

Muswellbrook Shire

Local Flood Plan

MUSWELLBROOK SHIRE FLOOD EMERGENCY SUB PLAN

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

Volume 1 of the Muswellbrook Shire Flood Emergency Sub Plan

**Endorsed by the Muswellbrook Shire Local Emergency Management
Committee**

Endorsed Date: 7th December 2022

AUTHORISATION

The Muswellbrook Shire Flood Emergency Sub Plan is a sub plan of the Muswellbrook Shire 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:

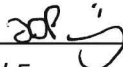
Andrew Abouzaid

Date:

1/12/22

Endorsed

Signature:



Chair, Local Emergency Management Committee

Print Name:

Derek Fiddigall

Date:

7 Dec 2022

VERSION HISTORY

Version Number	Description	Date
	Muswellbrook Shire Local Flood Plan	March 2013
	Muswellbrook Local Flood Plan	August 2007

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

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

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

Amendment Number	Description	Updated by	Date

DISTRIBUTION LIST

Available for general use and distribution on the NSW State Emergency Service website
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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-agency arrangements for the emergency management of flooding in the Muswellbrook Shire Council 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 Muswellbrook Shire Council Local Emergency Management Plan (EMPLAN) and is endorsed by the Muswellbrook Shire Council 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 Muswellbrook Shire 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 Muswellbrook Shire LGA. The Muswellbrook 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 Northern Zone and for emergency management purposes, is part of the Hunter Central Coast Emergency Management Region.
- 1.4.3 The plan sets out the Muswellbrook Shire level emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Muswellbrook Shire 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 This plan outlines the local level arrangements for the management of downstream consequences of flooding due to dam failure, however it does not cover the management of flooding of an underground mine by inrush or other

cause, which should be covered by the Mine Emergency Sub Plan for the respective mine.

1.5 GOALS

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

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

1.6 KEY PRINCIPLES

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

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

1.7 ROLES AND RESPONSIBILITIES

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

1.7.2 Specific roles and responsibilities for agencies, functional areas and organisations in relation to flooding within Muswellbrook 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. The NSW SES Incident Controller (for local or zone level responsibilities during response operations).
- b. The NSW SES Zone Duty Commander (for regional level responsibilities outside of response operations).

1.8 PLAN MAINTENANCE AND REVIEW

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

- a. Ensuring that all supporting emergency services and functional areas, organisations and officers mentioned in it are aware of their roles and responsibilities.
- b. Conduct a minimum of one exercise every five years or within two years of the plan being reviewed.
- c. Reviewing the contents of the plan:
 - When there are changes which alter agreed plan arrangements.
 - When changes to land use strategic plans and policies increase the population at risk.
 - After a flood including recommendations from after action reviews, reports, or inquiries.
 - As determined by the NSW SES Commissioner.
- d. The plan is to be reviewed no less frequently than every five years or after a significant flood event.

1.9 SUPPLEMENTARY DOCUMENTS

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

2 OVERVIEW OF NSW FLOOD HAZARD AND RISK

2.1 THE FLOOD THREAT

- 2.1.1 NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Muswellbrook Shire LGA. This is outlined in Volume 2 – Hazard and Risk in Muswellbrook Shire.
- 2.1.2 Declared dams in or upstream of the Muswellbrook Shire Local Government Area.

Dam Name	Owner	High Risk Dam
Glenbawn Dam	Water NSW	
Bayswater 2 Main Dam	BHP Billiton	
Bayswater Ash	AGL Macquarie Ltd	
Bayswater Cooling Make Up	AGL Macquarie Ltd	
Bengalla Stage Discharge	Bengalla Mining Co	
Bengalla CW1 Dam	Bengalla Mining Co	
Bengalla DW1 Dam	Bengalla Mining Co	
Dartbrook Mne Water	Anglo Coal	
Drayton Water Supply	Anglo Coal	

Liddell Ash Disposal	AGL Macquarie Ltd	
Liddell Ash Levee	Maxwell Adventures P/L	
Liddell Cooling Water	AGL Macquarie Ltd	
Liddell Water Supply Dam	AGL Macquarie Ltd	

3 PREVENTION/ MITIGATION

3.1 INTRODUCTION

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

3.2 LAND USE PLANNING

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

Actions:

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

3.3 FLOODPLAIN RISK MANAGEMENT

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

Actions:

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

4 PREPARATION

4.1 INTRODUCTION

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

4.2 FLOOD EMERGENCY PLANNING

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

Actions:

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

4.3 FLOOD INTELLIGENCE SYSTEMS

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

Actions:

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

4.4 DEVELOPMENT OF WARNING SYSTEMS

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

Actions:

- a. All levels of government work in partnership to develop and maintain flood warning infrastructure.
- b. NSW SES maintains a list of the requirements for flood warnings for flood gauges in NSW (including flood classifications, warning times required and key statistics) and can be found in the supplementary document to the NSW State Flood Plan (see Section 1.9).
- 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 (Bureau) and those identified in the 'Provision and Requirements for Flood Warning in New South Wales' maintained by NSW SES.

4.5 BRIEFING, TRAINING AND EXERCISING

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

Actions:

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

4.6 COMMUNITY RESILIENCE TO FLOODING

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

Actions:

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

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

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

Actions:

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

5 RESPONSE

5.1 INTRODUCTION

5.1.1 Flood response operations will begin:

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

5.2 INCIDENT MANAGEMENT ARRANGEMENTS

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

Actions:

- a. NSW SES uses the Australasian Inter-service Incident Management System (AIIMS) to manage the flood response.
- b. Control of flood response will be at the lowest effective level and may be scaled to suit the incident.
- c. The NSW SES State Controller (or delegate) will appoint Incident Controllers and establish Incident Control Centres (see NSW SES facilities on map in Appendix A).

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

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

Actions:

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

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

Actions:

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

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

Actions:

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

5.3 USE OF INFORMATION AND COLLECTION OF INTELLIGENCE

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

Actions:

- a. Information relating to the consequences of flooding, response strategies, situational awareness and operational updates will be distributed by NSW SES to supporting emergency services and functional areas listed under this Plan.
- b. All supporting emergency services and functional areas and 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 to assist with the gathering of flood intelligence including (not limited to) maximum flood extents, peak flood heights, recording major flood damage at key high velocity locations and preparation of After-Flood Report.

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

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

5.4 PROVISION OF INFORMATION AND WARNINGS TO THE COMMUNITY

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

Actions:

- a. The Bureau issues public weather and flood warning products before and during a flood. These may include:
 - Severe Thunderstorm Warnings – Detailed - issued for all capital cities and surrounding areas when individual severe thunderstorms are within range of the capital city radars.
 - Severe Thunderstorm Warnings - Broad-based - issued for the entire Australian State or territories affected highlighting broad areas where severe storms may occur within the next 3 hours.
 - Severe Weather Warnings with reference to heavy rainfall and/or storm surge.
 - Flood Watches.

- Flood Warnings.
- b. 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 Systems:
 - Advice;
 - Watch and Act; and
 - Emergency Warning.
 - d. NSW SES liaises with the Bureau 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:
 - Muswellbrook Shire Council website;
 - Transport for NSW 'Live Traffic' website: www.livetraffic.com or 'Transport InfoLine': 131 500. VMS messaging on roadways may also be used to advise motorists.
 - 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. Muswellbrook Shire 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 Muswellbrook Shire 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 Local and Region EMPLAN's contain infrastructure inventories.

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

Actions:

- a. The Transport Services Functional Area is to coordinate the provision of information about the assessment and restoration of transport network infrastructure.
- b. The Energy and Utility Services Functional Area is to coordinate the assessment and restoration of essential energy and utility services (not including telecommunications).
- c. The Telecommunications Services Functional Area is to coordinate the assessment and restoration of telecommunications and the Public Safety Network.
- d. The Engineering Services Functional Area is to:
 - Coordinate the assessment and restoration of critical public buildings for example hospitals.
 - Assessment and operation of flood protection levees.
 - Protection of property.
 - Construction and repair of levees.

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

5.9 EVACUEE MANAGEMENT AND WELFARE

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

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

Actions:

- a. NSW SES will provide initial welfare for evacuees where required but will hand the responsibility over to the Welfare Services Functional Area as soon as possible. NSW SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.
- b. The Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the Welfare Services Functional Area Supporting Plan.
- c. Schools Administration (Government and Private) will manage the safety of students directly affected by flooding and will work with NSW SES in the temporary closure of schools and will coordinate with NSW SES, Transport and Welfare Services in the management of school evacuees.
- d. Disaster Victim Registration will be controlled and coordinated by NSW Police Force with the assistance of NSW SES and the Welfare Services Functional Area.

- e. NSW SES will provide details of all residents assisted in evacuations to the Welfare Services Functional Area as early as possible.
- f. Where the expected remaining number of evacuees and the duration of evacuation is assessed to be beyond the capability and capacity of the established evacuation centre arrangements the SEOCON may establish Major Evacuation Centres or Mass Care facilities.
- g. The decision to establish Major Evacuation Centres or Mass Care Facilities will be made by NSW SES and SEOCON in consultation with members of the State Emergency Management Committee.

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

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

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

Actions:

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

5.10 FLOOD RESCUE

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

Actions:

- a. NSW SES will perform flood rescue, where training and equipment is suitable and where a risk assessment has indicated that the risk to rescuers is acceptable.
- b. Flood rescue operations will be conducted in accordance with the State Rescue Board NSW State Rescue Policy which sets out the framework, governance, responsibilities and requirements for the management and conduct of flood rescue in NSW.
- c. NSW SES may request other supporting emergency services to undertake flood rescues on behalf of NSW SES. Agencies must be authorised/accredited to undertake flood rescue operations in accordance with State Rescue Board requirements, as prescribed by NSW SES. Supporting emergency services must supply information regarding rescues performed to NSW SES. Notification arrangements with NSW Police Force are outlined in the State Rescue Board NSW State Rescue Policy; and

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

5.11 RESUPPLY

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

Actions:

- a. NSW SES will advise communities and businesses if flood predictions indicate that areas are likely to become isolated, and indicative timeframes where possible.
- b. Retailers should be advised to ensure sufficient stock is available for the duration of the flood.
- c. When isolation occurs, NSW SES will establish loading points where retailers can instruct suppliers to deliver goods.
- d. NSW SES will endeavour to support the delivery of mail to isolated communities but may not be able to do so according to normal Australia Post timetables.
- e. NSW SES will assist hospitals with resupply of linen and other consumables where able.
- f. NSW SES may request resupply assistance from supporting agencies.
- g. NSW SES may conduct resupply operations as per the designated resupply plan for the event.
- h. Where additional supplies are required Engineering Services 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. The NSW SES Incident Controller will determine when it is safe to progressively return in consultation with the relevant Emergency Operations Controller and supporting agencies considering the ongoing risk to public safety.
- b. The NSW SES Incident Controller will specify the level of access to affected communities as the following:
 - Not suitable for access; or
 - Limited access by emergency services and response agencies; or
 - Limited access by residents and/or business operators; or
 - Full access.
- c. The NSW SES Incident Controller will issue an Advice Warning advising 'Reduced Threat: Return with Caution' when the immediate danger to life and property has passed for areas.
- d. NSW SES will facilitate the return of evacuees to their homes.

5.13 END OF RESPONSE OPERATIONS

5.13.1 Strategy: Conclude response operations.

Actions:

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

5.14 POST IMPACT ACTIONS

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

Actions:

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

- b. NSW SES will conduct After Action Reviews, at the conclusion of response operations, which will involve all stakeholders. Findings will be shared and incorporated into improved disaster resilience planning.
- c. NSW SES will provide information and data throughout the emergency response to inform community recovery. A report will be developed at the request of the SERCON at the conclusion of the response within an area. Should a response summary report be required it will include the following:
 - The emergency action plan in place at conclusion of the response emphasising any continuing activities including community meetings/ engagement activities.
 - Resources allocated to the emergency response and associated exit strategies.
 - Details of any areas or situations with potential to re-escalate the emergency.
 - A recommendation for the conclusion of NSW SES as lead agency to transition to Resilience NSW as the lead agency for Recovery.
 - Any actions that are incomplete or outstanding.
 - Damage Assessment Data and Information obtained throughout the response phase which will further support the long-term recovery of communities.
- d. NSW SES will undertake/coordinate a comprehensive review of intelligence and plans following significant flood events.

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

Actions: NSW SES works with relevant stakeholders and Muswellbrook 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.

6.2 NSW SES RECOVERY ROLE

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

6.2.2 **Actions:**

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

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

7 ABBREVIATIONS

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

8 GLOSSARY

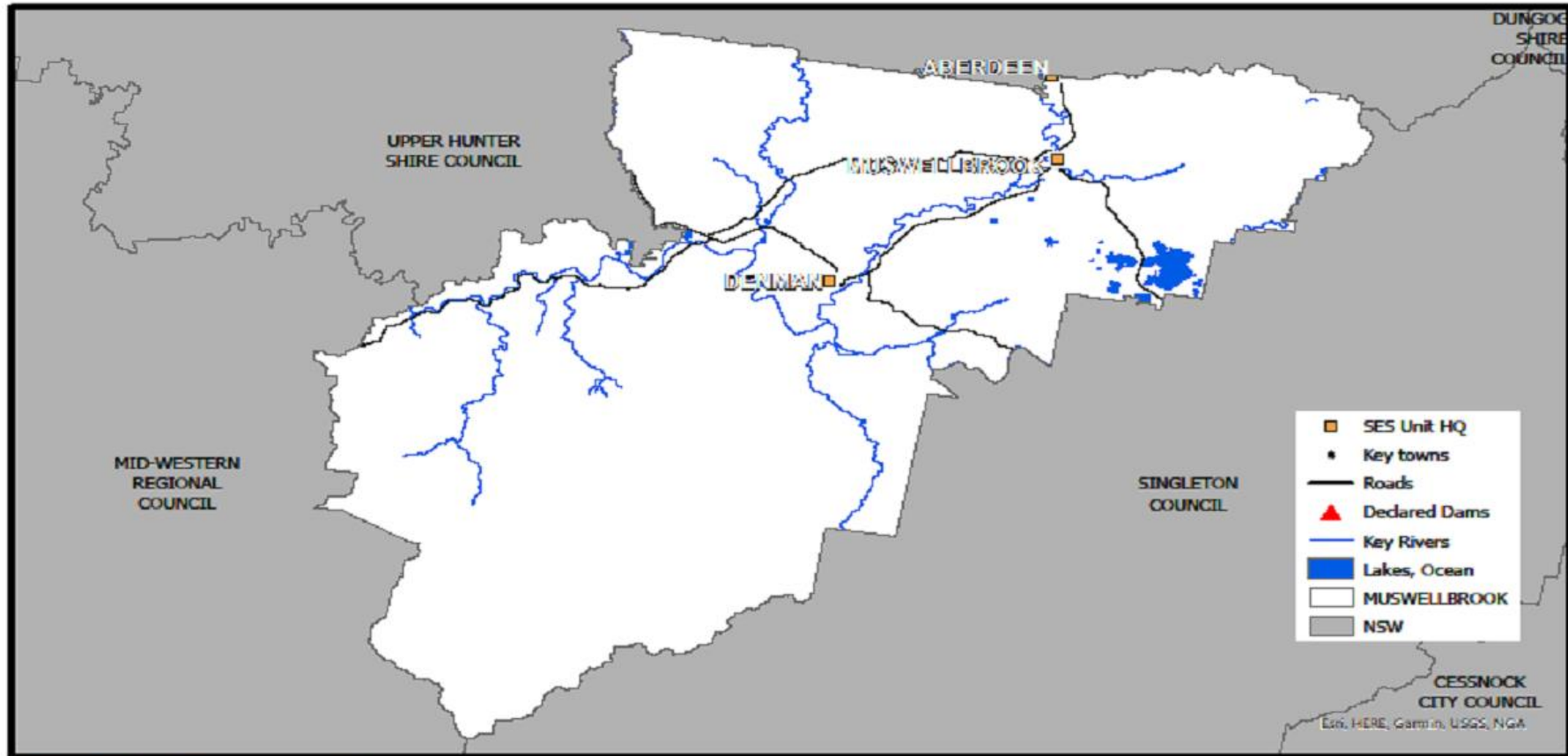
Common emergency service terminology can be found within the Australian Disaster Resilience Glossary.

Readers should refer to EMPLAN Annex 9 – Definitions.

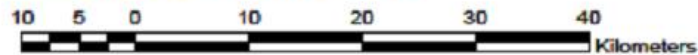
Refer to the NSW State Flood Plan for a complete glossary of terminology used throughout this plan and within NSW SES Flood Plans.

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

9 Appendix A – Map of Muswellbrook Shire Council Area



**MUSWELLBROOK
LGA**



DISCLAIMER This map publication is presented by the NSW State Emergency Service for the purpose of disseminating emergency management information free of charge to members of emergency management organisations. The information in this map publication is not intended for use by the general public or untrained persons, and is not a substitute for professional advice and/or training. Untrained persons should not use this map publication unless they are under the supervision of trained and qualified emergency management personnel. The State Emergency Service disclaims any liability (including for negligence) to any person in respect of anything and the consequences of anything, done, or not done by any such person in whole or partial reliance upon the whole or part of the information in this map publication.

10 Appendix B – Roles and Responsibilities

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

AGENCY	RESPONSIBILITIES
Agriculture and Animal Services Functional Area	The roles and responsibilities for Agriculture and Animal Services are outlined in the Agriculture and Animal Services Supporting Plan and NSW State Flood Plan.
Australian Government Bureau of Meteorology	The roles and responsibilities for the Australian Government Bureau of Meteorology are outlined in the NSW State Flood Plan.
Muswellbrook Shire Council	<p>Preparedness</p> <ul style="list-style-type: none"> • Establish and maintain floodplain and coastal risk management committees and ensure that key agencies are represented. • Develop and implement floodplain risk management plans in accordance with the NSW Government’s Flood Prone Land Policy and the Floodplain Development Manual. • Provide levee studies, flood studies and floodplain management studies to NSW SES. • Maintain council-owned flood warning networks and flood mitigation works. • Participate in NSW SES-led flood emergency planning meetings, to assist in the preparation of Flood Sub Plans. • Maintain a plant and equipment resource list for the council area. • Contribute to community engagement activities. <p>Response</p> <ul style="list-style-type: none"> • Subject to the availability of council resources, assist NSW SES with flood operations including: <ul style="list-style-type: none"> – Traffic management on council managed roads. – Provision of assistance to NSW SES (plant, equipment and personnel where able and requested). – Property protection tasks including sandbagging. – Assist with the removal of caravans from caravan parks. – Warning and/or evacuation of residents and other people in flood

AGENCY	RESPONSIBILITIES
	<p>liable areas.</p> <ul style="list-style-type: none"> – Provision of back-up radio communications. – Resupply of isolated properties. – Technical advice on the impacts of flooding. – 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. – Assist NSW SES to provide filled sandbags and filling facilities to residents and business in areas which flooding is expected. <ul style="list-style-type: none"> • Assist with making facilities available for domestic pets and companion animals of evacuees during evacuations. • Operate flash flood warning systems. • Operate flood mitigation works including critical structures such as detention basins and levees and advise NSW SES regarding their operation. • Manage and protect council-owned infrastructure facilities during floods. • 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. • Advise the Environmental Protection Authority of any sewerage overflow caused by flooding. • Work with NSW SES and NSW Department of Planning and Environment to collect flood related data during and after flood events. <p>Recovery</p> <ul style="list-style-type: none"> • Provide for the management of health hazards associated with flooding including removing debris and waste. • Ensure premises are fit and safe for reoccupation and assess any need for demolition. • Provide services, assistance and advice to State Government in accordance with the State Recovery Plan.
Caravan Park Proprietor(s)	<ul style="list-style-type: none"> • Prepare a flood emergency plan for the Caravan Park. • Ensure that owners and occupiers of movable dwellings are aware that the caravan park is flood liable by providing a written notice to occupiers taking up residence and displaying this notice and

AGENCY	RESPONSIBILITIES
	<p>emergency management arrangement within the park.</p> <ul style="list-style-type: none"> • 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"> – Provide the manager of the caravan park with a contact address and telephone number in case of an emergency. – Leave any movable dwelling in a condition allowing it to be relocated in an emergency (i.e.: should ensure that the wheels, axles and draw bar of the caravans are not removed and are maintained in proper working order). • Ensure that occupiers are informed of Flood Information. At this time, occupiers should be advised to: <ul style="list-style-type: none"> – Ensure that they have spare batteries for their radios. – Listen to a local radio station for updated flood information. – Prepare for evacuation and movable dwelling (cabins) relocation. • Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation when flooding occurs. • Coordinate the evacuation of people and the relocation of movable dwellings when floods are rising and their return when flood waters have subsided. Movable dwellings will be relocated back to the caravan park(s) by owners or by vehicles and drivers arranged by the park managers. • Secure any movable dwellings that are not able to be relocated to prevent floatation. • Inform NSW SES of the progress of evacuation and/or movable dwellings relocation operations and of any need for assistance in the conduct of these tasks.
<p>Childcare Centres and Preschools</p>	<ul style="list-style-type: none"> • When notified of possible flooding or isolation, childcare centres and preschools should. <ul style="list-style-type: none"> – Liaise with NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures. – Assist with coordinating the evacuation of preschools and childcare centres.
<p>Dams Safety NSW</p>	<p>The roles and responsibilities for Dams Safety NSW (formerly NSW Dam Safety Committee) are outlined in the NSW State Flood Plan.</p>
<p>Department of Defence</p>	<p>Arrangements for Defence Assistance to the Civil Community are detailed</p>

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

AGENCY	RESPONSIBILITIES
Management Officer (LEMO)	agencies and officers of the start of response operations.
Manly Hydraulics Laboratory (MHL)	The roles and responsibilities for Manly Hydraulic Laboratory are outlined in the NSW State Flood Plan.
Marine Rescue NSW	The roles and responsibilities for Marine Rescue NSW are outlined in the NSW State Flood Plan.
NSW Ambulance	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission	The roles and responsibilities for NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission are outlined in the NSW State Flood Plan.
NSW Department of Planning and Environment (Environment and Heritage Group)	The roles and responsibilities for NSW Department of Planning and Environment (Environment and Heritage Group) are outlined in the NSW State Flood Plan (referred to as DPIE EES).
NSW Department of Planning and Environment (Water)	<p>The roles and responsibilities for NSW Department of Planning and Environment (Water) are outlined in the NSW State Flood Plan.</p> <p>Owns and manages the Hunter Valley Flood Mitigation Scheme (HVFMS).</p> <p>Prevention</p> <ul style="list-style-type: none"> • Maintains the Hunter Valley Flood Mitigation Scheme in a flood ready state. • Maintains operational capability in relation to emergency management. <p>Preparedness</p> <ul style="list-style-type: none"> • Closes flood gates in response to flood watches and warnings issued by Bureau • in accordance with the Flood Emergency Response Plan. <p>Response</p> <ul style="list-style-type: none"> • Advises NSW SES on status of scheme infrastructure. • Monitors the functioning of the scheme. • Provides intelligence in terms of real time flood modelling, high risk assets and surveillance of operation of scheme. • Responds to community calls regarding damage to scheme infrastructure, or malfunctioning of infrastructure. • Supports NSW SES and ARTC in closing of the Maitland rail floodgates and Maitland ring levee in accordance with the Flood Emergency Response Plan.

AGENCY	RESPONSIBILITIES
	<p>Recovery</p> <ul style="list-style-type: none"> • Undertakes post flood damage assessment of Scheme infrastructure. • Responds to community calls regarding damage and debris. • Prioritises repairs on based risk. • Builds back better.
NSW Food Authority	The roles and responsibilities for NSW Food Authority are outlined in the Food Safety Emergency Sub Plan.
NSW National Parks and Wildlife Services	The roles and responsibilities for NSW National Parks and Wildlife Services are outlined in the NSW State Flood Plan.
NSW Police Force	The roles and responsibilities for NSW Police Force are outlined in the NSW State Flood Plan.
NSW Rural Fire Service	The roles and responsibilities for NSW Rural Fire Service are outlined in the NSW State Flood Plan.
Owners of Declared Dams within or upstream of the LGA	The roles and responsibilities for Owners of Declared Dams are outlined in the NSW State Flood Plan.
Public Information Services Functional Area	The roles and responsibilities for Public Information Services are outlined in the Public Information Services Supporting Plan and NSW State Flood Plan.
Resilience NSW	The roles and responsibilities for Resilience NSW are outlined in the NSW State Flood Plan.
SEOCN/SEOC	The roles and responsibilities for the SEOCN/SEOC are outlined in the NSW State Flood Plan.
Surf Life Saving NSW	The roles and responsibilities for Surf Life Saving NSW are outlined in the NSW State Flood Plan.
Telecommunications Services Functional Area	The roles and responsibilities for Telecommunications Services are outlined in the Telecommunications Services (TELCOPLAN) Supporting Plan.
Transport for NSW	<ul style="list-style-type: none"> • Transport for NSW coordinates information on road conditions for emergency services access. • Transport for NSW coordinates the management of the road network across all modes of transport. • Transport for NSW in conjunction will assist NSW SES with the evacuation of at-risk communities by maintaining access and egress routes. • Assist NSW SES with the communication of flood warnings and

AGENCY	RESPONSIBILITIES
	<p>information provision to the public through Live Traffic and Social Media according to the VMS protocols and procedures.</p> <ul style="list-style-type: none"> • Assist NSW SES with identification of road infrastructure at risk of flooding.
Transport Services Functional Area	The roles and responsibilities for Transport Services are outlined in the Transport Services Functional Area Supporting Plan and NSW State Flood Plan.
VRA Rescue NSW	The roles and responsibilities for VRA Rescue NSW are outlined in the NSW State Flood Plan.
Water NSW	The roles and responsibilities for Water NSW are outlined in the NSW State Flood Plan.
Welfare Services Functional Area	The roles and responsibilities for Welfare Services are outlined in the Welfare Services Functional Area Supporting Plan and NSW State Flood Plan.

11 Appendix C – Community Specific Roles and Responsibilities

<p>Community Members</p>	<p>Preparedness</p> <ul style="list-style-type: none"> • Understand the potential risk and impact of flooding. • Prepare homes and property to reduce the impact of flooding. • Understand warnings and other triggers for action and the safest actions to take in a flood. • Households, institutions and businesses develop plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours. • Have an emergency kit. • Be involved in local emergency planning processes. <p>Recovery</p> <ul style="list-style-type: none"> • Assist with community clean-up if required and able to do so. • Participate in After Action Reviews if required.
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HAZARD AND RISK IN MUSWELLBROOK SHIRE

Volume 2 of the Muswellbrook Shire Local Flood Plan

Last Update: August 2007

ANNEX A - THE FLOOD THREAT

Landforms and River System(s)

1. The Muswellbrook Council area is located in the Upper Hunter Valley of New South Wales and occupies an area of 3,401 square kilometres. The entire council area lies within the catchment areas of the Hunter and Goulburn Rivers.

Hunter River

2. The headwaters of the Hunter River are at elevations of up to about 1,500 metres in the Mt Royal and Liverpool ranges in the Upper Hunter Shire Council area. Most of the upper catchment is rugged, dissected and forested, but considerable areas of floodplain exist within the Muswellbrook council area. Along the main stem of the river, the floodplain within the shire is 60 kilometres long and averages 1.5 kilometres in width.
3. The main tributaries are Dart Brook, Middle Brook, the Kingdom Ponds, Parsons Gully, the Pages and Isis Rivers and the Rouchel, Stewarts, Moonan and Omardale Brooks. These tributaries enter the river upstream of the council area. Muscle and Sandy Creeks enter at the town of Muswellbrook and a different Sandy Creek enters at Denman where it shares a common floodplain with the Hunter River. Martindale Creek joins the Hunter to the south of Denman and below the confluence of the Hunter and Goulburn Rivers.
4. Several uncontrolled tributaries (the Pages and Isis Rivers, Dart and Rouchel Brooks and the Kingdom Ponds) enter the Hunter River between Glenbawn Dam and Muswellbrook. The Sandy Creek which enters the river at Denman is the only significant tributary joining it between the two towns.
5. At Muswellbrook, the Hunter River commands a catchment area of 3380 square kilometres.

Goulburn River

6. The Goulburn River, which joins the Hunter four kilometres downstream of Denman, drains a larger catchment than does the Hunter upstream of this town. Its headwaters are in the Great Dividing Range to the northwest, west and south of the council area and include the entire Goulburn River National Park and much of the Wollemi National Park. Within the shire the river's floodplain is 27 kilometres long and averages 300 metres in width.
7. The main tributaries of the Goulburn, which drains a large plateau area south of the Liverpool Ranges, are the Munmurra, Krui, Bow and Merriwa Rivers, Worondi Rivulet, Wollar, Bylong, Baerami, Halls, Giants and Wybong Creeks and Widdin Brook. Of these, only Wybong, Baerami and Giants Creeks and Widdin Brook enter the Goulburn River within the Muswellbrook Council area.

Storage Dams

Glenbawn Dam

8. This dam, the largest water storage on the Hunter River system, is located 42 kilometres upstream of Muswellbrook and commands a catchment area of 1,295 square kilometres (31% of the Hunter catchment at Muswellbrook and 28% of it at Denman).
9. About 120,000 megalitres of the dam's 870,000 megalitre capacity is allocated to 'store' flood waters and thus limit the impacts of flooding downstream. Considerable mitigation can be achieved for small floods and the frequency of low-level flooding has been reduced since the dam's construction.
10. The effect of the dam on more serious floods like those of 1870 and 1955 (and even 1976 and 1992) is minimal, however, and it cannot prevent severe flooding downstream in such events. The 1955 flood peak would have been reduced by only 0.1 metres at Muswellbrook had the dam existed then, and the 1971 and 1976 peaks were lowered by only about 0.2 and 0.3 metres respectively.
11. At Denman the height of the 1955 flood would have been reduced by only 0.05 metres had the dam been in existence. The level reached by the 1992 flood was reduced by only about 0.2 metres.
12. Glenbawn Dam, Liddell Dam and Plashett Dam (which are located within the Muswellbrook Council area) have been classed as 'non-deficient' by the NSW Dams Safety Committee and are therefore considered to have an unlikely chance of failure. In each case the dam's owner has prepared a Dam Safety Emergency Plan which details surveillance procedures and the management and notification of emergencies.

Weather Systems and Flooding

13. Flooding within the council area can be produced by a number of different types of weather system which tend to occur during particular times of the year. These are:
 14. Low pressure troughs moving into the catchments from northern parts of Australia, usually during the summer and autumn months and sometimes causing very severe flooding as occurred in February 1955. These systems could, on rare occasions, include rain depressions originating as tropical cyclones to the north of the continent.
 15. East coast low-pressure systems which travel along the NSW coast, usually in the cooler months, and produce cool, moist, easterly airflows which can penetrate far enough inland to cause flood-producing rain over the higher tributaries of the Hunter and Goulburn rivers.
 16. Frontal systems crossing the catchment from west to east. These systems rarely produce high daily falls but flooding can occur when sequences of these fronts cross the area over a period of a few days. In general, these systems are

experienced during winter and spring. Flooding in August 1998 resulted from such activity.

17. High-intensity, short-duration convective thunderstorms which usually occur during the summer months. The rain from such storms may cause town drainage systems to surcharge and small creeks to flood, but thunderstorm activity does not cause significant rises in the major rivers. When it occurs, such flooding is 'flash' flooding, with little prior warning.

Characteristics of Flooding

18. Several major tributaries join the Hunter River just above Muswellbrook, and flooding can occur there from individual tributaries or combinations of them. Between Muswellbrook and Denman there are two significant tributaries – Ramrod Creek and Sandy Creek – which enter the river, and there is consequently a high correlation between flood levels at the two towns. Both are built partly on floodplains, and both have periodically experienced partial inundation on several occasions. A part of Denman is located on the joint floodplain of Sandy Creek and the main river, and this area can be flooded from both streams and from the smaller Denman Creek which occupies a shallow depression between the larger streams. Large rural areas on the floodplain outside the towns can be inundated in serious floods.
19. Flood travel time from Aberdeen to Muswellbrook is approximately three hours. Flood waters take about six hours to travel from Muswellbrook to Denman in events of moderate severity but only four hours under high-discharge conditions.
20. There is no simple relationship between rainfall intensity and the severity of flooding within the council area. The prior wetness of the valley is a crucial factor, the sandbeds (especially those of the Goulburn River) being highly absorbent after long periods of dry weather. Considerable attenuation of flood severity can occur as flood waters move downstream.

Flood History

21. Overall, there is no single clear-cut flood season in the council area, though larger numbers of serious floods have been recorded in January and February at Muswellbrook than in any other months. The monthly distribution of such floods (defined here as floods exceeding 10 metres, the level of which the river breaks its banks and begins to inundated the floodplain) is as follows for the period 1806-1998:

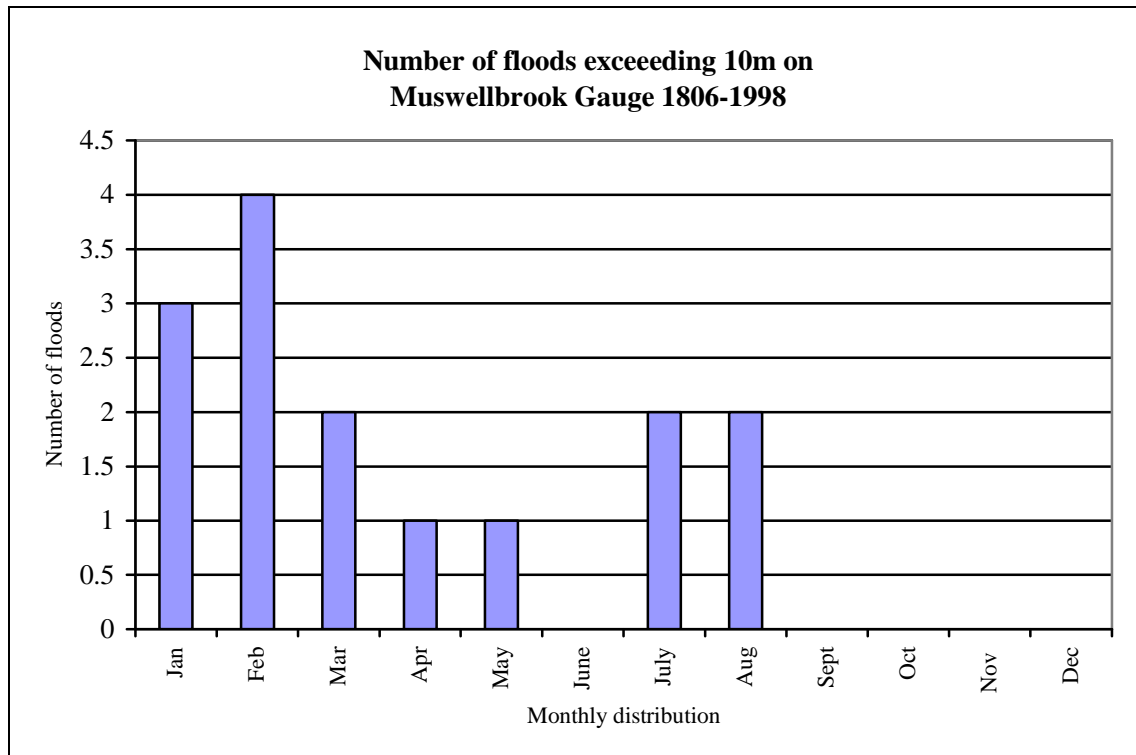


Table A-1: Number of major floods (1806-1998)

22. Flooding exceeding the 10 metre level at the Muswellbrook gauge is sporadic. While 15 separate floods of 10 metres or more have been recorded in the past 192 years (implying that this level is reached about once every 12 years, on average), the gap between 10-metre floods has been as long as 42 years. Equally, two or more such floods can occur in quick succession. Between 1856 and 1874, four floods exceeded the 10-metre level and there were three such events between 1955 and 1976. Since 1976 the level has been exceeded on only one occasion.
23. The most serious floods recorded at Muswellbrook since its foundation were in 1864, 1867, 1870, 1893, 1913, 1921, 1950, 1955, 1971, 1976 and 1992. Of these the most severe were the events of 1870 (which reached 11.77 metres on the Muswellbrook gauge) and 1955 (which reached 11.63 metres). There is anecdotal evidence of a flood in 1806 which may have exceeded 13 metres at the site of Muswellbrook, and another severe event in 1820.

24. Peak heights reached in the serious floods of recent decades at various centres within the council area and nearby were as shown below (in metres at the gauges indicated):

Location	1955	1971	1976	1992	1998	2000
Gundy (Pages R)	8.10	7.10	7.08	8.25	5.3	6.86
Aberdeen (Hunter R)	10.40	9.80	7.08	9.20	8.16	8.16
Muswellbrook (Hunter R)	11.63	11.10	10.40	10.32	9.66	9.98
Denman (Hunter R)	8.29	7.92	7.70	7.60	7.88	7.67
Sandy Hollow (Goulburn R)	10.90	9.50	6.00	7.10	6.07	5.24
Singleton (Hunter R)	14.57	14.07	12.38	11.20	11.6	9.78

Table A-2: Peak Flood Heights in Muswellbrook Shire (in bold)

25. The flood of August 1998 peaked at 9.65m at Muswellbrook.
26. Denman's highest recorded flood, in 1955, reached 8.29 metres on the local gauge. Other floods peaked above 8.0 metres in 1807, 1821 and 1870. The height at which water breaks out of the channel at Denman (7.25 metres) has been exceeded on 20 occasions since 1806.
27. The August 1998 flood peaked at Denman at 7.86 metres.

Design Floods

28. At Muswellbrook and Denman, the 1955 and 1992 floods are thought to represent approximately the 1% and 5% AEP flood events respectively (that is, those with a 1% and 5% chance respectively of occurring in any one year). These correspond with floods of a magnitude which are likely to occur, on average, once every 100 and 20 years respectively. Flood heights for particular Annual Exceedence Probability levels at Muswellbrook and Denman are shown below.

Average Recurrence Interval (ARI) (Years)	Annual Exceedence Probability (% chance of Occurrence in a Single Year)	Gauge Height, Muswellbrook Gauge (metres)	Gauge Height, Denman Gauge (metres)
100	1	11.55	8.23
50	2	11.30	8.02
20	5	10.30	7.60
10	10	8.80	6.93
5	20	6.65	5.50

Table A-3: Design Floods

Flood Mitigation Systems

29. Both Muswellbrook and Denman now have protective levees designed to divert fast-flowing waters and reduce the area of inundation and therefore the number of properties which experience flooding. Some inundation can still occur, however, in serious floods as a result of backwater flow around the levees or levees overtopping. This is especially so in the Muswellbrook case where the number of dwellings which can be inundated has changed little.
30. Augmentation of the Denman Levee at the Golden Highway crossing is required in floods expected to peak above 8.2 metres.
31. Other flood mitigation works within the council area include bank stabilisation and river training works.
32. Muswellbrook Levee is an open ended levee. The levee is tied into high ground at its northern end (Aberdeen Street). The bottom end of the levee is not tied to high ground and therefore allows water into the lower section of Muswellbrook to the west of the railway line. The levee is built to a height of 12.5 metres, which is 1 metre above the 1% AEP flood. A small section of the levee adjacent to the sharp right hand bend in the river (adjacent to Wilkins Street) was built slightly higher to account for the super elevation of the water as it flows around the bend.
33. The Denman Levee is also an open ended levee and is not tied into high ground at either end. The Denman Levee is built to a height of 9.2 metres, which is 1 metre above the 1% AEP flood. Where the Golden Highway (Crinoline Street) passes over the levee, the levee is only built to the height of the 1% AEP flood.

Extreme Flooding

34. From time to time, flood records are broken. This means that the worst floods ever recorded in the Muswellbrook Council area since European settlement are likely to be exceeded at some stage. Worse floods than have been seen in recent decades must be expected.
35. Such floods will be very rare but as tends to occur with extreme events they may reach considerably greater heights than have previously been recorded. In addition, they may be both faster to rise and more dangerous in terms of depth and velocity than previous events.

ANNEX B - EFFECTS OF FLOODING ON THE COMMUNITY

Community Profile

Census Description	LGA	Muswellbrook	Denman
Total Persons	14796	10036	1406
Total Dwellings	5930	4052	558
Total persons aged 65 years and over	1383	969	171
Total persons aged below 15 years	3651	2570	348
Total persons of indigenous origin	503	390	26
Total persons using Internet	4012	2832	304
Single parent families	592	474	46
Persons living alone	1137	834	117
Total persons who do not speak English well	12	8	0
Total persons who lived at a different address 5 years ago	5402	3858	436
Households without vehicles	546	378	24
Total persons residing in caravans, cabins or houseboats	150	92	21
Mean household size	2.7	2.6	2.7

Table B-1: Census of Housing and Population data (2001)

Specific Risk Areas

1. Substantial areas of rural land within the Muswellbrook Council area are inundated during floods and low-lying parts of the urban centres of Muswellbrook and Denman have been flooded quite frequently. Roads can be closed and outlying rural areas isolated. In the most severe floods large-scale evacuations are necessary, mostly in Muswellbrook itself, but some Denman residents and residents of rural areas also need to evacuate. In the most severe floods, farm fences and sheds have been completely washed away and serious stock losses have occurred.

Muswellbrook

2. Muswellbrook (2001 population 10,036) has periodically been affected by flooding, particularly on its western edge which was flooded severely in 1955. Scott, Brook, Ford and Hill Streets were all inundated, along with Sydney, portions of Forbes, Skellatar and Mitchell Streets and the New England Highway. Muscle Creek, which flows through the town, also burst its banks.
3. In this event approximately 250 residential and 40 commercial premises were flooded, some to depths of more than a metre, and many families were forced to take refuge on their roofs. Low-lying areas were flooded for more than 24 hours. In 1971, about 200 houses took in water, low-lying built-up areas being inundated for about 18 hours. A lesser event in February 1992 saw 25 houses inundated beyond floor level.
4. A levee constructed in 1992 to a height of 12.5 metres, which is 1 metre above the 1% AEP (Annual Exceedence Probability) flood, is designed to direct fast-flowing flood waters away from developed areas. This structure will not prevent backwater flooding, however, and property inundation behind it will still occur and will necessitate evacuations. If overtopping or failure occurred, dangerous flow velocities would be experienced. Even without these things taking place, a severe flood such as the 1% AEP event would cause flooding to depths of more than a metre in several residential streets. A major evacuation effort would be necessary.
5. In lesser events, nuisance flooding can occur on Muswellbrook's internal drainage system, especially adjacent to Muscle Creek, Possum Creek and Skellatar Gully.
6. The following river heights measured at the Muswellbrook Bridge Gauge (the gauge for which the Bureau of Meteorology provides flood warnings) cause the following things to occur. Note that inundation within the town begins at a river height of 10 metres.

Gauge Height	Consequences
7.2 metres	Muswellbrook underpass (Bridge Street) cut, Rosebrook Creek flood runner takes flow from Hunter River and Kayuga Road is cut. Impact is that up to 60 houses are eventually cut off from Muswellbrook and most of these can expect to experience over-floor inundation in severe events.
7.8 metres	Wybong Road cut, low-lying river flats flood.
10.0 metres	Hunter River breaks bank and begins to flood Scott and Brook Streets and cause inundation over some floors in Kayuga and Wybong Roads.
10.3 metres	General floodplain inundation occurs. Low-set houses likely to experience over-floor inundation. Access to Denman via MR209 cut.

10.5 metres	Water enters dwellings in Sydney, Brook, Lower Hill, Scott and Ford Streets; access to Racecourse area cut and up to 30 houses isolated along with horse stables. Local runoff could cause this isolation to occur even without main-river flooding.
11.0 metres	Over-floor inundation of dwellings in Mill, Skellator, Barrett and William Streets and Hunter Terrace; additional houses flooded in Sydney, Brook, Lower Hill, Scott and Ford Streets.
11.5 metres	Additional houses flooded in streets named above; over-floor inundation also occurring in Maitland, Mitchell, Fleming, Jordan and Keegan Streets.
11.55 metres	(The 1% AEP flood level). 249 residential and 39 commercial properties are flooded; Muswellbrook subway likely to be cut for 3 days.
12.05 metres	(The 1% AEP flood plus 0.5 metres, roughly equivalent to the once-in-500 year flood). About 326 residences and 59 commercial premises flooded.

Table B-2: Consequences of flooding against Muswellbrook Gauge

7. Muswellbrook SES maintains detailed records of urban flooding within Muswellbrook indicating numbers of dwellings and business premises inundated at different gauge heights up to and including the 1% plus 0.5 metre flood.

Denman

8. Denman (2001 population 1,406) has been severely affected by floods on its eastern side and cut off by flood waters when both Sandy Creek and the Hunter River are in flood simultaneously. The eastern side of the town has a levee with a crest height one metre above the height of a 1% AEP flood (8.20 metres). Where the Golden Highway (Crinoline Street) passes over the levee, the levee is only built to the height of the 1% AEP flood because of Roads and Traffic Authority sight requirements. Where flood heights above 8.20 metres are expected it will be necessary to sandbag this section of the levee. This levee protects the town from overbank flooding from the Hunter River and closes off the former breakout from Sandy Creek.
9. The town can still be completely isolated from all road access during severe events, however, and isolation can last for some days. Backwater flooding can still occur on the southern fringe of the urban area. The total area flooded in a 1% AEP event will be much smaller than the area which was inundated in 1955, when most of the land to the east of Virginia Street was flooded.

10. The following river heights, measured at the Denman Bridge Gauge, cause the effects noted:

Gauge Height	Consequences
5.5 metres	Low-lying river flats inundated, South Denman isolated.
6.9 metres	River breaks its banks; access to Muswellbrook cut at Sandy Creek bridge outside Denman Levee. This conditions evacuation operations on the rural floodplain east of Denman.
7.6 metres	Water begins to back up in the Denman flood depression south of Babbington Street. Access to Muswellbrook cut at Denman Levee.
7.9 metres	Continued back-up of water in the flood depression east of Paxton Street enters Ogilvie and Palace Streets.
8.2 metres	Height at which water would flow over levee at location of Golden Highway if sandbag protection not undertaken.
8.23 metres	(1% AEP flood level). Six residences and a commercial property are flooded in Denman.

Table B-3: Consequences of flooding against Denman Bridge Gauge

Rural Areas

11. Immediately west of Muswellbrook a large area of rural land is subject to inundation. Up to 60 houses can be cut off at relatively low levels by flood runners, and all must be evacuated in severe events. A further 30 dwellings (and several horse stables) in the vicinity of the racecourse can also be cut off and some can later be flooded).
12. Substantial areas of farmland and several houses to the east of Denman can be isolated and inundated. In the valley of the Goulburn River around Sandy Hollow, farm property can be inundated during periods of flooding as is also true near and downstream of the confluence of the Hunter and Goulburn Rivers where about 20 dwellings can be cut off.
13. In total, about 200 rural dwellings within the shire can become cut off from towns during flood periods. In many cases the isolation is caused by short-term flooding of creeks which only lasts for a few hours, but a severe flood on the Hunter and Goulburn rivers could cut some locations off for a period of days and necessitate substantial resupply operations.
14. Such floods in the past have washed away farm fences and sheds and caused severe stock losses.

Road Closures

15. The New England Highway and numerous local roads can be cut following heavy rain or during periods of riverine flooding. Movement to and within the council area can be severely restricted for periods of several days during significant floods. Minor roads can be cut, sometimes more than once in a day, by fast-rising and fast-falling ungauged creeks. In 1955, the New England and Muswellbrook-Merriwa railway lines were cut.
16. The principal roads subject to closure during floods are:
 - SH 9 New England Highway: can be closed in three locations between Muswellbrook and Aberdeen and at Muswellbrook Subway within Muswellbrook. Closure at the subway is in 15% AEP floods.
 - SH 23 Golden Highway (New England Highway to Merriwa): cut at Sandy Creek, Denman.
 - MR 209 Muswellbrook-Denman Road: closed for short periods by storm runoff and for longer periods by 5% AEP floods immediately outside Denman levee and at Whites Gully and Twin Dams Causeway.
 - MR 208 Wybong Road (Muswellbrook to Sandy Hollow): closed at various locations (Rosebrook, Sandy and Reedy Creeks) by low-level flooding.
 - MR 208 Rylstone Road: closed by low-level floods at causeways west of Kerrabee.
 - Castlerock Road: closed by low-level floods.
 - Kayuga Road: closed at Rosebrook Creek in low level floods.
17. Many minor roads are closed in very low-level floods of the kind that can be expected every year or two.

Effects on Utilities and Infrastructure

18. The Sewerage System becomes inoperable at 11.1m on the Muswellbrook Gauge. The Muswellbrook Water Treatment plant is inundated when a gauge height of 12.5 metres is reached (Overtopping of Levee).

SES RESPONSE ARRANGEMENTS FOR MUSWELLBROOK SHIRE

Volume 3 of the Muswellbrook Shire Local Flood Plan

Last Update: August 2007

ANNEX C - GAUGES MONITORED BY THE MUSWELLBROOK SES LOCAL HEADQUARTERS

Gauge Name	Type	AWRC No	Stream	Flood Classification			Reading Arrangements
				Min	Mod	Maj	
Aberdeen	Telemeter	210056	Hunter River				DECC
Cressfield (Parkville)	Telemeter	210093	Kingdon Ponds				DECC
Belltrees	Telemeter	210039	Hunter River				DECC
Muswellbrook*‡	Telemeter	210002	Hunter River	7.0	8.0	10.5	DECC
Denman *‡	Telemeter	210055	Hunter River	5.5	6.9	7.6	DECC
Liddell	Telemeter	210083	Hunter River				DECC
Moonan Dam Site	Telemeter	210018	Hunter River				DECC
Stick-Me-Up Bridge	Telemeter	210118	Isis River				DECC
Blandford	Telemeter	210061	Pages River				DECC
Gundy	Telemeter	210052	Pages River				DECC
Upstream of Kewell Creek	Telemeter	210142	Pages River				DECC
Aberdeen No 2	Telemeter	210088	Dart Brook				DECC
Yarrandi Br	Telemeter	210124	Dart Brook				DECC
McIntyre Br	Manual	10229	Dart Brook				SES
The Vale (Rouchel Brook)	Telemeter	210014	Rouchel Brook				DECC
Kerrabee	Telemeter	210016	Goulburn River				DECC
Sandy Hollow	Telemeter	210031	Goulburn River				DECC
Wybong	Telemeter	210040	Wybong Creek				DECC

Notes:

1. The Bureau of Meteorology provides flood warnings for the gauges marked with an asterisk (*).
2. SES Local Flood Advices are provided for the gauges marked with a single cross (†).
3. The SES holds a Flood Intelligence Card for the gauges marked with a double cross (‡).
4. The Muswellbrook SES Local Headquarters interrogates the Hunter Integrated Telemetry System (HITS) via the internet.

ANNEX D - DISSEMINATION OF SES FLOOD BULLETINS

The Hunter SES Region Headquarters distributes SES Flood Bulletins and other flood related information (including Flood Warnings) to the following regional media outlets:

Television Stations:

Station	Location
NBN 3	Newcastle
Prime	Newcastle
Prime (Channel 7)	Sydney
TEN (Southern Cross Ten)	Coffs Harbour
TEN (Southern Cross Ten)	Canberra

Radio Stations:

Station	Location	Frequency	Modulation
2NM	Muswellbrook	981	AM
2UH ABC	Muswellbrook/ Newcastle	1044	AM
Power FM	Muswellbrook	98.1	FM

Newspapers:

Name	Location
Newcastle Herald	Newcastle
Hunter Valley News/Muswellbrook Chronicle	Muswellbrook

Other Agencies:

- All other agencies listed with responsibilities under this plan or Local Disaster Plan

ANNEX E - TEMPLATE EVACUATION WARNING MESSAGE FOR MUSWELLBROOK, DENMAN AND VICINITIES

Evacuation Warning for []

Date/Time of Issue: []

Authorised By: []

The Bureau of Meteorology has predicted a flood level of [] metres at [] (*place*) at [] (*time*). This means that the following area(s) may be inundated [].

It is recommended that you prepare to evacuate/for evacuation within the next [] hours. If you leave it later, the roads may be congested or closed.

To prepare for evacuation, you should:

- Raise belongings by placing them on tables, beds and benches. Put electrical items on top. Some items may be able to be placed in ceilings.
- Gather medicines, personal and financial documents and mementos together to take with you.
- Listen to radio stations 2NM (AM 981), Power FM (98.1) or 2UH (AM 1044) for further information and to confirm this warning.
- If possible, check to see whether your neighbours need help.
- Make arrangements for care of pets or companion animals.

If evacuation is necessary:

- Turn off the electricity, gas and water.
- Take three days' supply of clothes with you.
- If you have a car, drive to the evacuation centre at [] (specify route if appropriate).
- If you don't have a car, buses will operate on normal routes. Special transport can also be provided on request if necessary, telephone the SES on 132-500.
- So that you can be accounted for, it is important that you register at the evacuation centre.
- After registering, you may go to the house of a friend or relative. Alternatively, accommodation will be arranged for you.
- The Police will provide security for your property while you are away.

ANNEX F - ARRANGEMENTS FOR THE EVACUATION OF CARAVAN PARKS AND THE RELOCATION OF CARAVANS

General

1. The following caravan parks are flood liable:
 - a. Riverside Caravan Park (Muswellbrook) needs to be evacuated before 8 metres is reached if 9 metres is forecast on the Muswellbrook Gauge.
 - b. Denman Van Village

Advising Procedures

2. Caravan Park proprietors are encouraged to ensure that the owners and occupiers of caravans are:
 - a. Made aware that the caravan park is flood liable by:
 - Handing a printed notice to occupiers taking up residence. The notice will indicate that the caravan park is liable to flooding and outline the evacuation and van relocation arrangements as detailed in this Annex.
 - Displaying this notice prominently in each van.
 - b. Made aware that if they are expecting to be absent from their vans for extended periods, they must:
 - Provide the manager with a key; in a sealed envelope; to the van.
 - Provide a contact address and telephone number.
 - Inform the manager if a vehicle will be required to relocate the van during flood time.
 - Leave any mobile van in a condition allowing it to be towed in an emergency (ie: tyres inflated, jacks wound up, personal effects secured and annexes and lines for water, sewer, electricity and gas readily detachable).
 - c. Informed when a flood is rising. 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 van relocation.

3. The Muswellbrook SES Local Controller will ensure that the managers of caravan parks are advised of flood warnings and the details of any evacuation order.

Evacuation of Occupants and Relocation of Vans

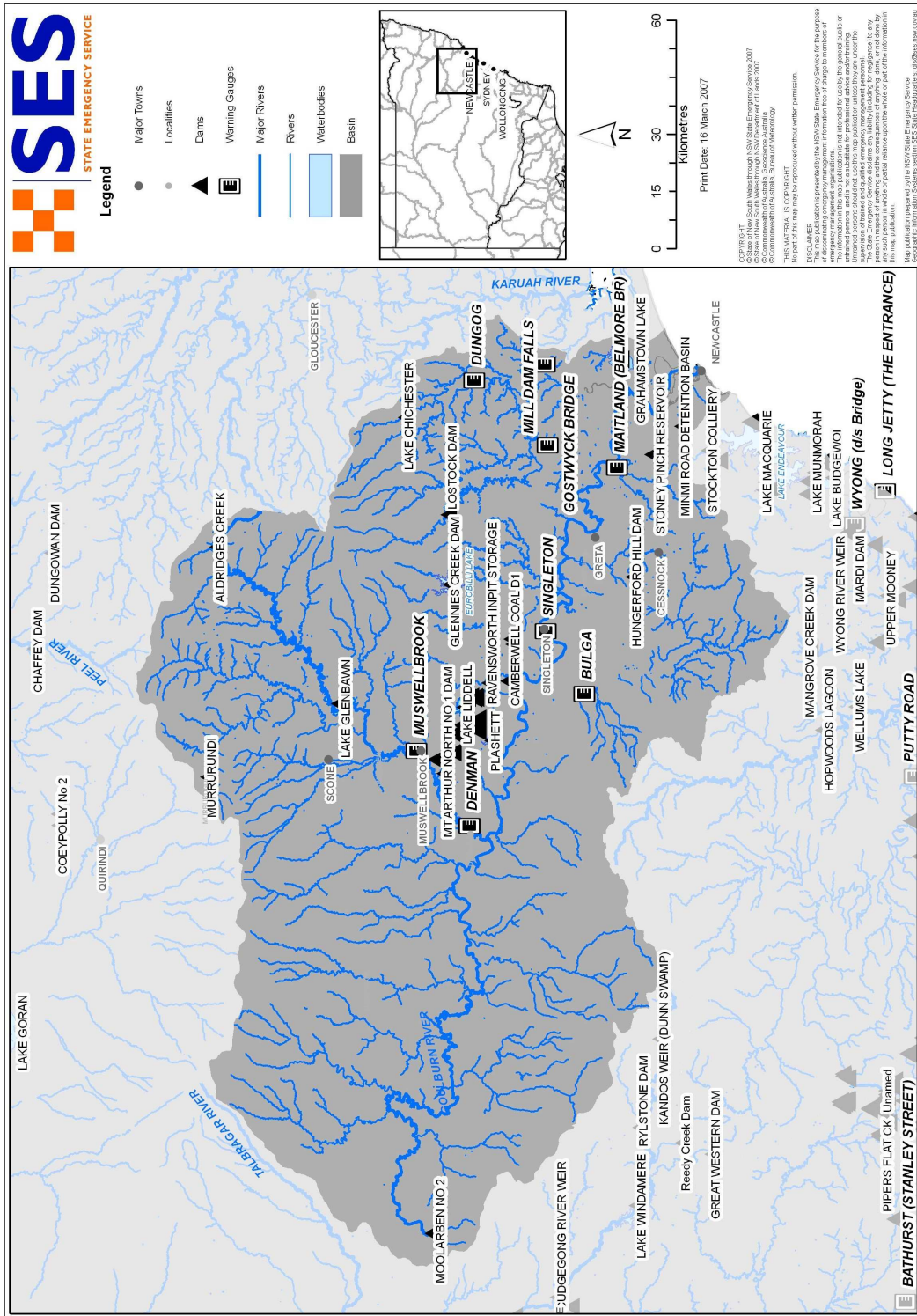
4. Caravan park proprietors are encouraged to install flood depth indicators and road alignment markers within their caravan parks.
5. When an evacuation order is given:
 - a. Occupiers of non-movable vans should:
 - Secure their vans by tying them down to prevent flotation.
 - Isolate power to their vans.
 - Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.
 - Lift the other contents of their vans as high as possible within the van.
 - Move to a designated evacuation centre in Muswellbrook or Denman if they have their own transport, or move to the caravan office to await transport.
 - b. Where possible, vans that can be moved will be relocated by their owners. Park managers will arrange for the relocation of mobile vans whose owners do not have a vehicle. Council and SES personnel will assist if required and may be able to provide additional vehicles. Vans are to be moved to the following locations:
 - Riverside residents and vans are to be relocated to Pinaroo Caravan Park via Sydney and Maitland Streets.
 - Denman Van Village will be relocated to Denman Showground via Virginia and Ogilvie Streets.
6. Caravan park managers are encouraged to:
 - a. Ensure that their caravan park is capable of being evacuated within 1.5 hours.
 - b. Advise the Muswellbrook SES Local Controller of:
 - The number of people requiring transport.
 - Details of any medical evacuations required.
 - Whether additional assistance is required to effect the evacuation.
 - c. Check that no people remain in non-removable vans that are likely to be inundated.

- d. Inform the Muswellbrook SES Local Controller when the evacuation of the caravan park has been completed.
- e. Provide the Muswellbrook SES Local Controller with a register of people that have been evacuated.

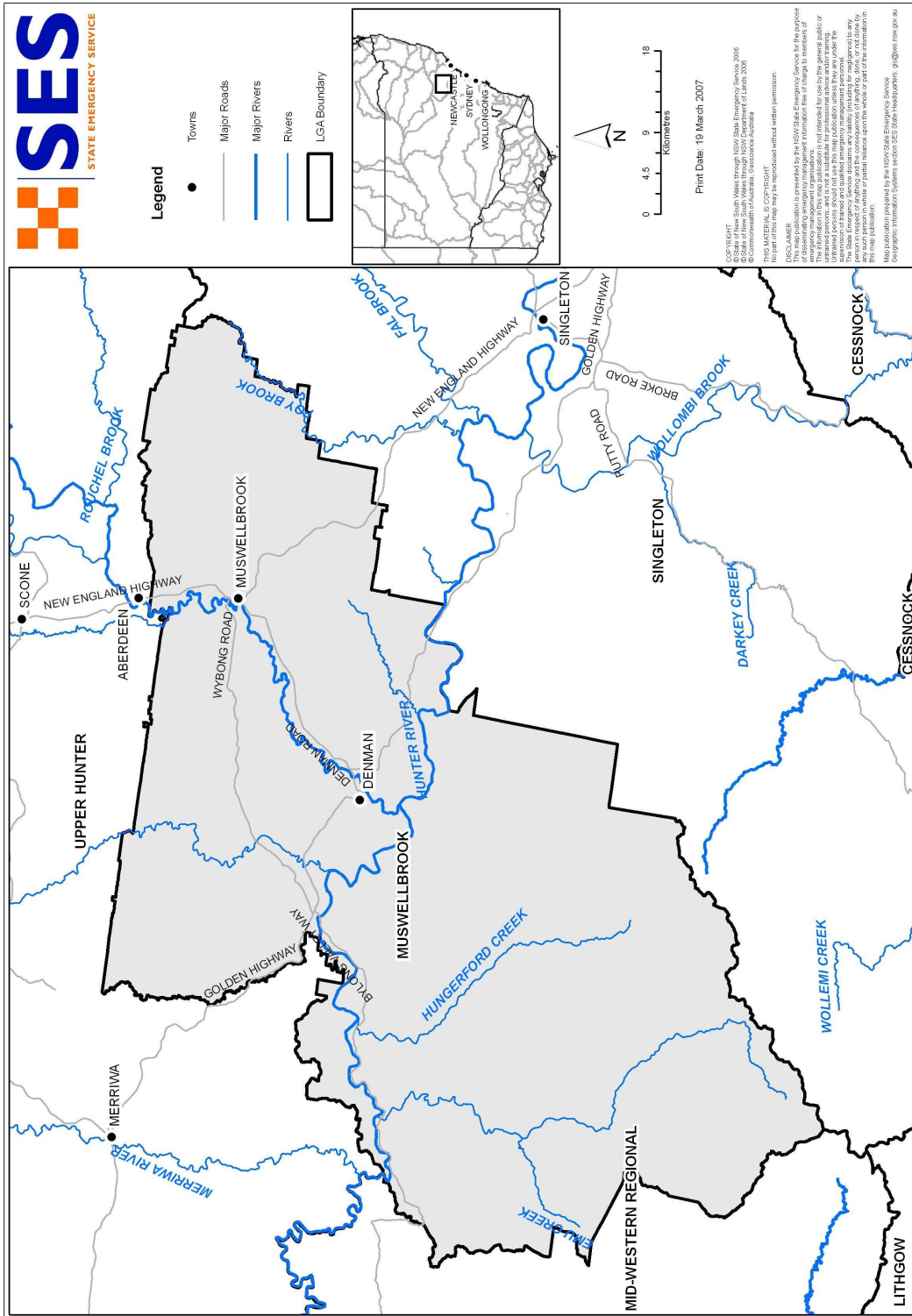
Return of Occupants and Vans

- 7. The Muswellbrook SES Local Controller, using council resources as necessary, will advise when it is safe for the caravan parks to be re-occupied.
- 8. Vans will be towed back to the caravan park(s) by van owners or by vehicles and drivers arranged by the park managers. Again, Council and SES personnel will assist if available.

MAP 1 - RIVER BASIN



MAP 2 - COUNCIL AREA



MAP 4 – DENMAN

