumbulgum have historically been inundated early in moderate to major flood events.
- b. Tumbulgum and Condong start to become isolated when the Tweed Valley Way is cut 3-4 hours after reaching 3.4 to 4m at the North Murwillumbah gauge (201402 - 58186) (Approximately 2m on the Tumbulgum gauge 201432 - 558014) (3).
- c. Terranora Rd, which provides access towards Banora Point and Tweed Heads, has historically been the last main access road to be cut off.
- d. Condong and Tumbulgum would require early evacuation due to closure of evacuation routes to Murwillumbah early in an event.

### 2.6.7 Flood Mitigation Systems

- a. At Condong, low riverside levees protect the sugar mill from low level flooding and all houses have floor levels above the major flood level. A 1% AEP flood would affect all residential and commercial premises, including the sugar mill.
- b. There are no flood mitigation systems for Tumbulgum. (3)

### 2.6.8 Dams

- a. Clarrie Hall dam is located upstream on the Tweed River, with modelled downstream flood wave predicted to reach Tumbulgum (8).
- b. See section 1.3 for more detail.

### 2.6.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Valley LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### 2.6.10 Other Considerations

- a. No additional considerations have been identified in this sector.

## 2.7 CHINDERAH AND KINGSCLIFF

### 2.7.1 Community Overview

- a. The Chinderah/Kingscliff sector includes the suburbs of Chinderah, Kingscliff, and the northern part of Cudgen. The sector has a population of approximately 9983 people, living in 4027 dwellings.
- b. **Chinderah** has a population of 1,639 people living in 973 dwellings and is located on the eastern bank of the Tweed River, just south of Barney's Point Bridge. 8.7% of the population are Indigenous population and 45.7% of the population are aged 65 or older.
- c. **Kingscliff** has a population of 8,355 people living in 4077 dwellings. 4.1% of the population are Indigenous, 25.6% are aged 65 and over, and 17.5% are under 14 (20).
- d. Chinderah and Kingscliff are shown on Map 8.

### 2.7.2 Characteristics of flooding

- a. Chinderah and West Kingscliff can experience flooding from both rainfall events over the Tweed River catchment causing riverine flooding and ocean storm surge, often during the same event.
- b. Flood extent in this sector can be influenced by tidal anomalies, storm surge and storm water flooding (3). The southern end of Kingscliff lies within the Tweed Coastal Creeks catchment, more specifically the Cudgen Creek catchment, and can also be susceptible to catchment flooding from this source.

### 2.7.3 Flood Behaviour

- a. **Chinderah:** Large areas of Chinderah experience flooding in the 5% AEP event with depths up to 1.5 metres in low lying areas adjacent to the Kingscliff drain (2).
- b. Chinderah village is adjacent to a fast-flowing section of the Tweed River. Flood flows through the village generally in a south to north direction and can have significant depth. Floodwaters will enter the floodplain at Stotts Island and return to the river at Chinderah (30).
- c. **Kingscliff:** The western edge of Kingscliff, extending approximately halfway from Sand Street to Kingscliff Street, is inundated in the 1% AEP flood event with depths up to approximately 1 metre in the lots, and 1.5 metres in the streets. Velocities are generally less than 0.01 m/s and velocity-depth products are less than 0.1 m<sup>2</sup>/s in the 1% AEP event in this area (2).
- d. In extreme events, flood levels in the Lower Tweed are controlled by constriction at the river mouth / entrance between Kingscliff and Fingal Head (13).

#### 2.7.4 Classification of Floodplain

- a. Parts of the Kingscliff community including the hills around Cudgen are High Flood Islands, however the majority of Kingscliff will be flooded during a PMF (30).
- b. Chinderah is a Low Flood Island with an Overland Escape Route to the west.
- c. For emergency management purposes, the Chinderah and Kingscliff sector can be further broken into down into subsector for floodplain classification, these classifications are as follows:

#### 2.7.5 Inundation

- a. This sector utilises the Chinderah gauge (558010), which is a Bureau of Meteorology Flood Forecasting gauge.
- b. **Chinderah:** Large areas of Chinderah experience flooding in the 5% AEP event with depths up to 1.5 metres in low lying areas adjacent to the Kingscliff drain. In the 1% AEP event, most of Chinderah is inundated with depths up to 2.5 metres (2).
- c. Chinderah begins to flood when river levels reach between 1.5m and 2.0m AHD on the Chinderah gauge and is inundated for between 1 and 2 days during a major flood (3).
- d. The lower parts of the village of Chinderah will begin to experience low-level flooding at river heights as low as 1.3m AHD on the Chinderah gauge (201426 - 558010), and significant flooding by 2.0m AHD (30).
- e. Above 3m AHD at Chinderah gauge (558010), most of Chinderah is inundated with depths up to 2.5 metres.
- f. **Kingscliff:** Low lying parts of Kingscliff begin to flood at major flood level around 2m AHD at the Chinderah gauge (558010).
- g. All of the area except for the hills around Cudgen to the south and the high sand dunes at the beachfront are inundated in the PMF event.
- h. The western edge of Kingscliff, extending approximately halfway from Sand Street to Kingscliff Street, is inundated in the 1% AEP flood event with depths up to approximately 1 metre in the lots, and 1.5 metres in the streets. Velocities are generally less than 0.01 m/s and velocity-depth products are less than 0.1 m<sup>2</sup>/s in the 1% AEP event in this area (2).

**Table 13: Estimated number of properties inundated above floor level and over ground in the Chinderah and Kingscliff sector related select design flood events (2).**

Design Flood Event	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	1	95
5% AEP	15	282
1% AEP	181	587
0.2% AEP	341	1021
PMF	1036	1444

### 2.7.6 Isolation

- a. Roads begin to flood in Chinderah during minor floods from around 1.3m on the Chinderah gauge (558010). The Pacific Motorway and Wommin Bay Road remain open during small events, however local access roads including Chinderah Road and Chinderah Bay Drive close early (6). By the major flood level (2m on the Chinderah gauge 558010) most of Chinderah is flooded with access only possible by boat.
- b. Kingscliff becomes cut off from Tweed Heads when the Pacific Motorway closes from above 2.2m on the Chinderah gauge (558010) (3).

### 2.7.7 Flood Mitigation Systems

- a. There are no flood mitigation systems in place for Chinderah or Kingscliff.

### 2.7.8 Dams

- a. Clarrie Hall Dam is located upstream on the Tweed River, however dam failure is not anticipated to cause any affects within the Chinderah or Kingscliff areas (8).

### 2.7.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.
- b. The new Tweed Valley Hospital site is located at 771 Cudgen Rd, Cudgen. It is expected to open to patients in early 2024. Development associated with the hospital is at or above the level of the PMF, with the operational capacity of the hospital expected to be protected during extreme flood events. The site has local access points off Cudgen Road that are flood free in events up to the PMF event, however roads connecting to Cudgen Rd may be flood impacted including the M1 and Tweed Coast Rd. Modelling has determined flood free access to Kingscliff from the hospital site is maintained up to a PMF level (33).

### 2.7.10 Other Considerations

- a. Events occurring in Kingscliff which may mean an increased number of visitors to the area include;
  - i. Kingscliff Triathlon in November with anticipated attendance of 3000-4000 people.
  - ii. Carols by the Coast in December with anticipated attendance of 2000+ people.
  - iii. Seas the Day Women's Surf Festival in May with anticipated attendance 1500-2000 people.
- b. The Barneys Point and Chinderah area have a large number of caravan parks and will see large increases in visitors during holiday periods. Many Caravans within the area are fixed, and are not able to be moved easily.

## 2.8 BANORA

### 2.8.1 Community Overview

- a. The Banora Sector includes the western parts of the suburbs of Banora Point and Tweed Heads South bounded by the Pacific Motorway to the east. It also includes the eastern portion of Terranora that borders Banora Point.
- b. **Banora Point** has a population of 16,460. 31.8% of the population is 65 years of age or older, and 15.2% is under 14. There is a 5.1% Indigenous population (20).
- c. **Tweed Heads South** has a population of 7941. 34% of the population is 65 years of age or older, and 13.5% is under 14. There is a 7.2% Indigenous population (20). Only part of Tweed Heads South lies within this sector as noted above.
- d. Banora Point is shown on Map 9.

### 2.8.2 Characteristics of flooding

- a. Banora Point can experience flash flooding due to runoff from local catchments, as well as riverine flooding from backwater flows from Terranora Broadwater or the Tweed River. Flooding can also be influenced by tides and storm surge (3).

### 2.8.3 Flood Behaviour

- a. Parts of **Banora Point** which lie within the Banora sector are expected to be largely flood free during a 1% AEP riverine flood as well as storm surge flooding. The Banora Point Golf Course provides flood storage in events larger than the 20% AEP, with depths between 1.5 and 2 metres in the 1% AEP event (2).
- b. Flooding in this sector can occur due to runoff from local catchments or backwater flows from the Terranora Broadwater or the Tweed River, making the area susceptible to local flash flooding (30).
- c. Inundation may occur due to stormwater flooding independent of riverine flooding, usually caused by shorter duration, high intensity local rainfall events (30).
- d. **Tweed Heads South** has a levee system which is designed to protect the floodplain to the west of the Tweed River. Levee overtopping may begin at the 5% AEP flood event. However, the area of Tweed Heads South within the Banora Sector is not in the modelled extent of the area protected by the levee and may experience inundation from runoff from local catchments or backwater flows from the Terranora Broadwater or the Tweed River as described above (34).

### 2.8.4 Classification of Floodplain

- a. The Banora Point sector has a High Flood Island to the north of the sector, the southern part of the sector has rising road access.

### 2.8.5 Inundation

- a. The Chinderah gauge (558010), is currently utilised for flood forecasting purposes for communities within this sector.
- b. **Banora Point:** During Riverine Flooding, no above floor inundation of property is expected until a flood equivalent to a 0.2% AEP.
- c. Banora Point is expected to be mostly flood free in the 1% AEP flood with the exception of the Kirkwood Road area which is inundated from Terranora Creek in the 5% AEP flood and larger.
- d. Note however, that this is only based on flooding from either storm surge or a catchment flood. It does not include areas inundated by stormwater flooding, usually caused by shorter-duration, higher-intensity local rainfall events, such as that which occurred in June 2005 (2).
- e. **Tweed Heads South:** Some of areas of Tweed Heads South are vulnerable to inundation in the 5% AEP event, along both Dry Dock Road and Minjungbal Drive. During a 1% AEP event, depth of inundation in residential areas are mostly between 0.5 and 1m. During the 1% AEP event most of the southern commercial area is flood free with the exception of some of the northern streets including Minjungbal Drive north of Machinery Drive (2).

**Table 14: Estimated number of properties inundated above floor level and over ground in the Banora Sector\* related to select design flood events (2).**

Design flood event (%AEP)	No. Properties with Over floor Flooding		No. Properties with Over-ground Flooding	
	Banora Point	Tweed Heads South*	Banora Point	Tweed Heads South*
20% AEP	0	0	172	55
5% AEP	0	0	270	95
1% AEP	0	256	486	1111
0.2% AEP	5	596	643	1314
PMF	1545	1394	2048	1792

*\*Note this data includes properties in Tweed Heads South, some of which may be located in the Tweed Heads South Sector.*

### 2.8.6 Isolation

- a. **Banora Point:** Flood free land is available in Banora Point during a PMF, however access is constrained from at risk properties in lower lying areas due to the lack of access roads, with residents unable to drive directly to the nearest high ground (12)
- b. **Tweed Heads South:** At risk areas of Tweed Heads South, may have key access routes cut off early in a flood event.



### **2.8.7 Flood Mitigation Systems**

- a. There are no specific flood mitigation systems within Banora Point.
- b. The Tweed Heads South Levee may provide some flood immunity up to a 5% AEP from flooding occurring from the Tweed River, however inundation of the area can occur from other sources, and the levee does not provide protection from Terranora Creek for the area of Tweed Heads South that is included in this sector.

### **2.8.8 Dams**

- a. Whilst Clarrie Hall Dam is upstream it is not expected to cause any impacts at Banora Point (8)

### **2.8.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Valley LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### **2.8.10 Other Considerations**

- a. There are a large number of aged care facilities and a relatively high percentage of the population identifying as having a need for assistance, or profound or severe core activity limitation (9.8% Banora Point and 11.9% Tweed Heads South (20) in the Banora sector.

## 2.9 TERRANORA

### 2.9.1 Community Overview

- a. The Terranora sector includes North Tumbulgum, Bungalora, and the parts of Terranora to the west of the intersection of Terranora Rd and Winchelsea Way.
- b. **North Tumbulgum** has a population of 238. 17.2% of the population is 65 years of age or older, and 21.4% is under 14. There is a 1.7% Indigenous population (20).
- c. **Bungalora** has a population of 73 living in 38 dwellings (20).
- d. **Terranora** has a population of 3365. 17.8% of the population is 65 years of age or older, and 21.2% is under 14. There is a 3.7% Indigenous population (20). Part of Terranora lies within the Banora sector as noted above.
- e. Terranora is shown on Map 10.

### 2.9.2 Characteristics of flooding

- a. **Terranora:** To the north of Terranora is the Terranora Broadwater and to the South the Tweed River both of which can be flooded due to riverine flooding with potential contributions from tidal influences and storm surge.
- b. **North Tumbulgum:** North Tumbulgum can be affected by riverine flooding from the Rous and Tweed Rivers, which join at Tumbulgum.

### 2.9.3 Flood Behaviour

- a. **Terranora:** The majority of the area remains flood free during a PMF (3).
- b. **North Tumbulgum:** At Tumbulgum, the Rous River joins the Tweed River. In both Tumbulgum and North Tumbulgum, the amount of riverine flooding is highly dependent on whether or not both rivers are in flood at the same time.
- c. Both Terranora and North Tumbulgum flooding will be tidally influenced (2).

### 2.9.4 Classification of Floodplain

- a. The Terranora sector largely has rising road access towards Bilambil Heights.

### 2.9.5 Inundation

- a. Bureau of Meteorology flood forecasting gauges exists at Tumbulgum (201432 - 558014) and Chinderah (558010).
- b. The majority of properties inundated within the sector are in North Tumbulgum, with some inundation of property in Terranora modelled in a PMF event. See the table below for more detail.

**Table 15: Estimated number of properties inundated above floor level and over ground in the Terranora sector related to select design flood events (2).**

Design Flood Event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	0	97
5% AEP	1	116
1% AEP	4	126
0.2% AEP	8	131
PMF	33	169

### 2.9.6 Isolation

- a. **North Tumbulgum:** At approximately 2m AHD at the Tumbulgum gauge (201432 - 558014), the main access routes out of North Tumbulgum are cut. This includes Terranora Rd, causing isolation for the area.
- b. **Terranora:** Whilst there is land above the PMF in Terranora, flooding or landslips of key access roads may lead to isolation.

### 2.9.7 Flood Mitigation Systems

- a. There are no flood mitigation systems in the Terranora sector (3).

### 2.9.8 Dams

- a. Whilst Clarrie Hall Dam is upstream it is not expected to directly affect the Terranora sector (3).

### 2.9.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### 2.9.10 Other Considerations

- a. Terranora Road is susceptible to land slips during heavy rain (3).

## 2.10 BILAMBIL AND DUROBY

### 2.10.1 Community Overview

- a. The Bilambil and Duroby sector includes the suburbs of Bilambil and Bilambil Heights, and the area of Duroby to the north of Duroby Creek.
- b. Bilambil and Duroby are small rural areas situated predominantly to the west of the Terranora Broadwater.
- c. **Bilambil** has a population of 441 living within 167 dwellings. 23% of the population is 65 years of age or older, and 15.6% is under 14. There is a 1.6% Indigenous population.
- d. **Bilambil Heights** has a population of 3,491 people in 1388 dwellings. 22.4% of the population is 65 years of age or older, and 17.3% is under 14. There is a 3.7% Indigenous population.
- e. **Duroby** has a population of 74 people in 32 dwellings (20).
- f. Bilambil is shown on Map 11

### 2.10.2 Characteristics of flooding

- a. Bilambil is subject to flash flooding from the Bilambil Creek catchment. Duroby is subject to flash flooding from the Duroby Creek catchment (12). The areas are also affected by storm surge and tidal influences in the Terranora Broadwater.

### 2.10.3 Flood Behaviour

- a. Both Bilambil and Duroby Creeks can convey high velocity flows. If major rain falls within the Tomewin or Duroby Creek catchment areas, then the effects of flooding can be less than 3 hours (3).

### 2.10.4 Classification of Floodplain

- a. Bilambil itself has Rising Road Access, however roads within this area are at risk of flash flooding and may become closed. Except for the immediate foreshore, Bilambil Heights is located on high ground and is largely unaffected by flooding, however it may become isolated due to road closures.

### 2.10.5 Inundation

- a. There are limited upstream gauges available for flood warning or intelligence purposes in this sector. Bilambil Creek and Duroby Creek are ungauged streams and may have significant impacts on flooding within these areas.
- b. Flood modelling indicates parts of Bilambil, including the school and the retirement village, lie within close proximity to Bilambil Creek and are within the PMF flood extent (30). This area is also subject to potentially high velocity flood flows. Some properties

along the eastern foreshore of Bilambil Heights on Broadwater Esplanade can be flood affected during a 1% AEP event and would also be subject to high velocity flows.

- c. Up to 200 residents in Bilambil could be inundated from flooding with adjacent sports fields and retirement village complex being affected by inundation.
- d. The Bilambil Creek Residential Village, situated at 382 Bilambil Rd Bilambil is located on the western bank of the Bilambil Creek and consists of residents over the age of 55 years housed in mobile homes. During the March 2017 as well as the January 2008 event around 0.5m of flood water entered the retirement complex with the residents closest to Bilambil Creek being worst affected. During the 2017 flood event the Bilambil West Sport Field Club, the Equestrian Club and Bilambil Jets Rugby Leagues Club all experienced flood damage (35).

**Table 16: Estimated number of properties inundated above floor level and over ground in the Bilambil and Duroby sector related to select design flood events (2).**

Design Flood Event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	0	109
5% AEP	0	113
1% AEP	1	134
0.2% AEP	1	139
PMF	10	184

### 2.10.6 Isolation

- a. Bilambil and Bilambil Heights can be isolated when the intersection of Duroby Creek Rd and Bilambil Road is cut north of the Duroby Creek Bridge, and when Kennedy Drive to the north-east of Bilambil is cut. Some rural properties can be isolated for up to 5 days.
- b. Within the Duroby area, Naponyah Road, Benevis Place and Ribbonwood Place can be affected by inundation which may cause isolation (3).
- c. Rural properties can also become isolated, with the potential for landslips cutting major roads.

### 2.10.7 Flood Mitigation Systems

- a. There are no flood mitigation systems in the Bilambil and Duroby area.

### 2.10.8 Dams

- a. There are no dams upstream that would influence flooding in this area.

### **2.10.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### **2.10.10 Other Considerations**

- a. No other considerations have been identified for this sector.

## 2.11 TWEED HEADS SOUTH

### 2.11.1 Community Overview

- a. The Tweed Heads South sector includes the parts of Tweed Heads South and Banora Point to the east of the Pacific Motorway.
- b. **Tweed Heads South** has a population of 7941 living within 3424 private dwellings. 34% of the population is 65 years of age or older, and 13.5% is under 14. There is a 7.2% Indigenous population (20). Only part of Tweed Heads South lies within this sector as noted above.
- c. **Banora Point** has a population of 16,460. 31.8% of the population is 65 years of age or older, and 15.2% is under 14. There is a 5.1% Indigenous population (20). Only part of Banora Point lies within this sector as noted above.
- d. Tweed Heads South is shown on Map 12.

### 2.11.2 Characteristics of flooding

- a. Tweed Heads South is affected by backwater flooding from the Terranora Broadwater and Tweed River.
- b. Tweed Heads South can also be affected by flash flooding and oceanic storm surge (3).

### 2.11.3 Flood Behaviour

- a. A levee protects Tweed Heads South from the more frequent floods up to around 2m on the Chinderah gauge and 1.8m on the Dry Dock gauge (201428 – 558029) (26). Once this levee overtops it is expected to fill quickly, however velocities are expected to be relatively low (12).
- b. The Tweed Heads South levee was designed to provide immunity for a 5% AEP flood. However, based on the survey of the levee, there are some sections of the levee that are overtopping. The levee is overtopped by up to 0.3 metre near the South Tweed Bowls Club (2).
- c. **Banora Point:** Part of Banora Point which lies within the Tweed Heads South sector experiences flooding from Terranora Creek from the 5% AEP flood around Kirkwood Rd (2).

### 2.11.4 Classification of Floodplain

- a. Tweed Heads South is a Low Flood Island meaning that it can become isolated and completely flooded.
- b. The majority of Tweed Heads South is within the PMF extent but has Rising Road Access to the south to Banora Point (2).

### 2.11.5 Inundation

- a. The Dry Dock gauge (201428 – 558029) and Chinderah gauge (558010) is utilised in this sector for areas around Tweed Heads South.
- b. The Tweed Heads South levee is designed to provide immunity for the 1954 flood level. Overtopping of the levee has been predicted in some sections at the 5% AEP event, around Dry Dock Rd and Munjungbal Drive, and at the South Tweed Bowls Club.
- c. Depth of inundation in the northern residential areas are mostly between 0.5 and 1 metre in the 1% AEP event. Velocity-depth products are less than 0.3 m<sup>2</sup>/s in the 1% AEP event. Most of the southern commercial area is flood free in the 1% AEP event with the exception of some of the northern streets including Minjungbal Drive north of Machinery Drive (2).
- d. The Pacific Highway traverses the sector in a north south direction. Minjungbal Drive allows traffic access into the township proper of Tweed Heads. Dry Dock Road which generally traverses the sector in an east/west direction is one of only two evacuation routes from the sector and is inundated at approximately a 5% AEP event.

**Table 17: Estimated number of properties inundated above floor level and over ground in the Tweed Heads South sector related to select design flood events (2).**

Design flood event (%AEP)	No. Properties with Over floor Flooding		No. Properties with Over-ground Flooding	
	Banora Point*	Tweed Heads South*	Banora Point*	Tweed Heads South*
20% AEP	0	0	172	55
5% AEP	0	0	270	95
1% AEP	0	256	486	1111
0.2% AEP	5	596	643	1314
PMF	1545	1394	2048	1792

*\*It should be noted only parts of these suburbs lie within this sector, numbers therefore should be used as a guide only, as some may lie within the Banora sector.*

### 2.11.6 Isolation

- a. The key evacuation route out of Tweed Heads South is Dry Dock Road. This road will begin to be flooded from around 1.4m and will be impassable by around 1.7m on the Dry Dock gauge (201428 – 558029). Other local roads including Floral Ave to Minjungbal Drive can close early during flood events isolating residents. Many vulnerable facilities and caravan parks can become isolated during relatively small flood events (3).



### 2.11.7 Flood Mitigation Systems

Table 18: Levees in Tweed Heads South summary of information

Tweed Heads South Levee	
Location	The levee runs along the eastern perimeter of the Tweed Heads South urban area towards the Ukerabagh Passage before turning west/north-west and following the alignment of Water Street and then Minjungbal Drive. It then turns south-west following Dry Dock Road before tying into an elevated section of Dry Dock Road immediately east of the Pacific Motorway bridge (23).
Type of Levee (ring etc.)	Earthen levee, 5.75km long with sections that tie into high ground (36) (34)
Owner	Tweed Shire Council
Design Height and freeboard	The original design height is listed as 5% AEP or around 2m on the Dry Dock gauge (201428 – 558029) (34).
Overtopping Height	Varying crest heights of 1.64m AHD and greater. The majority of the levee is above 2m AHD.
No. of properties protected	Schools, shopping centres, Essential Energy Depot and residential properties in the South Tweed area.
Known low points	Several locations along Dry Dock Road and Minjungbal Drive sections of the levee. <ul style="list-style-type: none"> <li>• 1.64 m AHD at the Boyds Bay Holiday Caravan Park foot gate access (Chainage 1,900 m);</li> <li>• 1.84 m AHD in the proximity of the South Tweed sports Club (Chainage 3,100 m).</li> </ul> The levee is overtopped by around 0.3m near the South Tweed Bowling Club at approximately 1.8m on the Dry Dock gauge (201428 – 558029) (2).
Location and sequence of inundation	Flood levels can rise rapidly once levee overtopping begins (12).
Consequences of levee overtopping or failure	Depth of inundation in the northern residential area is expected to be between 0.5- 1m at 2.3m on the Dry Dock gauge (201428 – 558029). During larger flood events including the PMF the majority of South Tweed Heads will be flood affected to significant depths.
Deficiencies	A visual audit in 2015 indicated that the levee was generally in acceptable condition. As noted above there are a number of locations along the levee which are lower than the original design height. Areas of particular concern are in the vicinity of the Tweed Heads South Bowling club and the foot gate access to the Boyds Bay Holiday Caravan Park (36).

### 2.11.8 Dams

- a. There are no dams upstream that would result in flood affects in this area (3).

### 2.11.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

**2.11.10 Other Considerations**

- a. There are no additional considerations identified for this sector.

## 2.12 TWEED HEADS WEST

### 2.12.1 Community Overview

- a. Tweed Heads West sector includes the suburbs of Tweed Heads West, Cobaki Lakes, and the northern parts of Piggabeen, Cobaki and Bilambil Heights. The sector has a population of approximately 6727 people living in 3614 dwellings (20).
- b. **Tweed Heads West** is located to the west of the main centre of Tweed Heads, just upstream of the junction of the Terranora Broadwater with the Tweed River and the outlet through Tweed Heads to the ocean. It has a population of 6176 living in 3051 dwellings. It has a 6.5% Indigenous population, with 13.3% of the population under 14 years of age, and 29% over 65 (20).
- c. **Cobaki Lakes** has a population of 42 living in 11 dwellings (20). Additionally, the Banksia Waters retirement village consists of residents over 55 years of age, housed in mobile homes. There are approximately 280 mobile homes situated on the eastern bank of the Cobaki Creek.
- d. **Seagulls Estate** is located in the suburb of Tweed Heads; however it is of special interest due to its location. The Seagulls Estate is located southwest of Tweed Heads. Part of this residential estate is located on an island within the Terranora Broadwater that is connected to the mainland by Lakes Drive. The remainder of the Seagulls Estate to the west of this island is bounded by Scenic Drive and Inlet Drive.
- e. Bilambil Heights is described in more detail in Section 2.10
- f. Tweed Heads West is shown on Map 13.

### 2.12.2 Characteristics of flooding

- a. Tweed Heads West sector is affected by flooding from the Cobaki and Terranora Broadwaters. Flooding from the Terranora Broadwater is likely to be influenced by:
  - i. Localised flash and catchment flooding from Cobaki, Piggabeen and Bilambil Creeks.
  - ii. Storm surge and tidal anomalies.
  - iii. Backwater flooding from the Tweed River and constriction at the ocean entrance (3).

### 2.12.3 Flood Behaviour

- a. Parts of Tweed Heads West are flooded in 5% AEP events and larger. This area is generally considered to be flood fringe with low flood velocities expected (30).
- b. Storm surge and tidal anomalies are expected to have a significant impact on flooding within this area as well as intensive localised flash flooding from the Cobaki, Piggabeen and Bilambil Creek areas (3).

- c. In extreme events, flood levels in the Lower Tweed area are controlled by the constriction at the river mouth / entrance and the dunes between Kingscliff and Fingal Head (12).
- d. In addition to catchment flooding, stormwater flooding can affect this area.

#### 2.12.4 Classification of Floodplain

- a. The Tweed Heads West sector has rising road access into Bilambil Heights, and Cobaki Lakes area also has rising road access.

#### 2.12.5 Inundation

- a. The Dry Dock (201428 – 558029) and Chinderah gauge (558010) are utilised in this sector.
- b. Low lying areas of Tweed Heads West are expected to be inundated in the 5% AEP event and larger. Widespread inundation occurs in the 1% AEP event including most properties along Kennedy Drive, Gray Street, Rose Street, Blue Waters Crescent and Wyuna Road. Depths are typically 1 to 1.5 metres in this event (2).
- c. Approximately two thirds of Seagulls Estate are inundated in the 1% AEP (approximately 2.27m AHD at the Dry Dock gauge (201428 – 558029)), with depths up to 1.5 metres along Sunset Boulevard (2).

**Table 19: Estimated number of properties inundated above floor level and over ground in the Tweed Heads West sector related to select design flood events (2).**

Design Flood Event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	0	223
5% AEP	0	267
1% AEP	347	1089
0.2% AEP	610	1161
PMF	993	1252

#### 2.12.6 Isolation

- a. Evacuation is constrained from this area as roads can be cut early from both catchment and stormwater flooding.
- b. This area can become isolated due to local road closures:
  - i. Kennedy Drive can start to flood from around 0.9m AHD near Rose Street on the Dry Dock gauge (201428 – 558029). At 1.8m on the Chinderah gauge (558010) it is highly likely that Kennedy Drive will be covered by almost 0.3m of water and impassable to normal traffic near the vicinity of Rose Street (3).
  - ii. Kennedy Drive and Piggabeen Road are also known to close due to stormwater flooding which can occur quickly (12).

- c. **Seagulls Estate:** The only access route in and out of the estate, Lakes Drive, may flood to a depth of 0.6m in the 5% AEP flood.
- d. The main evacuation route is Kennedy Drive to the north which begins to flood from 0.9m at the Dry Dock gauge (201428 – 558029) (3). Kennedy Drive can also be affected by stormwater flooding which can impede evacuation along this road (12).

#### **2.12.7 Flood Mitigation Systems**

- a. There are no known flood mitigation systems in this sector (3).

#### **2.12.8 Dams**

- a. There are no known dam effects in this sector (3).

#### **2.12.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

#### **2.12.10 Other Considerations**

- a. No other considerations have been identified in this sector.

## 2.13 TWEED HEADS

### 2.13.1 Community Overview

- a. Tweed Heads sector includes the suburb of Tweed Heads and encompasses the main central business district. It has a population of 9176 people living within 5309 dwellings. It has a 3% Indigenous population, with 11% of the population under 14 years of age, and 29.9% over 65. (20). The area adjoins the Queensland state border and is located at the mouth of the Tweed River.
- b. Tweed Heads is shown on Map 14.

### 2.13.2 Characteristics of flooding

- a. Tweed Heads is affected by riverine flooding from the Cobaki and Terranora Broadwaters, which is influenced by flooding in the Tweed River.
- b. Storm surge and tidal anomalies are expected to have a significant impact on flooding within this area as well as any events of intensive localised flash flooding from the Cobaki, Piggabeen and Bilambil Creek areas (3).
- c. In extreme events, flood levels in the Lower Tweed area are controlled by the constriction at the river mouth / entrance and the dunes between Kingscliff and Fingal Head (12).

### 2.13.3 Flood Behaviour

- a. Terranora Creek and the Tweed River to the south of Tweed Heads can be subject to high velocity flows (30).
- b. Terranora Creek may overtop its banks from 1.4m at the Dry Dock gauge (201428 – 558029).

### 2.13.4 Classification of Floodplain

- a. In the PMF high land between Razorback and Flagstaff Hill forms a High Flood Island. The rest of Tweed Heads largely becomes a Low Trapped Perimeter.

### 2.13.5 Inundation

- a. The Dry Dock (201428 - 558029) or Chinderah (558010) gauges may be utilised in this sector.
- b. Most of the developed areas of Tweed Heads are flood free in the 1% AEP event with the exception of a few properties along Endeavour Parade in the north and Margaret Street near the canals. Some streets are also inundated in this event, including sections of Kennedy Drive up to 1 metre, Ducat Street up to 1 metre and Keith Compton Drive up to 0.5 metre near the Tweed Heads District Hospital (2).

- c. In a PMF event many parts of this sector are expected to be inundated, except for high land near Point Danger headland.

**Table 20: Estimated number of properties inundated above floor level and over ground in the Tweed Heads sector related to select design flood events (2).**

Design Flood event (%AEP)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	0	225
5% AEP	0	240
1% AEP	10	663
0.2% AEP	183	1052
PMF	1199	1567

### 2.13.6 Isolation

- a. At 1.4m at the Dry Dock gauge (201428 - 558029), Kennedy Road is expected to be covered with approximately 0.5m of water and impassable to all traffic at approximately 1.7m.
- b. It is highly likely that during an event greater than 2m at Chinderah gauge (558010), properties may become isolated due to localised flooding.
- c. During an event greater than 3.0m Chinderah gauge (558010) the following road closures which may cause isolations are expected:
- i. Sections of Kennedy Drive flooded by up to 1m.
  - ii. Ducat Street by up to 1m.
  - iii. Keith Compton Drive by up to 0.5m near the Tweed District Hospital (30).

### 2.13.7 Flood Mitigation Systems

- a. There are no levees, detention basins or groynes in this area (3).

### 2.13.8 Dams

- a. No downstream dam effects have been identified in this sector (3).

### 2.13.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweeds Heads LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### 2.13.10 Other Considerations

- a. Events occurring in Tweed Heads may mean an increased number of visitors to the area include;

- i. Kids in Need Dragon Boat Festival in November with anticipated attendance of 1500+ people.
  - ii. HCCA 8<sup>th</sup> International Tour on 26 May – 1 June, with anticipated attendance of 200-240 people and 100 vehicles travelling from Tweed Heads to the Tweed Valley.
- b. There is likely to be an increase in visitors to the area during peak holiday periods.
- c. There are also a large number of aged care facilities and a relatively high percentage of the population identifying as having a need for assistance, or profound or severe core activity limitation (8.5%) in the Tweed Heads sector.



## 2.14 FINGAL HEAD

### 2.14.1 Community Overview

- a. The Fingal Head Sector includes the suburb of Fingal Head. Fingal Head encompasses the coastal strip bounded by the Tweed River to the north and west, the Pacific Ocean to the east and Wommin Bay Rd to the south.
- b. It has a population of 615 people living within 318 dwellings. It has a 11.2% Indigenous population, with 15.3% of the population under 14 years of age, and 34.6% over 65 (20).
- c. Fingal Head is shown on Map 15.

### 2.14.2 Characteristics of flooding

- a. This sector can be affected by coastal inundation and riverine flooding from the Tweed River in the Chinderah floodplain (3).

### 2.14.3 Flood Behaviour

- a. Fingal Head can experience flooding from rainfall events over the Tweed River catchment as well as due to storm surge events (6).
- b. The main centre of Fingal Head is not affected by riverine flooding up to the 0.2% AEP flood event (2).

### 2.14.4 Classification of Floodplain

- a. The Fingal Head sector becomes a low trapped perimeter.

### 2.14.5 Inundation

- a. Gauges utilised within this sector include the Chinderah Gauge (558010) and Letitia 2A gauge (201429 – 558041).
- b. Letitia Road to the north (including some adjacent properties) and Fingal Road leading into Fingal Head from the south (also including some adjacent properties) are predicted to be inundated in the 5% AEP event. The depth of inundation over Fingal Road is up to 1.5 metres near Wommin Lake in the 1% AEP flood event (2).
- c. During the 2004 moderate flood event which reached 1.6m at the Chinderah gauge (558010) water was over Fingal Road and entered the yards of some properties (37).
- d. Flood water is expected to breakout across the peninsula to the ocean in a PMF event. There is anecdotal evidence that such breakouts have previously occurred in major historic floods (12).

**Table 21: Estimated number of properties inundated above floor level and over ground in Fingal Head related to select design flood events (2).**

<b>Design Flood Events</b>	<b>No. Properties with Over floor Flooding</b>	<b>No. Properties with Over-ground Flooding</b>
20%	0	25
5%	1	61
1%	58	185
0.2%	82	200
PMF	175	267

#### **2.14.6 Isolation**

- a. Fingal Road/ Wommin Lake Crescent are affected at 1.3m on Chinderah gauge (558010) isolating Fingal Head (3).

#### **2.14.7 Flood Mitigation Systems**

- a. There are no levees or detention basins in this area. Groynes exist along the Tweed River in this area (3).

#### **2.14.8 Dams**

- a. There no downstream dam consequences identified for this area (3).

#### **2.14.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

#### **2.14.10 Other Considerations**

- a. No other considerations have been identified in this sector.

## 2.15 BOGANGAR, CABARITA BEACH AND HASTINGS POINT

### 2.15.1 Community Overview

- a. This sector includes the suburbs of Casuarina, Kings Forest, Duranbah, Tanglewood, Bogangar, Cabarita Beach, Round Mountain and Hastings Point. It also includes the part of Kingscliff to the east of Cudgen Creek and along South Kingscliff Beach, as well as the northern part of Pottsville. The sector has a total population of 12667 people living in 5697 dwellings.
- b. The majority of settlement is along the coastal fringe, with Kingscliff, Casuarina, Bogangar, Cabarita Beach, Hastings Point and Pottsville the largest centres.
- c. **Casuarina** has a population of 3256 people living within 1355 dwellings. It has a 2.4% Indigenous population, with 24.4% of the population under 14 years of age, and 12.3% over 65.
- d. **Cabarita Beach** has a population of 101 people living within 71 dwellings.
- e. **Bogangar** has a population of 3313 people living within 1430 dwellings. It has a 5.3% Indigenous population, with 21% of the population under 14 years of age, and 15.4% over 65.
- f. **Hastings Point** has a population of 661 people living within 484 dwellings. It has a 3.2% Indigenous population, with 6.5% of the population under 14 years of age, and 55.5% over 65 (20) (20).
- g. Kingscliff is described in further detail in the Chinderah-Kingscliff sector, and Pottsville in the Pottsville-Wooyung sector.
- h. Bogangar and Cabarita Beach are shown on Map 16 and Hastings Point is shown on Map 17.

### 2.15.2 Characteristics of flooding

- a. Bogangar, Cabarita Beach and Hastings Point are affected by flooding generated by heavy rainfall over the Cudgen catchment. They can also be affected by storm surge or exceptional tidal conditions (3).

### 2.15.3 Flood Behaviour

- a. Flooding in this sector is influenced by the Cudgen and Cudgera Creek catchments.
- b. **Cudgen Creek:** Cudgen Creek is the main creek affecting Bogangar and Cabarita Beach and further to the north towards Kingscliff where Cudgen Creek eventually discharges to the ocean. Cudgen Creek is fed by the catchments of Reserve Creek and Clothiers Creek, however is also linked to the Christies Creek catchment upstream of the Pacific Highway. These creeks drain into Cudgen Lake located to the west of Bogangar which provides only minimal flood attenuation due to its shallow nature. Downstream of

Cudgen Lake flood flows are constricted within Cudgen Creek before discharging onto the broader floodplain. Old Bogangar Road near the Tweed Coast Road forms a barrier to flood flows, except for the bridge over Cudgen Creek. Downstream of Old Bogangar Road the flood behaviour is influenced by tidal conditions. The flood gradient within this section is relatively flat.

- c. **Cudgera Creek:** Hastings Point is primarily affected by flooding from the Christies Creek and Cudgera Creek Catchments which meet just prior to discharging into the ocean at Hastings Point. Christies Creek is also linked to the Cudgen Creek Catchment upstream of the Pacific Highway (6).

#### 2.15.4 Classification of Floodplain

- a. The Bogangar/Cabarita Beach/Hastings Point sector is a High Trapped Perimeter to the east of Tweed Coast Road from south of Casuarina Beach to the North of Hastings Point with Rising Road Access from the hinterland.
- b. There is another High Trapped Perimeter from Hastings Point to the northeast of Pottsville with Rising Road Access (38).

#### 2.15.5 Inundation

- a. There is no flood forecasting gauge within this sector. However, water level gauges exist at Cudgen Creek south of Kingscliff (202434), and at Cudgen Lake in Bogangar (202416 - 558043), as well as a barometric gauge at Kingscliff (202418 – 558050).
- b. **South Kingscliff** lies mainly outside of the flood extent, however, can become isolated.
- c. **Cabarita-Bogangar**
- d. 20-10% AEP: Clothiers Creek Road is predicted to be inundated at the creek crossing west of Cabarita Road from a 10% AEP design flood event. Access to the Pacific Motorway via Clothiers Creek Road however is lost in flood events less than the 20% AEP design event on the Tanglewood floodplain.
- e. 5% AEP: Parcels along Tamarind Avenue, Bogangar start to be inundated from backwaters from Cudgen Lake and the Cudgen Creek floodplain in events less than the 5% AEP design event. Tamarind Avenue in Cabarita-Bogangar is a low-lying area that is frequently flooded.
- f. 2% AEP: In a 2% AEP design event, the inundation also covers the area between Rosewood Avenue and Mimosa Avenue and into Hastings Road Bogangar, with waters predicted to break out of the Friday Island canal across Rosewood Avenue.
- g. 1% AEP: Most of the area to the north of Rosewood Avenue Bogangar is predicted to be inundated, with depths generally below 0.5m. Flood waters are also predicted to cross over east of Hastings Road towards commercial land in the Cabarita Beach CBD for this event.

- h. PMF: In a PMF event, peak flood levels are predicted to reach 5.7m AHD in this area, generating flooding for most of the area north of Sandalwood Drive, Bogangar and west of the Tweed Coast Road, (this floodplain area was filled for residential development). Cabarita Beach to the east of the Tweed Coast Road is located on the high coastal dune, so is predicted to remain flood free (39).

### **Hastings Point**

- i. 5% AEP: Land parcels along Creek Street to the north of Christies Creek are predicted to be flooded in a 5% AEP event with peak flood levels of around 2.2m AHD. Overland flooding is also predicted in Young Street near the bend in Cudgera Creek.
- j. 1% AEP: During a 1% AEP event flood levels are predicted to reach up to 2.5m AHD, which would mean up to 1m of floodwater over the ground level in places.
- k. PMF: During a PMF event water levels are predicted to be as high as 3.9m AHD, or 2.5m of water above ground level. During a PMF event the area south of Peninsula Street and east of Tweed Coast Road is also expected to be flooded (39).

### **2.15.6 Isolation**

- a. Access from the south can be cut by local heavy rainfalls, but usually for periods of less than 12 hours. Access from the north depends on the flood situation at Chinderah. Roads can be inundated for up to 3 days (3).
- b. Main access roads for this area include the Tweed Coast Rd running north/south, which may experience inundation in major flood events.

### **2.15.7 Flood Mitigation Systems**

- a. There are no flood mitigation systems within this area (3).

### **2.15.8 Dams**

- a. There are no dams within this area (3).

### **2.15.9 At Risk Facilities**

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### **2.15.10 Other Considerations**

- a. This area attracts people for regular daily visits as well as short term holidays and scheduled school holidays.
- b. Additionally, events occurring in Cabarita may mean an increased number of visitors to the area include;

- i. Tweed Coast Pro in February with anticipated attendance of 500-1000 people, at Lions Park, Norries Cove and Cabarita Headland.

## 2.16 POTTSVILLE WOoyUNG

### 2.16.1 Community Overview

- a. The Pottsville sector includes the suburbs of Pottsville, Wooyung, Crabbes Creek, Upper Burringbar, Burringbar, Mooball, Sleepy Hollow and part of Cudgera Creek.
- b. The northern part of Pottsville Village, Seabreeze Estate and Koala Beach Estate are in the Cudgera Creek Catchment. The southern part of Pottsville Village, Pottsville Waters and Black Rocks Estate are in the Mooball Creek Catchment.
- c. **Pottsville** has a population of 7209 people living within 2884 dwellings. It has a 3.5% Indigenous population, with 23.4% of the population under 14 years of age, and 20.9% over 65.
- d. **Wooyung** has a population of 139 people living within 62 dwellings.
- e. **Crabbes Creek** has a population of 343 people living within 137 dwellings.
- f. **Upper Burringbar** has a population of 289 people living within 151 dwellings.
- g. **Mooball** has a population of 193 people living within 74 dwellings.
- h. **Sleepy Hollow** has a population of 123 people living within 48 dwellings.
- i. Burringbar, Mooball and Crabbes Creek villages are located within the upper Mooball Creek catchment within the Tweed Coastal Creek catchments, upstream of the Motorway. Burringbar has a population of 878 living in 299 dwellings. Mooball has a population of 193 living in 74 dwellings and Crabbes Creek has 343 people living in 137 dwellings (20).
- j. Pottsville and Wooyung are shown on Map 18.

### 2.16.2 Characteristics of flooding

- a. Pottsville and Wooyung are affected by flooding generated by heavy rainfall over the Cudgera and Mooball Creek Catchments, storm surge or exceptional tidal conditions.
- b. Burringbar, Mooball and Crabbes Creek lie within the Mooball Creek catchment and are affected by high flow flash flooding from the two main creeks within the catchment, Burringbar Creek and Crabbes Creek (5).

### 2.16.3 Flood Behaviour

- a. Cudgera Creek is constricted by high land upstream of Seabreeze Estate. Downstream the floodplain widens into an estuarine creek. Significant flows also occur between Cudgera Creek and Christies Creek across agricultural (sugar cane) land. Cudgera and Christies Creek converge at Hastings Point before discharging to the ocean.
- b. Downstream of the Pacific Highway the Mooball floodplain becomes wider. Mooball Creek runs parallel to the coastline, has a flat gradient and wide floodplain. Water is

constricted by filled developments of Black Rock and Pottsville Waters Estates. The area west of Pottsville has a very flat gradient and low flood velocities (39).

- c. The upper catchment areas including Burringbar, Mooball and Crabbes Creek convey high flood flows and are part of the floodway. Flooding within these areas can be very fast from the onset of rainfall (6).
- d. Burringbar Creek is relatively constrained by the topography in this area, so that the extent of flooding does not vary much between the different flood events (except for extreme events like the PMF). This also means that the floodwaters cannot spread out, resulting in high velocities and depths (3).
- e. Mooball experiences similar high velocities and depths to Burringbar (6). The area north of the railway line lies within the 'active' floodplain of Burringbar Creek, where secondary flow paths develop during flood events (3).

#### **2.16.4 Classification of Floodplain.**

- a. The areas of Black Rocks Estate, Pottsville Area, southeastern parts of Koala Beach Estate are Low Flood Islands (6).
- b. The Koala Beach Estate is primarily a High Flood Island predicted to remain flood free over nearly the entire area (6) (39). Part of south Pottsville (around Kellehers Road area) is also a High Flood Island in a PMF event (6).
- c. Mooball and Crabbes Creek are both Low Flood Islands.
- d. Burringbar has Rising Road Access (38).

#### **2.16.5 Inundation**

- a. A Flash Flood Warning System is in place for parts of Burringbar and Mooball for the Burringbar Creek catchment and Crabbes Creek Village in the Crabbes Creek catchment. Local rain and stream gauge data along with Bureau of Meteorology predictions are used to provide warning messages to local residents who have opted into the system. This system is owned and operated by Tweed Shire Council.
- b. Gauges within this area exist on Mooball Creek at Pottsville (202435), as well as rainfall and water level gauges in Burringbar Creek and Crabbes Creek.

#### **Seabreeze Estate**

- c. 1% AEP: Inundation of open spaces and roadways is predicted for events similar or greater than a 1% AEP flood event, including flooding of the north-eastern corner of Lennox Circuit and the intersection of Seabreeze Boulevard and Ballina Street. Flood levels in this event range from 5.04m AHD at Newcastle Drive, to 3.03m AHD at Lennox Circuit (39).



- d. 0.2% AEP: Flooding extends east along Seabreeze Boulevard, with depths of water of more than 0.5m (but less than 1m) at the Koala Beach Link Road. Flood levels in this event range from 5.05m AHD at Newcastle Drive, to 3.09m AHD at Lennox Circuit (39).
- e. PMF: Peak flood levels are predicted to reach up to 4.6m AHD, generating up to 2m of flooding north of Mylestom Circle and Korora Parkway. The northern part of Lennox Circuit is also predicted to be flooded in this extreme event, with depths below 1m. Seabreeze Boulevard is predicted to become a major flow path in this event (39).

#### **Koala Beach Estate**

- f. 2% to 0.2% AEP: Only the reserve to the east of Muskheart Circuit is predicted to start being inundated in a 2% AEP event, with peak depths below 0.5m in a 0.2% event. Flood levels in a 0.2% AEP event may range from 2.51m AHD at Link Road Bridge, to 2.51m AHD at Cudgera Ave Bridge (39)
- g. PMF: Cudgera Avenue and properties on the eastern half of Muskheart Circuit, and west of Lomandra Avenue are predicted to be inundated with depths of water of up to 2m in a PMF event. Local streets such as Muskheart Circuit, Bandicoot Street and Sugar Glider Drive are predicted to become major flow paths during this event (39).

#### **Pottsville**

- h. 2% AEP: The creek linking Mooball Creek and Cudgera Creek catchments is predicted to break out downstream of Pottsville Road and generate minor flooding along and to the north of Coronation Avenue (Pottsville Village CBD) (12). Mooball Creek is also predicted to break out and inundate residential land along Philip Street.
- i. 1% AEP: Inundation extends northward across the village green between Phillip St and Tweed Coast Road.
- j. 0.2% AEP: Pottsville Road and Coronation Avenue may be inundated, with floodwaters from Mooball Creek and Cudgera Creek connecting overland through the CBD.
- k. PMF: Almost the entire area is predicted to be inundated, with depths of water of up to 2m creating a major flow path with the connection of floodwaters from Mooball Creek and Cudgera Creek, with velocity higher than 1 m<sup>2</sup>/s in some sections (39).

#### **Pottsville Waters & Black Rocks Estates**

- l. 1% AEP: Pottsville Waters and Black Rocks Estates are predicted to remain flood free for all flood events up to the 1% AEP design event.
- m. 0.2% AEP: In a 0.2% AEP event, floodwaters are predicted to inundate most filled estates north of McKenzie Avenue as water from the Sheens Creek floodplain joins waters from Mooball Creek.

- n. PMF: The entire area is predicted to be underwater in a PMF event, with flood levels up to 5.6m AHD at the southern end of the development. Peak flood depths of up to 3m in places are predicted although flow velocities remain low (39).

### Wooyung

- o. Wooyung Road is inundated at the canal crossing west of Tea Tree Road from Crabbes Burringbar Creeks. It is then overtopped east of Tea Tree Road when floodwaters from Mooball Creek backup to the South in the vicinity of the Wooyung Caravan Park (30).
- p. Historical: In 2017, 7 properties in Wooyung Beach Holiday Park were damaged. This included caravans, 1 severe, 3 moderate and the remainder slightly damaged (35).
- q. 1% AEP: Flood velocities are anticipated to change from low flow to medium flows at the canal crossing flow path as velocities increase across the road (30).
- r. 0.2% AEP: The floodplain east of Tea Tree Road is constrained by the coastal dune system, hence the extent of flooding does not vary. Peak flood levels are however predicted to go up by approximately 1m between the 20% and 0.2% AEP events.
- s. PMF: Another 1m depth is predicted. In this event, the entire length of Wooyung Road east of the high ground is predicted to be overtopped with depths of up to 4m (12).

### Burringbar

- t. In a flash flood event, key areas of inundation in Burringbar include areas in the vicinity of Dignan St, Hunter St and Tweed Valley Way.
- u. 20% AEP: Overland flooding is predicted in relatively frequent flood events along Burringbar Creek affecting residential properties around Hunter Street and Tweed Valley Way, south of the Burringbar Creek Bridge. Depths of up to 2m are predicted for the 20% AEP design flood event at the back of parcels east of the Tweed Valley Way, where creek breakouts create a major flow path. Peak flood levels for this event may be approximately 17.76m AHD at the Tweed Valley Way bridge at Burringbar (39).
- v. 5-10% AEP: Properties on the southern side of the Broadway begin to be affected, as the creek breaks out and water travels northwards. Peak flood levels for this event may range from approximately 18.08-18.57m AHD at the Tweed Valley Way bridge at Burringbar (39).
- w. 1% AEP: Many parts of the township are predicted to be inundated by flooding from Burringbar Creek, including rural residential development in Greenvale Court. This area is predicted to remain subject to low flood flows, whereas the other inundated areas are located within the floodwater conveyance paths and as such are characterised by medium to high flows (particularly east of Tweed Valley Way). Peak flood levels for this event may be approximately 19.01m AHD at the Tweed Valley Way bridge at Burringbar (39)

- x. PMF: In a PMF event, the entire area between Burringbar Creek and Burringbar Road is predicted to be inundated, and the railway line is predicted to be overtopped in two sections: near Greenvale Court entrance, and north of the Hunter Street / Tweed Valley Way junction (39).

### **Mooball**

- y. In a flash flood event, both northern and southern sections of Mooball in proximity to the railway embankment are susceptible to inundation.
- z. 20% AEP: Extensive developed areas are predicted to be inundated in the 20% AEP design flood event. It is noted that backwater flooding is also predicted to the south of the railway line and Tweed Valley Way. However, this area is characterised by low velocities and depths of less than 0.5m. Peak flood levels for this event may be approximately 12.77m AHD at the Quinns Bridge on Pottsville Mooball Rd at Mooball (39).
- aa. 1% AEP: In a 1% AEP event, the entire floodplain north of the railway line is expected to be inundated, with depths up to 2m in places. Ponding of backwater on the southern side of the Tweed Valley Way is also predicted to increase to depths of about 2m locally. Peak flood levels for this event may be approximately 13.21 m AHD at the Quinns Bridge on Pottsville Mooball Rd at Mooball (39).
- bb. PMF: In a PMF event, the entire township of Mooball is predicted to be inundated, extending some 250m south of the Tweed Valley Way. High peak depths and velocities are predicted to the north of the railway line, with most of the floodplain subject to high flood flows. The area south of the Tweed Valley Way is predicted to be subject to medium flood flows (39).

### **Crabbes Creek**

- cc. Although Crabbes Creek is predicted to break out at the Crabbes Creek Road bridge in a 20% AEP design flood event, the inundation is not predicted to reach the school and general store (at the road) up to the 1% AEP design flood event. This flooding is mainly due to the constrictions of flow downstream at the Tweed Valley Way. In a PMF event, the entire township is expected to be underwater, with the main path to convey flood waters (high to medium flows) breaking out of the creek and into the back of the school and general store (12).

### **2.16.6 Isolation**

- a. Koala Beach Estate becomes isolated by road in the PMF event (3).
- b. Burringbar, Mooball and Crabbes Creek can all be isolated during flood events, with road closures occurring along major access routes including the Tweed Valley Way.

### 2.16.7 Flood Mitigation Systems

- a. Levees within the sector are described below.

Seabreeze Levee	
Location	The Seabreeze Levee is situated along Cudgera Creek to protect the Seabreeze Estate at Pottsville (40).
Type of Levee (ring etc.)	Partial levee
Owner	Tweed Shire Council
Design Height and freeboard	Designed to the June 2005 flood of record + freeboard.
Overtopping Height	The levee is designed to provide protection to an approximately 1% AEP event.
No. of properties protected	The levee is designed to protect properties within the Seabreeze Estate
Known low points	-
Location and sequence of inundation	The levee has no spillways or pump. Expected time to fill to levee height is approximately 1-2 hours (40).
Consequences of levee overtopping or failure	Inundation of properties within the estate.
Deficiencies	No known deficiencies

### 2.16.8 Dams

- a. There are no known dam effects within this sector (3).

### 2.16.9 At Risk Facilities

- a. The facilities that are at risk of flooding and/or isolation within the Tweed Shire LGA including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 3.

### 2.16.10 Other Considerations

- a. Events occurring in Pottsville may mean an increased number of visitors to the area include;
- i. Tweed Coast Enduro on 24-25 February with anticipated attendance of 2000-3000 people.
  - ii. The Northern Rivers Rail Trail also experiences regular use between Mooball and Murwillumbah, which can result in an increase in visitors to the area.

## SPECIFIC RISK AREAS – COASTAL EROSION

### Point Danger to Cape Byron

- b. Tweed Shire’s coastline extends some 37 kilometres from Wooyung in the south to Point Danger on the NSW – Queensland border. It comprises extended sandy beaches between rocky headlands and nearshore reefs, the entrances to coastal estuaries at Pottsville, Hastings Point, Kingscliff and the Tweed River.
- c. The most significant threat to development and assets in the region due to severe beach erosion is at Kingscliff (41). This is due to a number of processes;
- d. The Coastline in the Tweed Shire is broken up into five units which include:
  - i. Wooyung to Hastings Point
  - ii. Hastings Point to Norries Head
  - iii. Norries Head to Sutherland Point (Cabarita, Bogangar and Casuarina Beaches)
  - iv. Sutherland Point to Fingal Head (Kingscliff/Dreamtime Beach)
  - v. Fingal Head to Point Danger (3).

### 2.17 WOoyUNG TO HASTINGS POINT

- a. There is no development within the immediate hazard zone that is under threat from coastal erosion or oceanic inundation.

### 2.18 HASTINGS POINT TO NORRIES HEAD

- a. There is no development within the immediate hazard zone (41).

### 2.19 NORRIES HEAD TO SUTHERLAND POINT - CABARITA, BOGANGAR AND CASUARINA BEACHES

- a. The immediate hazard zone does not impinge on any developed areas within this beach unit.
- b. The dune system is generally sufficiently high to accommodate elevated water levels during storm events without direct inundation from the sea. However, there are some areas at the southern end of the Cabarita township where the dunes are only around 5m AHD and under extreme conditions it is possible that some oceanic inundation may occur.

## 2.20 SUTHERLAND POINT TO FINGAL HEAD

- a. Dreamtime Beach extends northward from Sutherland Point some 7 km to Fingal Point. The township of Kingscliff fronts the southern-most 3 km of the beach. At Fingal, a small settlement (about 26 allotments) is located on the seaward side of Wommin Lake, extending about 700 metres south of Fingal Point.
- b. Development is set back from the beach along this beach unit except at Kingscliff where the Kingscliff Bowls Club is located on the dune system and has been protected from erosion by a rock revetment seawall (3)
- c. A number of coastal hazards may threaten property or assets within Kingscliff, those which may threaten development include;
  - i. Erosion, including immediate storm erosion. The main area where the immediate hazard line for coastal erosion extends into development is between the Cudgen Surf Lifesaving Club and the Kingscliff Bowls Club. It should be noted the hazard line has been drawn landward of the Bowls Club building on the basis of no seawall being in place. The realisation of the erosion threat at this location will be dependent on future management decisions on whether the seawall is to be maintained to a suitable standard to withstand cyclonic erosion.
  - ii. Coastal inundation due to ocean wave runup and overtopping of dune barriers may also threaten the area stated above (41).
- d. The surf club suffered coastal erosion problems in the events of 2012.

## 2.21 FINGAL HEAD TO POINT DANGER

- a. Letitia Spit extends some 3.6 km in a north-northwest direction from Fingal Head towards Point Danger, controlled at its northern end by the Tweed River break walls. It is bounded on its western side by the training walls of the Tweed River.
- b. The village of Fingal extends a short distance north from the headland, generally set back from the main dune escarpment except for the Surf Club and caravan park.
- c. There is a small area in the vicinity of the Tweed Holiday Park and Fingal Surf Life Saving Club that lies seawards of the immediate erosion hazard line (41).
- d. The surf club suffered coastal erosion problems in the events of 2012
- e. At Duranbah Beach the alignment and sand supply are primarily governed by the operation of the Tweed River Entrance Sand Bypassing Project. Under the project Duranbah Beach is receding to a position some 50 to 80 metres landward of its 2002 position.
- f. Coastal erosion and oceanic inundation may impact on Flagstaff Beach Road (3).

## ROAD CLOSURES AND ISOLATED COMMUNITIES

### 2.22 ROAD CLOSURES

- a. Table 22 lists major roads liable to flooding in the Tweed Shire LGA, [these locations are shown on Maps 3-17 Town Maps). Please note this includes only major thoroughfares and that there will also be local road closures.

**Table 22: Roads liable to flooding in Tweed Shire LGA.**

Sector	Road	Closure location	Consequences of closure	Alternate route	Indicative Gauge height
<b>Chillingham</b>	Numinbah Road	Bridge over Rous River	Evacuation route to Chillingham cut	None	5m at North Murwillumbah gauge (201420 - 58186)
<b>Murwillumbah</b>					
	Queensland Road	Before Murwillumbah Showgrounds	Access to Dungay cut off	None	2.1m at North Murwillumbah gauge (201420 - 58186)
	Kyogle Road	50m west of SES HQ	Alternate route available	Via local roads to evacuation routes	3m at North Murwillumbah gauge (201420 - 58186)
	Nullum Street	Wollumbin Street	Access to evacuation center cut off	Alternate route on local roads	3.5m at North Murwillumbah gauge(201420 - 58186)
	Commercial Road	Hartigan Street	Nil	Alternate route available	4.5m at North Murwillumbah gauge (201420 - 58186)
(South Murwillumbah)	Tweed Valley Way	Intersection of Buchanan St	Evacuation route from South Murwillumbah cut off. Up to 3 days for flood waters to recede, 4 days or more during 0.2% AEP event (17).		5.2m at North Murwillumbah gauge (201420 - 58186)
	Kyogle Road	Southern Bride at intersection of Oxley and Tweed rivers	Evacuation route to Uki cut off	Park Avenue and North Arm Road	5.8m at North Murwillumbah gauge (201420 - 58186)
<b>Tumbulgum</b>	Tweed Valley way	East of Riverside Drive	All access out of Tumbulgum is cut		2m at Tumbulgum gauge (201432 - 558014)
<b>Chinderah</b>	Chinderah Road	North of Pacific Motorway offramp	Evacuation route cut off	None, evacuation should occur	1.8m at Chinderah

				before Tweed Coast Road is closed to the south	gauge (201426 - 558010)
	Tweed Coast Road	Southeast of Chinderah Golf Course	Evacuation route cut off		1.7m at Chinderah gauge (201426 - 558010)
<b>Terranora</b>	Bilambil Road over Duroby Creek		Access to Terranora and Bilambil evacuations centers cut. Bilambil isolated.		
<b>Tweed Heads South</b>	Dry Dock Road	West of Pacific Motorway bridge over Terranora Creek	Isolation of Tweed Heads South	None	1.2m at Dry Dock gauge (201428 - 558029)
<b>Tweed Heads West</b>	Scenic Drive	Scenic Drive and Gull Place intersection	Access to Bilambil evacuation center cut off	None	2.8m AHD at Dry Dock gauge (201428 - 558029)
	Kennedy Drive	Kennedy Drive bridge over Tweed River	Evacuation routes cut		2.5m AHD on Dry Dock gauge (201428 - 558029)
<b>Tweed Heads</b>	Minjungbal Drive	South of the bridge in various locations	Access to evacuation routes cut off		
<b>Fingal Head</b>	Fingal Road	Bambury Street	Fingal isolated	None	1.3m at Chinderah gauge (201426 - 558010)
<b>Bogangar, Cabarita and Hastings Point</b>	Tweed Coast Road	From Intersection of Yugari Drive in the south, to Round Mountain Road to the South	Evacuation routes cut		
<b>Pottsville Wooyung</b>	Tweed Coast Road	Elanora Avenue	Evacuation Route cut in PMF event		



## **2.23 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES**

- a. Table 23 lists communities liable to isolation and potential periods of isolation. Information presented here is based on historical information and does not reflect the duration of isolation expected in larger and extreme events.
- b. Arterial roads can be cut by floodwater which can isolate the villages of Nobby's Creek, Chillingham, Crystal Creek, Dungay (access to Qld via Tomewin), Stokers Siding (access Smiths Creek Road), Uki, Richard's Deviation, Stokers Siding Road, Byangum Road, North Arm Road, Kyogle Road, Dallas Park, Bakers Road at Anthony's Flats become flood affected resulting in difficulty with movement out of and into the council area from the south and west (3).

Table 23: Potential Periods of Isolation for communities in the Tweed 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		
Fingal Heads	687pp, 347 dwellings	Low Trapped Perimeter	Up to 4 days	■	■	■	■						Sewerage, power and water services at risk of failure. Becomes isolated when Fingal Road Cuts.
Kingscliff	Up to 8355 pp, 4077 dwellings	High Flood Island	Up to 5 days	■	■	■	■						Sewerage, power and water services at risk of failure.
Tweed	Up to 9176 pp, 5309	Low Flood Island	Up to 4 days	■	■	■	■						Sewerage, power and water services at risk of failure.
Banora	Up to 18,467pp, 8310 dwellings	Rising Road Access	Up to 4 days	■	■	■	■						The Banora sector may become isolated with closure of main access routes.
Condong	314pp, 115 dwellings	Low Flood Island	Up to 4 days	■	■	■	■						Isolation may occur from 4m at Murwillumbah gauge
Terranora	Up to 3365pp, 1157 dwellings	High Flood Island/ Overland Escape Route?	Up to 4 days	■	■	■	■						
Tumbulgum	382pp, 156 dwellings in village area. 72 in rural area.	Low Flood Island	Up to 4 days	■	■	■	■						
North Tumbulgum	238pp, 82 dwellings	Overland Escape route into a High Trapped Perimeter.	Up to 4 days	■	■	■	■						
Bilambil/ Bilambil Creek	3935pp, 1555 dwellings	Rising Road Access to High Flood Island	Up to 3 days	■	■	■							
Duroby	Up to 192 in 80 dwellings	Indirectly affected area	Up to 3 days	■	■	■							Isolated after Beltana Drive cut

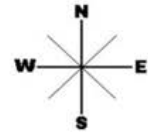
Bogangar/ Cabarita	12,667pp within sector	Rising road access to High Flood Islands.	Up to 4 days									Sewerage under threat
Hastings Point	661pp, 484 dwellings	High Trapped Perimeter	Up to 4 days									
Chillingham	Up to 3000	Rising Road Access	Up to 3 days									Aerial movement usually restricted in early stages of flood due to low cloud and poor visibility
Murwillumbah	7616pp, 3360 dwellings.	Low Flood Island	Up to 4 days									Sewerage, power and water services at risk of failure.
Tyalgum	206pp, 98 dwellings in township, 1063pp, 499 dwellings in sector	Rising Road Access	Up to 2 days									Sewerage, power and water services at risk of failure.
Uki	211pp, 104 dwellings in village, 2020pp in sector.	Rising Road Access	Up to 3 days									Multiple rural settlements which have single road access which may also become isolated in the Uki sector.
Wooyung	Up to 700pp, 273 dwellings	Low Flood Island	Up to 3 days									Includes Crabbes Creek, Mooball.
Pottsville	Up to 7209pp, 2884 dwellings	Rising Road Access	Up to 3 days									
Burringbar	1200pp in 522 dwellings	Rising Road Access	Up to 3 days									

**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: TWEED RIVER BASIN SCHEMATIC

## Tweed Basin No 201 River System Schematic

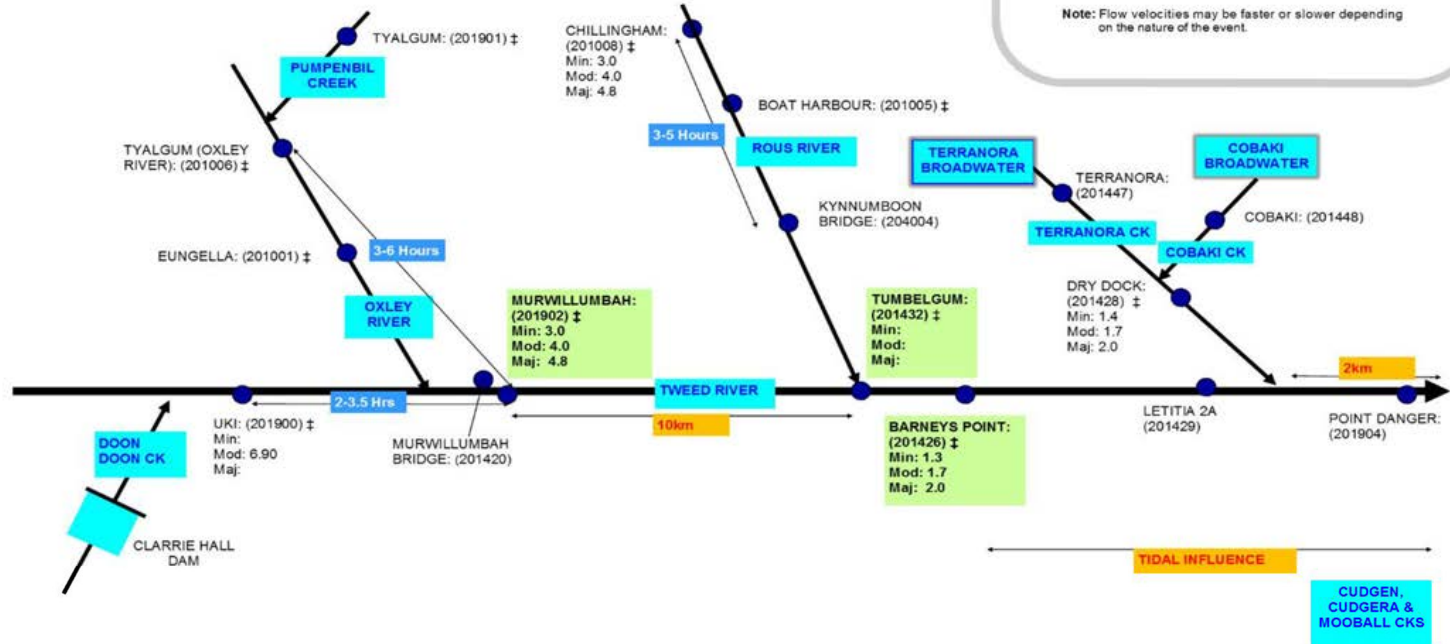
Source: Bureau of Meteorology— NSW Flood Warning Centre 2011, edited January 2013;  
 Broadwater Area representation modified Jan 2018  
 N.B. see Tweed Shire Local Flood Plan for more information



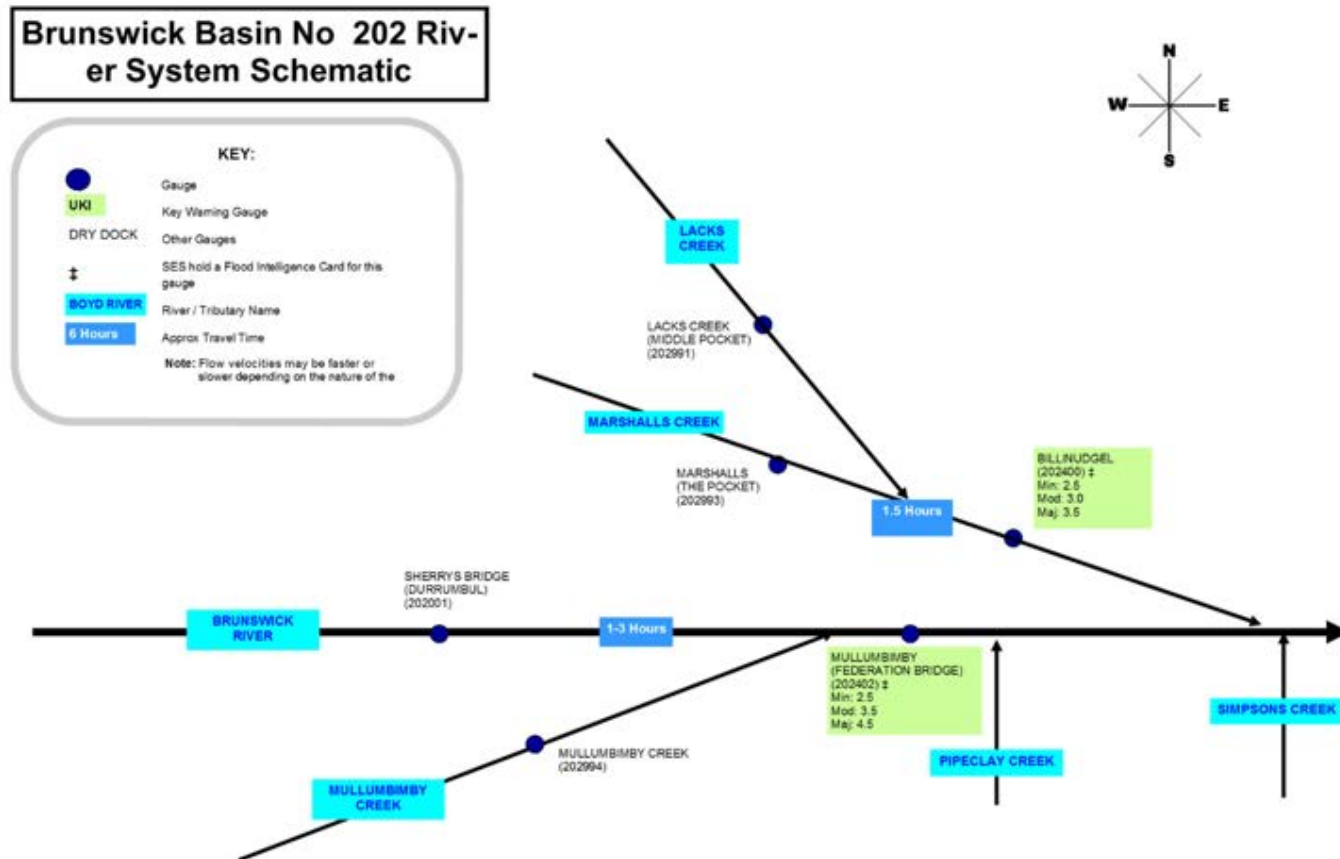
**KEY:**

- Gauge
- UKI Key Warning Gauge
- DRY DOCK Other Gauges
- ‡ SES hold a Flood Intelligence Card for this gauge
- BOYD RIVER River / Tributary Name
- 6 Hours Approx Travel Time

**Note:** Flow velocities may be faster or slower depending on the nature of the event.



## ANNEX 2: BRUNSWICK RIVER BASIN SCHEMATIC



Source: Bureau of Meteorology— NSW Flood Warning Centre 2011

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

### Tweed River Valley

- Please note that inundation data is based on inundation layers currently available to SES and will need to be updated once inundation layers from the 2023 Tweed Valley Flood Study are finalized and uploaded onto GEMS. References to either AEP design event or gauge height are based on available data on GEMS and from Flood Intelligence Cards. References to both Design events and gauge heights for the Dry Dock gauge (201428 - 558029) have been updated with new data from the 2023 Tweed Valley Flood Study Update and vary significantly from the previous 5% AEP design height.

Facility Name	Street	Suburb	Comment
<b>Schools</b>			
Centaur Primary School	1 Eucalyptus Drive	Banora Point	This school is vulnerable to a PMF event (38)
Banora Point High School	2 Eucalyptus Drive	Banora Point	This school is vulnerable to a PMF event (38).
St James' Primary School	2 Boyle Avenue	Banora Point	This school is vulnerable to a flood event equal to or greater than a 5% AEP event (0.78m AHD Dry Dock gauge 201428 - 558029). In a 20yr ARI event it is estimated that the flood depth within the school will be between 0.0m – 0.5m.
St Joseph's College	2 Doyle Drive	Banora Point	This school is vulnerable to a flood event equal to or greater than a 5% AEP (0.78m AHD Dry Dock gauge 201428 - 558029). In a 5% AEP event it is estimated that the flood depth within the school will be between 0.0m – 0.5m.
Bilambil Public School	418 Bilambil Rd	Bilambil	This school is vulnerable to a PMF event (38).
Carool Public School	411 Carool Road	Carool	
Chillingham Primary School	1420 Numinbah Rd	Chillingham	This school is vulnerable to a flood event equal to or greater than a 5% AEP event (0.78m AHD Dry Dock gauge). In a 5% AEP event it is estimated that the flood depth within the school will be 0-0.5m.
Condong Public School	77 McLeod St	Condong	This school is vulnerable to a 20% AEP event (38).

Crystal Creek Public School	813 Numinbah Rd	Crystal Creek	Outside of PMF extent (38).
Cudgen Public School	11 Collier St	Cudgen	Outside of PMF extent (38).
Dungay Public School	305 Tomewin Road	Dungay	Tomewin Rd is closed at around 4.5m on the Boat Harbour gauge. Students may require early release prior to this height.
Duranbah Public School	105 Duranbah Road	Duranbah	
Fingal Head Public School	100 Letitia Rd	Fingal Head	Fingal Head township is isolated when Fingal head Road closes around 1.3m at Chinderah gauge. Unclear if this is flooded or not during a PMF.
St Anthony's Primary School	23 Boomerang Street	Kingscliff	Identified within the Tweed Coastal Creeks Floodplain Risk Management Study (2015) as a vulnerable institution (6)
Kingscliff High School	33 Oxford Street		Outside of PMF extent and able to access evacuation centres
Mount St Patrick Primary School	30 Mooball Street	Murwillumbah	Vulnerable in events greater than 20% AEP but located close but evacuation route accessible.
Murwillumbah East Public School	45 George St Murwillumbah	Murwillumbah	Located outside of the East Murwillumbah levee. Inundation is predicted during events as frequent as the 20% AEP event
Mount St Patrick College	143 Murwillumbah Street	Murwillumbah	One space on grounds may be inundated by events as frequent as a 20%AEP, however buildings are not inundated up to and including a 0.2%AEP flood.
Murwillumbah High School	86 Riverview St	Murwillumbah	The grounds are partially affected in a 20% AEP, however buildings are not affected until the PMF (12)
Murwillumbah Primary School	Prince St	Murwillumbah	Shallow inundation of the southern portion of the school grounds is predicted from a 20% AEP, and access may be cut.
Sathya Sai College	9 Nullum Street	Murwillumbah	May be inundated or have access roads cut from a 20%AEP
TAFE NSW - North Coast Institute Murwillumbah Campus	Murwillumbah Street	Murwillumbah	The TAFE buildings are predicted to remain flood free during all design flood events.
Tweed Valley Adventist College	9 Hall Drive	Murwillumbah	Vulnerable from 20% AEP event.
The Small School	8 King St	Murwillumbah	Vulnerable to inundation from events greater than 2% AEP
Murwillumbah South Infants School	427-433 Tweed Valley Way	South Murwillumbah	Access will be cut off from a 5% AEP event.

St Joseph's Primary School	3 Greville Street	South Murwillumbah	The school is located behind the South Levee and is affected at 4.8m when the levee overtops. Its located in a high hazard area with depths over 2m.
Stokers Siding Public School	246 Stokers Rd	Stokers Siding	
Aetaomah Steiner School	2486 Kyogle Rd	Terragon	
Terranora Public School	650 Terranora Road	Terranora	
Lindisfarne Anglican Grammar School	86 Mahers Lane	Terranora	
Tumbulgum Public School	Fawcett St	Tumbulgum	
Caldera School	37 Corporation Circuit	Tweed Heads South	
Pacific Coast Christian School	3a Acacia St	Tweed Heads	This school is vulnerable to a flood event equal to or greater than a 5% AEP event (0.78m AHD Dry Dock gauge). In a 5% AEP event it is estimated that the flood depth within the school will be between 0.0m – 0.5m.
Pacific Gulgangali Jarjums Christian School	3a Acacia St	Tweed Heads South	
Southern Cross University - Lakeside Campus	Caloola Drive	Tweed Heads	May have some flooding during a PMF event
Southern Cross University - Tweed Heads Riverside Campus	Brett St	Tweed Heads	May have some flooding during a PMF event
St Joseph's Primary School	3 Frances St	Tweed Heads	Vulnerable in a PMF event (38).
Lindisfarne Anglican Grammar School, Junior School	Sunshine Avenue	Tweed Heads South	Vulnerable from a 5% AEP event (38).
Tweed Heads South Public School	10 Heffron St	Tweed Heads South	This school is vulnerable to a flood event equal to or greater than a 5% AEP event (0.78m AHD Dry Dock gauge). In a 5% AEP event it is estimated that the flood depth within the school will be between 0.0m – 0.5m.
Tweed River High School	4 Heffron St	Tweed Heads South	This school is vulnerable to a flood event equal to or greater than a 5% AEP event (0.78m AHD Dry Dock gauge). In a 5% AEP



			event it is estimated that the flood depth within the school will be between 0.0m – 0.5m.
Tyalgum Public School	2 Coolman St	Tyalgum	
Uki Public School	1463 Kyogle Rd	Uki	
<b>Childcare Centres</b>			
Banora Point Early Learning and Childcare Centre	38 Woodlands Drive	Banora Point	This facility may become inundated in a PMF event (38).
Bright Buttons Learning Centre Banora Point	101-110 Leisure Drive	Banora Point	This facility may become inundated in a PMF event (38).
Kids Fun Club (OSHC)	Centaur State Primary School, 1 Eucalyptus Drive	Banora Point	This facility may become inundated in a PMF event (38).
Little Angels World of Learning	17 Covent Gardens Way	Banora Point	This facility may become inundated in a PMF event (38).
Wallum Community Preschool & Family Centre	Woodlands Drive	Banora Point	This facility may become inundated in a PMF event (38).
Bilambil Community Preschool	418 Bilambil Road	Bilambil	This facility is on the edge of the PMF extent but close to the Bilambil Public School evacuation centre (38).
Bili Kids	24 Buenavista Drive	Bilambil Heights	This facility is outside the flood extent and able to access evacuation route (38).
Chillingham Community Preschool	1411 Numinbah Rd	Chillingham	Outside of flood extent and close to evacuation centre (38).
Smiley Tots Childrens Centre	65 Wommin Bay Road	Chinderah	This facility may become inundated from 5% AEP event (38).
Beach Kids Early Learning & Preschool Centre	11 Waugh St	Chinderah	This facility may become inundated from 5% AEP event (38).
Story House Early Learning	30 Naru St	Chinderah	This facility may become inundated from 5% AEP event (38).
Kunghur Community Preschool	Corner Kyogle & Cooloon Streets	Kunghur	Outside of flood extent (38).
Petit Early Learning Journey Murwillumbah	5 Central Pde	Murwillumbah	This facility may become inundated from the 1% AEP event (38).

Uniting Preschool Murwillumbah	2-6 Byangum Road	Murwillumbah	The centre is located on sufficiently high ground to remain flood free during all design events up to and including the 0.2%AEP.
Joeys Pouch Early Years Educational and Preschool Centre Inc	40 Ewing St	Murwillumbah	This facility may become isolated at PMF event, evacuation should occur before this (38).
Murwillumbah Early Education Centre	55 Commercial Road	Murwillumbah	This facility may become inundated from the 20% AEP event (38).
Rosellas Community Preschool	Banner Street	Murwillumbah	This facility is outside the flood extent and able to access evacuation route (38).
Lindisfarne Anglican Grammar School OOSHc	Lindisfarne Anglican School, 36 Sunshine Avenue	Tweed Heads South	This facility may become inundated from the 5% AEP event (38).
Teddy Bears Child Care Centre	27 Corporation Circuit	Tweed Heads South	This facility may become inundated in a PMF event (38).
Jellybeans Family Day Care	1 Sands St	Tweed Heads South	This facility may become inundated in a PMF event (38).
Cooloon Children's Centre	2 Park Street	Tweed Heads	This facility may become inundated in a PMF event (38).
Creative Care Oshap	St Joseph's Primary School, 3-5 Frances Street	Tweed Heads	This facility may become inundated in a PMF event (38).
Freckles Kindy & Learning Centre	205-207 Kennedy Drive	Tweed Heads	This facility may become isolated before the 5% AEP event and require evacuation before this (38).
Goodstart Early Learning Tweed Heads	53-55 Greenway Drive	Tweed Heads	This facility may become inundated in a PMF event (38).
Tweed Heads Kindy Care	239 Kennedy Drive	Tweed Heads	This facility may become inundated before a 5% AEP event requiring evacuation beforehand (38).
Twin Towns Early Learning Centre	44 Recreation St	Tweed Heads South	This facility may become inundated in a PMF event (38).
Capturing Kids Minds	20 Sullivan St	Tweed Heads South	This facility may become inundated before a 5% AEP event requiring evacuation beforehand (38).
Erlibyrd's Preschool & Early Learning Centre	1 Seymour St	Tweed Heads South	This facility may become inundated before a 5% AEP event requiring evacuation beforehand (38).
Tweed Heads South Public School Preschool	Heffron Street	Tweed Heads South	This facility may become inundated before a 5% AEP event requiring evacuation beforehand (38).

Little Grommets Early Learning Centre	62 Greenway Drive	Tweed Heads South	This facility may become inundated in a PMF event, but may require evacuation before the 5% AEP event due to water over Enterprise Avenue (38).
Mt Warning Childcare	120 Glenrock Rd	Uki	
<b>Facilities for the aged and/or infirm</b>			
Banora Point Retirement Village	57-59 Leisure Drive	Banora Point	This facility may be inundated at the PMF event but would require evacuation before the 20% AEP event due to local road closures (38).
Bolton Clarke Darlington	126 Leisure Drive	Banora Point	This facility may be inundated at the PMF event but would require evacuation before the 20% AEP event due to local road closures (38).
Bolton Clarke Winders	26 Winders Pl	Banora Point	This facility may become inundated at the 2% AEP event requiring evacuation before this (38).
Bupa Aged Care Banora Point	18 Ballymore Court	Banora Point	This facility may be inundated at the PMF event but would require evacuation before the 20% AEP event due to local road closures (38).
Southern Cross St Martha's Residential Aged Care	3-7 Leisure Dr	Banora Point	This facility may start to become inundated at the 1% AEP event (38).
Southern Cross Care St. Martha's Village	81-83 Leisure Drive	Banora Point	This facility may become inundated in the PMF event, however would require evacuation before evacuation routes are cut at 20% AEP event (38).
Winders Retirement Community	Winders Pl	Banora Point	This facility may become inundated in a 1% AEP event, however would require evacuation before evacuation routes are cut at 20% AEP event (38).
Bilambil Creek Residential Village	382 Bilambil Rd	Bilambil	This facility may become inundated at the 20% AEP event (38).
Aveo Mountain View	1 Ingram Pl	Murwillumbah	Some housing may be affected in a PMF (38)
McKenzie Aged Care - Heritage Lodge	194 Byangum Road	Murwillumbah	This facility is on the edge of the PMF extent (38).

Murwillumbah Greens (Opal HealthCare)	18 Ingram Place	Murwillumbah	This facility is outside of the PMF extent (38).
Greenhills Lodge	437 Tweed Valley Way	South Murwillumbah	This facility may be inundated in a PMF event (38).
Adventist Senior Living	20 Banks Ave	Tweed Heads	This facility may be inundated in a PMF event (38).
Serene Retirement Living	31 Florence St	Tweed Heads	This facility may be inundated in a PMF event (38).
Tweed Fairways Retirement Village	1-3 Soorley St	Tweed Heads	This facility may be inundated in a PMF event (38).
Canowindra Aboriginal Community Care	65 Ducat Street	Tweed Heads	This facility may be inundated in a PMF event (38).
Tweed River Care Community	7-9 Florence Place	Tweed Heads	This facility may be inundated in a PMF event (38).
Tweed Transitional Aged Care Service	Tweed Hospital	Tweed Heads	This facility may be inundated in a PMF event (38).
The Tweed District Hospital	14 Powell Street*  *The new Tweed Valley Hospital is expected to open in early 2024 at 771 Cudgen Rd, Cudgen.	Tweed Heads	The hospital has a bed capacity of 214 beds and is affected by floodwaters in a 1% AEP event or greater. In a PMF event the extent of flooding would be between 1.0m and 2.0m of floodwaters throughout the ground level. The provision of medical supplies including linen/laundry and prescribed medications has been de-centralised and the hospital would require re-supply during an event of more than 3 days of isolation (12)
Bangalor Retreat	27 Stott St	Tweed Heads South	This facility is outside of the flood extent (38).
Southern Cross St Joseph's Apartments	1-9 Blundell Boulevard	Tweed Heads South	Considered vulnerable in an event equal to or greater than a 5% AEP event. The ACF has 44 residents with nine high care patients. The facility has no transport facilities and would require assistance if required to evacuate.
Raffles Mckenzie Assisted Aged Care	Lot 9 Peregrine Way	Tweed Heads South	This facility may become inundated in a PMF event (38).
Banksia Waters Over 50s Living	192 Piggabeen Rd	Tweed Heads West	The Retirement Village consists of residents over 55 years of age, housed in mobile homes. There are approximately 280 mobile homes situated on the eastern bank of the Cobaki Creek. Piggabeen Road is cut at Cobaki Creek at 1.6m (Chinderah gauge).

			This facility may become inundated in a PMF event (38).
Tweed Valley Care Community	Carramar Drive	Tweed Heads West	The Centre is considered flood free however the facility would be isolated by road closures which could affect staffing levels of the facility. In 2005 this facility required assistance to convey staff and medical supplies to the facility.
<b>Utilities and infrastructure</b>			
Banora Point Telephone Exchange	9 Pioneer Pde	Banora Point	This facility is outside of the flood extent (38).
Bilambil Telephone Exchange		Bilambil Heights	
Condong Essential Energy Zone Substation	McLeod St	Condong	This facility may become inundated from a 1% AEP event (38).
Duranbah Telephone Exchange	Clothiers Creek Rd	Duranbah	
Murwillumbah Telephone Exchange	118 Murwillumbah Street	Murwillumbah	This facility may become inundated from a 1% AEP event (38).
Murwillumbah Essential Energy Zone Substation	3 Charles St	Murwillumbah	This facility may become inundated from a 1% AEP event (38).
Murwillumbah Water Treatment Plant	15 Frances Street	Murwillumbah	This is facility is in proximity to the PMF extent (38).
Tumbulgum Telephone Exchange	8576 Tweed Valley Way	Tumbulgum	This facility may become inundated from a 1% AEP event (38).
Tumbulgum Water Treatment Plant	8814 Tweed Valley Way	Tumbulgum	This facility may become inundated in the 20% AEP event (38).
Tweed Heads Telephone Exchange	Corner Enid Street & Empire Lane	Tweed Heads	This facility may become inundated in a PMF event (38).
Banora Point Water Treatment Plant	46 Enterprise Avenue	Tweed Heads South	This facility may become inundated in a PMF event (38).
Stokers Siding Telephone Exchange	Pacific Hwy	Stokers Siding	

Mooball Wastewater Treatment Plant	Pottsville Rd	Mooball	
Terranora Lodge Telephone Exchange		Terranora	
Tweed Heads West Telephone Exchange	55 Inlet Drive	Tweed Heads West	This facility may become inundated in a PMF event (38).
Tweed Heads West Water Treatment Plant	Grey Street	Tweed Heads West	
Tumbulgum Telephone Exchange		Tumbulgum	
Tyalgum Wastewater Treatment Plant	85 Brays Creek Rd	Tyalgum	
Uki Wastewater Treatment Plant	165 Smiths Rd	Uki	
Uki Telephone Exchange			
<b>Camping Ground / Caravan Parks</b>			
Chinderah by Gateway Lifestyle	2-6 Tweed Coast Rd	Bogangar	This facility is outside of the flood extent (38).
Chinderah by Gateway Lifestyle	16 Anne Street	Chinderah	This facility may become inundated in the 5% AEP event (38).
Chinderah Lakes Caravan Pk	101 Anne St	Chinderah	This facility may become inundated in the 5% AEP event (38).
Chinderah Village Tourist Caravan Pk	94-104 Chinderah Bay Drive	Chinderah	This facility may become inundated in the 5% AEP event (38).
Royal Pacific Caravan Pk	109 Chinderah Rd	Chinderah	This facility may become inundated in the 5% AEP event (38).
Homestead Holiday Pk	25 Chinderah Bay Drive	Chinderah	This facility may become inundated in the 5% AEP event (38).
Tweed Heritage Caravan Pk	92 Chinderah Bay Drive	Chinderah	This facility may become inundated in the 5% AEP event (38).
Tweed River Hacienda Caravan Pk	37-63 Chinderah ay Drive	Chinderah	This facility may become inundated from the 20% AEP event (38).

Fingal Caravan Pk	9 Prince St	Fingal Head	Flood waters begin to enter the lower parts of the caravan park at approximately 2.1m (Chinderah gauge) necessitating the re-location of the caravans and residents (6)
Cutters Camp campground	Cutters Camp Road	Mebbin	Expected maximum occupancy of 51
Midginbil Eco Resort	252 Midginbil Road	Midginibil	
Mt Warning Rainforest Park	153 Mount Waring Road	Mount Warning	Can become isolated when Dum Dum Bridge closes around 8m on Uki gauge. Maximum occupancy of up to 655 people.
Greenhills Caravan Pk	488 Tweed Valley Way	South Murwillumbah	This facility may become inundated from the 20% AEP event (38).
Border Caravan Pk	3 Dry Dock Rd	Tweed Heads	This facility may become inundated from a 5% AEP event (38).
River Retreat Caravan Park	8 Philip Parade	Tweed Heads	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).
Palms Village Caravan Park	112 Dry Dock Rd	Tweed Heads	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).
Pyramid Holiday Park	145 Kennedy Drive	Tweed Heads	This facility may become inundated from a 5% AEP event (38).
Tweed Billabong Holiday Village	Holden St	Tweed Heads	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).
Colonial Tweed Caravan Park	158 Dry Dock Rd	Tweed Heads	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).

Boyds Bay Holiday Park	3 Dry Dock Rd	Tweed Heads	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).
Tweed Broadwater Village	250 Kirkwood Rd	Tweed Heads South	It is recommended that at a height of 1.25m (Dry Dock gauge) with further rises expected, the mobile caravans and cars are relocated from the caravan park to the Tweed Heads Recreational area adjacent to the Police and Community Youth Club (PCYC).

## Brunswick River Valley

Facility Name	Street	Suburb	Comment
<b>Schools</b>			
Burringbar Public School	59 Burringbar Road	Burringbar	Burringbar Public School was undamaged during the 2017 flood event (35). It is identified within the Tweed Coastal Creeks Floodplain Risk Management Study (2015) as a vulnerable institution (6)
Crabbes Creek Public School	Crabbes Creek Rd	Crabbes Creek	Crabbes Creek Public School was severely damaged during the 2017 flood event with water damage to all school buildings with water levels reaching between 50 and 100cm (35)
Pottsville Beach Public School	Tweed Coast Road	Pottsville	Identified within the Tweed Coastal Creeks Floodplain Risk Management Study (2015) as a vulnerable institution (6)
St Ambrose	1 Charles St	Pottsville	This facility may become inundated in a PMF event (38).
<b>Childcare Centres</b>			
Burringbar Community Preschool	Gumnut Community Pre School, 27 Greenvale Court	Burringbar	Unknown. Not identified as a vulnerable institution within the Tweed Coastal Creeks Floodplain Management Study (6)



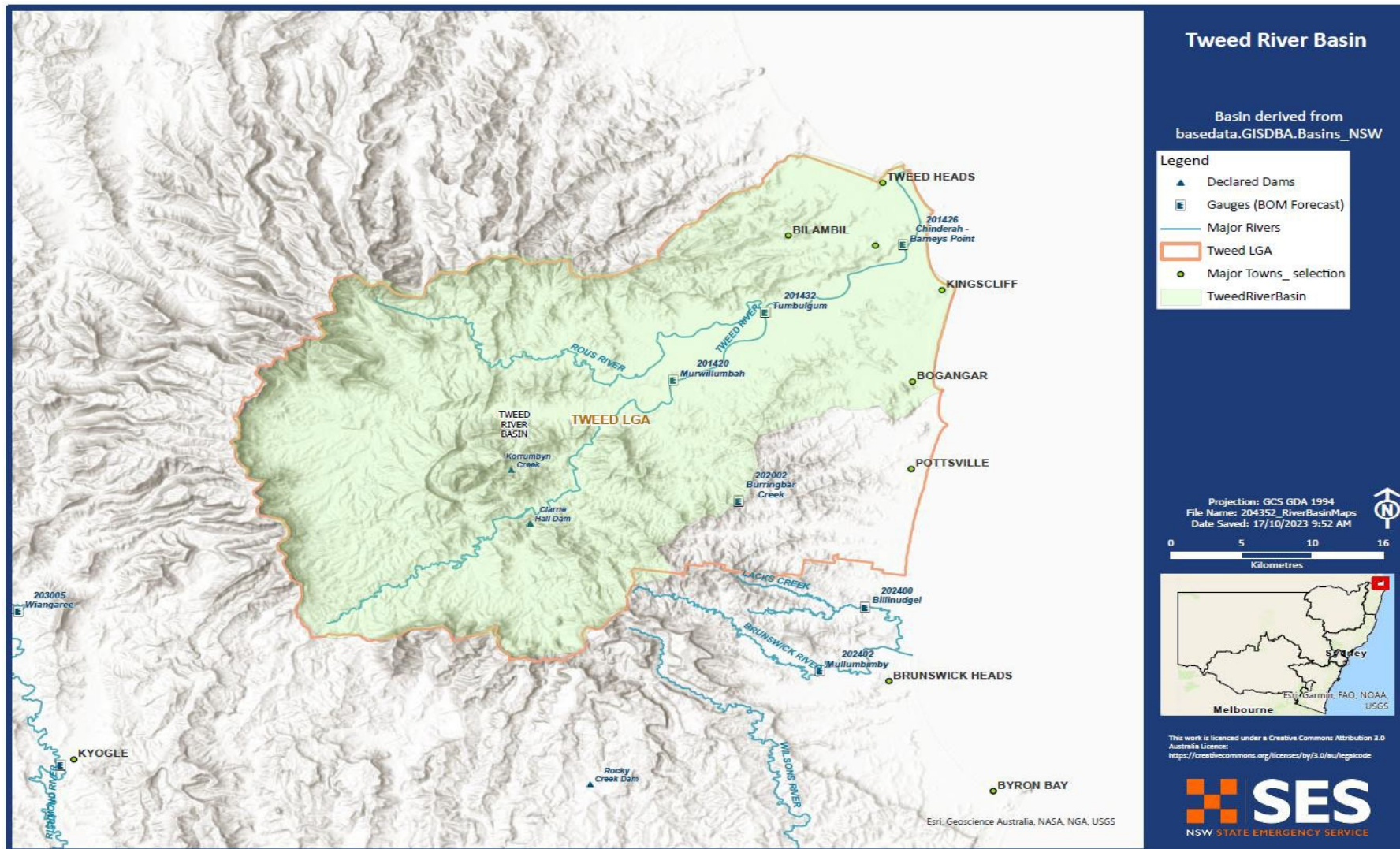
Natural Elements Early Learning Centre	44 Seabreeze Boulevard	Pottsville	This facility may become inundated in the PMF event (38).
Pottsville Gumnuts Preschool and Childcare Centre	8 Hampton Court	Pottsville	Unknown. Not identified as a vulnerable institution within the Tweed Coastal Creeks Floodplain Management Study (6).
<b>Facilities for the aged and/or infirm</b>			
Hastings Point Retirement Village	87-89 Tweed Coast Road	Hastings Point	This facility is outside of the flood extent (38).
Bupa Aged Care Pottsville Beach	41-51 Ballina Street	Pottsville	This facility is in close proximity to the PMF extent and may require evacuation before evacuation route is cut at 5% AEP event (38).
<b>Utilities and infrastructure</b>			
Mooball Telephone Exchange	6045 Tweed Valley Way	Burringbar	This facility may be inundated in a PMF event (38).
Hastings Point Wastewater Treatment Plant	139 Round Mountain Rd		This facility is in close proximity to the PMF (38).
Hastings Point Telephone Exchange	Tweed Coast Rd	Hastings Point	Hastings Point Telephone Exchange
<b>Camping Ground / Caravan Parks</b>			
Tweed Coast Holiday Park: Hastings Point	7 Tweed Coast Road	Hastings Point	This facility outside the PMF extent (38).
North Star Holiday Resort	1 Tweed Coast Road	Hastings Point	This facility may become inundated in the 1% AEP event (38).
Pottsville North Caravan Park	27 Tweed Coast Road	Pottsville	This facility is outside the flood extent (38).
Pottsville South Caravan Park	2 Tweed Coast Road	Pottsville	This facility may become inundated in the 5% AEP event (38).
Wooyung Beach Holiday Park	515 Wooyung Rd	Wooyung	This facility may become inundated in the 20% AEP event (38).

## Tweed Coastal Creeks

Facility Name	Street	Suburb	Comment
<b>Schools</b>			
Bogangar Public School	123-147 Tweed Coast Road	Bogangar	Evacuation Centre
Kingscliff High School	33 Oxford Street	Kingscliff	This facility may become inundated in a PMF event (38).
Kingscliff Public School	12 Orient Street	Kingscliff	Evacuation Centre
St Anthony's Primary School	23 Boomerang St	Kingscliff	This facility may become inundated in the 5% AEP event (38).
TAFE NSW – North Coast – Kingscliff Campus	Cudgen Road	Kingscliff	Evacuation Centre
<b>Childcare Centres</b>			
Beach Kids Early Learning & Preschool Centre	68 Hastings Road	Bogangar	This facility may become inundated in the PMF event (38).
Pippies Early Childhood Centre	34 Tallowood Drive	Bogangar	This facility may become inundated in the PMF event (38).
Kingscliff Mini School	60-62 Kingscliff St	Tweed Heads	This facility may become inundated in the PMF event (38).
<b>Facilities for the aged and/or infirm</b>			
Kingscliff Retirement Village	1-9 Blue Jay Circuit	Kingscliff	This facility may become inundated in the PMF event (38).
Uniting Kingscliff	24A Kingscliff St	Kingscliff	This facility may become inundated in the 1% AEP event (38)
Noble Lakeside Park	34 Monarch Drive	Kingscliff	This facility may become inundated in the PMF event (38)
Feros Village, Wommin Bay	1 McKissock Drive	Kingscliff	This facility may become inundated in the PMF event (38)
<b>Utilities and infrastructure</b>			
Banora Point Essential Energy Zone Substation	Corner Johnson St & Pioneer Parade	Banora Pt	This facility is outside the flood extent (38).
Bungalora Essential Energy Zone Substation	Terranora Rd	Bungalora	

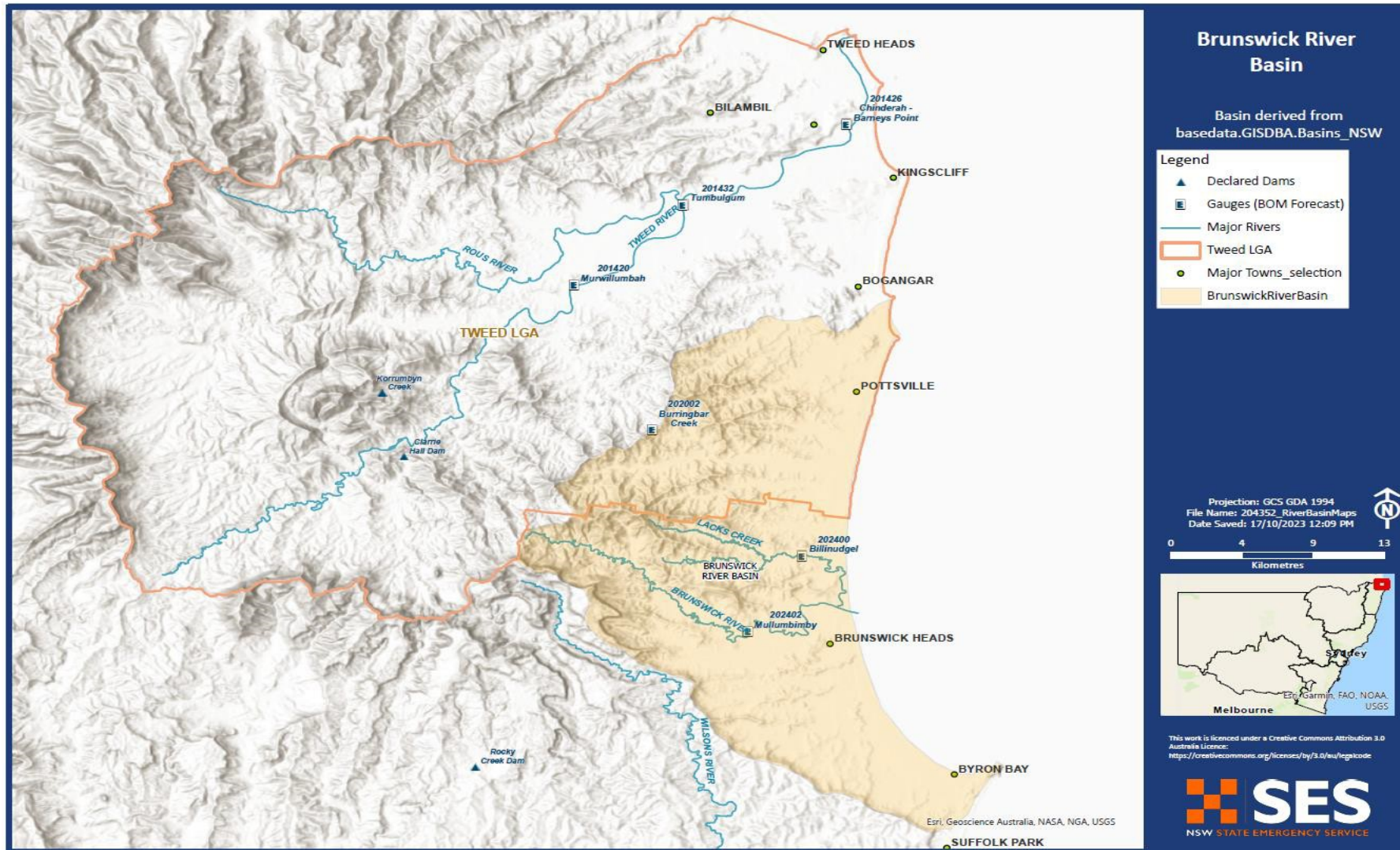
Facility Name	Street	Suburb	Comment
Cudgen Essential Energy Zone Substation	571 Cudgen Rd	Cudgen	This facility is outside the flood extent (38).
Kingscliff Point Waste Treatment Plant	Altona Rd	Chinderah	
Kingscliff Telephone Exchange	17 Pearl Street	Kingscliff	This facility may become inundated in the PMF event (38)
<b>Camping Ground / Caravan Parks</b>			
Ingenia Holidays Kingscliff	46 Wommin Bay Rd	Kingscliff	This facility may become inundated in the 5% AEP event (38)
Kingscliff Beach Holiday Park	125 Marine Parade	Kingscliff	This facility is outside the flood extent (38).
Kingscliff North Holiday Park	277 Marine Parade	Kingscliff	This facility is in close proximity to the PMF extent (38).

# MAP 1: TWEED RIVERBASIN MAP

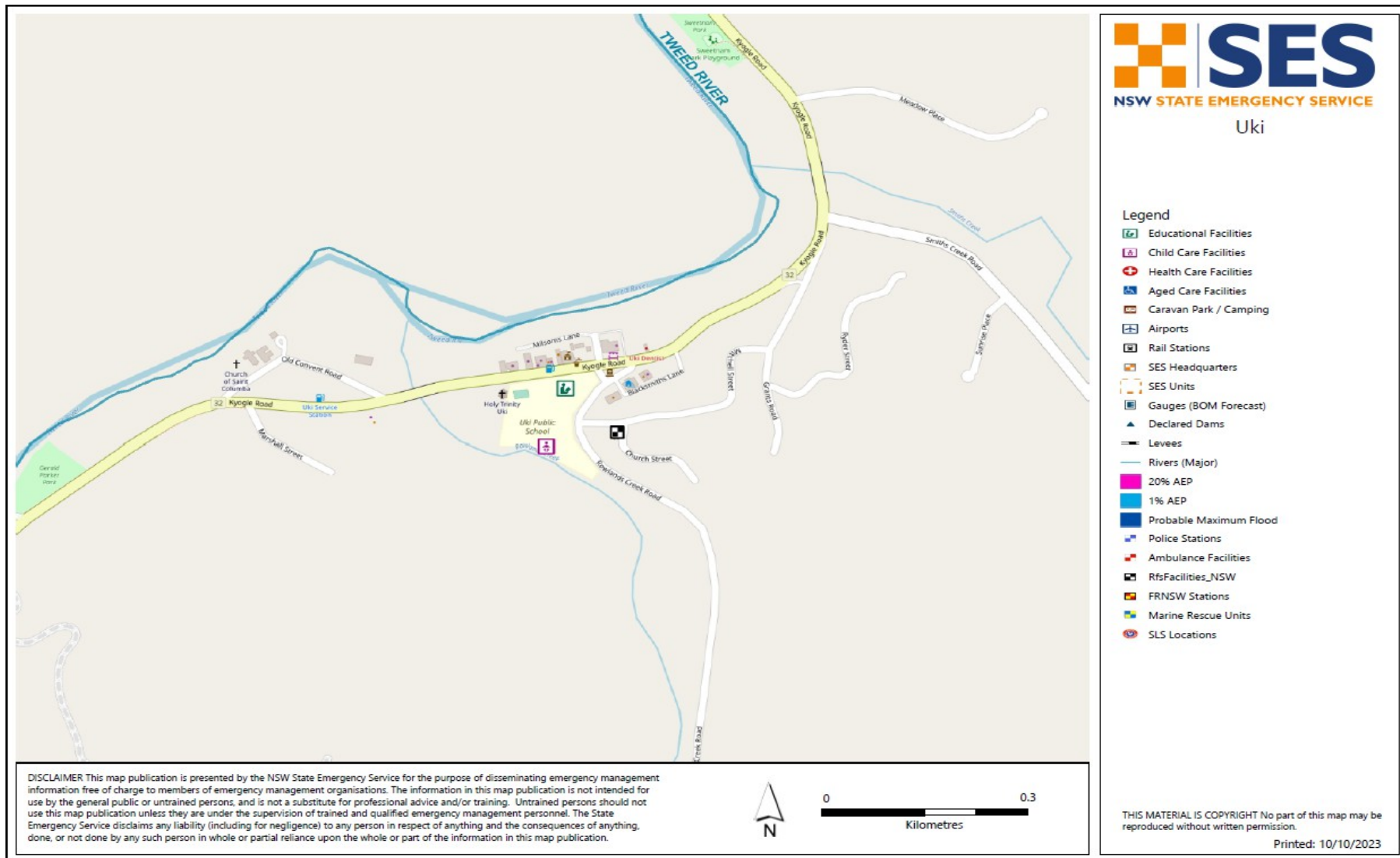




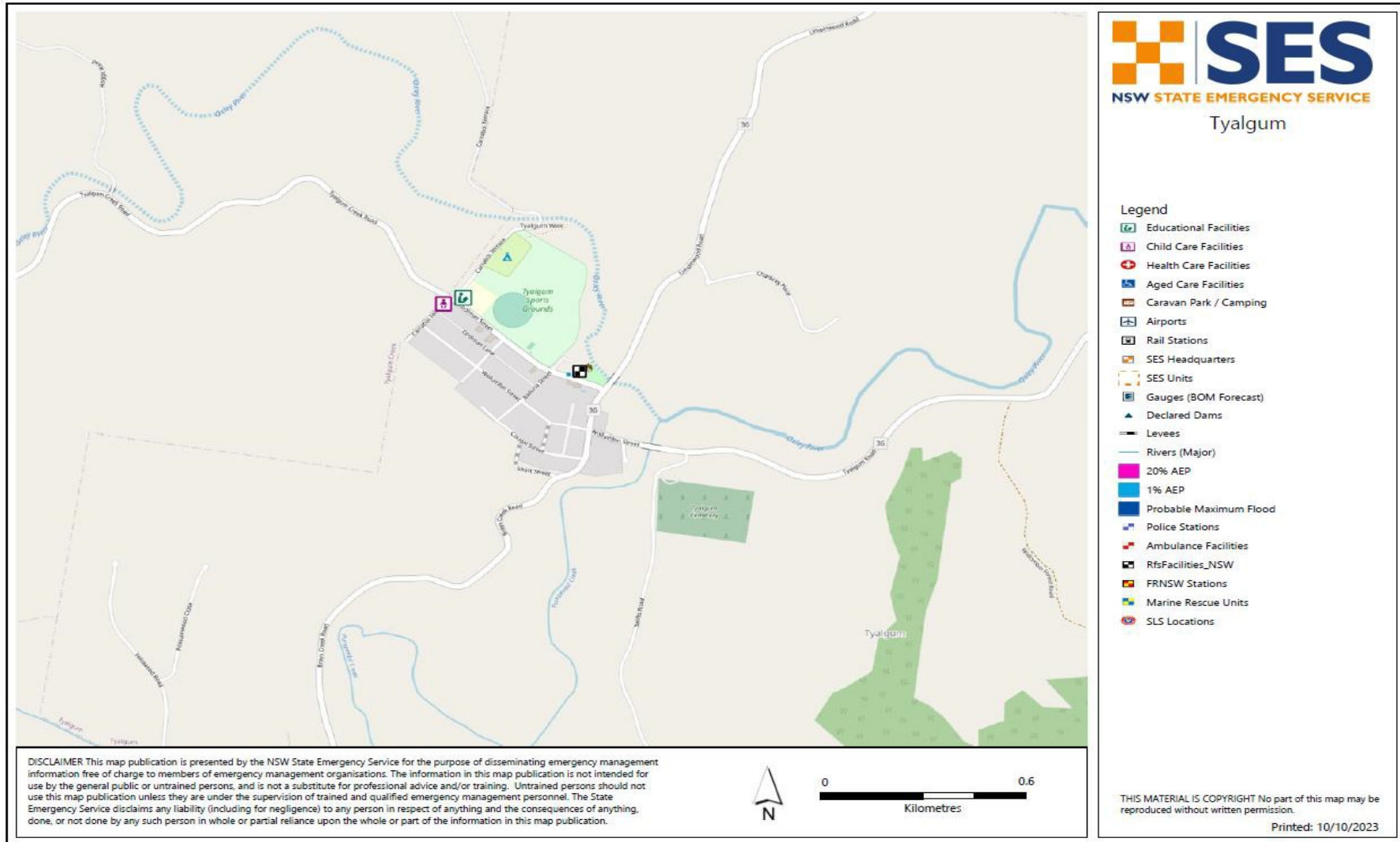
## MAP 2: BRUNSWICK RIVERBASIN MAP



### MAP 3: UKI TOWN MAP

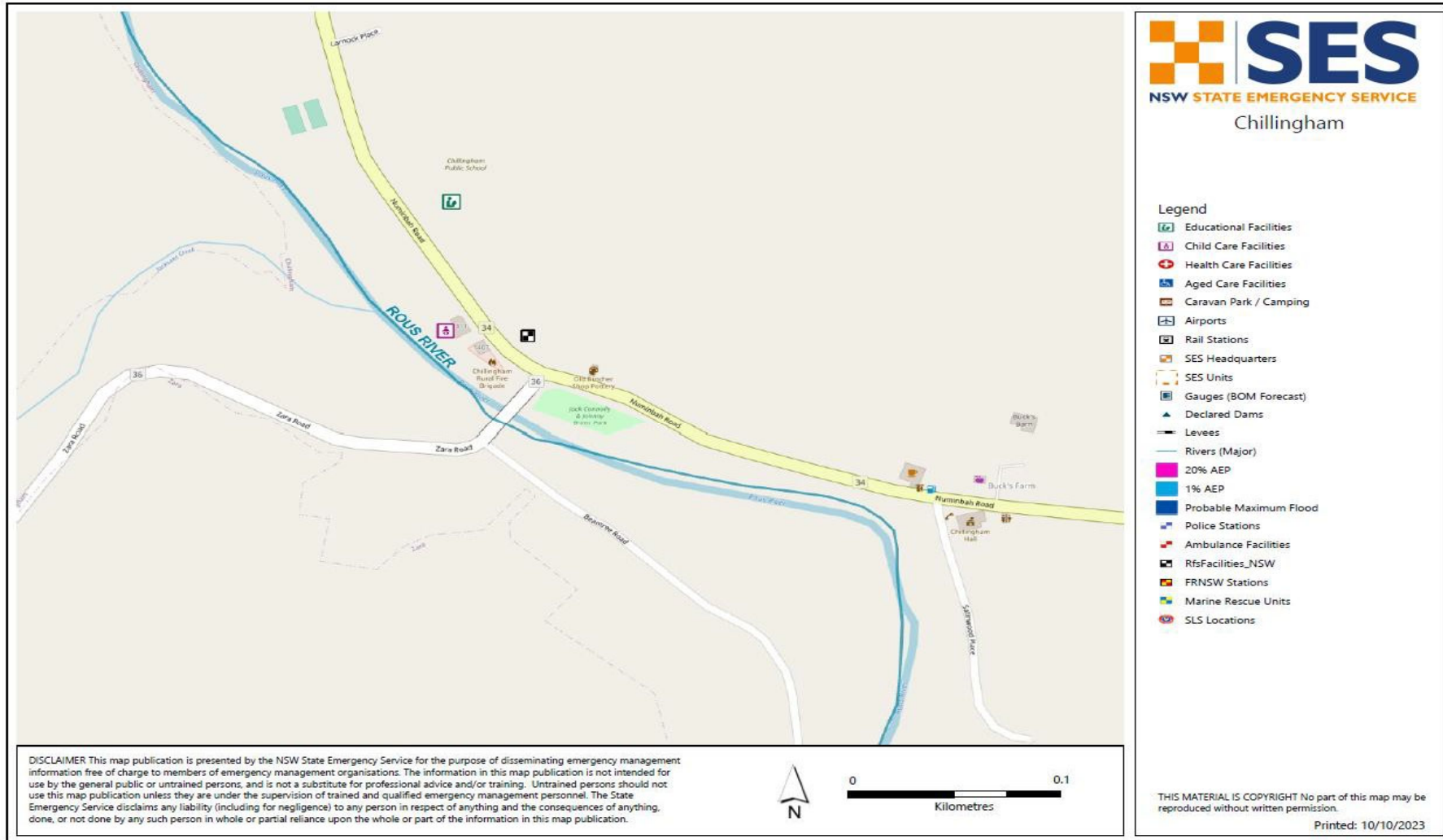


### MAP 4: TYALGUM TOWN MAP



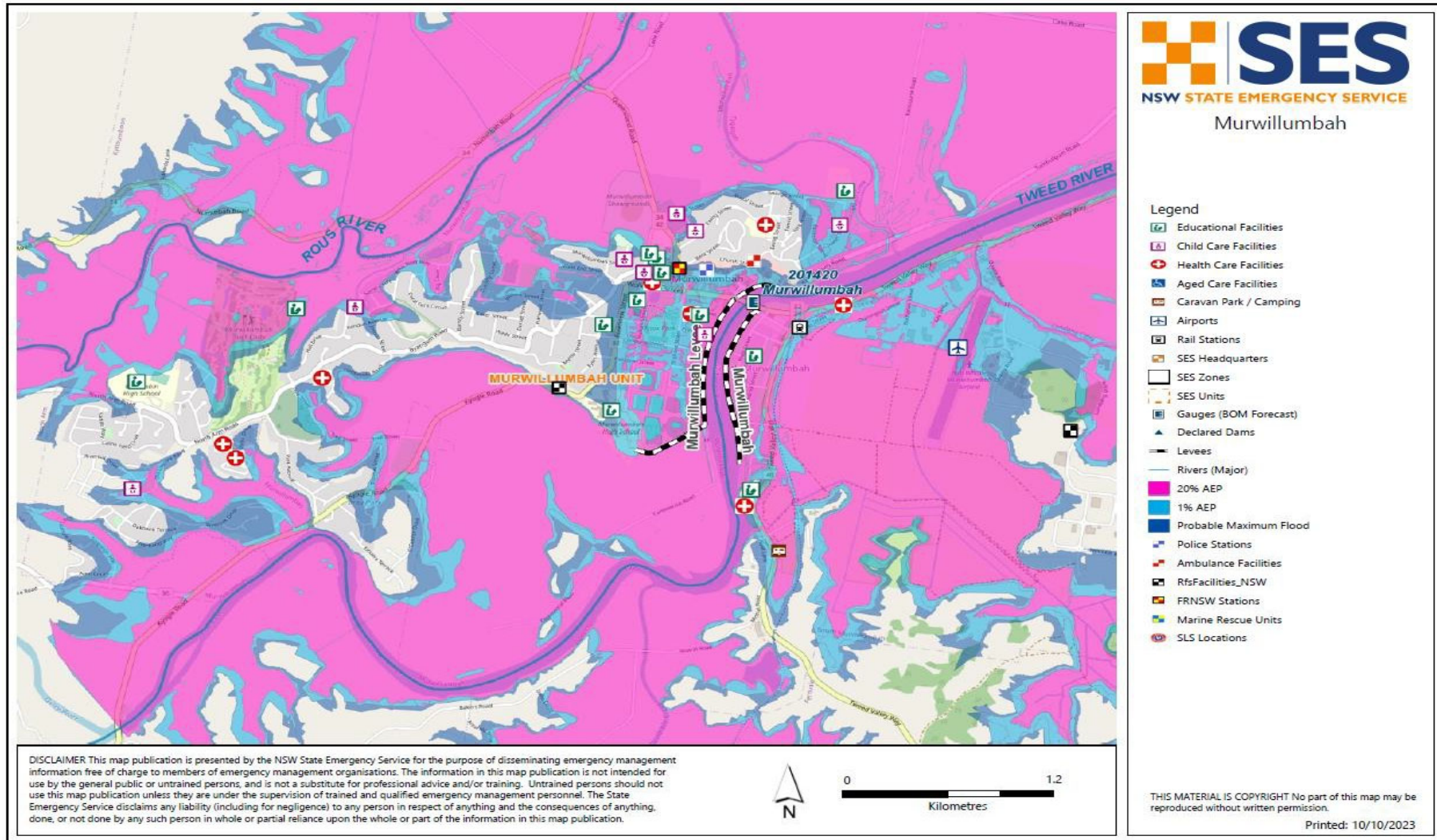


# MAP 5: CHILLINGHAM TOWN MAP

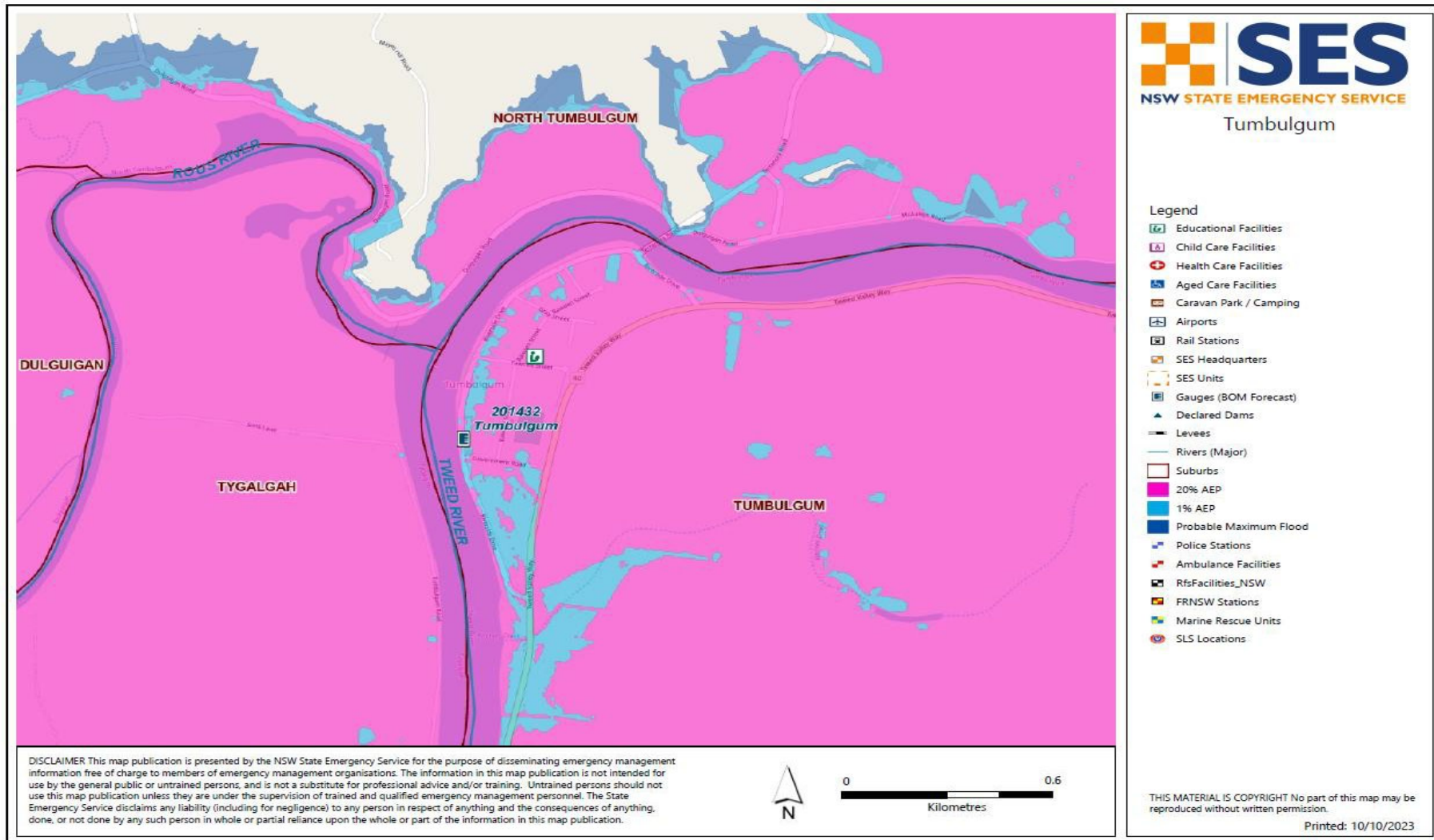




# MAP 6: MURWILLUMBAH TOWN MAP

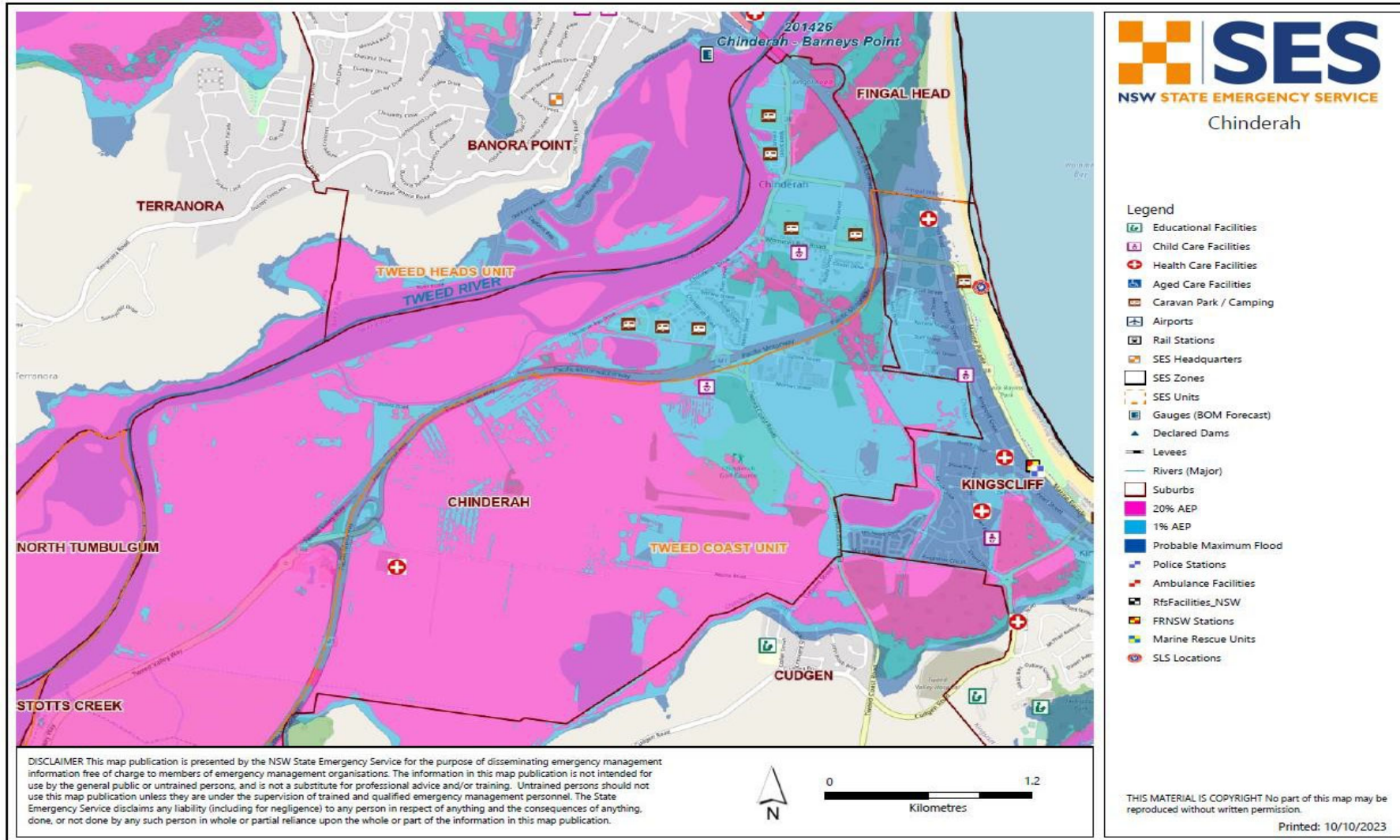


## MAP 7: TUMBULGUM TOWN MAP

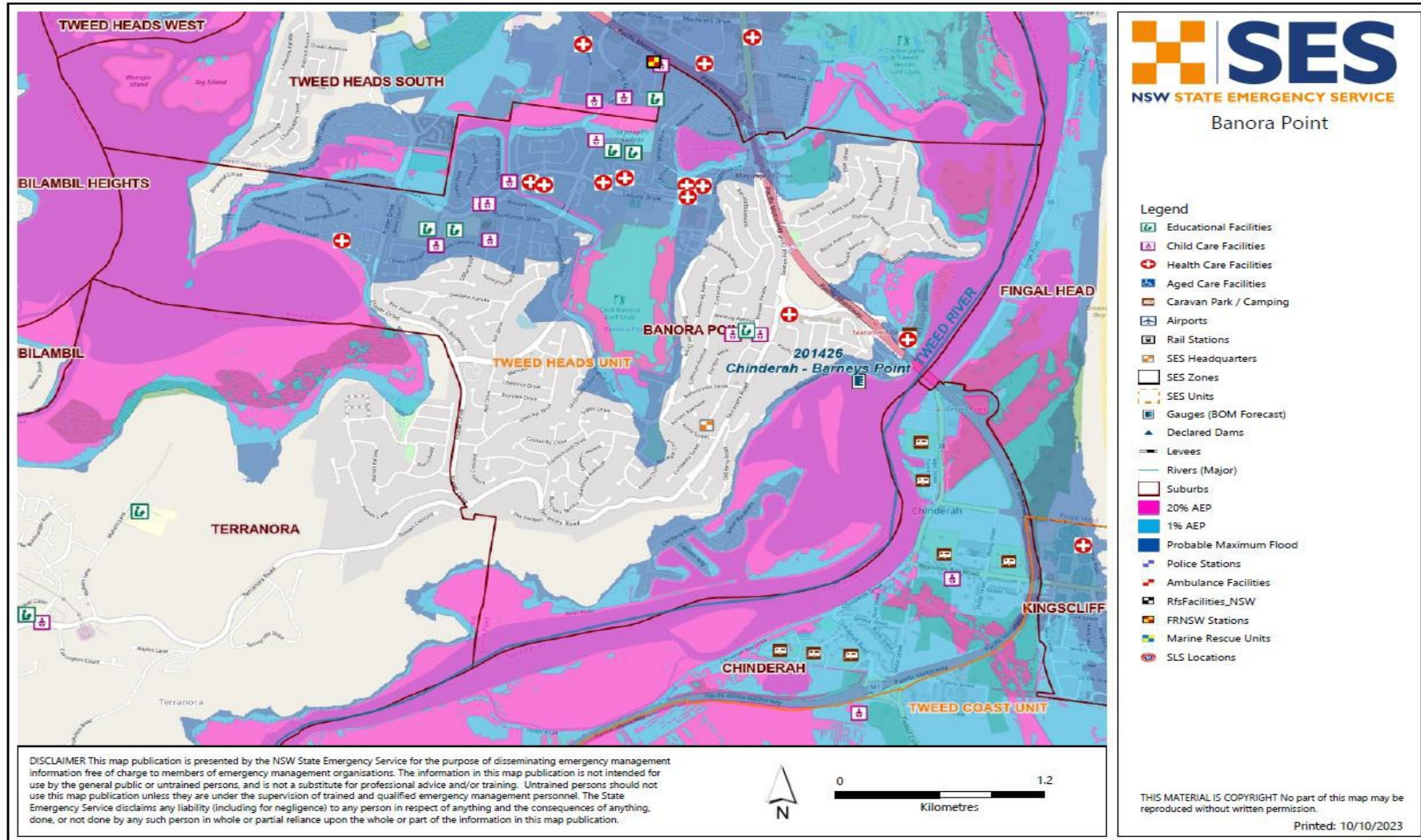




### MAP 8: CHINDERAH TOWN MAP

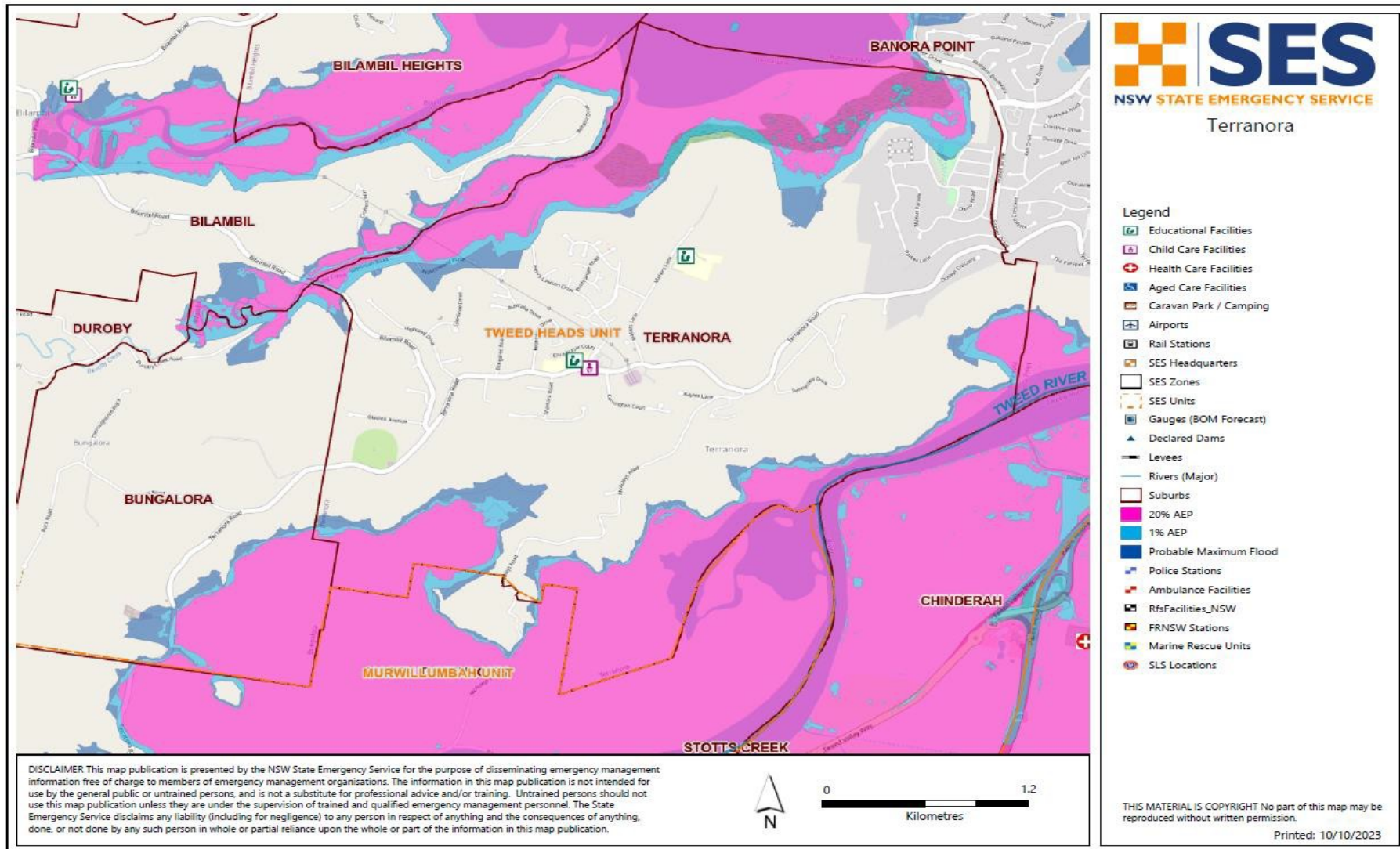


# MAP 9: BANORA POINT TOWN MAP

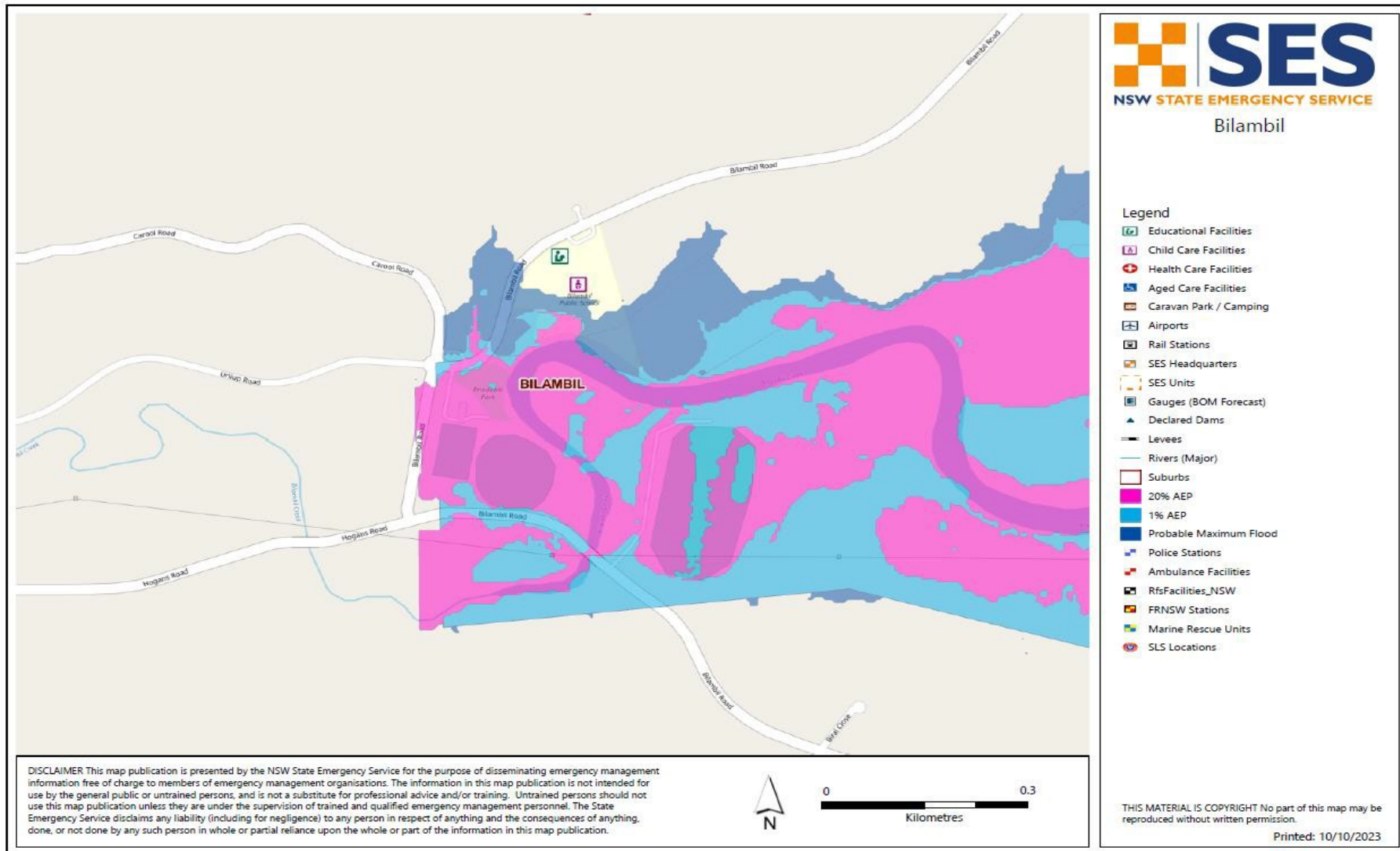




# MAP 10: TERRANORA TOWN MAP

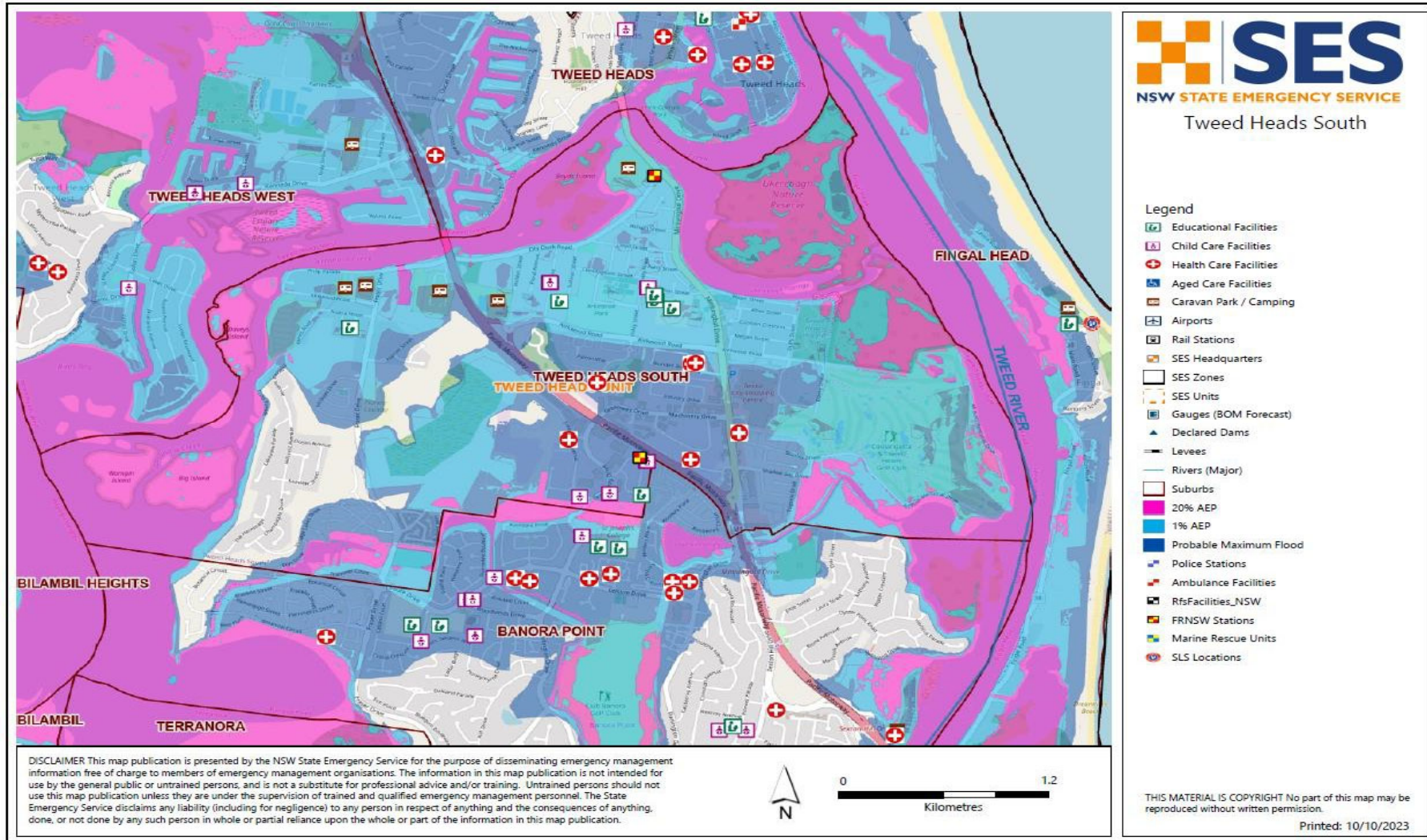


# MAP 11: BILAMBIL TOWN MAP



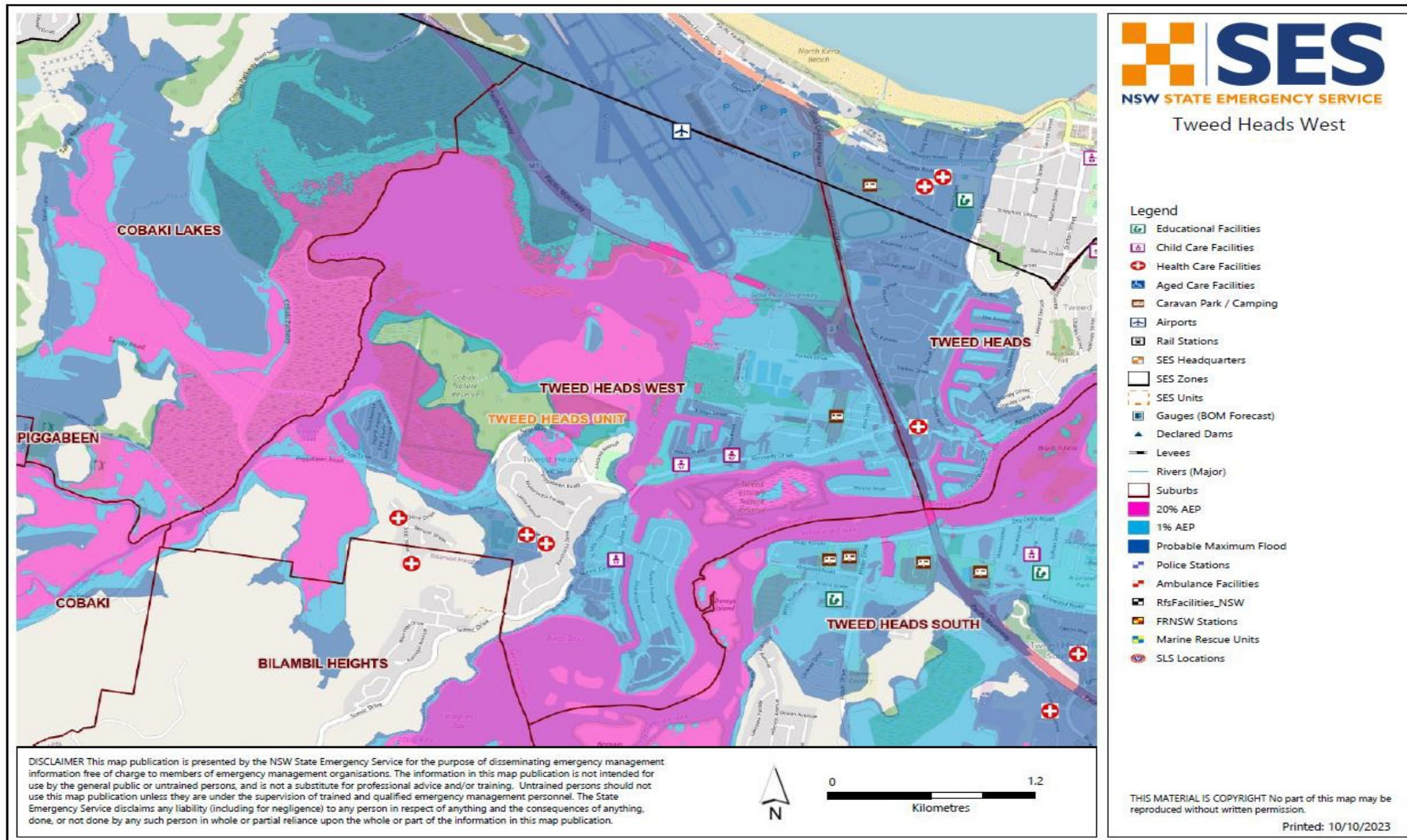


# MAP 12: TWEED HEADS SOUTH TOWN MAP



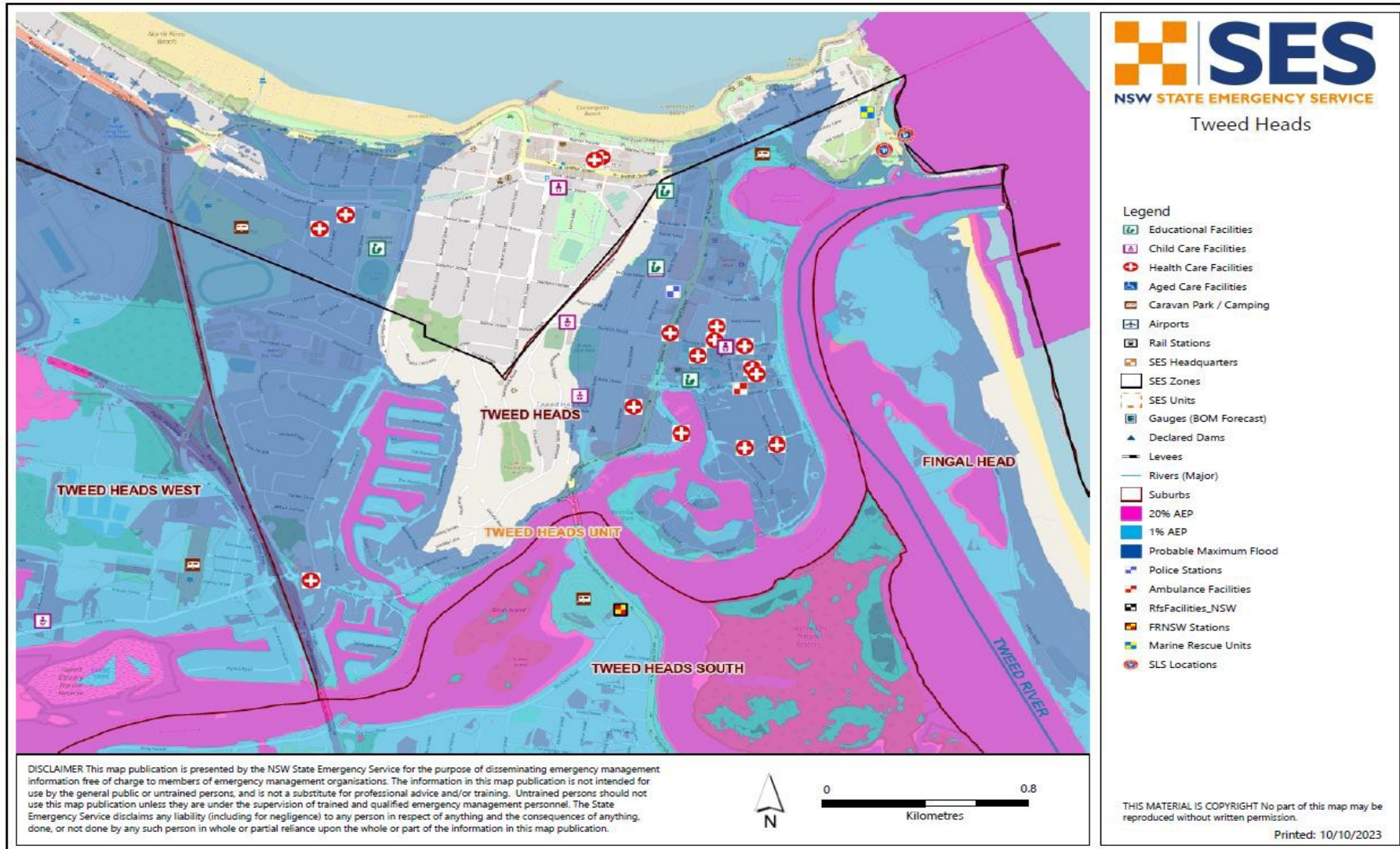


### MAP 13: TWEED HEADS WEST TOWN MAP

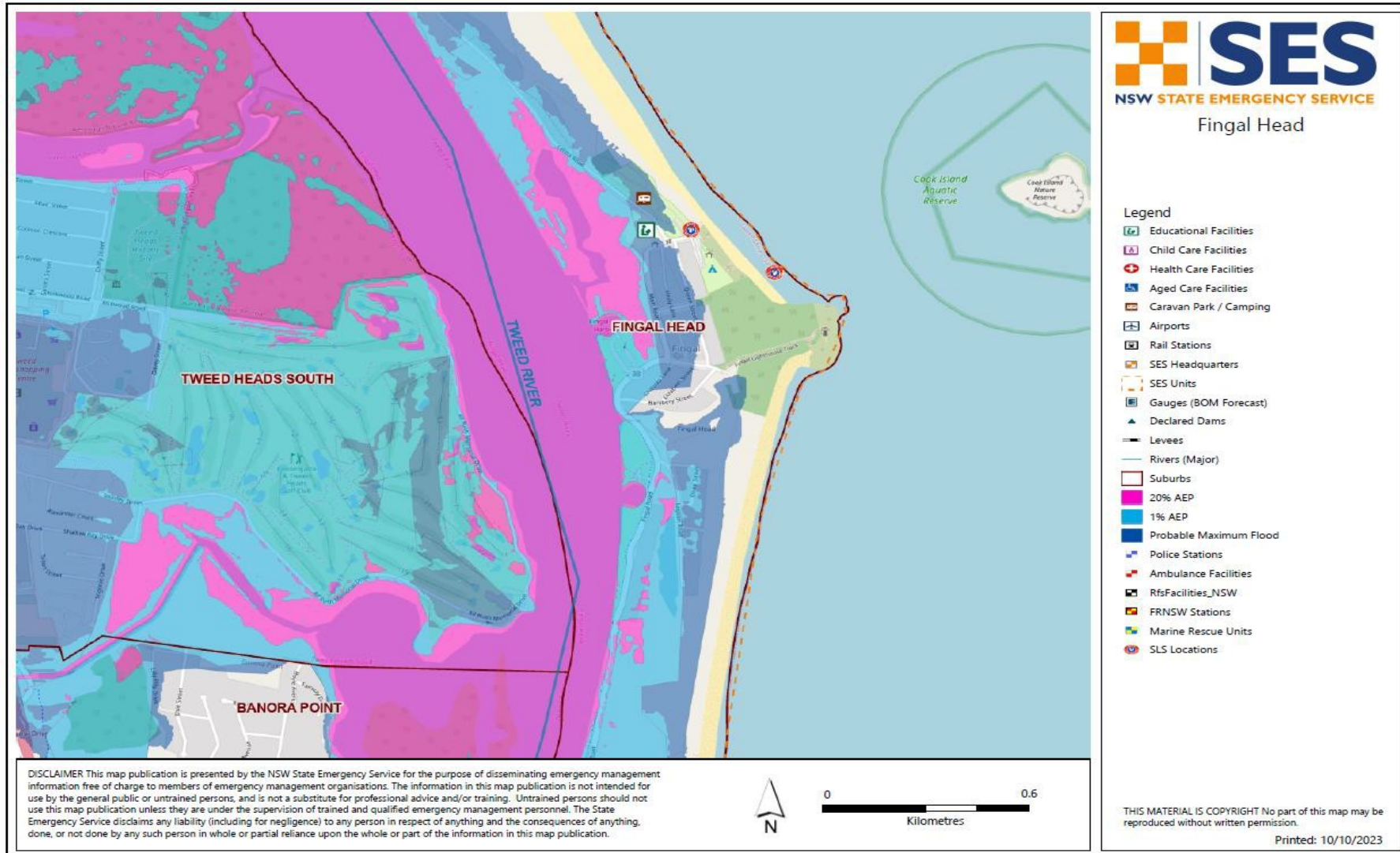




### MAP 14: TWEED HEADS TOWN MAP

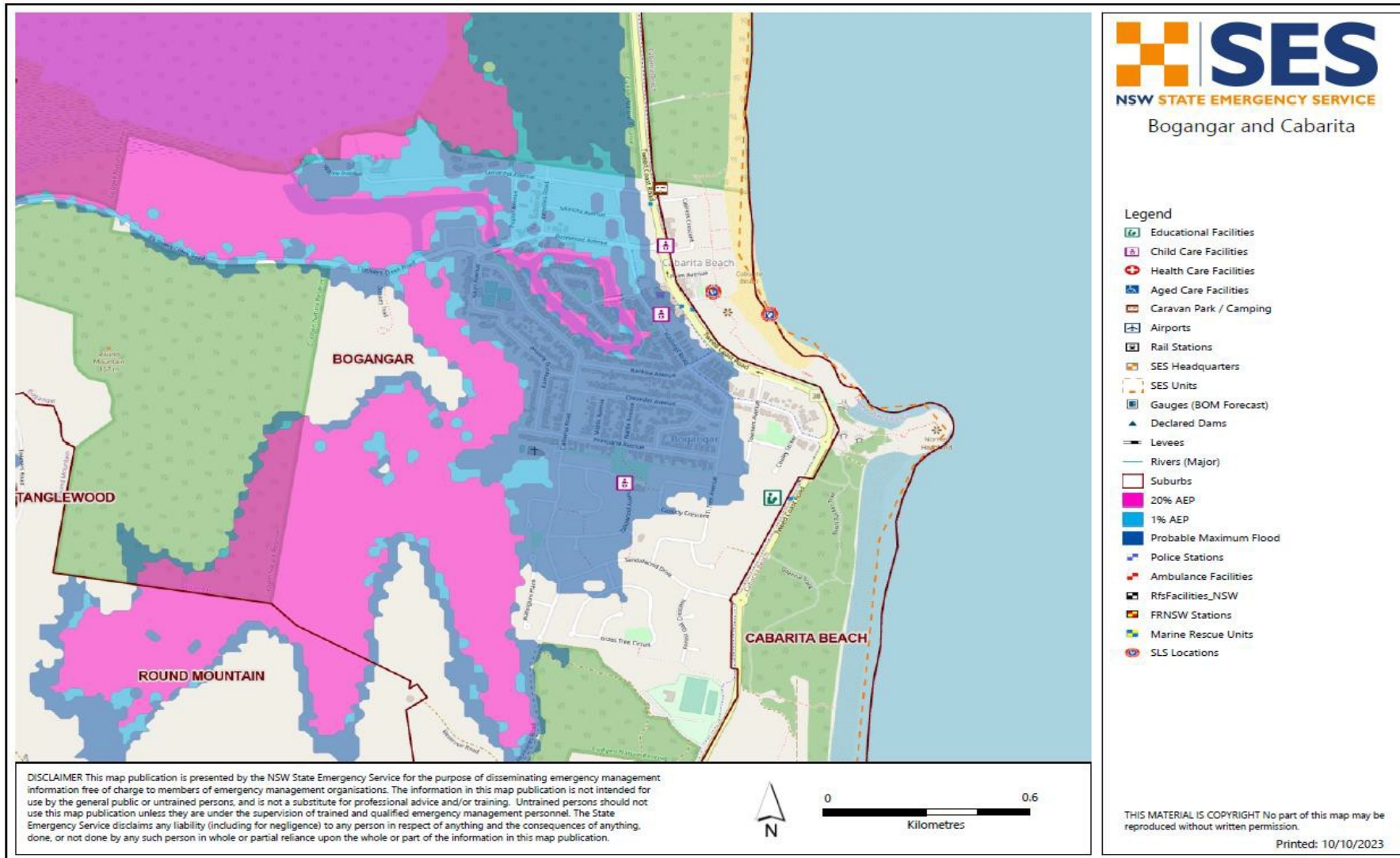


### MAP 15: FINGAL HEADS TOWN MAP

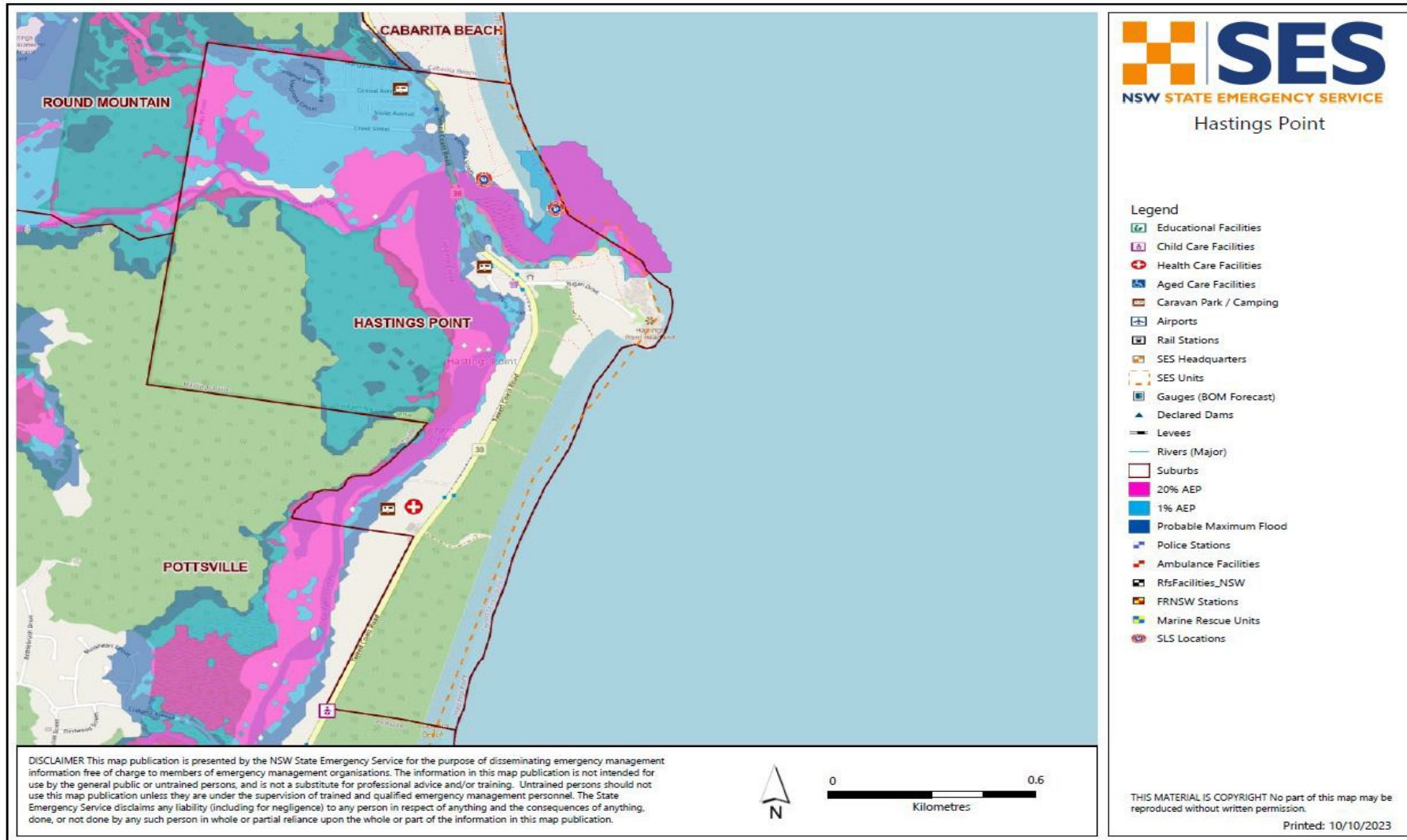




# MAP 16: BOGANGAR AND CABARITA TOWN MAP

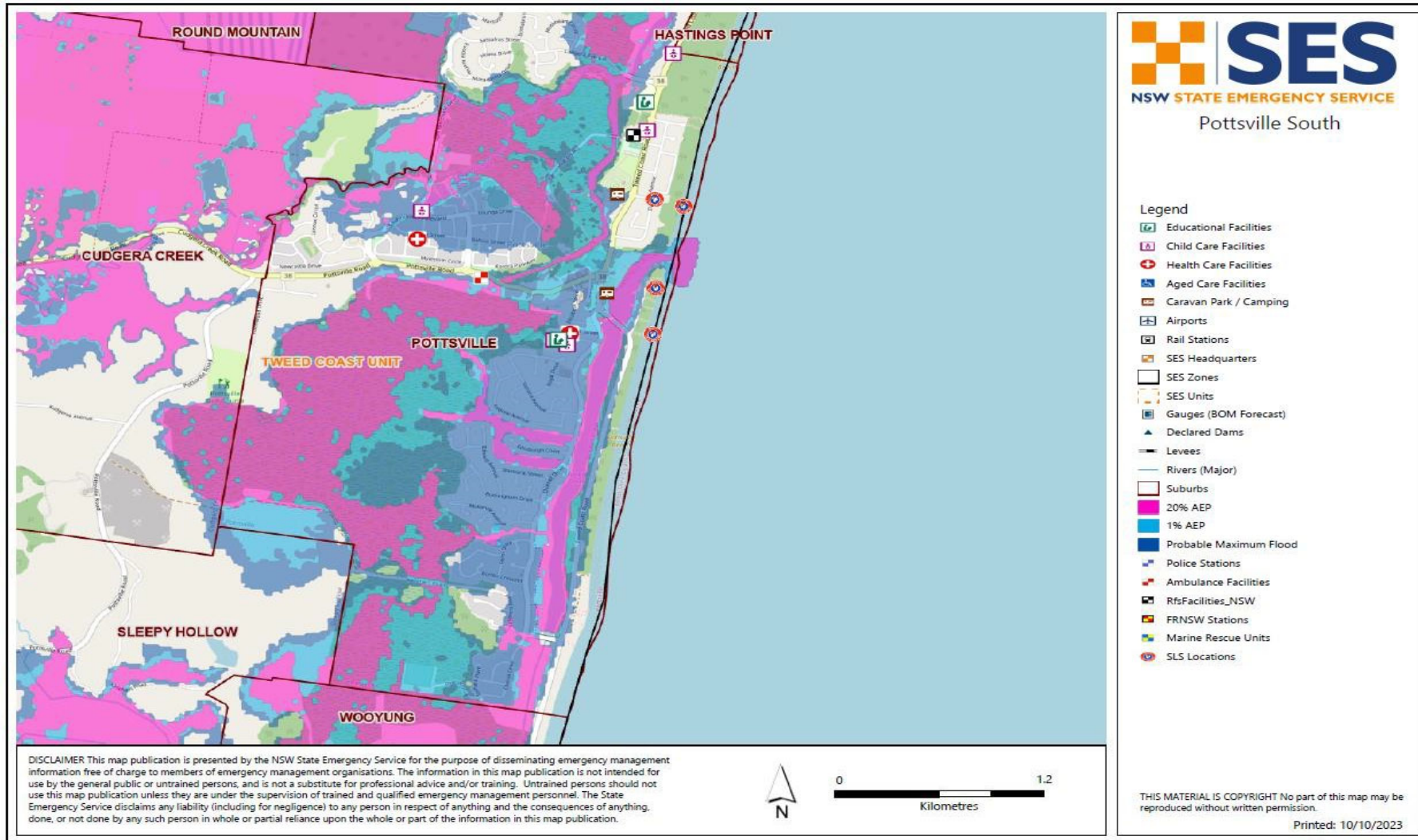


# MAP 17: HASTINGS POINT TOWN MAP





# MAP 18: POTTSVILLE TOWN MAP



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# **TWEED SHIRE FLOOD WARNING SYSTEMS AND ARRANGEMENTS**

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**Chapter 1 of Volume 3 (NSW SES Response Arrangements for Tweed  
Shire) of the Tweed Shire Flood Emergency Sub Plan**

Last Update: September 2024

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# 1. GAUGES MONITORED BY THE NSW SES MURWILLUMBAH, TWEED COAST AND TWEED HEADS LOCAL HEADQUARTERS

Table 1: Gauges monitored by the NSW SES Murwillumbah, Tweed Coast and Tweed Heads Local Headquarters

Gauge Name	Type	AWRC No.	Bureau Gauge No.	Stream	Flood level classification in metres			Owner
					MIN	MOD	MAJ	
North Murwillumbah *†‡	Automatic	201420	58186	Tweed River	3.0	4.0	4.8	Tweed Shire Council/ NSW DCCEEW
Tumbulgum *†‡	Automatic	201432	558014	Tweed River	1.4	1.8	2.5	Tweed Shire Council/ NSW DCCEEW
Chinderah *†‡	Automatic	-	558010	Tweed River	1.3	1.7	2.0	Tweed Shire Council
Barneys Point	Automatic	201426	558102	Tweed River	2.2	2.6	2.9	NSW DCCEEW
Boat Harbour (Rous River) †	Automatic	201906	058204	Rous River	-	-	-	Tweed Shire Council
Rous River at Boat Harbour No 3 †‡	Automatic	201005	558077	Rous River	-	-	-	Water NSW
Bray Park Weir	Automatic	201455	558065	Tweed River	-	-	-	Tweed Shire Council/ NSW DCCEEW
Chillingham †‡	Automatic	201008	058011	Rous River	-	-	-	Tweed Shire Council
Clarie Hall Dam	Automatic	201905	558028	Doon Doon Creek	-	-	-	Tweed Shire Council
Cobaki	Automatic	201448	558045	Cobaki Creek	-	-	-	NSW DCCEEW
Dry Dock †‡	Automatic	201428	558029	Terranora Creek	-	-	-	Tweed Shire Council/ NSW DCCEEW
Eungella†‡	Automatic	201001	058193	Oxley River	-	-	-	Tweed Shire Council/ Water NSW

Kynnumboon†	Automatic	201422	558051	Rous River	-	-	-	Tweed Shire Council/ NSW DCCEEW
Letitia 2A	Automatic	201429	558041	Tweed River	-	-	-	NSW DCCEEW
Murwillumbah Bridge	Automatic	201465	558067	Tweed River	-	-	-	Tweed Shire Council/ NSW DCCEEW
Palmers Rd	Automatic	201015	558018	Tweed River	-	-	-	Tweed Shire Council
Terranora	Automatic	201447	558056	Terranora Creek	-	-	-	NSW DCCEEW
Tyalgum Bridge †‡	Automatic	201901	558088	Oxley River	-	-	-	Tweed Shire Council
Uki †‡	Automatic	201900	058167	Tweed River	-	-	-	Tweed Shire Council/ Water NSW
Burringbar Creek at Tweed Valley Way †‡	Automatic	-	558103	Burringbar Creek	-	-	-	Tweed Shire Council
Crabbes Creek Village †	Automatic	-	558105	Crabbes Creek	-	-	-	Tweed Shire Council
Mooball Creek at Tweed Coast Rd	Automatic	202035	558050	Mooball Creek	-	-	-	NSW DCCEEW
Bogangar (Cudgen Lake)	Automatic	202416	558043	Cudgen Lake	-	-	-	NSW DCCEEW

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

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

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

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

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

### 2.1 DISSEMINATION OF WARNINGS:

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

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

### Television Stations:

Station	Location
ABC TV (Channel 2, 20 & 21)	Northern NSW
ABC NEWS, (Channel 24)	Northern NSW
NBN (Channel 8, 81)	Northern NSW

SBS (Channel 3)	Northern NSW
WIN/10 (Channel 5)	Northern NSW
Seven West (Channel 6, 61)	Northern NSW
SkyNews (Channel 53)	Northern NSW
10 HD Brisbane (Channel 1, 15)	Gold Coast / Tweed
ABC TV (Channel 2, 21)	Gold Coast / Tweed
SBS (Channel 3)	Gold Coast / Tweed
10 Gold Coast (Channel 5)	Gold Coast / Tweed
Seven Gold Coast (Channel 6, 61)	Gold Coast / Tweed
Seven Gold Coast (Channel 7, 71)	Gold Coast / Tweed
Nine-NBN Gold Coast (Channel 8, 81)	Gold Coast / Tweed
Nine Gold Coast (Channel 9, 91)	Gold Coast / Tweed
Sky News Regional (Channel 53)	Gold Coast / Tweed

### Radio Stations:

Station	Location	Frequency	Modulation
ABC Radio	North Coast	738	AM
		94.5	FM
ABC News	Richmond / Tweed Grafton / Kempsey	98.5 Channel; 204	FM
Radio 97	Currumbin/Broadbeach	104	FM
Tweed Coast Country	Murwillumbah	101	FM
ABC North Coast	Richmond/Tweed	94.5	FM
ABC Classic	Richmond/Tweed	95.3	FM
Triple J	Richmond/Tweed	96.1	FM
Radio National	Richmond/Tweed	96.9	FM
ABC News	Richmond/Tweed	98.5	FM

### Digital/On-Line Services

- Streaming Services
- Podcasts
- YouTube Channels

### Other Agencies:

#### Stakeholders include:

- Tweed Shire Council

- Chamber of Commerce
- Business Owners
- Not for Profit Organisations
- NDIS and Community Care Providers
- Department of Education
- Aged Care Providers
- Emergency Services
- Schools and Child Care
- NSW Health
- Media Outlets
- Australian Red Cross
- Others where appropriate



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# **TWEED SHIRE FLOOD EMERGENCY SUB PLAN: NSW SES LOCALITY RESPONSE ARRANGEMENTS**

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**Chapter 2 of Volume 3 (NSW SES Response Arrangements for Tweed  
Shire) of the Tweed Shire Flood Emergency Sub Plan**

Last Update: September 2024





## AUTHORISATION

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

Approved



---

*NSW SES North Eastern Zone Coordinator Planning (Acting)*

Elena Palamara

Date: 06/09/2024

Approved



---

*NSW SES North Eastern Zone Commander (Acting)*

Kristine McDonald

Date: 06/09/2024

Tabled at LEMC

---

13th November 2024

Date:

*Document Issue: V3.2-07042014*

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## SECTOR OVERVIEW

**Table 1: Overview of Sectors in the Tweed Shire LGA.**

*These Sectors provide further detail of the planned response strategies within Communities in the Tweed Shire LGA.*

Sector Name	Community	Sector Basis	Total properties	Properties potentially at risk in a PMF
Sector 1	Uki	Rising Road Access or Overland Escape	917 dwellings recorded. Unknown number of multiple occupancy dwellings.	No over floor inundation data available. 274 with ground level flooding in Uki, approx. 600+* in remainder of sector.
Sector 2	Tyalgum	Rising Road Access or Overland Escape	503 dwellings recorded. Unknown number of multiple occupancy dwellings.	No over floor inundation data available. 214 with ground level flooding in Tyalgum, approx. 380* in remainder of sector
Sector 3	Chillingham	Rising Road Access or Overland Escape.	692 dwellings	112 inundated above floor in areas immediately north of Murwillumbah, no over floor data is available for the remainder of the sector.  Isolation of communities within 2-3 hours for up to 2-3 days.
Sector 4	Murwillumbah/ South Murwillumbah	Much of Murwillumbah is a Low Flood Island, there is some Rising Road Access, and High Flood Islands near Murwillumbah Hospital and west of Murwillumbah Primary School.	4209 dwellings.	1410 inundated above floor level, isolation of Murwillumbah and South Murwillumbah.
Sector 5	Tumbulgum / Condong	Tumbulgum and Condong are Low Flood Islands. There is rising road access to the south of the sector.	981 dwellings.	404 inundated above floor level in Condong, Tumbulgum and surrounds.

Sector 6	Chinderah/Kingscliff	Chinderah is a Low Flood Island, with Rising Road Access in Kingscliff	3867 dwellings.	1028 inundated above floor level.
Sector 7	Banora Point, Tweed Heads South (northwest part)	There is a High Flood Island to the north of the sector, the southern part of the sector has rising road access.	8212 dwellings.	1545 inundated above floor in Banora Point, 1394 in Tweed Heads South (some within Tweed Heads South Sector).
Sector 8	Terranora, Bungalora, North Tumbulgum	Terranora and North Tumbulgum have rising road access to Bilambil Heights.	976 dwellings.	33 inundated above floor level. Isolation of North Tumbulgum
Sector 9	Bilambil and Duroby	Bilambil has rising road access.	1366 dwellings	14 inundated above floor level. Isolation of Bilambil, Bilambil Heights and parts of Duroby.
Sector 10	Tweed Heads South (northeast) and Banora Point (southeast).	Tweed Heads South is a Low Flood Island, with Rising Road Access in Banora Point.	3067 dwellings	1394 in Tweed Heads South (some within Banora Sector), 1545 inundated above floor in Banora Point (some within Tweed Heads South Sector). Isolated caravan parks in small events.
Sector 11	Tweed Heads West, Seagulls Estate.	Tweed Heads West has Rising Road Access into Bilambil Heights. The Cobaki Lakes area has rising road access.	3695 dwellings	995 inundated above floor level, a further 70 with ground level flooding in Piggabeen and over floor data not available. Isolation of sector.
Sector 12	Tweed Heads	Much of Tweed Heads becomes a High trapped perimeter.	5251 dwellings.	1199 inundated above floor level.
Sector 13	Fingal Head	Low Trapped Perimeter	347 dwellings.	175 inundated above floor level, isolation of Fingal Head.
Sector 14	Bogangar/ Cabarita Beach / Hastings Point	Casuarina Beach and Cabarita Beach areas become a High Trapped Perimeter. The remainder of the sector has rising road access.	5781 dwellings.	2843 total properties inundated overfloor in the Tweed Coastal catchments from Kingscliff to Wooyung. Cabarita and Bogangar.

				Properties at risk along Tamarind Ave, Willow Ave, Poplar Ave, Grevillia Rd, Mimosa Ave, Rosewood Ave and Hastings Road
Sector 15	Pottsville / Wooyung	<p>Black Rocks Estate, Pottsville Area, southeastern parts of Koala Beach Estate are Low Flood Islands.</p> <p>Koala Beach and parts of south Pottsville are High Flood Islands.</p> <p>Mooball and Crabbes Creek are both Low Flood Islands.</p> <p>Burringbar has Rising Road Access.</p>	3091 dwellings.	<p>2843 total properties inundated overfloor in the Tweed Coastal catchments from Kingscliff to Wooyung.</p> <p>Koala Beach Estate, Burringbar, Mooball and Crabbes Creek isolated.</p> <p>Landslip hazard for Upper Burringbar</p>

*\*Indicates properties modelled to experience ground level impacts in a PMF event by suburb. Suburb boundaries may not exactly align with sector boundaries, and numbers should be treated as a guide only.*

# 1. UKI SECTOR

UKI RESPONSE ARRANGEMENTS																				
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector.																				
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Uki Sector is located within the upper reaches of the Tweed River Catchment and includes the towns and settlements of Uki, Dum Dum, Dunbible, Stokers Siding, Smiths Creek, Chowan Creek, Rowlands Creek, Commissioners Creek, Doon Doon, Terragon, Midginbil, Kunghur Creek, Kunghur, Mount Burrell, Cedar Creek, Byrill Creek and part of Mount Warning</li> <li>Uki Sector borders Byron Shire to the east, Lismore City to the south and Kyogle Council to the west.</li> </ul>																			
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Riverine flooding from the Tweed River, as well as flash flooding.</li> </ul>																			
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Most parts of the Uki sector have Rising Road Access or Overland Escape to flood free land.</li> </ul>																			
<b>At risk properties</b>	274 in PMF flood extent in Uki, approx. 600+ in remainder of the sector. No over floor inundation data is available.	<b>Total number of properties within Sector/Community</b>	917																	
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.																			
<b>Key Warning Gauge Name</b>	<table border="1"> <thead> <tr> <th>Name</th> <th>AWRC No.</th> <th>Min (m)</th> <th>Mod (m)</th> <th>Maj (m)</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>North Murwillumbah</li> <li>Uki</li> </ul> </td> <td>201420</td> <td>3.0</td> <td>4.0</td> <td>4.8</td> </tr> <tr> <td></td> <td>201900</td> <td>-</td> <td>6.9</td> <td>-</td> </tr> </tbody> </table> <p><i>*There is no forecast gauge in this sector, however it falls within the forecast reference area for the North Murwillumbah gauge.</i></p>	Name	AWRC No.	Min (m)	Mod (m)	Maj (m)	<ul style="list-style-type: none"> <li>North Murwillumbah</li> <li>Uki</li> </ul>	201420	3.0	4.0	4.8		201900	-	6.9	-				
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<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Uki Public Hall or Uki Public School</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>																			
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Isolation for rural properties beyond Palmers Road causeway, and Cedar Creek, Pretty Gully and Byrill Creek localities. Further isolation of properties beyond Lange Road, Aults Rd and Tarcoola Lane causeways, and east of Byangum Bridge.</li> <li>Inundation of main access routes</li> <li>Potential loss of life from inundation</li> <li>Inundation of a number of dwellings and businesses</li> </ul>																			



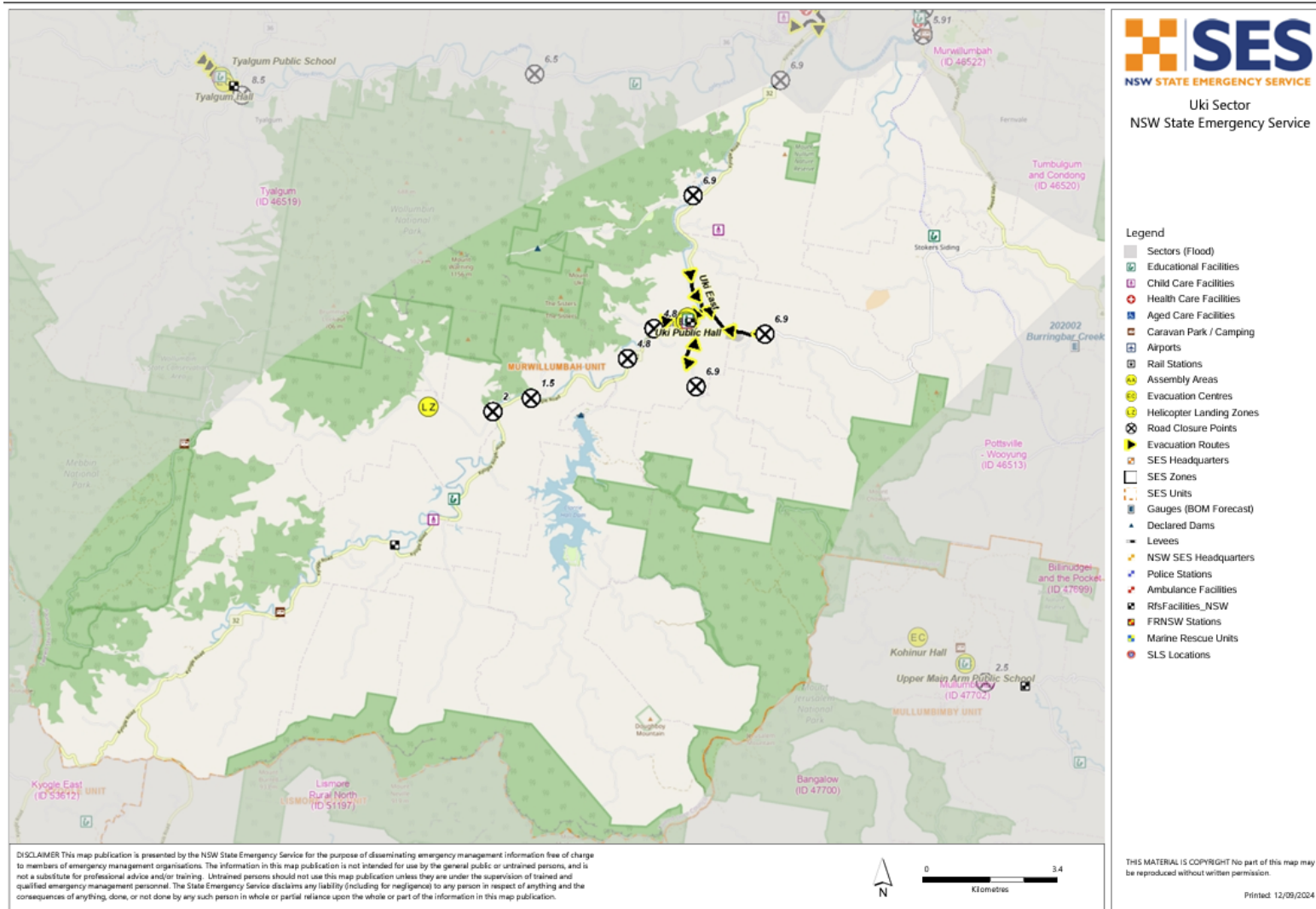
<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• Flood Watch to North Murwillumbah Gauge (BoM)</li> <li>• Flood Warnings to North Murwillumbah Gauge (BoM)</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• Uki Water Treatment Plant may become impacted during flood events. It currently supplies 170 households in Uki and adjacent rural areas.</li> <li>• Uki wastewater treatment plant is located along Smiths Creek Road in Uki. This facility is capable of servicing 800 people per day or 190KL/day. Parts of Smiths Creek Road are impacted up to a PMF.</li> <li>• Uki Telephone Exchange is located along Rowlands Creek Road. This may be impacted in flooding up to and including a PMF.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Isolation</li> </ul>
<p><b>Evacuation Triggers and/or warnings</b></p>	<p><b>Evacuation or warning may be considered when:</b></p> <ol style="list-style-type: none"> <li>1.) <b>Prediction for moderate to major flooding at the Murwillumbah forecast gauge</b></li> </ol> <p>More targeted actions may be considered based on likely heights at the Uki gauge;</p> <ol style="list-style-type: none"> <li>2.) <b>Prediction to reach and/ or exceed 1.5m at Uki Gauge:</b> 9 rural properties may be isolated for a short period when the Palmers Road causeway is flooded at this height (Subsector Palmers Road). This height is generally reached early in a rain event.</li> <li>3.) <b>Prediction to reach and/or exceed 2m at Uki Gauge:</b> Multiple causeways along Byrill Creek Road flooded causing short term isolation of rural properties within the Cedar Creek, Pretty Gully and Byrill Creek localities (Subsector Byrill Creek Rd).</li> <li>4.) <b>Prediction to reach and/or exceed 4.8m at Uki Gauge:</b> Lange Road, Aults Rd and Tarcoola Lane causeways may be cut causing short term isolation of approximately 25 rural properties at this height (Subsector Tweed River at Uki).</li> <li>5.) <b>Prediction to reach and/ or exceed 6.1m at Uki Gauge:</b> Flood waters start to breach the riverbanks at Uki resulting in all properties along Kyogle Road</li> </ol>

	<p>between Old Convent Road and Milsoms Lane being impacted by above ground flooding at this height (Subsector Tweed River at Uki). By 6.9m above floor flooding of this area may occur and extend to the north of Norco Street.</p> <p><b>6.) Prediction to reach or exceed 6.9m at Uki Gauge:</b> Roberts Bridge on Smiths Creek Road and Byangum Bridge on Kyogle Road may be cut at this height, isolating Uki from Murwillumbah at this height.</p> <ul style="list-style-type: none"> <li>• The Mount Warning Road bridge may be cut at this height, isolating Mount Warning Rainforest Park and a number of properties.</li> <li>• Meadow Place becomes cut off.</li> <li>• Rowlands Creek Road may be cut isolating 50-60 small acreage properties and a number of multiple occupancy settlements (Subsector Rowlands Creek).</li> </ul> <p><b>7.) From 12.6m at the Uki gauge:</b> Depths in the 1% event in Uki are modelled to be up to 2m along some parts of Kyogle Road, and up to 2.5m along Smiths Creek Road. Over floor inundation of property would be expected in this event.</p>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p><b>1.) For prediction 1 at the North Murwillumbah gauge:</b> Watch and Act messaging should be considered for all subsectors in the Uki sector due to lack of upstream forecast gauging.</p> <p><b>2.) For predictions 1.5-2m at the Uki gauge:</b> Consideration of messaging should be given prior to this height being reached to subsectors Palmers Rd GEMS ID 97521), Mount Warning (GEMS ID 95152), Byrrill Creek Rd (GEMS ID 97520) and Rowlands Creek (GEMS ID 95142) and Upper Tweed River (GEMS ID 96831) due to expected isolation by road. If heights are expected to exceed these levels, any targeted evacuations should be completed prior to this height being reached.</p> <p><b>3.) For predictions to exceed 4.8m at the Uki gauge:</b> Issue Watch and Act messaging for Subsector Tweed River at Uki (GEMS ID 97494) if heights expected to reach 4.8m at Uki gauge. If heights are expected to exceed this level, properties along Lange Road, Aults Rd and Tarcoola Lane will be isolated, so any targeted evacuations should be completed prior to this height if required.</p> <p><b>4.) For predictions 6.1-6.9m at the Uki gauge:</b> Emergency Warning messaging for low lying parts of Subsector Tweed River at Uki (GEMS ID 97494), Dum Dum (GEMS ID 97497), Rowlands Creek PMF (GEMS ID 95142) and Smiths Creek (GEMS ID 97496) may be required if heights are expected to reach <i>and</i> exceed this level due to expected road closures that may affect evacuation from this height. The majority of properties in Uki township are not flooded over floor until a 1%AEP event (12.6m at the Uki gauge). Properties along Smiths Creek and low-lying parts of Kyogle Rd may be affected earlier than the main township.</p> <p><b>5.) For predictions from 12.6m at the Uki gauge:</b> In an event of this size and greater, evacuation of all listed subsectors may be required. In the event of a flood equal to a PMF, areas of high ground are identified with the evacuation centres below, and all subsectors in Uki would require emergency warning messaging.</p>
<p><b>Evacuation Routes</b></p>	<ul style="list-style-type: none"> <li>• <b>Kyogle Road:</b> Kyogle Road, east and south –Uki evacuation centres</li> <li>• <b>Rowlands Creek Road:</b> Rowlands Creek Road – Uki evacuation centres</li> <li>• <b>Smiths Creek Rd:</b> Smiths Creek Rd - Uki evacuation centres</li> </ul>
<p><b>Evacuation Route Closure</b></p>	<p>Known local closures which may affect evacuation include;</p> <ul style="list-style-type: none"> <li>• 1.5m at the Uki gauge: Palmers Rd causeway</li> <li>• 2m at the Uki gauge: a number of causeays along Byrrill Creek Rd</li> <li>• 4.8m at the Uki gauge: Lange Rd, Aults Rd and Tarcoola Lane.</li> <li>• 6.9m at the Uki gauge: Smiths Creek Rd Bridges and Byangum Bridge on Kyogle Rd. Rowlands creek Rd at the first causeway south of Uki.</li> </ul>

<p><b>Method of Evacuation</b></p>	<ul style="list-style-type: none"> <li>Primarily self-evacuation by private transport to higher ground</li> <li>Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<p><b>Evacuation Centre/Assembly Point</b></p>	<ul style="list-style-type: none"> <li>Uki Public Hall 1462 Kyogle Road Uki.</li> <li>Uki Public School 1463 Kyogle Road, Uki.</li> <li>Both of these identified centres are within the PMF extent. In this event, if evacuation towards alternate evacuation centres is not possible, areas of high ground outside the modelled PMF extent are in the vicinity of Grants Rd and Ryder St, Uki.</li> </ul>
<p><b>Large scale evacuations</b></p>	<ul style="list-style-type: none"> <li>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>Assembly areas may be utilised on higher ground.</li> </ul>
<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>Short term isolation of rural properties begins from approx. 1.5m at the Uki gauge.</li> <li>However, resupply is unlikely to be required in this sector until floods exceeding 6.9m at the Uki Gauge. This height causes isolation Uki from Murwillumbah, and further isolation of a caravan park and several houses west of the Mount Warning Bridge, and Rowlands Creek Road is closed isolating 50-60 properties.</li> <li>If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible location for a helicopter landing point. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>Uki Sports Oval S 28° 25' 00" E 153° 19' 38"</li> </ul> <p>Firm hard surfaces          Light towers on all boundaries          Caution wires on ridge line to east behind club house          Caution wires from light tower to light tower          Last Surveyed: July 2013</p> <ul style="list-style-type: none"> <li>Byrrill Creek Road S 28.44465° E 153.23833°</li> </ul>

	<p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>The nearest airport is Murwillumbah Airfield, which has an 800m king grass strip able to accommodate up to two twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>Closure of schools - coordinated through the Department of Education and Training.</li> <li>The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>The entire village of Uki is a Heritage Conservation area which includes some historical sites.</li> <li>There are a significant number of people living in unrecorded multiple occupancy dwellings in the Uki area. Accurate statistics for the number of people and dwellings are not held and it is likely that telecommunications may be limited.</li> </ul>

# UKI SECTOR MAP

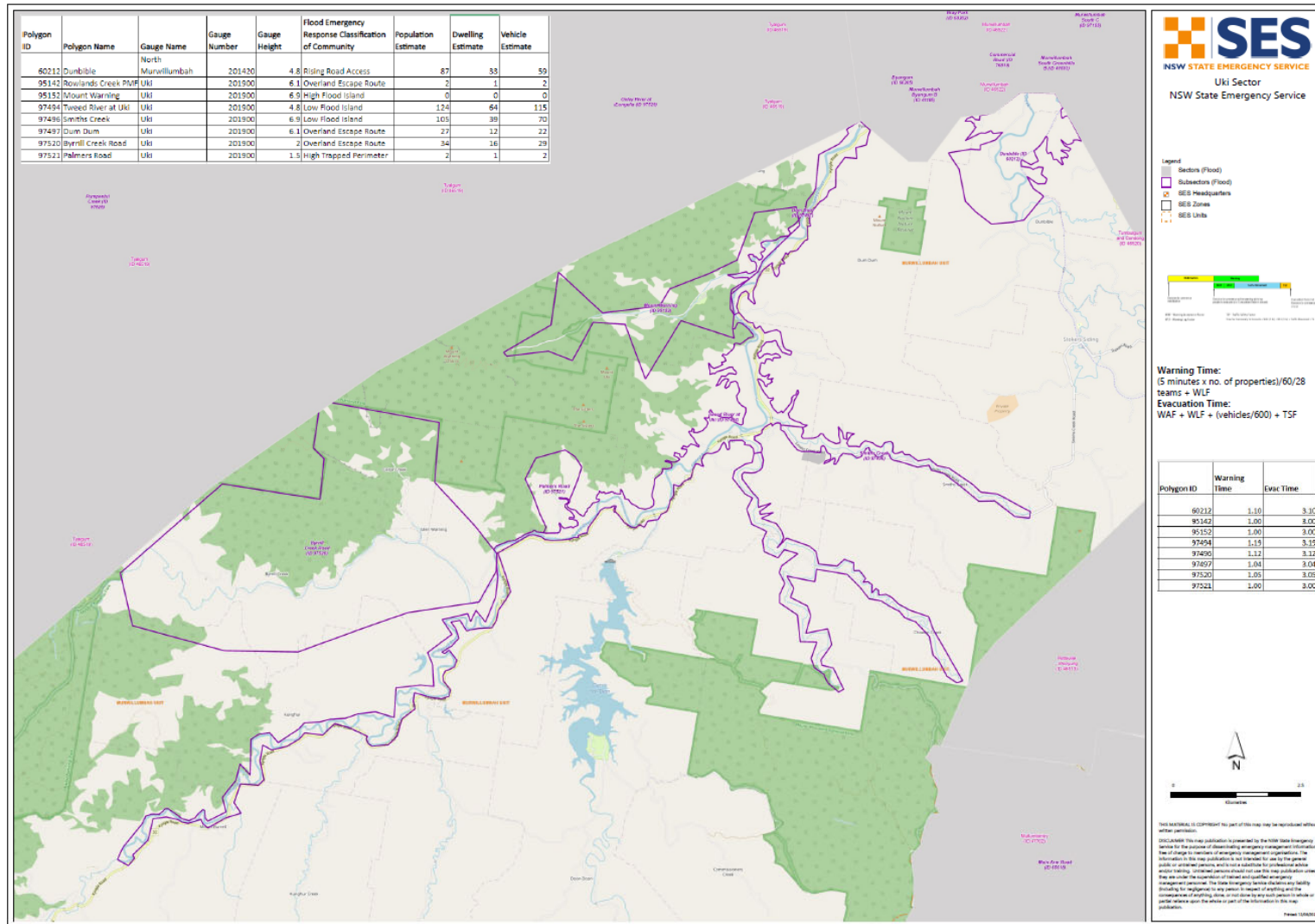


Uki Sector Map Inset





# EVACUATION PLANNING



## 2. TYALGUM SECTOR

<b>TYALGUM RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Tyalgum sector is located in the upper reaches of the Tweed River catchment, along the Oxley River.</li> <li>It includes the areas of Tyalgum, Tyalgum Creek, Limpinwood, Back Creek, Brays Creek, Mebbin, Eungella, Pumpenbil and part of Mount Warning.</li> <li>Main settlement in the area is focused around the rural village of Tyalgum, which is located in the Tweed hinterland on the western bank of Tyalgum Creek where it joins the Oxley River.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Tyalgum is affected by flash flooding from Tyalgum Creek and the Oxley River.</li> <li>Localised overland flooding may also occur in this area as a result of heavy localised rainfall.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Rising Road Access or Overland Escape for most parts of the sector.</li> </ul>				
<b>At risk properties</b>	214 in flood extent in Tyalgum, approx. 380+ in remainder of the sector. No over floor inundation data is available. Tyalgum township, Limpinwood and Eungella may all become isolated.	<b>Total number of properties within Sector/Community</b>	503		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	*North Murwillumbah Tyalgum Bridge Eungella	201420 558088 201001	3.0 - -	4.0 - -	4.8 - -
*There is no forecast gauge in this sector, however it falls within the forecast reference area for the North Murwillumbah gauge					
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Tyalgum Community Hall or Tyalgum Public School</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				



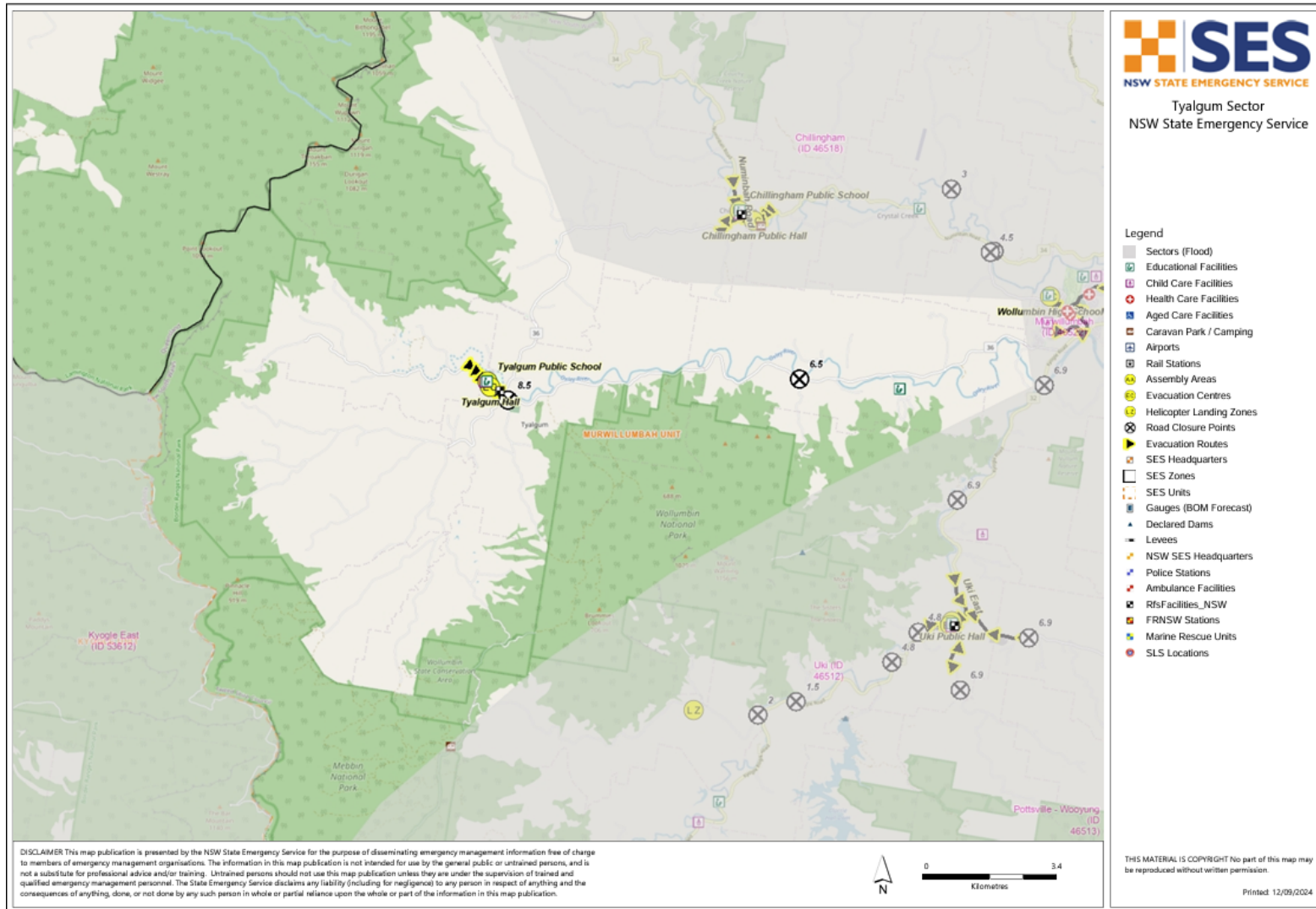
<p><b>Key Risks / Consequences</b></p>	<ul style="list-style-type: none"> <li>• Isolation for communities in Tyalgum, Limpinwood and Eungella.</li> <li>• Inundation of main access routes</li> <li>• Potential loss of life from inundation</li> <li>• Potential inundation of a number of dwellings and businesses</li> </ul>
<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• Flood Watch (BoM)</li> <li>• Flood Warnings (BoM)</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul> <ul style="list-style-type: none"> <li>• There is a CRT and NSW RFS Brigade in Tyalgum, and warning and evacuation support from other agencies may be requested as per arrangements in the Volume 1 Tweed Shire Flood Emergency Sub Plan.</li> <li>• Time available for warning can be short due to rapid onset flash flooding in the sector.</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• The water supply at Tyalgum is sourced from the weir pool on the Upper Oxley River, if compromised during a flood event this would impact on the town water supply.</li> <li>• There is a Waste Water Treatment Plant at 85 Brays Creek Road, Tyalgum which services up to 500 people. There are no known impacts to this facility.</li> <li>• There is a telephone exchange in Coolman Street, Tyalgum with no known impacts.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation may be considered for floods that are expected to cause;</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to Inundation</li> <li>• Property inundation</li> <li>• Failure of essential services</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>Warning messaging will be considered when:</p> <p><b>1.) Prediction for moderate to major flooding at the North Murwillumbah forecast gauge</b></p> <p>More targeted messaging may be considered based on likely heights at the Tyalgum Bridge and Eungella gauges;</p>

	<p><b>Tyalgum Bridge Gauge</b></p> <p><b>2.) Prediction to reach and/or exceed 9.2m at Tyalgum Bridge Gauge (558088):</b> Road access to the E.J Bartrim Bridge may be lost by this height. Possible above floor inundation of Tyalgum commences at this height, with all low-lying properties predicted to be inundated by 11m (Subsector Tyalgum).</p> <p><b>Eungella Gauge</b></p> <p><b>3.) Prediction to reach and/or exceed 6.5m at the Eungella gauge (201001):</b> Inundation of low-lying farmland along the Oxley River. Tyalgum Rd is expected to be cut in multiple locations, affecting access between Tyalgum and Murwillumbah along this road. This route may close earlier in an event due to prior significant flood damage along sections of the road. A number of properties are expected to be flooded in their yards from this level, however over floor inundation data is not available.</p>
<b>Sequencing of warnings and /or evacuation</b>	<p>Evacuation of vulnerable facilities such as the hospital, aged care facilities, schools, and child-care facilities will require a higher priority.</p> <p><b>6.) For Predictions of moderate to major flooding at the North Murwillumbah gauge:</b> Watch and Act messaging should be considered for all subsectors in the Tyalgum sector due to lack of upstream forecast gauging.</p> <ul style="list-style-type: none"> <li>• <b>For predictions 9.2m at Tyalgum Bridge Gauge:</b> Emergency Warning Messaging may be considered for subsectors Tyalgum (60187) if this height is likely. If heights are expected to exceed this level, consideration of targeted evacuations of low-lying properties in subsectors Pumpenbil Creek (GEMS ID 97525) and North Pumpenbil Creek (GEMS ID 97526) should be given.</li> <li>• <b>For predictions 6.5m at the Eungella gauge:</b> Watch and Act messaging for messaging for Subsector Oxley River at Eungella (GEMS ID 97529) and Hopping Dicks Creek (GEMS ID 97528). If heights are expected to exceed this, and significant flooding predicted to occur, Emergency Warning messaging should be considered for this area, prior to closure of Tyalgum Rd towards Murwillumbah. Earlier consideration of messaging may have to be given depending on status of Tyalgum Rd.</li> </ul>
<b>Evacuation Routes</b>	<ul style="list-style-type: none"> <li>• Local roads towards evacuation centres/assembly areas.</li> <li>• Properties in Eungella <i>may</i> be able to reach Murwillumbah evacuation centres prior to Tyalgum Rd closure, however ground truthing of this route is recommended as local rainfall may affect route viability.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• Sections of Tyalgum Rd are susceptible to landslips and have suffered significant damage in prior flood events. Restoration work is ongoing, with the road likely to close during significant rain events.</li> <li>• Tyalgum road may close at 6.5m on the Eungella gauge (201001) near the intersection of Hidden Valley Road. This will close the evacuation route to the Tyalgum Public School Evacuation Centre for residents east of this point.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas.</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>• Tyalgum Public School, 2 Coolman Street, Tyalgum; and</li> <li>• Tyalgum Community Hall, 1 Cudrigan Street, Tyalgum.</li> <li>• The above evacuation centres may be in the flood extent for a PMF event. In this event, modelled high may be in the vicinity of Coolman Lane, Wollumbin St and Carraboi Tce.</li> </ul>

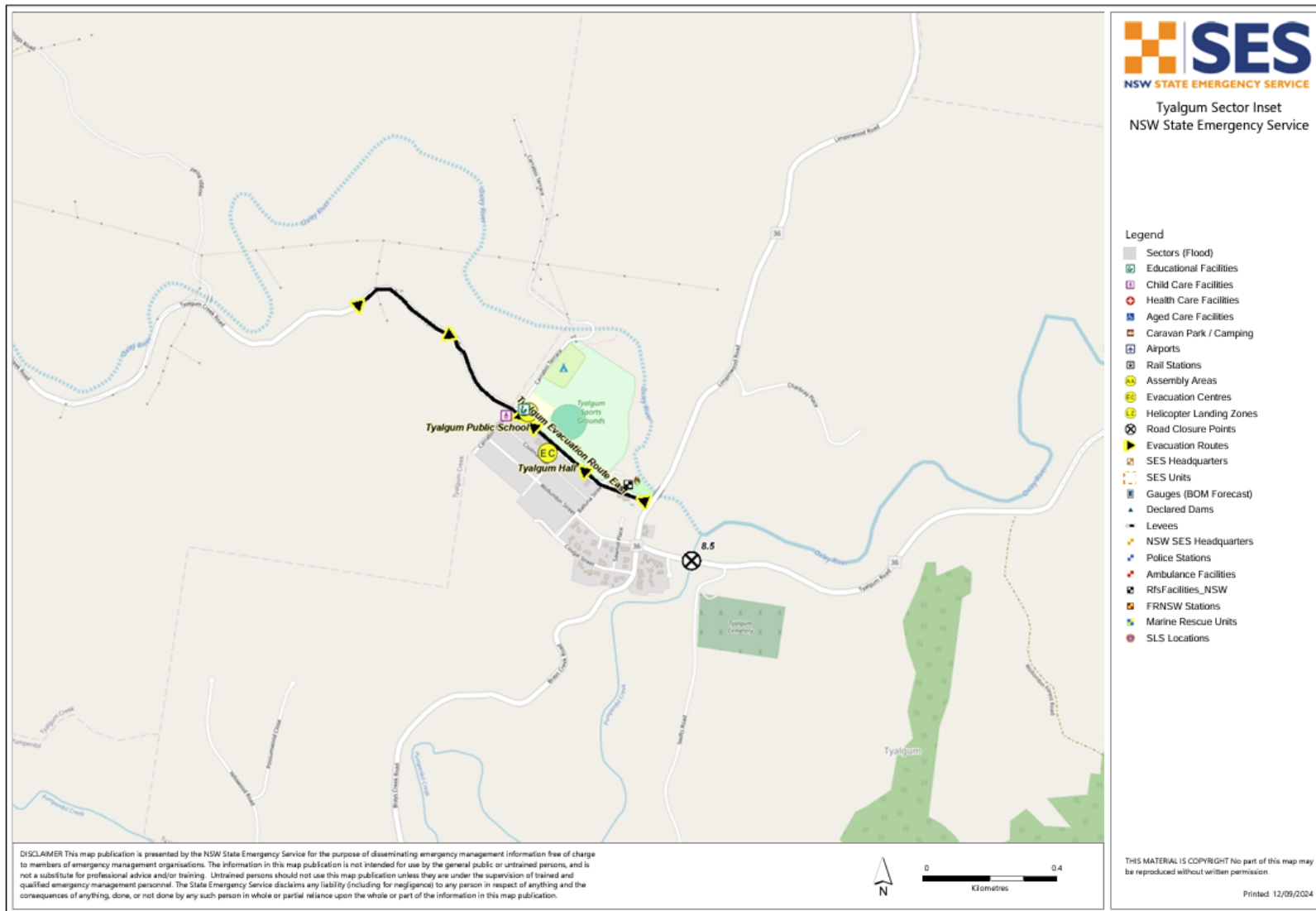
	<ul style="list-style-type: none"> <li>• Murwillumbah Evacuation Centres may be accessible for some parts of the sector early in an event, including Wollumbin High School if Tyalgum Road is open.</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>• Resupply may be required in major flood events.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible location for a helicopter landing point. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Tyalgum Oval S 28° 21' 17" E 153° 12' 22"</li> </ul> <p>Firm all weather surface no slope          Goal post on at both ends of northern field          Notes: Alternative landing site to the South East in paddock behind tennis courts          Last Surveyed: July 2013</p> <p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• The nearest airport is Murwillumbah Airfield, which has an 800m king grass strip able to accommodate up to two twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop.</li> </ul>
<b>Other</b>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> </ul>

	<ul style="list-style-type: none"><li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li><li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li><li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li><li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li><li>• There are a significant number of people living off the grid in multiple occupancy dwellings in the Tyalgum area and it is likely that telecommunications may be limited.</li></ul>
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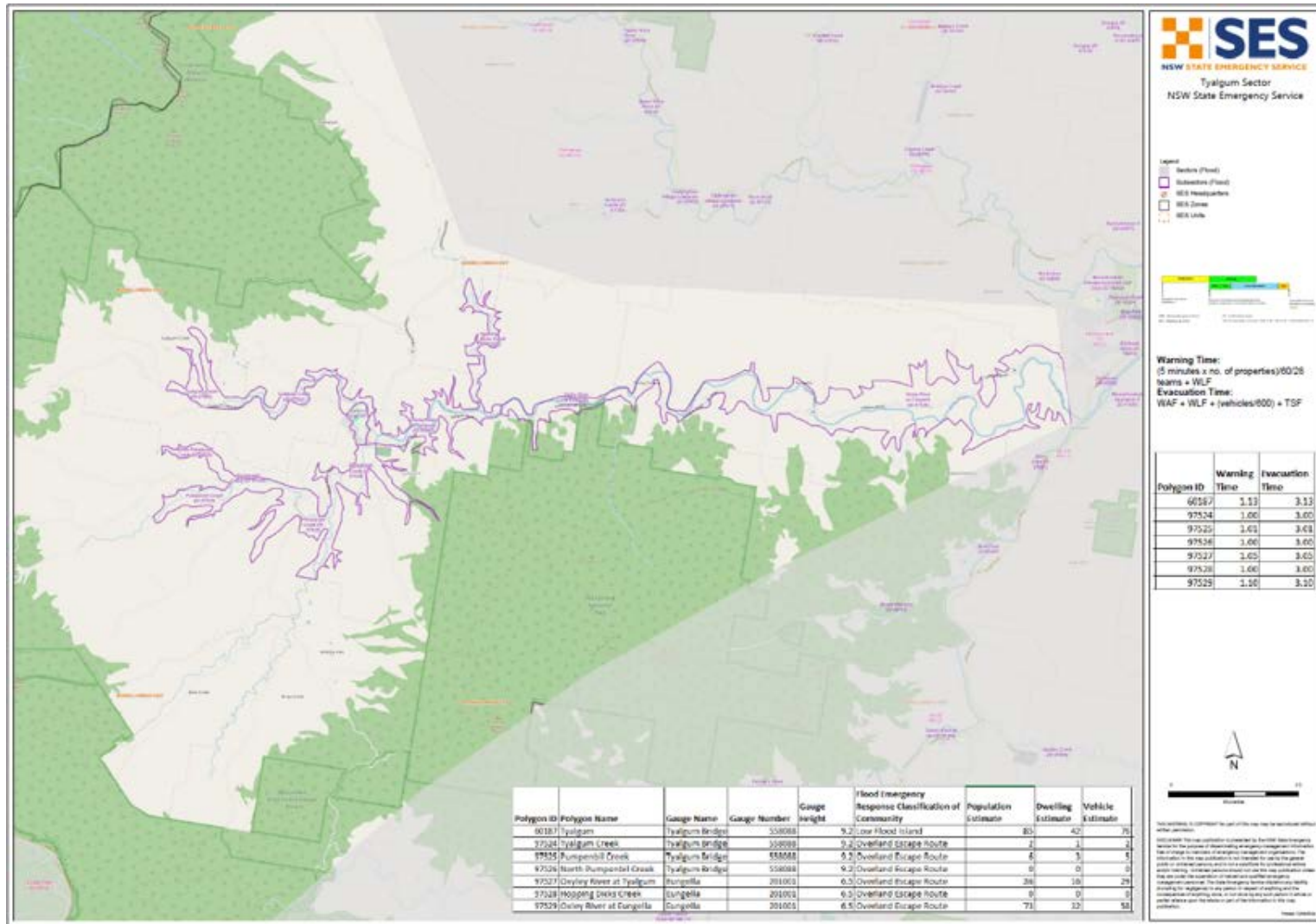
# TYALGUM SECTOR MAP



Tyalgum Sector Map Inset



# EVACUATION PLANNING



Insert



### 3. CHILLINGHAM SECTOR

<b>CHILLINGHAM RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>Located west of Murwillumbah on the Rous River, the Chillingham Sector is located in a flash flood environment.</li> <li>The Chillingham Sector includes the suburbs of Numinbah, Hopkins Creek, Zara, Upper Crystal Creek, Chillingham, Crystal Creek, North Arm, Nobbys Creek, Dungay, Kynnumboon, Tygalgah, Dulgiugan, Urliup, Tomewin, Glengarrie, Upper Duroby, Carool, Piggabeen and parts of Cobaki.</li> <li>Rainfall in the catchment area, particularly the Bald Mountain area can significantly impact upon the Chillingham village.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Flash flooding</li> <li>Riverine flooding from the Rous River</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Communities in the Chillingham sector have Rising Road Access or Overland Escape Routes.</li> </ul>				
<b>At risk properties</b>	21 properties in Kynnumboon, 55 in Tygalgah, 14 in Dulgiugan, 12 in Dungay, 4 in Urliup, 2 in Nobbys Creek, 4 in North Arm at risk of over floor flooding in a PMF. Over floor inundation may occur in other parts of the sector. Isolation of Sector within may occur.	<b>Total number of properties within Sector/Community</b>	692		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	*North Murwillumbah Chillingham Boat Harbour (Nobbys Creek)	201420 201008 201005	3.0 - -	4.0 - -	4.8 - -
<i>*There is no forecast gauge in this sector, however it falls within the forecast reference area for the North Murwillumbah gauge</i>					
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Chillingham Public Hall</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Isolation for communities</li> <li>Inundation of main access routes</li> <li>Potential loss of life from inundation</li> <li>Inundation of a small number of dwellings and businesses</li> </ul>				



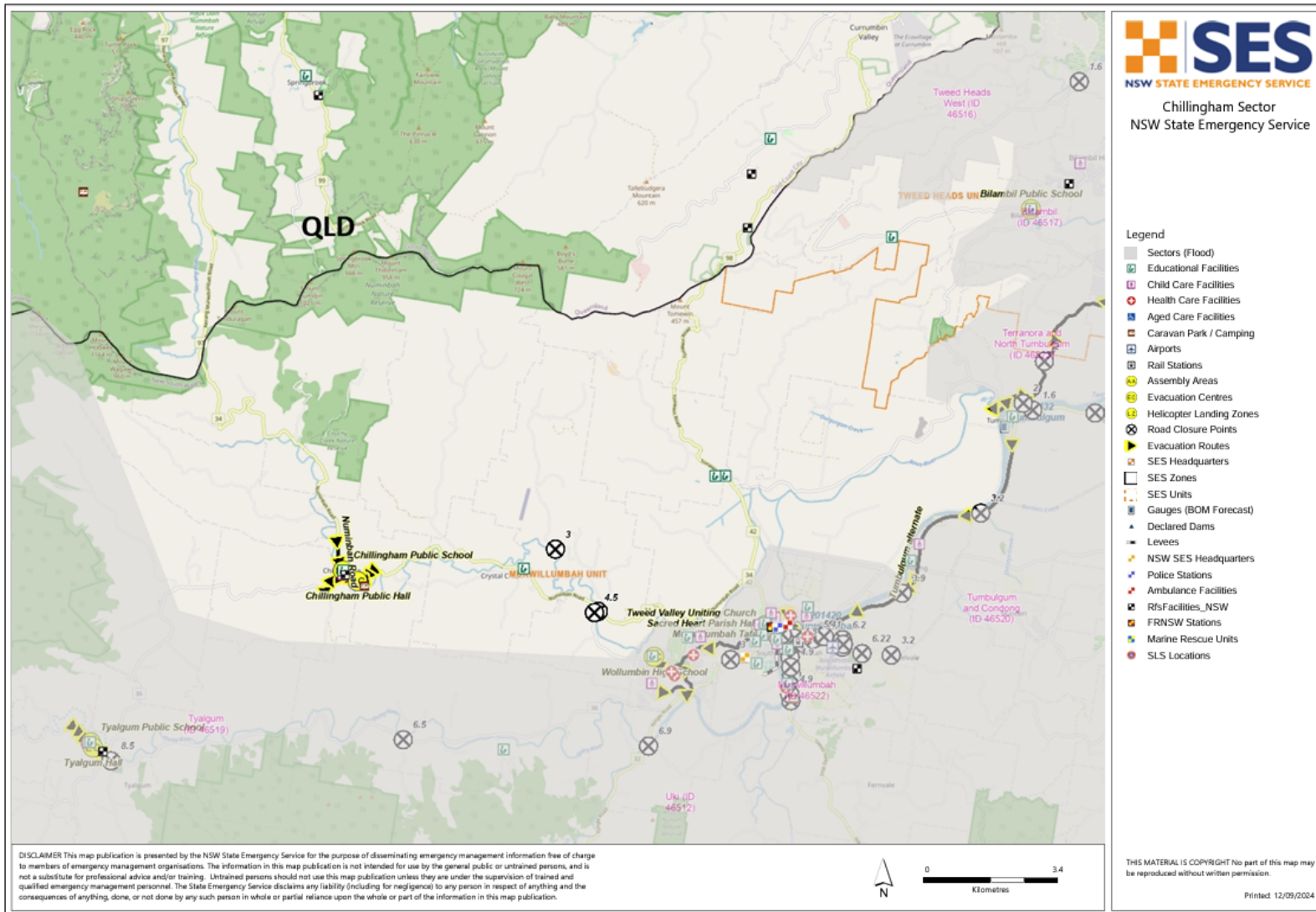
<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• Flood Watch (BoM)</li> <li>• Flood Warnings (BoM)</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• No identified essential infrastructure requiring protection below a PMF event.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation may be considered for floods that are expected to cause;</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to Inundation</li> <li>• Property inundation</li> <li>• Failure of essential services</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>All effects listed below associated with gauge heights will need to be monitored and verified via reconnaissance wherever possible and should not be considered as absolute. Different sources of flooding within the Chillingham Sector may affect consequences.</p> <ul style="list-style-type: none"> <li>• Flash flooding impacts may occur before riverine flooding occurs. If significant rainfall in the Bald Mountain, Numinbah and Couchy Creek rain gauges are occurring this should be monitored. In previous events, 350mm of rain over 24 hours, and 690mm over 4 days have caused significant flooding.</li> </ul> <p>Evacuation or warnings for Chillingham utilising the North Murwillumbah Gauge will be considered when</p> <p><b>1.) Prediction to reach and/or exceed 4.8m at the North Murwillumbah gauge:</b>          Areas to the North of Murwillumbah are experiencing inundation at this height. Over floor inundation for properties in Tygalgah is not expected until approx. 5.4m, however it is likely road closures will occur prior to this height being reached.</p> <p>Evacuation or warnings for Chillingham utilising the Chillingham Gauge will be considered when:</p> <p><b>1.) Prediction to reach or exceed 5.5m at Chillingham Gauge:</b> Flood impacts for low lying areas in Chillingham are imminent at this height on the downstream</p>

	<p>gauge, with the Rous River expected to overtop its banks at 6m (Subsector Chillingham Village Lowlands.) Low lying properties in the upper catchment area may begin to have over ground inundation anytime from this height (subsectors Jacksons Creek and Upper Rous River, Rous River and Crystal Creek).</p> <p>2.) <b>Prediction to reach or exceed 6.0m at Chillingham Gauge:</b> Potential for high velocity floodwater to impact low lying areas along the Rous River. There is limited data available on potential over floor inundation in this area.</p> <p>Evacuation or warnings for areas downstream of Chillingham, including Nobbys Creek, North Arm, Kynnumboon, Urliup and Dulguigan, utilising the Boat Harbour (Nobbys Creek) Gauge (also described as Boat Harbour No 3 - 558077) will be considered when:</p> <p>1.) <b>Prediction to reach or exceed 3m at Boat Harbour (Nobbys Creek) Gauge:</b> Nobbys Creek Road may be cut at this height isolating properties in Nobbys Creek (Subsector Nobbys Creek). Some low-lying properties along the creek may be within the flood extent from a 20% AEP event (approx. 6.5m), however no properties in Nobbys Creek are modelled to be inundated over floor until a PMF event.</p> <p>2.) <b>Prediction to reach or exceed 4.5m at Boat Harbour (Nobbys Creek) Gauge:</b> Low-lying farmland along the Rous River in the vicinity of Numinbah Road, Tomewin Road and Dulguigan Road may become inundated (Subsectors Kynnumboon A and Dulguigan B). Road access to Chillingham may also be cut at Boat Harbour Bridge at this height. There are overland escape routes to areas of high ground north of Numinbah Road and Dulguigan Road. At this height, minimal over floor inundation is expected, with 2 properties in Kynnumboon and Dulguigan modelled to have overfloor inundation by 6.5m.</p> <p>3.) <b>Prediction to reach and exceed 7.2m at Boat Harbour (Nobbys Creek) Gauge:</b> From this height, further properties may seen overfloor inundation in Kynnumboon (5 properties at 7.2m and 19 in a PMF) and Dulguigan (6 properties at 7.2m and 13 in a PMF). In a PMF event (approx. 10.2m), further overfloor inundation would be expected in Dungay (12 properties), and Urliup (4 properties).</p>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p>Evacuation of vulnerable facilities such as the hospital, aged care facilities, schools, and child-care facilities will require a higher priority.</p> <p><b>Sequencing for the North Murwillumbah gauge</b></p> <ul style="list-style-type: none"> <li>• <b>For Predictions to reach and exceed 4.8m:</b> Targeted evacuations <i>may</i> be required in subsector Tygalgah (GEMS ID 60182) if heights are expected to reach and exceed this level.</li> </ul> <p><b>Sequencing for the Chillingham gauge</b></p> <ul style="list-style-type: none"> <li>• <b>For predictions to reach and/or exceed 5.5m:</b> Watch and Act messaging for Subsectors Chillingham Village Lowlands (GEMS ID 97517), Rous River (GEMS ID 97123), Jacksons Creek (GEMS ID 97124), Crystal Creek (GEMS ID 97516) and Upper Rous River (GEMS ID 97518). Some targeted evacuations may be required for low lying areas along Numinbah Rd and Beantree Rd in Chillingham. Localised flash flooding should also be monitored.</li> <li>• <b>For predictions to reach and/or exceed 6.0m:</b>, Emergency Warning messaging may need to be considered for subsector Chillingham Village lowlands. Other targeted evacuations may be required in other subsectors.</li> </ul>

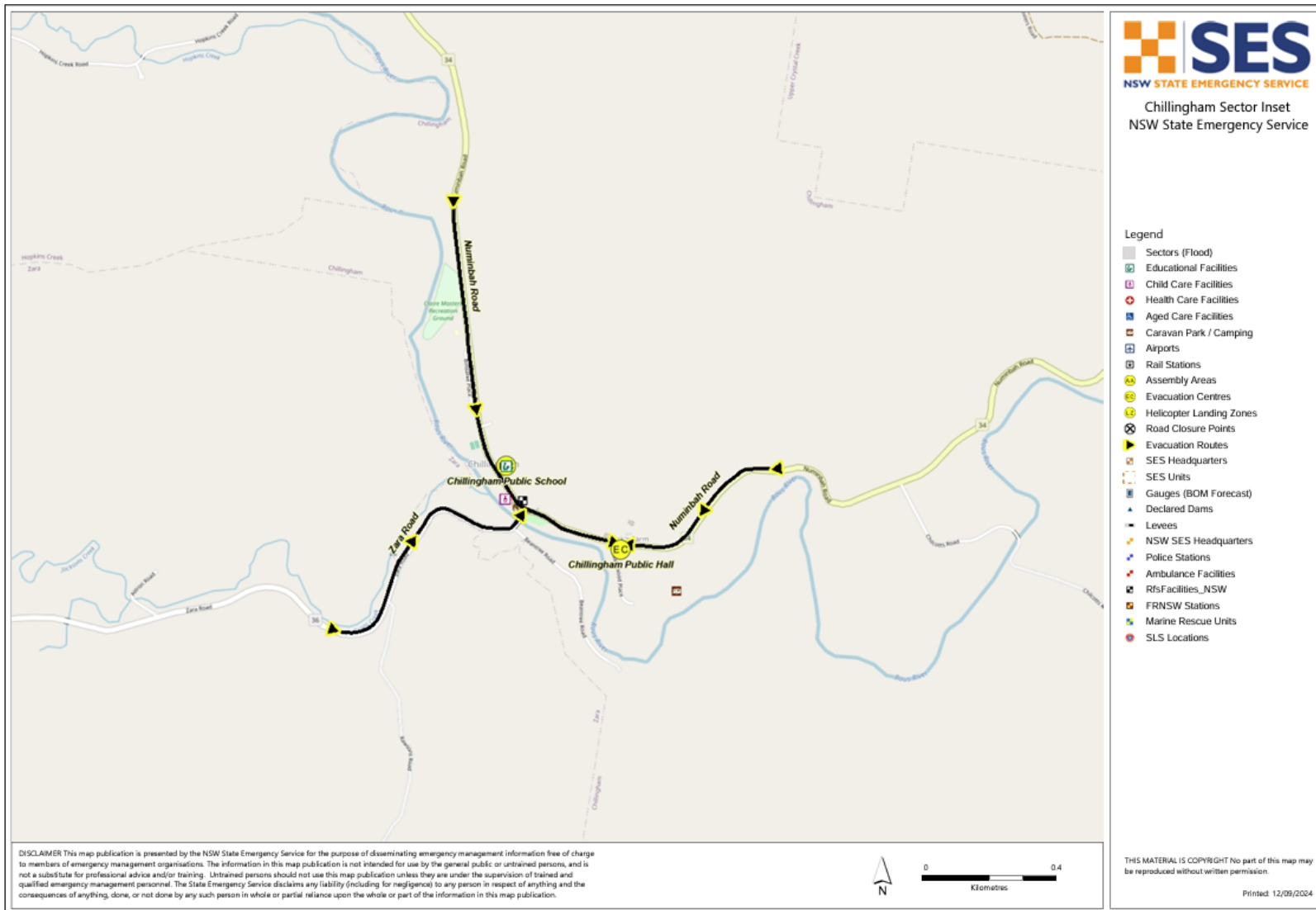
	<p><b>Sequencing for the Boat Harbour (Nobbys Creek) gauge</b></p> <ul style="list-style-type: none"> <li>• <b>For predictions to reach and/or exceed 3.0m:</b> Watch and Act for subsector Nobbys Creek (GEMS ID 76797) if heights are expected to reach or exceed 3m at the Nobbys Creek (Boat Harbour) Gauge.</li> <li>• <b>For predictions to reach and/or exceed 4.5m:</b> Watch and Act messaging for Subsectors Kynnumboon A (GEMS ID 42407) and Dulguigan B (GEMS ID 42409). If heights are expected to reach greater than 6m, targeted evacuations may be required in these subsectors. Watch and Act messaging can be considered at this height for subsectors Urliup (GEMS ID 42408), Dungay (GEMS 97519) and Pipeclay (GEMS ID 96720).</li> <li>• <b>For predictions to reach and/or exceed 7.2m:</b> Further targeted evacuations may be required for floods expected to exceed this height in subsectors Urliup (GEMS ID 42408), Dungay (GEMS 97519) and Pipeclay (GEMS ID 96720).</li> </ul>
<b>Evacuation Routes</b>	<ul style="list-style-type: none"> <li>• Local roads to Numinbah Rd to Chillingham Evacuation Centres.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• Numinbah Rd may close at the Boat Harbour Bridge over the Rous River at 4.5m on the Boat Harbour (Nobbys Creek) gauge, restricting access for Chillingham towards Murwillumbah.</li> <li>• Other localised road closures are likely to occur, however gauge height to closure relationship is not known.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>• Chillingham Public Hall, Numinbah Road Chillingham. Outside of 0.2% AEP extent but within PMF extent.</li> <li>• Chillingham Public School, 1420 Numinbah Road Chillingham. Outside of 0.2% AEP extent but within PMF extent.</li> <li>• High ground in a modelled PMF may be available to the north-east of Chillingham Hall.</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy</li> <li>• Rescue hotspots in the sector include Nobbys Creek Road from Blackwoods Road, Boat Harbour Bridge, Numinbah and Crystal Creek.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>• Chillingham may be isolated for up to 3 days, and aerial resupply has historically been restricted in early stages of a flood due to low cloud cover and poor visibility.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>

	<ul style="list-style-type: none"> <li>• Tweed Palliative Support &amp; Wedgetail Retreat, 12 Wedgetail Court, Dulguigan, may be isolated for up to 3 days, and may require resupply and assistance with staff changeover.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><i>Helicopter Landing Points:</i></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Chillingham - S 28° 19' 01" E 153° 16' 47"</li> </ul> <p>Firm grass surface          Old cricket pitch in middle of field          Power lines on Western side of field running Nth to Sth          Last surveyed: August 2013</p> <p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>• The nearest airport is Murwillumbah Airfield, which has an 800m king grass strip able to accommodate to twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop, approximately a few hours after the North Murwillumbah Gauge (201420-58186) exceeds 5.0m</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.</li> </ul>

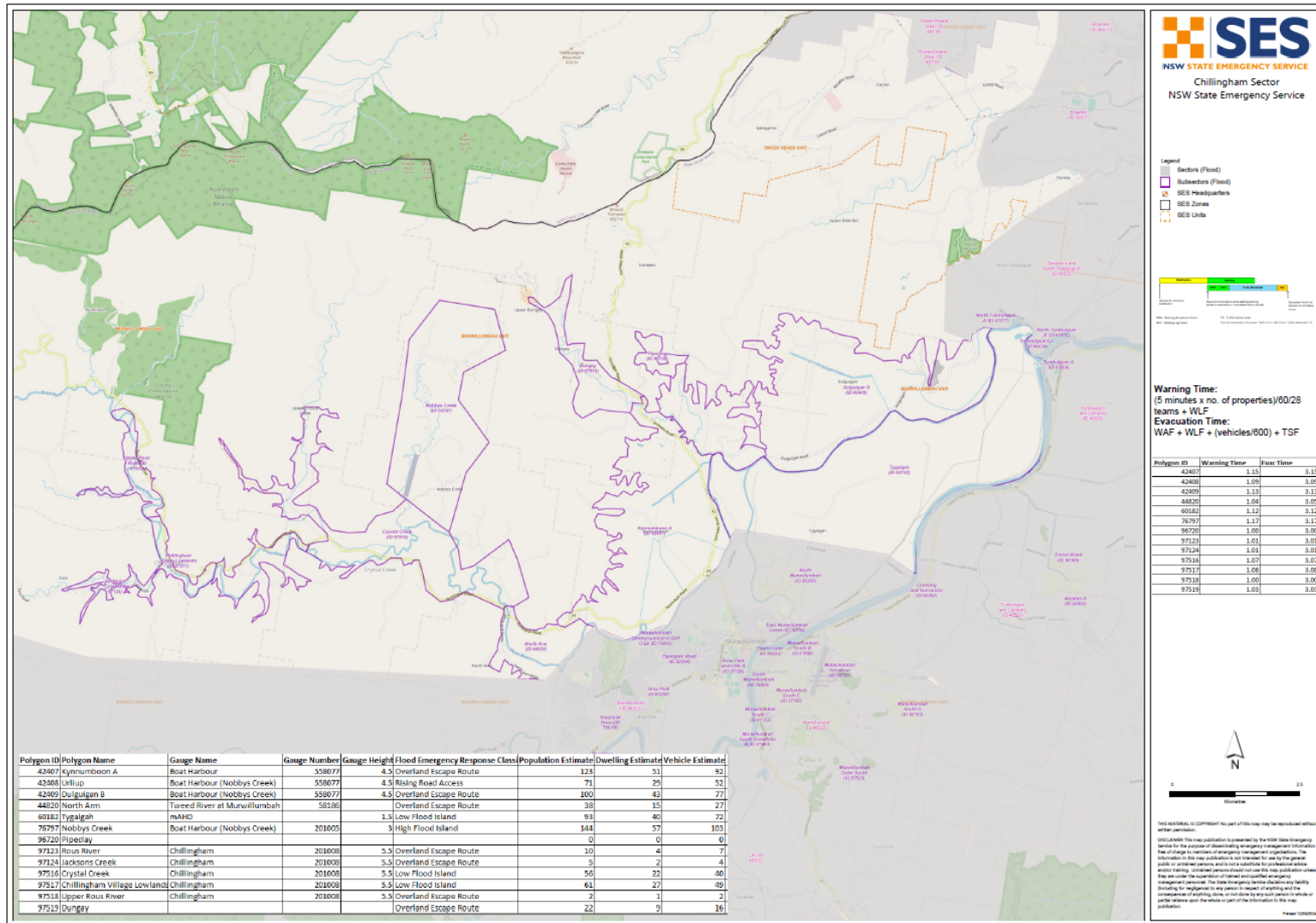
# CHILLINGHAM SECTOR MAP



Chillingham Sector Map Inset



# EVACUATION PLANNING





## 4. MURWILLUMBAH SECTOR

<b>MURWILLUMBAH RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Murwillumbah Sector includes the suburbs of Murwillumbah, Bray Park, South Murwillumbah and parts of Fernvale, Kielvale and Byangum.</li> <li>Murwillumbah is situated on the Tweed River approximately 8km east of the junction of the Tweed and Oxley Rivers, with the Rous River flowing to the north and Lavender Creek draining through and discharging to the Tweed River under Commercial Road.</li> <li>Murwillumbah CBD, East Murwillumbah, South Murwillumbah and Bray Park are protected by systems of levees. The South Murwillumbah levee is lower in height and South Murwillumbah therefore floods more frequently.</li> <li>The CBD Levee overtopping height is 6.2m at the North Murwillumbah Gauge.</li> <li>The Dorothy-Williams Street Levee overtopping height is 4.8m at the Kynumboon Gauge.</li> <li>The East Murwillumbah Levee overtopping height is 6.4m at the North Murwillumbah Gauge.</li> <li>The South Murwillumbah levee overtopping height is approx.4.8m at the North Murwillumbah Gauge.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Riverine flooding from the Tweed River.</li> <li>Knox Park behind the CBD Levee is subject to flash flooding.</li> <li>Ponding can occur in the following locations: Bray Park east of Kyogle Road, football fields in Queensland Road, Knox Park, Willward Park</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Murwillumbah is largely classified as Low Flood Island, with a High Flood Island in the vicinity of the Murwillumbah Hospital.</li> </ul>				
<b>At risk properties</b>	861 properties in Murwillumbah, 465 in South Murwillumbah, 83 in Bray Park and 1 in Fernvale at risk of over floor flooding in a PMF.	<b>Total number of properties within Sector/Community</b>	4209		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	North Murwillumbah	201420	3	4	4.8
	Kynumboon	201422	-	-	-
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Evacuation Centre at Murwillumbah TAFE, Wollumbin High School or Tweed Valley Uniting Church, where evacuees are able to gather while flood situation is monitored.</li> <li>Where a major levee overtopping and/or failure occurs, evacuees will either remain at Murwillumbah TAFE/ Tweed Valley Uniting Church/Wollumbin High</li> </ul>				



	School or be transported to an appropriate alternate evacuation centre if capacity is exceeded.
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>• Overtopping and/or failure of levees resulting in inundation behind the levees.</li> <li>• Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario.</li> <li>• Closure of evacuation routes</li> <li>• Inundation of a large number of dwellings.</li> <li>• Potential of isolation to supplies for thousands of people in a large flood event for a number of days.</li> </ul>
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>• Flood Watch (BoM)</li> <li>• Flood Warnings (BoM)</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
	<ul style="list-style-type: none"> <li>• Targeted door knocking complemented by AWS messaging and use of Emergency Service vehicles with loud speakers.</li> </ul>
<b>Property Protection</b>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Monitoring rising flood waters.</li> <li>• Relocation of furniture and valuable goods.</li> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Monitoring integrity of existing levee system and floodgates to be conducted by Tweed Shire Council.</li> <li>• Control of surface water inside levee system.</li> </ul>
	<p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbagging station may be set up at a nominated location to assist with property protection.</li> </ul>
	<p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• The Essential Energy Substation at 3 Charles St is within the 1% AEP extent.</li> <li>• The Water Treatment Plant at Durroon Avenue, Bray Park is within the 1% AEP extent.</li> <li>• Murwillumbah Wastewater Treatment Plant is located on the banks of the Rous River in Frances Street Murwillumbah. Parts of the facility start to be impacted from a 20% AEP event.</li> </ul>
<b>Evacuation and/or Isolation Triggers</b>	<p>Evacuation may be considered due to;</p> <ul style="list-style-type: none"> <li>• Predicted levee overtopping or failure</li> <li>• Significant local inundation occurring behind the levees prior to overtopping</li> <li>• Inundation of property</li> <li>• Closure of main access routes</li> <li>• Failure of essential services</li> </ul>

<p><b>Evacuation and/or Warning Triggers</b></p>	<p>Evacuation and/or warnings will be considered when:</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/ or exceed 4-4.3m at North Murwillumbah Gauge:</b> Local stormwater runoff begins inundating the lower lying areas behind the South Murwillumbah Levee around Hayes Lane at this height (Subsector Hayes Lane).</li> <li><b>2.) Prediction to reach and/ or exceed 4.8m at North Murwillumbah Gauge:</b> The South Murwillumbah Levee is predicted to overtop from this height causing progressive above ground inundation for properties behind the levee, most of which are elevated (Subsector Murwillumbah South). Once the levee overtops, the evacuation route into from South Murwillumbah into Murwillumbah is lost soon after. Many parts of Murwillumbah not protected by levee systems experience inundation from this height. The Quarry Rd levee in subsector Murwillumbah Industrial may experience overtopping from this height, with overtopping likely to initiate at its southern end.</li> <li><b>3.) Prediction to reach and/ or exceed 6.1-6.2m at North Murwillumbah Gauge:</b> The CBD Levee is predicted to overtop at 6.2m in the vicinity of Murwillumbah High School with further breaches occurring between Condong Street and the Murwillumbah Bridge around 6.3m (Subsector CBD Levee). Overtopping was observed in 2017 at the earthen end of the levee with a peak height of 6.2m, and in 2022 south of Les Cave field and across Murwillumbah High School Sports Field with a peak height of 6.51m. The Dorothy-William St area (subsectors Dorothy William St Levee) is expected to have immunity until a 1% AEP event, however this area is highly dependant on flows from the Rous River, so the Kynnumboon gauge should be monitored for expected overtopping at a height of 4.8m (Kynnumboon gauge 201422), as it is difficult to correlate an overtopping height to the North Murwillumbah gauge. Murwillumbah East Public School outside the East Murwillumbah Levee may become inundated at this height (Subsector Murwillumbah East Public School).</li> <li><b>4.) Prediction to reach and/ or exceed 6.4m at North Murwillumbah Gauge:</b> The East Murwillumbah Levee may begin to overtop at this height threatening properties behind the levee (Subsector East Murwillumbah Levee). Minor overtopping has been observed in prior events between 6.1-6.2m, so this needs to be closely monitored. The levee was overtopped by 300mm near the Murwillumbah East Primary School in the 2017 flood, and east of Charles St in the 2022 flood.</li> <li><b>5.) Prediction to reach and/ or exceed 10.36m at North Murwillumbah Gauge:</b> The area along Byangum Road between Tree Street and Prince Street is a High Flood Island until a PMF event at this approximate height, which may see inundation along parts of Tombonda Road, Kyogle Road and Baker Street, and along Riverview Street between Hartigan Street and Wollumbin Street. West End Street and Murwillumbah Street may also be impacted (Byangum Road Subsector). In a PMF event (approx. 11.4m) the subsector Murwillumbah East B is a High Flood Island, isolating the hospital. Murwillumbah Byangum B is also isolated as a high flood island in a PMF event (GEMS ID 41185).</li> </ol>
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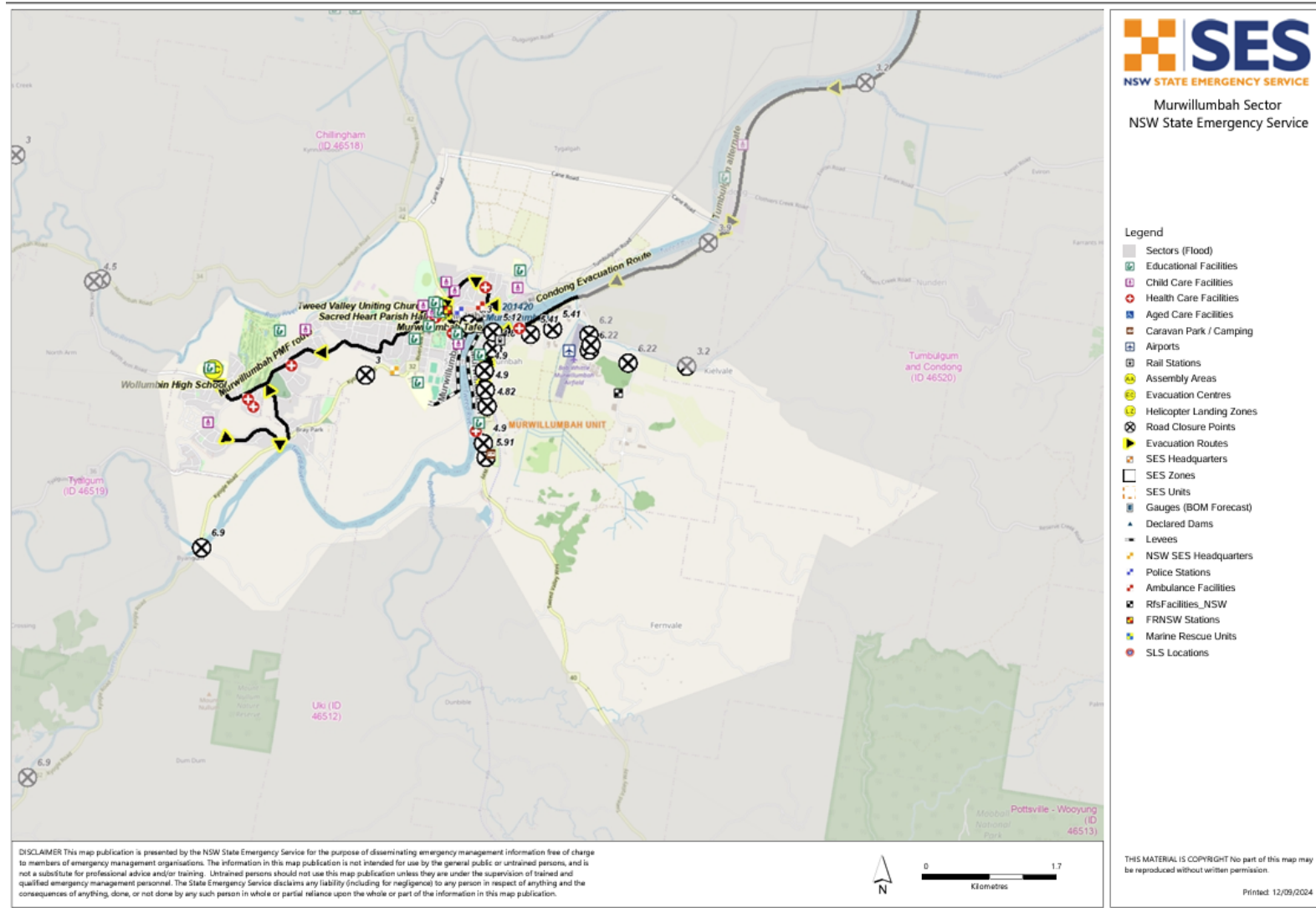
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p>Evacuation or warnings will be considered when:</p> <ul style="list-style-type: none"> <li>● <b>Prediction to reach and/ or exceed 4-4.3m at North Murwillumbah Gauge 1:</b> Issue Watch and Act (Prepare to Evacuate) for Subsector Hayes Lane (GEMS ID 76802) and Emergency Warning if heights are expected to reach or exceed 4.8m.</li> <li>● <b>Prediction to reach and/ or exceed 4.8m at North Murwillumbah Gauge:</b> <i>In the South Murwillumbah area</i> Issue <b>Emergency</b> Warning evacuation messaging for subsectors South Murwillumbah (GEMS ID 76803) and Murwillumbah South C (GEMS ID 97155) if heights are expected to reach or exceed 4.8m at the North Murwillumbah Gauge and levee overtopping is expected to occur. If heights are likely to exceed 4.8m, Emergency Warning Messaging should also be issued for Murwillumbah South B (GEMS ID 41698).</li> <li>● A Watch and Act should be issued for Murwillumbah South Greenhills B (GEMS ID 41693), which is not inundated at this height. Inundation of this subsector is not expected until a PMF, however any targeted evacuations will need to be completed before evacuation routes towards Murwillumbah are compromised after levee overtopping from this height.</li> <li>● Watch and Act messaging should be considered for Murwillumbah Outer South (GEMS ID 97523) and Murwillumbah Industrial (GEMS ID 96788) Inundation of property is not expected at this height, however if flood levels continue to rise, evacuation routes may be compromised. If heights are expected to exceed 6.0m, Emergency Warning Messaging should be issued prior to evacuation route closure.</li> </ul> <p><i>In the Murwillumbah area</i></p> <ul style="list-style-type: none"> <li>● Watch and Act messaging for the Knox Park and CBD A subsector (GEMS ID 97136), with monitoring required to determine potential for early evacuation due to flash flooding. Murwillumbah Showgrounds and Golf Club may require emergency warning messaging at this height (GEMS ID 76812) and messaging may be required if heights are expected to exceed 5.3m for Bray Park (GEMS ID 60202), Byangum (GEMS ID 60205) North Murwillumbah (GEMS ID 60200) and Commercial Rd subsectors (GEMS ID 76810) which all experience progressive inundation from this height.</li> <li>● Watch and Act messaging should also be issued for subsector CBD levee A (GEMS ID 97137) and Dorothy William St levee (GEMS ID 76821) if heights are expected to rise due to potential closure of evacuation routes prior to levee overtopping.</li> <li>● The Dorothy William St levee subsector needs to be carefully monitored with the Kynnumboon gauge, as overtopping height more closely correlated with this gauge. Emergency Warning messaging needs to be issued prior to the <b>Kynnumboon gauge</b> reaching 4.8m. Inundation behind the levee due to local catchment flooding also needs to be monitored, as has occurred in previous flood events.</li> <li>● <b>Prediction to reach and/ or exceed 6.1-6.2m at North Murwillumbah Gauge:</b> Emergency Warning messaging should be issued for subsector CBD levee A (GEMS ID 97137) due to expected levee overtopping from this height. Subsector East Murwillumbah levee (GEMS ID 76798) should be closely monitored with expected levee overtopping to occur at 6.4m. However, earlier Emergency Warning messaging may be required, as minor overtopping has occurred in previous events at this height.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>Prediction to reach and/ or exceed 6.4m at North Murwillumbah Gauge:</b> If not already issued under prediction 3, Emergency Warning messaging should occur for subsector East Murwillumbah levee (GEMS ID 76798). Subsector Riveroak Drive (GEMS ID 76815) may see progressive inundation from this height and may need Watch and Act or Emergency Warning messaging depending on predicted heights. Many properties in this subsector are not within the flood extent until a PMF, however access would likely be cut off prior to this.</li> <li>• <b>Prediction to reach and/ or exceed 10.36m at North Murwillumbah Gauge:</b> Emergency Warning messaging should be considered for subsectors Byangum Rd (GEMS ID 60204) and Murwillumbah East B (GEMS ID 41180) which become high flood islands at this height and Murwillumbah Byangum B is also isolated as a high flood island in a PMF event (GEMS ID 41185).</li> </ul>
<p><b>Evacuation Routes</b></p>	<ul style="list-style-type: none"> <li>• <b>South Murwillumbah:</b> Tweed Valley Way – Alma Street – Wollumbin Street - Brisbane Street - Murwillumbah Street – Tweed Valley Uniting Church/ Murwillumbah TAFE</li> <li>• <b>East Murwillumbah:</b> Little Street – Ewing Street – Waterloo Street – Queensland Road - Murwillumbah Street – Tweed Valley Uniting Church/ Murwillumbah TAFE</li> <li>• <b>Murwillumbah CBD:</b> Local roads to join South Murwillumbah evacuation route, or towards Byangum Rd to Murwillumbah evacuation centres.</li> <li>• <b>Murwillumbah PMF evacuation route:</b> In the event of an extreme flood, the route along Byangum Rd towards Wollumbin High School.</li> </ul>
<p><b>Evacuation Route Closure</b></p>	<ul style="list-style-type: none"> <li>• <b>Knox Park Area:</b> Nullum St may cut early in a significant flood event (in as little as 3 hours). A number of roadways in this vicinity may also become inundated, meaning local evacuation via Commercial Rd to evacuation routes needs to occur prior to any levee overtopping.</li> <li>• <b>East Murwillumbah:</b> Murwillumbah St and Reynolds St may be cut early (after 27 hours from rain onset in a 1% and 13 hours in a 0.2%)</li> <li>• <b>Dorothy St Levee:</b> William St is cut in multiple locations, however alternate access should be possible.</li> <li>• <b>South Murwillumbah:</b> The South Murwillumbah route may be cut from a 20% event (approx. 4.8m-5.12m) at Alma St. Local roads also begin to close at approximately this height. Roads in the industrial area close from approx. 6.0m.</li> <li>• <b>Murwillumbah PMF route:</b> This route may become compromised near Riverview Lane and William St. Alternate access towards a High Flood Island in the vicinity of the hospital may be possible.</li> </ul>
<p><b>Method of Evacuation</b></p>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground.</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas.</li> </ul>
<p><b>Evacuation Centre/Assembly Point</b></p>	<ul style="list-style-type: none"> <li>• Wollumbin High School, North Arm Road Murwillumbah (Outside of PMF extent)</li> <li>• Tweed Valley Uniting Church (Outside of PMF extent)</li> <li>• Murwillumbah TAFE, 146 Murwillumbah Street Murwillumbah (Within PMF extent)</li> <li>• Sacred Heart Parish Hall, 143 Murwillumbah Street Murwillumbah (Within PMF extent, partially within 1%AEP extent)</li> </ul>

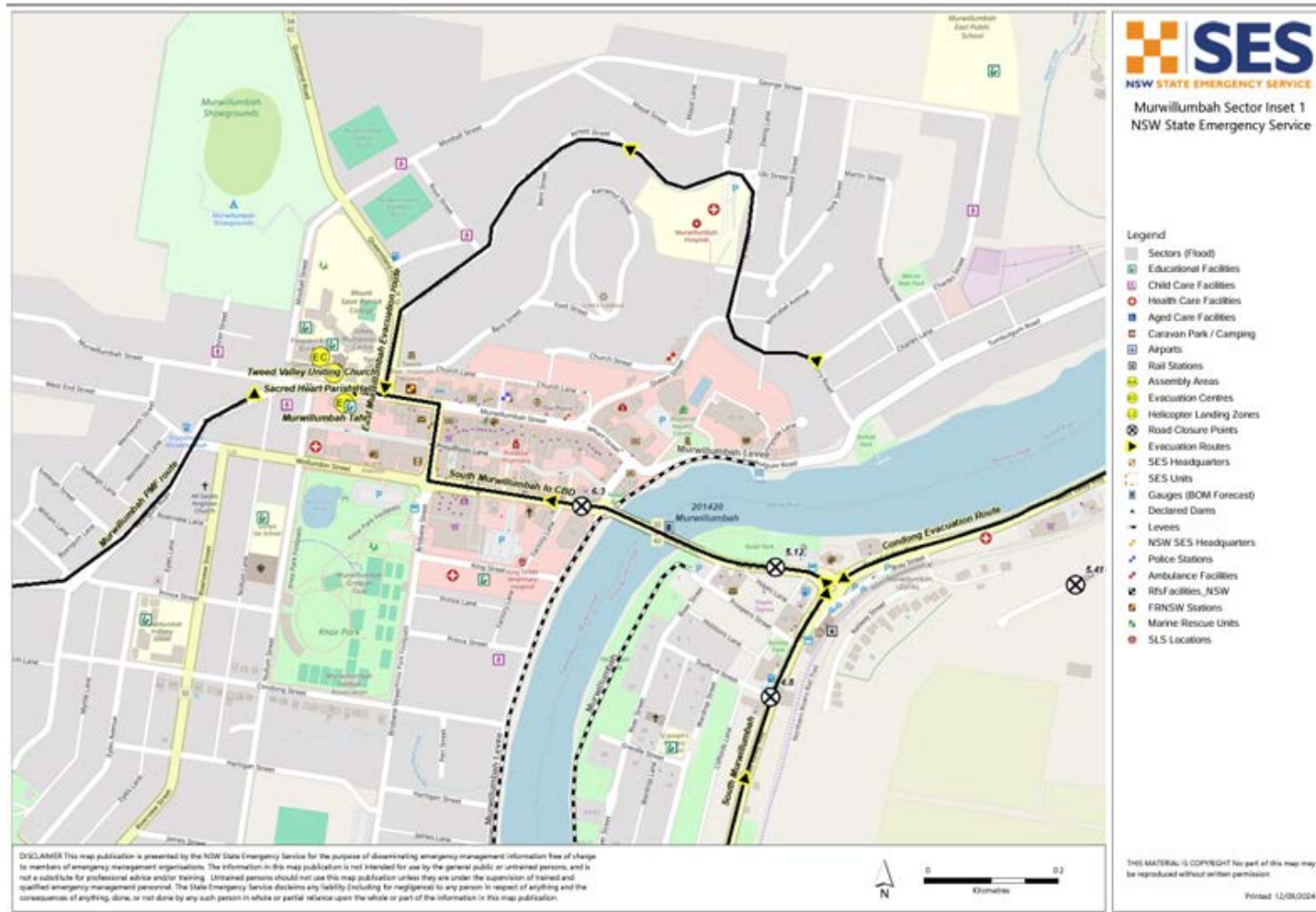
<p><b>Large scale evacuations</b></p>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required.</li> <li>• In the case of levee break or failure, rapid increases in water level are modelled for a 1% AEP event of up to 2.8m for the Commercial Rd levee, 1.1m for the East Murwillumbah Levee and 0.4m for the Dorothy St levee, with significant increases in velocity around the commercial Rd levee.</li> <li>• Failure of the pump systems would result in rapid rises in flood levels behind the CBD levee and a longer time of inundation.</li> </ul>
<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>• Early evacuation of South Murwillumbah is critical to minimising the need for and risk involved in conducting rescues in an area of high velocity flows.</li> <li>• Early onset of flooding in Tyngah along with early road closures, may require rescue via helicopter.</li> </ul>
<p><b>Aircraft Management</b></p>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following the possible locations for helicopter landing points. Ground truthing of these sites is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Murwillumbah High School - S 28° 20' 05" E 153° 23' 35"</li> </ul> <p>Firm all weather surfaces          Light towers and goal posts on northern field          Goal posts on southern field adjacent to hockey field          Notes: All ovals permissible to land with exception of hockey field          Last Surveyed: July 2013</p> <ul style="list-style-type: none"> <li>• Murwillumbah Airfield - S 28° 19' 55" E 153° 24' 46"</li> </ul> <p>Firm grass surface          Nil known hazards          CTAF 126.7          Can have partial submersion at Southern end of field          Vehicle access mid strip on eastern side          Last Surveyed: December 2013</p>

	<p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>The nearest airport is Murwillumbah Airfield, which has an 800m king grass strip able to accommodate to twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>Closure of schools - coordinated through the Department of Education and Training.</li> <li>The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>Most fuel stations in the Murwillumbah area are located on Tweed Valley Way, which is inundated in major flood events.</li> <li>The Tweed District water supply is a run-of-river supply augmented by releases from Clarrie Hall Dam. Raw water is drawn from upstream of Bray Park Weir, which is a salt-water barrage in the Tweed River. The weir has a level of 1.23mAHD and if overtopped, raw water may be contaminated by salt-water resulting in water quality incidents, as occurred in 2017.</li> </ul>

# MURWILLUMBAH SECTOR MAP

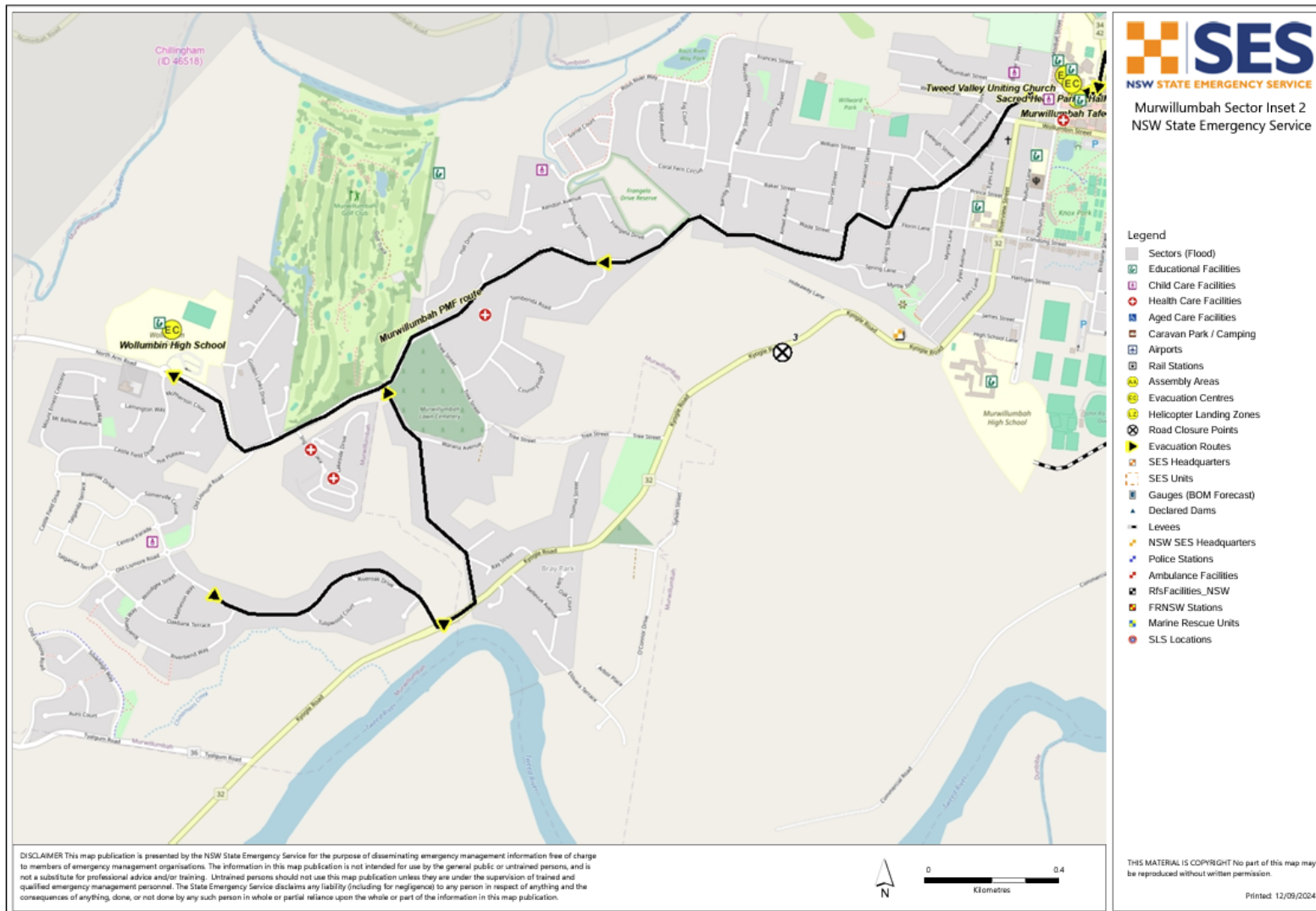


Murwillumbah Sector Map Inset 1

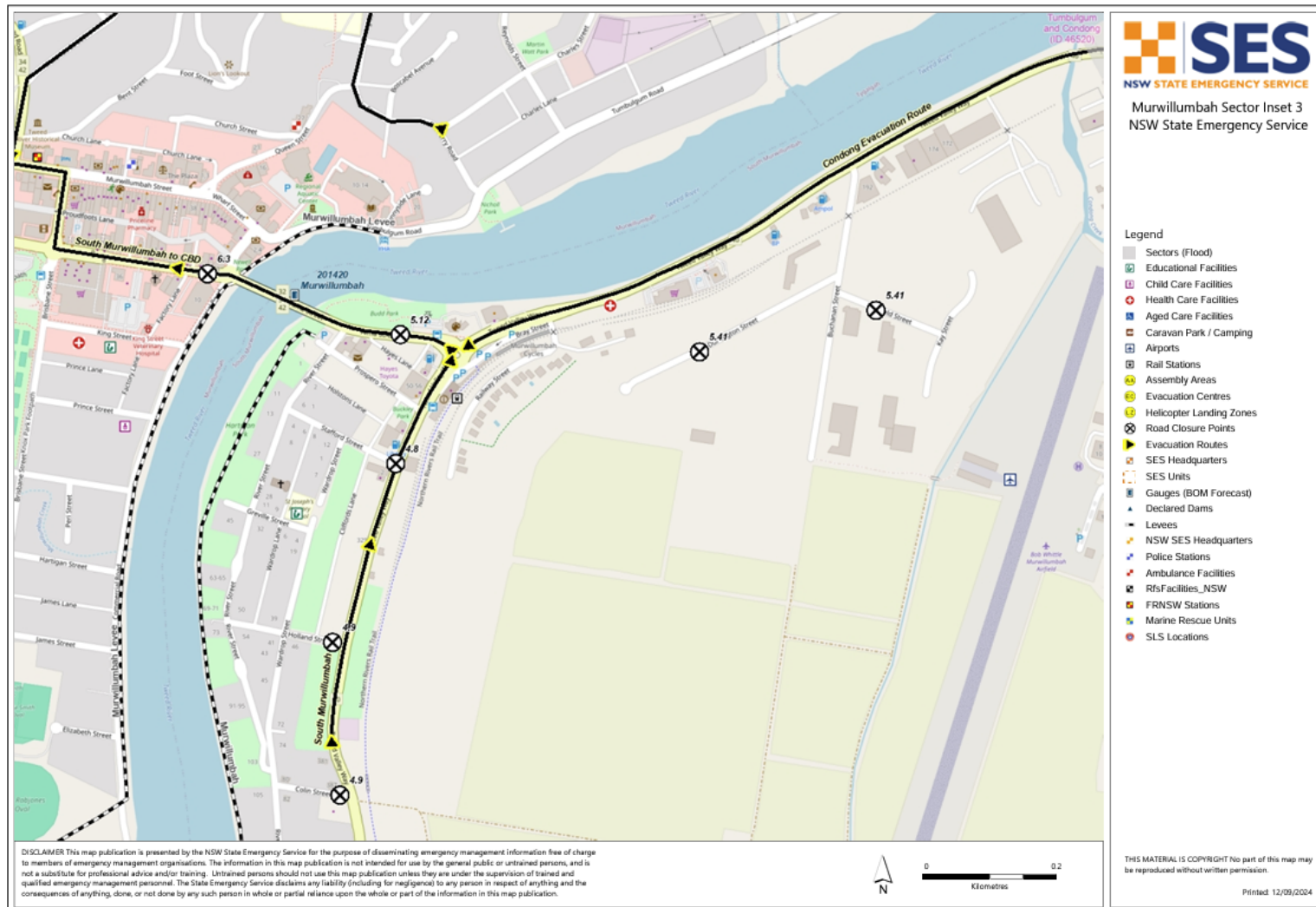




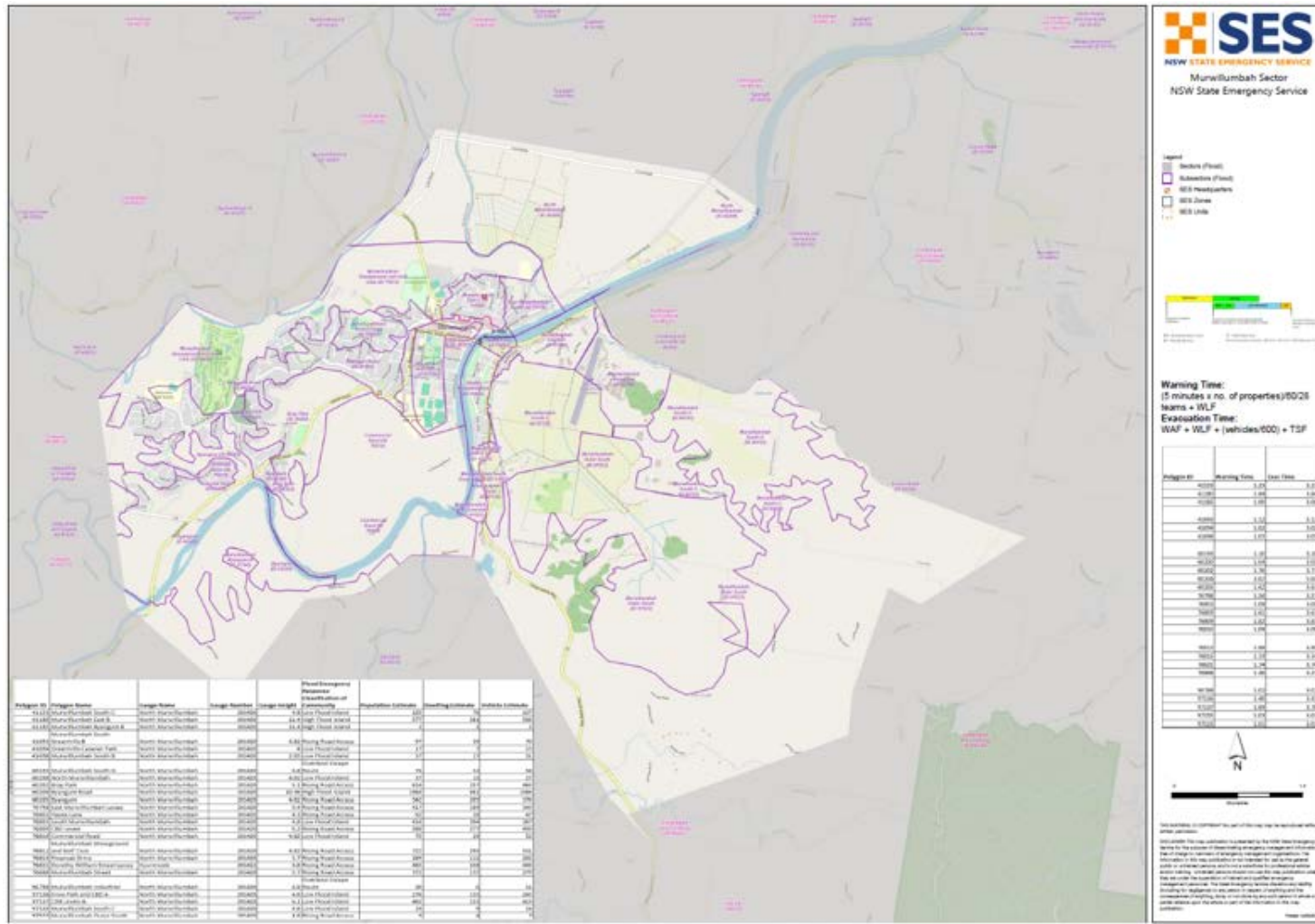
Murwillumbah Sector Map Inset 2



Murwillumbah Sector Map Inset 3



# EVACUATION PLANNING



## 5. TUMBULGUM SECTOR

<b>TUMBULGUM RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Tumbulgum Sector includes the suburbs of Condong, Tumbulgum, Eviron, Nunderi, Kielvale, Fernvale, Wardop Valley, Palmvale, Reserve Creek, Nunderi, Farrants Hill, Stotts Creek, Clothiers Creek, Reserve Creek, and part of Cudgera Creek. The main areas of settlement are Tumbulgum and Condong.</li> <li>Tumbulgum is located 10km downstream of Murwillumbah on the eastern bank of the Tweed River. The Tweed Valley Way runs along the eastern border of the village, generally separating the village from agricultural activities.</li> <li>Condong is located 4km downstream of Murwillumbah.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Tumbulgum and Condong are affected by riverine flooding from the Tweed and Rous Rivers. They are also impacted by overland flooding through the neighbouring cane fields.</li> <li>Flooding in Tumbulgum is also tidally influenced.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Tumbulgum and Condong are Low Flood Islands.</li> </ul>				
<b>At risk properties</b>	118 properties in Condong, 18 in Kielvale, 55 in Nunderi, 29 in Eviron, 181 in Tumbulgum and 3 in Stotts Creek at risk of over floor flooding in a PMF. Condong and Tumbulgum can become isolated quickly.	<b>Total number of properties within Sector/Community</b>	981		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	<ul style="list-style-type: none"> <li>North Murwillumbah</li> <li>Tumbulgum</li> </ul>	201420 201432	3 1.4	4 1.8	4.8 2.5
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Murwillumbah evacuation centres</b> and <b>Terranora evacuation centres</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of main access routes</li> <li>Potential loss of life from inundation</li> <li>Inundation of a small number of dwellings and businesses</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> </ul>				

	<ul style="list-style-type: none"> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods</li> </ul> <hr/> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbagging station may be set up at a nominated location to assist with property protection.</li> </ul> <hr/> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• No identified essential infrastructure requires protection below a PMF event.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation may be considered for floods that are expected to cause;</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to Inundation</li> <li>• Property inundation</li> <li>• Failure of essential services</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>Evacuation and/or warnings will be considered when:</p> <p>Predictions utilising the North Murwillumbah Gauge (201420):</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/ or exceed 3.9m at North Murwillumbah Gauge:</b> The village of Condong may become isolated from Murwillumbah at this height due to road closures on Tweed Valley Way (Subsector Condong and Surrounds). Access road in Condong may be inundated within 3 hours after this height is reached at Murwillumbah</li> <li><b>2.) Prediction to reach and/ or exceed 4.8m at North Murwillumbah Gauge:</b> During a 20% AEP event, above floor flooding in Condong may occur, with 1 property impacted at this height with an additional property impacted during a 5% AEP event at 5.41m (Subsector Condong and Surrounds).</li> <li><b>3.) Prediction to reach and/ or exceed 6.01m at North Murwillumbah Gauge:</b> During a 1% AEP event wider above floor flooding is predicted to occur at this height, impacting 18 properties (Subsector Condong and Surrounds).</li> <li><b>4.) Prediction to reach and/ or exceed 6.5m at North Murwillumbah Gauge:</b> All properties in Condong are predicted to be flooded above floor level by this height (Subsector Condong and Surrounds).</li> </ol> <p>Predictions utilising the Tumbulgum Gauge (201432):</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/or exceed 1.4m at the Tumbulgum Gauge:</b> Water enters Irving Street and Bawden Street caused by inundation from back up water from cane field (Subsector Tumbulgum A).</li> </ol>



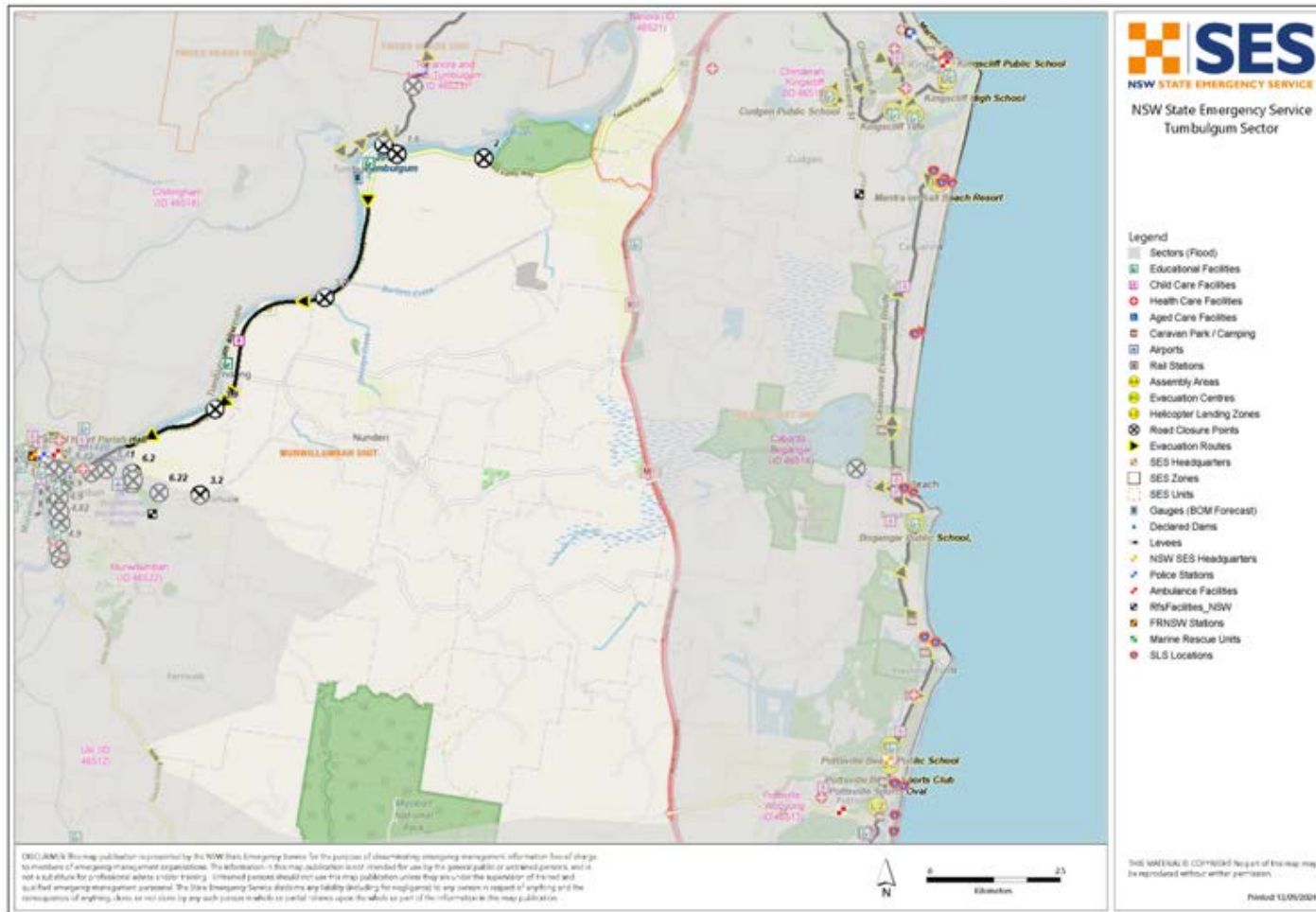
	<p><b>2.) Prediction to reach and/or exceed 2m at the Tumbulgum Gauge:</b> All access out of Tumbulgum is cut at this height, along Tweed Valley Way, and via Terranora Road in North Tumbulgum (Subsector Tumbulgum A).</p> <ul style="list-style-type: none"> <li>• At 1.8m water crosses Riverside Drive immediately east of the bridge and backs up into the lower areas on the eastern side of the village (Subsectors Tumbulgum D and Tumbulgum A).</li> <li>• At 2.3m water is predicted to flow from the area near the boat ramp and crosses Riverside Drive into the village (Subsector Tumbulgum A).</li> </ul> <p><b>3.) Prediction to reach and/or exceed 2.72m at the Tumbulgum Gauge:</b> During a 20% AEP event, most of the town is inundated apart from smaller areas of high ground with depths of up to 1.5m in low lying areas, with 8 properties flooded above floor level (Subsector Tumbulgum A).</p> <p><b>4.) Prediction to reach and/or exceed 2.9-3m at the Tumbulgum Gauge:</b> Most properties in Tumbulgum will start to have above ground flooding (Subsector Tumbulgum A).</p> <p><b>5.) Prediction to reach and/or exceed 4.02-4.5m at the Tumbulgum Gauge:</b> During the 1% AEP event, all of Tumbulgum is inundated, with 67 properties flooded above floor level (Subsector Tumbulgum A). At this height, 14 properties in Eviron and 2 in Nunderi may have over floor flooding (subsector Eviron).</p> <p><b>6.) PMF event, 8.53m at the Tumbulgum gauge:</b> Additional properties experience over floor inundation in this event with 29 properties in Eviron, 18 in Kielvale and 3 in Stotts Creek and 56 in Nunderi (subsectors Eviron Rd, Stotts Island and surrounds, Nunderi A and Condong and surrounds).</p>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p>Evacuation or warnings will be considered when:</p> <p>Condong Sequencing at the North Murwillumbah Gauge</p> <ul style="list-style-type: none"> <li>• <b>Prediction to reach and/ or exceed 3.9m at North Murwillumbah Gauge:</b> Issue Watch and Act messaging for Subsector Condong and Surrounds (GEMS ID 60162). If heights are expected to exceed 3.9 and reach height at which inundation is expected to occur (<b>predictions from approx. 4.8m</b>), then Emergency Warning evacuation messaging is required.</li> </ul> <p>Tumbulgum Sequencing at the Tumbulgum Gauge</p> <ul style="list-style-type: none"> <li>• <b>Prediction to reach and/or exceed 1.4m at the Tumbulgum Gauge::</b> Advice or Watch and Act (Do not Enter Floodwater) messaging may be considered for floods predicted to reach or exceed 1.4m at the Tumbulgum gauge (Subsector Tumbulgum A GEMS ID 41169)</li> <li>• <b>Prediction to reach and/or exceed 2m at the Tumbulgum Gauge:</b> Issue Watch Act (Prepare to Evacuate) if heights are expected to reach but not exceed 2m at the Tumbulgum gauge (Subsector Tumbulgum A GEMS ID 41169) and low-lying properties in Stotts Island and Surrounds (GEMS ID 60163). If heights are expected to exceed 2m and rise towards the major flood level, Emergency Warning Messaging Should be issued for evacuation prior to road access out of Tumbulgum being lost by 2m.</li> <li>• <b>Prediction to reach and/or exceed 4.02m at the Tumbulgum Gauge:</b> Additional evacuations may be required for predictions expected to reach this height in subsector Eviron Rd (GEMS ID 60189). This messaging should be issued prior to evacuation route closures towards Murwillumbah.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>For a PMF event 8.53m at the Tumbulgum gauge:</b> Additional evacuations may be required in subsectors Stotts Island and surrounds (GEMS ID 60163) and Nunderi A (42404). Rising road access should be available to the south.</li> </ul>
<b>Evacuation Routes</b>	<p>Condong Evacuation Routes</p> <ul style="list-style-type: none"> <li>• <b>Condong Evacuation Route:</b> Tweed Valley Way – Alma Street – Brisbane Street – Murwillumbah St – Murwillumbah TAFE or alternate Murwillumbah evacuation centres</li> </ul> <p>Tumbulgum Evacuation Routes</p> <ul style="list-style-type: none"> <li>• <b>Tumbulgum Evacuation Route:</b> Terranora Road – Terranora evacuation centres.</li> <li>• <b>Tumbulgum North Main Evacuation Route:</b> Dulguigan Road – Terranora Road – Terranora evacuation centres.</li> <li>• <b>Tumbulgum to Murwillumbah:</b> If this route is the preferred strategy, evacuation should proceed along Tweed Valley Way to join the Condong evacuation route.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• <b>Condong Evacuation Route:</b> May be cut at along Tweed Valley Way at 4.1m northeast of Quarry Road and at 5.2m near Buchanan Street at the North Murwillumbah gauge. Access to the Alma Street bridge may also be cut from 4m onwards at the North Murwillumbah gauge.</li> <li>• <b>Tumbulgum Evacuation Route:</b> Terranora Rd in North Tumbulgum is typically the last main access road to be cut, at approximately 2m at the Tumbulgum gauge.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to Murwillumbah evacuation centres for Condong</li> <li>• Primarily self-evacuation by private transport to Terranora evacuation centres for Tumbulgum</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<p>Murwillumbah evacuation centres.</p> <ul style="list-style-type: none"> <li>• Wollumbin High School, North Arm Road Murwillumbah (Outside of PMF extent)</li> <li>• Tweed Valley Uniting Church (Outside of PMF extent)</li> <li>• Murwillumbah TAFE, 146 Murwillumbah Street Murwillumbah (Within PMF extent)</li> <li>• Sacred Heart Parish Hall, 143 Murwillumbah Street Murwillumbah (Within PMF extent, partially within 1%AEP extent)</li> </ul> <p>Terranora evacuation centres (both outside of PMF extent)</p> <ul style="list-style-type: none"> <li>• Terranora Public School 650 Terranora Road, Terranora</li> <li>• Lindisfarne Anglican School Mahers Lane, Terranora</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground.</li> </ul>

<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> <li>• If resupply is required, this would require aerial resupply.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><i>Helicopter Landing Points:</i> There are no designated helicopter landing points in this sector.</p> <p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>• The nearest airport is Murwillumbah Airfield, which has an 800m king grass strip able to accommodate to twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop, approximately a few hours after the North Murwillumbah Gauge (201420-58186) exceeds 5.0m</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>• At Condong, low riverside levees protect the sugar mill from low level flooding and all houses have floor levels above the major flood level. A 1% AEP flood would affect all residential and commercial premises, including the sugar mill.</li> </ul>



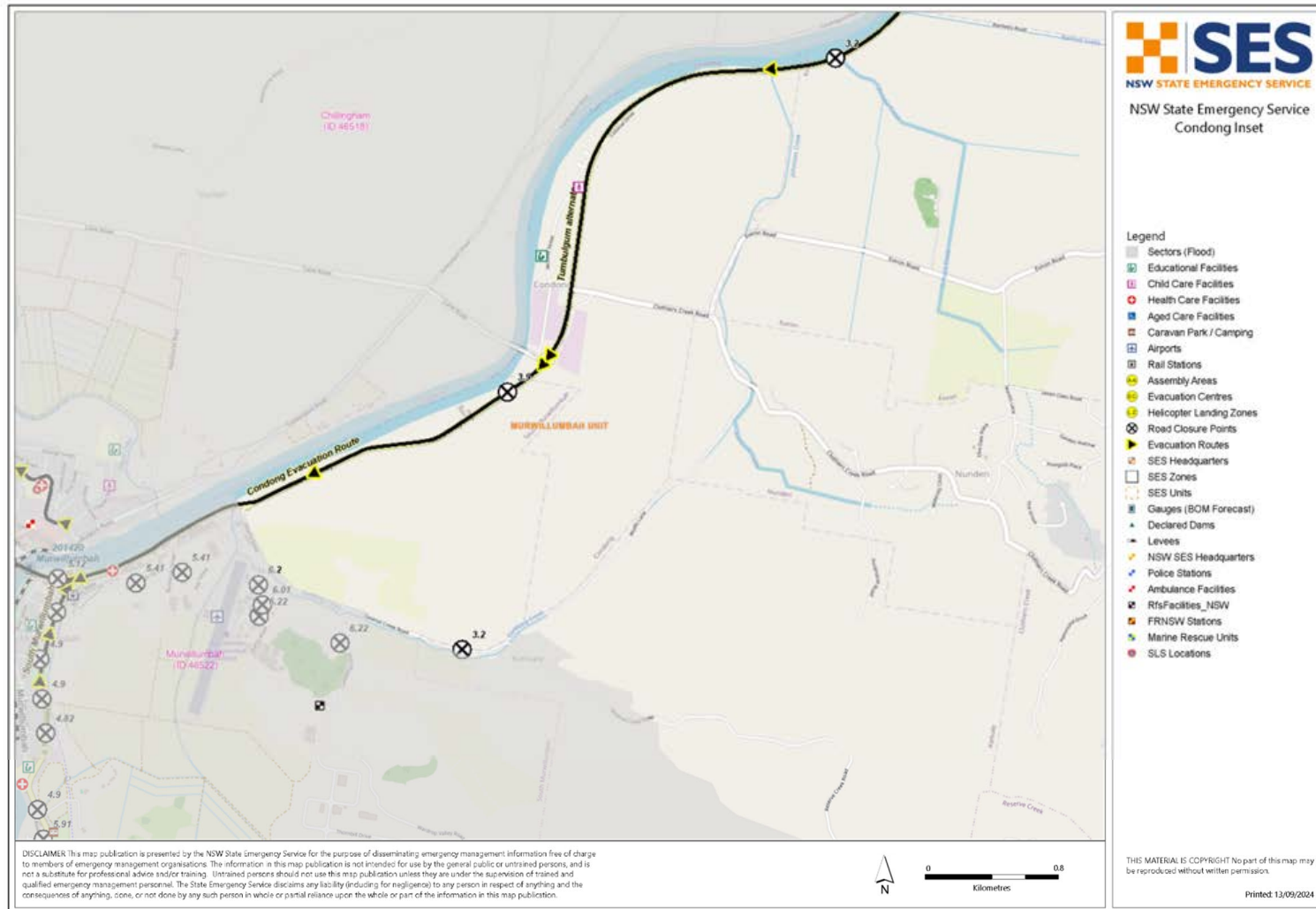
# TUMBULGUM SECTOR MAP



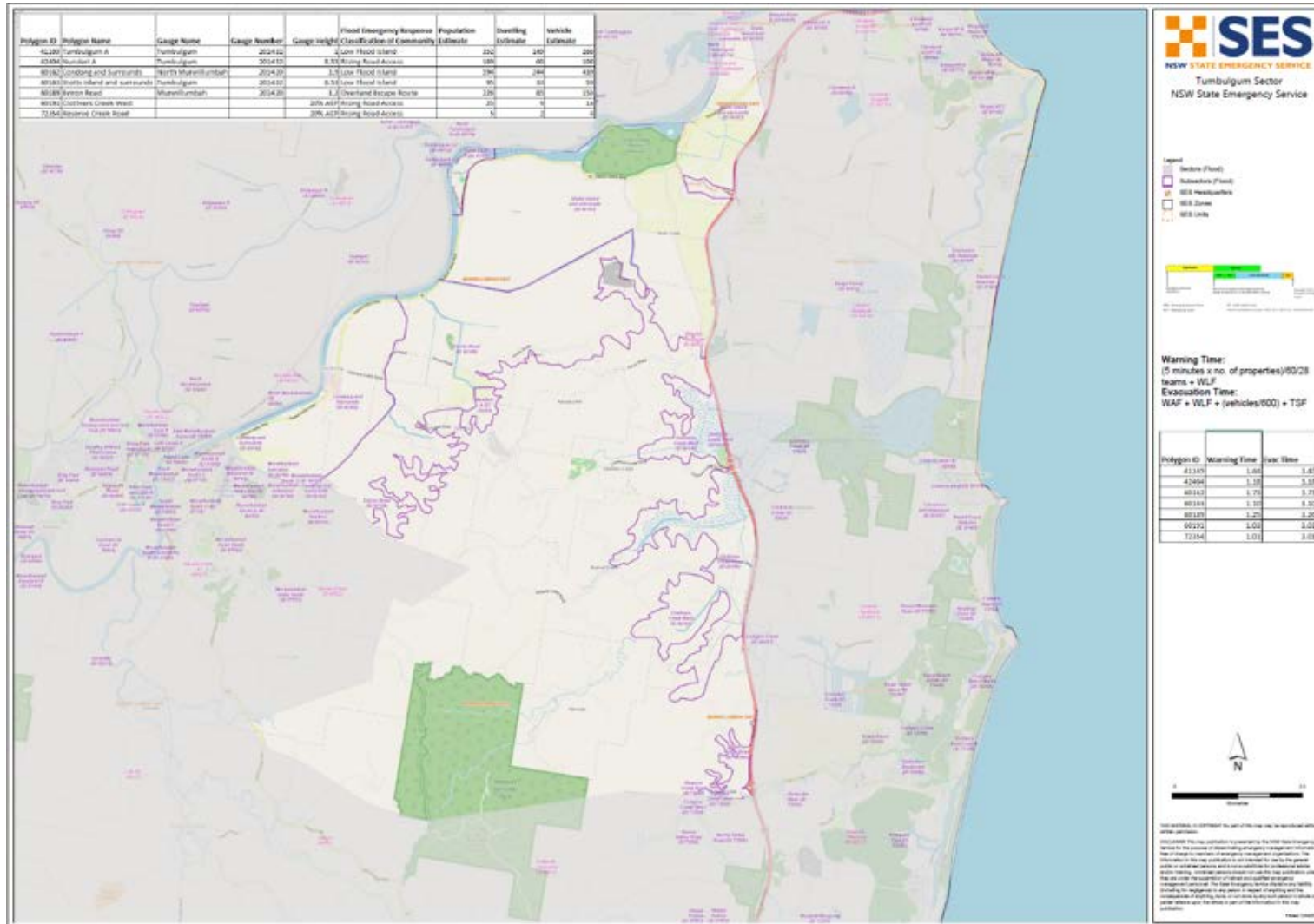
Tumbulgum Sector Map Inset 1



Tumbulgum Sector Map Inset 2



# EVACUATION PLANNING



## 6. CHINDERAH SECTOR

<b>CHINDERAH RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Chinderah/Kingscliff sector includes the suburbs of Chinderah, Kingscliff, and the northern part of Cudgen. The sector has a population of approximately 9983 people, living in 3867 dwellings.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Chinderah and West Kingscliff can experience flooding from both rainfall events over the Tweed River catchment causing riverine flooding and ocean storm surge, often during the same event.</li> <li>Flood extent in this sector can be influenced by tidal anomalies, storm surge and storm water flooding. The southern end of Kingscliff lies within the Tweed Coastal Creeks catchment, more specifically the Cudgen Creek catchment, and can also be susceptible to catchment flooding from this source.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>This Sector is largely classified as a Low Flood Island</li> <li>The parts of Kingscliff that fall within this sector have Rising Road Access</li> </ul>				
<b>At risk properties</b>	248 in Chinderah, 8 in Cudgen and 780 in Kingscliff are at risk of above floor flooding in a PMF.	<b>Total number of properties within Sector/Community</b>	3867		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	<ul style="list-style-type: none"> <li>Chinderah</li> </ul>	-/558010	1.3	1.7	2
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Kingscliff or Cudgen</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a large number of dwellings.</li> <li>Closure of evacuation routes</li> <li>Short term isolation</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sectors</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> </ul>				



	<ul style="list-style-type: none"> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <p><i>Note: Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment. The SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works. The Tweed Shire Council is responsible for the activation of the Tweed Shire Council Coastal Zone Management Plan.</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Assist in the lifting of furniture to residents in need.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self Serve sandbag stations may be set up at nominated locations to assist with property protection</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• The Kingscliff Wastewater Treatment Plant on Altona Road Kingscliff is within the flood extent, however its infrastructure has been built to a level above a 1% AEP flood event.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Storm surge events may impact areas within this sector.</li> <li>• Community isolation</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>Evacuation and/or warning messaging will be considered based on Bureau of Meteorology flood heights predictions at the Chinderah gauge:</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/or exceed 1.3m-1.6m at the Chinderah Gauge:</b> Local roads between the Pacific Motorway and the Tweed River which may affect evacuation begin to flood from this height, including Chinderah Bay Dr and Chinderah Road (Subsector Chinderah A). However, the Pacific Motorway and Wommin Bay Dr are expected to remain open at the minor flood level.</li> <li>• This subsector includes a number of residential parks with permanent fixed dwellings, including Chinderah Lakes Lifestyle Estate (79 sites), Tweed Shores Lifestyles Estate (167 sites), Royal Pacific Residences (44 sites) and Tweed Ski Lodge (15 sites).</li> <li><b>2.) Prediction to reach and/or exceed 1.8m-2.0 at the Chinderah Gauge:</b> Many low-lying areas of Chinderah experience flooding at this height, with approximately 15 properties modelled to experience over floor flooding, and 222 over ground.</li> <li><b>3.) Prediction to reach and/or exceed 2.0m at the Chinderah Gauge:</b> This is the height at which most of Chinderah is inundated, with expected closures of the Pacific Motorway from this height near Barneys Point Bridge, with all</li> </ol>

	<p>remaining road access to Chinderah expected to be lost by 2.1m. Water begins to enter low lying areas of Kingscliff.</p> <p><b>4.) Prediction to reach and/or exceed 2.73m at the Chinderah Gauge:</b> Most of Chinderah is inundated in the 1% AEP event, with some inundation on the western side of Kingscliff. 156 properties in Chinderah and 25 properties in Kingscliff are modelled to have over floor flooding in this event. In an event which reached a modelled PMF, subsectors Kingscliff and Kingscliff Beach would also be impacted, there is rising road access along Cudgen Rd and Marine Parade.</p>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p>Flood effects in Chinderah can be influenced by tides, and tidal conditions need to be identified prior to the onset of flooding.</p> <ul style="list-style-type: none"> <li>• <b>Prediction to reach and/or exceed 1.3m-1.6m at the Chinderah Gauge:</b> If heights are not expected to exceed 1.3m-1.6m, Watch and Act Messaging should be considered.</li> <li>• <b>Prediction to reach and/or exceed 1.8-2.0m at the Chinderah Gauge:</b> If heights are expected to reach and exceed 1.8 -2m, Emergency Warning evacuation messaging for subsector Chinderah A (GEMS ID 41657) and Chinderah B (GEMS ID 60159) should be considered prior to a height of 1.3m-1.6m, when expected road closures progressively occur.  There are a number of caravan parks that will be impacted between 1.1m and 2m at the Chinderah gauge and may require early warning, refer to chapter 4.</li> <li>• <b>Prediction to reach and/or exceed 2.0m at the Chinderah Gauge:</b> If heights are expected to exceed 2m then Chinderah South (GEMS ID 59780), Kingscliff B (GEMS ID 60158) may require Emergency Warning messaging. Chinderah A and B should have received Emergency Warning messaging under predictions 1 and 2.</li> <li>• <b>Prediction to reach and/or exceed 2.73m at the Chinderah Gauge:</b> If an event equal to or greater than this height is expected, consideration of Emergency Warning messaging for subsectors Kingscliff A (GEMS ID 59777) and Kingscliff Beach (GEMS ID 95119) should be considered depending on predicted heights. Whilst not modelled to be impacted by floodwaters until events from approximately a 0.2%AEP (3.5m at the Chinderah gauge), evacuation would be necessary prior to road access becoming compromised. Subsector Kingscliff C (GEMS ID 60160) is modelled to be mostly flood free to the PMF, with some floodwater modelled to extend into the parkland adjacent to Cudgen Creek and the southern end of the Kingscliff High School lot.</li> </ul>
<p><b>Evacuation Routes</b></p>	<p>For subsector Chinderah A:</p> <ul style="list-style-type: none"> <li>• For areas south of the Kingscliff drain near River Street and Walsh Street, travel along Chinderah Drive/Chinderah Bay Drive to Chinderah Road to Tweed Coast Road, onto Cudgen Road, to Kingscliff evacuation centres.</li> <li>• For areas in Chinderah A Subsector, north of the drain near Wommin Bay Road, travel along Wommin Bay Road, south on Marine Parade to Kingscliff evacuation centres.</li> <li>• Evacuation may also be possible via Waugh St to the Pacific Motorway to Banora Point.</li> </ul> <p>For Kingscliff subsectors:</p>

	<ul style="list-style-type: none"> <li>Travel via Elrond Drive then onto Turnock Street, Cudgen Road and to Kingscliff evacuation centres.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>Local roads begin to progressively flood in Chinderah from 1.3m, including Chinderah Rd and Chinderah Bay Drive (Chinderah Gauge).</li> <li>Access to the Pacific Motorway has historically been cut prior to a height of 2m, which will affect evacuation towards Banora Point.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>Primarily self-evacuation by private transport to higher ground</li> <li>Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<p>There are a number of evacuation centres which may be utilised for this sector, which are outside the modelled PMF extent.</p> <p>Kingscliff evacuation centres are located at:</p> <ul style="list-style-type: none"> <li>Kingscliff TAFE</li> <li>Kingscliff Public School</li> <li>Kingscliff High School</li> </ul> <p>Cudgen evacuation centres are located at:</p> <ul style="list-style-type: none"> <li>Cudgen Public School</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required.</li> <li>Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>Chinderah can become isolated by road and may remain so for a number of days in large flood events.</li> <li>In large flood events, the majority of Chinderah is only accessible by boat.</li> <li>If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following the possible locations for helicopter landing points. Ground truthing of these sites is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>Chinderah Sports Fields: S 28° 14' 13" E 153° 33' 53"</li> </ul> <p>Firm grass surface Caution goal posts on fields Light towers on boundaries</p>



	<p>Inside Gold CTA  LZ is Bearing 324 grid / 4.5nm from Gold Coast airfield  Last surveyed: December 2014</p> <ul style="list-style-type: none"> <li>• Kingscliff TAFE College S 28° 15' 58'' E 153° 34' 03''</li> </ul> <p>Firm all weather surfaces  No known hazards  Notes: Can use either top or bottom landing sites as indicated by arrows  Access via sealed road to both HLS  Last Surveyed: December 2014</p> <p><i>Airports:</i>  Insert detail</p> <ul style="list-style-type: none"> <li>• Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• Road access to this airport from the Chinderah sector would be cut off in a major flood event.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.</li> <li>• Major events of several thousands people are held in November, December and May annually.</li> <li>• The Chinderah area has a large number of caravan parks and will see large increases in visitors during holiday periods. Many Caravans within the area are fixed and are not able to be moved easily.</li> </ul>

# CHINDERAH SECTOR MAP



Chinderah Sector Map Inset 1

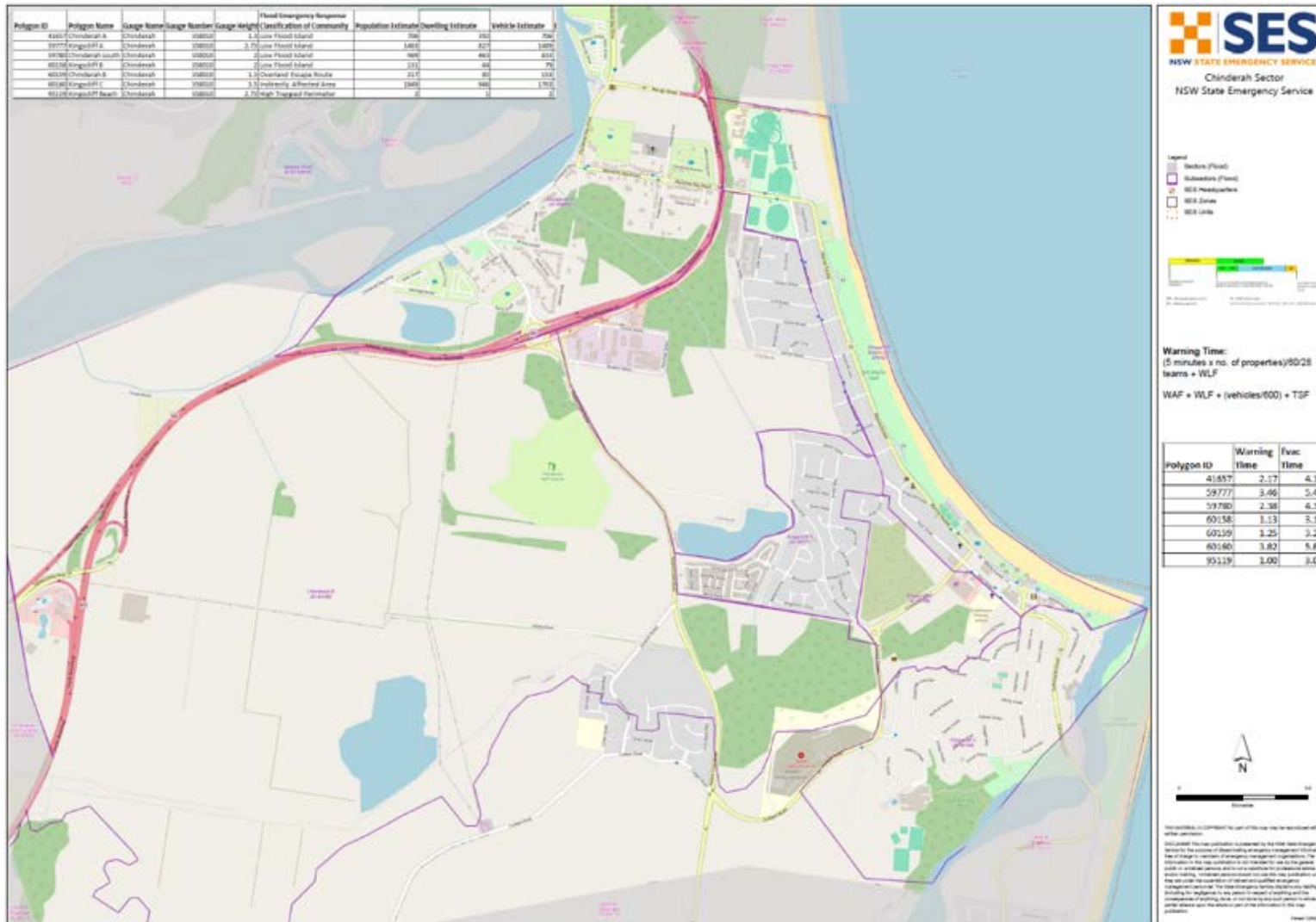


Chinderah Sector Map Inset 2





# EVACUATION PLANNING



## 7. BANORA POINT SECTOR

<b>BANORA POINT RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Banora Sector includes the western parts of the suburbs of Banora Point and Tweed Heads South bounded by the Pacific Motorway to the east. It also includes the eastern portion of Terranora that borders Banora Point.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Banora Point can experience flash flooding due to runoff from local catchments, as well as riverine flooding from backwater flows from Terranora Broadwater or the Tweed River.</li> <li>Flooding can also be influenced by tides and storm surge</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Much of the sector has Rising Road Access. There is a High Flood Island to the north of the sector.</li> </ul>				
<b>At risk properties</b>	1545 inundated above floor in Banora Point, 1394 in Tweed Heads South in a PMF (some of these properties fall within Tweed Heads South Sector).	<b>Total number of properties within Sector/Community</b>	8212		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC / Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Chinderah	-/588010	1.3	1.7	2
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Banora Point evacuation centres</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a large number of dwellings.</li> <li>Closure of evacuation routes</li> <li>Isolation for a large number of people for a number of days.</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> </ul>				

	<ul style="list-style-type: none"> <li>• Standard Emergency Warning Signal</li> </ul>
Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul>
	<p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> </ul>
	<p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• Banora Point Wastewater Treatment Plant on Enterprise Avenue is within the flood extent for a PMF event.</li> </ul>
Evacuation and/or Isolation Triggers	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Expected levee overtopping or failure</li> <li>• Community isolation</li> </ul>
Evacuation Triggers	<p><b>Evacuation or warning may be considered when:</b></p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/ or exceed 1.8-2.0m at Chinderah Gauge:</b> Some parts of Tweed Heads South may experience flooding from Terranora Creek around Kirkwood Rd, Phillip Parade and Acacia Street (Subsector Tweed Heads South A). At this height only 1 property in Tweed Heads South and no properties in Banora Point are modelled to experience over floor flooding. Low sections of Phillip Parade and Dry Dock Rd may close and require monitoring.</li> <li><b>2.) Prediction to reach and/ or exceed 2.0-2.2m at Chinderah Gauge:</b> At this height there may be closures along Dry Dock Rd, along with levee overtopping in Tweed Heads South sector which will affect any possible evacuation routes into Tweed Heads for subsector Tweed Heads South A. Evacuation to Banora Point Evacuation Centres may be possible at this height depending on local road closures.</li> <li><b>3.) Prediction to reach and/ or exceed 2.5-2.8m at Chinderah Gauge:</b> Flood water breaks out at Barneys Point floodway and crosses the Pacific Hwy closing it to light traffic; no access between Tweed Heads and Kingscliff. No alternative route available. At 2.73m many properties are inundated with up to 566 properties in Tweed Heads South flooded above floor. In Banora Point no over floor flooding of property is modelled until 3.5m, however 486 properties may have over ground flooding.</li> <li><b>4.) Prediction to reach and/or exceed 3.5m at the Chinderah gauge:</b> In this flood event, 598 properties in Tweed Heads South and 5 properties in Banora Point expected to have over floor inundation.</li> <li><b>5.) PMF event at the Chinderah gauge (7.12m):</b> In this flood event, subsectors that are modelled to remain flood free include Tweed Heads South West, and the southern portion of Banora Point H. (1395 properties in Tweed Heads South and 1534 properties in Banora Point are expected to have over floor inundation in the PMF event.</li> </ol>

<p><b>Sequencing of warnings and /or evacuation</b></p>	<ul style="list-style-type: none"> <li>• <b>Prediction to reach and/ or exceed 1.8-2.0m at Chinderah Gauge:</b> Watch and Act messaging should be considered for subsector Tweed Heads South A (GEMS ID 42400). Road closures along Dry Dock Rd may occur affecting evacuation towards Tweed Heads. There are a number of Caravan Parks in this subsector that may require earlier evacuation (Refer to Chapter 4). If heights are expected to exceed 2m, see prediction 2. Subsectors Banora Point West (GEMS ID 59770) and Banora Point A (GEMS ID 42794) may also require Watch and Act messaging due to inundation of low lying areas.</li> <li>• <b>Prediction to reach and/ or exceed 2.0-2.2m at Chinderah Gauge:</b> Emergency Warning Evacuation messaging may be required for subsector Tweed Heads South A (GEMS ID 42400) if heights of 2-2.2m are predicted. If heights are expected to reach and exceed this level, evacuations may be required in subsectors Tweed Heads South N (GEMS ID 42440) and low-lying properties in Banora Point West prior to expected road closures at this height. Targeted evacuations may be required in Banora Point East, however the majority of this subsector is flood free until the PMF event, with road closures along Leisure Drive to be monitored which may affect access out of the subsector.</li> <li>• <b>Prediction to reach and/or exceed 3.5m at the Chinderah gauge:</b> Some properties in Banora Point A (42794) and Banora Point B (GEMS ID 94515) may be in the flood extent, or may become isolated by road from this height up to the PMF. If flood levels are predicted to rise, targeted evacuations may be required in these subsectors.</li> <li>• <b>PMF event at the Chinderah gauge (7.12m):</b> Properties in the northern portion of Banora Point H (GEMS ID 44386) in the vicinity of Banora Point High School, and properties in subsector Banora Point West (GEMS ID 59770), Tweed Heads South West (GEMS ID 59771), Tweed Heads South O (GEMS ID 41713), Tweed Heads South B (GEMS ID 42439) and Banora Point A1 (GEMS ID 41686) may be in the flood extent for the PMF event and require Emergency Warning messaging prior to these heights being reached. Additional properties may require evacuation in Banora Point East (GEMS ID 59769).</li> </ul>
<p><b>Evacuation Routes</b></p>	<p>For subsectors <b>Tweed Heads South A and Tweed Heads South B:</b> Depending on local conditions, evacuation may take place towards Tweed Heads or towards Banora Point.</p> <p><b>To Tweed Heads-</b> Fraser Drive to Dry Dock Rd, then Minjungbal Dr over Boyds Bay Bridge towards Wharf St and to Tweed Heads evacuation centres</p> <p><b>To Banora Point-</b> Fraser Drive to either Leisure Drive or Terranora Rd to Banora Point evacuation centres.</p> <p><b>For subsector Tweed Heads South and Tweed Heads South N:</b> Local Roads to Greenway Drive, Machinery Drive, Minjungbal Dr, Sexton Hill Dr towards Banora Point Evacuation Centres.</p> <p><b>Alternate route to Terranora:</b> May be available via Fraser Drive towards Terranora Rd.</p>
<p><b>Evacuation Route Closure</b></p>	<ul style="list-style-type: none"> <li>• Boyds Bay Bridge approaches may close between 2.0m to 2.2m (Chinderah gauge)</li> <li>• Dry Dock Road may have localised closures from early in an event.</li> </ul>



	<ul style="list-style-type: none"> <li>Sections of Kennedy Drive and Ducat Street close from approximately a moderate flood level and should be monitored.</li> <li>Fraser Drive may be impacted near Pioneer Country</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>Primarily self-evacuation by private transport to higher ground</li> <li>Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>The only evacuation centre that is outside the PMF extent in this sector is <b>Banora Point Primary School, Pioneer Parade Banora Point</b>. Road access may also be possible via Terranora Rd to Lindisfarne Anglican School in Mathers Lane Terranora and Terranora Public School at 650 Terranora Road Terranora.</li> <li>Evacuation centres at Banora Point High School, Centaur Public School and the Salvation Army Tweed Centre are within the PMF extent, however, <i>may</i> be suitable for flood events up to and including the 0.2% AEP. Road access to these centres is likely to be impacted in events more frequent than the 0.2% AEP.</li> </ul>
<b>Large scale evacuations</b>	<p>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</p> <ul style="list-style-type: none"> <li>Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>Resupply is unlikely to be required in this sector until flood exceeding the major flood level, when parts of the sector may become isolated by road.</li> <li>If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated landing sites in this sector, sites may be identified and used as required during flood events.</p> <p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the Southeast Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> </ul>

	<ul style="list-style-type: none"> <li>• It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>• There are a large number of aged care facilities and a relatively high percentage of the population identifying as having a need for assistance.</li> </ul>

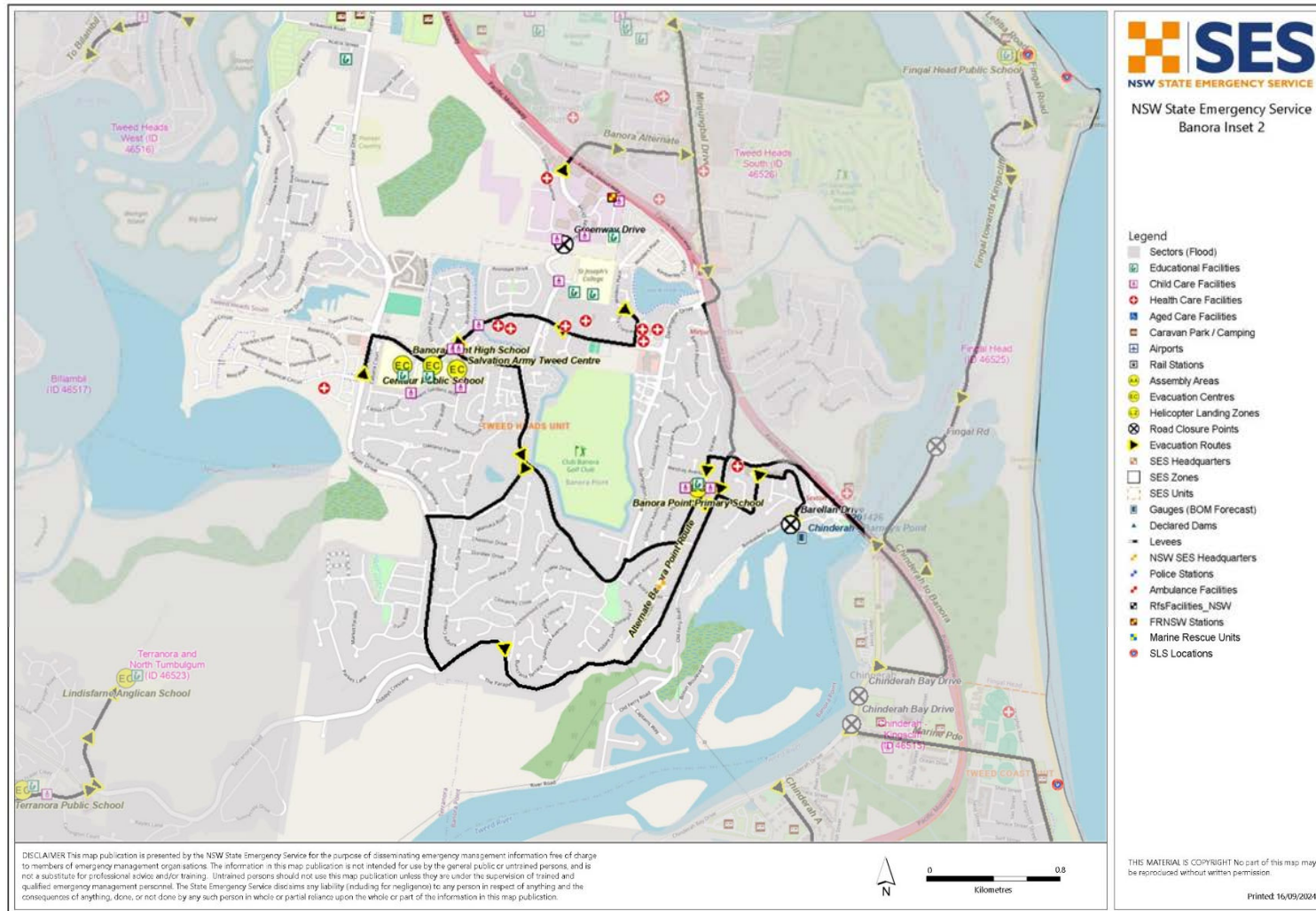
# BANORA POINT SECTOR MAP



Banora Point Sector Map Inset 1

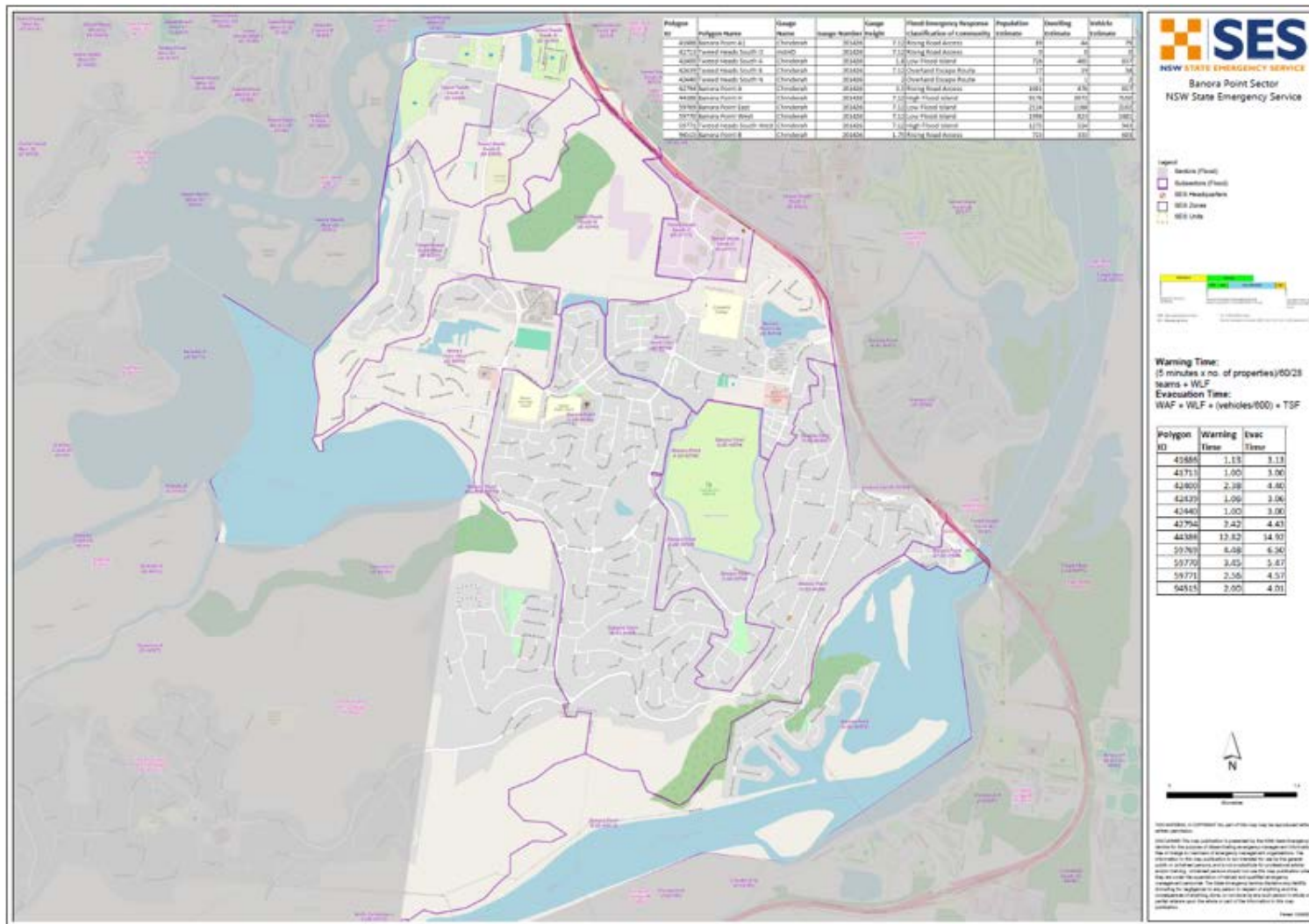


Banora Point Sector Map Inset 2





# EVACUATION PLANNING



## 8. TERRANORA SECTOR

<b>TERRANORA RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Terranora Sector includes the villages of Terranora and North Tumbulgum.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Terranora can be affected by riverine flooding from the Tweed River and Terranora Broadwater, with potential contributions from tidal influences and storm surge.</li> <li>North Tumbulgum can be affected by riverine flooding from the Rous and Tweed Rivers, which join at Tumbulgum.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Terranora and North Tumbulgum have Rising Road Access to Bilambil Heights.</li> </ul>				
<b>At risk properties</b>	20 properties in North Tumbulgum, 13 in Terranora inundated above floor level in a PMF. Isolation of North Tumbulgum	<b>Total number of properties within Sector/Community</b>	976		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Tumbulgum	201432/558014	1.4	1.8	2.5
	Chinderah	-/588010	1.3	1.7	2.0
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Lindisfarne Anglican School</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a small number of dwellings.</li> <li>Closure of evacuation routes</li> <li>Isolation of North Tumbulgum</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> </ul>				

	<ul style="list-style-type: none"> <li>• Standard Emergency Warning Signal</li> <li>• A telephone tree exists for North Tumbulgum, through the Community Resilience Team – North Tumbulgum.</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbagging stations may be set up at nominated locations.</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• Bungalora Substation on Terranora Road is on the edge of the modelled PMF extent.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Isolation</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>Evacuation and/or warning messaging will be considered in North Tumbulgum when:</p> <p><b>1.) Prediction to reach and/or exceed 1.4m-2.0m at the Tumbulgum Gauge:</b> From this height closure of low lying roads in North Tumbulgum may occur with road closures including Dulguigan Road. Dulguigan Road is cut opposite Tumbulgum village, isolating the Seventh Day Adventist Church car park, which is utilised by locals to park their vehicles above the modelled flood extent (Subsector Tumbulgum G1).</p> <ul style="list-style-type: none"> <li>• A number of properties south and west of the Seventh Day Adventist Church along Dulguigan Road may be flooded above floor level during a 1% AEP event at approximately 4.02m at the Tumbulgum gauge. Evacuation routes may be cut at 1.4m at the Tumbulgum gauge, requiring evacuation if road closures are anticipated for subsectors North Tumbulgum A and B). Low-lying areas of North Tumbulgum along the Tweed River may also be impacted at this height (Subsector North Tumbulgum C).</li> <li>• Low-lying areas in the proximity to the Rous River in the western part of North Tumbulgum are not modelled to be inundated until a PMF event at approximately 8.53m at the Tumbulgum gauge, but road closures along Dulguigan Road are expected to occur from 1.4m. There are however Overland Escape Routes out of the modelled flood extent (Subsector North Tumbulgum A).</li> </ul> <p>Evacuation and/or warning messaging for Terranora:</p> <ul style="list-style-type: none"> <li>• Flooding in Terranora may originate from the ungauged Duroby Creek.</li> <li>• Approximately 13 properties along Duroby Creek in Terranora are modelled to be impacted over floor in a PMF event, with some properties in the flood extent from a 1% event. These properties have overland escape or rising road access to flood free parts of Terranora.</li> </ul>

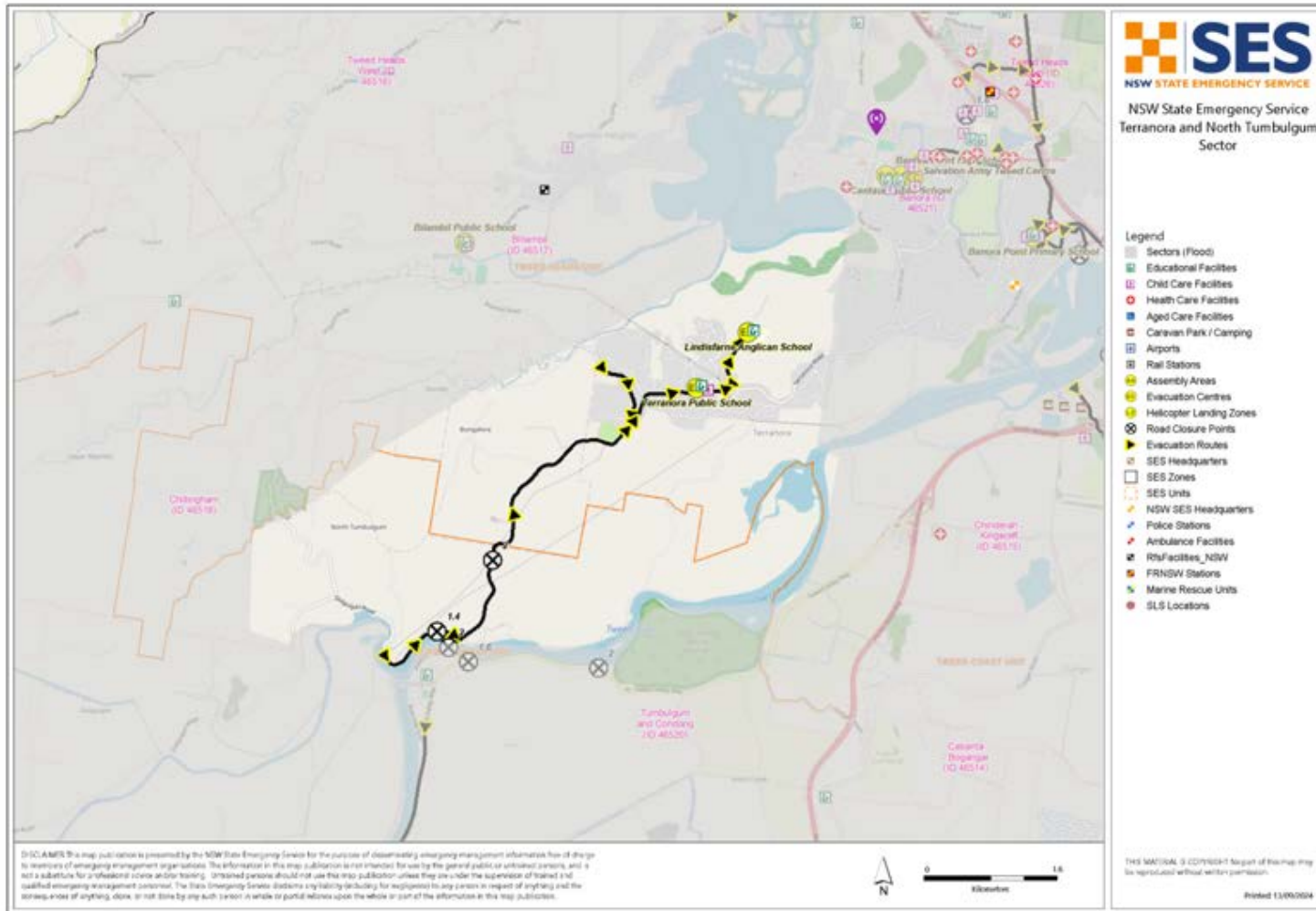


	Therefore, a <b>prediction for moderate to major flooding at the Chinderah gauge may trigger warnings for Terranora subsectors, but needs to be closely monitored, with Duroby and Terranora Creeks to be monitored.</b>
<b>Sequencing of warnings and /or evacuation</b>	<p>North Tumbulgum</p> <ul style="list-style-type: none"> <li>• <b>Prediction to reach and/or exceed 1.4m-2.0m at the Tumbulgum Gauge:</b> Liaise with Tumbulgum CAT regarding relocation of vehicles if heights are expected to reach but not exceed 1.4m at the Tumbulgum gauge (Subsector Tumbulgum G1 (GEMS ID 46439)).</li> <li>• Targeted evacuations may be required for properties in subsector North Tumbulgum C (GEMS ID 41174) if heights are expected to exceed 3.3m. These evacuations would need to be carried out prior to local road closures if further rises were anticipated.</li> <li>• Watch and Act messaging for North Tumbulgum A (GEMS ID 41177) and North Tumbulgum B (GEMS ID 41176) if heights are expected to reach and exceed 1.4m-2m at the Tumbulgum gauge. Properties in these subsectors are largely outside the modelled flood extent until a PMF event, with high ground available. However if targeted evacuations are required towards Terranora evacuation centres, these would need to be carried out prior to closures along Terranora Rd.</li> </ul> <p>Terranora</p> <ul style="list-style-type: none"> <li>• <b>Moderate to major flood warning for Chinderah:</b> Watch and Act messaging for low lying areas of Terranora including Naponyah Road and Ribbonwood place (Subsector Terranora A GEMS ID 44387).</li> <li>• <b>If a flood event with peak heights exceeding a 1%AEP is predicted:</b> Targeted evacuations in low lying areas of Terranora including Namonyah Road and Ribbonwood place.</li> </ul>
<b>Evacuation Routes</b>	<ul style="list-style-type: none"> <li>• <b>Tumbulgum North Main Evacuation Route:</b> Dulguigan Road – Terranora Road – to Terranora evacuation centres.</li> <li>• <b>Terranora Main Evacuation Route:</b> To Bilambil Road then left on Terranora Road to Terranora evacuation centres.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• <b>Dulguigan Rd</b> may be cut from approximately 1.4m at the Tumbulgum gauge near the confluence of Tweed and Rous rivers. May be cut at 1.7m-2.0m at Dulguigan Road before Terranora Road entrance.</li> <li>• <b>Terranora Rd</b> may be susceptible to landslips during periods of heavy rainfall, and may also close at approximately 2m at the Tumbulgum gauge.</li> <li>• There may be potential for <b>Bilambil Road</b> to close at the intersection of Naponyah Road which could impact road evacuations in this area.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground.</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas.</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<p>Evacuation centres in this sector include:</p> <ul style="list-style-type: none"> <li>• Lindisfarne Anglican School</li> <li>• Terranora Public School</li> </ul>

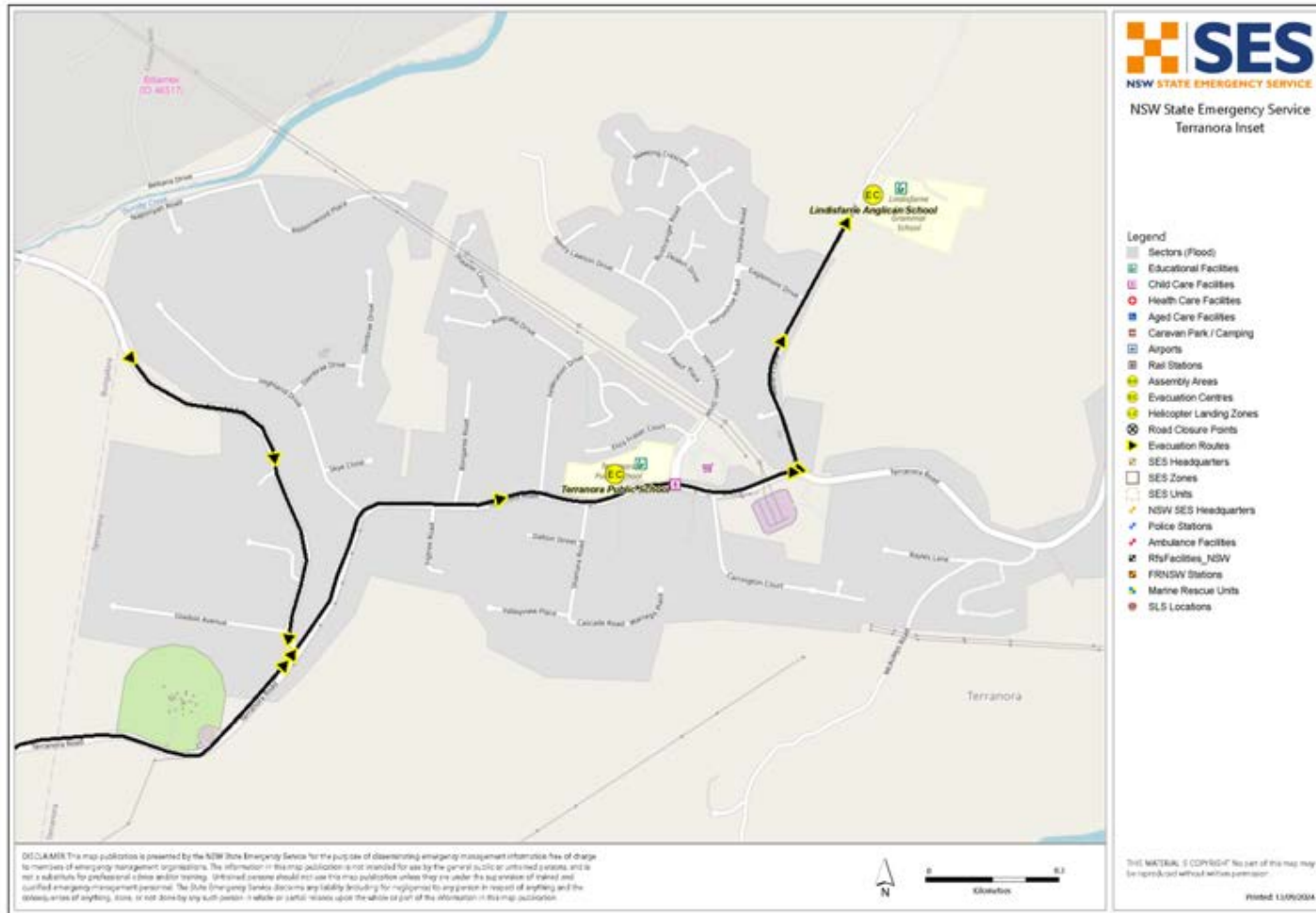
<p><b>Large scale evacuations</b></p>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>• Parts of North Tumbulgum, including the vicinity of the Seventh Day Adventist Church and along Dulguigan Road between Hogans Road and Palm Road, may require resupply if flood waters persist for more than 2-3 days cutting access routes.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Lindisfarne Anglican Grammar S 28° 14' 09" E 153° 30' 24"</li> </ul> <p>Firm all weather surfaces. No known hazards. Inside Gold Coast CTA LZ is Bearing 005 grid / 4.0nm from Gold Coast airfield Goal posts on field Limited vehicle access to of load an aircraft Last checked 08.12.2014</p>
	<p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• The nearest airports are the Gold Coast Airport and Murwillumbah Airfield, with similar transit distance. However, access to both airfields is likely to be cut during flooding.</li> <li>• Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the Southeast Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> </ul>

	<ul style="list-style-type: none"> <li>• It can handle aircraft up to the size of a Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• Murwillumbah Airfield, has an 800m king grass strip able to accommodate to twin propeller aircraft, limited to general aviation use during daylight hours only. This facility is predicted to become inundated once the Quarry Road Levee begins to overtop at approximately 4.7m AHD, approximately a few hours after the North Murwillumbah Gauge (201420-58186) exceeds 5.0m</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>• Terranora Road is susceptible to land slips during heavy rain.</li> </ul>

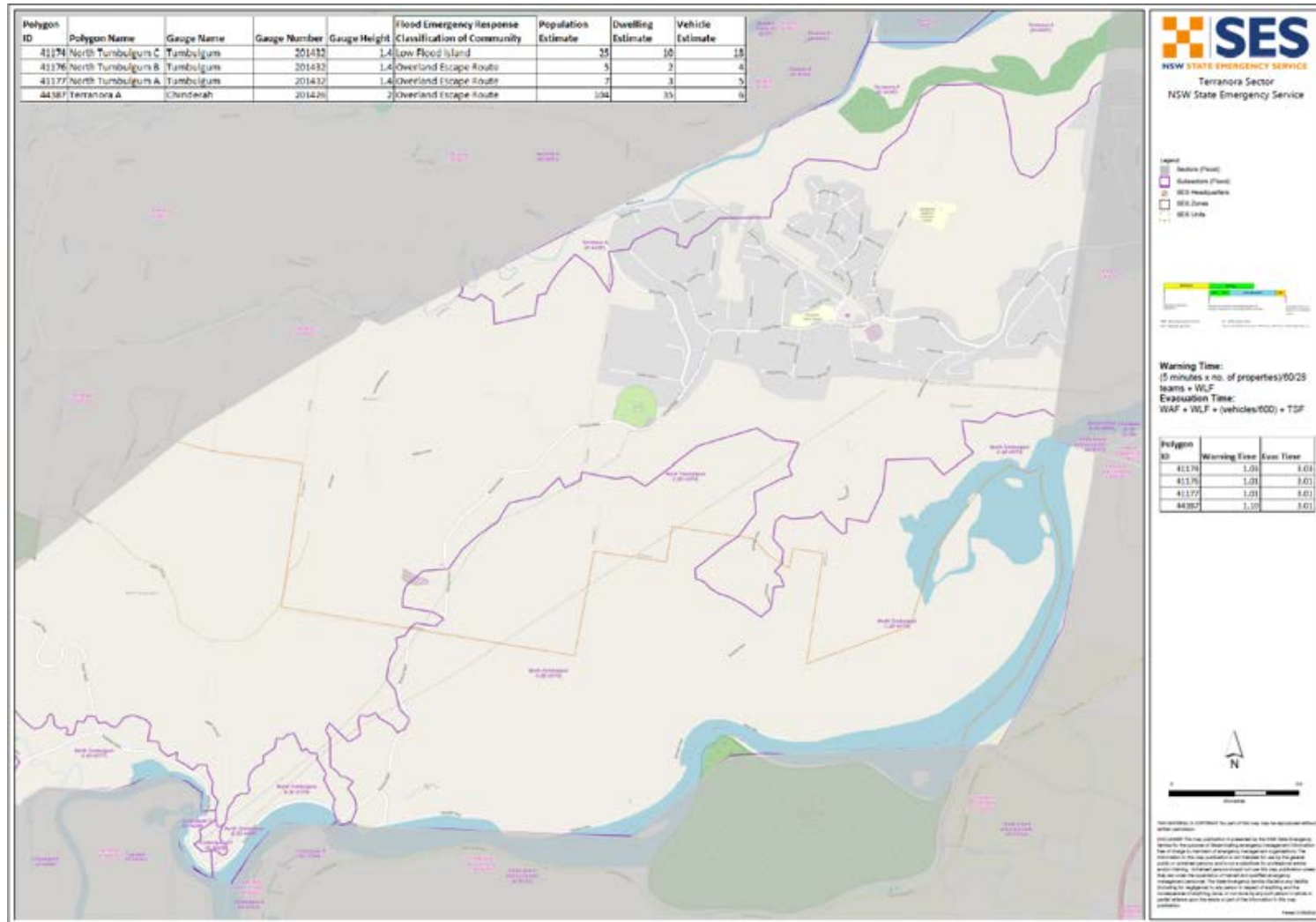
# TERRANORA SECTOR MAP



Terranora Sector Map Inset 1



# EVACUATION PLANNING



## 9. BILAMBIL SECTOR

<b>BILAMBIL RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Bilambil Sector includes the suburbs of Bilambil and Bilambil Heights, and the area of Duroby to the north of Duroby Creek.</li> <li>Bilambil and Duroby are small rural areas situated predominantly to the west of the Terranora Broadwater.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Bilambil is subject to flash flooding from the Bilambil Creek catchment. Duroby is subject to flash flooding from the Duroby Creek catchment.</li> <li>Both areas are also affected by storm surge and tidal influences in the Terranora Broadwater.</li> <li>If major rain falls within Tomewin Catchment area warning time could be less than 3 hours. If rain falls within Duroby Creek catchment area warning time could be less than 3 hours.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Bilambil has Rising Road Access.</li> </ul>				
<b>At risk properties</b>	10 properties in Bilambil and 4 in Bilambil Heights at risk of over floor flooding in a PMF. Isolation of Bilambil, Bilambil Heights and parts of Duroby.	<b>Total number of properties within Sector/Community</b>	1366		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	There are limited upstream gauges available for flood warning or intelligence purposes in this Sector. Bilambil Creek and Duroby Creek are ungauged streams and may have significant impacts on flooding within these areas.	-	-	-	-
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area at Bilambil Public School where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a small number of dwellings.</li> <li>Closure of evacuation routes.</li> <li>Expected isolation of communities</li> </ul>				

<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• Flood Watch (BoM)</li> <li>• Flood Warnings (BoM)</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sectors</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Monitoring rising flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods</li> <li>• Control of surface water through sandbagging measures.</li> <li>• Assist in the lifting of furniture to residents in need.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <hr/> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbagging stations may be set up at nominated locations.</li> </ul> <hr/> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• There is no identified essential infrastructure at risk in this sector.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Landslip potential</li> <li>• Flash flooding of smaller tributaries in the Bilambil area.</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>This area is subject to flash flooding from the ungauged upper catchments of Bilambil and Duroby creeks. Active monitoring of rainfall and associated creek rises should be undertaken at event onset.</p> <p>There is a flood camera at Bilambil Sports Club on the corner of Hogans and Bilambil Roads which can be utilised to assist monitoring in the area.</p> <p>Warning or evacuation messaging may be considered when:</p> <ul style="list-style-type: none"> <li>▪ There is a prediction to reach and/or exceed a 20% AEP event (1.36mAHD on the Chinderah gauge) in the Bilambil Sector. From this height active monitoring to determine the influence of upper catchment flows will determine messaging and sequencing of evacuation. Note over 55’s Residential Village (382 Bilambil Rd Bilambil) on the western bank of Bilambil Creek.</li> <li>▪ A 20% AEP equates to 1.36m on the Chinderah gauge, however due to the absence of gauges in the upper catchment and associated intelligence this area this needs to be monitored and heights verified and cannot be taken as absolute.</li> <li>▪ There is a prediction to reach and/or exceed a 1% AEP event in the Bilambil</li> </ul>

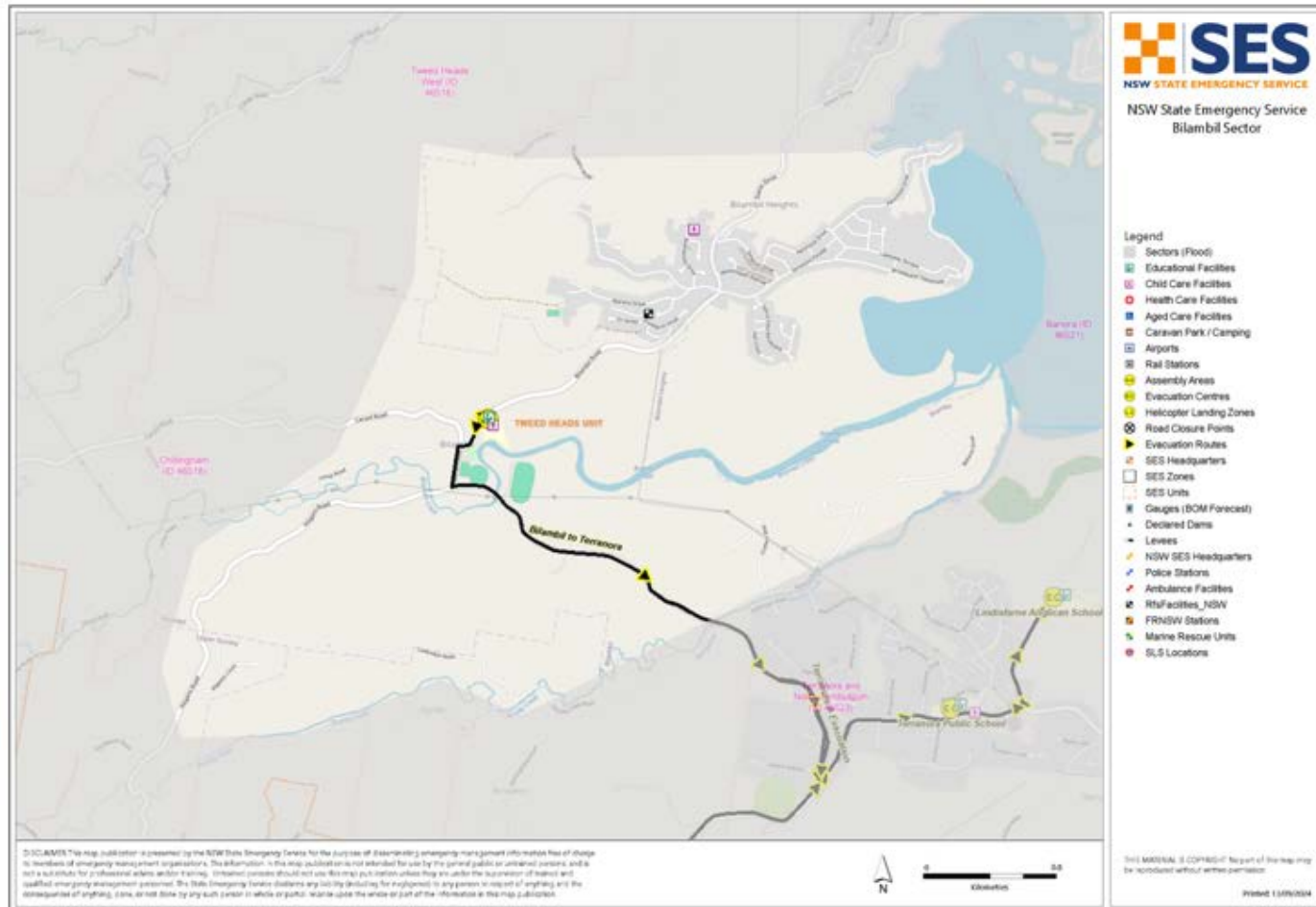


	<p>Sector. This may cause inundation of low-lying parts of Bilambil Village and the Broadwater Esplanade.</p> <ul style="list-style-type: none"> <li>▪ A 1% AEP event is equivalent to 2.73m Chinderah gauge, however due to the absence of gauges in the upper catchment and associated intelligence this area this needs to be monitored and heights verified and cannot be taken as absolute.</li> <li>▪ Additional properties (up to 10) maybe affected in events equal to a PMF.</li> </ul>
<b>Sequencing of warnings and /or evacuation</b>	<ul style="list-style-type: none"> <li>• <b>20% AEP</b> event: Watch and Act Messaging for Low-lying areas adjoining Bilambil Creek and the Terranora Broadwater. Consider evacuation of the Bilambil Creek over 55's Residential Village and low-lying properties along Bilambil and Duroby Creeks (GEMS ID 59157) from this height if heights are predicted to rise. Based on monitoring of road closures along Bilambil Road between Bilambil Creek and Duroby Creek, Watch and Act Isolation messaging may be required for subsector Bilambil A (GEMS ID 44391).</li> <li>• <b>1% AEP:</b> Some evacuations may be required in Bilambil and Broadwater Esplanade (GEMS ID 59774). No other evacuations are likely to be required unless heights approach modelled PMF.</li> <li>• <b>PMF:</b> Further properties in Bilambil subsectors may be within the flood extent, including the nominated Assembly Area (Bilambil Public School). Bilambil Heights is outside of the modelled PMF extent.</li> </ul>
<b>Evacuation Routes</b>	<ul style="list-style-type: none"> <li>• If there is sufficient warning time, evacuation may proceed along Bilambil Rd towards Terranora Rd and Terranora evacuation centres.</li> <li>• Local roads to nominated assembly areas, either at Bilambil Public School at 418 Bilambil Rd, Bilambil or towards flood free land in Bilambil Heights.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• Bilambil and Bilambil Heights may be isolated from the south when the intersection of Duroby Creek Rd and Bilambil Road is cut.</li> <li>• Kennedy Drive to the north-east of Bilambil is cut at when local heights exceed 2.5mAHD</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>• There are no listed evacuation centres in this sector, the closest evacuation centres are in the neighbouring Terranora sector, at Terranora Public School, and Lindisfarne Anglican School.</li> <li>• Bilambil Public School may be utilised as an Assembly Area however it may be impacted during a PMF event.</li> <li>• There is flood free land outside the PMF extent in Bilambil Heights.</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> </ul>

	<ul style="list-style-type: none"> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>• Resupply is likely into the town of Bilambil. Rural properties may be isolated for up to 5 days and will require resupply. After roads are closed if a High Clearance Vehicle can not be used then primary means of resupply will be by helicopter to the Rugby League Oval or Bilambil RFS Headquarters.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><i>Helicopter Landing Points:</i></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Bilambil Sports Field - S 28° 13' 19.2" E 153° 28' 07.7".</li> </ul> <p>Goal posts at East &amp; West end, powerlines parallel to road &amp; light towers on boundary of LZ</p>
	<p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>• Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• Road access to the airport from this sector is likely to be cu during periods of major flooding.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> </ul>

	<ul style="list-style-type: none"><li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li><li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li></ul>
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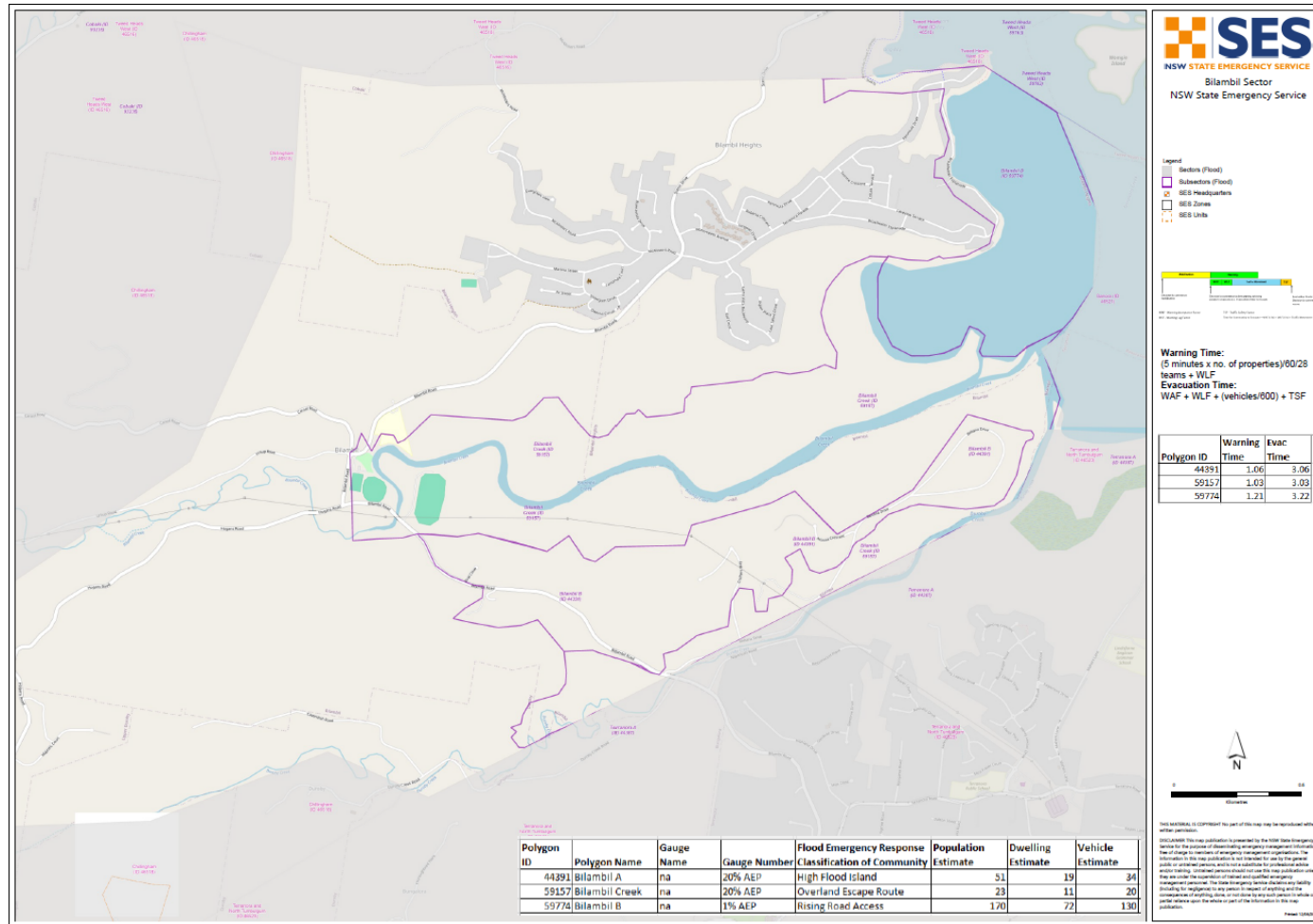
# BILAMBIL SECTOR MAP



Bilambil sector Map Inset 1



# EVACUATION PLANNING



## 10. TWEED HEADS SOUTH SECTOR

TWEED HEADS SOUTH RESPONSE ARRANGEMENTS					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Tweed Heads South Sector includes the parts of Tweed Heads South and Banora Point to the east of the Pacific Motorway.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Tweed Heads South is affected by backwater flooding from the Terranora Broadwater and Tweed River.</li> <li>Tweed Heads South can also be affected by flash flooding and oceanic storm surge.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>This Sector is largely a Low Flood Island with Rising Road Access in Banora Point</li> </ul>				
<b>At risk properties</b>	1394 properties in Tweed Heads South (some within Banora Sector), 1545 in Banora Point (some within Tweed Heads South Sector) at risk of over floor flooding in a PMF.	<b>Total number of properties within Sector/Community</b>	3067		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Chinderah (BoM 558010) Dry Dock	-/558010 201428/558029	1.3 1.4	1.7 1.7	2 2
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Police &amp; Citizens Youth Clubs Tweed Heads</b> or Banora Point evacuation centres where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Tweed Heads South Levee overtopping from 2m on the Chinderah gauge with monitoring to begin from 1.8m.</li> <li>Inundation of a large number of dwellings.</li> <li>Closure of evacuation routes</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> </ul>				

	<ul style="list-style-type: none"> <li>Standard Emergency Warning Signal</li> <li>There are a number of Caravan Parks in this sector which may require earlier warning.</li> </ul>
Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>Control of surface water through sandbagging measures.</li> <li>Monitoring integrity of dwellings surrounded by flood waters.</li> <li>Assist Council engineers to monitor integrity of existing levee system.</li> <li>Control of surface water inside levee.</li> </ul>
	<p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>Refer to Chapter 4: Caravan Park Arrangements</li> </ul>
	<p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>Essential energy depot at 39 Sunshine Avenue Tweed Heads South. This is a 66/11 kV substation which becomes inundated in a 1% AEP event.</li> </ul>
	<p><i>Specific resource requirements:</i></p> <ul style="list-style-type: none"> <li>Downstream ends of each pipe/culvert beneath the levee system has a flood gate which will initially assist in preventing inundation behind the levee. They will remain closed when river/creek levels are inundated. These are operated by Tweed Shire Council.</li> </ul>
Evacuation and/or Isolation Triggers	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>Predicted levee overtopping</li> <li>Closure of main evacuation routes prior to inundation</li> <li>Property inundation</li> </ul>
Evacuation Triggers	<p>The effects on the towns and outlying areas in this sector are very much dependent on <b>tidal influences</b>. Tidal times and levels will need to be identified at the onset of main riverine flooding.</p> <p>Evacuation and/or warning messaging will be considered when:</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/or exceed 1.8-2.0m at the Chinderah Gauge:</b> Some areas of Tweed Heads South are vulnerable to inundation along Dry Dock Rd and Minjungbal Drive. No properties are expected to have significant over floor flooding at this height, however up to 95 properties may be experiencing water at ground level. Isolated overtopping may occur along the Tweed Heads South levee along Dry Dock Rd, Minjungbal Dr, and by up to 0.3m near the South Tweed Bowls/Sports Club.</li> <li><b>2.) Prediction to reach and/or exceed 2.0m at the Chinderah Gauge:</b> This is the expected overtopping height of the Tweed Heads South Levee. This can also be monitored at the Dry Dock gauge (201428), with an expected overtopping height of 1.8m.</li> <li><b>3.) Prediction to reach and/or exceed 2.7m 1% AEP, at the Chinderah Gauge:</b> Approx 566 properties in the suburb of Tweed Heads South may experience over floor flooding by this height.</li> <li><b>4.) Prediction to reach 3.5m 0.02% at the Chinderah Gauge:</b> Subsector Tweeds Heads South C may experience inundation by this height affecting approximately 598 properties in Tweed Heads South.</li> </ol>

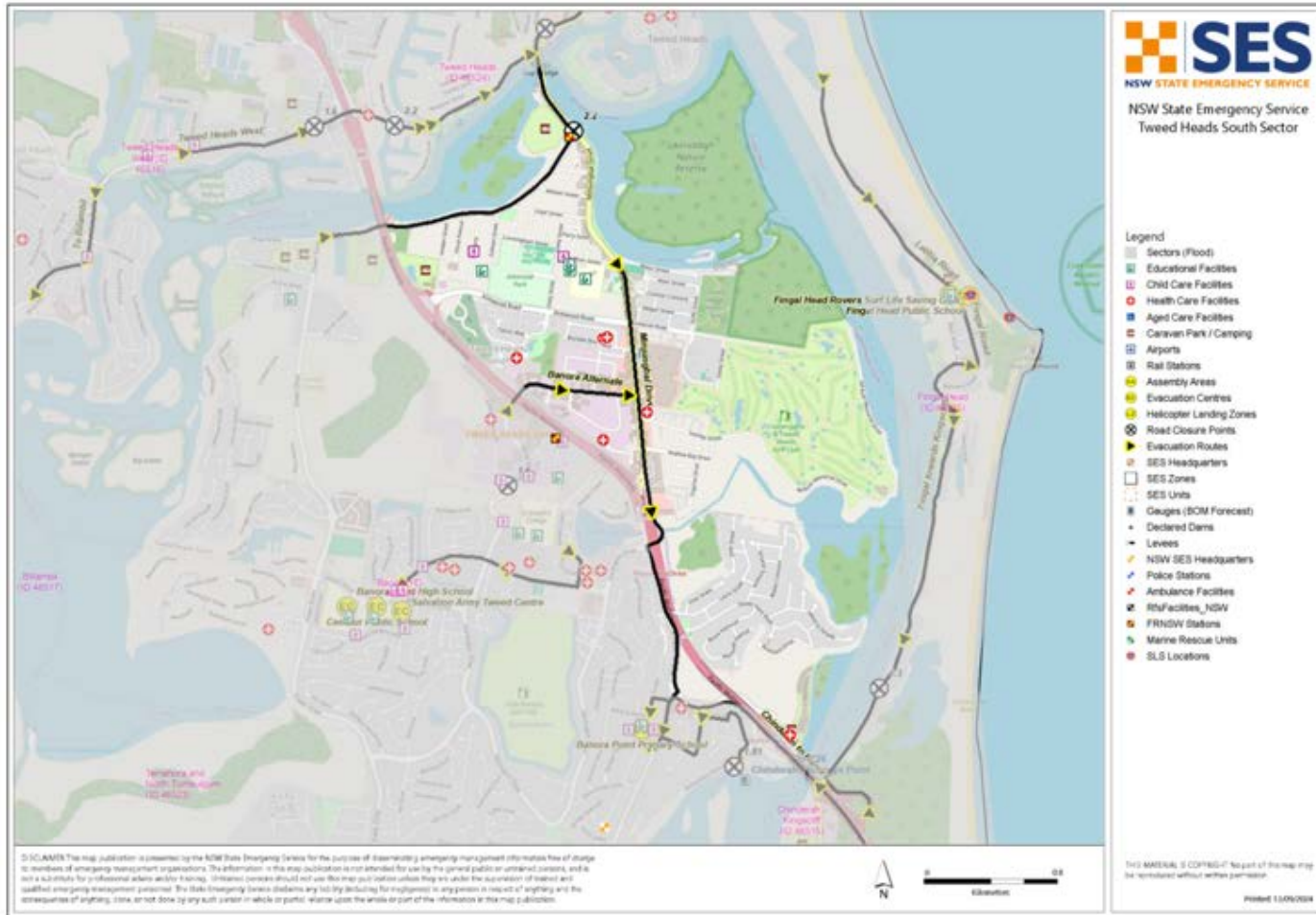


<b>Sequencing of warnings and /or evacuation</b>	<ul style="list-style-type: none"> <li>• <b>Prediction to reach and/or exceed 1.8-2.0m at the Chinderah Gauge:</b> Watch and Act Prepare to evacuate for subsector Tweed Heads South. Careful monitoring and assessment of levee integrity of known low points around the levee along Dry Dock Rd and Minjungbal Drive and near the Tweed South Bowls Club should occur prior to these heights being reached. If heights are expected to exceed this level, Emergency Warning messaging should be considered for subsector Tweed Heads South (GEMS ID 59767) prior to this height being reached.</li> <li>• <b>Prediction to reach and/or exceed 2.0m at the Chinderah Gauge:</b> Emergency Warning for evacuation of subsector Tweed Heads South if not already issued under prediction 1. Subsector Tweed Heads South C (GEMS ID 42436) is a High Flood Island up to a PMF, at which point it becomes inundated, but may become isolated in smaller floods. Consideration should be given to isolation or evacuation messaging for floods expected to exceed the levee and cut access roads.</li> <li>• <b>Prediction to reach and/or exceed 2.7m at the Chinderah Gauge:</b> Subsector Banora Point B in areas around Lilly Pilly Drive and Blueberry Court (GEMS ID 42433) may become affected, however there is rising road access available to flood free parts of Banora Point H. Targeted evacuations may be required in this subsector.</li> <li>• <b>Prediction to reach 3.5m 0.02% at the Chinderah Gauge:</b> Subsector Sextons Hill (GEMS ID 59768) remains flood free from riverine flooding up to the PMF, however main access roads are likely to be closed.</li> </ul>
<b>Evacuation Routes</b>	<p><b>Upper Tweed South:</b> Dry Dock Rd to Minjungbal Dr to Wharf St, to Florence St to Tweed PCYC</p> <p><b>Lower Tweed South:</b> Minjungbal Dr to Sexton Hill Dr towards Banora Pt Evacuation centres</p>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• Parts of Dry Dock Rd may close early in a flood event, at approx. 1.7m at the Dry Dock gauge</li> <li>• Minjungbal Dr south of Boyds Bay Bridge (various locations) from approx. 2m at the Chinderah Gauge.</li> <li>• Wharf St near Recreation St at approx. 2m at the Chinderah gauge</li> <li>• Recreation St near the Tweed head Police Station has a road height of 1.75mAHD and may close when spot heights reach approx. 2mAHD.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<p>There are no evacuation centres within this sector that are above the PMF, however neighbouring sectors have evacuation centres and are listed below:</p> <ul style="list-style-type: none"> <li>• Police &amp; Citizens Youth Club (PCYC) Tweed Heads, Florence Street Tweed Heads</li> <li>• Banora Point Primary School, Pioneer Parade Banora Point.</li> </ul>
<b>Large scale evacuations</b>	<p>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</p> <ul style="list-style-type: none"> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> </ul>

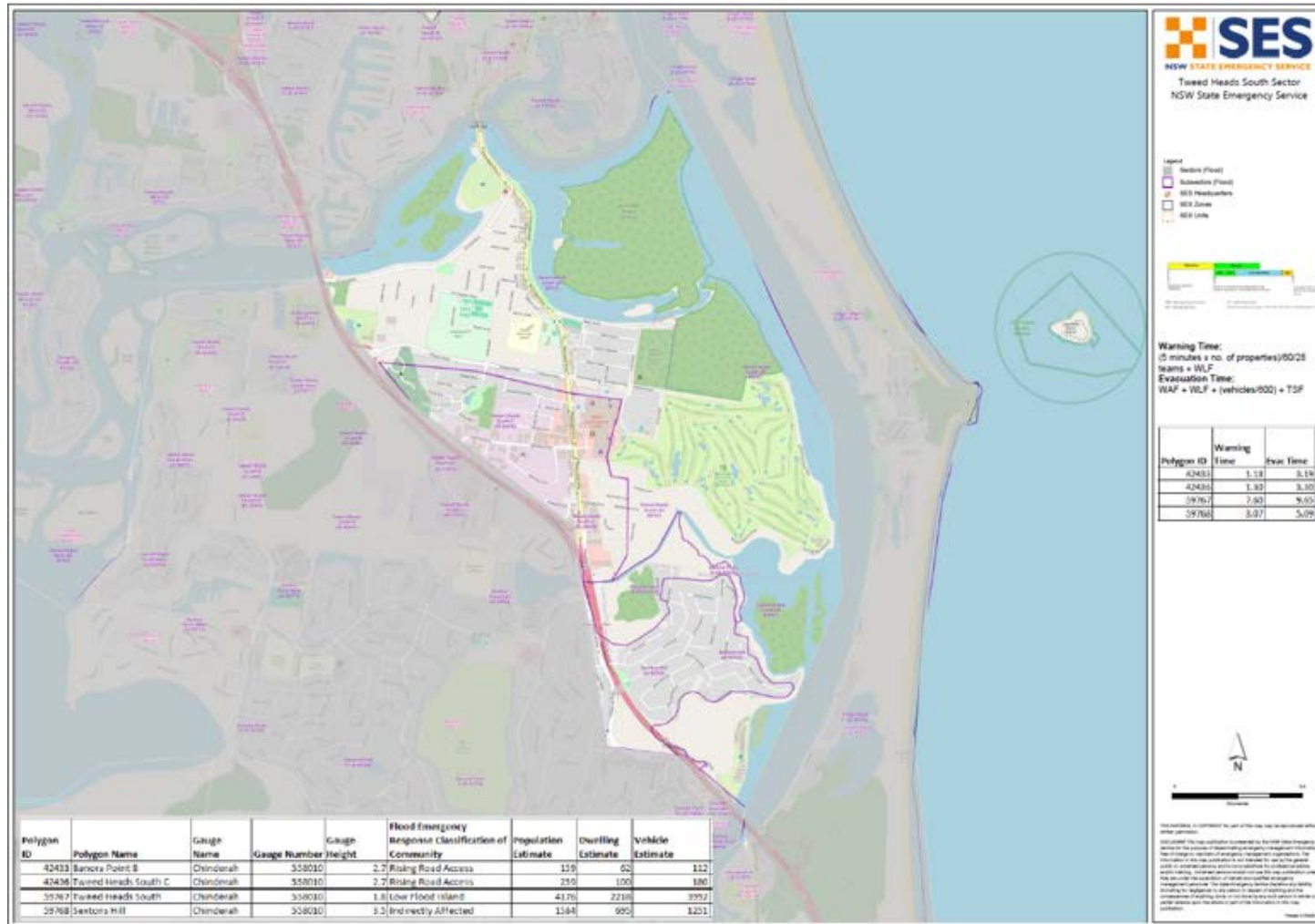
	<ul style="list-style-type: none"> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>• Resupply is unlikely to be required in this sector until floods which overtop the levee system.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points in the adjoining Banora Point sector. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Banora Point High School S 28° 13' 20" E 153° 32' 36"</li> </ul> <p>Firm all weather surface no slope Tennis courts in nth east corner caution high fence Notes: Inside Gold Coast CTA LZ Bearing 150 / 3.6nm from Gold Coast airfield Golf course due west of LZ</p>
	<p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• The near airport is Gold Coast Airport, located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of a Boeing 787 and Airbus A340 commercial aircraft.</li> </ul>
<b>Other</b>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> </ul>

	<ul style="list-style-type: none"><li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li><li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li></ul>
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## TWEED HEADS SOUTH SECTOR MAP



# EVACUATION PLANNING



## 11. TWEED HEADS WEST SECTOR

<b>TWEED HEADS WEST RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>Tweed Heads West Sector includes the suburbs of Tweed Heads West, Cobaki Lakes, Piggabeen and the northern parts of Cobaki and Bilambil Heights.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Tweed Heads West sector is affected by flooding from the Cobaki and Terranora Broadwater.</li> <li>Flooding from the Terranora Broadwater is likely to be influenced by; localised flash and catchment flooding from Cobaki, Piggabeen and Bilambil Creeks, and storm surge and tidal anomalies.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Seagulls Estate, the Piggabeen Sport Complex, and northwest Tweeds Heads West are Low Flood Islands</li> <li>There are High Flood Islands to the east and west of Piggabeen Sport Complex and Rising Road Access to the south.</li> </ul>				
<b>At risk properties</b>	992 properties in Tweed Heads West, 2 in Cobaki, 1 in Cobaki lakes at risk of over floor flooding in a PMF. A further 70 properties in the flood extent at Piggabeen (over floor data not available).	<b>Total number of properties within Sector/Community</b>	3695		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Dry Dock Chinderah (558010)	201428/558029 -/558010	1.4 1.3	1.7 1.7	2 2
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area at <b>Bilambil Public School</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a large number of dwellings.</li> <li>Isolation and inundation of commercial property and caravan parks.</li> <li>Closure of evacuation routes, which can be influenced by storm surge and tides.</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> </ul>				

	<ul style="list-style-type: none"> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Monitoring rising flood waters.</li> <li>• Relocation of livestock.</li> <li>• Relocation of farm machinery and valuable goods</li> <li>• Control of surface water through sandbagging measures.</li> <li>• Assist in the lifting of furniture to residents in need.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul>
	<p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbagging stations may be set up at nominated locations.</li> </ul>
	<p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• Tweed Heads telephone exchange at 55 Inlet Drive Tweed Heads may be inundated in a PMF event.</li> <li>• Part of the Gold Coast Airport is in the Tweed Shire, this is an Australian domestic and International Airport. The entrance to the airport is situated in Bilinga and the runway spans the Queensland-NSW border. The airport maybe affected during a PMF event (4.94mAHD on the Dry Dock gauge).</li> <li>• Tweed Heads West Water Treatment Plant is in Grey Street Tweed Heads West. It starts to become inundated from a 1% AEP event.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation may be considered due to flood conditions that are expected to cause;</p> <ul style="list-style-type: none"> <li>▪ Inundation of property.</li> <li>▪ Closure of primary evacuation routes.</li> <li>▪ Failure of essential services</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>Storm surge and tidal anomalies are expected to have a significant impact on flooding within this area as well as intensive localised flash flooding and stormwater flooding.</p> <p>Evacuation and/or warnings may be considered when:</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/or exceed 1.6mAHD at the Chinderah Gauge:</b> Closure of the Piggabeen/Cobaki Road may occur at 1.6m. This will potentially isolate dwellings in Piggabeen and Cobaki suburbs. This closure will depend on levels in Cobaki Creek and Piggabeen which should be monitored.</li> <li><b>2.) Prediction to reach and/or exceed 1.8mAHD - 2.0mAHD at the Chinderah Gauge:</b> From this height Seagulls Estate may become isolated when the only evacuation route is closed at Lakes Drive and is progressively inundated from this height. Suggest reconnaissance of the Banksia Waters Over 50’s Living Village on Piggabeen Road.  Low lying areas of Tweed Heads West are expected to be inundated in this event. No flooding above floor level at this height.</li> <li><b>3.) Prediction to reach and/or exceed 2.2m at the Chinderah Gauge:</b> Inundation of large areas around Cobaki Creek and Kennedy Drive. It is highly likely that</li> </ol>

	<p>properties may start to become isolated due to localised road closures and the main evacuation route Kennedy Drive may start to be impacted. Approx 522 properties in the suburb of Tweed Heads West may experience over floor flooding at 2.73m.</p> <p><b>4.) Prediction to reach and/or exceed 3.5m at the Chinderah Gauge:</b> There may be some inundation at the Southern end of the Gold Coast Airport. This is modelled to be inundated in a PMF event.</p> <p><b>5.) Prediction to reach and/or exceed 7.12m at the Chinderah Gauge:</b> Approx 992 properties in the suburb of Tweed Heads West may experience over floor flooding by this height.</p>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<ul style="list-style-type: none"> <li> <p>• <b>Prediction to reach and/or exceed 1.5m at the Chinderah Gauge:</b> Watch and Act Messaging should be considered for Seagulls Estate and Banksia Waters Over 50’s Living Village – Prepare to Evacuate. (GEMS ID 46426) &amp; Tweed Heads West B2 (GEMS ID 46429). Watch &amp; Act Messaging for low lying areas if reach or exceed 1.8m for low lying areas of subsector Tweed Heads West C (GEMS ID 42396) and Tweed Heads West (GEMS ID 59763).</p> </li> <li> <p>• <b>Prediction to reach and/or exceed 1.6m at the Chinderah Gauge:</b> Consideration of Watch and Act (Prepare to Isolate) or Emergency Warning evacuation messaging for subsector Cobaki (GEMS ID 93235) depending on predicted heights, due to the expected isolation of Piggabeen and Cobaki from this height.</p> </li> <li> <p>• <b>Prediction to reach and/or exceed approx 1.8m-2.0m at the Chinderah Gauge:</b> Consideration of Emergency Warning messaging for Seagulls Estate and Banksia Waters Over 50’s Living Village – Evacuate Now/Before. (GEMS ID 46426) &amp; Tweed Heads West B2 (GEMS ID 46429). Emergency Warning may be required for low lying areas of Tweed Heads West – Evacuate Now/Before. (Subsectors Tweed Heads West and Tweed Heads West C GEMS ID 42396 &amp; 59763). Watch &amp; Act Don’t drive into floodwater messaging for remaining areas in Tweed Heads West if expected to reach or exceed 2.2m. (GEMS ID 42397, 46448 &amp; 46425).</p> </li> <li> <p>• <b>Prediction to reach and/or exceed 2.2m at the Chinderah Gauge:</b> Watch &amp; Act Messaging for Cobaki and Cobaki Lakes area if expected to reach 2.73m. (GEMS ID 93234 &amp; 93235)</p> </li> <li> <p>• <b>Prediction to reach and/or exceed 2.73m at the Chinderah Gauge:</b> Emergency Warning messaging may be required for Cobaki and Cobaki Lakes areas– Evacuate Now/Before. (GEMS ID 93234 &amp; 93235).</p> </li> </ul> <p>Emergency Warning – prepare to isolate for subsectors GEMS ID 42397, 46448 &amp; 46425.</p>

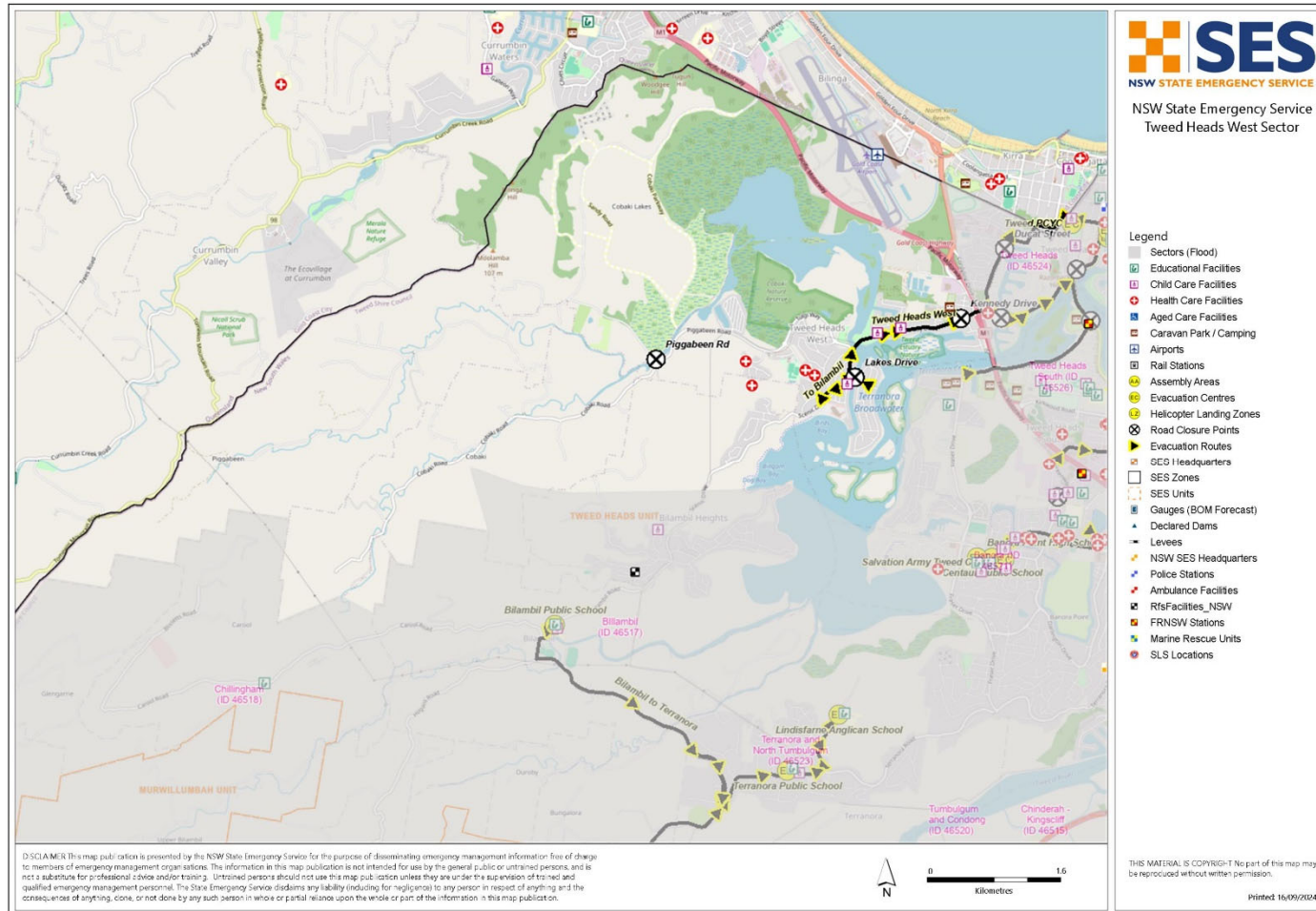


	<ul style="list-style-type: none"> <li>• <b>Prediction to reach and/or exceed 3.5m at the Chinderah Gauge:</b> Watch and Act may be considered for Gold Coast Airport and surrounds in consultation with cross-border arrangements. Inundation commences at the airport at PMF 7.12m at the Chinderah gauge.</li> <li>• <b>Prediction to reach and/or exceed 7.12m at the Chinderah Gauge:</b> Approx 992 properties in the suburb of Tweed Heads West may experience over floor flooding by this height. All areas move to higher ground messaging.  Emergency Warning for GEMS ID 42397 – move to higher ground.  In a PMF, Emergency Warning may be necessary for the Gold Coast Airport. GEMS ID 93236, however cross-border arrangements need to be considered, as only the southern portion lies within NSW.</li> </ul>
<p><b>Evacuation Routes</b></p>	<ul style="list-style-type: none"> <li>• <b>Seagulls Estate</b> evacuation is via Lakes Drive, then Gollan Drive, joining with Tweed Heads West evacuation routes listed below.</li> <li>• <b>Tweed Heads West Route 1:</b> Evacuation is to the east along Kennedy Drive, Wharf St, Florence St to the Police &amp; Citizens Youth Club (PCYC) Cnr Florence &amp; Adelaide Street, Tweed Heads.</li> <li>• <b>Tweed Heads West Route 2:</b> From Kennedy Drive, evacuation may proceed north along Ducat St, Mugga Way, Kent St, Dutton St and onto Florence St to the Police &amp; Citizens Youth Club (PCYC) Cnr Florence &amp; Adelaide Street, Tweed Heads.</li> <li>• Evacuation route choice will depend on local road conditions.</li> <li>• Alternate route may be available west on Scenic Drive to flood free parts of Bilambil Heights.</li> <li>• Piggabeen Rd may close in multiple locations, along all creek crossings.</li> </ul>
<p><b>Evacuation Route Closure</b></p>	<ul style="list-style-type: none"> <li>• Kennedy Drive near intersection of Rose Street will be cut at a height of 1.6m (Chinderah gauge), which will prevent access to Kennedy Drive in the east and possible evacuation to Police &amp; Citizens Youth Club (PCYC) Cnr Florence &amp; Adelaide Street, Tweed Heads.</li> <li>• Sections of Kennedy Drive and Ducat Street close from approximately a moderate flood level and should be monitored, as this will affect listed evacuation routes.</li> <li>• Scenic Drive towards Bilambil Heights may be cut, however gauge height to closure is not known.</li> </ul>
<p><b>Method of Evacuation</b></p>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<p><b>Evacuation Centre/Assembly Point</b></p>	<ul style="list-style-type: none"> <li>• Up to approximately 1.6m on the Chinderah gauge evacuations can move east to the Evacuation Centre at the Police &amp; Citizens Youth Club (PCYC) Cnr Florence &amp; Adelaide Street, Tweed Heads.</li> <li>• If evacuation is possible towards the Bilambil Sector, Assembly Areas may be nominated in flood free parts of Bilambil Heights or Bilambil.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> </ul>

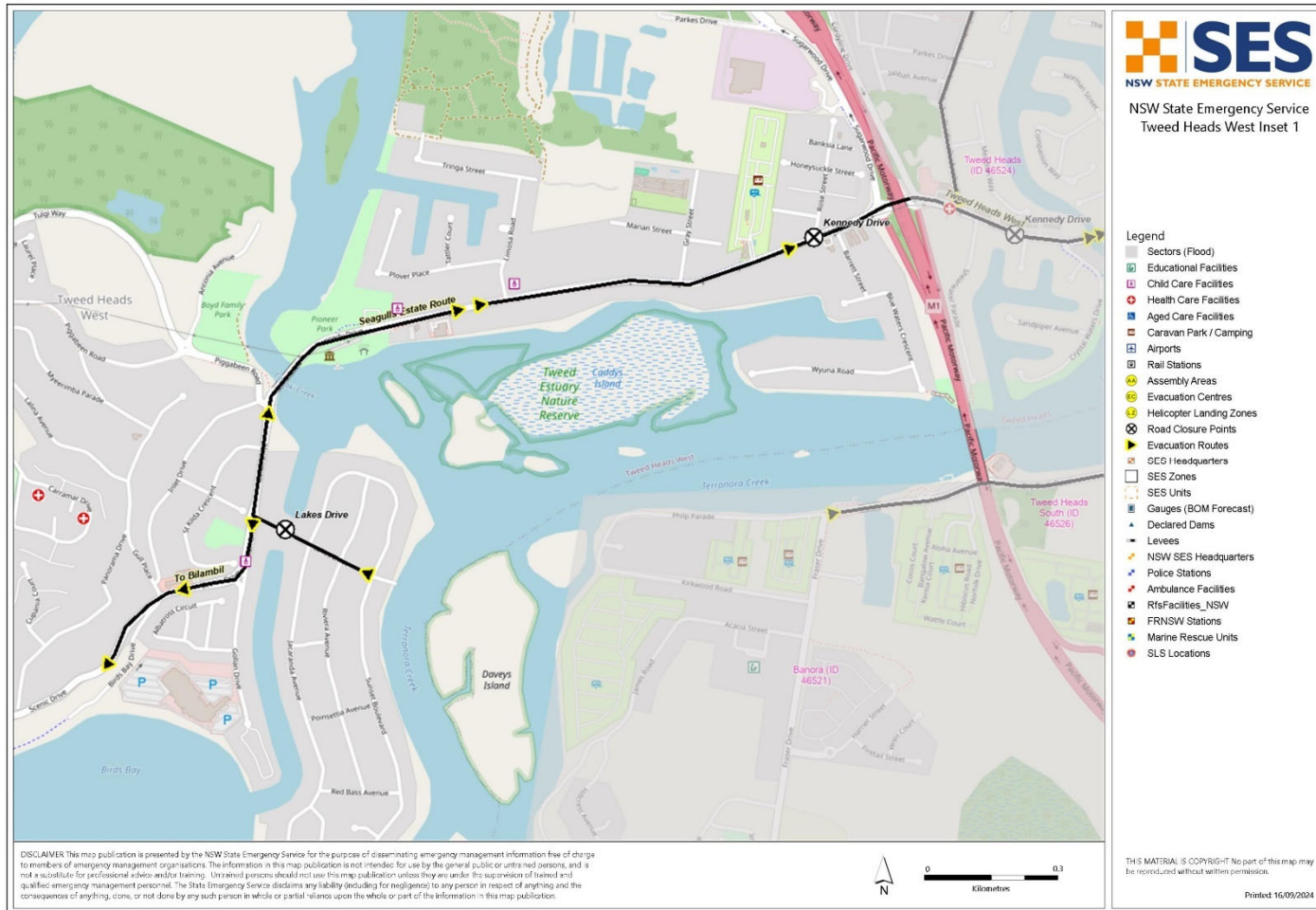
	<ul style="list-style-type: none"> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>• When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
	<ul style="list-style-type: none"> <li>• There are approx. 112 dwellings in Piggabeen and 73 in Cobaki which may be vulnerable to isolation during major floods.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation: °</p> <ul style="list-style-type: none"> <li>• Piggabeen Sports Field S 28° 11' 35" E 153° 30' 00"</li> </ul> <p>Firm all weather surfaces            Light towers on East and western sides of oval            Single light tower on northern end obscured by trees            Notes: Inside Gold Coast CTA            LZ is Bearing 204 grid / 1.3nm from Gold Coast airfield            Gold posts on field            Last Surveyed: 08.12.2014</p>
	<p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• The nearest airport is Gold Coast Airport International Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of a Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• This will likely be inaccessible during flooding.</li> </ul>
<b>Other</b>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> </ul>

	<ul style="list-style-type: none"><li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li><li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li><li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li><li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li><li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li><li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li><li>• No other considerations have been identified in this Sector.</li></ul>
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# TWEED HEADS WEST SECTOR MAP

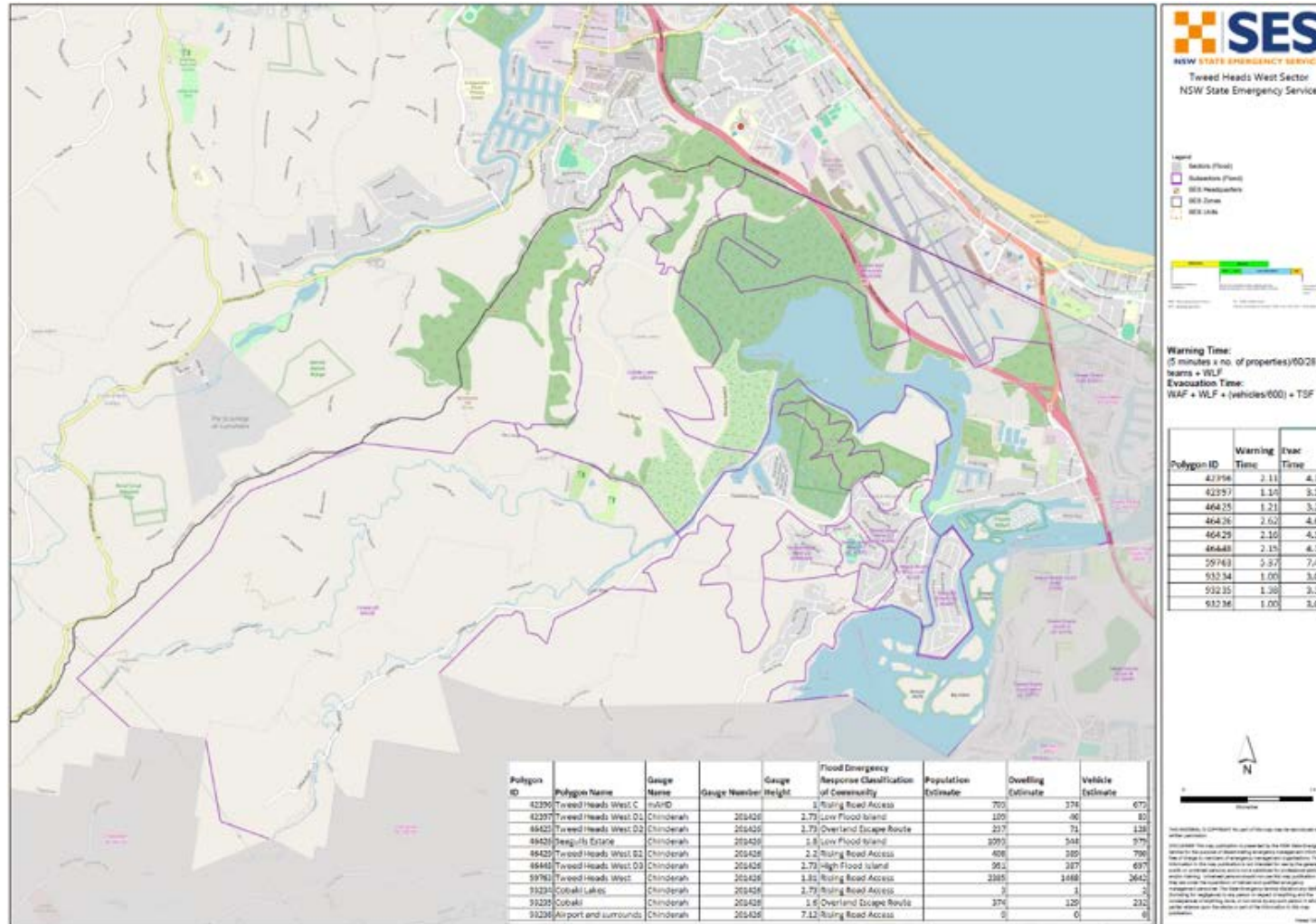


Tweed Heads West Sector Map Inset 1





# EVACUATION PLANNING



## 12. TWEED HEADS SECTOR

<b>TWEED HEADS RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>Tweed Heads Sector includes the suburb of Tweed Heads and encompasses the main central business district.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Tweed Heads is affected by riverine flooding from the Cobaki and Terranora Broadwaters, which is influenced by flooding in the Tweed River.</li> <li>Storm surge and tidal anomalies are expected to have a significant impact on flooding within this area as well as any events of intensive localised flash flooding from the Cobaki, Piggabeen and Bilambil Creek areas.</li> <li>In extreme events, flood levels in the Lower Tweed area are controlled by the constriction at the river mouth / entrance and the dunes between Kingscliff and Fingal Head</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Much of Tweed Heads becomes a High Trapped Perimeter</li> </ul>				
<b>At risk properties</b>	1199 properties at risk of over floor flooding in a PMF.	<b>Total number of properties within Sector/Community</b>	5251		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Dry Dock Chinderah	201428/558029 -/558010	1.4 1.3	1.7 1.7	2 2
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Evacuation Centre at <b>Police &amp; Citizens Youth Club (PCYC) Tweed Heads</b>, where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a large number of dwellings.</li> <li>Closure of evacuation routes, the inundation of many of which will be influenced by tides.</li> <li>Potential of isolation to supplies for thousands of people in a large flood event for a number of days.</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> </ul>				

	<ul style="list-style-type: none"> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Assist in the lifting of furniture to residents in need.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> <li>• Self-serve sandbag stations may be set up at nominated locations to assist with property protection.</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• Tweed Heads Telephone Exchange. Corner of Enid Street and Empire Lane Tweed Heads – may be impacted in a PMF event.</li> <li>• Further investigation maybe required to assess impacts to sewage treatment and water within this sector.</li> <li>• Electricity substation at 13 Florence Street Tweed Heads. Voltage is a 66/11kV Substation which is within the possible PMF extent.</li> <li>• Over a 1% AEP event significant impact to commercial infrastructure and localised supply sources would be expected.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation may be considered due to:</p> <ul style="list-style-type: none"> <li>• Inundation of property</li> <li>• Closure of main evacuation routes</li> <li>• Failure of essential services</li> </ul>
<p><b>Evacuation Triggers</b></p>	<p>The following triggers will need to be considered in conjunction with tidal influence and storm surge.</p> <p>Evacuation will be considered when:</p> <ol style="list-style-type: none"> <li><b>1.) Prediction to reach and/or exceed 2.0 m at the Chinderah gauge (558010):</b> Localised road closures impact the properties bound by Mugga Way, The Quarterdeck, Crystal Waters Drive and Ducat Street, the low lying properties along Kennedy Drive between the Motorway and Wharf Street, the properties around the marina bound by Wharf Street, Keith Compton Drive and Terranora Creek, and the properties bound by Bay Street, the Tweed River, Banks Avenue and Endeavour Parade.</li> <li><b>2.) Prediction to reach 2.2m -2.8m at the Chinderah gauge (558010):</b> Properties west of Ducat Street and east of the Pacific Motorway and Gold Coast Highway may become isolated due to road closures from 2.2m. From 2.8m evacuation routes are likely flooded and houses may become inundated.</li> <li><b>3.) Prediction to reach and/or exceed 3.5 m at the Chinderah gauge (558010):</b> Elevated areas around Razorback Hill and Point Danger Headland areas remain a high flood island. Most of the remaining Tweed Heads will be flooded at this height, inundating approximately 183 properties at 3.5m and 1210 at 7.12m (PMF).</li> </ol>



<p><b>Sequencing of warnings and /or evacuation</b></p>	<ul style="list-style-type: none"> <li>• <b>For Prediction to reach and/or exceed 2.0 m (Chinderah 558010):</b> Watch and Act Messaging for low lying areas around canals and adjoining waterways (GEMS ID 59156 &amp; 93281).</li> <li>• <b>For Prediction to reach 2.2m exceed 2.5 m (Chinderah 558010):</b> If floodwaters are expected to reach 2.2m and exceed 2.5m consider issuing an Emergency Warning for low lying areas around canals and adjoining waterways (GEMS ID 59156)</li> <li>• <b>Prediction to reach 2.2m exceed 2.8 m (Chinderah 558010):</b> If floodwaters are expected to reach 2.2m and exceed 2.8m consider evacuation warning for areas west of Ducat Steet and north of Kennedy Drive (GEMS ID 93281)</li> <li>• <b>Prediction to reach and/or exceed 7.12 m PMF (Chinderah 558010):</b> Significant urban areas will be inundated, most of Tweed Heads affected with the exception of two high flood islands. If this height is predicted, consider evacuation messaging including move to higher ground for all low lying subsectors.</li> </ul>
<p><b>Evacuation Routes</b></p>	<p><b>For Prediction 1: to reach and/or exceed 2.0 m (Chinderah 558010)</b></p> <ul style="list-style-type: none"> <li>• For people around Margaret Street and Kennedy Drive the evacuation route is Kennedy Drive, Wharf Street, left onto Florence Street to the Tweed Heads PCYC.</li> <li>• For people around Endeavour Parade and Keith Compton Drive should head west on Florence Street to the Tweed Heads PCYC.</li> <li>• Depending on local and road conditions, access southbound onto the M1 and along Terranora Rd towards Terranora evacuation centres may be possible.</li> </ul> <p><b>Prediction to reach and/or exceed 7.12 m PMF (Chinderah 558010)</b></p> <ul style="list-style-type: none"> <li>• Tweed PCYC in Adelaide Street is the only Evacuation Centre that is above the PMF. Recommend advising all residents in low lying areas to walk or drive to Tweed PCYC or to high ground above the PMF.</li> </ul>
<p><b>Evacuation Route Closure</b></p>	<ul style="list-style-type: none"> <li>• Wharf Street may close at 2.2m (Chinderah 558010). An alternate route may be available via Second Avenue, Charles Street then onto Adelaide Street.</li> <li>• Keith Compton Drive may close in a 1% AEP flood. Alternate routes may be available on streets to the west.</li> <li>• Kennedy Drive may close from 2m (Chinderah 558010) just east of the Ducat Street intersection.</li> <li>• Ducat Street may close at 2.2m (Chinderah 558010).</li> <li>• Closures of the M1 may occur around 2m at the Chinderah gauge.</li> </ul>
<p><b>Method of Evacuation</b></p>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<p><b>Evacuation Centre/Assembly Point</b></p>	<ul style="list-style-type: none"> <li>• Police &amp; Citizens Youth Club (PCYC) Tweed Heads.</li> <li>• Tweed Heads Bowl Club, within PMF extent.</li> <li>• Tweed Shire Civic Centre, within PMF extent.</li> </ul> <p>High ground in a modelled PMF is also available in two High Flood Islands, Razorback Hill and Point Danger.</p>

<p><b>Large scale evacuations</b></p>	<p>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</p> <ul style="list-style-type: none"> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<p><b>Resupply</b></p>	<p>If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</p> <p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Police &amp; Citizens Youth Club (PCYC) Tweed Heads S 28° 10' 34'' E 153° 32' 17''</li> </ul> <p>Firm all weather surfaces          Goal posts may be on field depending on time of year          Notes: Inside Gold Coast CTA          LZ is Bearing 100 grid / 1.5nm from Gold Coast airfield          Suitable for multiple aircraft both light and heavy          Last Surveyed: 08.12.2014</p> <p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• The nearest airport is Gold Coast Airport International Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the Southeast Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of a Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• This will likely be inaccessible during flooding.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> </ul>

	<ul style="list-style-type: none"><li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li><li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li><li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li><li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li><li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li><li>• No other considerations have been identified in this Sector.</li></ul>
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# TWEED HEADS SECTOR MAP

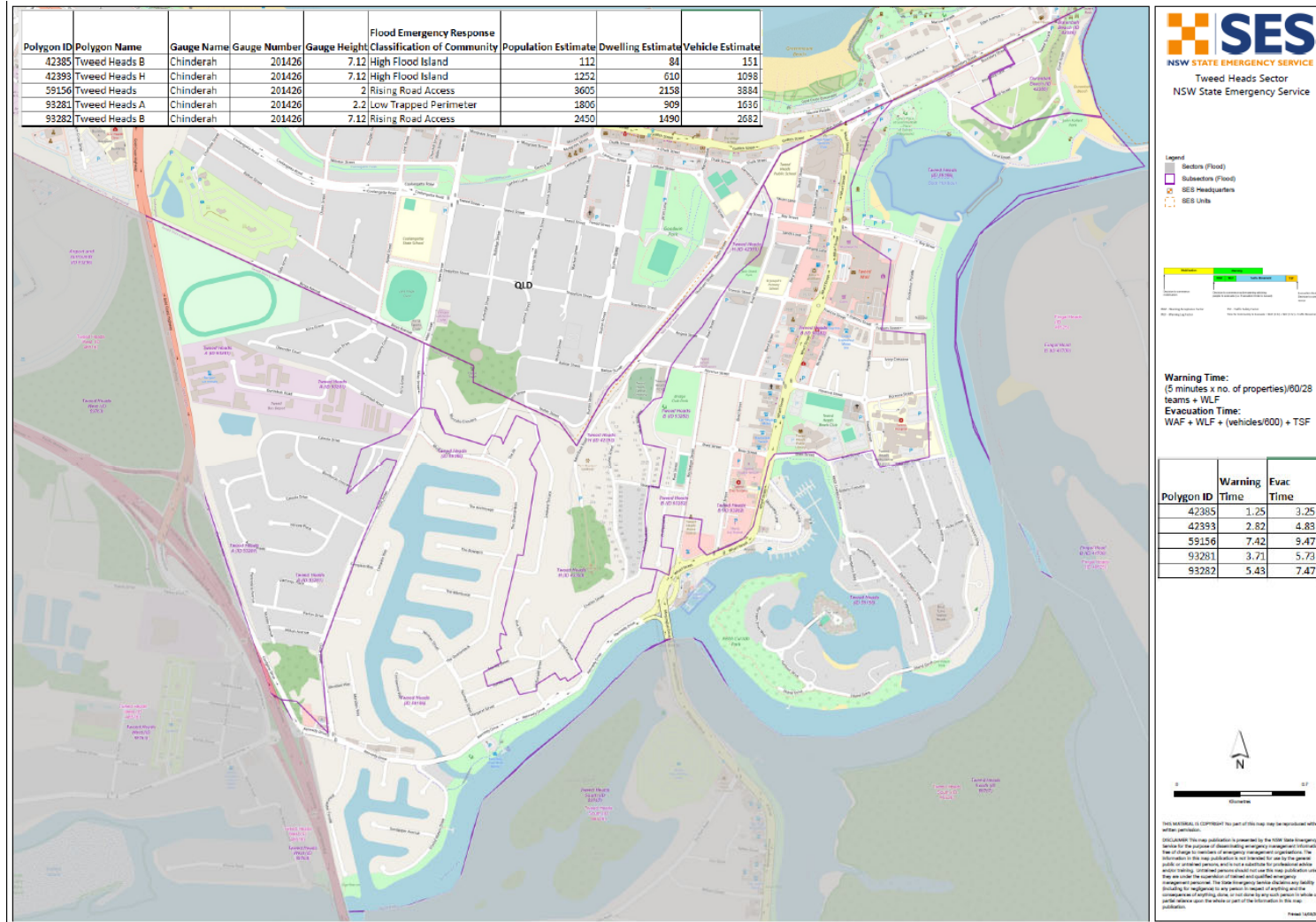


Tweed Heads Sector Map Inset 1





# EVACUATION PLANNING



## 13. FINGAL HEAD SECTOR

<b>FINGAL HEAD RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector/Community.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Fingal Head Sector includes the suburb of Fingal Head. Fingal Head encompasses the coastal strip bounded by the Tweed River to the north and west, the Pacific Ocean to the east and Wommin Bay Rd to the south.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>This Sector can be affected by coastal inundation and riverine flooding from the Tweed River in the Chinderah floodplain.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Fingal Head is a Low Trapped Perimeter</li> </ul>				
<b>At risk properties</b>	175 properties at risk of over floor flooding in a PMF.	<b>Total number of properties within Sector/Community</b>	347		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Chinderah	-/558010	1.3	1.7	2.0
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Fingal Head Rovers Surf Life Saving Club</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>				
<b>Key Risks / Consequences</b>	<ul style="list-style-type: none"> <li>Inundation of a large number of dwellings.</li> <li>Closure of evacuation routes</li> <li>Isolation of Sector</li> <li>Storm surge/large wave events may impact areas within this sector.</li> </ul>				
<b>Information and Warnings</b>	<ul style="list-style-type: none"> <li>Flood Watch (BoM)</li> <li>Flood Warnings (BoM)</li> <li>AWS Advice</li> <li>AWS Watch and Act</li> <li>AWS Emergency Warning</li> <li>Sequenced door knocking of evacuation sector</li> <li>Media announcements (including social media)</li> <li>Emergency Alerts (SMS, landlines)</li> <li>Standard Emergency Warning Signal</li> </ul>				
	<ul style="list-style-type: none"> <li>There are active Community groups in the area who may be able assist in warning the community, and have active telephone trees. Details are held by Tweed Heads local unit.</li> </ul>				

Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> <li>Control of surface water through sandbagging measures.</li> <li>Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>Refer to Chapter 4: Caravan Park Arrangements</li> <li>Self-serve sandbag stations may be set up at nominated locations to assist with property protection.</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>No essential infrastructure has been identified in this area.</li> </ul>
Evacuation and/or Isolation Triggers	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>Closure of main evacuation routes prior to inundation</li> <li>Property inundation</li> <li>Failure of essential services</li> <li>Isolation</li> </ul>
Evacuation and Warning Triggers	<p>Inundation in this area will be influenced by tides.</p> <p>Evacuation will be considered when:</p> <ol style="list-style-type: none"> <li><b>Prediction to reach and/ or exceed 1.3m at Chinderah Gauge:</b> Fingal Road in the vicinity of Wommin Lake Crescent is affected by water over the road at approximately this height, which will isolate Fingal Head once the road closes.</li> <li><b>Prediction to reach and/or exceed 1.8-2.0m at the Chinderah Gauge</b> Inundation of property adjacent to the Tweed River may commence by this height in the areas near Letitia Rd to the north and Fingal Rd to the South. However, only 2 properties are predicted to have over floor inundation at this height <ul style="list-style-type: none"> <li>Fingal Caravan Park may see above ground flooding from 2.1m requiring the relocation of caravans and residents.</li> </ul> </li> <li><b>Prediction to reach and/or exceed 2.73m at the Chinderah Gauge</b> Overfloor property inundation in the Fingal area is extensive, with approximately 68 properties impacted over floor and depth over the road at the Fingal Rd low point up to 1.5m.</li> </ol>
Sequencing of warnings and /or evacuation	<ul style="list-style-type: none"> <li>Evacuation of vulnerable facilities such as aged care facilities, schools, and child-care facilities will require a higher priority.</li> <li><b>For Prediction 1:</b> Watch and Act prepare to evacuate messaging for all low-lying parts of all Fingal Head subsectors if flood peaks are expected to rise. If heights are not expected to exceed 1.3m, watch and act stay out of floodwater messaging may be considered.</li> <li><b>*If heights are expected to rise significantly, and evacuation towards Kingscliff is the preferred evacuation strategy, it will need to occur by this height before Fingal Rd closes.</b></li> <li><b>For Prediction 2:</b> Emergency Warning evacuation messaging if heights are expected to reach and exceed 1.81m as over floor inundation increases. If not expected to exceed this height, targeted evacuations of low-lying areas may need to occur.</li> </ul>
Evacuation Routes	<ul style="list-style-type: none"> <li><b>Fingal Head Evacuation Route:</b> Fingal Road – Lighthouse Parade – Queen Street – Prince Street – to the Fingal Head Rovers Surf Club</li> <li><b>Letitia Road Evacuation Route:</b> Letitia Road – Prince Street</li> </ul>



	<ul style="list-style-type: none"> <li>● <b>Evacuation Towards Kingscliff:</b> South on Fingal Road to join the Pacific Motorway.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>● Local road closures may occur along listed evacuation routes and may be influenced by tides.</li> <li>● Fingal Road will close around Wommin Lake Crescent from 1.3m (Chinderah Gauge). This closure isolates Fingal Head subsector Fingal Head A.</li> <li>● Road closures of the M1 occur at approximately 2m at the Chinderah gauge.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>● Primarily self-evacuation by private transport to higher ground</li> <li>● Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>● Fingal Head Rovers Surf Life Saving Club is outside of the PMF flood extent, however, would be isolated during a significant flood event.</li> <li>● Other areas of high ground in a modelled PMF event are in the vicinity of Bambery St.</li> <li>● Fingal Head Public School is a nominated evacuation centre, however it is within PMF flood extent.</li> <li>● Evacuation by road may also be possible towards Kingscliff, however this would need to occur prior to closure of Fingal Rd.</li> </ul>
<b>Large scale evacuations</b>	<ul style="list-style-type: none"> <li>● When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</li> <li>● Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>● Assembly areas may be utilised on higher ground.</li> <li>● Emergency beach evacuation may be available Fingal Quarry via beach side during low tide and suitable weather to Kingscliff.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>● The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>● The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>● All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
	<ul style="list-style-type: none"> <li>● Once roads are cut, the area would likely only be accessible by flood boat or helicopter.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>● Fingal Head may become isolated from 1.3m on the Chinderah gauge, and in larger flood may be isolated for a number of days.</li> <li>● If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of this site is recommended prior to activation:</p>

	<ul style="list-style-type: none"> <li>• Fingal Head School Oval - S 28° 11' 49'' E 153° 33' 53''</li> </ul> <p>Firm all weather surface            Caution slope on nth end of pad            Inside Gold Coast controlled airspace - 0.6nm due west of Cook Island reporting point            Limited space depending on level of flooding            Last Surveyed: December 2014</p> <p><i>Airports:</i></p> <ul style="list-style-type: none"> <li>• The nearest airport is Gold Coast Airport, is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales.</li> <li>• It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</li> <li>• This will be inaccessible from a Minor flood.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.</li> <li>• No other considerations have been identified in this Sector.</li> </ul>

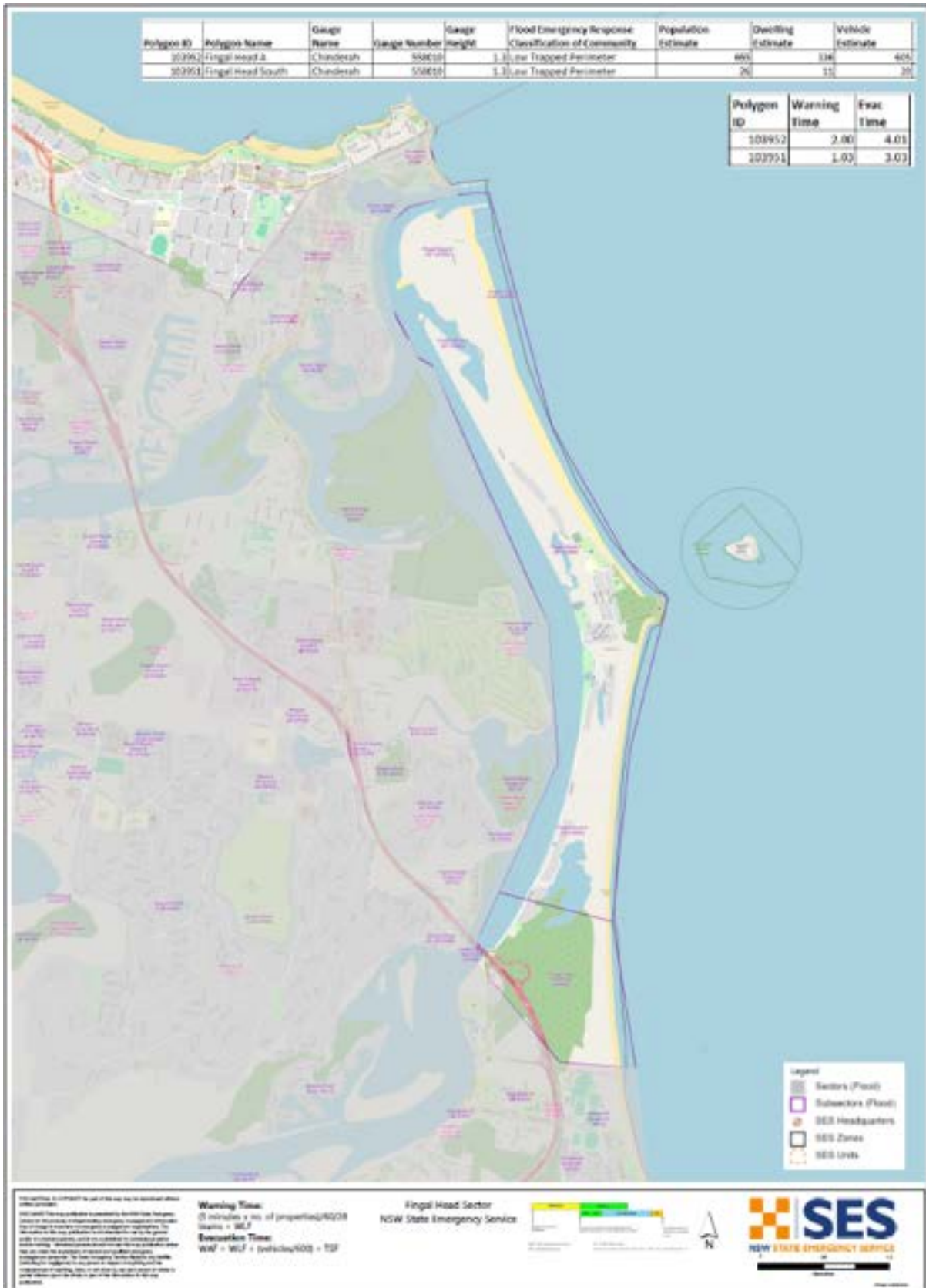
# FINGAL HEAD SECTOR MAP



Fingal Head Sector Map Inset 1



# EVACUATION PLANNING



## 14. BOGANGAR CABARITA SECTOR

<b>BOGANGAR CABARITA RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Bogangar Sector includes the suburbs of Casuarina, Kings Forest, Duranbah, Tanglewood, Bogangar, Cabarita Beach, Round Mountain and Hastings Point. It also includes the part of Kingscliff to the east of Cudgen Creek and along South Kingscliff Beach, as well as the northern part of Pottsville.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Bogangar and Cabarita Beach are affected by flash flooding from the Cudgen catchment, which is fed by the catchments of Reserve Creek and Clothiers Creek, and is also affected by the Cudgera catchment.</li> <li>Casuarina, between Old Bogangar Road and the ocean is highly influenced by tidal conditions. Southern Kingscliff and Casuarina may be inundated during a PMF event from local catchment flooding from Cudgen Creek.</li> <li>Hastings Point is primarily affected by flooding from the Christies Creek and Cudgera Creek Catchments which meet just prior to discharging into the ocean at Hastings Point.</li> <li>Cabarita/Bogangar and Hastings Point can also be impacted by storm surge.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>Casuarina Beach is a High Trapped Perimeter</li> <li>Casuarina, Bogangar and Round Mountain have Rising Road Access</li> <li>Kings Forest is a Low Flood Island</li> <li>Cabarita Beach is a High Trapped Perimeter and south Cabarita is an Indirectly Affected Area</li> </ul>				
<b>At risk properties</b>	2843 total properties at risk of overfloor inundation in a PMF in the Tweed Coastal catchments from Kingscliff to Wooyung.  Specific risk areas include Tamarind Ave, Willow Ave, Poplar Ave, Grevillia Rd, Mimosa Ave, Rosewood Ave and Hastings Road, Bogangar. Creek Street, Young Street and Peninsula Street, BP Service Station, Hastings Point	<b>Total number of properties within Sector/Community</b>	5781		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
<i>*This Sector does not have a BoM forecast gauge</i>	Bogangar	202416/558043	-	-	-
<b>General Strategy</b>	<ul style="list-style-type: none"> <li>Evacuation of at-risk population.</li> <li>Self-evacuation to friends/family outside of the impact area.</li> <li>Establishment of an Assembly Area/Evacuation Centre at <b>Bogangar Public School</b> or other nominated evacuation centres where evacuees are able to gather while flood situation is monitored.</li> </ul>				



<p><b>Key Risks / Consequences</b></p>	<ul style="list-style-type: none"> <li>• Inundation of a large number of dwellings.</li> <li>• Closure of evacuation routes</li> <li>• Key road access is via Tweed Coast Road and this may be cut in various places. East/West access roads from Tweed Coast Road to M1 (Pacific Highway) may also be cut.</li> <li>• No key warning gauges currently exist in this sector</li> </ul>
<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sector</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <p><i>Note: Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment. The SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works. The Tweed Shire Council is responsible for the activation of the Tweed Shire Council Coastal Zone Management Plan.</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <hr/> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> <li>• Refer to Chapter 4: Caravan Park Arrangements.</li> </ul> <hr/> <p><i>Protection of essential infrastructure:</i></p> <ul style="list-style-type: none"> <li>• No essential infrastructure has been identified in this area.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Expected property inundation</li> </ul>
<p><b>Evacuation and/or Warning Triggers</b></p>	<p>There is no Bureau of Meteorology forecast gauge for this location. Due to limited available information on flood consequence linked to gauge heights, evacuation and warning may be linked to expected road and property inundation at various design flood events and may be considered following monitoring and reconnaissance of identified locations.</p> <p><b>Prediction 1:</b> If heavy rainfall is predicted in the Cudgen and Cudgera Creek catchment areas. This may lead to flooding in parts of Southern Kingscliff, Cudgen, Casuarina, Kings Forest, Duranbah, Bogangar, Cabarita Beach, Cudgera Creek, Hastings Point and Pottsville. A flood watch issued over this area would trigger enhanced monitoring.</p> <p>There is no forecast gauge for this area, approximate peak design heights near the Cudgen Lake gauge may be observed in the below design events, but should be used as a guide only as flooding in this area comes from many sources.</p>

	<p><b>Peak design heights near Bogangar (Cudgen Lake - MHL gauge)</b>  20% AEP: 2.08mAHD  5% AEP: 2.26mAHD  2% AEP: 2.72mAHD  1% AEP: 2.92mAHD  PMF: 5.73mAHD</p> <p><b><i>The following outlines areas of inundation that may be expected in select design events.</i></b></p> <p><b>Prediction 2: 20% AEP event:</b></p> <ul style="list-style-type: none"> <li>• Inundation may occur from Blacks Creek and be of rapid onset in the subsector Kings Forest, there are a limited number of properties in this subsector.</li> <li>• Access to the Pacific Motorway via Clothiers Creek Road is lost in flood events less than the 20% AEP design event on the Tanglewood floodplain, affecting access for residents in Tanglewood. If heights continue to rise to a 1%AEP event, inundation of this area may last for &gt;72hours (Subsector Clothiers Creek). Most properties in this area are outside the modelled PMF extent. Further inundation of Clothiers Creek Road is predicted at the creek crossing west of Cabarita Road from a 10% AEP design flood event, affecting access for this area towards Cabarita Beach.</li> </ul> <p><b>Prediction 3: 5% AEP event:</b></p> <ul style="list-style-type: none"> <li>• In Bogangar, properties along Tamarind Avenue start to be inundated from backwaters from Cudgen Lake and the Cudgen Creek floodplain. Tamarind Avenue is a low-lying area that is frequently flooded (Subsector Cabarita West).</li> <li>• Land parcels along Creek Street to the north of Christies Creek in Hastings Point are predicted to be flooded in a 5% AEP event with peak flood levels of around 2.2m AHD. Overland flooding is also predicted in Young Street near the bend in Cudgera Creek (Subsectors Hastings Point and Cudgera Creek).</li> </ul> <p><b>Prediction 4: 2% AEP event:</b></p> <ul style="list-style-type: none"> <li>• Inundation increases in the Bogangar area (subsector Cabarita West), with flood extent covering the area between Rosewood Avenue and Mimosa Avenue and from Poplar Avenue to Hastings Road, with waters predicted to break out of the Friday Island canal across Rosewood Avenue. Friday Island is only predicted to be inundated during a PMF event, however access may be cut off prior to this, with a road low point of 3.05mAHD near the bridge.</li> <li>• <b>From this event</b>, inundation of the eastern end Muskheart Circuit for flooding in the Cudgera Creek subsector should be monitored (Subsector Cudgera Creek)</li> </ul> <p><b>Prediction 5: 1% AEP event:</b></p> <ul style="list-style-type: none"> <li>• Most of the area to the north of Rosewood Avenue, Bogangar is predicted to be inundated, with depths generally below 0.5m. Flood waters are also predicted to cross over east of Hastings Road towards commercial land in the Cabarita Beach CBD for this event (Subsector Cabarita West).</li> <li>• In Hastings Point, flood levels are predicted to reach up to 2.5m AHD, which would mean up to 1m of floodwater over the ground level in places, which may include Hastings Point village and the southern part of Young Street (Subsectors Hastings Point and Cudgera Creek).</li> </ul> <p><b>Prediction 6: PMF event:</b></p> <ul style="list-style-type: none"> <li>• In the PMF event, in Bogangar, flooding occurs in areas north of Sandalwood Drive and west of Tweed Coast Rd, with peak flood levels in the area of 5.7mAHD (subsector Casuarina and Bogangar). Flooding may also occur in this subsector in Casuarina east of Tweed Coast Rd and South of Grand Parade, and west of Casuarina Way between Laceflower Parade and Grand Parade.</li> </ul>
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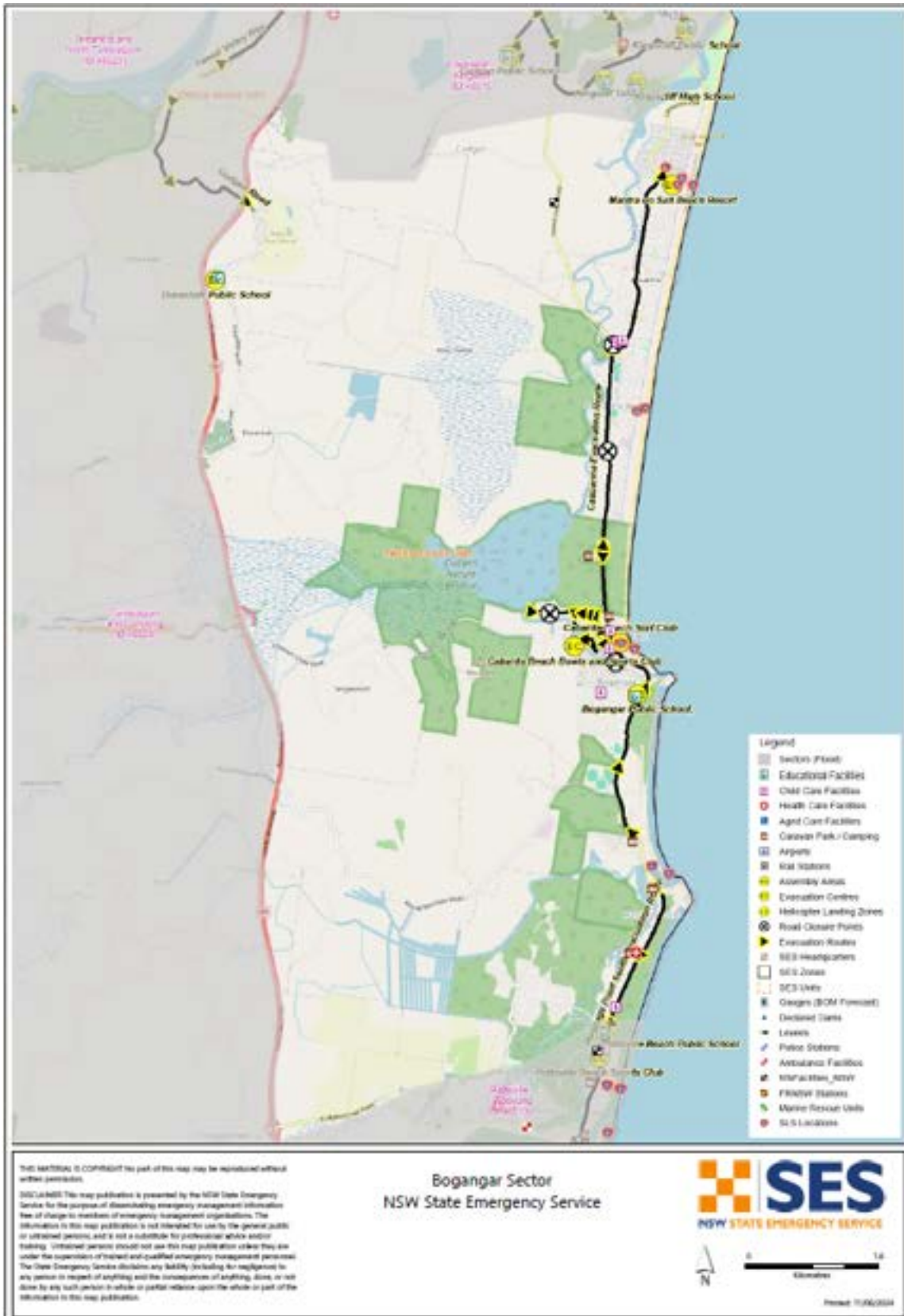


	<ul style="list-style-type: none"> <li>In Hastings Point, during a PMF event water levels are predicted to be as high as 3.9m AHD, or 2.5m of water above ground level. The area south of Peninsula Street and east of Tweed Coast Road is also expected to be flooded (Subsectors Hastings Point and Cudgera Creek), the Tweed Coast Rd Bridge is flood free until a PMF, where it is overtopped by 0.3m.</li> <li>The Koala Beach Estate remains mostly flood free in a PMF, however it is a High Flood Island. Local streets such as Muskheart Circuit, Bandicoot Street and Sugar Glider Drive are predicted to become major flow paths during this event (Subsectors Cudgera Creek and Sugar Glider Drive).</li> </ul>
<p><b>Sequencing of warnings and /or evacuation</b></p>	<p><b>Prediction 1:</b> If heavy rainfall over the upper catchments and sector are predicted, or a flood watch over the area is issued, warnings and increased monitoring may be considered due lack of forecast river level gauging. As the following sequencing is not based off warning gauges, it may be used as a guide to understand flood effects in the area.</p> <p><b>Prediction 2 (20% AEP):</b> Subsectors Kings Forest (GEMS ID 60211), Clothiers Creek (GEMS ID 59824) and Christies Creek (GEMS ID 72353) may be affected in this event. For the Clothiers Creek subsector, targeted messaging regarding isolation may be required based on the expected time of road inundation. If evacuations are required in these subsectors, they will be dealt with on a case-by-case basis based on monitoring of conditions.</p> <p><b>Prediction 3 (5% AEP):</b> Subsectors Hastings Point (GEMS ID 72345), Cudgera Creek East (GEMS ID 72350) and Cabarita West (GEMS ID 60198) may be affected in this event. Targeted evacuations may be required along the western end of Creek St in Hastings Point, and monitoring of depths along Tamarind Drive in Bogangar is recommended for residents in the north-west corner of subsector Cabarita West.</p> <p><b>Prediction 4 (2% AEP) and Prediction 5 (1%AEP):</b> Targeted evacuations may be required in the Cabarita West subsector (GEMS ID 60198). The bridge from Friday Island may close from a 1% event based on modelled design peak heights, and if inundation is expected to reach a PMF event, evacuation may be required prior to this. Targeted evacuations may be required in subsectors Hastings Point (GEMS ID 72345) and Cudgera Creek East (GEMS ID 72350) around Hastings Point Village and Young St.</p> <p><b>Prediction 6 (PMF):</b> If rises indicate heights may reach above a modelled 0.2% AEP event, evacuation and/or warning messaging may be required in all subsectors within the mapped flood extent. Subsector Sugar Glider Drive (GEMS ID 72351) becomes a major flow path in this event. The Subsector Casuarina and Bogangar (GEMS ID 60197) sees inundation of residential area, with rising road access to evacuation centres. Properties along subsector Round Mountain Rd (GEMS ID 72352) may lose road access and see property inundation from this height.</p> <p>The subsector Koala Beach Estate is isolated by road (GEMS ID 72348) and remains a High Flood Island. Subsector Cudgera Beach North (GEMS ID 72346) remains flood free to the PMF, but becomes a High Trapped Perimeter in this event. Subsector Tweed Coast Beaches (GEMS ID 97489) and Cabarita Beach (GEMS ID 73160) are High Trapped Perimeters in the PMF event.</p>
<p><b>Evacuation Routes</b></p>	<ul style="list-style-type: none"> <li>Evacuation should occur via local roads towards Tweed Coast Rd and towards Bogangar or Kingscliff Evacuation Centres.</li> </ul>

	<ul style="list-style-type: none"> <li>Evacuation for the Hastings Point area should occur south to the Pottsville Beach Public School if Tweed Coast Road is cut at Cudgera Creek.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li><b>Cabarita Route:</b> Tamarind Avenue may be cut early, and evacuation of this area will require a higher priority.</li> <li>Modelling suggests evacuation south on Tweed Valley Way towards Bogangar does not close in a PMF, but evacuation north towards Kingscliff will close early from a 1%AEP event</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>Primarily self-evacuation by private transport to higher ground</li> <li>Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<ul style="list-style-type: none"> <li>Bogangar Public School. 123-147 Tweed Coast Road, Bogangar</li> <li>Mantra on Salt Beach Resort. 1 Gunnamatta Avenue, Kingscliff</li> <li>Pottsville Beach Public School. 85 Tweed Coast Road, Pottsville</li> </ul>
<b>Large scale evacuations</b>	<p>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</p> <ul style="list-style-type: none"> <li>Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> <li>Assembly areas may be utilised on higher ground.</li> </ul>
<b>Rescue</b>	<ul style="list-style-type: none"> <li>The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
<b>Resupply</b>	<ul style="list-style-type: none"> <li>Resupply is unlikely unless the Pacific Motorway is cut for an extended period of time.</li> <li>If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<ul style="list-style-type: none"> <li>Friday Island in Cabarita may be isolated for a short period with approximately 49 properties at risk of isolation.</li> <li>The Koala Beach Estate may be isolated for a number of days with approximately 500 properties at risk of isolation.</li> </ul>
	<p>Table 23, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<b>Aircraft Management</b>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector.</p>
	<p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts through the state borders of Queensland and New South Wales. It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</li> <li>Access from this Sector would also likely be cut early in a flood event.</li> </ul>

<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>• This area attracts people for regular daily visits as well as short term holidays and scheduled school holidays.</li> </ul>
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### BOGANGAR CABARITA SECTOR MAP



Bogangar Sector Map Inset 1

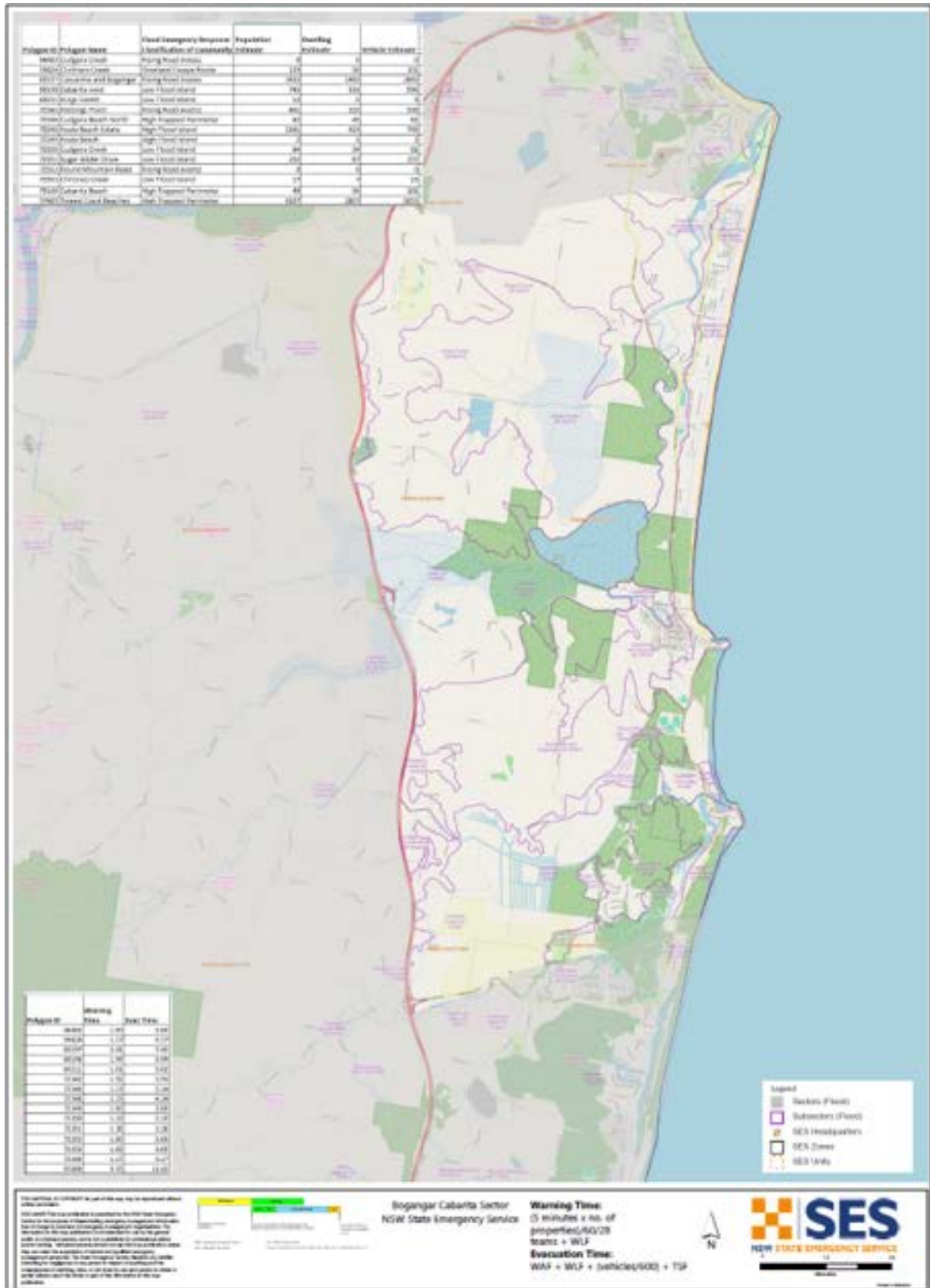


Bogangar Sector Map Inset 2





# EVACUATION PLANNING



## 15. POTTSVILLE WOoyUNG SECTOR

<b>POTTSVILLE WOoyUNG RESPONSE ARRANGEMENTS</b>					
Refer to Volume 2: Hazard and Risk in Tweed Shire for more information about this Sector.					
<b>Sector Description</b>	<ul style="list-style-type: none"> <li>The Pottsville Sector includes the suburbs of Pottsville, Wooyung, Crabbes Creek, Upper Burringbar, Burringbar, Mooball, Sleepy Hollow and part of Cudgera Creek.</li> <li>The northern part of Pottsville Village, Seabreeze Estate and Koala Beach Estate are in the Cudgera Creek Catchment. The southern part of Pottsville Village, Pottsville Waters and Black Rocks Estate are in the Mooball Creek Catchment.</li> </ul>				
<b>Hazard</b>	<ul style="list-style-type: none"> <li>Pottsville and Wooyung are affected by flooding generated by heavy rainfall over the Cudgera and Mooball Creek Catchments, storm surge or exceptional tidal conditions during floods.</li> <li>Burringbar, Mooball and Crabbes Creek are affected by high flow, rapid onset flash flooding from the two main creeks within the catchment, Burringbar Creek and Crabbes Creek.</li> </ul>				
<b>Flood Affect Classification</b>	<ul style="list-style-type: none"> <li>The residential area of Black Rocks Estate and the southeastern parts of Koala Beach Estate are Low Flood Islands.</li> <li>Mooball and Crabbes Creek are both Low Flood Islands.</li> <li>Burringbar has Rising Road Access</li> </ul>				
<b>At risk properties</b>	2843 total properties at risk of over floor inundation in a PMF in the Tweed Coastal catchments from Kingscliff to Wooyung. Properties at risk of isolation on Crabbes Creek road upstream of first causeway. Mooball. Dignan St, Hunter St & Greenvale Court in Burringbar. Landslide risk for Upper Burringbar.	<b>Total number of properties within Sector/Community</b>	3091		
<b>Sector Control</b>	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from other agencies where required as outlined in Volume 1 of the Tweed Shire Flood Emergency Sub Plan.				
<b>Key Warning Gauge Name</b>	<b>Name</b>	<b>AWRC/Bureau No.</b>	<b>Min (m)</b>	<b>Mod (m)</b>	<b>Maj (m)</b>
	Burringbar Creek at Tweed Valley Way	-/558103	3	4.4	5.8
	Crabbes Creek Village	-/558105	2	2.7	3.6
	Mooball Creek (Pottsville). MHL gauge only accessible at <a href="https://mhl.nsw.gov.au/Station-202435">https://mhl.nsw.gov.au/Station-202435</a>	202435/-			



<p><b>General Strategy</b></p>	<ul style="list-style-type: none"> <li>• Evacuation of at-risk population.</li> <li>• Self-evacuation to friends/family outside of the impact area.</li> <li>• Establishment of an Assembly Area/Evacuation Centre at <b>Pottsville Beach Club, Crabbes Creek Community Hall, Club Burringbar and Burringbar Public School</b> where evacuees are able to gather while flood situation is monitored.</li> </ul>
<p><b>Key Risks / Consequences</b></p>	<ul style="list-style-type: none"> <li>• Inundation of a large number of dwellings.</li> <li>• Short time available for warning due to rapid onset flash flooding</li> <li>• Isolation of Wooyung, Crabbes Creek and Mooball</li> <li>• Closure of evacuation routes</li> </ul>
<p><b>Information and Warnings</b></p>	<ul style="list-style-type: none"> <li>• Tweed Shire Council Flash Flood Warning System</li> <li>• AWS Advice</li> <li>• AWS Watch and Act</li> <li>• AWS Emergency Warning</li> <li>• Sequenced door knocking of evacuation sectors</li> <li>• Media announcements (including social media)</li> <li>• Emergency Alerts (SMS, landlines)</li> <li>• Standard Emergency Warning Signal</li> </ul> <ul style="list-style-type: none"> <li>• There are Community Response Teams in Burringbar and Crabbes Creek which may be able to activate telephone trees in flood events.</li> </ul>
<p><b>Property Protection</b></p>	<p><i>Specific property protection measures:</i></p> <p><i>Note: Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment. The SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works. The Tweed Shire Council is responsible for the activation of the Tweed Shire Council Coastal Zone Management Plan.</i></p> <ul style="list-style-type: none"> <li>• Control of surface water through sandbagging measures.</li> <li>• Monitoring integrity of dwellings surrounded by flood waters.</li> </ul> <p><i>Assistance with property protection:</i></p> <ul style="list-style-type: none"> <li>• Refer to Chapter 4: Caravan Park Arrangements</li> </ul> <p><i>Protection of essential infrastructure:</i></p> <p>Essential infrastructure may be affected during periods of major flooding, however no protective actions have currently been identified.</p> <ul style="list-style-type: none"> <li>• Hastings Point Wastewater Treatment Plant is within the PMF flood extent.</li> <li>• Mooball Wastewater Treatment Plant is within the 20% AEP flood extent.</li> </ul>
<p><b>Evacuation and/or Isolation Triggers</b></p>	<p>Evacuation or warning messaging may be considered due to:</p> <ul style="list-style-type: none"> <li>• Closure of main evacuation routes prior to inundation</li> <li>• Property inundation</li> <li>• Isolation of property</li> </ul>
<p><b>Evacuation and/or warning Triggers</b></p>	<p><b>For Burringbar and Mooball warnings are based off the Burringbar Creek Gauge (558106) which forms part of the Tweed Shire Council Flash Flood Warning System</b></p>

	<p><b>Prediction to reach and/ or exceed 3m at Burringbar Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Minor flooding at this height. Consequences include flooding of areas near waterways, closures of some roads and bridges and short-term isolation.</p> <ol style="list-style-type: none"> <li>1.) <b>Prediction to reach and/ or exceed 3m at Burringbar Creek Gauge:</b> Mooball township and rural area northeast of Mooball between Tweed Valley Way and Pottsville Road may start to become inundated at this height (Subsector Mooball). <ul style="list-style-type: none"> <li>• The area in the vicinity of Keilys Road may become isolated at this height (Kielys Road Subsector).</li> <li>• By 3.26m low-lying areas around creeks may start to become flooded around Burringbar (Subsector Burringbar West).</li> <li>• The area south of Burringbar accessed via Greenvale Court may become isolated at this height (Subsector Burringbar South).</li> <li>• By 3.86m under floor flooding starts to occur for properties located close to creeks (Subsector Burringbar West).</li> </ul> </li> <li>2.) <b>Prediction to reach and/ or exceed 4.4m at Burringbar Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Moderate flooding at this height. <ul style="list-style-type: none"> <li>• At this height, homes between Tweed Valley Way and Burringbar Creek may have flooding in their yards, Cudgera Creek Rd may be closed at the bridge north of the Tweed Valley Way intersection. In Mooball there will be some flooding of yards below floor level, Pottsville Rd will be closed in multiple locations, and Tweed Valley Way may be closed at the railway drain east of the village.</li> </ul> </li> <li>3.) <b>Prediction to reach and/ or exceed 5-5.76m at Burringbar Creek Gauge:</b> Burringbar Creek breaks out into the area around Hunter Street and Tweed Valley Way (Subsector Burringbar East). If heights are predicted to reach 6.16m this area may experience over floor flooding. <ul style="list-style-type: none"> <li>• The area to the southwest of Hunter Street and Tweed Valley Way may become isolated at this height (Subsector Waranga Crescent).</li> </ul> </li> <li>4.) <b>Prediction to reach and/ or exceed 5.8m at Burringbar Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Major flooding at this height. <ul style="list-style-type: none"> <li>• By 6.06m at Burringbar Creek Gauge: Residential properties southeast of Mooball along the Tweed Valley Way and Hulls Road may become isolated at this height (Subsector Hulls Road) and properties in subsector Burringbar East may experience over floor flooding.</li> </ul> </li> </ol> <p><b>For Crabbes Creek warnings are based off the Crabbes Creek Gauge (558105) which forms part of the Tweed Shire Council Flash Flood Warning System.</b></p> <ol style="list-style-type: none"> <li>1.) <b>Prediction to reach and/ or exceed 1.5m at Crabbes Creek Gauge:</b> The first causeway on Crabbes Creek Road may be cut around this height, isolating approximately upstream properties (Subsector Western Crabbes Creek).</li> <li>2.) <b>Prediction to reach and/ or exceed 2m at Crabbes Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Minor flooding at this height. From this height up to 2.75m, low lying areas around creeks are flooded, and Crabbes Creek Rd is flooded near Crabbes Creek Public School. Causeways along Crabbes Creek Rd may be closed, and Wooyung Rd may be closed at the creek crossings.</li> <li>3.) <b>Prediction to reach and/ or exceed 2.8m at Crabbes Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Moderate</li> </ol>
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	<p>flooding at this height. From this height, The area between Crabbes Creek Public School and Tweed Valley Way is predicted to be inundated, there may be some flooding of backyards in Crabbes Creek Village, and inundation along Crabbes Creek Rd and Wooyung Rd Crossing will be of greater depth.</p> <p><b>4.) Prediction to reach and/ or exceed 3.6m at Crabbes Creek Gauge:</b> The Tweed Shire Council Flash Flood Warning System will issue a warning for Major flooding at this height. From this height, Crabbes Creek store may experience over floor flooding at 3.75m, and residential houses may begin to experience over floor flooding from around 4.15m. Water may be deep and fast flowing.</p> <p><b>Wooyung/Pottsville</b>          There are no warning gauges for the areas of Wooyung, Pottsville and Seabreeze Estate. Therefore, warning and evacuation messaging in these areas may be considered based on expected inundation during modelled design flood events.</p> <p>Approximate peak design heights near the Mooball Creek gauge at Pottsville may be observed in the below design events, but should be used as a guide only as flooding in this area comes from many sources.</p> <p>Peak design heights near Mooball Creek -Pottsville (MHL gauge)          20% AEP: 1.2mAHD          5% AEP: 2.17mAHD          2% AEP: 2.43mAHD          1% AEP: 2.55mAHD          PMF: 4.90mAHD</p> <ul style="list-style-type: none"> <li>• <b>20% AEP event:</b> The area west of Tea Tree Road and Jones Road in Wooyung along Wooyung Road to the Pacific Motorway is predicted to be inundated from a 20% AEP event (Subsector Crabbes Creek East).</li> <li>• <b>2% AEP event:</b> In Pottsville, the creek linking Mooball Creek and Cudgera Creek catchments is predicted to break out downstream of Pottsville Road and generate minor flooding along and to the north of Coronation Avenue and Mooball Creek is also predicted to break out and inundate residential land along Philip Street (Subsector Pottsville East).</li> <li>• <b>1% AEP event:</b> In Seabreeze Estate, inundation of low-lying areas and roadways occurs, including north eastern corner of Lennox Circuit and the intersection of Seabreeze Boulevard and Ballina Street (Subsector Seabreeze Boulevard). In Pottsville, inundation spreads northward across the village green area and monitoring of the area between Phillip Street and Tweed Coast Road for creek rises which may inundate the area may be required. Pottsville Waters and Black Rocks Estates are predicted to be flood free in this event.</li> <li>• <b>0.2% AEP event:</b> In Seabreeze Estate, flooding extends eastward along Seabreeze Boulevard, with depths up to 0.5m near Tom Merchant Drive (Subsector Seabreeze Boulevard). In Pottsville, Pottsville Rd and Coronation Ave are inundated in several sections, and floodwaters from Mooball and Cudgera Creek connect in the CBD area.</li> <li>• Pottsville Waters and Black Rocks Estates see inundation north of McKenzie Ave.</li> <li>• <b>PMF:</b> In Wooyung, the area between Tea Tree Road and Jones Road is predicted to be flood free until a PMF at this approximate height (Subsector Tea Tree Road). At Seabreeze Estate, inundation is increased over the majority of the residential area.</li> <li>• In Pottsville, the entire village area is predicted to be inundated, with depths of up to 2m and it may become a major flow path.</li> </ul>
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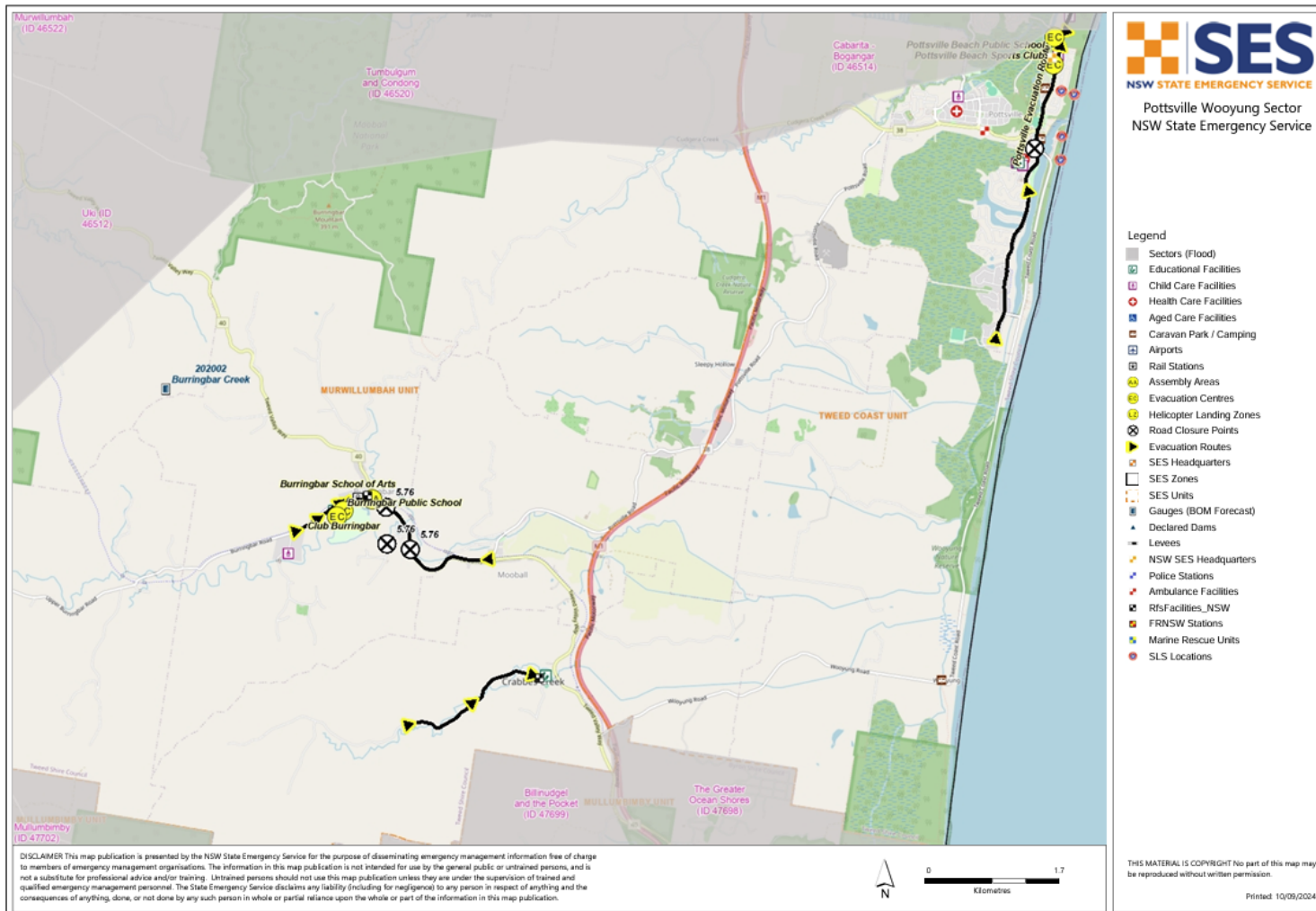
	<ul style="list-style-type: none"> <li>• Pottsville Waters and Black Rocks Estates are completely inundated with peak flood depths of up to 3m, although velocities are low as the area is predicted to act as flood storage.</li> </ul>
<p><b>Sequencing of warnings and/or evacuation</b></p>	<p><b>Burringbar and Mooball Sequencing</b></p> <ul style="list-style-type: none"> <li>• <b>For Prediction 1:</b> On receipt of a minor flood warning, if heights are expected to rise Advice or Watch and Act messaging should be considered for all subsectors including Mooball (GEMS ID 60176), Mooball Wooyung (GEMS ID 73578) East Burringbar (99073), Burringbar West (GEMS ID 60177) and Sleepy Hollow (GEMS ID 97503).</li> <li>• Watch and Act messaging may also be considered for subsectors likely to become isolated, including Kielys Rd (GEMS ID 60178), Hulls Rd (GEMS ID 73573), Waranga Crescent (GEMS ID 59802), Burringbar South (GEMS ID 59177) and Upper Burringbar (GEMS ID 93275).</li> <li>• <b>For Prediction 2:</b> If a moderate flood warning is issued, if heights are expected to reach and exceed Prediction 3, then Emergency Warning Messaging may be considered for subsectors Mooball (GEMS ID 60176), Mooball-Wooyung (GEMS ID 73578) and East Burringbar (99073). Targeted evacuations may also be required for low lying properties along the creek for subsector Burringbar West (GEMS ID 60177), however properties in this subsector along Greenvale Court are not expected to be inundated at these heights.</li> <li>• <b>For Prediction 4:</b> Evacuation messaging should have been issued prior to the major flood warning being issued, prior to expected road closures, however over floor flooding may commence from this height.</li> </ul> <p><b>Crabbes Creek Sequencing</b></p> <ul style="list-style-type: none"> <li>• <b>For Prediction 1 and 2:</b> Watch and Act messaging should be considered for all subsectors along Crabbes Creek (Crabbes Creek GEMS ID 97492) and Crabbes Creek East GEMS ID 73581). If heights are expected to rise past this level towards major flood heights, targeted evacuations may need to be considered early based on rate of rise prior to evacuation routes closing. Consideration of vulnerable facilities, including Crabbes Creek Public School, needs to be given at this height.</li> <li>• <b>For Prediction 3:</b> Emergency Warning messaging may be required for low-lying properties in Crabbes Creek subsectors for this level. Exact messaging given will depend on speed and depth of inundation occurring at time of messaging due to rapid onset nature of flooding in this area.</li> <li>• <b>For Prediction 4:</b> If evacuation has not occurred prior to this height, and evacuation along Crabbes Creek Rd and/or Wooyung Rd is not possible due to road closures, Emergency Warning (Move to Higher Ground) messaging should be utilised for all properties in the flood extent for all Crabbes Creek subsectors.</li> </ul> <p><b>Pottsville and Wooyung sequencing</b></p> <ul style="list-style-type: none"> <li>• <b>2% AEP:</b> Enhanced monitoring and messaging may be considered for Pottsville East (GEMS ID 72357) if this height is expected. Monitoring of the area around Phillip St and Berkleys Lane should occur and targeted evacuations may be required.</li> <li>• <b>1% AEP:</b> Monitoring of evacuation routes for Seabreeze Boulevard subsector (GEMS ID 72356) along Pottsville Rd and Coronation Ave should occur and messaging may be issued. Inundation of this road is expected from a 0.2% AEP event with inundation of residential areas in a PMF, so if heights are anticipated to reach &gt;0.2% AEP, targeted evacuations may be considered prior to evacuation route closure.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>0.2% AEP:</b> Evacuations of low lying areas in Pottsville East (GEMS ID 72357) should be considered prior to this height being reached.</li> </ul>
<b>Evacuation Routes</b>	<ul style="list-style-type: none"> <li>• <b>Burringbar Evacuation Route:</b> Burringbar Road – Fourth Avenue –Burringbar evacuation centres</li> <li>• <b>Mooball Evacuation Route:</b> Tweed Valley Way – Broadway – Fourth Avenue - – Burringbar evacuation centres.</li> <li>• <b>Pottsville Evacuation Route:</b> Local roads to Overall Drive – Phillip Street – Tweed Coast Road – Pottsville evacuation centres</li> <li>• <b>Wooyung Evacuation Route:</b> Wooyung Road west to the Assembly Area at Crabbes Creek Community Hall. Wooyung Road is likely to close early an alternate strategy may be to use overland escape to higher ground.</li> </ul>
<b>Evacuation Route Closure</b>	<ul style="list-style-type: none"> <li>• <b>Mooball Evacuation Route:</b> Tweed Valley Way may close at several points between Mooball and Burringbar, at approximately 5.6m at the Burringbar Creek gauge.</li> <li>• <b>Pottsville Evacuation Route:</b> Road closures may occur along Overall Drive and at Phillip Street and need to monitored during an event.</li> <li>• <b>Crabbes Creek and Wooyung:</b> Both Crabbes Creek and Wooyung Roads may close early in a flood event at creek crossings from 2m at the Crabbes Creek gauge.</li> </ul>
<b>Method of Evacuation</b>	<ul style="list-style-type: none"> <li>• Primarily self-evacuation by private transport to higher ground</li> <li>• Primarily self-evacuation by private transport to evacuation centres/assembly areas</li> </ul>
<b>Evacuation Centre/Assembly Point</b>	<p>Possible evacuation centres in this sector include:</p> <p><b>Burringbar</b></p> <ul style="list-style-type: none"> <li>• Burringbar Public School*</li> <li>• Club Burringbar*</li> <li>• In a PMF event, there is rising road access from the above evacuation centres to the east to areas of high ground.</li> </ul> <p><b>Pottsville</b></p> <ul style="list-style-type: none"> <li>• Pottsville Beach Sports Club</li> <li>• Pottsville Beach Public School*</li> </ul> <p><b>Crabbes Creek</b></p> <ul style="list-style-type: none"> <li>• There are no designated evacuation centres in the Crabbes Creek area. Assembly areas including Crabbes Creek Hall could be utilised, however this is partially within the flood extent from a 1%AEP event, and inundated in a PMF. Overland escape is available in a PMF event, and assembly areas on high ground may be utilised.</li> </ul> <p><i>*These centres are within the PMF extent, and in this event Assembly Areas may be identified on higher ground.</i></p>
<b>Large scale evacuations</b>	<p>When large-scale evacuations are likely, the NSW SES Incident Controller will liaise with the LEOCON and request support of the EOC as required. Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.</p> <ul style="list-style-type: none"> <li>• Additional locations may be identified in large scale evacuations, or if existing evacuation centres are flood affected or isolated.</li> </ul>

	<ul style="list-style-type: none"> <li>• Assembly areas may be utilised on higher ground.</li> </ul>
<p><b>Rescue</b></p>	<ul style="list-style-type: none"> <li>• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations.</li> <li>• The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues.</li> <li>• All Flood Rescue Operations will be undertaken as per the State Rescue Policy.</li> </ul>
	<ul style="list-style-type: none"> <li>• Potential road closures along Pottsville Road and Tweed Valley Way may limit flood rescue access.</li> </ul>
<p><b>Resupply</b></p>	<ul style="list-style-type: none"> <li>• Resupply is unlikely to be required for isolation beyond 2-3 days.</li> <li>• Communities which may become isolated for include Upper Burringbar, Burringbar, Crabbes Creek and Mooball.</li> <li>• If resupply is required, it will be coordinated as per the arrangements outlined in Volume 1 of this plan.</li> </ul>
	<p>Table 2, in Volume 2 provides information about isolated communities in the Tweed Shire area and potential periods of isolation.</p>
<p><b>Aircraft Management</b></p>	<p><b>Helicopter Landing Points:</b></p> <p>There are no designated helicopter landing points in this sector. However, NSW SES has identified the following possible locations for helicopter landing points. Ground truthing of these sites is recommended prior to activation:</p> <ul style="list-style-type: none"> <li>• Burringbar Sports Oval S 28° 26' 12" E 153° 28' 04"</li> </ul> <p>Firm grass surface            Caution goal posts on fields            Light towers on boundaries of field            Power lines on Western side of field            Last checked August 2013</p> <ul style="list-style-type: none"> <li>• Pottsville Sports Oval S 28° 23' 16" E 153° 33' 54"</li> </ul> <p>Firm grass surface            Caution possible goal posts on field            Light towers on boundaries            Powerlines running Nth – Sth parallel to road            Notes: Concrete cricket pitch in centre of oval            Suitable for multiple aircraft both light and medium            Last Surveyed: 08.12.2014</p>
	<p><b>Airports:</b></p> <ul style="list-style-type: none"> <li>• Gold Coast Airport is an international Australian airport located at the southern end of the Gold Coast and approximately 90 km (56 mi) south of Brisbane, within the South East Queensland agglomeration. The entrance to the airport is situated in the suburb of Bilinga near Coolangatta. The main runway itself cuts</li> </ul>

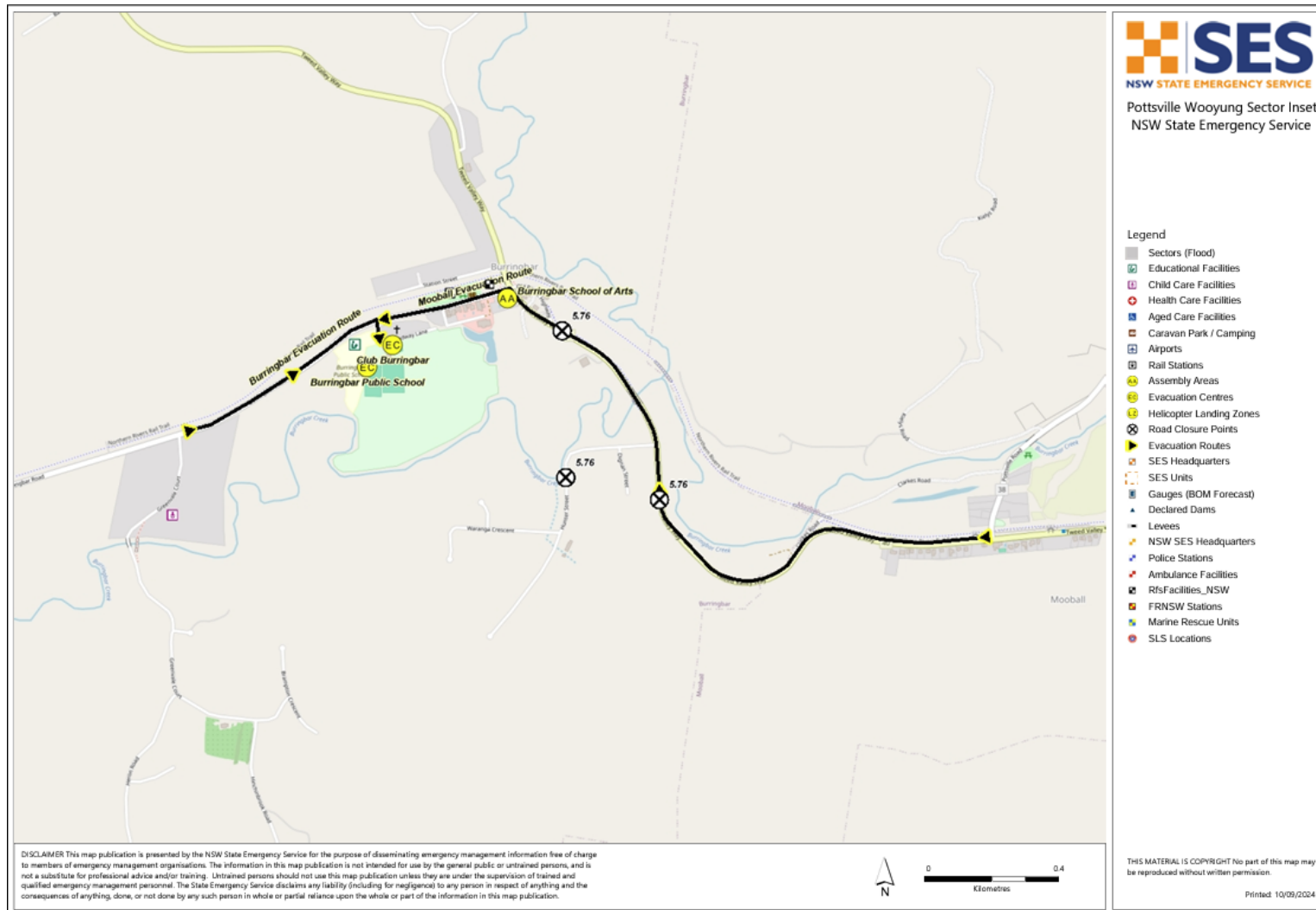
	<p>through the state borders of Queensland and New South Wales. It can handle aircraft up to the size of Boeing 787 and Airbus A340 commercial aircraft.</p> <ul style="list-style-type: none"> <li>• Access from this Sector would also likely be cut early in a flood event.</li> </ul>
<p><b>Other</b></p>	<p>Special considerations relating to evacuation:</p> <ul style="list-style-type: none"> <li>• Closure of schools - coordinated through the Department of Education and Training.</li> <li>• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.</li> <li>• Closure of licensed premises. All hotels and licensed clubs will be closed if required.</li> <li>• Security. Police patrols to be established to maintain law and order after evacuation has occurred.</li> <li>• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.</li> <li>• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.</li> <li>• These arrangements will stay in place until the “Return with Caution” is provided by the NSW SES to residents to return to their premises.</li> <li>• Events occurring in Pottsville may mean an increased number of visitors to the area include;</li> <li>• Tweed Coast Enduro on 24-25 February with anticipated attendance of 2000-3000 people.</li> <li>• The Northern Rivers Rail Trail also experiences regular use between Mooball and Murwillumbah, which can result in an increase in visitors to the area.</li> </ul>

# POTTSVILLE WOONYUNG SECTOR MAP

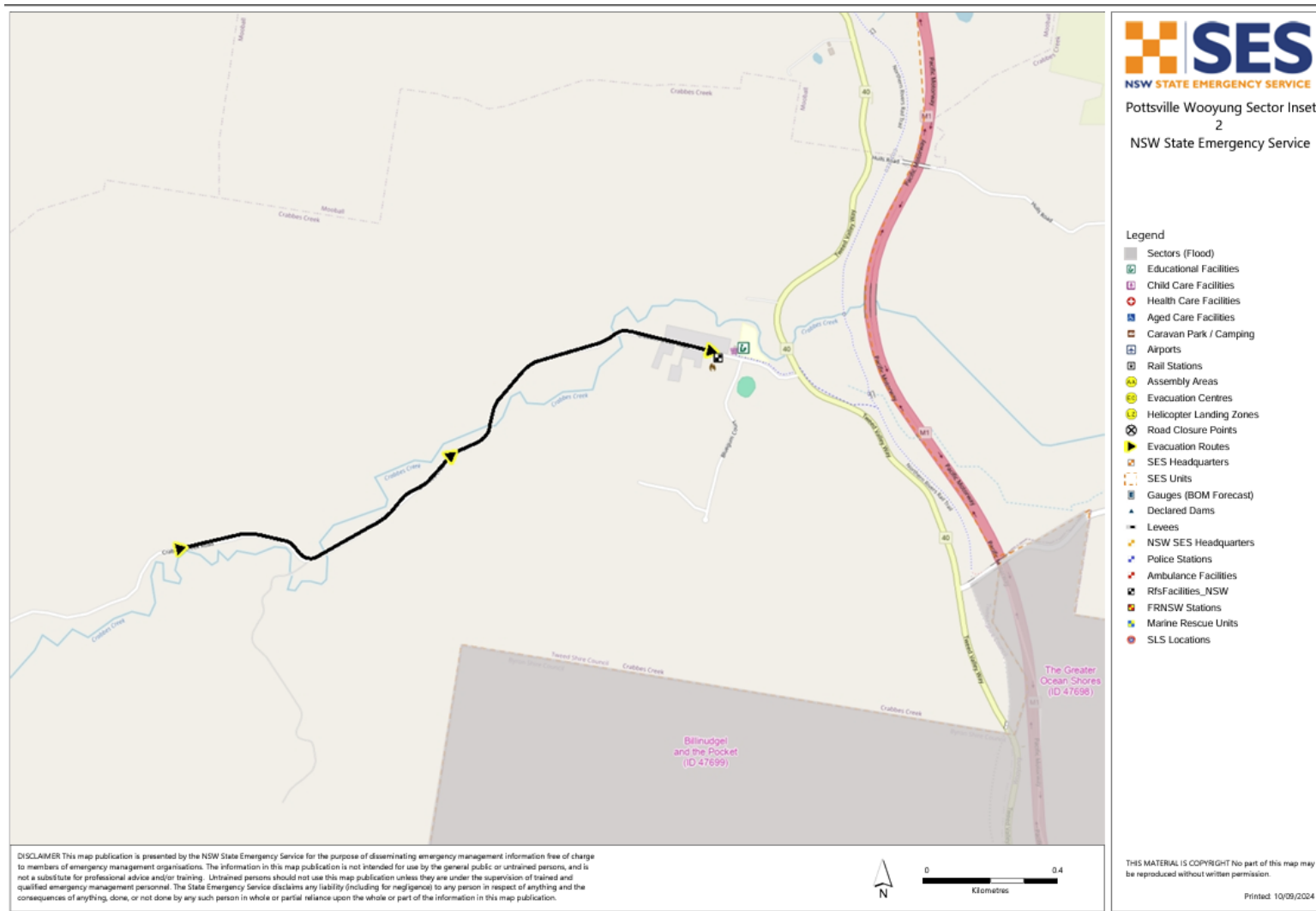




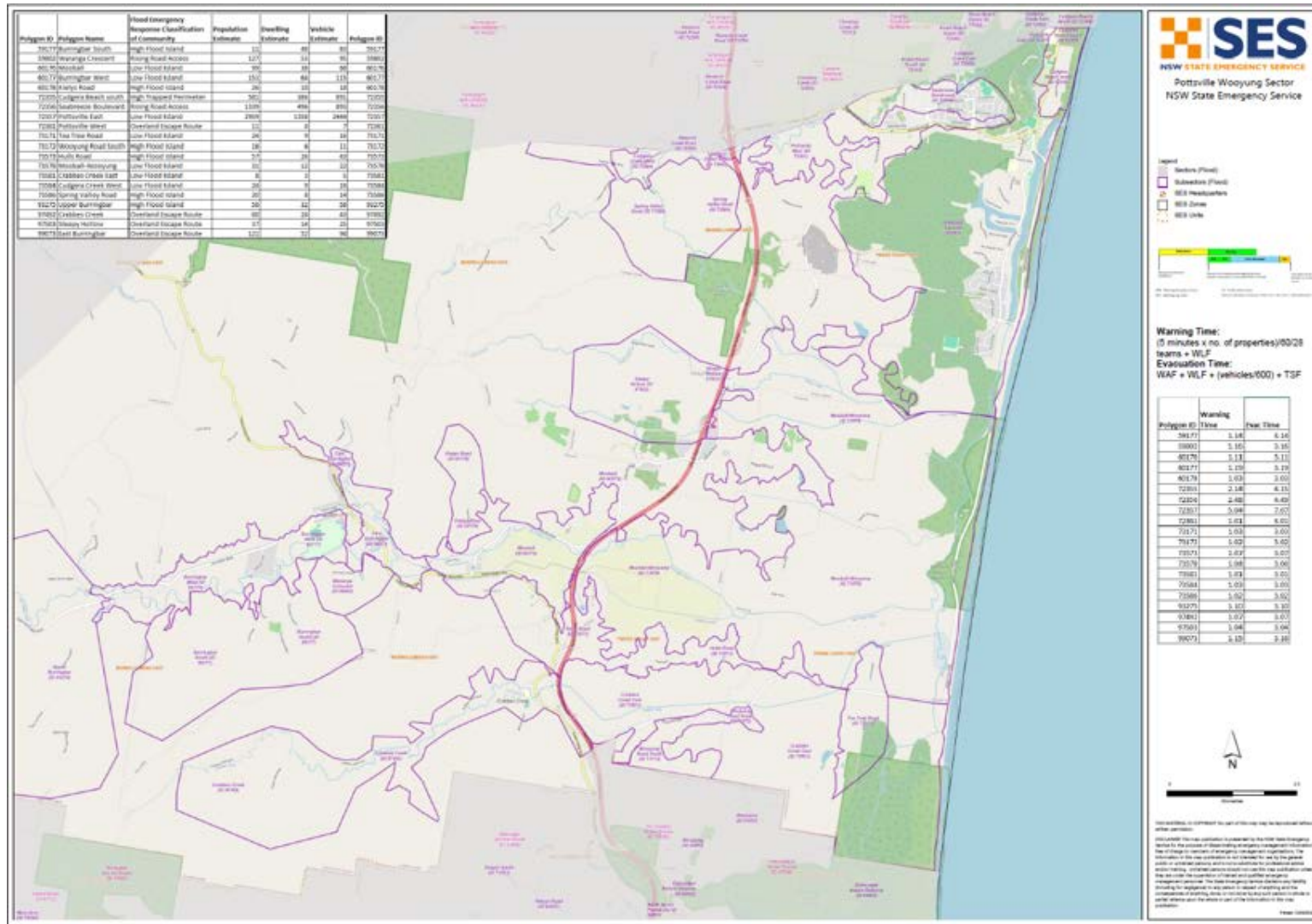
Pottsville Wooyung Sector Map Inset 1



Pottsville Wooyong Sector Map Inset 2



# EVACUATION PLANNING





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# **TWEED SHIRE NSW SES DAM FAILURE ARRANGEMENTS**

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**Chapter 3 of Volume 3 (NSW SES Response Arrangements for Tweed  
Shire of the Tweed Flood Emergency Sub Plan**

Last Update: September 2024

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# 1 DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR CLARRIE HALL DAM

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

## 1.1 INTRODUCTION

1.1.1 Clarrie Hall Dam is a water supply dam built to augment the water supply to towns in the Tweed Shire Water Supply District. This dam consists of a 43m high concrete face rockfill structure with a crest length of 175m and width of 6.4m. The maximum spillway width is 37.45m and consists of a concrete lined chute with an ogee crest.

The storage capacity of the dam is 16,000 ML at full supply (61.5m AHD) and the catchment area is 60.2km<sup>2</sup>. The maximum flood level is at 70.4m AHD.

The dam is located on Doon Doon Creek about 1.5km upstream from the confluence with the Tweed River, 15km south-west of Murwillumbah. It lies within the Tweed LGA and Tweed River Basin.

1.1.2 The two most likely causes of dam failure are:

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

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

1.1.4 The Clarrie Hall Dam spillway was upgraded in 2014 to allow it to pass the theoretical PMF without overtopping the parapet wall (dam crest).

## 1.2 CONSEQUENCES OF FAILURE

1.2.1 Dam failure could result in the following:

- a. Approximately one hundred and seventy-two (172) residences have the potential to be adversely affected by a failure of the dam structure in 'Sunny Day' conditions, four hundred and seventy six (476) by a PMF without a dambreak and five hundred and eight (508) residences have the

potential to be adversely affected by PMF and the failure of Clarrie Hall Dam.

**Table 1: Number of houses at risk of inundation and Population at Risk (PAR)**

Dambreak Case	Inundated Houses	PAR	Incremental PAR
Sunny Day Dambreak	172	482	482
DCF Without Dambreak	401	1,122	-
DCF With Dambreak	478	1,338	216
PMF without Dambreak	476	1,332	-
PMF with Dambreak	508	1,422	90

1.2.2 The number of houses at risk of inundation in the five (5) modelled scenarios is shown in the table above. The study area of the model extents covered a total of 35km along the Tweed River from Terragon in the upstream to Tumbulgum in the downstream.

1.2.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Clarrie Hall Dam, some or all of these properties may require evacuation.

### 1.3 FLOW TRAVEL TIMES

1.3.1 The table below shows floodwave travel times for three dambreak cases.

**Table 2: Travel times of flood peak**

Location	Sunny Day Dambreak (h:min)	DCF Dambreak (h:min)	PMF Dambreak (h:min)
Clarrie Hall Dam	0:00	0:00	0:00
Downstream of Dam	0:10	0:02	0:02
Junction with Upper Tweed River	0:20	0:08	0:11
Doon Doon Dip	0:26	0:08	0:11
Malabar	0:28	0:15	0:20
Uki	0:30	0:21	0:23
Trefern Stud	0:59	0:23	0:26
Glenrock	1:08	0:30	0:34
Upstream of Dum Dum	1:12	0:32	0:34
Upstream of Hattons Bluff	1:15	0:37	0:38
Upstream of Byangum Bridge	1:27	0:48	0:45
Tweed side	1:29	0:50	0:45
Upstream of Bray Park Weir	1:31	0:53	0:45
Trizah	1:35	1:02	1:03



Sunnymeadows Field	1:40	1:02	1:07
South Murwillumbah	1:45	1:03	1:07
Upstream of Murwillumbah Bridge	1:46	1:06	1:11
Downstream of Murwillumbah Bridge	1:48	1:08	1:13
South Murwillumbah Dip	1:49	1:12	1:15
Upstream of Condong Bridge	1:58	1:17	1:19
Bartlets	2:09	1:31	1:26
Camden Haven		1:38	1:34
Tumbulgum	2:15	-	-

- 1.3.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

## 1.4 INUNDATION AREA

- 1.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

### Flood Failure

- 1.4.2 Being a rockfill dam embankment, some short-term overtopping can be tolerated since only minor damage and displacement of rocks is expected. Additionally, this would occur in a PMF order of magnitude event which has an extremely low occurrence probability.
- 1.4.3 Wave wall was raised in 2014 to 70.4mAHD in conjunction with a new spillway (entrance widened from 22m to 35m) to allow for the safe passing of a PMF event.

### Sunny Day Failure

- 1.4.4 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.
- 1.4.5 This may occur due to structural issues, a serious earthquake experience at or near the dam, terrorism or sabotage, or malfunction of equipment.
- 1.4.6 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

## 1.5 INUNDATION MAPPING

- 1.5.1 Dam break flood inundation mapping has been prepared for Clarrie Hall Dam and is contained in the Clarrie Hall Dam Safety Emergency Plan.

## 1.6 MONITORING

- 1.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.
- 1.6.2 Clarrie Hall Dam is monitored by a network of instrumentation comprising surface settlement points, seepage weir, continuous water storage monitoring, rainfall, spillway seepage monitoring and site inspections.

## 1.7 NOTIFICATION PROCEDURES

- 1.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North-Eastern Zone Incident Controller or After-Hours Duty Officer. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

## 1.8 WARNING

- 1.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 3 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 3. The meaning of each alert is as follows:
- a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.
  - b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.
  - c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.
- 1.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

**Table 2: Clarrie Hall Dam Flood Failure Alert for 6hr PMF Event**

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	64.5m AHD 3.0m height over spillway	1:30
Amber Alert	67.5m AHD 6.0m height over spillway	2:36
Red Alert	*68.4m AHD 6.9m height over spillway	3:48

*\*Timing in table based on reaching 69.0m AHD.*

**Table 4: Clarrie Hall Dam Flood Failure Alert for 36hr PMF Event**

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	64.5m AHD 3.0m height over spillway	8:30
Amber Alert	67.5m AHD 6.0m height over spillway	22:30
Red Alert	*68.4m AHD 6.9m height over spillway	27:00

*\*Timing in table based on reaching 69.0m AHD.*

- 1.8.3 The NSW SES will disseminate dam failure warnings.
- 1.8.4 Tweed Shire Council Staff will keep the NSW SES informed of the reservoir level and discharge through the spillway. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.
- 1.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Clarrie Hall Dam.

Table 5: Notification, Warning and Evacuation Arrangements for a potential failure of Clarrie Hall Dam

<b>WHITE ALERT</b>	
<b>Defining Conditions:</b> 64.5m AHD 3.0m height over spillway	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of White Alert Level being reached and provide regular updates on the situation at the dam.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from NSW SES SHQ.</li> <li>▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters.</li> <li>▪ Advise the Regional Emergency Management Officer (REMO).</li> <li>▪ Consider need for out of area assistance for warning and evacuation operations.</li> <li>▪ Refer to Tweed Shire Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified</li> <li>▪ Implement arrangements in Flood Emergency Sub Plan.</li> <li>▪ Refer to Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1).</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ No action required.</li> <li>▪ Some evacuations may be necessary due to mainstream riverine flooding.</li> </ul>

<b>AMBER ALERT</b>	
<b>Defining Conditions:</b> 67.5m AHD 6.0m height over spillway	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam.</li> <li>▪ Closely monitor the condition of Clarrie Hall Dam and implement preventative measures to return it to a safe condition as soon as possible.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Notify NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES units and NSW SES LHQ.</li> <li>▪ Provide NSW SES AWS warnings to the media organisations listed in Volume 3: Chapter 1, of this Tweed Flood Emergency Sub Plan.</li> <li>▪ Coordinate provision of out of area assistance for warning and evacuation operations.</li> <li>▪ Coordinate the notification of other agencies as listed in Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified</li> <li>▪ Coordinate the delivery of warnings to at-risk residents.</li> <li>▪ Coordinate the notification of other agencies as listed in Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of the Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate.</li> <li>▪ Notify NSW SES doorknockers if transport to evacuation centres will be required.</li> <li>▪ Some evacuations may be necessary due to mainstream riverine flooding.</li> </ul>

<b>RED ALERT</b>	
<b>Defining Conditions:</b> 68.4m AHD 6.9m height over spillway	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES Units and NSW SES LHQ.</li> <li>▪ Advise the REMO.</li> <li>▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached.</li> <li>▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warning Evacuation Messaging is broadcast over the radio stations listed in Volume 3: Chapter 1 of this Tweed Shire Flood Emergency Sub Plan.</li> <li>▪ Coordinate provision of out of area assistance for evacuation operations.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified.</li> <li>▪ Evacuate at-risk residents.</li> <li>▪ Coordinate the notification of other agencies as per Tweed Shire Flood Emergency Sub Plan.</li> <li>▪ Ensure that evacuation centres are ready to receive evacuees.</li> <li>▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles.</li> <li>▪ Coordinate transport of evacuees without their own vehicles</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of the Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Evacuate to nearest evacuation centre or assembly area.</li> </ul>

<b>DAM FAILURE ALERT CANCELLATION</b>	
<b>Defining Conditions:</b> Dam owner assesses threat and advises whether the risk to the dam structure has passed.	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES OCC of the outcome of the risk assessment</li> </ul>
<b>SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Commander or Incident Controller or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue an 'Reduced Threat – Return with Caution'.</li> <li>▪ Issue 'Reduced Threat – Return with Caution' message to NSW SES Unit Commander or Duty Officer, NSW SES units, NSW SES Local HQ and NSW SES State HQ.</li> <li>▪ Advise the REMO/LEMO that 'Reduced Threat – Return with Caution' has been issued.</li> <li>▪ Issue 'Reduced Threat – Return with Caution' message over radio stations listed in Volume 3: Chapter 1, of this Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Coordinate issue of 'Reduced Threat – Return with Caution' message at evacuation centres or by phone/doorknock.</li> <li>▪ Deliver 'Reduced Threat – Return with Caution' message to other agencies as necessary.</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Stay home, return home or await further advice.</li> </ul>

## 1.9 EVACUATION PLANNING

- 1.9.1 **Sunny Day Failure:** There are 172 properties identified as being at risk during a Sunny Day Failure. Once the Sunny Day Failure has commenced, there is a wave travel time of 10 minutes to immediately downstream of the dam, 30 minutes to Uki and 1 hour 45 minutes to Murwillumbah.

Activation of Clarrie Hall Dam Sunny Day polygon (GEMS ID 85280), with warning level dependant on alert level of Clarrie Hall Dam and potential time to failure.

There are four bridges in the downstream study area, three bridges crossing the Tweed River and one crossing Doon Doon Creek. The Sunny day Dambreak affects only the Byangum Bridge. The depth of flooding and the flood velocity are high, imposing danger to public.

1.9.2 **Dam Crest Flood with Dambreak:** There 401 properties identified as being at risk during a Dam Crest Flood without dambreak. With dambreak there are an additional 77 properties identified as being at risk.

1.9.3 **PMF Flood with Dambreak:** There are 476 properties identified as being at risk during a PMF event without dambreak., with dambreak an additional 32 properties identified as being at risk.

Activation of Clarrie Hall Dam PMF polygon (GEMS ID 73208), with warning level dependant on alert level of Clarrie Hall Dam and potential time to failure.

There are four bridges in the downstream study area, three bridges crossing the Tweed River and one crossing the Doon Doon Creek. Both the PMF cases, with and without the Dambreak floods, result in flooding conditions at the bridges and impose danger to the public, as the flood depths and the associated flood velocity are high.

The table below outlines calculated warning and evacuation time in various modelled dambreak scenarios.

**Table 6: Warning and evacuation time for Clarrie Hall Dam in various modelled scenarios**

Modelled event	Properties at Risk	Warning Time* (hrs)	Evacuation Time (hrs)
Sunny Day Dambreak	172	1.5	3.5
DCF with Dambreak	478	2.4	4.4
PMF with Dambreak	508	2.5	4.5

\*Warning time calculated on doorknocking with 28 teams. This time may be variable depending on available resources and should be used as a guide only.



## 2 DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR KORRUMBYN CREEK DAM

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

### 2.1 INTRODUCTION

2.1.1 Korrumbyn Creek Dam is a fully silted dam. The 14.1m high dam is a thin concrete single arch with concrete gravity abutment on the left bank.

The reservoir originally had a capacity of 27,300 ML (not silted), however an outlet blockage means it now stores a high level of sediment. The spillway is a broad crested weir; water falls on the dam downstream face and apron slab.

Korrumbyn Creek Dam is located 12km southwest of Murwillumbah within Wollumbin National Park. Normal access to the dam is from Mount Warning Road, 4.2km from the intersection with Kyogle Rd.

2.1.2 The most likely causes of dam failure are:

- a. Serious deterioration of the dam structure, e.g., major cracking,
- b. Deterioration of the abutments, to the extent that they are unable to support the loads imparted to them by the arching action of the dam, which could be caused by weathering of seams, erosion by seepage of clay lenses, or fine material, slippage of blocks from the abutment along clay seams, etc.,
- c. Erosion or scour of toe of dam during a significant or prolonged flood event, resulting in the removal of rock from the foundation of the dam, which could in turn result in undercutting of the dam foundation and eventual failure of the dam,
- d. Detonation of explosives at the downstream toe of the dam, abutments or any other location on the dam structure, e.g., by a terrorist organisation or disgruntled person,
- e. Loading of the structure during an extreme flood event,
- f. Significant earthquake

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

It is unknown if Korrumbyn Creek Dam can withstand a PMF inflow flood.

## 2.2 CONSEQUENCES OF FAILURE

2.2.1 Generally, the outflow from Korrumbyn Creek Dam runs along Mount Warning Road through rural residential areas, reserves and small commercial operations. Impacts for Sunny Day failure and PMPDF flooding events are quite similar and are limited to Mount Warning Road. The following sites are located along Mount Warning Road and would be inundated in a dambreak event.

- a. Local Car Park approximately 200m downstream
- b. Mt Warning Rainforest Park approximately 2899m downstream
- c. Mavis's Kitchen and Cabins, Mt Warning Lodge Sanctuary, Mt Warning B&B, approximately 3900m downstream

2.2.2 Residential properties and houses located along the creek.

**Table 7: Total and Incremental Population at Risk (PAR)/Potential Loss of Life (PLL) for Korrumbyn Creek Dam**

Dambreak Event	Dambreak Population at Risk (silted)	Dambreak Population at Risk (silt assumed to be water)	Dambreak Potential Loss of Life
Sunny Day	0 (Total) 0 (Incremental) if silted	11.2 high season/5.8 low season	0 (Total) 0 (Incremental)
PMPDF	55.9 high season/ 14.5 low season	64.9 high season/20.3 low season	1.32 (Total) 0 (Incremental)

2.2.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Korrumbyn Creek Dam, some or all of these properties may require evacuation.

## 2.3 FLOW TRAVEL TIMES

2.3.1 Flow travel times have not been modelled within the Korrumbyn Creek Dam Safety Emergency Plan.

## 2.4 INUNDATION AREA

2.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

## Flood Failure

- 2.4.2 Dam failure may occur with structural failure of the dam wall coinciding with a PMF.

## Sunny Day Failure

- 2.4.3 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.
- 2.4.4 Potential cause would be a failure of the dam wall.
- 2.4.5 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

## 2.5 INUNDATION MAPPING

- 2.5.1 Dam break flood inundation mapping has been prepared for Korrumbyn Creek Dam and is contained in the Korrumbyn Creek Dam Safety Emergency Plan.

## 2.6 MONITORING

- 2.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.
- 2.6.2 No instrumentation has been installed at Korrumbyn Creek Dam. There are no automated messaging facilities.

## 2.7 NOTIFICATION PROCEDURES

- 2.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North-Eastern Zone Incident Controller or After-Hours Duty Officer. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

## 2.8 WARNING

- 2.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 2. The meaning of each alert is as follows:
- a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.
  - b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

- c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

2.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants. No alert levels for flooding have been determined for flooding events over Korrumbyn Creek Dam, the criteria below outline structural criteria to assess conditions in a non-flood event.

**Table 8: Korrumbyn Creek Dam Flood Failure Alerts**

Alert	Defining Conditions
White Alert	Structural defect detected (e.g., crack, piping) or heavy rainfall event
Amber Alert	Failure possible if storage continues rising or structural defect not repaired
Red Alert	Failure imminent or occurred

- 2.8.3 The NSW SES will disseminate dam failure warnings.
- 2.8.4 National Parks & Wildlife Service Staff will keep the NSW SES informed of the all developments. The dam alerts will be activated in sequence and will be sent to the NSW SES as they occur.
- 2.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Korrumbyn Creek Dam.

Table 9: Notification, Warning and Evacuation Arrangements for a potential failure of Korrumbyn Creek Dam

<b>WHITE ALERT</b>	
<b>Defining Conditions:</b> Structural defect detected	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of White Alert Level being reached and provide regular updates on the situation at the dam.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Controller or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from NSW SES SHQ.</li> <li>▪ Advise NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES Units and NSW SES Local Headquarters.</li> <li>▪ Advise the Regional Emergency Management Officer (REMO).</li> <li>▪ Consider need for out of area assistance for warning and evacuation operations.</li> <li>▪ Refer to Tweed Shire Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified</li> <li>▪ Implement arrangements in Flood Emergency Sub Plan.</li> <li>▪ Refer to Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1).</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ No action required.</li> <li>▪ Some evacuations may be necessary due to mainstream riverine flooding.</li> </ul>

<b>AMBER ALERT</b>	
<b>Defining Conditions:</b> Failure possible if defect not repaired or if major earthquake.	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam.</li> <li>▪ Closely monitor the condition of Korrumbyn Creek Dam and implement preventative measures to return it to a safe condition as soon as possible.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Notify NSW SES Local Commander and/or Unit Commander or Duty Officer, NSW SES units and NSW SES LHQ.</li> <li>▪ Provide NSW SES AWS warnings to the media organisations listed in Volume 3: Chapter 1, of this Tweed Flood Emergency Sub Plan.</li> <li>▪ Coordinate provision of out of area assistance for warning and evacuation operations.</li> <li>▪ Coordinate the notification of other agencies as listed in Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified</li> <li>▪ Coordinate the delivery of Evacuation Warnings (Watch and Act) to at-risk residents.</li> <li>▪ Coordinate the notification of other agencies as listed in Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of the Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate.</li> <li>▪ Notify NSW SES doorknockers if transport to evacuation centres will be required.</li> <li>▪ Some evacuations may be necessary due to mainstream riverine flooding.</li> </ul>

<b>RED ALERT</b>	
<b>Defining Conditions:</b> Failure imminent or occurred, increased loading due to flooding significant damage following earthquake.	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES Operations Communications Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.</li> </ul>
<b>NSW SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Incident Control Centre or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES Units and NSW SES LHQ.</li> <li>▪ Advise the REMO.</li> <li>▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached.</li> <li>▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that Emergency Warning Evacuation Messaging is broadcast over the radio stations listed in Volume 3: Chapter 1 of this Tweed Shire Flood Emergency Sub Plan.</li> <li>▪ Coordinate provision of out of area assistance for evacuation operations.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Confirm NSW SES Zone HQ has been notified.</li> <li>▪ Evacuate at-risk residents.</li> <li>▪ Coordinate the notification of other agencies as per Tweed Shire Flood Emergency Sub Plan.</li> <li>▪ Ensure that evacuation centres are ready to receive evacuees.</li> <li>▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles.</li> <li>▪ Coordinate transport of evacuees without their own vehicles</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> <li>▪ Activation of the Tweed Shire Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Evacuate to nearest evacuation centre or assembly area.</li> </ul>

<b>DAM FAILURE ALERT CANCELLATION</b>	
<b>Defining Conditions:</b> Dam owner assesses threat and advises whether the risk to the dam structure has passed.	
<b>Stakeholder</b>	<b>Arrangements and Actions</b>
<b>Dam Owner</b>	<ul style="list-style-type: none"> <li>▪ Advise NSW SES OCC of the outcome of the risk assessment</li> </ul>
<b>SES SOC</b>	<ul style="list-style-type: none"> <li>▪ Receive notification from dam operator.</li> <li>▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer.</li> <li>▪ Advise SEOC.</li> </ul>
<b>NSW SES Zone Commander or Incident Controller or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Following risk assessment of the dam, decide in consultation with NSW SES Incident Controller and State Duty Commander whether to issue an 'Reduced Threat – Return with Caution'.</li> <li>▪ Issue 'Reduced Threat – Return with Caution' message to NSW SES Unit Commander or Duty Officer, NSW SES units, NSW SES Local HQ and NSW SES State HQ.</li> <li>▪ Advise the REMO/LEMO that 'Reduced Threat – Return with Caution' has been issued.</li> <li>▪ Issue 'Reduced Threat – Return with Caution' message over radio stations listed in Volume 3: Chapter 1, of this Tweed Shire Flood Emergency Sub Plan.</li> </ul>
<b>NSW SES Local Commander and/or Unit Commander or After Hours Duty Officer</b>	<ul style="list-style-type: none"> <li>▪ Coordinate issue of 'Reduced Threat – Return with Caution' message at evacuation centres or by phone/doorknock.</li> <li>▪ Deliver 'Reduced Threat – Return with Caution' message to other agencies as necessary.</li> </ul>
<b>LEOCON/Other Agencies</b>	<ul style="list-style-type: none"> <li>▪ When requested by the NSW SES Incident Controller, coordinate support.</li> </ul>
<b>People at Risk</b>	<ul style="list-style-type: none"> <li>▪ Stay home, return home or await further advice.</li> </ul>



## 2.9 EVACUATION PLANNING

- 2.9.1 There are a number of campsites in the inundation extent, and number of occupants may be variable throughout the year.
- 2.9.2 Areas located along Mount Warning Road may require evacuation including the local car park 200m downstream, Mount Warning Rainforest Park, Mavis's Kitchen and Cabins, Mt Warning Lodge Sanctuary and Mt Warning B&B. Residential properties and houses located along the creek may also require evacuation. There is a PAR of 11 during a Sunny Day Failure and PAR of 65 during a PMF failure.
- 2.9.3 During large floods, it may be difficult for emergency support personnel to access the site or affected downstream areas. In flood weather Mount Warning Road is frequently cut at the Tweed River crossing near the intersection with Kyogle Rd.

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# TWEED NSW SES CARAVAN PARK ARRANGEMENTS

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**Chapter 4 of Volume 3 (NSW SES Response Arrangements for Tweed Shire) of the Tweed Shire Flood Emergency Sub Plan**

Last Update: September 2024

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# 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. Chinderah Village Tourist Caravan Pk, 94-104 Chinderah Bay Drive Chinderah
- b. Ingenia Holidays Kingscliff, 46 Wommin Bay Road, Chinderah
- c. Tweed Holidays Parks Kingscliff, 277 Marine Parade, Kingscliff
- d. Tweed Holidays Parks Kingscliff Beach, 125 Marine Parade, Kingscliff
- e. Fingal Caravan Pk, 9 Prince St, Fingal Head
- f. Cutters Camp campground, Cutter Camp Road, Mebbin
- g. Midginbil Eco Resort, 252 Midginibil Road, Midginibil
- h. Mt Warning Rainforest Park, 153 Mount Warning Road, Mount Warning
- i. River Retreat Caravan Park, 8 Philip Parade, Tweed Heads South
- j. Pyramid Holiday Park, 145 Kennedy Drive Tweed Heads
- k. BIG4 Tweed Billabong Holiday Village , Tweed Heads South
- l. Colonial Tweed Caravan Park , 158 Dry Dock Road, Tweed Heads South
- m. Tweed Holidays Parks Hastings Point, 7 Tweed Coast Road, Hastings Point
- n. Tasman Holidays Park North Star, 1 Tweed Coast Road, Hastings Point
- o. Tweed Holiday Parks Pottsville North, 27 Tweed Coast Road, Pottsville
- p. Tweed Holiday Parks Pottsville South, 2 Tweed Coast Road, Pottsville
- q. Chinderah Lake Caravan Park, 16 Anne Street Chinderah
- r. Homestead Holiday Park, 200/25 Chinderah Bay Drive Chinderah
- s. Royal Pacific Tourist Retreat, 27 Chinderah Road Chinderah
- t. Tweed Ski Lodge Caravan Park, 1-3 Chinderah Bay Drive Chinderah
- u. Tweed River Hacienda, 300/37-63 Chinderah Bay Drive Chinderah
- v. Wooyung Beach Holiday Park. 515 Wooyung Road Wooyung
- w. Banksia Waters Village. 55/192 Piggabeen Road Tweed Heads
- x. Tweed Heads Holiday Park. 3 Dry Dock Road Tweed Heads
- y. Tallaringa Luxury Camping. 147 Clothiers Creek Road, Nunderi.

1.1.2 For more information on individual caravan parks see Table 1 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 Murwillumbah Unit, Tweed Heads Unit and Tweed Coast Unit Commanders will ensure that the managers of caravan parks are advised of Flood Information (described in Volume 1 of the Tweed Shire Flood Emergency Sub Plan).

## **1.3 EVACUATION OF OCCUPANTS AND RELOCATION OF MOVEABLE DWELLINGS**

1.3.1 When an emergency warning is given caravan park occupants should follow the flood evacuation procedures for the park under the direction of the caravan park management. This should include advice to:

- a. Isolate power to moveable dwellings.

- b. Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.
  - c. Lift the other contents in any remaining dwellings as high as possible.
  - d. Move to friends, relatives or a designated evacuation centre if they have their own transport, or move to the caravan office to await transport.
  - e. If undertaking self-managed evacuation, register their movements with the caravan park management upon leaving the park.
- 1.3.2 Where possible, movable dwellings that can be moved will be relocated by their owners. Park managers will arrange for the relocation of movable dwellings as required. Council and NSW SES personnel may assist if required as per Flood Emergency Sub Plan Volume 1. Vans are to be moved to the locations outlined in Table 1 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 relevant NSW SES Unit Commander of:
    - The number of people requiring transport.
    - Details of any medical evacuations required.
    - Whether additional assistance is required to effect the evacuation.
  - d. Check that all residents and visitors are accounted for.
  - e. Inform the relevant NSW SES Unit Commander when the evacuation of the caravan park has been completed.
  - f. Provide the relevant NSW SES Unit Commander with a register of people that have been evacuated.

## **1.4 RETURN OF OCCUPANTS AND MOVEABLE DWELLINGS**

- 1.4.1 The NSW SES Murwillumbah Unit, Tweed Heads Unit and Tweed Coast Unit Commanders, 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 as per Flood Emergency Sub Plan Volume 1.

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
Chinderah Village Tourist Caravan Pk	94-104 Chinderah Bay Drive	Chinderah	40 sites, 10 fixed.	This facility may become inundated in the 5% AEP event.	Wommin Bay Road – Marine Parade – Sutherland St – Orient St	Wommin Bay Road may be cut at 1.4m at Chinderah gauge.	Jack Bayliss Park or Kingscliff Public School oval.	Kingscliff Public School	Low Flood Island
Ingenia Holidays Kingscliff	46 Wommin Bay Road	Chinderah	63 caravan sites, 20 cabins, 105 permanent sites.	This facility may become inundated from a 5% AEP event.	Wommin Bay Road – Marine Parade – Seaview St – Sutherland St – Orient St	Wommin Bay Road may be cut at 1.4m at Chinderah gauge.	Jack Bayliss Park or Kingscliff Public School oval.	Kingscliff Public School	Low Flood Island
Chinderah Lake Caravan Park	16 Anne Street, Chinderah	Chinderah	407 Sites mixed uses.	This facility may become inundated from a 5% AEP event.	Chinderah Road – Tweed Coast Road – Cudgen Road – McPhail Avenue and onto Oxford Street	Chinderah Road maybe cut at 1.8m AHD and Tweed Coast Road may be cut from 1.7m AHD.	Cudgen Foreshore Park or Kingcliff Public School Oval	Kingscliff High School	Low Flood Island

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Homestead Holiday Park	200/25 Chinderah Bay Drive	Chinderah	Approximately 172 sites	This facility may become inundated from a 5% AEP event.	Chinderah Bay Drive – Waugh Street – north on the Pacific Motorway – Exit onto Sexton Hill Drive – Terranora Road – Kittiwake Street and Pioneer Parade	Waugh Street may close at 1.4m AHD at the intersection of Chinderah Bay Drive.	Possibly Banora Point primary school oval	Banora Point Primary School	Low Flood Island
Tweed Ski Lodge Caravan Park	1-3 Chinderah Bay Drive	Chinderah	Unknown	This facility may become inundated from a 5% AEP event.	Chinderah Bay Dr – Waugh St – north on the Pacific Motorway – Exit onto Sexton Hill Drive – Terranora Road – Kittiwake Street and	Waugh Street may close at 1.4m AHD at the intersection of Chinderah Bay Drive.	Possibly Banora Point primary school oval	Banora Point Primary School	Low Flood Island



Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Royal Pacific Tourist Retreat	27 Chinderah Road, Chinderah	Chinderah	Approximately 50 powered sites	This facility may become inundated from a 5% AEP event.	Pioneer Parade Chinderah Road – Tweed Coast Road – Cudgen Road – McPhail Avenue and onto Oxford Street	Chinderah Road maybe cut at 1.8m AHD and Tweed Coast Road may be cut from 1.7m AHD.	Cudgen Foreshore Park or Kingcliff Public School Oval	Kingscliff High School	Low Flood Island
Tweed River Hacienda	300/37-63 Chinderah Bay Drive, Chinderah	Chinderah	Approximately 200 sites	This facility may become inundated from a 5% AEP event.	Chinderah Bay Drive – Waugh Street – north on the Pacific Motorway – Exit onto Sexton Hill Drive – Terranora Road – Kittiwake Street and	Waugh Street may close at 1.4m AHD at the intersection of Chinderah Bay Drive.	Possibly Banora Point primary school oval	Banora Point Primary School	Low Flood Island

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Tweed Holidays Parks Kingscliff North	277 Marine Parade	Kingscliff	8 cabins, 16 caravan sites, 21 campsites.	This facility may become isolated during a PMF event with some possible inundation of low-lying areas in the southwest of the park.	Pioneer Parade Marine Parade – Seaview St – Sutherland St – Orient St	Marine Parade may be cut during a PMF event.	Jack Bayliss Park or Kingscliff Public School oval.	Kingscliff Public School	Low Trapped Perimeter
Tweed Holidays Parks Kingscliff Beach	125 Marine Parade	Kingscliff	8 cabins, 44 caravan sites, 9 campsites.	This facility may become isolated during a PMF event.	Marine Parade – Seaview St – Sutherland St – Orient St	Marine Parade may be cut during a PMF event.	Kingscliff Public School oval.	Kingscliff Public School	High Trapped Perimeter
Fingal Caravan Pk	9 Prince St	Fingal Head	12 cabins, 42 permanent sites, 47 tentsites, 74 caravan sites	Flood waters begin to enter the lower parts of the caravan park at approximately 1.8m (Chinderah gauge) necessitating the relocation of campers.	Fingal Road – Pacific Motorway – Wommin Bay Rd – Marine Parade – Seaview St – Sutherland St – Orient St	Fingal Road at 1.4m, 1.45m and 1.7m at Chinderah gauge. Pacific Motorway at 1.3m at Chinderah gauge.	Limited higher ground located in vicinity Surf Life Saving Club. Alternate early evacuation to Kingscliff on receipt of Minor flood warning.	Kingscliff Public School	Low Flood Island

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Cutters Camp Campground	Cutters Camp Road	Mebbin	12 camp sites.	May become isolated for a short period due to flooding of causeways along Cadell Road and Mebbin Forest Road.	Mebbin Forest Road – Byrill Creek Road – Brays Creek Road – Coolman St	Local road closures due to causeway flooding may occur along Mebbin Forrest Road, Byrill Creek Road and Brays Creek Road.	Campsite located approximately 20m higher than Byrill Creek.	Tyalgum Community Hall or Tyalgum Public School	High Flood Island
Midginbil Eco Resort	252 Midginbil Road	Midginibil	3 cabins, 27 campsites	May become isolated for a number of days due to local creek flooding.	NA	NA	High ground available to west	NA	Overland Escape Route
Mt Warning Rainforest Park	153 Mount Warning Road	Mount Warning	29 campsites, 34 caravan sites, 12 cabins.	Can become isolated when Dum Dum Bridge closes around 6.9m on Uki gauge.	NA	NA	Some high ground available to east.	NA	Overland Escape Route
Tallaringa Luxury Camping	147 Clothiers Creek Road	Nunderi	One site	May become isolated from a 20% AEP event.	NA	NA	NA	NA	High Flood Island

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Tweed Heads Holiday Park, Tweed Heads	3 Dry Dock Rd	Tweed Heads	12 cabins, 228 caravan sites, 50 tent sites, 11 permanent sites.	This facility may become inundated from a 5% AEP event.	Minjungbal Drive – Wharf St – Florence St	2.2m on Minjungbal Drive, 2.2m on Wharf St, Brett St at 1.6m.	Bridge Club Park on Recreation St, however may be inundated in PMF. Limited space.	Tweed Heads PCYC	Low Flood Island
River Retreat Caravan Park	8 Philip Parade	Tweed Heads	38 campsites, 7 cabins, permanent sites.	This facility may become inundated from a 5% AEP event.	Ohilip Parade - Dry Dock Road – Minjungbal Drive – Wharf St – Florence St	Dry Dock Road at 1.2m, 2.2m on Minjungbal Drive, 2.2m on Wharf St, Brett St at 1.6m.	Bridge Club Park on Recreation St, however may be inundated in PMF. Limited space.	Tweed Heads PCYC	Low Flood Island
Pyramid Holiday Park	145 Kennedy Drive	Tweed Heads	24 cabins, 50 caravan sites, 116 permanent sites	This facility may become inundated from a 5% AEP event.	Kennedy Drive - Wharf St – Florence St. Alternate route to Queensland along Pacific Motorway.	Dry Dock Road Road at various points 2.1m, 1.2m and 2.2m. Minjungbal Drive, 2.2m on Wharf St, Brett St at 1.6m.	Bridge Club Park on Recreation St, however may be inundated in PMF. Limited space.	Tweed Heads PCYC.	Rising Road Access

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
BIG4 Tweed Billabong Holiday Village	Holden St	Tweed Heads	62 caravan sites. 47 cabins. 66 permanent sites.	This facility may become inundated from a 5% AEP event.	Pacific Motorway - Dry Dock Road – Minjungbal Drive – Wharf St – Florence St	Dry Dock Road at 1.2m, 2.2m on Minjungbal Drive, 2.2m on Wharf St, Brett St at 1.6m.	Bridge Club Park on Recreation St, however may be inundated in PMF. Limited space.	Tweed Heads PCYC.	Low Flood Island
Colonial Tweed Caravan Park	158 Dry Dock Rd	Tweed Heads	100 sites, including cabins and campsites.	This facility may become inundated from a 5% AEP event.	Philip Parade - Dry Dock Road – Minjungbal Drive – Wharf St – Florence St	Dry Dock Road at 1.2m, 2.2m on Minjungbal Drive, 2.2m on Wharf St, Brett St at 1.6m.	Bridge Club Park on Recreation St, however may be inundated in PMF. Limited space.	Tweed Heads PCYC	Low Flood Island
Wooyung Beach Holiday Park	515 Wooyung Road, Wooyung	Pottsville	Approx 9 Vans. 52 camping sites and 5 cabins	This facility may become Inundated from a 20% AEP	Wooyung Road west to the AA at Crabbes Creek Community Hall. An alternate strategy may be to use overland escape to higher ground.	Wooyung Road may close early at around 2m at the Crabbes Creek Gauge	To higher ground within the park bounday	AA at Crabbes Creek Community hall or to higher ground.	Low Flood Island

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Banksia Waters	55/192 Piggabeen Road, Tweed Heads	Tweed Heads West	-	This facility may become inundated in a PMF.	Piggabeen Road to Kennedy Drive, Gollan Drive then Scenic Drive.	-	Piggabeen Sports Complex up to a PMF	Bilambil School	Rising Road Access
Tweed Holidays Parks Hastings Point	7 Tweed Coast Road	Hastings Point	54 caravan sites, 349 campsites.	This facility may experience some inundation in low-lying areas near Cudgera Creek from a 5% AEP event.	Tweed Coast Road	-	Depending on occupancy some flood free ground may be available within the park along Yugari Drive. Alternatively Pottsville Beach Sports Club.	Pottsville Beach Public School or Pottsville Beach Public School	High Trapped Perimeter

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Tasman Holidays Park North Star	1 Tweed Coast Road	Hastings Point Road	92 caravan sites, 51 permanent sites, 5 apartments, 2 units.	This facility may become inundated from a 5% AEP event.	Tweed Coast Road – Padanus Parade	-	Barry Sheppard Oval and Cabarita Beach Pony Club on Round Mountain Road. Les Burger Field on Tweed Coast Road.	Cabarita Beach Surf Club	Rising Road Access
Tweed Holiday Parks Pottsville North	27 Tweed Coast Road	Pottsville	5 cabins, 55 caravan sites, 19 campsites.	This facility may become isolated for a number of days. Possibility of some inundation of low-lying areas in south of park during a PMF event.	Tweed Coast Road	-	Higher ground within park or Pottsville Beach Sports Club.	Pottsville Beach Sports Club or Pottsville Beach Public School.	High Trapped Perimeter
Tweed Holiday Parks Pottsville South	2 Tweed Coast Road	Pottsville	11 cabins, 72 caravan sites, 12 camp sites.	This facility may experience inundation from a 5% AEP event with wider	Tweed Coast Road	Tweed Coast Road may be cut from a 2% AEP event.	Pottsville Beach Sports Club.	Pottsville Beach Sports Club or Pottsville Beach	Low Flood Island

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				inundation by a 0.2% AEP event and complete inundation during a PMF event.				Public School.	
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## 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.