

Corowa Shire

Local Flood Plan



July 2015

To be reviewed no later than July 2020

COROWA SHIRE FLOOD EMERGENCY SUB PLAN

A Sub-Plan of the Corowa Shire Local Emergency Management Plan (EMPLAN)

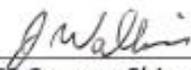
Volume 1 of the Corowa Shire Local Flood Plan



AUTHORISATION

The Corowa Shire Flood Emergency Sub Plan is a sub plan of the Corowa 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 authorised by the Local Emergency Management Committee in accordance with the provisions of the **State Emergency and Rescue Management Act 1989 (NSW)**.

Recommended



NSW SES Corowa Shire Local Controller

Date: 20-7-15

Approved



Chair, Local Emergency Management Committee

Date: 20 July 2015

CONTENTS

AUTHORISATION	i
CONTENTS	ii
LIST OF TABLES	iii
DISTRIBUTION LIST	iv
VERSION HISTORY.....	v
AMENDMENT LIST	v
LIST OF ABBREVIATIONS	vi
GLOSSARY.....	viii
PART 1 - INTRODUCTION	1
1.1 Purpose.....	1
1.2 Authority.....	1
1.3 Area Covered by the Plan	1
1.4 Description of Flooding and its Effects	1
1.5 Responsibilities	1
PART 2 - PREPAREDNESS.....	16
2.1 Maintenance of this Plan	16
2.2 Floodplain Risk Management	16
2.3 Development of Flood Intelligence.....	16
2.4 Development of Warning Systems	16
2.5 Community Resilience	17
2.6 Training.....	17
2.7 Resources.....	17
PART 3 - RESPONSE.....	18
3.1 Control Arrangements	18
3.2 Operational Management	18
3.3 Start of Response Operations.....	18
3.4 Response Strategies.....	19
3.5 Operations Centres.....	20
3.6 Liaison.....	20
3.7 End of Response Operations.....	21
3.8 Collating Situational Information.....	21
3.9 Provision of Flood Information and Warnings.....	23
3.10 Aircraft Management	25
3.11 Assistance for Animals.....	26
3.12 Communication Systems	26
3.13 Preliminary Deployments	26
3.14 Road and Traffic Control.....	27
3.15 Stranded Travellers.....	27
3.16 Managing Property Protection Operations	27
3.17 Managing Flood Rescue Operations	28
3.18 Managing Evacuation Operations.....	28

3.19 Managing Resupply Operations..... 34

PART 4 - RECOVERY..... 36

4.1 Recovery Coordination at the Local level 36

4.2 Recovery Coordination at the Region and State level 36

4.3 Arrangements for Debriefs / After Action Reviews 37

ATTACHMENT 1 - Resupply Flowchart 38

ATTACHMENT 2 - Dam Failure Alert Notification Arrangements Flowchart 39

ATTACHMENT 3 - Corowa Shire LGA Map 40

LIST OF REFERENCES 41

LIST OF TABLES

Table 1: Dam Failure Alert Levels 25

DISTRIBUTION LIST

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

VERSION HISTORY

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

Description	Date
Corowa Shire Local Flood Plan	April 2008

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

The Corowa Local Controller
 NSW State Emergency Service
 112 John St
 COROWA, NSW, 2646

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

Amendment Number	Description	Updated by	Date

Document Issue: V1-07072015

LIST OF ABBREVIATIONS

The following abbreviations have been used in this plan:

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

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

GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Flood. Relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences, including Tsunami.

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

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

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

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

Flood of Record. Maximum observed historical flood.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Inundation. See definition for Flood.

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

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

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

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

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

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

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

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

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

- does not have operational responsibility for the incidents under its' authority;
- sets agency priorities;
- coordinates and allocates critical resources;
- ensures effective communications;
- ensures high level coordination between participating agencies; and ensures incident management objectives are met (5).

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

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

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

Riverine Flooding. Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam. Riverine flooding

generally excludes watercourses constructed with pipes or artificial channels considered as stormwater channels (1).

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

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

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

Total Flood Warning System. A flood warning system is made up of components which must be integrated if the system is to operate effectively. Components of the total flood warning system include monitoring rainfall and river flows, prediction, interpretation of the likely impacts, construction and dissemination of warning messages, response by agencies and community members, and review of the warning system after flood events (6).

PART 1 - INTRODUCTION

1.1 PURPOSE

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

1.2 AUTHORITY

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

1.3 AREA COVERED BY THE PLAN

- 1.3.1 The area covered by the plan is the Corowa Shire LGA which includes: the major towns of Corowa, Howlong and Mulwala, and the villages of Daysdale, Balldale and the localities of Coreen, Hopefield, Redlands, Buraja/Lowesdale, Rennie and Savernake and intervening rural areas.
- 1.3.2 The council area and its principal rivers and creeks are shown in Attachment 3.
- 1.3.3 The council area is in the NSW SES Murray Region and for emergency management purposes is part of the Riverina - Murray Emergency Management Region.

1.4 DESCRIPTION OF FLOODING AND ITS EFFECTS

- 1.4.1 The NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Corowa Shire LGA.

1.5 RESPONSIBILITIES

- 1.5.1 The general responsibilities of emergency service organisations and supporting services (functional areas) are listed in the Local and State Emergency Management Plans (EMPLAN). Some specific responsibilities are expanded upon in the following paragraphs. The extent of their implementation will depend on the severity of the flooding.

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

Preparedness

- a. Maintain a Local Headquarters at Edward Street, Corowa in accordance with the NSW SES Controllers' Guide and the NSW SES Operations Manual.
- b. Ensure that NSW SES members are trained to undertake operations in accordance with current policy as laid down in the NSW SES Controllers' Guide and the NSW SES Operations Manual.
- c. Coordinate the development and operation of a flood warning service for the community.
- d. Participate in floodplain risk management initiatives organised by the Corowa Shire Council.
- e. Coordinate a community engagement and capacity building program regarding local flood issues and associated risks to assist communities in building resilience to floods.
- f. Identify and monitor people and/or communities at risk of flooding.
- g. Ensure that the currency of this plan is maintained.

Response

- h. Appoint an appropriate Incident Controller to undertake response roles. The Incident Controller will;
 - Control flood and storm response operations. This includes;
 - Directing the activities of the NSW SES units operating within the council area.
 - Coordinating the activities of supporting agencies and organisations and ensuring that liaison is established with them.
 - Contribute to preparation of Region IAP.
 - Coordinate the provision of information services in relation to;
 - Flood heights and flood behaviour.
 - Road conditions and closures.
 - Advice on methods of limiting property damage.
 - Confirmation of evacuation warnings and evacuation orders.
 - Direct the conduct of flood rescue operations.
 - Coordinate the provision of the evacuation of people and/or communities.
 - Provide immediate welfare support for evacuated people.

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

Recovery

- i. Ensure that appropriate After Action Reviews are held after floods.
- j. Provide appropriate representation to the recovery committee for the duration of the response phase of an event and as agreed during the recovery phase.

1.5.3 NSW SES Corowa Unit Members

- a. Carry out flood response tasks. These may include;
 - The management of the NSW SES Corowa Local Headquarters Operations Centres.
 - Assist in the collection of flood information for the development of intelligence.
 - Flood rescue.
 - Evacuation.
 - Providing immediate welfare for evacuated people.
 - Delivery of warnings and information.
 - Resupply.
 - Levee monitoring.
 - Sandbagging.
 - Lifting and/or moving household furniture and commercial stock.
 - Animal rescue.
 - Assisting in repairing or improving levees.
 - Assisting with road closure and traffic control operations.
 - Assisting with emergency fodder supply operations.
- b. Assist with preparedness activities.
- c. Undertake training in flood and storm response operations.

1.5.4 Corowa Shire Local Emergency Operations Controller (LEOCON)

- a. Monitor flood operations.
- b. Request and coordinate support to the NSW SES Corowa Local Controller if requested to do so.

1.5.5 Corowa Shire Local Emergency Management Officer

- a. Provide executive support to the LEMC and LEOCON in accordance with the Corowa Shire Local Emergency Management Plan.
- b. At the request of the NSW SES Corowa Local Controller, advise appropriate agencies and officers of the start of response operations.

1.5.6 Corowa Shire Council

Preparedness

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

- b. Establish and maintain floodplain risk management committees and ensure that key agencies are represented on such committees.
- c. Provide levee studies, flood studies and floodplain management studies to the NSW SES.
- d. Maintain a plant and equipment resource list for the council area.
- e. Work with NSW SES on the development and implementation of a community engagement and capacity building program.

Response

- f. At the request of the NSW SES Local Controller, deploy personnel and resources for flood related activities.
- g. Close and reopen council roads (and other roads nominated by agreement with the RMS) and advise the NSW SES Corowa Local Controller and the Police.
- h. Provide information on the status of roads.
- i. Assist with the provision of filled sandbags to urban and village areas in which flooding is expected.
- j. Assist with the removal of caravans from caravan parks.
- k. Provide back-up radio communications.
- l. In the event of evacuations, assist with making facilities available for the domestic pets and companion animals of evacuees.

Recovery

- m. Provide for the management of health hazards associated with flooding. This includes removing debris and waste.
- n. Ensure premises are fit and safe for reoccupation and assess any need for demolition.
- o. Arrange for storage of evacuees' furniture as required.

1.5.7 Community Members

Preparedness

- a. Understanding the potential risk and impact of flooding;
- b. Preparing homes and property to reduce the impact of flooding;
- c. Understanding warnings and other triggers for action and the safest actions to take in a flood;
- d. Households, institutions and businesses developing plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours;
- e. Having an emergency kit;
- f. Being involved in local emergency planning processes.

1.5.8 Agriculture and Animal Services Functional Area

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

1.5.9 New South Wales Ambulance

- a. Assist with the evacuation of at risk communities (in particular elderly and/or infirm people).
- b. Deploy ambulance resources to appropriate locations if access is expected to be lost.
- c. Assist the NSW SES with flood rescue operations.

1.5.10 Australian Government Bureau of Meteorology (The Bureau)

- a. Provide Flood Watches for the Murray River Basin.
- b. Provide Flood Warnings, incorporating height-time predictions, for Corowa (409002) and Yarrowonga Weir (409025) gauges.
- c. Provide severe weather warnings when flash flooding is likely to occur.

1.5.11 Caravan Park Proprietor(s)

- a. Prepare a flood emergency plan for the Caravan Park.
- b. Ensure that owners and occupiers of moveable dwellings are aware that the caravan park is flood liable by;
 - Providing a written notice to occupiers taking up residence. The notice will indicate that the caravan park is liable to flooding and designate the location of flood liable land within the park.
 - Displaying this notice and the emergency arrangements for the Caravan Park prominently in the park.
- c. Ensure that owners and occupiers of moveable dwellings are aware that if they are expecting to be absent for extended periods, they should:

- Provide the manager of the caravan park with a contact address and telephone number in case of an emergency.
 - Leave any moveable 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) (7).
- d. Ensure that occupiers are informed of Flood Information. At this time, occupiers should be advised to;
- Ensure that they have spare batteries for their radios.
 - Listen to a local radio station for updated flood information.
 - Prepare for evacuation and moveable dwelling relocation.
- e. Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and moveable dwelling relocation when flooding occurs.
- f. Coordinate the evacuation of people and the relocation of moveable dwellings when floods are rising and their return when flood waters have subsided. Moveable dwellings will be relocated back to the caravan park(s) by owners or by vehicles and drivers arranged by the park managers.
- g. Secure any moveable dwellings that are not able to be relocated to prevent flotation.
- h. Inform the NSW SES of the progress of evacuation and/or moveable dwellings relocation operations and of any need for assistance in the conduct of these tasks.

1.5.12 **Child Care Centres and Preschools**

- a. Childcare Centres are to be contacted by the NSW SES in the event of possible flooding or isolation.
- b. When notified the child care centres and preschools should;
- Liaise with the NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures.
 - Assist with coordinating the evacuation of preschools and child care centres.

1.5.13 **Energy and Utility Services Functional Area**

- a. When requested by NSW SES;
- Implement the Energy and Utilities Services Functional Area Supporting Plan.

- Where required, coordinate energy and utility services emergency management planning, preparation, response and recovery, including the restoration of services following a flood event.
 - Coordinate advice to the NSW SES of any need to disconnect electricity, gas, water or wastewater services.
 - Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
 - Identify interdependencies between flooding and utility services due to secondary impacts of flooding and advise the NSW SES.
 - Assist the NSW SES with advisory notices relating to hazards from utility services during flooding.
 - Coordinate with utilities on restoration of services, including advisory notices relating to estimated time for restoration and mandatory safety checks prior to reconnection. Advise the NSW SES and the relevant recovery committee and coordinator of the timetable for restoration.
- b. Local utility service distribution providers (electricity, gas, water, waste water):
- Provide advice to the NSW SES Corowa Local Controller of any need to disconnect power/gas/water/waste water supplies or of any timetable for reconnection.
 - Advise the NSW SES of any hazards from utility services during flooding.
 - Advise the public with regard to electrical hazards during flooding and to the availability or otherwise of the electricity supply.
 - Clear or make safe any hazard caused by power lines or electricity distribution equipment.
 - Reconnect customers' electrical/ gas/ water/waste water installations, when certified safe to do so and as conditions allow.
 - Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.14 Engineering Services Functional Area

- a. When requested by NSW SES;
- Provide engineering advice regarding the integrity of damaged structures.
 - Assist the NSW SES with damage assessment.
 - Acquire and/or provide specialist technical engineering expertise.
 - Assist the NSW SES and councils with the assessment and operation of flood protection levees when requested.

- Assist with property protection, including the construction or repair of levees.
 - Coordinate the restoration of critical public facilities.
- b. When requested by the Recovery Coordinator:
- Establish Recovery Centres by the procurement and fit-out of suitable properties.
- 1.5.15 **Environmental Services Functional Area**
- a. When requested by NSW SES;
- Implement the Environmental Services Functional Area (Enviroplan) Supporting Plan if required.
- 1.5.16 **Fire and Rescue NSW, Corowa and Mulwala**
- a. FRNSW responsibilities are primarily confined to the FRNSW Fire District. Any deployment of FRNSW resources to assist NSW SES in flood events rests with the respective FRNSW Commander which must be a Senior Officer.
- b. The FRNSW Commander will assess the capability of FRNSW to assist NSW SES in the following tasks:
- Assist the NSW SES with the warning and/or evacuation of at risk communities.
 - Assist the NSW SES with the monitoring / reconnaissance of flood prone areas.
 - Assist the NSW SES with the resupply of isolated communities and/or properties.
 - Assist the NSW SES with property protection tasks including sandbagging.
 - Provide resources for pumping flood water out of buildings and from low-lying areas.
 - Assist with cleanup operations, including the hosing out of flood affected properties.
 - Coordinate the deployment of fire resources to communities within Fire and Rescue NSW fire districts if access is expected to be lost in consultation with the NSW SES.
- c. FRNSW will use its best endeavours to deploy appliances and or resources into locations where access is expected to be lost.
- 1.5.17 **Forestry Corporation of NSW**
- a. Close and evacuate at risk camping grounds in State Forest managed areas.

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

1.5.18 Health Services Functional Area

- a. When requested by NSW SES;
 - Activate Healthplan if required.
 - Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods.
 - Provide medical support to the NSW SES.
 - Establish health surveillance in affected areas.
 - Assess potential public health risks that either acutely endanger the health of human populations or are thought to have longer term consequences.
 - Provide environmental health advice.
 - Provide public health warnings and advice to affected communities.
 - Provide psychological counselling support to the community and emergency response workers impacted, via NSW Health Mental Health Division.
 - Assist the NSW SES with the warning and evacuation of public hospitals, private hospitals and residential aged care facilities.
 - Undertake vulnerable persons assessment for mental health and drug and alcohol dependant persons, dialysis, frail and/or aged and oxygen dependant persons in the community, known to the health service.

1.5.19 NSW Office of Water

- a. Collect and maintain flood data including data relating to flood heights, velocities and discharges.
- b. Provide the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings.
- c. Provide flow rating charts for river height gauges.

- d. Manage (with technical support from OEH) the approval process under the Water Act 1912 and Water Management Act 2000 for flood control works (earthworks, embankments and levees which can affect the distribution of floodwaters) including;
 - Assessment and approval of flood control works (including flood mitigation works) in rural areas designated under the Acts.
 - Use of floodplain management plans prepared by OEH in rural areas designated under the Acts to assess flood control work approvals.
 - Giving the NSW SES access to relevant studies regarding flooding and studies supporting floodplain management plans prepared by OEH including flood studies, floodplain risk management studies and flood behaviour investigations.
- 1.5.20 **NSW Police Force, Albury Local Area Command (LAC)**
- a. Assist the NSW SES with the delivery of evacuation warnings and evacuation orders.
 - b. Assist the NSW SES with the conduct of evacuation operations.
 - c. Conduct road and traffic control operations in conjunction with council and/or RMS.
 - d. Coordinate the registration of evacuees.
 - e. Secure evacuated areas.
- 1.5.21 **NSW Rural Fire Service (RFS Corowa Shire)**
- a. Provide personnel in rural areas and villages to;
 - Inform the NSW SES Corowa Local Controller about flood conditions and response needs in their own communities, and
 - Disseminate flood information.
 - b. Provide personnel and high-clearance vehicles for flood related activities.
 - c. Assist the NSW SES with the delivery of evacuation warnings and evacuation orders.
 - d. Assist the NSW SES with the conduct of evacuations.
 - e. Provide equipment for pumping flood water out of buildings and from low-lying areas.
 - f. Assist with the removal of caravans.
 - g. Provide back-up radio communications.
 - h. Assist with clean-up operations, including the hosing of flood affected properties.
 - i. Deploy fire resources to appropriate locations if access is expected to be lost.

1.5.22 Office of Environment and Heritage

- a. Provide specialist policy, engineering and scientific advice to councils and the NSW SES on flood related matters including assistance with;
 - The identification of flood problems.
 - The preparation of Floodplain Risk Management Plans and associated studies.
 - The implementation of floodplain risk management plans. This involves floodplain management projects which include flood mitigation works, flood warning, strategic land use planning and upgrade of evacuation routes.
 - The exercising of Local Flood Plans.
- b. Provide specialist advice flood related matters as follows:
 - Provide the NSW SES with access to relevant studies regarding flooding, including Flood Studies and Floodplain Risk Management Studies.
 - Coordinate the collection of post event flood data, in consultation with the NSW SES.
 - Provide data to the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings (through a contract with MHL as described in the Response section of this plan).
- c. **Parks and Wildlife Service**
 - Close and reopen Parks and Wildlife Service roads when affected by flood waters and advise the NSW SES of its status.
 - Facilitate the safe reliable access of emergency resources on Parks and Wildlife Service managed roads.
 - Assist the NSW SES with identification of road infrastructure at risk of flooding.
 - Manage traffic on Parks and Wildlife Service roads.
 - Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

1.5.23 Owners of Prescribed Dams within or upstream of Corowa

Dam	Owner
Hume Dam	Murray Darling Basin Authority
Yarrawonga Weir	Murray Darling Basin Authority

- a. Maintain and operate the Dam Failure Warning System for their Dam(s).
- b. Contribute to the development and implementation of community engagement and capacity building programs on flooding.
- c. Consult with NSW SES on the determination of dam failure alert levels and notification arrangements when developing Dam Safety Emergency Plans.
- d. Maintain a Dam Safety Emergency Plan and provide copies to the NSW SES.
- e. Provide information on the consequences of dam failure to the NSW SES for incorporation into planning and flood intelligence.

1.5.24 Private Companies

- a. Assist with the provision of;
 - Bus transport and drivers for evacuation, resupply or commuting purposes.
 - Trucks and drivers to relocate furniture.
 - Warehousing facilities to store furniture.
 - Sand for sandbagging.
 - Space for evacuation centres.

1.5.25 Public Information Services Functional Area

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

1.5.26 Roads and Maritime Services

- a. Manage traffic on state roads, state highways and waterways affected by flood waters and advise the NSW SES of their status including the Riverina Highway.
- b. Facilitate the safe reliable access of emergency resources on RMS managed roads.
- c. Assist the NSW SES with identification of road infrastructure at risk of flooding.
- d. Assist in Traffic management associated with evacuations where necessary.
- e. Enter state road closure information into the Live Traffic site.

-
- f. Assist the NSW SES and local councils with the communication of warnings and information provision to the public through variable message signs.
- g. Cooperate with the Transport Services Functional Area Coordinator.
- 1.5.27 **School Administration Offices (including Catholic Education Office Wagga Wagga, Department of Education Wagga Wagga and Private Schools)**
- a. Liaise with the NSW SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures (or where required, for students to be moved to a suitable location until normal school closing time).
- b. Pass information to school bus drivers/companies and/or other schools on expected or actual impacts of flooding.
- c. Assist with coordinating the evacuation of schools when flooding or isolation is expected to occur.
- d. Provide space in schools for evacuation centres where necessary.
- 1.5.28 **Service and Sporting Clubs - Apex and Lions**
- a. Assist with;
- Delivery of evacuation warnings.
 - Conduct of evacuations.
 - Lifting and/or moving household furniture and commercial stock.
 - Sandbagging.
- 1.5.29 **Telecommunication Services Functional Area**
- a. When requested by NSW SES;
- Coordinate the restoration of telephone facilities damaged by flooding.
 - Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
- 1.5.30 **The Transport Services Functional Area Coordinator (TSFAC)**
- a. The TSFAC will assist NSW SES, emergency services and other functional areas through the provision of transport services, including;
- The movement of emergency equipment and personnel.
 - The movement of emergency supplies and goods, including water, fuel and food.
 - The evacuation of people and animals.
 - Assistance for medical transport.
 - Transportation of animals and infectious material/dangerous goods.

- Maintaining and operating a transport route advisory service to the NSW SES, emergency services organisations and other Functional Areas and members of the community.
- Coordinate the provision of traffic and transport operations as consistent with the roles of Transport organisations.

1.5.31 **NSW Train Link and Sydney Trains**

- a. Operate NSW rail services through the Corowa Shire including the management of railway services affected by flood waters and advise the NSW SES.
- b. Assist the NSW SES with the movement or evacuation of people during flood response operations if required.
- c. Convey flood information and flood warnings to passengers and travellers on NSW/Sydney trains.
- d. Cooperate with, and assist the NSW SES Local Controller in relation to public safety during flood emergencies.
- e. Cooperate with the Transport Services Functional Area Coordinator.

1.5.32 **Welfare Services Functional Area**

- a. When requested by NSW SES;
 - Establish and manage evacuation centres, and provide disaster welfare services from recovery centres.
 - Administer the Personal Hardship and Distress component of the NSW Disaster Relief Scheme established to provide financial assistance to people affected by emergencies.

1.5.33 **NSW Volunteer Rescue Association (VRA), Corowa**

- a. Assist the NSW SES Corowa Local Controller with flood operations, where equipment and training are suitable.

PART 2 - PREPAREDNESS

2.1 MAINTENANCE OF THIS PLAN

- 2.1.1 The NSW SES Corowa Local Controller will maintain the currency of this plan by;
- a. Ensuring that all agencies, organisations and officers mentioned in it are aware of their roles and responsibilities.
 - b. Conducting exercises to test arrangements.
 - c. Reviewing the contents of the plan;
 - After each flood operation.
 - When significant changes in land-use or community characteristics occur.
 - When new information from flood studies become available.
 - When flood control or mitigation works are implemented or altered.
 - When there are changes that alter agreed plan arrangements.
- 2.1.2 The plan is to be reviewed no less frequently than every five years.

2.2 FLOODPLAIN RISK MANAGEMENT

- 2.2.1 The NSW SES Corowa Local Controller will ensure that;
- a. NSW SES participates in local floodplain risk management committee activities when those committees are formed, in accordance with the protocols outlined in the NSW SES Controllers' Guide.
 - b. The NSW SES Murray Region Headquarters is informed of involvement in floodplain risk management activities.

2.3 DEVELOPMENT OF FLOOD INTELLIGENCE

- 2.3.1 Flood intelligence describes flood behaviour and its effects on the community.
- 2.3.2 The NSW SES maintains a centralised flood intelligence system.

2.4 DEVELOPMENT OF WARNING SYSTEMS

- 2.4.1 The NSW SES establishes total flood warning systems for areas affected by flooding. This requires;
- a. An identification of the potential clients of flood warning information at different levels of flooding (i.e. who would be affected in floods of differing severities).
 - b. Available information about the estimated impacts of flooding at different heights.

- c. Identification of required actions and the amounts of time needed to carry them out.
- d. Appropriate means of disseminating warnings to different clients and at different flood levels.

2.5 COMMUNITY RESILIENCE

- 2.5.1 The community needs to be as prepared as emergency agencies for the impact of all hazards (8) including flooding.
- 2.5.2 As the combat agency, NSW SES has the primary responsibility for the collation, assessment and public dissemination of information relating to flooding (3). To do this, NSW SES will require assistance from other agencies, particularly local government councils, dam owners, and the Bureau in the development and delivery of materials.
- 2.5.3 The NSW SES Corowa Local Controller, with the assistance of the Corowa Shire Council, the NSW SES Murray Region Headquarters and NSW SES State Headquarters, is responsible for the collation, assessment and public dissemination of information relating to flooding (3).
- 2.5.4 A range of tailored strategies to be employed with NSW communities include:
 - a. Dissemination of flood-related brochures and booklets in flood liable areas.
 - b. Talks and displays orientated to community organisations, businesses and schools.
 - c. Publicity given to this plan and to flood-orientated NSW SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

2.6 TRAINING

- 2.6.1 Throughout this document there are references to functions that must be carried out by the members of the NSW SES Corowa Unit. The NSW SES Corowa Local Controller is responsible for ensuring that the members are;
 - a. Familiar with the contents of this plan.
 - b. Trained in the skills necessary to carry out the tasks allocated to the NSW SES.

2.7 RESOURCES

- 2.7.1 The NSW SES Corowa Local Controller is responsible for maintaining the condition and state of readiness of NSW SES equipment and the NSW SES Corowa Local Headquarters.

PART 3 - RESPONSE

CONTROL

3.1 CONTROL ARRANGEMENTS

- 3.1.1 The NSW SES is the legislated Combat Agency for floods and is responsible for the control of flood operations. This includes the coordination of other agencies and organisations for flood management tasks.
- 3.1.2 The Local EMPLAN will operate to provide support as requested by the NSW SES Incident Controller.

3.2 OPERATIONAL MANAGEMENT

- 3.2.1 NSW SES utilises the Australasian Inter-service Incident Management System (AIIMS), which is based on five principles;
 - a. Flexibility;
 - b. Functional management;
 - c. Management by objectives;
 - d. Unity of Command; and
 - e. Span of control.
- 3.2.2 AIIMS provides for different incident levels based on the complexity of management.
- 3.2.3 The Local Government Area may be divided into sectors and divisions to manage the flood event (divisions are usually a group of sectors).
- 3.2.4 Sectors and divisions may be based on floodplain classifications, geographical, physical or functional boundaries. A town, city or suburb may be one sector or split into several sectors and divisions.

3.3 START OF RESPONSE OPERATIONS

- 3.3.1 This plan is always active to ensure that preparedness actions detailed in this plan are completed.
- 3.3.2 Response operations will begin;
 - a. On receipt of a Bureau of Meteorology Preliminary Flood Warning, Flood Warning, Flood Watch, Severe Thunderstorm Warning or a Severe Weather Warning for flash flooding.
 - b. On receipt of a dam failure alert.
 - c. When other evidence leads to an expectation of flooding within the council area.

- 3.3.3 Contact with the Bureau of Meteorology to discuss the development of flood warnings will normally be through the NSW SES Murray Region Headquarters and/or NSW SES State Headquarters.
- 3.3.4 The following persons and organisations will be advised of the start of response operations regardless of the location and severity of the flooding anticipated:
- a. NSW SES Murray Region Headquarters.
 - b. Corowa Rescue Squad (VRA).
 - c. Corowa Shire Local Emergency Operations Controller (for transmission to the NSW Police Force Local Area Command Headquarters).
 - d. Corowa Shire Local Emergency Management Officer (for transmission to appropriate council officers and departments).
 - e. Corowa Shire Council Mayor.
 - f. Other agencies listed in this plan will be advised by the Local Emergency Management Officer on the request of the NSW SES Incident Controller and as appropriate to the location and nature of the threat.

3.4 RESPONSE STRATEGIES

- 3.4.1 The main response strategies for NSW SES flood operations include;
- a. Information Provision and Warning
 - Provision of warnings, information and advice to communities.
 - Inform the community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.
 - Provide timely and accurate information to the community.
 - b. Property protection
 - Protect the property of residents and businesses at risk of flood damage.
 - Assistance with property protection by way of sandbagging and the lifting or transporting of furniture, personal effects, commercial stock and caravans.
 - Assistance with the protection of essential infrastructure.
 - c. Evacuation
 - Evacuation is a risk management strategy that may be used to mitigate the effects of an emergency on a community. It involves the movement of people to a safer location and their return. For an evacuation to be effective it must be appropriately planned and implemented (6).

- d. Flood Rescue
 - The rescue or safe retrieval of persons or animals trapped by floodwaters.
 - e. Resupply
 - Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.
 - Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.
- 3.4.2 The NSW SES Incident Controller will select the appropriate response strategy to deal with the expected impact of the flood in each sector and/or community. The impact may vary so a number of different strategies may need to be selected and implemented across the whole operational area. The available strategies for each sector and/or community are maintained by the NSW SES.
- 3.4.3 Supporting agency strategies may include;
- a. Protect the community from incidents involving fire and hazardous materials.
 - b. Maintain the welfare of communities and individuals affected by the impact of a flood.
 - c. Minimise disruption to the community by ensuring supply of essential energy and utility services.
 - d. Ensure coordinated health services are available to and accessible by the flood affected communities.
 - e. Maintain the welfare of animals affected by the impact of a flood.

3.5 OPERATIONS CENTRES

- 3.5.1 The NSW SES Corowa Operations Centre is located at the Corowa Rescue Squad Building, Edward Street, Corowa.
- 3.5.2 Supporting EOCs are located at;
- a. The Corowa Shire Emergency Operations Centre is located at the RFS Building, Corowa Aerodrome.

3.6 LIAISON

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

- 3.6.2 In accordance with NSW EMPLAN, Liaison Officers will;
- a. Maintain communication with and convey directions/requests to their organisation or functional area;
 - b. Provide advice on the status, resource availability, capabilities, actions and requirements of their organisation or functional area, and
 - c. Where appropriate, have the authority to deploy the resources of their parent organisation at the request of the NSW SES Incident Controller.

3.7 END OF RESPONSE OPERATIONS

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

PLANNING

3.8 COLLATING SITUATIONAL INFORMATION

Strategy

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

Actions

- 3.8.2 The NSW SES Corowa Local Headquarters collates information on the current situation in the Corowa Shire LGA and incorporates in Situation Reports.
- 3.8.3 The NSW SES Murray Region Headquarters collates Region-wide information for inclusion in NSW SES Region Situation Reports.
- 3.8.4 Sources of situational information during times of flooding are;
- a. **Agency Situation Reports.** Agencies and functional areas provide regular situation reports (SITREPs) to the NSW SES.
 - b. **Active Reconnaissance.** The NSW SES Incident Controller is responsible for coordinating the reconnaissance of impact areas, recording and communicating observations. Reconnaissance can be performed on the ground and using remote sensing (more commonly aerial). The NSW SES monitors the following problem areas:
 - Rural properties on the floodplain on the southern side of the Riverina Highway between Corowa and Howlong.
 - Caravan parks in Howlong and Corowa.

- c. The **Bureau of Meteorology's Flood Warning Centre** provides river height and rainfall information, data is available on the website <http://www.bom.gov.au/nsw/flood/>.
 - d. **Manly Hydraulics Laboratory (a business unit within NSW Public Works)** automated river watch system funded by the Office of Environment and Heritage. This system provides river height and rainfall readings for a number of gauges in the Corowa Shire LGA. Recent data from this system is available on the Manly Hydraulic Laboratory website: <http://www.mhl.nsw.gov.au>. A history of area floods is also available upon request via the website.
 - e. **NSW Office of Water**. This office advises flow rates and rates of rise for the Murray River. Daily river reports containing information on gauge heights and river flows are available from the website: <http://waterinfo.nsw.gov.au/>.
 - f. **Hume Dam Dam Failure System**. This system provides information on inflows to, outflows from and heights at Hume Dam. This system is operated by the Murray Darling Basin Commission.
 - g. **NSW SES Murray Region Headquarters**. The Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins and Situation Reports).
 - h. **Corowa Shire Council**. Road closure information.
 - i. **River Murray Water**. River Murray Water has been established by the Murray-Darling Basin Ministerial Council as an internal business division of the Murray-Darling Basin Authority for the specific purpose of operating and managing the River Murray system. Weekly river reports containing information on gauge heights and river flows are available online http://www.mdbc.gov.au/rmw/river_information_centre.
- 3.8.5 During flood operations sources of information on roads closed by flooding include;
- a. Corowa Shire Council (website and telephone service)
 - b. Albury Police Local Area Command.
 - c. Roads and Maritime Services (website and telephone service).
 - d. NSW SES Murray Region Headquarters.
 - e. NSW SES Corowa Local Headquarters.
- 3.8.6 Situational information relating to consequences of flooding should be used to verify and validate NSW SES Flood Intelligence records.

3.9 PROVISION OF FLOOD INFORMATION AND WARNINGS

Strategy

- 3.9.1 The NSW SES Corowa Local Headquarters provides advice to the NSW SES Murray Region Headquarters on current and expected impacts of flooding in the Corowa Shire LGA.
- 3.9.2 The NSW SES Murray Region Headquarters issues NSW SES Flood Bulletins, NSW SES Livestock and Equipment Warnings, Evacuation Warnings and Evacuation Orders to media outlets and agencies on behalf of all NSW SES units in the Region.

Actions

- 3.9.3 The **NSW SES Incident Controller** will ensure that the NSW SES Operational Area Commander is regularly briefed on the progress of operations.
- 3.9.4 **NSW SES Corowa Local Headquarters operations staff** will be briefed regularly so that they can provide information in response to inquiries received in person or by other means such as phone or fax.
- 3.9.5 **Bureau of Meteorology Severe Thunderstorm Warning.** These are issued direct to the media by the Bureau when severe thunderstorms are expected to produce dangerous or damaging conditions, including flash flooding. Severe thunderstorms are usually smaller in scale than events covered by Flood Watches and Severe Weather Warnings.
- 3.9.6 **Bureau of Meteorology Severe Weather Warnings for Flash Flooding.** These are issued direct to the media by the Bureau and provide a warning of the possibility for flash flooding as a result of intense rainfall. These warnings are issued when severe weather is expected to affect land based communities with 6 to 24 hours. Severe Weather Warnings may also include other conditions such as Damaging Winds.
- 3.9.7 **Bureau of Meteorology Flood Watches.** Flood Watches are issued by the Bureau to advise people of the potential for flooding in a catchment area based on predicted or actual rainfall. Flood Watches will be included in NSW SES Flood Bulletins issued by the NSW SES Murray Region Headquarters.
- 3.9.8 **Bureau of Meteorology Flood Warnings.** The NSW SES Murray Region Headquarters will send a copy of Bureau Flood Warnings to the NSW SES Corowa Unit. On receipt the NSW SES Incident Controller will provide the NSW SES Murray Region Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in NSW SES Region Flood Bulletins.
- 3.9.9 **NSW SES Livestock and Equipment Warnings.** Following heavy rain or when there are indications of significant creek or river rises (even to levels below Minor Flood heights), the NSW SES Incident Controller will advise the NSW SES Murray Region Headquarters which will issue NSW SES Livestock and Equipment Warnings.

- 3.9.10 **NSW SES Local Flood Advices.** The NSW SES Incident Controller may issue Local Flood Advices for locations not covered by Bureau Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into NSW SES Region Flood Bulletins.
- 3.9.11 **NSW SES Flood Bulletins.** The NSW SES Murray Region Headquarters will regularly issue NSW SES Flood Bulletins which describe information on the estimated impacts of flooding at the predicted heights (using information from Bureau Flood Warnings and NSW SES Local Flood Advices) to NSW SES units, media outlets and agencies on behalf of all NSW SES units in the Region.
- 3.9.12 **NSW SES Evacuation Warnings and Evacuation Orders.** These are usually issued to the media by the NSW SES Operational Area Commander on behalf of the NSW SES Incident Controller.
- 3.9.13 **Dam Failure Alerts.** Dam failure alerts are issued to NSW SES by the dam owner, in accordance with arrangements in the Dam Safety Emergency Plan (DSEP), the system involves the Dam Owner notifying NSW SES State Headquarters Operations Communications Centre, who in turn distribute the warning to the NSW SES Region Headquarters and NSW SES Unit Headquarters.
- 3.9.14 A flow chart illustrating the notification arrangements for potential dam failure is shown in Attachment 2.
- 3.9.15 Dam failure alert levels are set in consultation with the NSW SES and are used to trigger appropriate response actions. The conditions that define each of the alert levels are listed in the relevant DSEP. Responses escalate as the alert level migrates from white to amber to red. Table 1 briefly outlines example defining conditions and appropriate NSW SES responses associated with each alert.

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

Table 1: Dam Failure Alert Levels

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

- 3.9.16 The NSW SES / Dam Owner will disseminate warnings to the population at risk of dam failure (these arrangements are specific to each dam, are negotiated between the Dam Owner and NSW SES, and are documented in the DSEP).
- 3.9.17 Special arrangements apply in the case of severe flooding that may have the potential to cause the failure of Hume Dam. Details of these arrangements are maintained by the NSW SES.
- 3.9.18 **Standard Emergency Warning Signal (SEWS)**. This signal may be played over radio and television stations to alert communities to Evacuation Warnings, Evacuation Orders, Special Warnings or Dam-Failure Warnings. Approval to use the signal is associated with who approves the warning/order message.
- 3.9.19 **The Public Information and Inquiry Centre (PIIC)** (operated by the NSW Police Force) will answer calls from the public regarding registered evacuees.
- 3.9.20 **The Disaster Welfare Assistance line** is a central support and contact point for disaster affected people inquiring about welfare services advice and assistance. This normally operates during business hours, but can be extended when required.
- 3.9.21 **The RMS Transport Information Line** will provide advice to callers on the status of roads. The RMS website also lists road closure information.
- 3.9.22 **Corowa Shire Council** will provide information on the status of roads.
- 3.9.23 Collation and dissemination of road information is actioned as follows:
 - a. As part of Situation Reports, the NSW SES Incident Controller provides road status reports for main roads in the council area to the NSW SES Murray Region Headquarters.
 - b. The NSW SES Murray Region Headquarters distributes information on main roads to NSW SES units, media outlets and agencies as part of NSW SES Flood Bulletins.

OPERATIONS

3.10 AIRCRAFT MANAGEMENT

- 3.10.1 Aircraft can be used for a variety of purposes during flood operations including evacuation, rescue, resupply, reconnaissance and emergency travel.
- 3.10.2 Air support operations will be conducted under the control of the NSW SES Region Headquarters, which may allocate aircraft to units if applicable.

- 3.10.3 NSW SES maintains the following information for the Corowa Shire Council area;
- a. Locations of suitable helicopter landing points.
 - b. Locations of suitable airports and records detailing aircraft size and type that can land at airports.
 - c. Intelligence on when access to these locations is expected to be lost.

3.11 ASSISTANCE FOR ANIMALS

- 3.11.1 Matters relating to the welfare of livestock, companion animals and wildlife are to be referred to Agriculture and Animal Services Functional Area.
- 3.11.2 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be referred to Agriculture and Animal Services Functional Area.
- 3.11.3 Requests for animal rescue should be referred to the NSW SES.

3.12 COMMUNICATION SYSTEMS

- 3.12.1 The primary means of communications between fixed locations is by telephone, email and facsimile.
- 3.12.2 The primary means of communication to and between deployed NSW SES resources is by UHF radio, the NSW SES PMR system and/or by PSTN and satellite phone.
- 3.12.3 All liaison officers will provide their own communication links back to their parent agencies.
- 3.12.4 All other organisations will provide communications as necessary to their deployed field teams.
- 3.12.5 Back-up communications are provided as follows:
- a. Corowa Rural Fire Service.
 - b. Corowa Shire Council.

3.13 PRELIMINARY DEPLOYMENTS

- 3.13.1 When flooding is expected to be severe enough to cut road access to towns, within towns and/or rural communities, the NSW SES Incident Controller will ensure that resources are in place for the distribution of foodstuffs and medical supplies to the areas that could become isolated.
- 3.13.2 When access between locations is expected to be cut, the NSW SES Incident Controller will advise appropriate agencies so that resources (including sandbags, fire fighting appliances, ambulances, etc.) are deployed to ensure that operational capability is maintained.

3.14 ROAD AND TRAFFIC CONTROL

- 3.14.1 A number of roads within the council area are affected by flooding. NSW SES maintains details of these roads.
- 3.14.2 The council closes and re-opens its own roads.
- 3.14.3 The NSW Police Force has the authority to close and re-open roads but will normally only do so (if the Council or the RMS have not already acted) if public safety requires such action.
- 3.14.4 When resources permit, the NSW SES assists Council, RMS or the Police by erecting road closure signs and barriers.
- 3.14.5 In flood events, the NSW SES Incident Controller may direct the imposition of traffic control measures. The entry into flood affected areas will be controlled in accordance with the provisions of the State Emergency Service Act, 1989 (Part 5, Sections 19, 20, 21 and 22) and the State Emergency Rescue Management Act, 1989 (Part 4, Sections 60KA, 60L and 61).
- 3.14.6 Police, RMS or Council officers closing or re-opening roads or bridges affected by flooding are to advise the NSW SES Corowa Local Headquarters, which will then provide a road information service to local emergency services, the public and the NSW SES Murray Region Headquarters. All such information will also be passed to the Police, RMS and the Council.

3.15 STRANDED TRAVELLERS

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

3.16 MANAGING PROPERTY PROTECTION OPERATIONS

Strategy

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

Actions

- 3.16.2 The NSW SES is the responsible agency for the coordination of operations to protect property.
- 3.16.3 Property may be protected from floods by;
- a. Lifting or moving of household furniture.
 - b. Lifting or moving commercial stock and equipment.
 - c. Sandbagging to minimise entry of water into buildings.
- 3.16.4 The NSW SES Corowa Local Headquarters maintains a small stock of sandbags, and back-up supplies are available through the NSW SES Murray Region Headquarters. A motorised sandbag-filling machine is available from NSW SES

Murray Region Headquarters. Alternatively, local concrete trucks may be used.

3.17 MANAGING FLOOD RESCUE OPERATIONS

Strategy

3.17.1 Rescue of people and animals from floods.

Actions

3.17.2 The NSW SES Incident Controller controls flood rescue in Corowa Shire LGA during a flood emergency.

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

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

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

3.18 MANAGING EVACUATION OPERATIONS

Strategy

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

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

Actions

3.18.2 The evacuation operation will have the following stages:

- a. Decision to evacuate.
- b. Mobilisation (mobilisation may begin prior to the decision to evacuate).
- c. Evacuation Warning delivery.
- d. Evacuation Order delivery.
- e. Withdrawal.
- f. Shelter.
- g. Return.

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

Decision to evacuate

- 3.18.4 In most cases the decision to evacuate rests with the NSW SES Incident Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the NSW SES Operational Area Commander and the Local Emergency Operations Controller.
- 3.18.5 In events that require large scale evacuations, the decision to evacuate must be escalated to the NSW SES Operational Area Commander or the State Controller.
- 3.18.6 Some people will make their own decision to evacuate earlier and move to alternate accommodation, using their own transport. This is referred to as self-managed evacuation (9).

Mobilisation

- 3.18.7 The NSW SES Incident Controller will request the following personnel for doorknock teams for designated Sectors/locations:
- NSW SES Corowa Unit members.
 - RFS Corowa District members via the RFS Fire Control Officer.
 - Local Police Force officers via the local area command.
- 3.18.8 The NSW SES Operational Area Controller will request any additional personnel required to assist with doorknock teams using;
- NSW SES members from the NSW SES Murray Region and surrounding NSW SES Regions.
 - FRNSW personnel arranged via the FRNSW Liaison Officer.
 - RFS personnel arranged via the RFS Liaison Officer.
- 3.18.9 The NSW SES Incident Controller will request the Chairperson of the LEMC to provide Council personnel to assist with traffic coordination within Sector(s)/Community.
- 3.18.10 The NSW SES Incident Controller will arrange liaison officers for Sector Command Centres.
- 3.18.11 The NSW SES Operational Area Commander will request the required number of buses for Sectors via the Transport Services Functional Area.

Delivery of Evacuation Warnings and Evacuation Orders

- 3.18.12 The NSW SES will advise the community of the requirements to evacuate. The NSW SES will issue an **Evacuation Warning** when the intent of an NSW SES

- Incident Controller is to warn the community of the need to prepare for a possible evacuation.
- 3.18.13 The NSW SES will issue an **Evacuation Order** when the intent of the NSW SES Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.
- 3.18.14 The NSW SES Incident Controller will distribute Evacuation Warnings and Evacuation Orders to;
- a. Sector/Division Command Centres (where established).
 - b. Corowa Shire Local Emergency Operations Centre.
 - c. Corowa Shire Council.
 - d. Albury Police Local Area Command.
 - e. Corowa Rural Fire Service Control Centre.
 - f. Radio Stations.
 - g. Other local agencies and specified individuals.
- 3.18.15 The NSW SES Operational Area Commander will distribute Evacuation Warnings and Evacuation Orders to;
- a. The NSW SES State Operations Centre.
 - b. The NSW SES Incident Controller.
 - c. Affected communities via dial-out warning systems where installed or applicable.
 - d. Relevant media outlets and agencies.
- 3.18.16 Evacuation Warnings and Evacuation Orders may be delivered through;
- a. Radio and television stations.
 - b. Doorknocking by emergency service personnel.
 - c. Public address systems (fixed or mobile).
 - d. Telephony-based systems (including Emergency Alert).
 - e. Two-way Radio.
 - f. Direct access to Radio Station - ABC Goulburn Murray
- 3.18.17 The Standard Emergency Warning Signal (SEWS) may be used to precede all Evacuation Orders broadcast on Radio Stations.
- 3.18.18 Sector Commanders, where established, will distribute Evacuation Orders via Emergency Service personnel in doorknock teams to areas under threat of inundation.
- 3.18.19 Doorknock teams will work at the direction of;
- a. The Incident Controller

- 3.18.20 Field teams conducting doorknocks will record and report back the following information to their Incident Controller;
- a. Addresses and locations of houses doorknocked and/or evacuated.
 - b. The number of occupants.
 - c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).
 - d. Details of residents who refuse to comply with the Evacuation Order.
- 3.18.21 Refusal to evacuate. Field teams should not waste time dealing with people who are reluctant or refuse to comply with any Evacuation Order. These cases are to be referred to the NSW Police Force.

Withdrawal

- 3.18.22 Evacuations will generally be carried out in stages starting from the lowest areas, low flood islands and low trapped perimeters; and progressively from higher areas.
- 3.18.23 The most desirable method of evacuation is via road using private transport. This may be supplemented by buses for car-less people. However, other means of evacuation may also be used if available and as necessary (e.g. by foot, rail, air).
- 3.18.24 Evacuees who require emergency accommodation or disaster welfare assistance will be directed to designated evacuation centres. Evacuees who have made their own accommodation arrangements will not be directed to evacuation centres. It is not possible to determine in advance how many will fall into this category.
- 3.18.25 Evacuees will:
- a. Move under local traffic arrangements from the relevant Sectors/Community via managed evacuation routes;
 - b. Continue along the suburban and rural road network to allocated Evacuation Centres.
- 3.18.26 **Health Services.** The Health Services Functional Area will coordinate the evacuation of hospitals, health centres and aged care facilities (including nursing homes).
- 3.18.27 **Schools.** School administration offices (Department of Education, Catholic Education Office and Private Schools) will coordinate the evacuation of schools if not already closed.
- 3.18.28 If there is sufficient time between the start of response operations and the evacuation of communities, the NSW SES Operational Area Commander will discuss the temporary closure of appropriate schools with the Regional Director, Riverina Region, Department of Education. This will enable pupils to

- stay at home or be returned home so they can be evacuated (if required) with their families.
- 3.18.29 Note that in the Corowa Shire LGA, school principals may close some schools affected by flooding in the early stages of flooding.
- 3.18.30 **Caravan parks.** When an evacuation order is given occupiers of moveable dwellings should:
- a. Isolate power to moveable dwellings.
 - b. Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.
 - c. Lift the other contents in any remaining dwellings as high as possible.
 - d. Move to friends, relatives or a designated evacuation centre if they have their own transport, or move to the caravan office to await transport.
 - e. If undertaking self-managed evacuation, register their movements with the caravan park management upon leaving the park.
- 3.18.31 Where possible, dwellings that can be moved will be relocated by their owners. Park managers will arrange for the relocation of moveable dwellings as required. Council and NSW SES personnel may assist if required.
- 3.18.32 Caravan park managers will ensure that their caravan park is capable of being evacuated in 24 hours.
- 3.18.33 Advise the NSW SES Corowa Local Controller of:
- a. The number of people requiring transport.
 - b. Details of any medical evacuations required.
 - c. Whether additional assistance is required to effect the evacuation.
- 3.18.34 Check that all residents and visitors are accounted for.
- 3.18.35 Inform the NSW SES Corowa Local Controller when the evacuation of the caravan park has been completed.
- 3.18.36 Provide the NSW SES Corowa Local Controller with a register of people that have been evacuated.
- 3.18.37 **Assistance Animals, Pets and Companion Animals of Evacuees:** Assistance animals (guide dogs, hearing assistance animals, etc.) will remain in the care of their owners throughout the evacuation. This includes transport and access into evacuation centres etc.

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

- 3.18.38 **Transport and storage:** Transport and storage of furniture from flood threatened properties will be arranged as time and resources permit.
- 3.18.39 **Security:** The NSW Police Force will coordinate the provision of overall security for evacuated areas.
- 3.18.40 The NSW SES Incident Controller is to provide the following reports to the NSW SES Murray Region Headquarters:
- a. Advice of commencement of the evacuation of each Sector,
 - b. Half-hourly progress reports (by Sectors) during evacuations,
 - c. Advice of completion of the evacuation of each Sector.
- 3.18.41 **Assembly areas:** An assembly area is a designated location used for the assembly of emergency-affected persons before they move to temporary accommodation or a nominated evacuation centre. As such these areas do not provide welfare assistance nor are they used for long term sheltering or provision of meals. An assembly area may also be a prearranged, strategically placed area, where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency.

Shelter

- 3.18.42 **Evacuation Centres:** Evacuees will be advised to go to friends or relatives, or else be taken to the nearest accessible evacuation centre, which may initially be established at the direction of the NSW SES Incident Controller, but managed as soon as possible by Welfare Services.
- 3.18.43 The following locations are suitable for use as flood evacuation centres:
- a. Small scale flooding:
 - Memorial Hall, Corowa
 - Community Hall, Hammer Street, Howlong
 - Evacuation centre in Town Hall, Mulwala
 - b. Large scale flooding or Dam failure:
 - Evacuation centres in Wagga Wagga
- 3.18.44 **Registration:** The NSW Police Force will facilitate the requirement of Disaster Victim Registration for people evacuated to designated evacuation centres.
- 3.18.45 **Animal Shelter:** Facilities to hold and care for companion animals of evacuees will be coordinated by Agriculture and Animal Services if required. If required, Agriculture and Animal Services will also coordinate refuge areas for livestock (eg horses) where feasible.

Return

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

- 3.18.47 The NSW SES Incident Controller will determine when it is safe for evacuees to return to their homes in consultation with:
- a. The Recovery Coordinating Committee (if established)
 - b. Welfare Services Functional Area Coordinator (welfare of evacuees)
 - c. Engineering Services Functional Area Co-ordinator (safety of buildings, structural integrity of levees/dams)
 - d. Health Service Functional Area Coordinator (public health)
 - e. Transport Services Functional Areas Coordinator (arrangement of transport)
 - f. The Corowa Shire LEOCON
 - g. The Corowa Shire Council
 - h. NSW SES Operational Area Commander
 - i. Other appropriate agencies/functional areas as required (mitigation and advice regarding identified risks resulting from the flood event).
- 3.18.48 Once it is considered safe to do so, the NSW SES Incident Controller will authorise the return of evacuees.
- 3.18.49 The return will be controlled by the NSW SES Incident Controller and may be conducted, at their request, by the Recovery Coordinator.

3.19 MANAGING RESUPPLY OPERATIONS

- 3.19.1 The NSW SES is responsible for the coordination of the resupply of isolated communities and properties.
- 3.19.2 If isolation is expected to occur, residents should be encouraged to consider their needs and suitability for an unknown period of isolation.
- 3.19.3 If properties/communities are going to remain in locations expected to become isolated, households/retailers should be encouraged to stock up on essential supplies.
- 3.19.4 Where practicable, once supplies are delivered to the NSW SES designated loading point, the NSW SES Incident Controller will arrange for the delivery of essential foodstuffs, fuels or urgent medical supplies required by an isolated property or community.
- 3.19.5 All reasonable effects will be made to deliver supplies, however where necessary the NSW SES will prioritise the delivery of items.

Resupply of Isolated Towns and Villages

Strategy

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

Actions

- 3.19.7 The NSW SES is responsible for the coordination of the resupply of isolated communities.
- 3.19.8 If flood predictions indicate that areas are likely to become isolated, the NSW SES Incident Controller should advise retailers that they should stock up.
- 3.19.9 When isolation occurs, retailers will be expected to place orders with suppliers where they have a line of credit and to instruct those suppliers to package their goods and deliver them to loading points designated by the NSW SES.
- 3.19.10 The NSW SES is prepared to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.
- 3.19.11 The NSW SES will assist hospitals with resupply of linen and other consumables where able.

Resupply of Isolated Properties

Strategy

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

Actions

- 3.19.13 The resupply of isolated properties is a common requirement during floods and coordination can be difficult because requests can emanate from a variety of sources. Isolated properties may call their suppliers direct, place their orders through their own social networks or contact the NSW SES.
- 3.19.14 The principles to be applied when planning for the resupply of isolated properties are;
 - a. The NSW SES will coordinate resupply and establish a schedule.
 - b. Some isolated households will not have the ability to purchase essential grocery items due to financial hardship. If an isolated household seeks resupply from the NSW SES and claims to be, or is considered to be, in dire circumstances, he/she is to be referred to Welfare Services for assessment of eligibility. Where financial eligibility criteria are met, Welfare Services will assist with the purchase of essential grocery items. Welfare Services will deliver the essential grocery items to the NSW SES designated loading point for transport.
 - c. Local suppliers will liaise with the NSW SES regarding delivery of resupply items to the designated loading point.
 - d. Local suppliers are responsible for packaging resupply items for delivery.
- 3.19.15 A flowchart illustrating the Resupply process is shown in Attachment 1. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes.

PART 4 - RECOVERY

4.1 RECOVERY COORDINATION AT THE LOCAL LEVEL

- 4.1.1 The NSW SES Corowa Local Controller will ensure that planning for long-term recovery operations begins at the earliest opportunity, initially through briefing the Local Emergency Management Committee (LEMC). As soon as possible the LEMC will meet to discuss recovery implications including the need for a Local Recovery Committee. The LEMC will consider any impact assessment in determining the need for recovery arrangements. This is conveyed in the first instance to the State Emergency Operations Controller (SEOCN) for confirmation with the State Emergency Recovery Controller (SERCON).
- 4.1.2 Once the need for recovery has been identified, the SERCON, in consultation with the SEOCN, may recommend the appointment of a Local Recovery Coordinator and nominate an appropriate candidate to the Minister for Emergency Services.
- 4.1.3 The SERCON may send a representative to the LEMC and subsequent recovery meetings to provide expert recovery advice and guidance.
- 4.1.4 The NSW SES Corowa Local Controller and Local Emergency Operations Controller (LEOCN) attend recovery meetings to provide an overview of the emergency response operation.
- 4.1.5 The NSW SES Operational Area Commander, the Regional Emergency Management Officer and appropriate Regional Functional Area Coordinators will be invited to the initial local meeting and to subsequent meetings as required.
- 4.1.6 The recovery committee will:
- a. Develop and maintain a Recovery Action Plan with an agreed exit strategy.
 - b. Monitor and coordinate the activities of agencies with responsibility for the delivery of services during recovery.
 - c. Ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of recovery objectives and strategies and are informed of progress made.
 - d. Provide the SERCON with an end of recovery report.
 - e. Ensure the recovery is in line with the National Principles of Disaster Recovery and the NSW tenets.

4.2 RECOVERY COORDINATION AT THE REGION AND STATE LEVEL

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

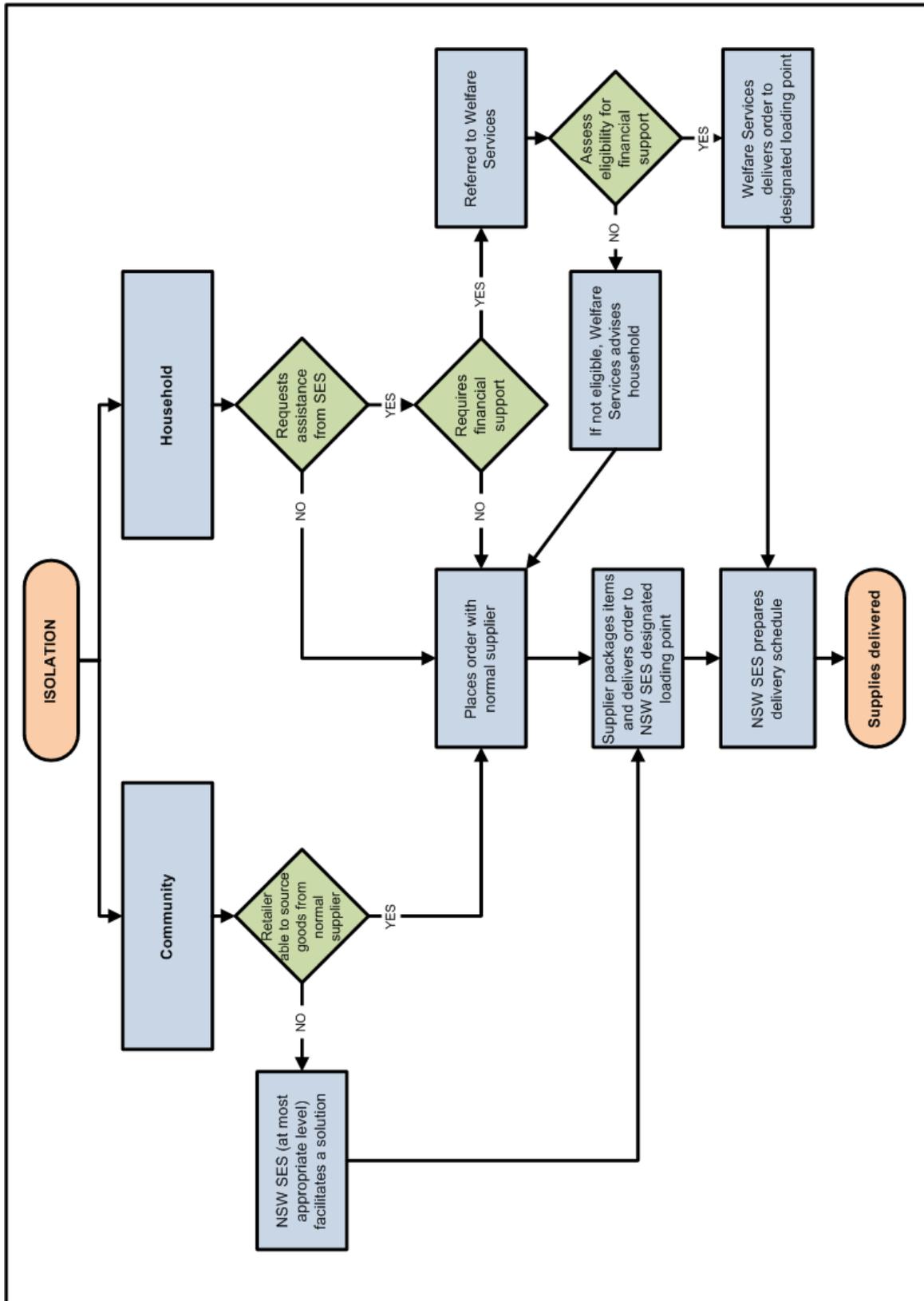
implications including the need for a Region Recovery Committee. This is conveyed in the first instance to the SEOCN for confirmation with the SERCON.

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

4.3 ARRANGEMENTS FOR DEBRIEFS / AFTER ACTION REVIEWS

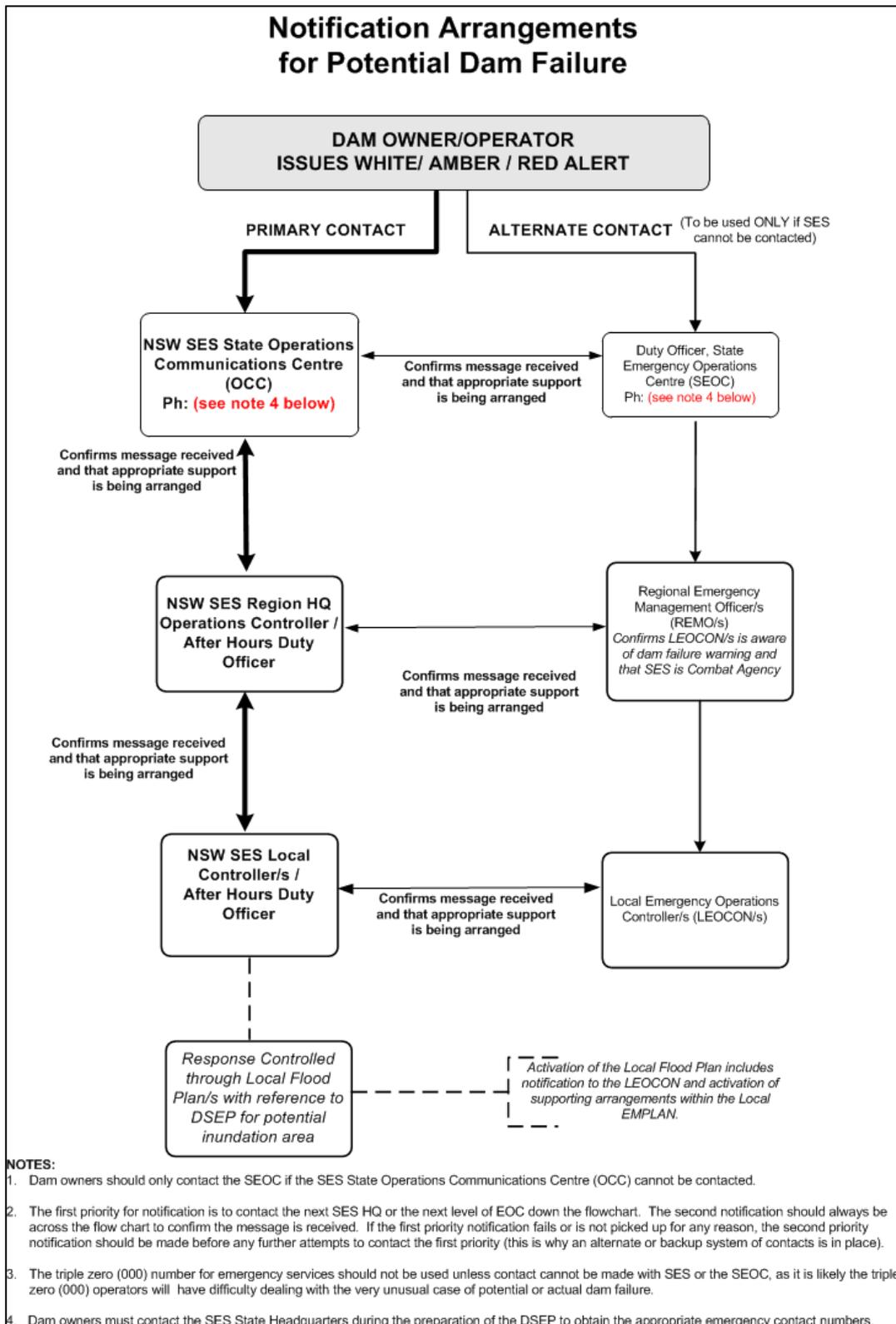
- 4.3.1 As soon as possible after flooding has abated, the NSW SES Corowa Local Controller will advise participating organisations of details of response operation after action review arrangements.
- 4.3.2 The NSW SES Corowa Local Controller will ensure that adequate arrangements are in place to record details of the after action review and each item requiring further action is delegated to an organisation or individual to implement.
- 4.3.3 Follow-up to ensure the satisfactory completion of these actions will be undertaken by the Corowa Shire Local Emergency Management Committee.

ATTACHMENT 1 - RESUPPLY FLOWCHART

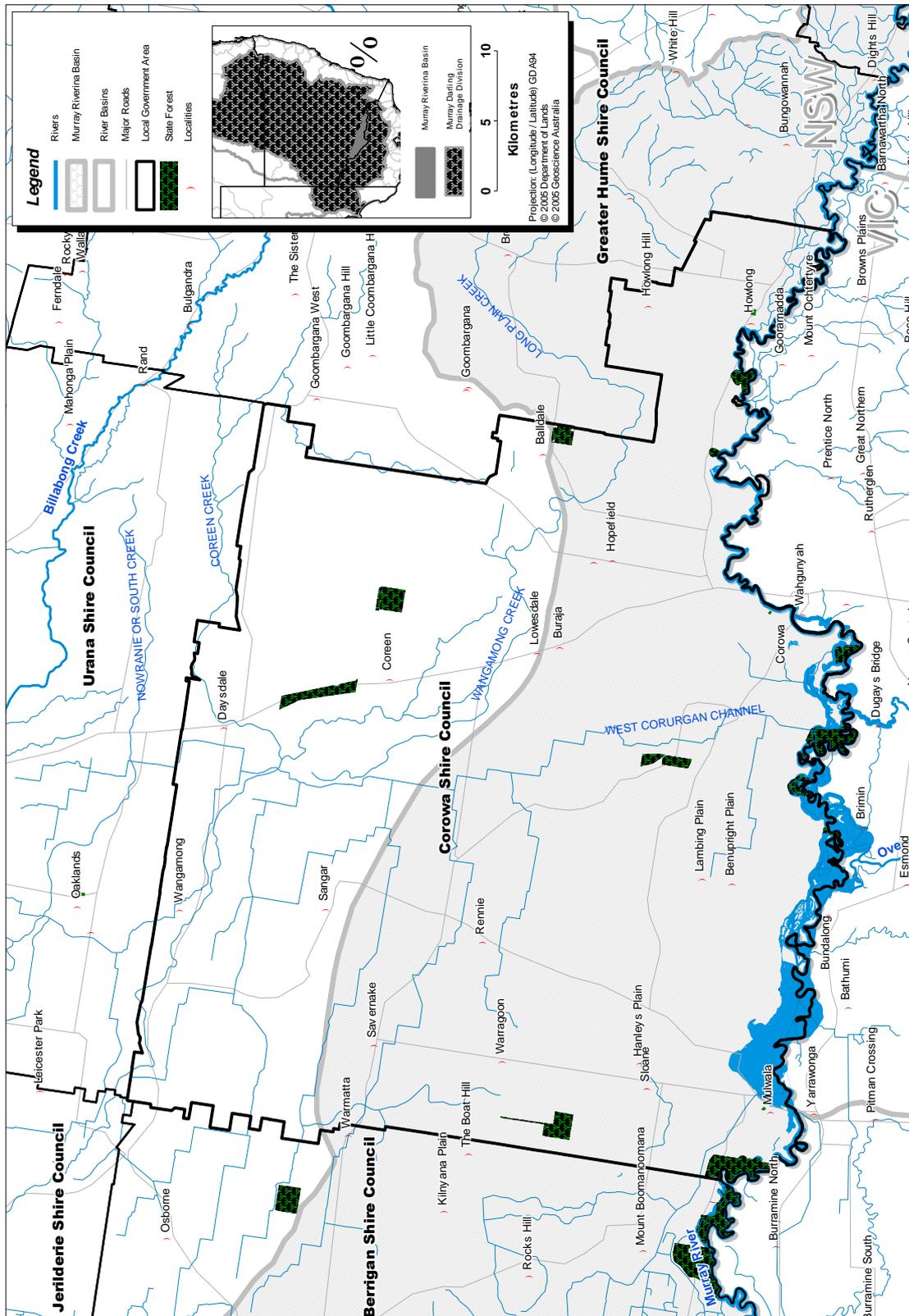


Please Note: The chart outlines the resupply process, but does not encompass all potential situations and outcomes.

ATTACHMENT 2 - DAM FAILURE ALERT NOTIFICATION ARRANGEMENTS FLOWCHART



ATTACHMENT 3 - COROWA SHIRE LGA MAP



LIST OF REFERENCES

1. **AEMI.** *Managing the floodplain: a guide to best practice in flood risk management in Australia.* s.l. : AEMI, 2013.
2. **Department of Infrastructure, Planning and Natural Resources.** *Floodplain Development Manual.* 2005.
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4. **NSW Government.** *Local Government Act 1993 No 30.* 1993.
5. **NSW SES.** *Incident Management Policy.* 2015.
6. **Attorney General's Department.** *Evacuation Planning: Australian Emergency Management Handbook Series Handbook 4.* s.l. : Australian Government, 2013.
7. **NSW Government.** *Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings Regulation.* 2005.
8. **Attorney General's Department.** *Flood Warning: Australian Emergency Manuals Series Manual 21.* s.l. : Australian Government, 2009.
9. **SEMC Evacuations Working Group.** *Evacuation Management Guidelines.* 2014.

HAZARD AND RISK IN COROWA SHIRE

Volume 2 of the Corowa Shire Local Flood Plan

Last Update: April 2008

ANNEX A - THE FLOOD THREAT

Landforms and River Systems

1. The Murray River rises in the Australian Alps and extends across New South Wales, forming the State border with Victoria. It flows into South Australia, entering the ocean at Goolwa. The Murray River is affected by significant flows from the Mitta Mitta, Kiewa, Goulburn, Ovens and King Rivers originating in Victoria, and in the lower reaches by the Murrumbidgee, Lachlan and Darling Rivers. The length and complexities of the river are such that floods of record will vary along its 2,500km course.
2. The Murray River has been highly regulated to create a reliable source of water for irrigation, agricultural, industrial and domestic needs. To regulate the river system, River Murray Water operates four major storages, sixteen weirs, five barrages and numerous other smaller structures.
3. Corowa is situated on the Lake Hume to Tocumwal reach of the Murray River. Along this reach the Murray River is joined by the Kiewa River upstream of Albury and the Ovens River immediately upstream of Yarrawonga Weir. The section of the Murray River from Hume Dam to Corowa is characterised by steep narrow valleys with limited floodplain areas and no significant levees. This reach, while constituting only 2% of the catchment area for the Murray, provides 40% of the River's flow. In this region inundation of the flat land adjacent to the river is not uncommon, although floodwaters are usually confined to a few kilometres in width, causing flooding for several days during major events. The river as far downstream as Tocumwal has a large channel capacity and the flow rate is usually high. During major floods a flood runner develops along an old section of river bed (known as Barooga Cowal) near Barooga downstream of the Corowa Shire area. This is the first extensive floodplain in the Murray system.
4. The Murray River downstream of Hume Dam has an average depth of about 5 metres and a width of about 100 metres. The river bed slope reduces from 0.40m/km immediately downstream of the dam to about 0.07m/km at Corowa, which is 180km (within channel distance) downstream. The flat slope of the river is evident in the meandering character and curvilinear nature of the river with pools of water occurring at low flows. The floodplain extends to a width of 1.5km immediately downstream of the dam, 7km downstream of the dam it widens to width of 7km and narrows to 2.5km at Doctors Point. At Albury the floodplain widens again to 6km at a level of 180 m AHD and further widens at Widegeon to 18km at a level of 160mAHD. At Albury and Howlong, the elevated Murray Valley Highway at the left and the Riverina Highway to the right creates an embankment which restricts the spread of flood waters to a width of 5km and 7.5km respectively.

5. Majors Creek is a small tributary of the Murray which flows south through Hovel and Majors Plains into Howlong swamp to the northeast of the Howlong township.
6. Irrigation channels extend through the Corowa Shire and include the Wangamong Creek Channel, the West Cororgan Channel and the beginning of the Mulwala Channel.
7. Corowa is unique in NSW in that the minor flood level is below the level regularly reached as a result of routine irrigation and environmental dam releases.

Characteristics of flooding

8. Murray River flooding occurs generally from late Winter through Spring into early Summer. The combination of long travel times, considerable floodplain storage and large flood volumes can result in extended periods of inundation. Nuisance flooding of a shorter duration with a frequency of once every two or three years also occurs. The major change to the flood pattern around Corowa was due to the construction of the Hume Dam in the 1930's and its use as a river regulation storage to provide for irrigation downstream.
9. Within the towns of Howlong, Corowa and Mulwala flooding up to about the 1% AEP flood level is generally confined within quite steep banks to a two-kilometre wide floodplain.
10. The floodplain is constricted by high ground at Corowa and is less than 700 metres wide. This causes a noticeable aberration in the flood profile with flat grades upstream which increase noticeably downstream of the John Foord bridge between Corowa and Wahgunyah. Peak levels only last a few days even though the river may remain in flood for several months.
11. Flood behaviour at Mulwala was altered by the installation of Yarrawonga Weir in 1939. Floods became more predictable with flood levels around Lake Mulwala well defined. The steep banks that generally contained flooding before the weir was built continue to do so.
12. Rating Curve Information² for Corowa is tabulated in Table A-1.

² VICWATER (2003) Individual Site Information - Corowa Ratings Table
(<http://www.vicwaterdata.net>) Updated 13/04/2003. Accessed 23/05/2006.

Table A-1: Rating Table for Corowa gauge (as of 13 April 2003)

Level (Metres)	Flow (ML/day)	Level (Metres)	Flow (ML/day)	Level (Metres)	Flow (ML/day)
-0.9	0	0.8	2150.705	3.2	16951.986
-0.819	1.544	0.85	2315.359	3.4	18811.115
-0.725	8.489	0.9	2487.292	3.6	20787.428
-0.635	22.618	0.95	2666.666	3.8	22883.32
-0.542	47.165	1	2853.585	4	24965.758
-0.452	81.266	1.1	3250.471	4.2	26923.623
-0.362	126.706	1.2	3678.757	4.4	28978.461
-0.268	186.668	1.3	4134.631	4.592	31201.867
-0.178	258.678	1.4	4615.191	4.803	33752.621
-0.085	350.296	1.5	5116.272	4.994	36182.082
0.005	453.715	1.6	5648.652	5.247	39534.086
0.099	576.634	1.7	6212.958	5.502	43104.813
0.189	713.269	1.9	7419.156	5.74	46605.984
0.279	867.686	2	8048.691	6.004	50675.227
0.372	1050.454	2.1	8699.446	6.5	61916.086
0.462	1244.813	2.2	9358.102	7	76427.711
0.556	1464.646	2.4	10663.13	7.5	97624.617
0.65	1699.629	2.6	12071.669	8	137800
0.7	1842.935	2.8	13586.319	8.5	190200
0.75	1993.257	3	15209.62	9	259000

Indicative Peak Flow Travel Times

13. The following times are indicative of peak height flow times.

- a. Hume Dam to Albury 6 hours
- b. Albury to Corowa 24 - 28 hours
- c. Corowa to Yarrawonga 24 hours

14. During extreme floods a minimum of 24 hours warning time should be available.

15. In the event of a Hume Dam failure, the travel times from Hume Dam are:

Location	Start of dambreak flood wave*	Peak of dambreak flood wave*
Albury Airport	30 minutes	2 hours 40 minutes
Doctors Point	50 minutes	3 hours 10 minutes
Albury Railway Bridge	1 hour	3 hours 20 minutes
Lincoln Causeway	1 hour	3 hours 20 minutes
Howlong Road Bridge	3 hours	6 hours 50 minutes
Corowa Road Bridge	4 hours 40 minutes	15 hours 30 minutes

*travel times from Hume Dam, all times to nearest 10 minutes, based on scenario of a dam failure flood under a PMF over a period of one hour.

Flood Mitigation Systems

16. Whilst there are no significant levees in the Corowa Shire, there are at least two small private earthen levees. The levee at Corowa Caravan Park overtops at 6m and the levee at the Corowa Golf Club overtops at 8m on the Corowa gauge.

Storage Dams

17. The Hume Dam and Yarrawonga Weir are part of a comprehensive control system on the Murray River and are operated by the Murray-Darling Basin Commission (MDBC). They were designed and built to regulate irrigation downstream and provide only limited flood mitigation.
18. **Hume Dam** is on the Murray River downstream of the junction of the Murray and Mitta Mitta Rivers approximately 16 kilometres east of Albury in the Albury City Council area. The dam's primary purpose is for irrigation in the Murray Valley but it is also used for industrial and town water supplies, stock and domestic supplies, hydro-power generation, riparian uses and to sustain the riverine environment.
19. Hume Dam consists of a concrete gravity section in the main river channel extended by a short embankment section on the northern side and a long embankment section (No. 1 Bank) on the southern side. The concrete gravity section includes 29 vertical lift spillway gates, four irrigation outlets and a hydro-electrical power station. There are two embankment saddle dams to the south of the main embankment, known as the No. 2 Bank and No. 3 Bank.
20. The capacity of the Hume Reservoir³ is 3,038,000 megalitres at an FSL of 192mAHD and a surface area of almost 202 square kilometres. The total catchment area of the dam is 15,540 square kilometres.
21. **Yarrawonga Weir** is downstream of Corowa and located near the towns of Yarrawonga in Victoria, and Mulwala in New South Wales. Yarrawonga Weir is located 538 km from the source of the River Murray, and 1992 km from the mouth. Travel times of flood peaks from the headwaters to Yarrawonga are 6 days, with a further 8 days to Echuca.
22. The Weir, built in 1939 is comprised of two groups of gates: 8 on a southern structure and 2 on a northern structure. The 8 gates on the southern side are used for all flows. The 2 on the northern side are only used during floods larger than 60 000 ML/day to stop flows along the downstream side of the weir embankment that could cause scour. The lake formed by Yarrawonga Weir, Lake Mulwala, has an FSL of 124.90mAHD and a capacity of 118,000 megalitres.

³ MDBC (2006) River Murray Water: Hume Dam
(http://www.mdbc.gov.au/rmw/river_murray_system/hume_reservoir) Updated 02/02/2006. Accessed 23/05/06.

Weather Systems and Flooding

23. The annual median rainfall over the Murray River Valley generally shows an east to west gradation closely related to the overall westward decrease in elevation. In the east, upstream of Corowa, the median values decrease from more than 1600mm to less than 500mm per year at Yarrawonga. Rainfall, in general, is greater over the more elevated boundaries of the valley while areas of relatively low rainfall are found in the vicinity of the main watercourse.
24. Over 60 percent of the annual rainfall over the valley occurs in the months from May to October inclusive. On average June is the wettest month with a mean rainfall of 57.0mm (as measured at Corowa Airport⁴).
25. Flooding in Corowa Shire usually results from one of the following three weather mechanisms:
- **Well developed low-pressure troughs.** The most usual set of meteorological conditions causing flooding is a series of well-developed inland troughs associated with southern depressions crossing the council areas from west to east. These can be associated with thunderstorms and very heavy rain. Sequences of such troughs can produce high rainfall totals over a period of weeks, usually in the winter months.
 - **East coast low-pressure systems.** These systems develop off the coast of NSW and Victoria, usually during the cooler months of the year. They direct moist winds onto the coast and across the Great Dividing Range, often producing very heavy rain. Usually, but not exclusively, they move in a generally southerly direction and can generate floods in the upper reaches of westward flowing streams. East coast lows off the Victorian coast can produce substantial flooding in a number of the tributaries of the Murray River, exacerbating flood conditions on the NSW side of the border.
 - **Sequences of cold fronts.** Fronts crossing the State from west to east can produce flooding in the Murray River catchment during the winter months. The individual fronts are not usually associated with very heavy falls, but the cumulative effect of a series of them over a period of a few weeks may result in flooding. The major floods on the Murray River in 1870, 1917, and 1975 resulted from such systems. On occasion, these fronts may also be associated with low pressure systems at the tail end of the frontal system.
26. Major floods usually arise from large rain depressions originating over the Southern Ocean and moving into the Murray Valley from the south-west. Heavy rainfall over a period of a few days may occur over a major portion of the Murray River Valley from time to time. These falls are frequently associated with deep active depressions which, after developing over the eastern end of the Great Australian Bight, move eastward over the valley. These troughs rarely produce high daily rainfalls but can bring substantial falls

⁴ Australian Government Bureau of Meteorology (2005) Climate Averages (www.bom.gov.au) Updated 16/08/2004. Accessed 19/10/2005.

over longer periods. It is usually the sequence of fronts rather than individual ones that cause the flooding.

27. The Murray River within this reach can be categorised as having a warm temperate climate. Rainfall in this region has a predominant winter/spring pattern and as a result, under natural conditions, the Murray River demonstrates distinct seasonal pulses in the amount of water it carries. All moderate - major floods recorded at the Corowa gauge since 1909 have occurred in October and, it is interesting to note in Figure 1, all flood peaks above the minor flood level have occurred between the months of June and November.

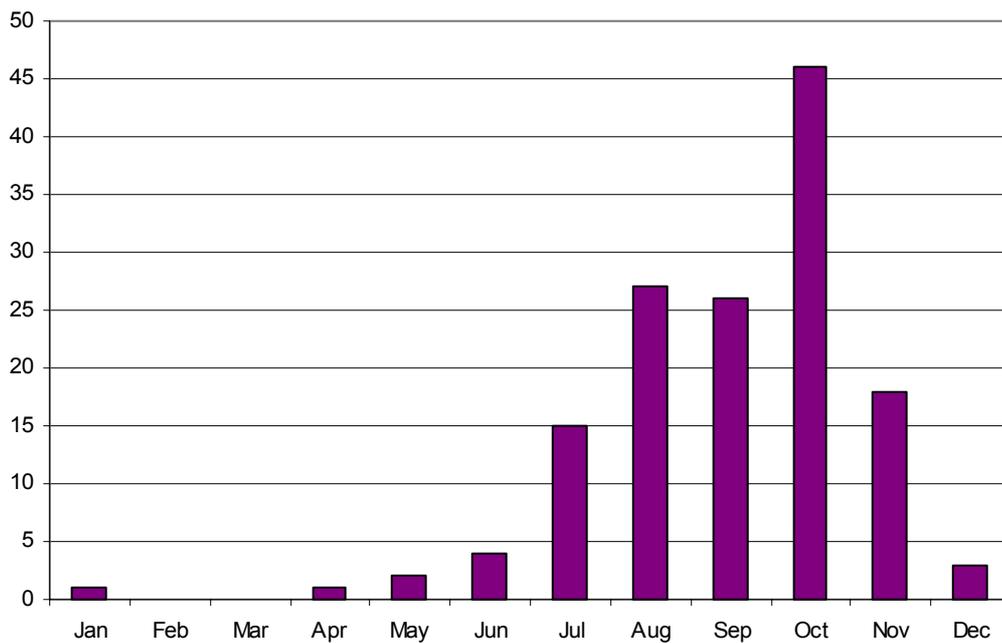


Figure 1: Number of floods above the minor flood level (3.8 metres) recorded at the Corowa gauge since 1909 by month⁵

28. There are also considerable year to year differences in flows in the Murray River consistent with periods of drought. As a result, there have been periods in which numerous flood peaks above the minor flood level have been recorded in a small number of years and also periods where no flooding has occurred for a number of years.

⁵ DIPNR (2004a) PINNEENA v8. On DVD. Department of Infrastructure, Planning & Natural Resources.

Flood History

29. Significant historical floods recorded at Corowa are briefly described⁶:
- 1870 Flood (***Flood of record***) – The flood level reached 8.8m at Corowa gauge. This is the highest flood on record in this reach of the river; significant modifications carried out to the flood plain this century would result in considerably higher levels were the 1870 flood to occur again today.
 - 1876 Flood – The 1876 flood is reported to rank in the 5 largest floods at several locations in the reach from Albury to Mildura, however there is a lack of data at most stations.
 - 1917 Flood – The level reached 8.7m at Corowa gauge. This is the second highest flood of record between Albury and Tocumwal. This is estimated to be the 1% AEP flood.
 - 1931 Flood – The level reached 7.9m at Corowa gauge. This is the sixth highest flood of record between Albury and Tocumwal.
 - 1974 Floods – Two floods occurred in May and October. In the Albury to Yarrawonga reach of the river, the October event was the larger (fifth highest record); the level reached 8.2m at Corowa gauge.
 - 1975 Flood – The level reached 8.6m at Corowa gauge. This was the third highest flood of record between Albury and Tocumwal.

Extreme Flooding

30. On rare occasions, flooding of extreme proportions can occur. Such floods can reach far greater heights than previously recorded, flooding areas without any previous flood history. In addition, these floods are generally both faster to rise and more dangerous in terms of depth and velocity than previous floods. Extreme flooding can result from dam failure, extreme rainfall events or both. The estimated probable maximum flood heights (without Hume Dam failure) for Howlong is 12.17m (on the Howlong gauge) and for Corowa 13.97m (on the Corowa gauge). Figure 2 shows the relative gauge heights at Corowa for significant historical and estimated floods.
31. Flooding occurring as a result of dam failure can be of even greater severity, resulting in large-scale property destruction. The resulting flood waters would be deep and fast flowing, consisting of large amounts of debris.
32. In the 1992 technical dam break study, the most likely mode of failure of Hume Dam was considered to be scouring (linear erosion) of the downstream face of the dam should the spillway capacity be exceeded and the dam were overtopped⁷.

⁶ GHD (1986) Murray River Floodplain Management Study - Detailed Report. Murray Shire Council.

⁷ Hume Dam Dambreak Flood Analysis. (1992) Department of Water Resources.

33. Floods of a magnitude up to and including the 1% AEP flood event will not necessitate large scale evacuations from the townships of Howlong, Corowa or Mulwala. However, flooding greater than the 1% AEP flood has an increasingly significant effect on properties and roads and will require evacuations.

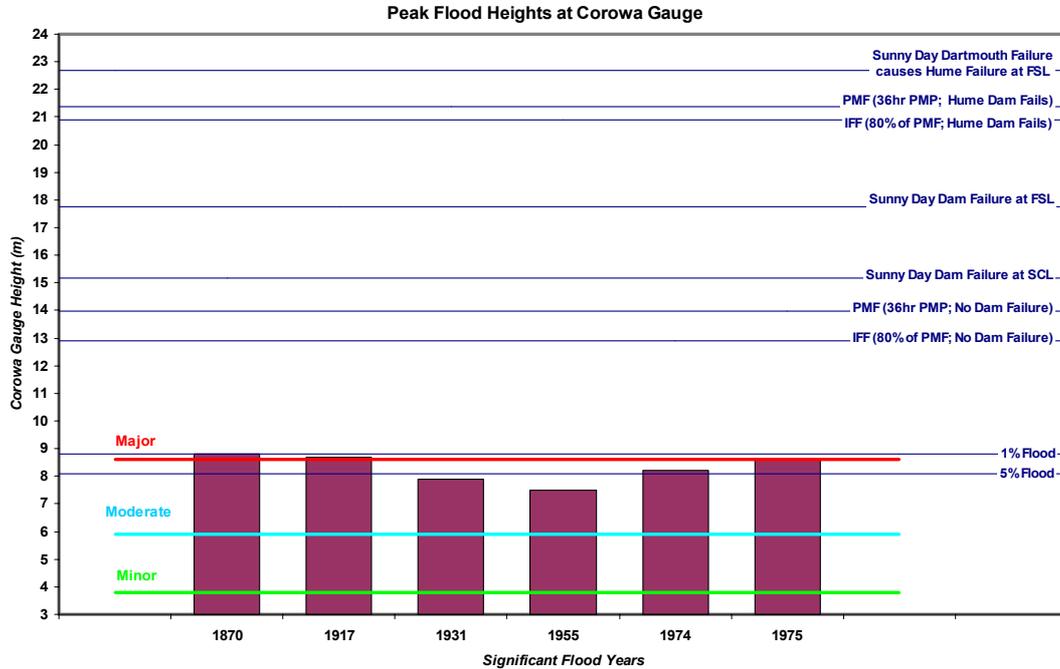


Figure 2: Significant Peak Heights at Corowa Gauge (409002) ⁸

⁸ Heights taken from DWR (1992) Hume Dam Dambreak Flood Analysis. NSW Department of Water Resources. ; DIPNR (2004b) PINNEENA v8. On DVD. Department of Infrastructure, Planning & Natural Resources.; and SES flood intelligence.

ANNEX B - EFFECTS OF FLOODING ON THE COMMUNITY

Community Profile

1. According to the 2001 census the total population of the Corowa Shire council area is approximately 10200 people, of this number approximately 5200 live in Corowa, 1950 live in Howlong and 1680 in Mulwala. The following table provides a brief overview of the demographic characteristics of the Corowa Shire council area.

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

Census Description	Corowa Shire	Howlong	Corowa	Mulwala
Total persons	10206	1949	5220	1677
Total dwellings	4767	803	2421	930
Total persons aged 65 years and over	2071	305	1168	429
Total persons aged below 15 years	2049	432	1076	266
Total persons of indigenous origin	103	44	32	8
Total persons using Internet	2660	471	1347	418
Single parent families	287	70	160	42
Persons living alone	1071	140	641	181
Total persons who do not speak English well	15	3	12	0
Total persons who lived at a different address 5 years ago	3731	731	2037	602
Households without vehicles	219	25	158	24
Total persons residing in caravans, cabins or houseboats	179	18	93	41
Mean household size	2.45	2.6	2.3	2.25

2. It is significant that 20 percent of the population is aged above 65 years. Elderly people are often frail and unable to respond quickly without assistance. Some of them may also be socially isolated, resulting in them being unaware of evacuation warnings or unable to decide on a course of action. Areas with particularly high proportions of elderly residents should be targeted for doorknocking and the provision of transport.
3. Flood awareness and preparedness of the community is considered low, primarily because of the nature of the flood threat and flood history. Rural property owners along the river and caravan park owners would be considered the most flood-aware of all sectors.

General

4. The Murray River floodplain throughout the Corowa Shire is narrow and well contained within a clearly defined land incline. Existing data indicates that the 1% AEP flood is readily contained within the floodplain and that whilst minor to moderate flooding has occurred on a regular basis, major flooding is less frequent.
5. The consequences of flooding are related to heights that can be measured on flood gauges at points along the Murray River system. The gauges used for the Corowa Shire are located at: Albury (below Union Bridge), Corowa (John Foord Bridge), Howlong and Yarrawonga (downstream of Weir). The Bureau of Meteorology provides predictions for the Albury, Corowa and Yarrawonga gauges (See Annex C).
6. The Albury river gauge relates to the major population centres of Albury and Wodonga, and the Howlong (and Albury) gauge to Howlong. Corowa gauge relates to the major population centres of Corowa and Wahgunyah, and Yarrawonga Weir Gauge relates to Mulwala and Yarrawonga. The main consequences of flooding are therefore described with reference to these gauges in the following paragraphs.

Effects of flooding at Howlong

7. The village of Howlong is located on the right (northern) bank of the Murray River, 30km downstream of Albury and 20km upstream of Corowa. The village is located in the Corowa Shire and has a population of approximately 2200. The limited nature of services in the town points to a strong dependence on and interaction with Albury.
8. Low lying areas and properties between Albury-Howlong-Corowa begin flooding between 2.9 and 3.0 metres (Albury gauge). Stock movement is required from these areas before shrinking flood islands form.
9. Only the lowest parts of Howlong are inundated by major floods on the Murray River. In 1996, a few homes on the western side of town were

flooded, however it is not known whether this was due to localised flooding; none were flooded in 1975. Peak levels generally last only a few days, although the river will often remain in flood for several months.

10. Howlong also experiences local flooding within the presently zoned area of the town, although the Council have undertaken works to improve town drainage into the Murray River. A known problem area is in the vicinity of Majors Creek, which drains into the Howlong Swamp.
11. The main transport routes are the Riverina Highway running east-west from Albury to Deniliquin and minor roads north to Walbundrie and south across the Murray River to Chiltern. Access is designed to remain open in all directions during major floods, as it did in 1975 (7.11m on the Howlong gauge; 5.68m on the Albury gauge), however in floods greater than this, these roads may become closed by floodwater making travel to and from Howlong difficult or even isolating the community entirely.
12. At Howlong, there is uncertainty in the consequences of flooding at levels greater than the 1% AEP, flooding may break out from the main channel and may inundate some properties in Clarke, Lowe, Larmer and Townsend Streets, and other houses adjacent to the river. Extremely severe flooding (though not associated with a dam failure) may cause the isolation of residents in an area south of Clarke Street and west of Townsend Street. A dam failure flood will completely inundate the town of Howlong.

Effects of flooding at Corowa

13. Within the urban area of Corowa the 1% AEP flood affects four caravan parks, a licensed club, town swimming pool, sporting facilities, scout building and several dwellings. Flooding of a lesser intensity has a varying effect on these areas, with the caravan parks first to be affected. Flooding in the rural areas of Corowa Shire occurs well before that affecting the township. Inundation from overbank river flows occurs during periods of channel capacity fully regulated irrigation flows (25,000 Ml/day). These overbank flows through anabranches and lagoons result in interrupted access to grazing and cropping areas. Extended periods of inundation can have severe adverse effects on crops and established pastures.
14. Roads that may be affected by flooding in the Corowa area are:
 - a. Lone Pine Ave (at 6.0 metres on the Corowa gauge)
 - b. Reisling Street (at 6.68 metres on the Corowa gauge)
 - c. River Street (lower end), South Corowa (at 6.7 metres on the Corowa gauge)
15. At Corowa flooding greater than the 1% AEP flood level (8.8m at Corowa gauge) has an increasingly significant effect on properties and roads. The first properties likely to be flooded are primarily the areas east of Federation

Avenue and River Streets, and also numerous properties in South Corowa. A probable maximum flood would cause the inundation of approximately 1000 dwellings and leave only a small flood island in the vicinity of the hospital. A dam failure flood will cause the inundation of approximately 2000 dwellings.

Effects of flooding at Mulwala

16. Mulwala is essentially flood free up to the 1% AEP (9.0m at Yarrawonga d/s gauge); the largest post weir flood in 1975 (8.32m at Yarrawonga d/s gauge) caused little damage in the town. In more extreme flooding however, evacuations will be required.
17. Roads that may be affected by flooding below the 1% AEP in the Mulwala area are:
 - a. Bayly Street (7.1m – 8m Yarrawonga d/s gauge)
 - b. Pimpala Crescent (7.1m – 8m Yarrawonga d/s gauge)
18. At Mulwala, floods greater than the 1% AEP may cause isolation of the town from deep over-road flooding. Some properties in the Mulwala Station Estate (including parts of Bayly Street, Pimpala Cres, Wanini Road, and Binda Road) will be also flooded and/or isolated. Significant evacuations will be required in Mulwala in the event of a dam failure.

Effects of flooding in rural areas

19. Beef cattle have proved to be the enterprise most suited to the flood plain in the reach of the Murray River contained in the Corowa Shire. There are two main reasons for this and both relate to the frequent inundation of the floodplain in this area. Firstly, beef cattle can handle the rank pasture growth conditions and secondly, they are fairly easily mustered and moved in times of flooding. As flood peaks can come at short notice, cattle are able to swim unassisted to high ground. However, high death rates in young animals are likely unless stock movement occurs in advance of flood peaks.
20. The area is generally not well suited to irrigation crops, despite the availability of good soils and ample access to watering points for the following reasons:
 - a. Broken topography
 - b. High risk of damage to plant if left on the flood plain, or alternatively the nuisance value of relocating plant during periods of flood
 - c. Difficulty in locating pumps and power sources to cater for flood levels
 - d. High risk of crop damage from flooding, particularly in October and November and difficulty with access at other times
21. Land ownership within the area is such that most properties occupy significant areas of flood-free land operated in conjunction with flood liable land.

However, the land adjacent to the river is often the richest and most productive. For this reason, the effects of flooding on rural properties in the Corowa Shire can be significant.

22. During minor flooding (3.8 metres on the Corowa gauge) the main problems in the Corowa Shire are minor road closures and loss of access and inundation of low lying paddocks. Once major flood levels are reached (8.6 metres on the Corowa gauge), inundation of significant areas of land occurs on the large properties on the NSW side of the river.
23. In general, flooding can have the following detrimental effects on farms along the Murray River:
 - a. Damage to crops
 - b. Death or retardation of pasture growth - particularly for floods with a duration of more than eight days
 - c. Livestock deaths of small or young animals such as sheep and calves
 - d. Loss of access to grazing and cropping areas due to in-stream flows through anabranches and lagoons
 - e. Intrusion of noxious weeds
 - f. Deposition of debris
 - g. Damage to infrastructure such as fences, sheds, bridging, etc
 - h. Disruption to livestock grazing and productivity - particularly to intensive operations
 - i. Erosion hazard - particularly for cultivated land
 - j. Extreme difficulty in improving pastures by conventional cultivation and seeding techniques.
 - k. Damage to hay either pre- or post-cutting
 - l. The impact of inundation for farmers along the Murray River is dependent on a number of factors which include:
 - i. The duration of inundation
 - ii. The type of pastures inundated (improved versus natural)
 - iii. The time of year (impacts increase progressively as the season matures)
 - iv. Frequency and timing of previous inundation events
24. The effect on grazing/feed loss depends on the time of year in which the flood occurs. The estimated number of weeks of grazing/feed loss by month of

flood occurrence for an inundation period of 20 days (as occurred in the 1975 flood) is tabulated in Table B-2:

Table B-2: Estimated grazing and feed loss by month.

Month of Flood Occurrence	Estimated Weeks Grazing/Feed Loss
July	8
August	10
September	15
October	22
November	18

Effects of flooding on transport and infrastructure

25. Murray River flooding is usually of sufficient duration and extent to affect a wide range of transport and communications systems including road, rail, air and water traffic as well as telecommunications services. Of those, road transport is the most vulnerable to interruption by flooding.

Road Transport

26. The following rural roads may be affected by flash flooding as a direct result of heavy local rainfall.

- Balldale Road south of Balldale – at depth marker
(Map Ref 55H DA531312)
- Daysdale to Walbundrie Road – east of the Coreen Vale Road at the T intersection
(Map Ref 55H DA466544)
- At Daysdale on the Urana Road – water breaks out of Coreen Creek in a high rainfall event
(Map Ref 55H DA377546)
- Coades Tank Road north west of Coreen
(Map Ref 55H DA355496)
- Redlands Road east side of channel past the piggery turnoff
(Map Ref 55 H DA364212)
- Redlands Road corner of Hudson Road
(Map Ref 55 H DA398187)
- Ferguson Road
(Map Ref 55H DA384176)
- Buraja-Lowesdale, on the Riverina Highway
(Map Ref 55H DA425337)

Bridges

27. The following bridges are designed to be trafficable up to a 1% AEP flood.

- Federation Bridge, Corowa
- John Foord Bridge, Corowa
- Howlong Bridge
- Mulwala Bridge

Rail Transport

28. Rail infrastructure is designed to be flood free to the 1% AEP flood

Air Transport

29. Access to the Corowa airport is designed to be flood free to the 1% AEP, however local flooding on Redlands Rd past the turnoff to the piggery may affect access.

Telecommunications

30. The Corowa Zone is radially supplied from Mulwala via a 66,000 Volt sub-transmission line. The line is currently unreliable and traverses areas that are difficult to access for maintenance and emergency restoration. Country Energy plans to build a new 132,000 Volt line to Corowa to improve the reliability (with a planned completion date of January 2007)⁹. There is uncertainty as to the height at which telecommunication services will be lost to Corowa.

Electricity

31. There is uncertainty as to the height at which electricity services will be lost to Corowa, however it is expected to occur at about 9.5m (on the Corowa gauge).

Water Supply

32. Water supply is not expected to be interrupted in flooding up to a 1%AEP however it is estimated to last only 4 -5 days in severe floods.

Sewerage

33. Sewage services throughout town are sequentially lost as pump stations become inundated, beginning at 6.17m at the Bindaree Caravan Park sewer pump station. During severe floods, waste would be discharged into the floodwaters.

⁹ Country Energy (2006) Reliability, Sustainability, Innovation PDF.
<http://www.countryenergy.com.au>. Updated 21/04/06. Accessed 19/06/06.

Health

34. Corowa Hospital is located on the highest part of Corowa, which is above the limit of worst case flooding (i.e. Cascade dam failure). However essential services to the whole area will likely be severely damaged or destroyed in a dam failure flood. Restoration of essential services may take several weeks.

SES RESPONSE ARRANGEMENTS FOR COROWA SHIRE

Volume 3 of the Corowa Shire Local Flood Plan

Last Update: April 2008

ANNEX C TO THE
COROWA LOCAL FLOOD PLAN

ANNEX C - GAUGES MONITORED BY COROWA SES LOCAL HEADQUARTERS

Station	AWRC No	Stream	Flood Classification			Type
			Min	Mod	Maj	
Albury	409001*	Murray	4.3	4.9	5.5	Telemetered
Howlong	409037	Murray	-	-	-	Telemetered
Corowa	409002*	Murray	3.8	5.9	8.6	Telemetered
Yarrawonga Weir (Mulwala)	409025*	Murray	6.4	6.7	7.8	Telemetered

Note:

1. The Bureau of Meteorology (BOM) provides flood warnings for the gauges marked with an asterisk (*).
2. Corowa is unique in NSW in that the minor flood level is below the level regularly reached as a result of regulated dam releases.
3. The BOM does not provide warnings for inundation of rural areas caused by routine releases from Hume Dam, however if the 3.8m (Corowa gauge) is exceeded by a flood, say, from very high Kiewa River inflows, the BOM will issue a warning.

ANNEX D TO THE
COROWA LOCAL FLOOD PLAN

ANNEX D - DISSEMINATION OF SES FLOOD BULLETINS

The Murray 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
Prime	Albury
Win	Albury
Ten Network	Albury

Radio Stations:

Station	Location
2CO – ABC	Wodonga
Star (B104.9) FM / (1494) 2AY AM	Albury
The River (105.7) FM	Albury
3NE	Wangaratta
Edge (102.5) FM	Wangaratta

Newspapers:

Name	Location
Border Morning Mail	Albury
Corowa Free Press	Corowa
Yarrawonga Chronicle	Yarrawonga

Other Agencies:

Flood Bulletins will be issued to all agencies with responsibilities in this plan

ANNEX E - TEMPLATE FLOOD EVACUATION WARNING MESSAGE FOR COROWA

Date/Time of Issue:

Authorised By:

The Bureau of Meteorology has predicted a flood level of [] metres at [] (*place*) at [] (*time*). This means that [] (*describe areas*) 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 momentos together to take with you.
- Listen to radio stations [] 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 (the Department of Primary Industries can assist)

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 [].
- 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 - TEMPLATE DAM FAILURE EVACUATION WARNING MESSAGE FOR COROWA

Date/Time of Issue:**Authorised By:**

Hume Dam has issued [] a Dam Failure Alert for all downstream communities. at [*(time)*]. This means that there is a high potential for the dam wall to fail due to [*(eg. extreme flood overtopping the embankments / earthquake / failure of Dartmouth Dam)*] causing catastrophic flooding to Albury, Wodonga, Howlong, Corowa, Wahgunyah, Mulwala and downstream communities.

This flood is likely to be much bigger than floods ever recorded in Corowa. This means flooding dangerous to life is likely to occur by [].

YOU MUST PREPARE TO EVACUATE IMMEDIATELY.

Deciding to remain in your home when it is flooded or surrounded by flood waters, or delaying your evacuation, is dangerous. Flood waters are expected to inundate homes to heights above rooftop level. Phone, power, water and sewerage will fail. There will be very deep, fast flowing turbulent water carrying fallen trees, collapsed buildings, animal carcasses and other debris.

To prepare for evacuation, you should:

- Gather medicines, personal and financial documents and mementos together to take with you.
- Listen to radio stations [] for further information and to confirm this warning.
- If possible, check to see whether your neighbours need help.
- Prepare your pets for evacuation; place them on leads or in safe pet containers. Take your pets with you when you leave.

Before leaving residents should:

- Take three days' supply of clothes with you, medicines, and important papers (passport, drivers licence, legal documents, wills) and memorabilia e.g. Photo albums.
- If you have a car, drive in a northerly direction away from the river, to evacuation centres established at **Wagga Wagga**. There will be traffic direction provided at the intersection of [*enter roads*].
- If you don't have a car, the bus assembly area is at the Howlong [], Corowa [eg.hospital] or Mulwala [].
- 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 by the Department of Community Services.

If you require transport or further assistance call the SES on 132 500. Continue listening to local radio.

ANNEX G - EVACUATION ARRANGEMENTS FOR THE COROWA SHIRE AREA

BACKGROUND

1. Floods of a magnitude of up to and including the 1% AEP flood event (7.1m at Howlong gauge, 8.8m at Corowa gauge; 9.0m at Yarrawonga gauge) will necessitate only small-scale evacuations, primarily from the low-lying edges of the area, to locally higher ground within the townships of Howlong, Corowa or Mulwala. Evacuees in these events will be accommodated within the Corowa Shire at the designated evacuation centre (Corowa High School) or through personal arrangements with family and friends.
2. During extreme floods, large-scale evacuations will become necessary in Corowa, Howlong, Mulwala, surrounding villages and rural areas and will involve large numbers of people having to move or be moved to safety in relatively short periods of time. In floods predicted to exceed 11.6 metres at Corowa, and in the event of a dam failure alert, evacuees will be directed to evacuation centres in Wagga Wagga.
3. This annex provides a summary of the flood evacuation plan for the Corowa Shire Council area. Evacuation plans for specific areas within the council area can be found in annexes H - L.

ARRANGEMENTS

Control

1. Evacuations will be controlled by the Corowa SES Local Controller.
2. Should the evacuation operation escalate beyond the capabilities of local resources, control will be handed over to the Murray SES Region Controller.

Operational Sectors

3. For the purpose of managing evacuations during severe floods, the Corowa Shire Council area may be divided into four operational sectors.
 - a. Howlong
 - b. Corowa
 - c. Mulwala
 - d. Rural Areas

Decision to Evacuate

4. The responsibility for issuing any general evacuation order during flooding rests with the Corowa SES Local Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the Local Emergency Operations Controller and the Murray SES Region Controller.
5. Refer to Part 1.5 for agency responsibilities.

Decision Making Parameters

6. Evacuations will be required if any of the following are likely:
 - a. **Failure of Essential Services.** The failure of public utilities such as sewerage, power, telephones and water pose a significant health risk to residents on the floodplain or in flood affected areas. In the event of any or all of these systems failing or potentially failing, the need for evacuations will be discussed with the members of the LEMC.
 - b. **Flooding affecting properties.** Evacuations will be conducted when it is likely properties will be flooded.
 - c. **Isolation of properties.** People who are not prepared for isolation, or unsuited due to medical conditions etc, should be encouraged to evacuate.
 - d. **Dam Failure.** A Dam Failure Warning will require the evacuation of all people at risk.
7. For each sector where flood evacuations are required, there are four critical parameters that have to be considered in the decision making process. These parameters are tabulated within each Sector Annex and are based on:
 - a. The time required to mobilise for a response operation
 - b. The time required to ensure all residents are warned of the need to evacuate
 - c. The time required to move all vehicles out of the area
 - d. The minimum time likely to be available before flood water closes road evacuation routes

Conduct

8. Evacuations will be conducted by SES, NSW Police Force, NSW Fire Brigade, Ambulance Service of NSW, VRA, NSW Rural Fire Service and sporting / service club personnel in four phases:

- a. Phase 1 – Warning.
- b. Phase 2 – Withdrawal.
- c. Phase 3 – Shelter.
- d. Phase 4 – Return.

Phase 1 – Warning

9. **Evacuation warnings.** As soon as possible after the decision to evacuate is made, the Corowa SES Local Controller will issue evacuation warnings to the ‘at risk’ residents, indicating what people should do before evacuating and when actually doing so.
10. **Content of Evacuation Warnings.** A template guide to the content of evacuation warning messages is at Annexes E and F. The Murray SES Region Headquarters also maintains prewritten flood bulletin messages. These are disseminated via:
 - a. The radio and TV stations listed in Annex D.
 - b. Door-knocks by emergency service personnel.
 - c. Public address systems from emergency service vehicles.
 - d. Telephone.
 - e. Two-way radio.
 - f. SES Flood Bulletins.
11. **Self-motivated evacuation.** Some people will make their own decision to evacuate earlier and move to alternative accommodation using their own transport. These evacuees will be advised, via the media, to inform the Police or SES of their evacuation and their temporary address.

Phase 2 – Withdrawal

12. **Introduction.** Withdrawal involves the actual removal of the community/individuals from dangerous or potentially dangerous areas to safer areas.
13. **Transport.** Evacuees are to be encouraged to move using their own transport where possible. The Corowa SES Local Controller will arrange transport for those people without their own vehicles
14. **Traffic Control.** When large scale evacuations are likely, evacuation routes are to be secured by the NSW Police Force and kept clear by the following means:

- a. Denying access to all traffic except for emergency vehicles (including buses and private vehicles being used for the purposes of evacuation).
 - b. Keeping one lane clear at all times for use by emergency vehicles.
 - c. Positioning a tow truck or similar vehicle at appropriate entry points, road blocks and exit points along the evacuation routes.
15. **Large-scale evacuations.** When large scale evacuations are likely, the Corowa SES Local Controller will liaise with the Murray SES Region Headquarters and request the deployment of helicopters and trains.
16. **Management of Evacuees' Pets.** Evacuees with their own pets will be encouraged to take their companion animals with them as they evacuate. Animals must be appropriately contained in a pet carry cage or on a leash. Companion animals will be collected from their owners at evacuation centres and taken to facilities to be arranged by NSW Department of Primary Industries. Due to safety restrictions, it may not be possible to allow companion animals to accompany their owners when transported via aircraft or flood boats. In these cases provision will be made for animals to be picked up as people are evacuated. Arrangements will also be made to pick-up animals that are left behind. Assistance animals (guide dogs etc.) will remain in the care of their owners throughout the evacuation. This includes the transport and access into evacuation centres.
17. **Doorknocking.** Field teams conducting doorknocks will record and report back the following information back to the Operations Centre:
- a. Addresses and locations of houses doorknocked and/or evacuated.
 - b. The number of occupants.
 - c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).
 - d. Details of residents who refuse to comply with the evacuation order.
18. Key steps in planning for a doorknock are:
- a. Define the flood-affected areas that require doorknocking.
 - b. Using a map of the affected area define street segments of 10-15 houses and assign a doorknocking team to each segment. Teams can be assigned one or more street segments.
 - c. Assume that it will take a doorknocking team of two people up to five minutes per property to doorknock. Rural properties will take a longer period of time.
 - d. In each flood-affected area, generally plan to doorknock the lowest lying areas first and then work up to higher areas.

- e. Typed warning messages should be given to each doorknocking team for distribution to property occupants.
19. **Refusal to evacuate.** Field teams should not waste time dealing with people who are reluctant or refuse to comply with any evacuation order. These cases should be referred to the Local Emergency Management Operations Controller who will arrange for Police to ensure their evacuation.
20. **Security.** The NSW Police Force will provide security for evacuated areas.

Phase 3 – Shelter

21. **Evacuation Centres.** Evacuation centres provide people affected by disaster with immediate basic needs such as food, clothing, blankets, accommodation and personal support, as well as financial and other immediate assistance. Evacuees will be advised to go to or be taken to the nearest accessible evacuation centre, which may initially be established at the direction of the Corowa SES Local Controller but managed as soon as possible by the Department of Community Services.
22. **Action on arrival.** On arrival, evacuees will be:
- a. registered;
 - b. medically checked, if necessary; and
 - c. provided with their immediate welfare needs.
23. **Registration.** The NSW Police Force will ensure that all evacuees are registered on arrival at the designated evacuation centres.
24. **Transport and storage.** Transport and storage of furniture from flood-threatened properties to Corowa Saleyards will be arranged as time and resources permit, but may not be possible on a large scale in severe floods.
25. People will be encouraged to store belongings in elevated areas within the buildings and take any essential/important belongings with them when evacuating. In the event of an imminent dam failure, people should not waste time raising belongings if they have not already done so.

Phase 4 – Return

26. Once it is considered safe to do so, the Corowa SES Local Controller will authorise the return of evacuees to their normal or alternative place of residence. This decision will be made in consultation with appropriate officers in regard to matters such as the electrical safety of buildings.
27. The return will be controlled by the Corowa SES Local Controller and may be conducted, at his/her request, by DoCS.

ANNEX H - COROWA SECTOR EVACUATION

General

1. The Corowa Sector is divided into four subsectors: Corowa East, Corowa South, Corowa West and Corowa CBD (see Map 3).
2. The **Corowa East** subsector is delineated by the River Murray, Honour Ave (from the north-most caravan park to Short St), Reisling St, Edward St and Federation Ave, to the southern boundary of the Pioneer Cemetery.
3. Corowa East consists of approximately 1000 people; 500 residential properties, a small number of commercial properties, an ambulance station, a licensed club, a TAFE campus, the town swimming pool, sporting facilities, a scout building and three caravan parks in the sector.
4. The **Corowa South** subsector is delineated by the Murray River (between Enfield and River Streets), Enfield Street, Nixon Street, and the southern boundary of the Pioneer Cemetery.
5. Corowa South consists of approximately 1200 people; 540 residential properties, a caravan park, the racecourse, Corowa South Public School, a golf course and the sewage ponds.
6. The **Corowa West** subsector is delineated by Nixon Street, Cemetery Lane, Taits Road, Clintons Road, Bullicourt Road, Whitehead Street (to an unnamed road 1.2km north), Corowa Road, Honour Avenue and Federation Avenue.
7. Corowa West consists of approximately 1200 people, 2700 residential properties, the hospital, aged care facility, three schools, two childcare centres, the piggery and the Saleyards.
8. The **Corowa CBD** subsector is delineated by Federation Ave, Short St, Reisling St and Edward St.
9. Corowa CBD consists of approximately 58 commercial properties, the police station and 170 residential properties.
10. Caravan Park Proprietors/Managers will activate their evacuation plans and implement arrangements provided in ANNEX L to relocate all at risk caravans within the caravan parks.

Sector Control

11. **Control.** The Corowa SES Local Controller will control evacuations in this sector.
12. **Conduct.** Evacuations in this sector will be conducted by the SES with assistance from NSW Police Force, Corowa – Rutherglen VRA, NSW Fire

Brigade, NSW Rural Fire Service, NSW Ambulance Service and Service Club volunteers.

Time

13. Refer to ANNEX L for evacuation information for caravan parks
14. The table below details the amount of time required to evacuate the entire at-risk population of Corowa, such as would be required in an extreme flood or dam failure alert, depending upon doorknocking resources available.

Number of Doorknocking Teams	Total Evacuation Time (hours)
1	205.17
5	41.83
10	21.42
15	16.50
20	14.86
25	12.28
30	11.04
35	11.04
40	11.04
50	11.04

Table H-1 Estimated time required to complete evacuation of Corowa. Assumes 2400 properties to be evacuated, 1.7 vehicles per house, 6 hours to decide and mobilise, 12 hours available for evacuation, warning acceptance factor (WAF) equal to 1 hour, warning lag factor (WLF) equal to 1 hour and a maximum movement of 600 vehicles per hour.

Sequencing of Evacuation

15. The following sequencing of evacuation within Corowa Township is based on triggers of water levels **predicted** to reach particular heights on the Corowa gauge. A flood height at Corowa of 11.6m is equivalent to a 60% PMF imminent failure flood at Hume Dam, at this level there is a credible threat of failure of the dam wall.
 - a. **Sequencing of evacuation for floods NOT expected to exceed 11.6m**
 - East Corowa

- a. Evacuations of the Caravan Parks, the Ball Park area and low lying properties occur between 3.0m and 8m.
- b. Between 8m and 12m flooding may progressively occur in the following areas; the lower ends of Lone Pine Ave, Reisling St, Piggin Crt, Parliament St, Victoria St, Murray St, Isabel St, Banksia Crt, Acacia Dr and Edward St.
- South Corowa
 - a. Evacuation of Corowa Caravan Park must be completed by 6m.
 - b. Numerous properties on River Road lose access and may require evacuation between 6m and 10m.
 - c. Between 10m and 12m flooding may occur in streets south of Brocklesby Street.
- West Corowa
 - a. Evacuations will be required only if flooding is expected to exceed 11m on the Corowa gauge.
 - b. Federation Ave may be cut at about 11m between Edward St and Nixon St.
 - c. Between 11m and 13m some properties may be flooded and require evacuation in Pinot Cres, Sauvignon and Federation Drives.
- Corowa CBD
 - a. Evacuations will be required only when flooding is expected to exceed 11m on the Corowa gauge.
 - b. Warning for evacuation in this subsector should begin in Edward St and be conducted in a northerly fashion and include Albert St, Gray St, Aitken St, Parliament St, and the southern sections of Lyndsay, Queen and Sanger Streets.

b. Sequencing of evacuation for floods expected to exceed 11.6m and for dam failure flooding

- Due to the uncertainty and increased risk of dam failure by floods of this magnitude, a complete evacuation of Corowa will be required. Whilst temporary refuge may be found on high ground near the hospital and Corowa High School, it is likely essential services will fail, and it will likely be several weeks before they are restored. Evacuees already sheltering at the High School will require relocation to evacuation centres in Wagga Wagga.
- People living above the natural limit of flooding will be required to evacuate to Wagga Wagga when floods are expected to reach 11.6m.
- Evacuations will already be underway within East and South Corowa. The remaining properties in all subsectors must be evacuated by 11.6m.

Evacuation Centres

16. When flooding is not expected to exceed 11.6m on the Corowa gauge, evacuees will be advised to go to Corowa High School.

17. When flooding is expected to exceed 11.6m on the Corowa gauge, evacuees will be advised to go to evacuation centres in Wagga Wagga.
18. On receipt of a dam failure alert, evacuees will be advised to go to evacuation centres in Wagga Wagga.

Evacuation Routes

19. When flooding is not expected to exceed 11.6m, small scale evacuations from low lying properties within the town of Corowa can be accommodated within Corowa at the evacuation centre at Corowa High School.
20. Evacuees will be advised to take local roads to Corowa High School on Redlands Rd.
21. A large scale evacuation of Corowa will be required when flooding is expected to exceed 11.6m (at the Corowa Gauge). Severe flooding of this magnitude will see extensive evacuations from all river-side towns in the upper Murray to major centres outside the area at risk. Evacuation of Corowa must be completed by 11.6m.
22. Evacuation traffic must head in a northerly direction, and must not be directed east to Albury or west to Mulwala. The evacuation route south to Victoria is likely to be lost at about 9m.
23. Evacuees will be advised to take the following route from Corowa via Hopefield, Walbundrie, Henty and The Rock to Wagga Wagga:
 - a. Take Corowa Rd to Hopefield-Rand Road, alternatively if closed by flooding use Whitehead Street, Riverina Highway, Lavis Road to Hopefield –Rand Road
 - b. N along Hopefield –Rand Road to Daysdale Road
 - c. E along Daysdale Road to Walbundrie
 - d. E along Walbundrie and Henty Walla Roads to Henty
 - e. N along the Olympic Highway to Wagga Wagga

Evacuation Route Closure

24. Annex B details locations where local roads can be flooded, and where flash flooding may close major roads.
25. In extreme flood situations evacuations should be completed before evacuation routes are closed. Once evacuation routes are closed, people will become trapped by rising flood water and risk losing their lives.

26. The evacuation route to Wangaratta (Victoria) is likely to close at about 8.8m on the Corowa gauge. The Federation Bridge is designed to withstand a 1% AEP flood¹⁰.
27. A number of closures can affect evacuation routes at the following locations:
 - a. Approx 10.4m - Federation Ave between Nixon and River Streets
 - b. Approx 12.5m – Corowa Road between Saleyards and Riverina Hwy
28. More information on road closures in this sector is displayed in Map 4.

Household and Business Contents

29. Transport and storage of household and business contents from flood threatened properties will be arranged as time and resources permit. If time is available the SES and service clubs may assist in the lifting or relocation of business or household contents. Storage facilities are available at the Corowa Saleyards and would be suitable for floods.

Vulnerable Institutions Affected

30. The following institutions may require evacuation if flooding is expected to exceed 11.6 on the Corowa gauge:
 - Corowa Public School
 - Corowa South Public School

¹⁰ DUAP (2001) Roads and Traffic Authority - Proposed New Crossing of the Murray River Between Corowa (NSW) and Wahgunyah (Victoria). Director-General's Report Section 115C of the Environmental Planning and Assessment Act. Department of Urban Affairs and Planning.

ANNEX I - HOWLONG SECTOR EVACUATION

General

1. The Howlong Sector is divided into two sub-sectors: Howlong South and Howlong North (see Map 5).
2. The **Howlong South** subsector covers the area bounded by the Riverina Highway (from the intersection of Brocklesby Rd), Sturt St, the Murray River to a point approximately 4km upstream of the Howlong Bridge.
3. The Howlong South subsector consists of approximately 350 residential properties.
4. The **Howlong North** subsector covers the area west of Sturt St and the area north of the Riverina Hwy.
5. The Howlong North subsector consists of approximately 450 residential properties, a Post Office, a Supermarket, Chemist, Banking services, a butcher, baker and Golf Club.
6. Caravan Park Proprietors/Managers will activate their evacuation plans and implement arrangements provided in ANNEX F to relocate all at risk caravans within the caravan parks.

Sector Control

7. **Control.** The Corowa SES Local Controller will control evacuations in this sector.
8. **Conduct.** Evacuations in this sector will be conducted by the SES with assistance from NSW Police Force, Corowa - Rutherglen VRA, NSW Fire Brigade, NSW Rural Fire Service, NSW Ambulance Service and Service Club volunteers.

Time

9. Refer to ANNEX J for evacuation information for caravan parks
10. The table below details the amount of time required to evacuate the entire at-risk population of Howlong, such as would be required in an extreme flood or dam failure alert, depending upon doorknocking resources available.

Number of Doorknocking Teams	Total Evacuation Time (hours)
1	71.83
5	16.50
10	11.36
15	8.41
20	7.18
25	5.94
30	5.65
35	5.65
40	5.65
50	5.65

Table I-1 Estimated time required to complete evacuation of Howlong. Assumes 800 properties to be evacuated, 1.8 vehicles per house, 6 hours to decide and mobilise, 12 hours available for evacuation, warning acceptance factor (WAF) equal to 1 hour, warning lag factor (WLF) equal to 1 hour and a maximum movement of 600 vehicles per hour.

Sequencing of Evacuation

11. The following sequencing of evacuation within Howlong village is based on triggers of water levels **predicted** to reach particular heights on the Albury gauge. A flood height at Albury of 7.8m is equivalent to a 60% PMF imminent failure flood at Hume Dam, at this level there is a credible threat of failure of the dam wall.
- a. **Sequencing of evacuation for floods NOT expected to exceed 7.8m at Albury.**
 - Howlong South - A height of 6m at Albury may cause flooding of the road and some properties in Hume Close and Lowe St, Howlong.
 - Howlong North – Not required
 - b. **Sequencing of evacuation for floods expected to exceed 7.8m at Albury.**
 - Howlong South - The likelihood of dam failure during an extreme flood event increases, and if the dam fails, people will become trapped by fast rising floodwater. Therefore, a predicted height of 7.8m at Albury will require the evacuation of the following areas initially: Short St, Clarke St,

Lowe St, Bank St, Hume Cl, Larmer St, Townsend St (south of Clarke St), Hoddle St (west of Read St).

- Howlong South - Approximately 120 dwellings may be affected by yard or over floor flooding in a PMF, and an additional 100 dwellings may become isolated when evacuation routes close at about 9.4m (on the Howlong gauge). Howlong South - On receipt of a dam failure warning, all remaining people in Howlong South should begin evacuating immediately.
- Howlong North – On receipt of a dam failure warning, all people in Howlong North should evacuate immediately.

Evacuation Centres

12. When flooding is not expected to reach 7.8m on the Albury gauge, evacuees will be advised to go to evacuation centres in Lowe Square.
13. When flooding is expected to exceed 7.8m on the Albury gauge, evacuees will be advised to go to evacuation centres in Wagga Wagga.
14. On receipt of a dam failure warning, evacuees will be advised to go to evacuation centres in Wagga Wagga.

Evacuation Routes

15. When flooding is not expected to exceed 7.8m at Albury, small scale evacuations from low lying properties within the town of Howlong can be accommodated within Howlong at the evacuation centre at Lowe Square. Evacuees will be advised to take local roads.
16. When flooding is expected to reach 7.8 (at the Albury Gauge), or on receipt of a dam failure warning, a large scale evacuation of Howlong will be required. Severe flooding of this magnitude will see extensive evacuations from all river-side towns in the upper Murray to major centres outside the area at risk.
17. Evacuation traffic must head in a northerly direction, and must not be directed east to Albury, west to Corowa or south to Victoria.
18. Evacuees will be advised to take the following route from Howlong via Brocklesby, Walbundrie, Henty and The Rock to Wagga Wagga:
 - a. Take Brocklesby Rd N to Brocklesby then to Walbundrie
 - b. E along Walbundrie and Henty Walla Rds to Henty
 - c. N along the Olympic Highway to Wagga Wagga

Evacuation Route Closure

19. Annex B details locations where local and major roads can be flooded by rising floodwater or flash flooding.

20. In severe floods evacuations should be completed before evacuation routes are closed. Once evacuation routes are closed, people will become trapped by rising flood water and risk losing their lives.

Household and Business Contents

21. Transport and storage of household and business contents from flood threatened properties will be arranged as time and resources permit. If time is available the SES and service clubs may assist in the lifting or relocation of business or household contents. Storage facilities are available at the Corowa Saleyards.

ANNEX J - MULWALA SECTOR EVACUATION

General

1. The Mulwala Sector is divided into two sub-sectors: Mulwala Station Estate, Mulwala township and Mulwala Rural (see Map 4).
2. **The Mulwala Station Estate** sector is bounded by the Murray River from the Weir to a point 7.5km downstream and is inclusive of Bayly St, Pimpala Cres, Bimba Rd, Waratah Rd, Coobah Rd, Yarrah Rd, Wanani Rd, Wandoo Ct and Golf Club Rd.
3. The Mulwala Station Estate sector consists of approximately 110 dwellings and a golf course.
4. **Mulwala Township** is bounded by the urban fringe of town and includes Spring Drive, Tocumwal Rd, Mulwala – Savernake Rd, the Mulwala CBD and urban area.
5. The Mulwala Township Sector consists of approximately 700 dwellings and includes the CBD and tourist parks.
6. Caravan Park Proprietors/Managers will activate their evacuation plans and implement arrangements provided in ANNEX F to relocate all at risk caravans within the caravan parks.

Sector Control

7. **Control.** The Corowa SES Local Controller will control evacuations in this sector.
8. **Conduct.** Evacuations in this sector will be conducted by the SES with assistance from Yarrawonga SES (VIC SES), NSW Police Force, Corowa - Rutherglen VRA, NSW Fire Brigade, NSW Rural Fire Service, NSW Ambulance Service and Service Club volunteers.

Time

9. The table below details the amount of time required to evacuate the entire at-risk population of Mulwala depending upon doorknocking resources available.

Number of Doorknocking Teams	Total Evacuation Time (hours)
1	71.83
5	16.50
10	11.59
15	8.56
20	7.30
25	6.54
30	5.53
35	5.17
40	4.90
50	4.52

Table J-1 Time required to complete evacuation of Mulwala. Assumes 800 properties to be evacuated, 0.98 vehicles per house, 6 hours to decide and mobilise, 12 hours available for evacuation, warning acceptance factor (WAF) equal to 1 hour, warning lag factor (WLF) equal to 1 hour and a maximum movement of 600 vehicles per hour.

Sequencing of Evacuation

10. The following sequencing of evacuation within Mulwala is based on triggers of water levels **predicted** to reach particular heights on the Yarrawonga gauge. Given there is limited information about the consequences of flooding in Mulwala, the decision to evacuate Corowa will be a trigger for also evacuating Mulwala.

- a. Sequencing of evacuation for floods NOT expected to exceed the 1% AEP flood (9.46m at Yarrawonga gauge)**
 - Mulwala Station Estate – Evacuations may be required at flood levels of between 7.1m to 8m on Yarrawonga d/s gauge within the estate.
- b. Sequencing of evacuation for floods expected to exceed the 1% AEP flood (9.46m at Yarrawonga gauge)**
 - If large-scale evacuations are warranted at Albury and Corowa, Mulwala should also be evacuated as soon as possible.
 - In an extreme natural flood, but particularly in dam failure flood, Mulwala will become a shrinking flood island, and will lose the last evacuation route at approximately 10.5m (Yarrawonga gauge).

Evacuation Centres

11. When flooding is not expected to exceed 9.46m, small scale evacuations from low lying properties within the town of Mulwala can be accommodated within Mulwala.
12. When flooding is expected to exceed 9.46m, evacuees will be advised to go to evacuation centres in Wagga Wagga.
13. On receipt of a dam failure warning, evacuees will be advised to go to evacuation centres in Wagga Wagga.

Evacuation Routes

14. During large scale evacuations of Mulwala, evacuees will be advised to take Bull Plain Rd toward Wagga Wagga
15. Evacuation traffic must head in a northerly direction, and must not be directed east to Barooga or west to Corowa.

Evacuation Route Closure

16. Annex B details locations where local roads can be flooded, and where flash flooding may close major roads.
17. In extreme flood situations evacuations should be completed before evacuation routes are closed. Once evacuation routes are closed, people will become trapped by rising flood water and risk losing their lives.

Household and Business Contents

18. Transport and storage of household and business contents from flood threatened properties will be arranged as time and resources permit. If time is available the SES and service clubs may assist in the lifting or relocation of business or household contents.

ANNEX K - RURAL SECTOR EVACUATION

General

1. Rural areas are described in terms of 3 river reaches; Albury to Howlong; Howlong to Corowa; Corowa to Yarrawonga.
2. Rural landholders in the floodplain were surveyed¹¹ by River Murray Water in 2001 and are distributed as follows:

Reach	Number of Landholders (in NSW and VIC*)	Number of landholders experiencing inundation, impeded access and/or high watertables
Albury to Howlong	53	27
Howlong to Corowa	47	26
Corowa to Yarrawonga	18	11

* The discrimination between NSW and Victorian landholders was not available in the report.

Sector Control

3. **Control.** The Corowa SES Local Controller will control evacuations in this sector.
4. **Conduct.** Evacuations in this sector will be conducted by the SES with assistance from NSW Police Force, Corowa - Rutherglen VRA, NSW Fire Brigade, NSW Rural Fire Service, NSW Ambulance Service and Service Club volunteers.

Movement

5. Low lying areas of properties between Albury-Howlong-Corowa begin to get flooded between 2.9 and 3.0 metres (Albury gauge). Stock movement is required from these areas.

¹¹ Hassall & Assoc. P/L (2001) Impact of Full Regulated Flow Between Hume Dam and Yarrawonga. River Murray Water.

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

General

1. The caravan parks listed in the table below are flood liable:

Name and Address	Total Sites	Inundation begins at	Time required to evacuate	Description of consequences
Howlong Caravan Park (Hume St, Howlong)	68 powered 12 cabin	5.5m (Albury gauge)		During major flooding (5.5 metres on the Albury gauge), some low-lying areas may become inundated and access to and from individual sites within the park may be lost.
Rivergum Caravan Park (386 Honour Ave, Corowa)	140 powered 25 unpowered 12 cabin	3.8m (Corowa gauge)		Rivergum is the first caravan park in the Corowa area to be effected by flooding but requires only the movements of four vans to higher land. At 6.5m the caravan park is badly affected.
Bindaree Motel & Holiday (454 Honour Ave, Corowa)	81 powered 15 unpwr 5 cabin	5.9m (Corowa gauge)	2 ½ days	The park has only one access road. Evacuation requires the relocation of all caravans and associated annexes. The park is completely inundated at 6.3 metres.
Corowa Caravan Park (84 Federation Ave, Corowa)	89 powered 30 unpowered 22 cabins	6.0m (Corowa Gauge)	1 ½ days to evacuate unpowered sites	The park has only one access road. The park is protected by a levee to 6.0 metres. When that height is to be exceeded then all unpowered sites require evacuation.
Ball Park Caravan Park, (Bridge Rd, Corowa)	230 powered 130 unpowered 20 cabin	7.0m (Corowa gauge)	Several days	At 7.3 metres, 120 van sites are flooded and at 8.0 metres the whole park is inundated. As many of the sites house permanent vans with attached annexes and decking.

Table L-1: Flood liable caravan parks in Corowa Shire

Note: Melbourne Cup Day weekend is the busiest time of year for Caravan Parks in the Shire.

2. Council resources and voluntary organisations such as the Corowa Rescue Squad will assist the caravan park owners and non-resident owners to relocate their vans and mobile homes. Adequate warning time is available for this task.

Advising Procedures

3. Caravan Park proprietors/managers will ensure that the owners and occupiers of caravans are:
4. Made aware that the caravan park is flood liable by:
 - a. 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.
 - b. Displaying this notice prominently in each van.
 - c. 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, i.e.: tyres inflated; jacks wound up; personal effects secured; and annexes and lines for water, sewer, electricity and gas readily detachable.
 - d. 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.
 - e. The Corowa SES Local Controller will ensure that the proprietors/managers of caravan parks are advised of flood warnings and the details of any evacuation order.

Evacuation of Occupants and Relocation of Vans

5. Caravan park proprietors/managers will install flood depth indicators and road alignment markers within their caravan parks.
6. When an evacuation order is given:
 - a. Occupiers of non-movable vans will:
 - 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 if they have their own transport, or move to the caravan office to await transport.
7. 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.
 8. Vans are to be moved to the sites determined by the Corowa Shire Council at the time of predicted flooding.
 9. Occupants of vans that are being relocated should go to a designated evacuation centre if they have their own transport. Those without their own transport are to report to the caravan park office.
 10. Caravan park proprietors/managers will:
 - a. Advise the Corowa SES Local Controller of:
 - the number of people requiring transport;
 - details of any medical evacuations required, and
 - whether additional assistance is required to effect the evacuation.
 - Check that no people remain in non-removable vans that are likely to be inundated.
 - Inform the Corowa SES Local Controller when the evacuation of the caravan park has been completed.
 - Provide the Corowa SES Local Controller with a register of people that have been evacuated.

Return of Occupants and Vans

11. The Corowa SES Local Controller, using Council resources as necessary, will advise when it is safe for the caravan parks to be re-occupied.
12. 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.

ANNEX M - DETAILS OF THE DAM-FAILURE WARNING AND EVACUATION SYSTEM FOR HUME DAM

Background

1. Hume Dam is located on the Murray River, downstream of its junction with the Mitta Mitta River, approximately 16 kilometres east of Albury. It is operated by State Water (NSW) and River Murray Water (Victoria) on behalf of the Murray Darling Basin Commission (MDBC). For information on specifications of the dam refer to ANNEX A of this plan and the Hume Dam Safety Emergency Plan (DSEP).
2. Dartmouth Dam is located upstream of Hume Dam and impounds the waters of the Mitta Mitta River about 24 km from the township of Mitta Mitta in north eastern Victoria. It is operated by River Murray Water on behalf of the MDBC. It is the largest capacity dam in Victoria and the highest structure of its kind in Australia. When full, the dam stores 4,000,000 megalitres of high quality water from the surrounding alpine areas of Victoria.
3. There are three major possible causes of Hume Dam failure;
 - a. Failure due to extreme flood levels overtopping the embankments.
 - b. Flood failure consequent to the failure of Dartmouth Dam.
 - c. Failure due to a rapidly deteriorating structural deficiency such as may be induced by internal erosion or by an extreme earthquake. (This is the so-called “Sunny Day” failure, i.e. not induced by an inflow flood).
4. Although the dam is currently in good condition, it is recognised that an unsafe or emergency condition could occur at any time due to extreme natural events.
5. Hume Dam spillway is capable of passing as little as 60% of the PMF. Studies are currently underway to determine the hydrology of the upstream catchment and to define the peak inflow for the PMF (which is currently under debate).

Aim

6. This Annex describes the arrangements for the failure of Hume Dam and should be read in conjunction with Annexes F to J.

Consequences of Failure

7. A cascade failure would result in catastrophic flooding downstream of Hume Dam – in such an event the entire Murray River Floodplain will require evacuation.

8. Approximately 8500 people are at risk in the Corowa Shire in a Hume Dam failure scenario (not associated with a cascade failure). Approximately 800 dwellings in the village of Howlong, 2000 dwellings in the town of Corowa and 500 dwellings in the town of Mulwala could be inundated by a failure of Hume Dam as well as hundreds of businesses and commercial premises. Rural properties located along the Murray River between these urban areas will also be inundated.
9. It should be noted that a failure of Hume Dam resulting from extreme rainfall would be preceded by flooding many times more destructive than the 1870 flood of record. Consequently vast areas downstream of Hume Dam would already have been inundated and residents evacuated.
10. Severe flooding would also likely damage power supply facilities in the area resulting in loss of power, put telephone facilities out of action, and cut off evacuation routes.
11. In all failure scenarios, extreme velocities and depths are likely to be experienced resulting in the destruction of private property and public infrastructure.
12. Flow times between failure and the impact upon urban areas is short. It is estimated that travel times from the start of the breach at the dam to the arrival of the peak of the dam-break flood would be approximately 2 hours and 40 minutes to Albury Airport and 6 hours and 50 minutes to the Howlong Road Bridge. It would take significantly less time (30 minutes to Albury Airport and three hours to Howlong Road Bridge) for the start of the dam-break flood wave to reach these locations. The following table details the approximate dam break flood travel times¹²:

Table M-1: Dam Failure Flood Travel Times

LOCATION	START OF DAM BREAK FLOOD WAVE	PEAK OF DAM BREAK FLOOD WAVE
Albury Airport	30 minutes	2 hours, 40 minutes
Doctors Point	50 minutes	3 hours, 10 minutes
Albury Railway Bridge	1 hour	3 hours, 20 minutes
Lincoln Causeway	1 hour	3 hours, 20 minutes
Howlong Road Bridge	3 hours	6 hours, 50 minutes
Corowa Road Bridge	4 hours, 40 minutes	15 hours, 30 minutes

13. Note that these travel times are only one component of the lead-up time (and therefore the warning time) before flooding commences. Other components include:
 - a. Rainfall duration, flood travel times upstream of the dam and time to fill the storage (for flooding cases).

¹² State Water (2003) Dam Safety Emergency Plan for Hume Dam. Murray Darling Basin Commission (River Murray Water).

- b. Dartmouth Dam failure time and travel time from Dartmouth Dam to Hume Dam (approximately 3.5 hours) for the case of ‘cascade failure’ of both dams.
 - c. Lag time between the occurrence of an earthquake and the start of a consequential dam failure.
14. For all modes of failure, actual breach development times longer than one hour may give a greater time between ‘start of dam-break flood wave’ and ‘peak of dam-break flood wave’ and a correspondingly lesser rate of rise of flood waters.

Dam Break Flood Levels

15. The downstream effects of a Hume Dam failure event may vary considerably. Levels and extent of inundation, rates of rise and flood wave travel times will depend on a number of factors including:
- a. Pre-existing flood conditions.
 - b. Dam storage levels.
 - c. The cause of failure (e.g. flood or earthquake).
 - d. The actual mode of failure.
 - e. Actions taken at the dam to control releases and to contain damage.
16. The worst case scenario being considered is the failure of Dartmouth Dam on the Mitta Mitta River followed by failure of Hume Dam located downstream of the junction of the Mitta Mitta and Murray rivers. The flood wave could take about three and a half hours to travel from Dartmouth Dam to the upstream reaches of Lake Hume.
17. Table H-2 indicates a number of peak flood heights at Albury, Howlong and Corowa for the 5%, 2%, 1% AEPs, IFF and PMF, which indicate possible peaks during natural flooding without dam failure. These are included to provide a basis for comparison and to indicate the extreme nature of the floods being considered.
18. The two last scenarios relate to dam failure scenarios. If the dam were to fail through overtopping, it would be more likely to fail at a lower level closer to the IFF. It is possible though that failure could be delayed until closer to the top of the developing PMF – hence this set of heights is included.
19. It may become necessary during an emergency or an extreme flood for Hume Dam operators to lower the storage level to decrease seepage and/or loading on the structure or to minimise the impact of any failure. The maximum discharge from the dam at Full Supply Level (FSL) through the spillway is 590,000 megalitres per day. (Note: releases of 220,000 megalitres per day would result in peak heights of approximately 5.8 metres at the Albury gauge and may overtop the Albury levee). For further detailed information refer to the Hume Dam Safety Emergency Plan 2003 (DSEP).

Table M-2: Peak Flood Heights During Natural and Dam Failure Flood Events at Albury, Howlong and Corowa

FLOOD SCENARIO	LOCATION (PEAK)									
	ALBURY (409001)		HOWLONG (409037)		COROWA (409002)		YARRAWONGA (409025)			
	Albury Gauge Height (m)	Discharge m ³ /s	Howlong Gauge Height (m)	Discharge m ³ /s	Corowa Gauge Height (m)	Discharge m ³ /s	Yarrowonga Gauge Height (m)	Discharge m ³ /s		
5% AEP ⁹	7.97	165,000	Not Available	Not Available	8.1	156,000	8.26	235,000		
2% AEP ⁹	8.07	200,000	Not Available	Not Available	8.6	210,000	8.96	325,000		
1% AEP ⁹	8.27	250,000	7.14 (1975 flood)	Not Available	8.8	235,000	9.76	390,000		
Imminent Failure Flood – No dam failure*	7.83	9787	10.3	9770	11.64	9655	Not Available	Not Available		
Probable Maximum Flood (36Hr PMP) – No dam failure*	9.43	20,214	12.16	19,920	13.96	19,180	Not Available	Not Available		
Imminent Failure Flood – Dam Failure*	18.72	159,469	19.67	114,729	19.99	50,810	Not Available	Not Available		
Probable Maximum Flood (36Hr PMP) – Dam Failure*	18.99	170,489	20.16	122,963	20.86	55,000	Not Available	Not Available		

*Scenario: Failure of dam commences at **Dam Crest**. Full Supply Level. Normal Gate Operation. Imminent Failure Flood 60% of Probable Maximum Flood¹³.

To convert cubic metres per second to megalitres per day, multiply the value of m³/s by 86.4.

To convert megalitres per day to cubic metres per second, multiply the value of ML/day by 0.01157407.

¹³ DWR (1992) Hume Dam Dambreak Flood Analysis. NSW Department of Water Resources.

Operation and Procedures

20. **Flood Operation**¹⁴ – The operation of the storage is controlled from the River Murray Water office in Canberra. During flooding events, the dam will be continuously manned. The RMW Duty Officer in Canberra and the Duty Officer at Hume Dam are in regular contact with each other.
21. **Monitoring procedures** – Dam levels are monitored by River Murray Water in Canberra and State Water at the dam by:
- Rainfall gauges upstream of the Hume Dam are monitored on a daily basis and more frequently as required during flood events. River Murray Water will use this data in hydrological models to predict expected dam level rises.
 - The principal storage level indicator is a recorder and data logger located on a pier of Bethanga Bridge. The data logger is interrogated by telephone. The storage water level is also recorded continuously on an automatic recorder in the dam office. If the storage behaviour on the recorder looks suspect, the storage level reading should be visually checked on the dam wall gauge.
 - Manual readings of the gauge boards at the dam will be taken for dam levels above FSL.
22. **Notification Procedures** - The primary contact for dam failure warning notification is the NSW SES State Headquarters Communications Centre. This centre will subsequently notify the Murray Region Headquarters duty officer who will contact the Corowa SES Local Controller. An alternate NSW Police Force contact is available if this notification procedure was to fail.
23. The Duty officer, Hume Dam will keep the SES Region Controller informed of the anticipated river heights in Albury, Howlong and Corowa whenever a significant change in release from Hume Dam is made. In particular, the alerts outlined in Table N-3 will be sent to the SES in NSW (and Victoria):
24. Actions indicated as occurring at particular alert levels may be brought forward if the development of the flood event warrants.

¹⁴ State Water (2003) Dam Safety Emergency Plan for Hume Dam. Murray Darling Basin Commission (River Murray Water).

Table M-3: Alerts will be sent by Hume Dam to NSW and VIC SES

Alert Trigger	Alert
Storage Water Level Storage up to FSL 192.0m AHD	Flood releases through the spillway are about to begin
Hume Dam discharge plus Kiewa River flow will equal or exceed 43 000 ML/day	Murray River at Albury is expected to reach MINOR FLOOD LEVEL (4.3m)
Hume Dam discharge plus Kiewa River flow will equal or exceed 81 000 ML/day	Murray River at Albury is expected to reach MODERATE FLOOD LEVEL (4.9m)
Hume Dam discharge plus Kiewa River flow will equal or exceed 173 000 ML/day	Murray River at Albury is expected to reach MAJOR FLOOD LEVEL (5.5m)
Hume Dam discharge plus Kiewa River flow will equal or exceed 220 000 ML/day All spillway gates fully open spillway discharge will be 589,850ML/day	The Albury Levee may be overtopped in the near future. Hume dam is no longer able to regulate releases
RL 193.9	Storage at crest of main embankment, some outflanking of Embankment No.3
RL 194.3 (Spillway discharge 1,075,000ML/day)	Storage at critical safety level at top of core wall
RL 195.3 (Spillway Discharge 1,189,000ML/day)	Storage at top of parapet wall and at crest of Embankments No.2 and No.3

25. The SES is to be informed by State Water / RMW of any decreases in flow at all times. In particular the SES should be informed of instances where the anticipated combined flow (Kiewa and Murray Rivers) at Albury falls below the above mentioned levels.
26. In the event of a complete loss of communications between the dam and River Murray Water in Canberra, Hume Dam staff would operate the storage in accordance with standard flood operational procedures as detailed in the DSEP.

Monitoring

27. Dam owners/operators (State Water and River Murray Water) will undertake monitoring and inspections of their respective dams to ensure any situations, which may lead to potential dam failure, are identified.
28. If a situation is identified which may lead to potential dam failure, the dam owner will notify the SES.
29. State Water must ensure that appropriate agencies are made aware of any threat to the dam to maximise the time available for mobilising necessary resources.

Warning

30. Once an amber alert level is reached dam failure warnings will be disseminated.
31. The SES will disseminate dam failure warnings with assistance from NSW Police Force, NSW Fire Brigades, NSW Rural Fire Service, VRA, Service Clubs, State Water and Snowy Hydro Ltd.
32. Dam Failure Warnings will be disseminated by the following means:
 - a. Doorknocking of at-risk dwellings.
 - b. Telephone call being made to at-risk dwellings.
 - c. Mobile public address systems fitted to emergency service vehicles.
 - d. Sirens fitted to emergency service vehicles.
 - e. Broadcasts over radio and television stations.
 - f. By two-way radio.
33. Broadcast dam failure warning messages will describe the situation; say what is happening currently: what is expected to happen: when it will occur and indicate how people should act. If evacuation is required the message will be preceded by the playing of the Standard Emergency Warning Signal (SEWS) and will detail:
 - a. Instructions to evacuate.
 - b. The location of assembly areas for transport to evacuation centres.
 - c. The location of evacuation centres for those using private transport
 - d. Authorised or recommended evacuation routes.
 - e. Arrangements for children in schools and pre-schools.
 - f. Arrangements for elderly or infirm residents unable to self-evacuate.

Evacuation

If necessary, evacuations will be undertaken. Refer to Annex F to I of this plan for detailed evacuation arrangements.

Table M-4: Notification, Warning and Evacuation Arrangements for Potential Failure of Hume Dam

ALERT LEVEL	DEFINING CONDITIONS	APPROX. ELAPSED TIMES IN WORST CASE	FLOOD EFFECTS	NOTIFICATION ARRANGEMENTS AND ACTIONS					PEOPLE AT THREAT
				STATE WATER	SES STATE HQ	MURRAY SES REGION HQ	COROWA SES LOCAL HQ		
WHITE: (emergency services notification level and evacuation of areas inundated by levee overtopping flood in Albury).	<ul style="list-style-type: none"> Storage level = RL 188.5 to 189.0mAHD 3.74m to 4.24m above spillway crest Hume Dam discharge plus Kiewa River flows may exceed 220,000 ML/day 	TBC	<ul style="list-style-type: none"> Major flooding will already be occurring downstream. Flood heights may reach up to 5.8 metres on the Albury gauge. The Albury levee is likely to be overtopped. 	<ul style="list-style-type: none"> Staff at dam informed of any defining conditions being reached. Monitor dam. Advise SES State HQ of White Alert Level being reached and provide regular updates on the situation at the dam. 	<ul style="list-style-type: none"> Receive advice from State Water and inform Murray SES Region HQ. SHQ advises SEOC 	<ul style="list-style-type: none"> Informed by staff at the dam of any defining conditions being reached. Advise Corowa SES Local Headquarters and other SES units downstream of the dam. Advise the Murray District Emergency Management Officer (DEMO). Provides SES Flood Bulletins and evacuation warnings to the media organisations listed in Annex D. Organise out of area assistance for warning and evacuation operations. 	<ul style="list-style-type: none"> Activate Local Flood Plan. Advise NSW Police Force (Corowa Local Area Command Headquarters), Corowa Local Emergency Operations Controller (LEOCON), Corowa Fire Control Officer, the Department of Community Services (DoCS), Yarrowonga SES (VICSES) and other agencies that the White Alert Level has been reached. Ensure that evacuation centres are ready to receive evacuees. 	<ul style="list-style-type: none"> Residents and business owners in Corowa to prepare homes for inundation pack mementos and move pets and move to evacuation centres. Notify SES doorknockers if transport to evacuation centres is required. 	

<p>AMBER: (all at-risk households warned)</p>	<p>Storage up to Full Supply Level (RL 192.0mAHD).</p> <ul style="list-style-type: none"> Flood passing over spillway. All spillway gates fully opened. Staff at Hume Dam are no longer able to regulate releases. 	<p>TBC</p>	<ul style="list-style-type: none"> Extreme flooding downstream, Albury levee overtopped. Many downstream residents will already have been evacuated before this action level is reached. 	<ul style="list-style-type: none"> Staff at dam informed of Amber Alert Level being reached. Continue monitoring the dam. Advise SES State HQ of Amber Alert Level being reached and provide regular updates on the situation at the dam. Contact residents immediately downstream of dam and advise them to prepare to evacuate. 	<ul style="list-style-type: none"> Receive advice from State Water and inform Murray SES Region HQ. SHQ advises SEOC. 	<ul style="list-style-type: none"> Informed by staff at the dam that the Amber Alert Level has been reached. Advise Corowa SES Local Headquarters and other SES units downstream of the dam. Advise the Murray DEMO. Provides SES Flood Bulletins and evacuation warnings to the media organisations listed in Annex D. Coordinate provision of out of area assistance for warning and evacuation operations. 	<ul style="list-style-type: none"> Advise NSW Police Force (Albury Local Area Command Headquarters), Corowa LEOCON, Albury Fire Control Officer, DoCS, Wodonga SES (VICSES) and other agencies that Amber Alert Level has been reached. Ensure that evacuation centres are made ready. Conduct warning of downstream residents by doorknock and public address systems from emergency service vehicles. 	<ul style="list-style-type: none"> Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate. Notify SES doorknockers if transport to evacuation centres will be required.
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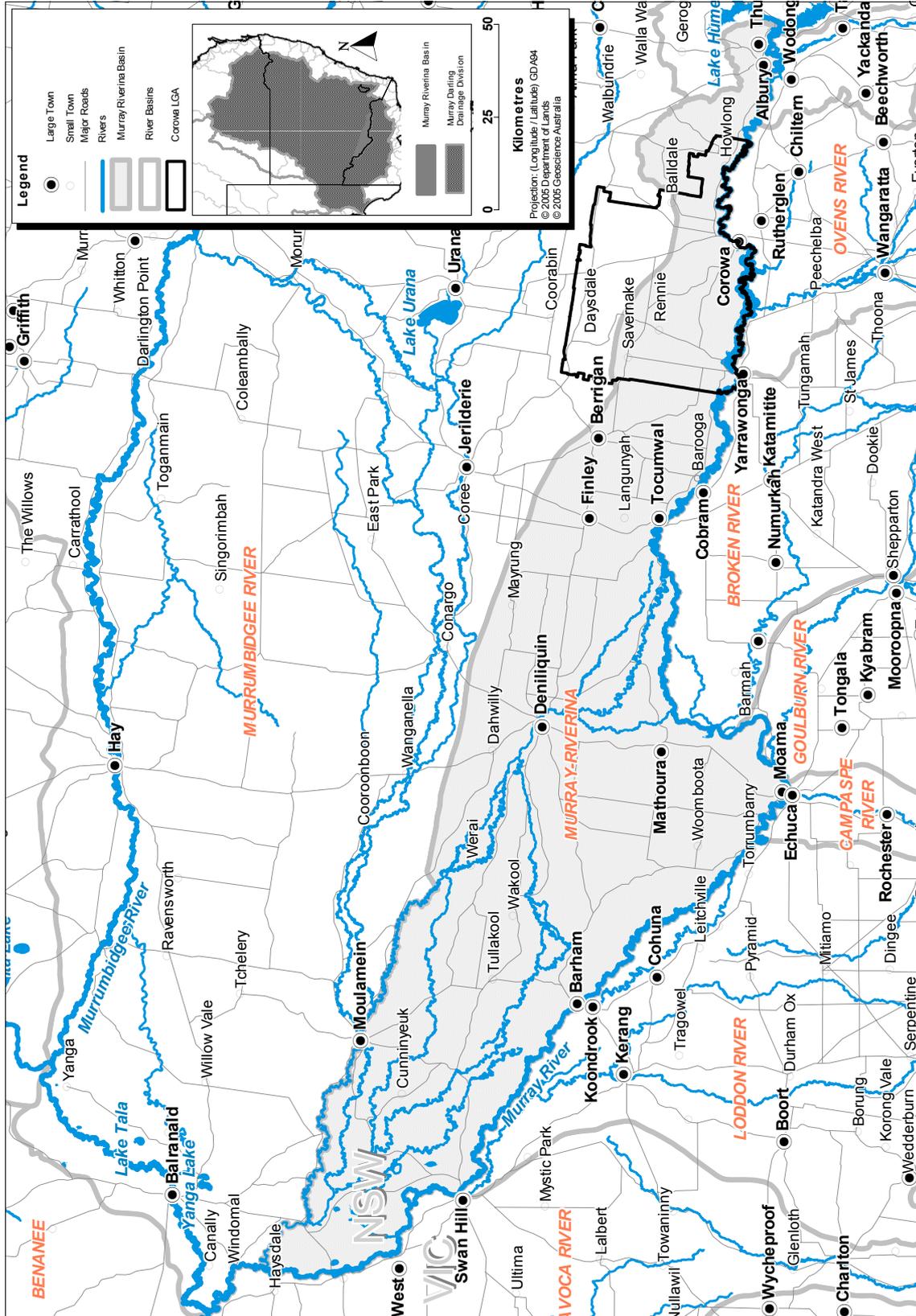
<p>RED: (evacuation level for all remaining Sectors).</p>	<p>Storage at critical safety level at top of core wall (RL 194.3mAHD).</p>	<p>TBC</p>	<ul style="list-style-type: none"> • Extreme flooding already occurring downstream and large parts of Albury evacuated. 	<ul style="list-style-type: none"> • Staff at dam informed of Red Alert Level being reached. <ul style="list-style-type: none"> • Continue monitoring the dam. • Advise SES State HQ of Red Alert Level being reached and provide regular updates on the situation at the dam. • Contact residents immediately downstream of dam and advise them to evacuate. 	<ul style="list-style-type: none"> • Receive advice from State Water and inform Murray SES Region HQ. <ul style="list-style-type: none"> • SHQ advises SEOC. 	<ul style="list-style-type: none"> • Informed by staff at the dam that the Red Alert Level has been reached. <ul style="list-style-type: none"> • Advise Corowa SES Local Headquarters and other SES units downstream of the dam. • Advise the Murray DEMO. • Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. <ul style="list-style-type: none"> • Activate the Standard Emergency Warning Signal (SEWS) and ensure that evacuation warnings are broadcast over the radio stations listed in Annex D. • Coordinate provision of out of area assistance for evacuation operations. 	<ul style="list-style-type: none"> • Advise NSW Police Force (Corowa Local Area Command Headquarters), Corowa LEOCON, Corowa Fire Control Officer, the Department of Community Services (DoCS), Yarrawonga SES (VICSES) and other agencies that Red Alert Level has been reached. <ul style="list-style-type: none"> • Ensure that evacuation centres are ready to receive evacuees. • Conduct warning and evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. • Coordinate transport of evacuees without their own vehicles. 	<ul style="list-style-type: none"> • Evacuate.
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<p>THEORETICAL FAILURE LEVEL/IMMINENT FAILURE LEVEL</p>	<ul style="list-style-type: none"> Storage at top of parapet wall and at crest of Embankments No. 2 and No. 3 (RL 195.3 m AHD). 	N/A	N/A	<ul style="list-style-type: none"> Continue to monitor the dam and advise SES State Headquarters. 	<ul style="list-style-type: none"> Receive advice from State Water and inform Murray SES Region HQ. SHQ advises SEOC. 	<p>As above.</p>	<p>As above.</p>	<p>As above.</p>
<p>ALL CLEAR (Danger at the dam is assessed as being over. NOTE: This could occur at any time after the White Alert Level is reached).</p>	<ul style="list-style-type: none"> Danger assessed as being over. 	N/A	N/A	<ul style="list-style-type: none"> Advise SES State Headquarters that danger assessed as being over. 	<ul style="list-style-type: none"> Receive advice from State Water and inform Murray SES Region HQ. SHQ advises SEOC. 	<p>As above.</p>	<p>As above.</p>	<ul style="list-style-type: none"> Stay home, return home or await further advice.

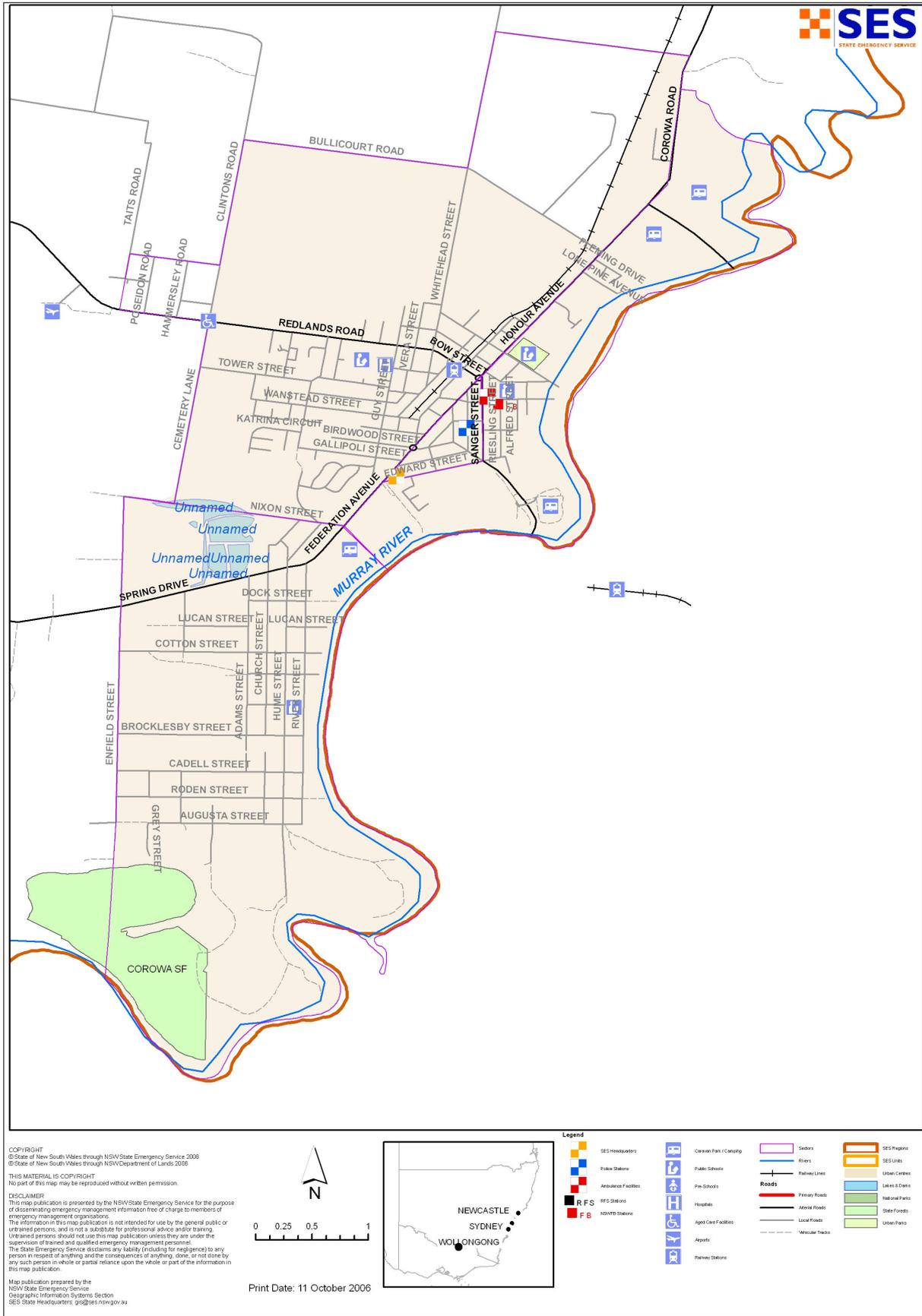
Notes to Table 4:

- Actions indicated as occurring at particular Alert Levels may be brought forward if the development of a flood event warrants.
- The 'Approximate Elapsed Times' are estimates of the worst possible case based upon PMF hydrographs. In real events which threaten to cause the Hume Dam to fail, it is likely that much more time would elapse between defined levels than is indicated in the table. Assessments of the speed of onset of developing events would be made at the time and advice given to residents would reflect these assessments.

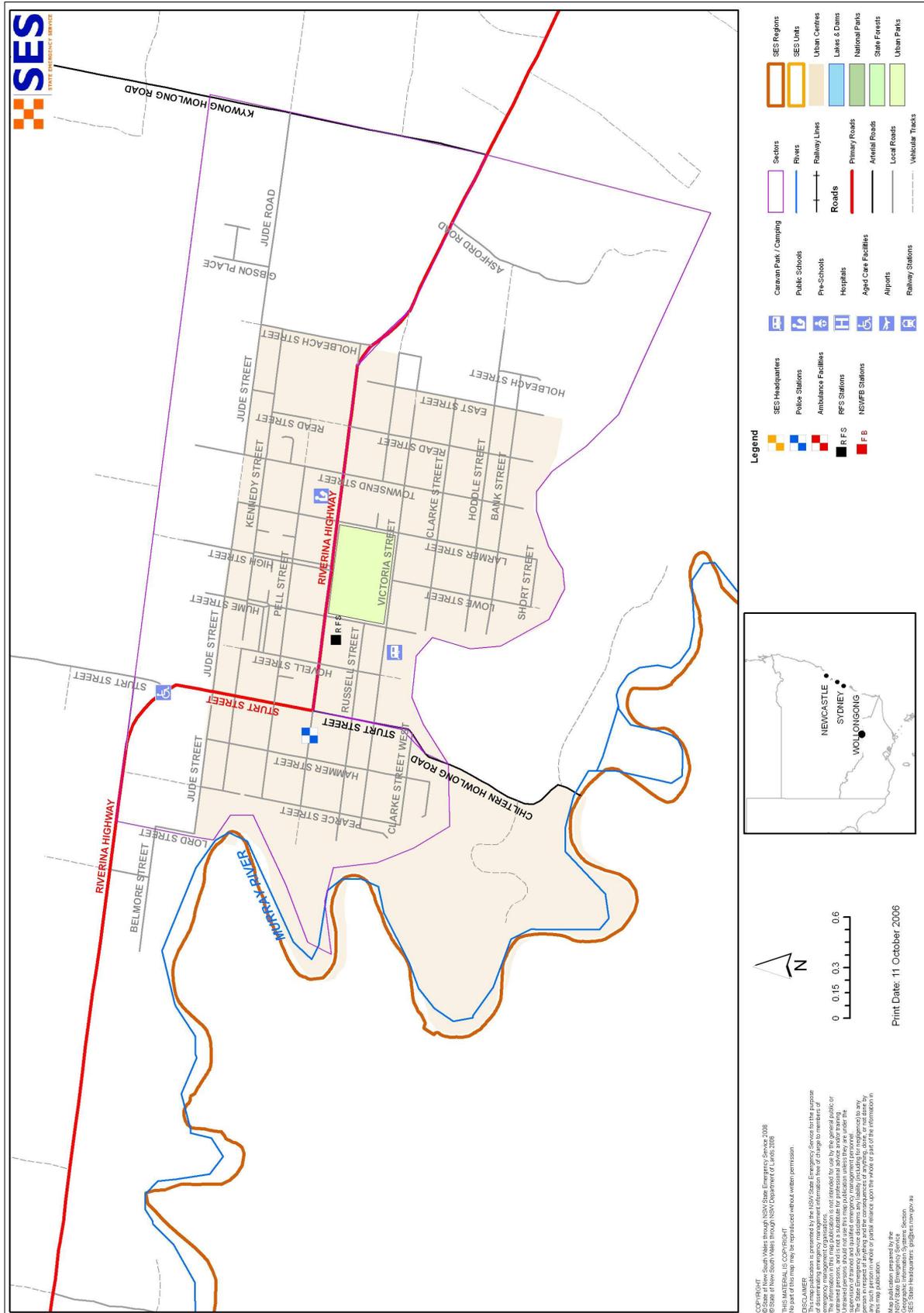
MAP 1 – MURRAY RIVERINA BASIN



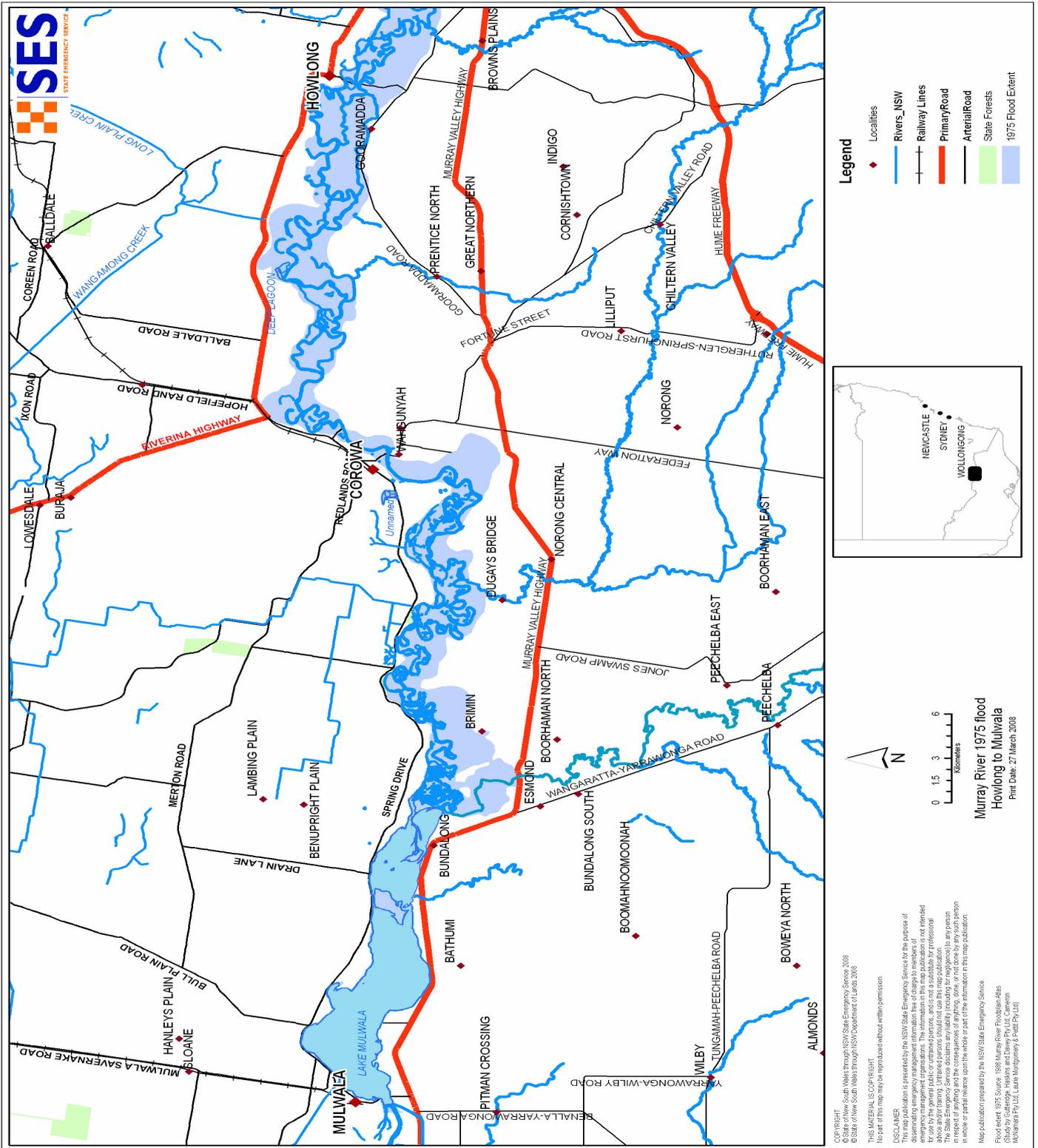
MAP 3 – TOWN AREA COROWA



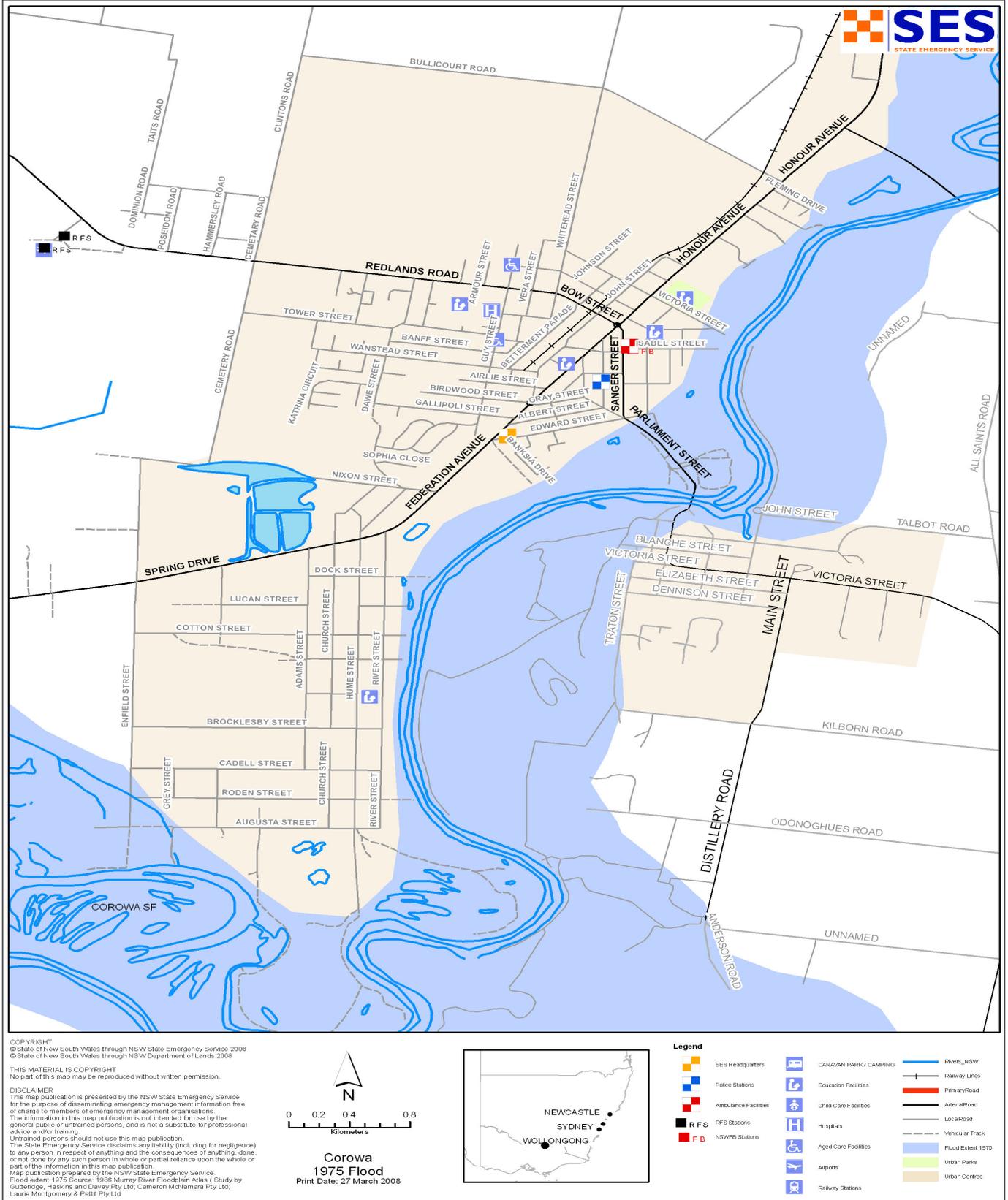
MAP 5 – TOWN AREA HOWLONG



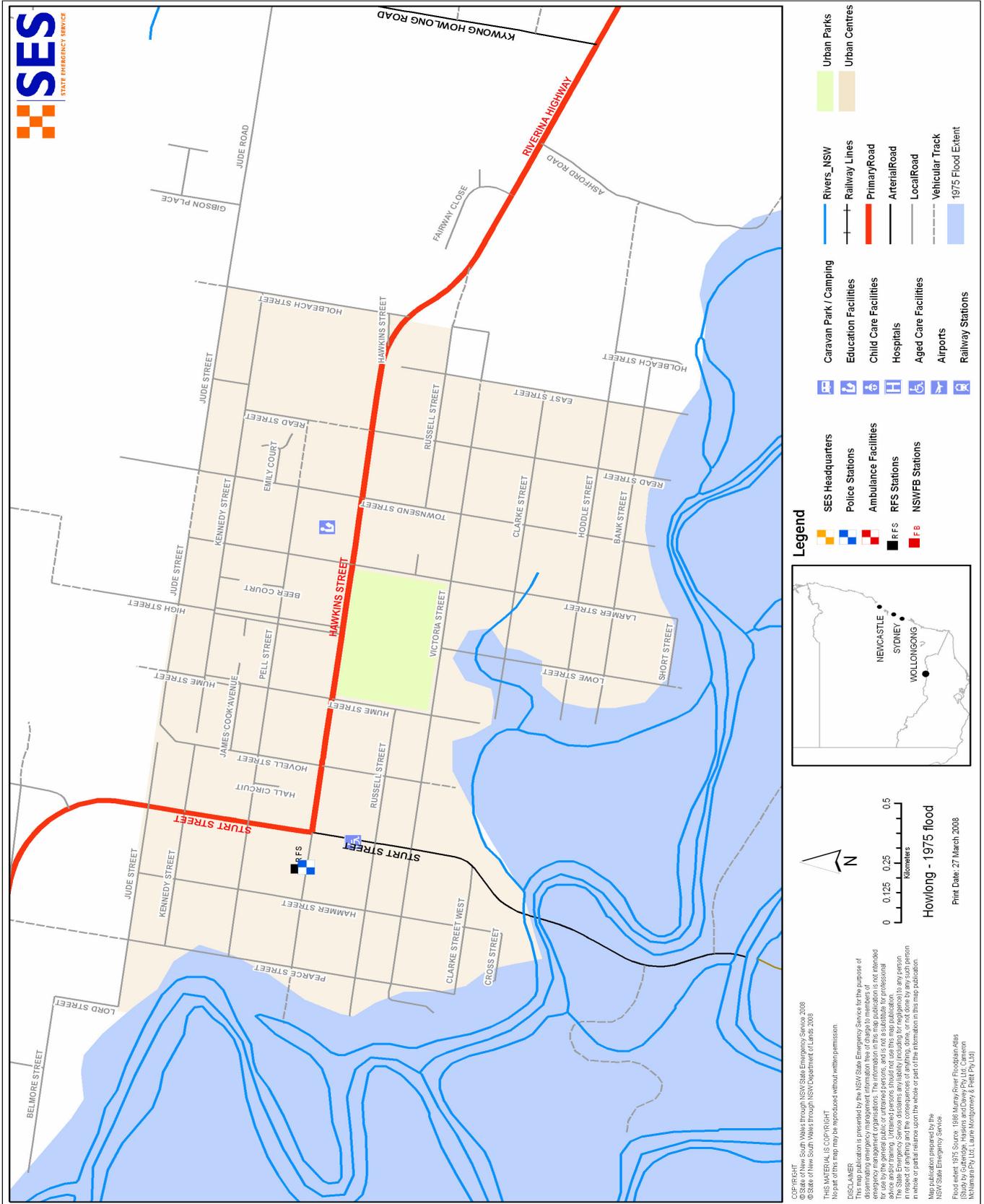
MAP 6 – COROWA SHIRE 1975 FLOOD EXTENT



MAP 7 – COROWA 1975 FLOOD EXTENT



MAP 8 – HOWLONG 1975 FLOOD EXTENT



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