



HAWKESBURY NEPEAN FLOOD PLAN

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

September 2015

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VOLUMES

Volume 1: Hawkesbury-Nepean Flood Emergency Sub Plan

Volume 2: Hazard and Risk in the Hawkesbury-Nepean Valley

Volume 3: Chapter 1: Flood Warning Gauges

Volume 3: Chapter 2: Sectors and Evacuation Strategy Selection Considerations

Volume 3: Chapter 3: Evacuee Management Arrangements

Volume 3: Chapter 4: Flood Evacuation Routes, Traffic and Transport Arrangements

Volume 3: Chapter 5: Dam Emergency Arrangements

ABBREVIATIONS

AIIMS	Australasian Inter-agency Incident Management System
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
Bureau	Australian Government Bureau of Meteorology
CCTV	Closed Circuit TV
DSEP	Dam Safety Emergency Plan
EOC	Emergency Operations Centre
EMPLAN	Emergency Management Plan
FRNSW	Fire and Rescue New South Wales
GIS	Geographic Information System
GRN	Government Radio Network
HNFESP	Hawkesbury-Nepean Flood Emergency Sub Plan
MRNSW	Marine Rescue NSW
NSW RFS	NSW Rural Fire Service
NSW SES	NSW State Emergency Service
NSW VRA	New South Wales Volunteer Rescue Association
OEH	Office of Environment and Heritage
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PMR	Private Mobile Radio
PSTN	Public Switched Telephone Network
REMC	Region Emergency Management Committee
RMS	Roads and Maritime Services
SEMC	State Emergency Management Committee
SEOC	State Emergency Operations Centre

SEOCON	State Emergency Operations Controller
SERCON	State Emergency Recovery Controller
SEWS	Standard Emergency Warning Signal
TCP	Traffic Control Plan
TMC	Transport Management Centre
Transport LO	Transport for NSW Liaison Officer
UHF PMR	Ultra High Frequency Private Mobile Radio
VMS	Variable Message Sign

GLOSSARY

Refer to the NSW State Flood Plan for a complete glossary of terminology used throughout this plan and within NSW SES Flood Plans (emergency.nsw.gov.au/publications and www.floodsafe.com.au).

Common emergency service terminology can also be found within the Australian Emergency Management Glossary located at www.em.gov.au.

Some specific terms frequently used within this plan are listed below for ease of reference.

All Clear. An advice that danger to life and property has passed.

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 height of 5.0 metres at a specified gauge has an AEP of 5%, it means that there is a 5% chance (i.e. one chance in 20) of such a height being reached or exceeded there in any one year. This value corresponds to the Average Recurrence Interval (ARI) which is the long-term average number of years between the occurrence of a flood as big as or larger than the selected event. For example, a flood with a peak height as great as or greater than the 20 year ARI flood event at a gauge will occur, on average, once every 20 years. In any particular 20-year period there may be more than one such flood or none at all.

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.

Combat Agency. Means the agency identified in the State EMPLAN as the agency primarily responsible for controlling the response to a particular emergency.

Concept of Operations. The Controller's general idea or notion, given the anticipated problems of the effects of the event, of how the emergency response and recovery operation is to be conducted. It is the statement of the Controller's operational intentions and may be expressed in terms of stages/ phases of the emergency operation (1).

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 dam break warning procedures, to be prepared for prescribed dams where persons may be at risk downstream if the dam were to fail.

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. A national telephony based alerting system available for use by emergency service agencies to send SMS and voice messages to landlines and/or mobile telephones (by billing address) in times of emergency.

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 Centre. A centre set up to meet the immediate needs of disaster affected people following evacuation from an emergency situation. This may include travellers (commuters and tourists), who are unable to complete their journey (2).

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.

Extreme Flood. A flood of exceptional severity and therefore of low probability. The AEP will be in the range from 1:1,500 up to 1:100,000 or lower i.e. up to the PMF.

Flood Bulletin. Issued by NSW SES to inform people about what is expected to happen during flooding. NSW SES Flood Bulletins contain information on likely flood consequences and what actions are required to protect persons and property.

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 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.

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.

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

Major Evacuation Centre. Large scale evacuation centre that requires multiagency co-ordination and response to deliver basic services to individuals and their companion animals affected by an emergency. Major evacuation centres are established to provide emergency accommodation when the scale and duration of the emergency are beyond the capability and capacity of the established local /regional emergency management arrangements for evacuation centres (9).

Major Flooding. Flooding which causes inundation of extensive rural areas, with properties, villages and towns isolated and/or appreciable urban areas flooded. Evacuation of flood affected areas may be required. Utility services may be impacted.

Minor Flooding. Flooding which causes inconvenience. Low-lying areas next to watercourses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required.

Moderate Flooding. Flooding which inundates low-lying areas, requiring removal of stock and/or evacuation of some houses. Main traffic routes may be flooded. In addition to the effects of minor flooding, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas removal of stock is required.

NSW SES State Controller. The person who has control of the NSW SES.

NSW SES State Operations Controller. The delegated authority appointed by the NSW SES State Controller, responsible for controlling NSW SES state level operations.

Probable Maximum Flood (PMF). The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the extent of flood liable 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 (i.e. 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.

Sector. The organisational level having responsibility for operations with a defined area or having a specific functional responsibility.

Sustainability Height. The flood height for an area (particularly a flood island) above which it would be too difficult to maintain the isolated population because of the failure of essential services such as water, sewer and power or because the area would be too small for the number of people in the area.

Utilities. In this plan, utilities are those businesses that own, operate and provide utility services, namely electricity, water, sewerage, gas and liquid fuels, but excluding telecommunication and engineering services.

Vulnerable Facilities. In this plan include hospitals, nursing homes, aged disability and other residential care facilities, schools, child care centres and correctional facilities. These facilities require advanced warning and assistance during flood emergencies due to the vulnerability and mobility requirements of their occupants.

HAWKESBURY NEPEAN FLOOD EMERGENCY SUB PLAN

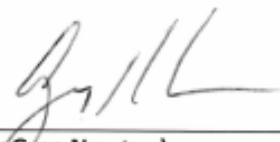
Volume 1 of the Hawkesbury Nepean Flood Plan

September 2015

AUTHORISATION

This Hawkesbury Nepean Flood Emergency Sub Plan is a sub plan of the State 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 State Emergency Management Committee in accordance with the provisions of the **State Emergency and Rescue Management Act 1989 (NSW)**.


Recommended



(Mr Greg Newton)
Acting Commissioner
NSW State Emergency Service

Dated: 1 MAR 16

Approved



(Mr Phil Koperberg, AO AFSM BEM)
Chairperson
State Emergency Management Committee

Dated: 1 APRIL 1, 2016.

VERSION HISTORY

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

Plan	Endorsed
Hawkesbury Nepean Flood Emergency Sub Plan	December 2005
Hawkesbury Nepean Flood Emergency Sub Plan	September 2013
Hawkesbury Nepean Flood Emergency Sub Plan (major amendment)	June 2014

AMENDMENT LIST

Proposals for amendment to this plan are to be forwarded to:

Manager, Emergency Risk Management Branch
NSW State Emergency Service, State Headquarters
PO Box 6126, Wollongong, NSW, 2500

Amendments promulgated are to be certified below when entered.

Amendment Number	Description	Updated by	Date

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PART 1 - OUTLINE AND SCOPE OF THIS PLAN

1.1 PURPOSE

- 1.1.1 The special arrangements described in this Hawkesbury-Nepean Flood Emergency Sub-Plan (HNFESP) cover prevention and preparedness measures, the conduct of flood operations and the transition to recovery for floods in the Hawkesbury-Nepean Valley.

1.2 AUTHORITY

- 1.2.1 This Plan (HNFESP) is a sub-plan of the State Emergency Management Plan (State EMPLAN). It is also a sub-plan of the NSW SES State Flood Plan and 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 endorsed by the State Emergency Management Committee (SEMC).

1.3 AREA COVERED

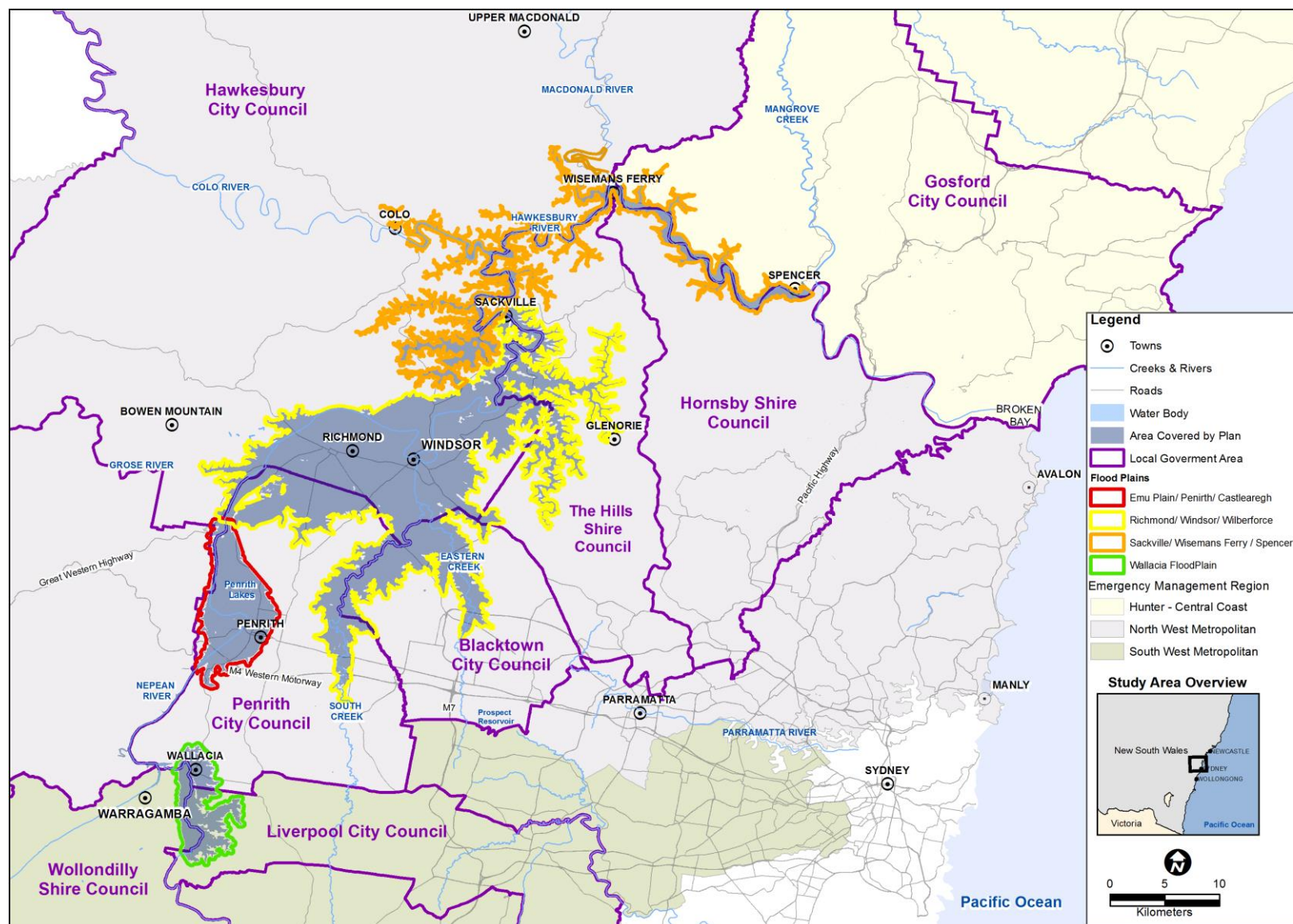
- 1.3.1 The area covered by this Plan (HNFESP) is that part of the Hawkesbury-Nepean River system (including its tributaries) from the township of Wallacia downstream to the township of Spencer. It includes:
- a. Parts of the Wollondilly and Liverpool Local Government areas, downstream from the southern end of Bents Basin near Wallacia, in the NSW SES Sydney Southern Region.
 - b. Parts of the Penrith, Hawkesbury, The Hills and Blacktown Local Government areas in the NSW SES Sydney Western Region.
 - c. Parts of the Hornsby and Gosford Local Government areas, downstream from Wisemans Ferry to Spencer in the NSW SES Sydney Northern Region.
- 1.3.2 Most of the area covered by this Plan is part of the North West Metropolitan Emergency Management Region. However, it also includes parts of the Hunter Central Coast Emergency Management Region and the South West Metropolitan Region (Map 1).

1.4 OUT OF SCOPE

- 1.4.1 This plan is based on existing information publically available at the time of writing. Planned and future development beyond current levels within the Hawkesbury-Nepean Valley are not covered by this plan. Consultation with the NSW SES and modification to this plan will be required to account for future population increases and development within the area.

1.5 FLOODS AND THEIR POTENTIAL IMPACTS

- 1.5.1 A description of flooding and potential impacts of flooding is presented in Volume 2 of this Plan.



Map 1: Area Covered by the Hawkesbury Nepean Flood Emergency Sub Plan (Wallacia to Spencer)

1.6 RELATIONSHIP BETWEEN PLANS

- 1.6.1 The NSW State Emergency Service (NSW SES) and other agencies with responsibilities listed in this plan (HNFESP) may prepare supporting plans in accordance with the *State Emergency and Rescue Management Act 1989* (NSW).
- 1.6.2 Supporting plans are described in PART 4 - Preparing for Floods.
- 1.6.3 The relationship between the various NSW SES flood plans is described below.

State Level Plans

- 1.6.4 The general arrangements for managing floods in NSW are outlined within the [NSW State Flood Plan](#). This plan (HNFESP) is a Sub Plan of the [NSW State Flood Plan](#) and should be read in conjunction with it.
- 1.6.5 The special arrangements in this plan (HNFESP) augment those described within the respective NSW SES Local Flood Plans.

Local Flood Plans

- 1.6.6 The plans listed below are subordinate plans to this plan (HNFESP) as well as being subordinate plans to the relevant Local EMPLANS.
 - a. Hawkesbury City Local Flood Plan (a sub-plan of the Hawkesbury Local EMPLAN);
 - b. Penrith City Local Flood Plan (a sub-plan of the Penrith Local EMPLAN);
 - c. Blacktown City Local Flood Plan (a sub-plan of the Blacktown Local EMPLAN);
 - d. The Hills Shire Local Flood Plan (a sub-plan of The Hills Local EMPLAN);
 - e. Hornsby Shire Local Flood Plan (a sub-plan of the Hornsby Local EMPLAN);
 - f. Gosford City Local Flood Plan (a sub-plan of the Gosford Local EMPLAN).

1.7 MAINTENANCE OF THIS PLAN

- 1.7.1 The NSW SES Commissioner will maintain the currency of this plan by:
 - a. Ensuring that all supporting emergency services and functional areas, organisations and officers mentioned in it are aware of their roles and responsibilities;
 - b. Conducting exercises to test arrangements;
 - c. Reviewing the contents of the plan:
 - After each flood operation;
 - When changes to the use of land significantly increases the population at risk;
 - When there are changes which alter agreed plan arrangements.
- 1.7.2 In any event, the plan is to be reviewed no less frequently than every two years.

PART 2 - ROLES AND RESPONSIBILITIES

2.1 INTRODUCTION

- 2.1.1 General responsibilities of emergency service organisations and functional areas are set out in the State EMPLAN.
- 2.1.2 More specific roles and responsibilities in relation to flooding are outlined within the [NSW State Flood Plan](#).
- 2.1.3 Specific responsibilities relating to emergency management of flooding in the Hawkesbury-Nepean Valley are expanded upon in the following paragraphs.
- 2.1.4 Local arrangements and details of the responsibilities of emergency service organisations and functional areas at the NSW SES local level are recorded in the NSW SES Local Flood Plans respectively.

2.2 NSW STATE EMERGENCY SERVICE

- 2.2.1 One of the NSW SES functions is to protect persons from dangers to their safety and health, and to protect property from destruction or damage, arising from floods (SES Act, 1989 section 8) (3).
- 2.2.2 The NSW SES is the designated Combat Agency for dealing with floods, and to coordinate the evacuation and welfare of affected communities (3) (1) (EMPLAN, 2012 and SES Act, 1989).
- 2.2.3 The NSW SES role for floods is outlined within the [NSW State Flood Plan](#) covering the areas of Prevention, Preparedness, Response and transition to Recovery.
- 2.2.4 Specific responsibilities of the NSW SES, in relation to Hawkesbury-Nepean Valley flooding, include:

Prevention

- a. Provide emergency management advice to Penrith City, Hawkesbury City, The Hills Shire, Blacktown City, Gosford City, and Hornsby Shire councils in relation to the management of land which is subject to flooding in accordance with the Floodplain Development Manual (4);
- b. Contribute to the deliberations of Floodplain and Coastal Risk Management Committees established by these councils;

Preparedness

- c. Contribute to the identification of flood problems within the Hawkesbury-Nepean Valley, specifically in relation to emergency management matters including warning, evacuation, rescue and resupply functions;
- d. Develop and maintain this Plan;
- e. Develop and maintain complementary arrangements for flooding in the Hawkesbury-Nepean Valley within NSW SES Local Flood Plans;

- f. Prepare, coordinate and deliver community engagement and capacity building programs to assist Hawkesbury-Nepean Valley communities in building resilience to floods;

Response

- g. Control and coordinate flood operations and response in the Hawkesbury-Nepean Valley in accordance with the [NSW State Flood Plan](#) and the Australasian Inter Agency Incident Management System (AIIMS) including:
- Coordinate the development and communication of NSW SES Flood Bulletins to at risk communities within the Hawkesbury-Nepean Valley;
 - Coordinate reconnaissance and flood response impact assessments of areas likely to be affected by floods;
 - Coordinate the resupply of isolated communities and properties;
 - Coordinate the evacuation and immediate welfare of people at risk;
 - Coordinate flood rescue operations;
 - Provide immediate welfare support to evacuees;
 - Establish a Joint Media Information Centre at the Sydney Western Region Headquarters.

Recovery

- h. Ensure that appropriate recovery arrangements are put in place in accordance with the NSW State Flood Plan (see also PART 8 - Recovery);
- i. Provide appropriate representation to the Recovery Committee for the duration of the response phase of an event and as agreed during the recovery phase.

2.3 COMMUNITY MEMBERS

- 2.3.1 Prepare now, know how to respond appropriately and recover effectively to help your community become more resilient, including:

Preparedness

- a. Know your risk: Understand the potential risks and impact of flooding at home, work and places you visit. The flood risk is so severe in parts of the Hawkesbury-Nepean floodplain that in a major flood, evacuation will be the only safe option for people in these areas.
- b. Know where to go: Including which evacuation route you will take and where you will stay in case you are flood affected.
- c. Get your home ready: Prepare homes and property to reduce the impact of flooding. Have an emergency kit and essential supplies.

- d. Plan for what you will do: Develop home emergency plans to identify who to contact, what to do, where to go and when. Share plans and practice them with family, friends, pets and neighbours.
- e. Businesses develop continuity plans to prepare, minimise losses and reinstate essential services as soon as possible after a flood.
- f. Be informed: Know where to find risk information, understand warnings, triggers and the safest actions to take in a flood.
- g. Be involved: Work with local Emergency Services, local leaders, councils and other stakeholders to anticipate and manage the flood emergencies that could affect your community.

Response

- h. Be aware: Monitor emergency warnings and broadcasts, and follow the advice of emergency services.
- i. Never drive, ride or walk through floodwater: The major cause of death during floods is due to people entering floodwater.
- j. Look out for each other: Share information with family, friends and neighbours and help those that may need assistance.
- k. Leave flood affected areas early: If you are at risk of flooding or are advised by emergency services to evacuate.

Recovery

- l. Stay clear of flood affected areas: Until you are advised by emergency services that it is safe to enter.
- m. Ensure your home is safe before entering: Check for structural damage and potential risk of electrocution.
- n. Manage ongoing health, safety and hygiene: Ensure personal items, food and water in contact with floodwater are not consumed and protective clothing is worn while cleaning.
- o. Understand where and how to get support and assistance with your recovery.

- 2.3.2 Check the NSW SES website for further information on what to do before, during and after a flood.

2.4 AGRICULTURE AND ANIMAL SERVICES FUNCTIONAL AREA

Prevention

- 2.4.1 Assist NSW SES in the Hawkesbury-Nepean Valley to build awareness for emergency prevention and preparedness by primary producers, animal holding establishments and the community.

Preparedness

- 2.4.2 Prepare the Hawkesbury-Nepean Agriculture and Animal Services Supporting Plan (refer 4.1.3).

Response

- 2.4.3 Coordinate support to primary producers, animal holding establishments, evacuees and the community in emergencies, including rescue, evacuation and emergency care of animals in accordance with the NSW State Flood Plan (refer 7.14.2).
- 2.4.4 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4).
- 2.4.5 Activate the Agriculture and Animal Services Area Functional Area Supporting Plan (Hawkesbury-Nepean Agricultural and Animal Services Area Supporting Plan once developed) if required (refer 7.14.2).

Recovery

- 2.4.6 Support recovery arrangements in accordance with the NSW State Flood Plan.

2.5 AUSTRALIAN GOVERNMENT BUREAU OF METEOROLOGY

- 2.5.1 Maintain, coordinate and deliver operational 24-hour weather warning services as detailed in the [NSW State Flood Plan](#). The following outlines some key responsibilities of relevance to the Hawkesbury-Nepean Valley:

Preparedness

- 2.5.2 Within the current capabilities of meteorological prediction and hydrologic forecasting, provide detailed briefings to the NSW SES, the SEMC and other relevant parties on impending Hawkesbury-Nepean flood events;
- 2.5.3 Formulate, issue and publish official forecasts and warnings for:
- a. Hawkesbury-Nepean River basins (Flood Watches);
 - b. Key locations on rivers and creeks as listed in Volume 3 Chapter 1 of this plan (Preliminary Flood Warnings and Flood Warnings).

Response

- 2.5.4 Provide weather information including warnings, forecasts and briefings to the media, the NSW SES, the SEMC and other relevant parties;

- 2.5.5 Provide the NSW SES with data and graphical products that show the development and progression of flood events; and
- 2.5.6 Include NSW SES safety messages within warnings (refer 5.2).

2.6 COUNCILS OF LOCAL GOVERNMENT AREAS

- 2.6.1 The agreed responsibilities of Local Governments are outlined within the [NSW State Flood Plan](#) and are further detailed within Local Flood Sub-Plans (Refer 1.6.6). The following outlines some key responsibilities of relevance to the Hawkesbury-Nepean Valley:

Preparedness

- a. Develop and implement floodplain risk management plans for urban areas in accordance with the NSW Government's Flood Prone Land Policy and the Floodplain Development Manual;
- b. Assist the NSW SES with community engagement and capacity building programs; and
- c. Provide the NSW SES with information to assist in effective emergency response planning by collecting flood data and providing outputs required by NSW SES on the local flood threat, its effects and community at risk through Flood Studies and Floodplain Risk Management Studies.

Response

- d. Assist the NSW SES in flood response operations;
- e. Manage and where possible protect council-owned infrastructure facilities during floods;
- f. Close and reopen council roads (and other roads nominated by agreement with the RMS) and advise the NSW SES, the NSW Police Force, the Transport Management Centre (TMC) and people who contact the council for road information (refer Volume 3 Chapter 4 of this plan);
- g. Provide advice to the NSW SES and the Health Services Functional Area during floods about key council managed infrastructure such as sewerage treatment and water supply;
- h. Ensure flooded premises are fit and safe for reoccupation and assess any need for repair or demolition; and
- i. Coordinate the collection of post event flood data, in consultation with the NSW SES and Office of Environment and Heritage (OEH).

Recovery

- j. Provide services, assistance and advice to State Government in accordance with the State Recovery Plan informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.8 DEPARTMENT OF JUSTICE, OFFICE OF EMERGENCY MANAGEMENT

Preparedness

- 2.8.1 Display, wherever practicable, the most recent endorsed version of this plan (HNFESP) on the Department of Justice, Office of Emergency Management Website; and
- 2.8.2 Develop and maintain the Hawkesbury-Nepean Recovery Strategy (refer 4.1.3).

Response

- 2.8.3 Maintain and operate the State Emergency Operations Centre (SEOC); and
- 2.8.4 Display, wherever practicable, the Bureau weather and flood warnings without change on the Emergency NSW website.

2.9 ENERGY AND UTILITY SERVICES FUNCTIONAL AREA

Preparedness

- 2.9.1 Participate in all-organisation briefing sessions and disseminate briefing to energy and utility services, supporting emergency services and functional areas and related stakeholders;
- 2.9.2 Maintain Energy and Utility Services Functional Area Supporting Plan (EUSFAC's) 'Concept of Operations' for response to major flood events;
- 2.9.3 Participate in inter-organisation exercises and participating organisation exercises with flood event and flood damage scenarios; and
- 2.9.4 Assist NSW SES to identify utilities infrastructure at risk of flood damage for incorporation into planning and intelligence.

Response

- 2.9.5 Coordinate responses to flood events, including support to NSW SES, SEOC, other combat agencies (consistent with Glossary) and assist functional areas with the prioritisation of restoration of utility services;
- 2.9.6 Coordinate Energy and Utility responses to flood events, including support to NSW SES, other combat emergency services and functional areas with the prioritisation of restoration of utility services, as required;
- 2.9.7 Coordinate support to utility network operators in the repair and restoration of flood -damaged network infrastructure;
- 2.9.8 Coordinate liaison between NSW SES, State Emergency Operations Centre (SEOC) and utility network operators as required;
- 2.9.9 Coordinate the supply of specialist advice from energy and utility service providers as required;
- 2.9.10 Provide input into resupply management planning during a State-coordinated flood response; and
- 2.9.11 Participate in After Action Reviews of major flood events.

2.10 ENGINEERING SERVICES FUNCTIONAL AREA

Response

- 2.10.1 Activate the Engineering Services Functional Area Supporting Plan if required (refer 7.16.2);
- 2.10.2 Provide a Liaison Officer to the NSW SES Sydney Western Region headquarters if required (refer 7.4); and
- 2.10.3 Assist the NSW SES with reconnaissance and damage assessment.

Recovery

- 2.10.4 Assist the NSW SES with re-establishing access to properties and dwellings;
- 2.10.5 Establish Recovery Centres by the procurement and fit-out of suitable properties when requested by the SERCON;
- 2.10.6 Coordinate the restoration of critical public facilities; and
- 2.10.7 Provide support informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.11 ENVIRONMENTAL SERVICES FUNCTIONAL AREA

Response

- 2.11.1 Activate the Environmental Services Functional Area (Enviroplan) Supporting Plan if required;
- 2.11.2 Provide a Liaison Officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4); and
- 2.11.3 Coordinate Environmental Services technical and regulatory advice and support.

Recovery

- 2.11.4 Participate in After Action Reviews;
- 2.11.5 Coordinate Environmental Services technical and regulatory advice and support; and
- 2.11.6 Provide support informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.12 FIRE AND RESCUE NSW

Preparedness

- 2.12.1 Identify and notify the NSW SES of any locations within the Hawkesbury-Nepean Valley at risk of fire (or hazardous materials) that pose a significant threat to surrounding populations due to the impact of a flood for incorporation into NSW SES flood intelligence and planning;

Response

- 2.12.2 Maintain legislated responsibility within Fire Districts (5), throughout the State for fire and hazardous materials (refer 7.13.8);
- 2.12.3 When requested by NSW SES, provide support to the NSW SES in response to flood emergencies within the Hawkesbury-Nepean floodplain in accordance with the NSW State Flood Plan including:
- a. Assist the NSW SES with the warning and/or evacuation of at risk communities (refer 7.28.27);
 - b. Assist the NSW SES with the monitoring/reconnaissance of flood prone areas;
 - c. Assist the NSW SES with the resupply of isolated communities and/or properties;
 - d. Coordinate the deployment of fire resources to communities within NSW Fire Districts if access is expected to be lost, in consultation with the NSW SES; and
 - e. Where rescue accredited, maintain rescue coverage during flood emergencies.
- 2.12.4 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4)

Recovery

- 2.12.5 Provide support informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.13 HEALTH SERVICES FUNCTIONAL AREA

- 2.13.1 Coordinate NSW Health services response for prevention, preparation, emergency response and subsequent recovery from the impacts of a flooding event in accordance with the NSW State Flood Plan, NSW Healthplan and any relevant supporting plans including the Nepean Blue Mountains Local Heath District - Hawkesbury-Nepean – Healthplan.

Response

- 2.13.2 Activate the NSW Healthplan and any relevant supporting plans including the Nepean Blue Mountains Local Heath District - Hawkesbury-Nepean - Healthplan if required (refer 4.1.3);
- 2.13.3 Consider and act on the advice of the NSW SES with regard to the warning and evacuation of hospitals, private hospitals and residential aged care facilities;
- 2.13.4 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4); and

Recovery

- 2.13.5 Provide support informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.14 MANLY HYDRAULICS LABORATORY

Response

- 2.14.1 Provide data from stream and rain gauges within the Hawkesbury-Nepean Valley and provide to the Bureau and NSW SES as outlined within the NSW State Flood Plan.

2.15 MARINE RESCUE NSW

Response

- 2.15.1 When requested by NSW SES, assist in flood operations when training and equipment are available and suitable including assistance with:
- Warning and/or evacuation of at risk communities;
 - Providing communications personnel; and
 - Flood rescue operations.

2.16 NSW AMBULANCE SERVICE

Response

- 2.16.1 Activate NSW AMPLAN if required;
- 2.16.2 Assist the NSW SES with the flood warning, response and rescue operations, in particular elderly and/or infirm people, where accredited units are available;
- 2.16.3 Deploy ambulance resources to appropriate locations if access is expected to be lost; and
- 2.16.4 Provide a Liaison Officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4).

2.17 NSW ASSOCIATION OF INDEPENDENT SCHOOLS

Preparedness

- 2.17.1 Encourage flood liable schools to have evacuation plans with arrangements for flooding; and
- 2.17.2 Assist NSW SES with community engagement and capacity building programs.

2.19 NSW DEPARTMENT OF EDUCATION AND CATHOLIC EDUCATION COMMISSION

Preparedness

- 2.19.1 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) (refer 7.28.43; 7.28.44; 7.28.45);
- 2.19.2 Ensure that evacuation plans for flood liable schools have arrangements for flooding; and
- 2.19.3 Assist NSW SES with community engagement and capacity building programs.

Response

- 2.19.4 Assist with the coordination of the evacuation of schools and the immediate welfare of students until returned to the appropriate carer;
- 2.19.5 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters if required (refer 7.4);
- 2.19.6 Pass information to school bus drivers/companies and/or school principals on expected or actual impacts of flooding; and
- 2.19.7 Provide space in schools for evacuation centres where necessary (Refer Volume 3 Chapter 3).

2.20 NSW FOOD AUTHORITY

Response

- 2.20.1 Activate the State Food Industry Emergency Sub Plan as required; and
- 2.20.2 Provide coordination and control of the mobilisation of food-related resources to emergencies in NSW.

2.21 NSW OFFICE OF WATER

Preparedness

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

2.22 NSW POLICE FORCE

Response

- 2.22.1 Provide Liaison Officers including Specialist Liaison Officers to the NSW SES Sydney Western Region Headquarters if required (refer 7.4);
- 2.22.2 When requested by NSW SES, when training and equipment are available and suitable, provide assistance with:
 - a. Warning and/or evacuation of at risk communities;
 - b. Monitoring / reconnaissance of flood prone areas; and
 - c. Flood rescue operations.
- 2.22.3 In conjunction with the NSW Transport Management Centre (Refer 7.25) secure, control and keep clear evacuation routes as outlined within Volume 3 Chapter 4 of this plan and the associated Draft Hawkesbury-Nepean Flood Emergency – Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual;
- 2.22.4 Coordinate security for supply lines, evacuated and damaged areas;
- 2.22.5 Manage Disaster Victim Registration (refer Section 7.22); and
- 2.22.6 Operate the Public Information and Inquiry Centre, if requested or otherwise needed during large scale events (refer 7.1.4c).

2.23 NSW RURAL FIRE SERVICE

- 2.23.1 Meet the agreed arrangements described in the NSW SES / NSW RFS Memorandum of Understanding and the NSW State Flood Plan;

Response

- 2.23.2 Provide a Liaison Officer to the NSW SES Sydney Western Region if required; (refer 7.4);
- 2.23.3 Assist the NSW SES with the monitoring / reconnaissance of flood prone areas in the Hawkesbury-Nepean Valley in accordance with the NSW State Flood Plan including:
 - a. Warning and/or evacuation of at risk communities (refer 7.28.47);
 - b. Back-up radio communications;
 - c. Deploying resources to communities within Rural Fire Districts where access is expected to be lost in consultation with the NSW SES (refer 7.13.13);
 - d. The resupply of isolated communities and/or properties;
 - e. The provision of trained members to support an IMT, Joint Mapping Unit and public information; and
 - f. The provision and management of aircraft through the State Air Desk.

2.24 NSW TRANSPORT MANAGEMENT CENTRE

Response

- 2.24.1 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters (refer 7.4);
- 2.24.2 Provide information to the public on traffic conditions on regional evacuations routes; and
- 2.24.3 In conjunction with the NSW Police Force, secure, control and keep clear evacuation routes as outlined within Volume 3 Chapter 4 of this plan and the associated Draft Hawkesbury-Nepean Flood Emergency – Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual (6) (7).

2.25 NSW VOLUNTEER RESCUE ASSOCIATION

Response

- 2.25.1 When requested by the NSW SES and when training and equipment are available and suitable, assist in flood operations in accordance with the NSW State Flood Plan.

2.26 OFFICE OF ENVIRONMENT AND HERITAGE

Preparedness

- 2.26.1 Provide specialist flood risk policy, engineering and scientific advice to councils and the NSW SES on flood-related matters in accordance with the NSW State Flood Plan. This includes assistance with:
 - a. The identification of flood risks; and
 - b. The preparation of Floodplain Management Plans.
- 2.26.2 Assist the NSW SES to gain access to relevant studies regarding flooding, including Flood Studies and Floodplain Risk Management Studies undertaken under the Floodplain Management Program.

2.27 OWNERS OF PRESCRIBED DAMS

Preparedness

- 2.27.1 Consult with the NSW SES State Headquarters in the development of Dam Safety Emergency Plans (DSEPs), including the development of alert levels, in accordance with the Dam Safety Committee Guidelines;
- 2.27.2 Assist the NSW SES with community engagement programs; and
- 2.27.3 Provide NSW SES with all available information to allow flood planning to be carried out for the purpose of warning and/or evacuating people at risk from dam failure or other dam emergencies.

Response

- 2.27.4 Notify NSW SES of potential or actual dam emergencies in accordance with the Dam Safety Emergency Plan (Refer 2.36 and Volume 3 Chapter 5).

2.28 PARKS AND WILDLIFE SERVICE**Preparedness**

- 2.28.1 Assist the NSW SES with identification of road infrastructure and campgrounds at risk of flooding in National Parks within the Hawkesbury-Nepean Valley.

Response

- 2.28.2 Close and reopen National Parks and Wildlife Service roads, campgrounds and other areas when affected by / at risk of flooding and advise the NSW SES of their status;
- 2.28.3 Facilitate the safe reliable access of emergency resources on National Parks and Wildlife Service managed roads; and
- 2.28.4 Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

2.29 PUBLIC INFORMATION SERVICES FUNCTIONAL AREA**Response**

- 2.29.1 Assist NSW SES in the release of public information during an actual or imminent emergency as requested (refer 7.7); and
- 2.29.2 Assist the NSW SES in the establishment and operation of a Joint Media Information Centre at the NSW SES Sydney Western Region Headquarters, (refer 7.9.2 and 7.9.3).

2.30 STATE EMERGENCY OPERATIONS CENTRE**Response**

- 2.30.1 Monitor flood operations;
- 2.30.2 Facilitate and process requests made to the State Emergency Operations Controller (SEOCN) for Commonwealth assistance;
- 2.30.3 Notify State Emergency Management Committee members of potential flooding and the existence of flood warnings, or NSW SES warning products;
- 2.30.4 Distribute NSW SES operational updates to the SEOCN, State Emergency Management Committee members and Australian Government; and
- 2.30.5 If requested, coordinate support to the NSW SES and / or other agencies.

2.31 STATE EMERGENCY OPERATIONS CONTROLLER

Response

- 2.31.1 Monitor flood operations within the Hawkesbury-Nepean Valley;
- 2.31.2 Activate the State Emergency Operations Centre if required (refer 7.1.4b);
- 2.31.3 Activate the Public Information and Inquiry Centre (refer 7.1.4c);
- 2.31.4 Request Emergency Management Australia to activate the National Registration and Inquiry System (refer 7.1.4h);
- 2.31.5 Request the Energy and Utilities Functional Area Coordinator to begin monitoring the impact of flooding on utilities and keep the NSW SES State Duty Operations Controller advised (refer 7.1.4d);
- 2.31.6 Request the Transport Services Functional Area Coordinator to activate the Transport Services Functional Area Coordination Centre (refer 7.1.4e);
- 2.31.7 Request the Commonwealth to provide Defence air assets for possible use in large scale evacuations (refer 7.1.4i);
- 2.31.8 Advise the Commonwealth that further Defence assistance may be required (refer 7.1.4j);
- 2.31.9 Liaise with Defence on the status of Richmond Air Force Base;
- 2.31.10 Co-ordinate the establishment of a Major Evacuation Centre where the scale and duration of the emergency are beyond the capability and capacity of the established local / regional evacuation centre arrangements in accordance with the relevant provisions of the Major Evacuation Centre Guideline (Volume 3 Chapter 3); and
- 2.31.11 If requested, coordinate support to the NSW SES and/or other agencies;

Recovery

- 2.31.12 Coordinate assessments of the extent of damage in conjunction with the SERCON if the response is still ongoing and a recovery operation is likely to be initiated; and
- 2.31.13 Assist with the transition to recovery informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.32 STATE EMERGENCY RECOVERY CONTROLLER

Recovery

- 2.32.1 Coordinate recovery operations in accordance with the NSW State Recovery Plan informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.33 TELECOMMUNICATIONS SERVICES FUNCTIONAL AREA

Preparedness

- 2.33.1 Assist the NSW SES to identify critical telecommunications infrastructure in public telecommunications networks at risk of flood damage within the Hawkesbury-Nepean Valley for incorporation into planning and intelligence; and
- 2.33.2 Develop and maintain supporting plans for dealing with damage to and restoration of failed critical telecommunication infrastructure in public telecommunication networks during flood response.

Response

- 2.33.3 Activate the Telecommunications Services Functional Area Supporting Plan as required (refer 7.24.4);
- 2.33.4 At the request of the NSW SES Controller, provide liaison to NSW SES operations centres, including a Liaison Officer as required (refer 7.4);
- 2.33.5 Keep the NSW SES informed of the status of critical telecommunications infrastructure during flood operations; and
- 2.33.6 Coordinate requests to the NSW SES, by Australian Telecommunication Carriers, to assist with access to critical telecommunications infrastructure.

Recovery

- 2.33.7 Coordinate the restoration of failed critical telecommunications infrastructure damaged by flooding.

2.34 TRANSPORT SERVICES FUNCTIONAL AREA

Response

- 2.34.1 Activate and operate the Transport Services Functional Area Coordination Centre (refer 7.1.4e);
- 2.34.2 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters (refer 7.4.2);
- 2.34.3 Coordinate the provision of traffic and transport operations consistent with the roles of Transport organisations (refer 7.20.2); and
- 2.34.4 Provide resources and capability to assist NSW SES Controllers with their responsibilities for evacuation.

Recovery

- 2.34.5 Provide support informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).

2.35 UNIVERSITY OF WESTERN SYDNEY

Preparedness

- 2.35.1 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 university closing time); and
- 2.35.2 Ensure that evacuation plans for the university have arrangements for flooding.

2.36 WATER NSW

Preparedness

- 2.36.1 Provide information, data and advice to the NSW SES and the Bureau in accordance with the NSW State Flood Plan to assist with planning for floods within the Hawkesbury-Nepean Valley:
 - a. Flow rating charts for river height gauges;
 - b. Real-time or near real-time access to river height gauges and height data for the development of official flood warnings; and
 - c. Real-time or near real-time advice and information from dams and hydrometeorological stations during floods.
- 2.36.2 Maintain Dam Safety Emergency Plans (DSEPs) for Warragamba, Nepean, Avon, Wollondilly, Cataract and Cordeaux Dams and provide copies to the NSW SES.

Response

- 2.36.3 In larger floods provide a liaison officer to the NSW SES Sydney Western Region Headquarters (refer 7.4);
- 2.36.4 Provide all available information to the Bureau and the NSW SES on storage levels and actual and prospective water releases and their likely impacts on downstream river levels in accordance with the State Flood Plan (refer 5.2.6);
- 2.36.5 Notify NSW SES of potential or actual dam emergencies in accordance with the Dam Safety Emergency Plans (DSEPs) (refer Volume 3 Chapter 5); and
- 2.36.6 Close and evacuate camping grounds/recreational areas at risk of flooding in Water NSW managed areas.

2.37 WELFARE SERVICES FUNCTIONAL AREA

Response

- 2.37.1 Provide a liaison officer to the NSW SES Sydney Western Region Headquarters (refer 7.4);
- 2.37.2 Implement the arrangements within Welfare Services Functional Area Supporting Plan and as outlined within the NSW State Flood Plan;

- 2.37.3 Establish and manage Evacuation Centres to provide welfare services for those affected by a disaster;
- 2.37.4 In the event of a Major Evacuation Centre being required, assist the SEOCON in the management of the centre (refer to Vol 3 Chapter 3);
- 2.37.5 Provide key welfare services to meet the immediate needs of disaster affected people (children, adults and/or families); and
- 2.37.6 Assist NSW SES with resupply of isolated properties;

Recovery

- 2.37.7 Support the recovery process as detailed in the Welfare Services Functional Area Supporting Plan.

PART 3 - MITIGATING FLOODING AND MANAGING FLOODPLAINS

3.1 GENERAL

- 3.1.1 Actions to minimise the risk to life and to reduce property damage can be undertaken by carefully managing floodplains. These actions help to ensure that the use of floodplain land is not at odds with the nature of the flood hazard and allows for sustainable use of the land.
- 3.1.2 The arrangements for managing flood prone land in New South Wales are detailed in the State Government's Flood Prone Lands Policy and the Floodplain Development Manual (4). Further detail is contained within the NSW State Flood Plan, Section 3.
- 3.1.3 The NSW SES is to be represented on relevant floodplain risk management committees established by local councils within the Hawkesbury-Nepean Valley.

3.2 MANAGING FLOODPLAINS

Evacuation Routes

- 3.2.1 The regional road evacuation routes within the Hawkesbury-Nepean Valley are designated in Volume 3 Chapter 4. The NSW SES will provide GIS layers for the evacuation routes to Councils, TMC and RMS.
- 3.2.2 The capacity of the existing evacuation routes within the Hawkesbury-Nepean Valley may need to be increased to cope with the evacuation of the existing population in particular areas by reducing evacuation timelines to within the limit of confident flood forecasting where evacuation timelines extend beyond that limit (2) (9).
- 3.2.3 Council and RMS are to advise the NSW SES of any proposed changes to roads and supporting infrastructure on the regional road evacuation routes.
- 3.2.4 Proposals for modifying existing Regional Evacuation Routes, or for new evacuation routes are to take into account the following improvement objectives:
 - a. Extent - Regional evacuation routes are to extend firstly beyond the PMF extent and then to a point where the wider traffic network can absorb evacuation traffic without causing congestion back into the evacuation route network.
 - b. Increase capacity - Where relevant evacuation timelines extend beyond the limit of confident flood forecasting, provide more lane capacity on current routes or provide new additional routes to reduce the timeline to within the forecasting limit.
 - c. Resilience - Regional evacuation routes affected by local flooding from local streams crossing the route are protected where practicable up to 1:500 year local flood events.

- d. Higher evacuation route - Where the route is inundated by mainstream flooding and where practicable, raise the height of the lowest point/s on the route.
 - e. Independence - Routes should be independent where possible to reduce or eliminate convergence of evacuation routes before merging into the wider traffic network.
 - f. Simplify traffic management –improvement in intersections, upgrading the type of road and ensuring traffic flows freely to safety without prolonged congestion or queuing
 - g. Decouple evacuation from floodplains - Divert evacuation streams from the Hawkesbury River floodplain to reduce or eliminate convergence on evacuation routes in the Nepean River floodplain.
 - h. Redundancy - Provide an alternative route where possible to provide redundancy in case of serious incidents on the main route.
- 3.2.5 Any changes to evacuation routes will, after consultation with Councils and RMS, be advised by way of amendment to the Chapter (refer Volume 3 Chapter 4).

Land Use Planning

- 3.2.6 The NSW SES encourages councils to ensure emergency management considerations are accounted for in land use planning for flood liable areas. OEH supports this by providing funding and technical assistance for the preparation and implementation of floodplain risk management plans through the State Government's Floodplain Management Program. The NSW SES and OEH have published Floodplain Risk Management Guidelines ([NSW SES Requirements from the Floodplain Risk Management Process](#) and [Flood Emergency Response Planning Classifications of Communities](#)) to inform councils and other bodies of the NSW SES's requirements from flood studies and floodplain risk management studies.
- 3.2.7 The Floodplain Development Manual (4) provides guidance to Councils in NSW to ensure that future urban development does not contribute to an unacceptable increase in the flood risk exposure.
- 3.2.8 Flood emergency management is focussed on protecting people first and then their property. The capability to evacuate people off the floodplain is the key flood emergency management strategy for the Hawkesbury-Nepean Valley.
- 3.2.9 It is vital that any future population increases and development within the Hawkesbury-Nepean Valley considers evacuation requirements. This Plan only deals with the emergency management arrangements for the current population and land use in the Hawkesbury-Nepean Valley.

Development Guidelines

- 3.2.10 One of the key findings of the Hawkesbury-Nepean Flood Management Strategy (1998) was that the planning and construction of urban development on the floodplain must be improved to reduce the impact of flooding on people and property. To this end, the Hawkesbury-Nepean Flood Management Advisory Committee commissioned the production of flood-specific planning guidelines:
- a. [Land Use Guidelines](#)
 - b. [Sub-division Guidelines](#)
 - c. [Building Guidelines](#)
- 3.2.11 These guidelines provide advice to individuals and organisations to improve flood emergency risk management outcomes. They:
- a. Recognise that all new development should be designed and built to ensure that emergency management action can be safely and efficiently implemented when a flood threatens.
 - b. Assist individuals and businesses to minimise the damage that would otherwise be done to their property when it is flooded. Houses and buildings cannot be moved as a flood approaches but basic modifications, some required at the time of construction, can make the difference between a total flood loss and a recoverable asset.

PART 4 - PREPARING FOR FLOODS

4.1 PLANNING

- 4.1.1 As the combat agency for flooding, the NSW SES is required to take the lead in planning for the occurrence of floods as detailed within the NSW State Flood Plan.
- 4.1.2 The planning work to prepare for the eventuality of a severe to extreme flood in the Hawkesbury-Nepean Valley is a complex and on-going process. In addition to this Plan (HNFESP) and the lower level NSW SES Local Flood Plans, there are a number of Supporting Plans and Strategies that are required to deal with the management of important functions which contribute to an efficient and effective response to a flood.
- 4.1.3 Supporting plans and strategies are prepared by agencies with the responsibility and expertise to develop the appropriate supporting arrangements. Some of the supporting plans and strategies for the Hawkesbury-Nepean Valley are currently in development, or are yet to be developed. The number and scope of supporting plans and strategies may change over time. The current list of supporting plans and strategies, their state of completeness, the lead agency for the plan or strategy (in brackets), and the main functions of the plan or strategy are described below:

Existing

- a. **Nepean Blue Mountains Local Health District - Hawkesbury-Nepean Healthplan**
 - (NSW Health) Deals with the evacuation of health facilities such as hospitals and nursing homes during a flood and health clients at risk in the community.
- b. **Draft Hawkesbury-Nepean Recovery Strategy**
 - (Department of Justice, Office of Emergency Management) Deals with the recovery arrangements following a flood event within the Hawkesbury-Nepean Valley.
- c. **Draft Hawkesbury-Nepean Flood Emergency - Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual**
 - (Transport for NSW) Deals with the detailed transport and traffic management arrangements for the Hawkesbury-Nepean regional flood evacuation routes.

To be developed

- d. **Hawkesbury-Nepean Flood Emergency – Agriculture and Animal Services Supporting Plan**
 - (Department of Primary Industry) To deal with the management of livestock and animals from farming areas affected by flood. The plan

also deals with the important issue of domestic pets and companion animals belonging to people who have to be evacuated during a flood.

4.2 FLOOD INTELLIGENCE

- 4.2.1 Flood intelligence describes flood behaviour and its effects on the community. It is used by the NSW SES to determine what actions will need to be taken by response agencies and what information and advice should be provided to community members.
- 4.2.2 The NSW SES Flood intelligence system is described within the NSW State Flood Plan.
- 4.2.3 Additional Hawkesbury-Nepean Valley flood intelligence resources include:
 - a. Flood modelling outputs for a large range of flood scenarios;
 - b. Various Geographic Information System (GIS) data layers;
 - c. Evacuation time-line modelling estimates.

4.3 COMMUNITY RESILIENCE

- 4.3.1 Members of the community that prepare ahead of time and know how to respond appropriately often recover more efficiently and effectively. This helps them, their household and their community to become more resilient.
- 4.3.2 Preparation is particularly important within the Hawkesbury-Nepean Valley due to the high risk to life from flooding (as described in Volume 2 – Hazard and Risk in the Hawkesbury-Nepean Valley).
- 4.3.3 Floods within the Hawkesbury-Nepean Valley are likely to require the mass evacuation of people from flood impact areas in order to protect life. Given the large population and short timeframes to evacuate these areas, the protection of property is a secondary priority.
- 4.3.4 NSW SES encourages and supports individuals and businesses to build community resilience. This may include activities to prevent, prepare, respond and recover from the impact of flooding based on policy, guidance, and resources from government and other sources such as community organisations.
- 4.3.5 The NSW SES will use a range of strategies to deliver community engagement, education and awareness programs in partnership with and tailored to communities in the Hawkesbury-Nepean Valley. These include, but are not limited to:
 - a. Development and delivery of community engagement and capacity building programs that enhance community resilience to floods;
 - b. Fostering of partnerships and building links with networks that can enhance community engagement, education and awareness;
 - c. Providing opportunities for community members to be involved in the flood planning process;

- d. Education and training programs for key community and at-risk groups;
- e. Design, production and distribution of information resources and online tools.

4.4 PLANNING FOR FIRE AND HAZARDOUS MATERIALS

- 4.4.1 Flooding can result in secondary incidents of fire and hazardous materials.
- 4.4.2 Locations at risk of fire during flooding which may pose a significant threat to surrounding populations should be identified by the Fire and Rescue NSW and NSW Rural Fire Service.
- 4.4.3 Fire and Rescue NSW, in consultation with Local Government, WorkCover and the Environment Protection Authority, are to identify any land based locations which may pose a risk of hazardous material incidents. The NSW SES is to be notified of those facilities that pose a significant threat for incorporation into NSW SES flood intelligence and planning.
- 4.4.4 NSW Health as Public Health can provide advice on the likely public health impacts of a Hazmat incident.

PART 5 - FLOOD WARNING

5.1 INTRODUCTION

- 5.1.1 Flood warning services are provided by the Australian Government Bureau of Meteorology (Bureau), with the NSW SES augmenting the Bureau's predictions with additional information in accordance with the NSW State Flood Plan.

5.2 FLOOD WARNING PRODUCTS

- 5.2.1 **Livestock and Equipment Warnings:** These are issued by the NSW SES when there is evidence of significant rises in stream levels to below minor flood heights. The NSW SES may seek advice from the Bureau on likely rises.
- 5.2.2 **Severe Thunderstorm Warnings:** range in character from short-lived events causing patchy localised damage to more organised systems producing widespread damage across broader areas. Weather phenomena accompanying these storms include any combination of large hail, damaging or destructive winds, tornadoes and intense rainfall leading to local flash flooding. These warnings are issued when severe thunderstorms are already occurring in an area or are expected to develop within or move into the specified area over the next few hours.
- 5.2.3 **Detailed Severe Thunderstorm Warnings – Sydney / Newcastle / Wollongong – (Cell - Based)** are issued when severe thunderstorms are actually occurring or are about to move into the heavily populated region around Sydney, Newcastle and Wollongong, the Bureau will issue a more detailed Severe Thunderstorm Warning for people in the affected region. High quality, full-time weather radar coverage in this area allows these warnings to describe the current location of individual thunderstorms, and the places likely to be affected within the next 30 to 60 minutes. The more detailed warnings are available for Sydney, Newcastle, Wollongong and surrounds.
- 5.2.4 **Severe Weather Warnings:** These are issued when severe weather is expected to affect land based communities within the next 24-36 hours but are not directly the result of severe thunderstorms. They aim to provide advance notice of very heavy rainfall leading to local flash flooding or storm surge which is sometimes exacerbated by abnormally high tides. Severe Weather Warnings are distributed to the media by the Bureau and published on the Bureau's website ([Bureau of Meteorology](#)).
- 5.2.5 **Flood Watches:** Flood Watches are issued by the Bureau based on an assessment of catchment conditions and forecast rainfall. They provide advanced warning of large-scale weather systems that have the potential to cause flooding. This information is published on the Bureau's web site ([Bureau of Meteorology](#)) and is incorporated into NSW SES Flood Bulletins for distribution to media outlets.

- 5.2.6 **Flood Warnings:** These normally predict flood heights (in metres at a gauge) which will be reached at a location at a specified time in the future. Flood Warnings are published on the Bureau's web site ([Bureau of Meteorology](#)) and are incorporated into NSW SES Flood Bulletins for distribution to media outlets.
- 5.2.7 **Flood Bulletins:** These are issued to radio stations by NSW SES to inform people about what is expected to happen during flooding. NSW SES Flood Bulletins contain information on likely flood consequences and what actions are required to protect persons and property.
- 5.2.8 **NSW SES Evacuation Warning:** Evacuation Warnings are a message advising the community to prepare for likely evacuation. The warning advises people what to do and what to prepare to take with them.
- 5.2.9 **NSW SES Evacuation Order:** Evacuation Orders communicate the need for a community (or parts of a community) to evacuate by a specified time in response to an imminent threat. An Evacuation Order also advises where people should go and may advise which evacuation route to take.

5.3 DELIVERY OF FLOOD WARNINGS AND ORDERS

- 5.3.1 The NSW SES will deliver flood warning information directly when possible, in addition to the media. Combinations of the following methods of warning that may be utilised include:
- a. Mobile and fixed public address systems;
 - b. Two-way radio;
 - c. Emergency alert;
 - d. Telephone and fax;
 - e. Doorknocking;
 - f. Mobile sirens;
 - g. Variable message signs;
 - h. Community notices in identified hubs;
 - i. Distribution through established community liaison networks, partnerships and relationships; and
 - j. Internet.
- 5.3.2 As new and emerging technologies become viable the warning system will continually evolve.
- 5.3.3 **Standard Emergency Warning Signal (SEWS):** The Standard Emergency Warning Signal will be used to precede all *Top Priority* Flood Warnings and all Evacuation Warnings.

PART 6 - CONCEPT OF OPERATIONS

6.1 BACKGROUND

- 6.1.1 This concept of operations should be read in conjunction with the concept of operations contained in the State Flood Plan.
- 6.1.2 This concept of operations provides guidance for:
 - a. The development of subordinate flood plans;
 - b. The development of Incident Action Plans (IAPs) for particular flood events.
- 6.1.3 IAPs for a particular event will contextualise this Concept of Operations and Response Part to the prevailing and predicted conditions at the time.

6.2 PRINCIPLES OF FLOOD OPERATIONS

- 6.2.1 The NSW SES is the combat agency for dealing with floods and members of the NSW Police Force, other emergency service organisations and other agencies are required to recognise the authority of emergency officers appointed under the SES Act 1989.
- 6.2.2 The nature of the flood threat within the Hawkesbury-Nepean Valley is such that many other agencies and organisations (including non-government agencies) will likely need to play a part, as will the people at risk of flood impacts. Other agencies are to assist the NSW SES in accordance with arrangements laid down in this Hawkesbury-Nepean Flood Plan and Local Flood Sub Plans.
- 6.2.3 Control and coordination of flood operations are carried out at the lowest effective level. However, control and coordination may be assumed at the NSW SES Region and State levels for whole operations, or for the performance of particular functions after consultation with the relevant controllers.
- 6.2.4 To ensure that local knowledge is available for operations, local resources should be utilised whenever possible.
- 6.2.5 If local NSW SES and other local resources are insufficient or likely to be exhausted, additional NSW SES resources may be deployed by the appropriate NSW SES Region Headquarters. If further NSW SES resources are required from other Regions they will be deployed by the NSW SES State Headquarters.
- 6.2.6 Resources from supporting emergency services and functional areas may be requested directly by the NSW SES at any level (local, regional or state), or under EMPLAN arrangements. Emergency Operations Controllers (EOCONS) will be responsible, when requested, to coordinate this additional support and are to be responsive to the requirements of NSW SES Controllers.

6.3 OPERATIONAL OBJECTIVES

- 6.3.1 The operational objectives of this Plan are:
- Protection of life (highest priority);
 - Minimisation of damage to property;
 - Minimisation of interruption to utilities; and
 - Effective transition to recovery.

6.4 OPERATIONAL STRATEGIES

- 6.4.1 The main response strategies for NSW SES flood operations are;
- Provision of timely, relevant, accurate and tailored **information** to the community regarding the potential impacts of a flood and what actions to undertake to support and encourage proactive measures;
 - Evacuate** people pre-emptively from dangerous or potentially dangerous places created by the flood hazard to safe locations away from the hazard;
 - Rescue** people and domestic animals from floods in accordance with the NSW Flood Rescue Policy including where evacuation operations have not been successfully completed;
 - Coordinate the **protection of property** of residents, businesses and essential infrastructure at risk of flood damage where feasible;
 - Resupply** properties, towns and villages which have become isolated as a consequence of flooding to minimise disruption of the community;
 - Manage the **transition** from response operations **to recovery**.
- 6.4.2 The impact may vary so a number of different strategies may need to be selected and implemented across the whole operational area.
- 6.4.3 The NSW SES Controllers will select the appropriate mix of response strategies to deal with the expected impact of floods and set operational objectives.
- 6.4.4 Circumstances may arise where a NSW SES Controller varies the priority of the strategies. This shall be documented and done in consultation with relevant stakeholders based on sound predictions, intelligence and risk assessments.

6.5 KEY CONSIDERATIONS

Areas of Operation

- 6.5.1 The Hawkesbury Nepean system is divided into three main areas of operation for the purposes of incident control:
- Upper Nepean** – upstream from Bents Basin/Wallacia;
 - Hawkesbury-Nepean** - from Bents Basin/Wallacia to Wisemans Ferry (including the Colo River, Webbs Creek and Macdonald Rivers);
 - Lower Hawkesbury** - from Wisemans Ferry to Broken Bay;

- 6.5.2 The Incident control arrangements for these areas of operation are outlined in Section 7.2 of this plan.
- 6.5.3 This Concept of Operations and the Response part of this Plan are focussed primarily on the **Hawkesbury-Nepean** area of operation and outlines some of the arrangements from Wisemans Ferry to Spencer within the Lower Hawkesbury area of operation. Refer to the relevant Local Flood Plans for detailed arrangements in the Upper Nepean and Lower Hawkesbury areas of operation.

Concurrent Flood Operations in the Greater Sydney

- 6.5.4 The likely weather events (e.g. East Coast Lows) which would cause flooding on the Hawkesbury-Nepean can also cause flooding on:
- a. Georges River,
 - b. Cooks River,
 - c. Upper Nepean River,
 - d. Upper Parramatta River,
 - e. Lower Parramatta River,
 - f. Central Coast,
 - g. Various creeks systems in the Sydney Metropolitan area.
- 6.5.5 These weather events may also extend into the NSW SES Illawarra South Coast and Hunter Regions and possibly further north.
- 6.5.6 As a result there would likely be concurrent flood and storm operations being conducted in the NSW SES Sydney Southern, Sydney Western and Sydney Northern Regions.
- 6.5.7 The allocation of resources between these concurrent large operations will be complex and will need to be considered by the NSW SES State Duty Operations Controller.

The Hawkebury Nepean flood problem

- 6.5.8 Detailed studies have been undertaken since 1997 to identify the factors, which are critical to the conduct of flood operations on the scale required to deal with the consequences of severe to extreme floods in the Hawkesbury-Nepean Valley.
- 6.5.9 Many issues have been identified but none has more significance than the timing of decisions to commence warning and evacuation of the population due to:
- a. Significant rates of rise (refer Volume 2);
 - b. Extreme depth of flooding due to the river constrictions in the Valley (refer Volume 2);
 - c. Heavy reliance on the road network for vehicle-based evacuation given the limitations on rail and air transport in the Valley (refer Volumes 2 and Volume 3 Chapter 4);

- d. Many of the critical roads are cut at low points before the areas being evacuated are actually flooded (refer Volumes 2, Volume 3 Chapter 2 and Volume 3 Chapter 4).
- 6.5.10 The decision to implement this plan is driven primarily by the potential need to:
- a. Completely evacuate whole communities before mainstream flooding cuts evacuation routes (refer Volume 3 Chapter 4);
 - b. Undertake rescue operations where areas are not fully evacuated (refer Volume 3 Chapter 4);
 - c. Manage large scale resupply operation to some affected areas where full evacuation is not required.

Complex flood behaviour

- 6.5.11 The flood behaviour in the Hawkesbury-Nepean Valley is complex and unusual with an often complex interaction of flooded rivers (see Volume 2). The relative contribution of rivers can be highly variable. For example there may be rises at Windsor due to flows from Grose River before the Nepean River rises.
- 6.5.12 In a single flood event, the severity of flooding may vary widely from area to area due to the complex flood behaviour in the Hawkesbury-Nepean Valley (see Volume 2).

Warning and Evacuation Decisions

- 6.5.13 Detailed analyses of the dynamics of the warning and evacuation process have concluded that decisions must be related to the expected rate of rise of the river.
- 6.5.14 Evacuation decisions will often need to be made under uncertainty due to the limit of confident flood prediction for the Hawkesbury-Nepean Valley.

Timing of Flood Operations

- 6.5.15 To ensure that planning is flexible enough to deal with any contingency (worst case planning) the calculated time available for decisions and actions is based on the rate of river rise expected in the most extreme flood. The Probable Maximum Flood (PMF) is the worst case flood scenario.
- 6.5.16 In a PMF the time available for all decisions, all warning and all evacuation is about 24 hours.
- 6.5.17 To ensure that all critical operational decisions and actions are timed as efficiently as possible, a common reference point has been chosen to synchronise operations across all sectors. This reference point is the time at which the river at Windsor Bridge is expected to reach a height of 6m. It is not safe to use a height lower than 6 metres because too little information will be available about the flood before this level is reached. It is also not safe to use a level higher than 6 metres because then there may not be sufficient time to complete the operation.

6.6 RESPONSE STRATEGIES

- 6.6.1 The following sections describe the response strategies that will be used to deal with flood events under this Plan. The basis on which a strategy or set of strategies may be selected is also described. The implementation of strategies during operations is detailed in Part 7: Response.
- 6.6.2 The main strategies available in the response operation are:
- a. Progressive evacuation;
 - b. Partial evacuation;
 - c. Complete evacuation;
 - d. Resupply;
 - e. Rescue.
- 6.6.3 The Sectors and Sub-Sectors (Described in Map 1 and Tables 1 to 4 in Volume 3 Chapter 2 of this Plan and further described in Local Flood Plans) are classified into categories (refer Section 2.5 Volume 2) based on the impact of flooding on the community as one of the following:
- a. Flood Islands (Low or High);
 - b. Trapped Perimeters (Low or High);
 - c. Areas with Overland Access;
 - d. Areas with Rising Road Access; or
 - e. Indirectly Affected Areas.
- 6.6.4 For each of these categories the selection of these response strategies will depend on the severity of flooding. These considerations are detailed in the following paragraphs.

Progressive Evacuation (Rising Road Access)

- 6.6.5 The only strategy needed for these areas should be to progressively evacuate depending on the expected upper limit of flooding. Evacuation can take place by vehicle or on foot along roads as floodwater advances.

Partial Evacuation Strategy (Islands, Overland Access)

- 6.6.6 In some floods, at the upper limit of expected flooding the road evacuation routes for a sector will be cut but the island will not be submerged beyond the point of sustainability. If the assessment of the upper limit of flooding can be made with a high level of confidence, a decision may be made by the Controller to implement a partial evacuation strategy.
- 6.6.7 The purpose of partial evacuation is to reduce the total number of people isolated on the island requiring resupply. Also, if it later becomes necessary to remove those people not evacuated if the flood height is revised upward, the rescue operation required will not be as large.

- 6.6.8 It is also possible that even though a complete evacuation may have been initiated, it could become necessary to change to a partial evacuation strategy. This will result when a road evacuation is commenced on the basis of an initial flood prediction and is deliberately terminated before completion because later flood predictions indicate that although an island will form, it **definitely** will not be completely covered by floodwater. Alternatively a partial evacuation may need to be changed to a complete evacuation strategy if flood predictions are increased.
- 6.6.9 A partial evacuation strategy will result in the need to maintain the isolated island population by conducting a resupply operation until road routes re-open.
- 6.6.10 Note that during a partial evacuation operation there may still be some internal evacuations from the low-lying edges of the island to higher ground on the island.
- 6.6.11 During a partial evacuation strategy consideration will need to be given to the sufficiency and availability of essential services to support the population that remains.

Complete Evacuation Strategy (Low and High Island, Low and High Trapped Perimeter Overland Access)

- 6.6.12 A complete evacuation may be initiated for an area for one of the following reasons:
- The predicted flood height will result in the area being completely submerged;
 - The predicted flood height will result in the area being flooded to such an extent that it is too small or has too few support services functioning to cope with the number of people left on the island (i.e. flooded beyond the point of sustainability);
 - Services such as water, electricity and sewage are expected to be unavailable for a prolonged period;
 - There is a high level of uncertainty about the predicted upper level of flooding.
- 6.6.13 For Trapped Perimeters, if it will not be possible to provide adequate support to the community, evacuation may have to take place before isolation occurs or in some cases after isolation.

Resupply Strategy (Islands, Overland Access, Trapped Perimeters)

- 6.6.14 If there is a **definite prediction** that the sector's road evacuation routes will be cut but the island or trapped perimeter will not be substantially inundated there may be no need to evacuate all people away to external evacuation centres.
- 6.6.15 This will result in the need to maintain the isolated population by conducting a resupply operation.
- 6.6.16 Resupply is the responsibility of the NSW SES as detailed in the NSW State Flood Plan.

- 6.6.17 There may be some internal evacuation from the low-lying edges of the island or trapped perimeter to higher ground.
- 6.6.18 However, evacuation may also be required if services such as water electricity and sewage are likely to be unavailable for extended periods of time. The decision to evacuate will also need to consider the loss of essential services for extended periods of time such as power, gas, water and wastewater services.
- 6.6.19 Resupply of essential goods and services to the populations may be required for a period ranging from a few hours up to several days and may have to deal with populations ranging in number from 1,000 up to 9,000 people per area.

Rescue Strategy (Islands, Overland Access)

- 6.6.20 For Rising Road Access Areas people should not be trapped unless they delay their evacuation. For example people living in two storey homes may initially decide to stay but reconsider after water surrounds them. In these circumstances people may need to be rescued.
- 6.6.21 If road evacuation routes are cut, particularly on flood islands or in overland escape route areas, a rapid rescue operation may be required to save large numbers of people before the area is inundated by floodwater. This will require the use of large numbers of aircraft (mostly rotary wing) and flood rescue boats. Short-term resupply may be required until all people have been rescued.
- 6.6.22 Even though an evacuation strategy (complete or partial) or an isolated population strategy may have been initiated on the basis of the early flood prediction, a revised assessment of the expected upper limit of flooding may make it necessary to change to a rescue strategy for one of the following reasons:
 - a. Temporary closure of a road evacuation route because of short term local flooding or some other blockage, resulting in insufficient time being available to complete the road evacuation of the required number of people;
 - b. Permanent closure of a road evacuation route before the road evacuation of the required number of people can be completed.

Indirectly Affected Areas

- 6.6.23 During an extreme flood indirectly affected communities outside the Hawkesbury-Nepean Valley could be without essential services such as electricity, water, and sewer for some time.
- 6.6.24 Interruptions of electricity can have the following impacts:
 - a. Communities can be without power for several days to months. For example for flood levels exceeding 14.5m, all electricity supply west of the river is likely to be shut off. The communities most likely to be affected are in North Richmond, Bilpin, Grose Vale, Grose Wold, Kurmond, Kurrajong, Kurrajong Heights, Ebenezer, Freemans Reach, Glossodia and Wilberforce. Marlow and Lower Mangrove may also be indirectly affected. During extreme flood

events electricity supply to wide parts of Western Sydney can also be interrupted for extended periods of time;

- b. Loss of mobile telephone services. Mobile base stations typically have 4 – 8 hour battery backup and if electricity mains power is not restored in that time then the base stations dependent on that mains power will fail;
- c. Loss of landline voice and data services. Telecommunications roadside cabinets will fail in the event of the loss of mains power or from being inundated;
- d. Back-up generators at telecommunications exchanges will need to be refuelled. Telecommunications exchanges have back up power generators and batteries on site. Beyond 4 – 8 hours of loss of main power this infrastructure will require refuelling and telecommunication maintenance crews may require assistance from NSW SES to access the site;
- e. Transmission line circuits owned by Transgrid, Endeavour Energy or Sydney Trains (Transport for NSW) passing through flood affected areas may remain energised at lethal voltages to maintain electricity supplies for essential services and customers in the Sydney Metropolitan areas.

Table 1: Response Strategy Options dependant on Flood Emergency Classification

Classification	Progressive evacuation	Partial Evacuation	Complete Evacuation	Resupply	Rescue
Low Flood Island		Yes (in low lying areas)	Yes	Yes	Yes
High Flood Island		Yes	Yes	Yes	Yes
Low Trapped Perimeter		Yes (in low-lying areas)	Yes	Yes	Yes
High Trapped Perimeter		Yes	Yes	Yes	Yes
Overland Escape Route		Yes	Yes	Yes	Yes
Rising Road Access	Yes				Yes
Indirectly Affected		Yes			

6.7 SELECTION OF RESPONSE STRATEGIES

- 6.7.1 The initial choice of a particular strategy or group of strategies is highly dependent on flood prediction information. The choice between an Evacuation Strategy and a Resupply Strategy for example, must be made early in the flood event because of the need to maximise time available for warning and evacuation. This means that decisions may have to be made before the Bureau of Meteorology can provide a clear indication of the likely upper limit of flooding.
- 6.7.2 The selection of a Resupply Strategy depends on the fact that people who are left in a sector will be safe from subsequent inundation, even after the road evacuation route or other escape route is closed. The selection of this strategy also requires that there is a low probability that the river could experience a later rise, flooding so much land within a sector that people could not be sustained there.
- 6.7.3 Strategy selection depends therefore on a high level of confidence in the predicted flood height and a clear picture of the expected weather over the hours and days following the initial flood producing rainfall. In the early stages of most floods, particularly because rainfall has often not ceased, there is a high level of uncertainty. The early assessments of flooding are likely to only contain indications that certain heights will be exceeded, rather than indications of what the upper limit of flooding might be.
- 6.7.4 There are several critical flood heights associated with the strategy selection process for the various sectors. These are:
- a. The height that closes the sector road evacuation route/s;
 - b. The height that cuts the sectors last viable escape route of any kind;
 - c. The height that limits the capability of a sector to sustain an isolated population (Sustainability Height);
 - d. The height that will completely submerge all safe land within a sector.
- 6.7.5 The possibility of any of these critical flood heights being reached or exceeded will set the parameters within which strategy selection must take place.
- 6.7.6 In reality a mix of strategies is the most likely course of action. It must also be remembered that as circumstances change during a flood, such as a revised flood prediction after additional rainfall, it may be necessary to change to one of the other available strategies.
- 6.7.7 The critical heights for strategy selection for the various sectors are summarised in Tables 1 to 4 in Volume 3 Chapter 2 (also refer to Volume 2, Tables 3 and 4 for further details).
- 6.7.8 The selection of a particular strategy for sectors will be highly dependent on the ability of the Bureau to provide a confident assessment of the upper limit of expected flooding.

6.8 DECISION MAKING PARAMETERS

- 6.8.1 As noted in Volume 2 – Hazard and Risk in the Hawkesbury-Nepean Valley, Volume 3 Chapter 2 – Sectors and Evacuation Strategy Selection Considerations and Volume 3 Chapter 4 – Flood Evacuation Routes, Traffic and Transport Arrangements, there are several sectors, especially the potential flood islands, for which operational decisions must be made very early in a flood.
- 6.8.2 In a PMF event, the last of the critical evacuation routes, Castlereagh Road out of the Richmond Sector, will be cut by floodwater at a height of about 20.2 metres. In a PMF, this will happen around 24 hours after the river exceeds a height of about 6 metres at Windsor Bridge. All other evacuation routes will have been cut earlier and at lower flood levels. The operational decisions therefore relate to the need to complete evacuation from sectors by using the road network in the time available before the roads are cut by floodwater.
- 6.8.3 For each sector where a flood will have an impact, there are four critical parameters that have to be considered in the decision making process. These parameters are:
- The time required to mobilise for a response operation;
 - The time required to ensure all residents are warned of the need to evacuate;
 - The time required to move all vehicles out of the area;
 - The minimum amount of time likely to be available before floodwater closes the road at the low point.

6.9 DECISION MAKING TRIGGERS

- 6.9.1 By assessing the above parameters on a sector-by-sector basis, decision making triggers for each sector can be determined. There is a relationship between elapsed time and the average rate of river rise. However, as the rate of river rise can be variable (10) it is difficult to define these triggers definitively in terms of flood height. Rather, decisions must be made based on the amount of time required to evacuate the sector compared with the amount of time predicted to be available before the evacuation route is cut.
- 6.9.2 The decision to evacuate may need to be made when there is still a high degree of uncertainty regarding when the critical points on evacuation routes are cut. This is particularly the case for Windsor and Richmond due to the amount of time required to evacuate the population at risk.
- 6.9.3 As an indication of possible timings Table 5 in Volume 3 Chapter 2 – Sectors and Evacuation Strategy Selection Considerations summarises the information used to make decisions about the conduct of evacuation operations for various flood island Sectors in a PMF scenario. However, note that in determining decision timings the following will need to be taken into account:
- the actual flood heights achieved prior to the decision point;
 - predicted heights;

- c. the expected rates of rise over the subsequent time period; and
 - d. any changes to the number of dwellings and vehicles.
- 6.9.4 Whilst an average rate of rise of 0.5m /hr has most often been used in evacuation planning based on the 72hr PMF, an average rate of rise of 0.7m/hr is possible in a 24hr PMF (10). The actual rate of rise can be variable, is normally higher in the initial stages of flooding and can depart significantly from average rates of rise (10).
- 6.9.5 During large flood events, in order to complete the evacuation of all vehicles before evacuation routes are cut, the decision to evacuate will need to be made early. This means that decisions may have to be made before the Bureau can provide a clear indication of the key flood heights and the likely upper limit of flooding.
- 6.9.6 The NSW SES Sydney Western Region Incident Controller may decide to call off evacuation of specific flood island Sectors based on firm predictions by the Bureau of Meteorology that key thresholds will not be exceeded. This may result in supply operations to the remaining population on the flood islands.

PART 7 - RESPONSE

Control

7.1 START OF RESPONSE OPERATIONS

- 7.1.1 Flood response operations will start:
- On receipt of a Bureau Flood Watch or Flood Warning for the Hawkesbury-Nepean River indicating that flooding is likely; or
 - On receipt of a dam emergency alert; or
 - When other evidence leads to an expectation of flooding.
- 7.1.2 The NSW SES Sydney Western Region Incident Controller will implement flood operations in accordance with this plan, and Local Flood Plans.
- 7.1.3 The NSW SES State Duty Operations Controller will direct:
- The activation of the Joint Media Information Centre (JMIC) at the NSW SES Sydney Western Region Headquarters to coordinate media liaison;
 - That the NSW SES Operations Centre at NSW SES State Headquarters is to assist with the management of flood enquiries from the community.
- 7.1.4 Depending on the severity of expected flooding, the NSW SES State Duty Operations Controller will advise the State Emergency Operations Controller that larger operations are about to commence and may request support from the State Emergency Operations Controller to:
- Advise the Minister for Police and Emergency Services to request the Premier to declare a State of Emergency to ensure that the seriousness of the event is recognised by the community;
 - Activate the State Emergency Operations Centre;
 - Activate the Public Information and Inquiry Centre if not already activated;
 - Request the Energy and Utilities Functional Area Coordinator to begin monitoring the impact of flooding on utilities and keep the NSW SES advised;
 - Request the Transport Services Functional Area Coordinator to activate the Transport Services Functional Area Coordination Centre;
 - Advise the Welfare Services Functional Area to prepare for possible evacuations;
 - Request the Telecommunication Services Functional Area Coordinator to monitor the impact of flood on telecommunications networks and the Government Radio Network and keep the NSW SES Sydney Western Region Incident Controller advised;
 - Request Emergency Management Australia to activate the National Registration and Inquiry System;

- i. Request the Commonwealth to provide Defence air assets for possible use in large scale evacuations (refer 7.28.9);
 - j. Advise the Commonwealth that further Defence assistance may be required if it is likely that the states resources will be exhausted (refer 7.23).
- 7.1.5 The NSW SES Sydney Western Region Incident Controller will:
- a. Advise Water NSW of the activation of this plan.
 - b. Designate the “Start Time” to help Incident Controllers at all levels calculate the timings that apply to their areas of responsibility. This will be done with the assistance of the Bureau and normally based on a Flood Warning. The “Start Time” will be based on the time the Hawkesbury River reached, or is expected to reach, 6 metres on the Windsor gauge (refer to 6.8.1).
 - c. Request the activation of the following supporting plans to this Plan:
 - Draft Hawkesbury-Nepean Flood Emergency – Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual;
 - NSW Healthplan;
 - Nepean Blue Mountains Local Health District: Hawkesbury Nepean Healthplan;
 - Agriculture and Animal Services Supporting Plan (Hawkesbury-Nepean Flood Emergency - Agriculture and Animal Services Supporting Plan when completed);
 - d. Request the activation of the Hawkesbury-Nepean Recovery Strategy when finalised (currently in draft).

7.2 CONTROL AND COORDINATION

Strategy

- 7.2.1 Maintain effective control of flood operations across the Hawkesbury-Nepean Valley.

Actions

- 7.2.2 The NSW SES is the combat agency for dealing with floods under the SES Act 1989. Control of flood operations will be conducted in accordance with the NSW State Flood Plan.
- 7.2.3 The NSW SES State Operations Centre will provide overall coordination of flood and storm operations and allocate resources between possible concurrent flood and storm operations in Sydney and elsewhere in NSW.
- 7.2.4 The NSW SES State Controller may relocate to the NSW SES Sydney Western Region Headquarters and operate forward of the NSW SES State Headquarters to more closely monitor flood operations in the Sydney Metropolitan area and to deal with strategic issues.

- 7.2.5 Flood operations throughout the Hawkesbury-Nepean River system, from Bents Basin to Wisemans Ferry, will be under the control of the NSW SES Sydney Western Region Incident Controller using arrangements under this plan and the Local Flood Plans for Penrith, Blacktown, Hawkesbury and The Hills (refer 7.5).
- 7.2.6 Concurrent flood operations on the Hawkesbury River downstream of Wisemans Ferry will be under the control of the NSW SES Sydney Northern Region Incident Controller and using arrangements under the Local Flood Plans for Hornsby and Gosford (refer 7.5).
- 7.2.7 Concurrent flood operations on the upper Nepean River (upstream from Bents Basin) will be under the control of the NSW SES Sydney Southern Region Incident Controller (other than the sectors in the Wollondilly and Liverpool LGAs reporting to the Penrith Local Controller as detailed below in 7.5) and using arrangements under the Local Flood Plans for Wollondilly, Camden and Liverpool (refer 7.5).

7.3 OPERATIONS CENTRES

Strategy

- 7.3.1 Maintain a single strategic control centre and coordinate support of flood operations in the Hawkesbury-Nepean Valley.

Actions

- 7.3.2 The Operations Centre controlling flood operations within the Hawkesbury-Nepean Valley will be located at the NSW SES Sydney Western Region Headquarters, Unit 3, 7 St James Place, Seven Hills.
- 7.3.3 Refer to the Local Flood Plans for Penrith, Hawkesbury, Blacktown, The Hills, Hornsby and Gosford for locations of NSW SES Local Headquarters.
- 7.3.4 Supporting Emergency Operations Centres (EOC's) will be located as follows:
- a. NSW SES State Operations Centre NSW SES State Headquarters 6-8 Regent Street, Wollongong;
 - b. State EOC (SEOC), Level 4, Sydney Police Centre, 151-241 Goulburn Street, Surrey Hills.
 - c. EOC North West Metropolitan District, Second Floor, Penrith Police Station, High Street, Penrith.
 - d. EOC Hunter – Central Coast District.
- 7.3.5 The State EMPLAN and the relevant Region and Local EMPLANs will operate to provide support as requested by the respective NSW SES Incident Controllers.
- 7.3.6 Other supporting operations centres will be functional as required:
- a. Health Services Emergency Operations Centre (HSEOC);
 - b. Transport Services Functional Area Coordination Centre (TSFACC);
 - c. NSW Transport Management Centre, Eveleigh.

- 7.3.7 The NSW SES State Controller may request the SEMC to meet (in person or via teleconference) on a regular basis at a location determined by the NSW SES State Controller.
- 7.3.8 The Joint Media Information Centre will be responsible to the NSW SES State Controller and will be located at the NSW SES Sydney Western Region Headquarters.

7.4 LIAISON

Strategy

- 7.4.1 Effective liaison is to be established and maintained between the NSW SES and supporting agencies.

Actions

- 7.4.2 The following liaison officers may be provided to the NSW SES Sydney Western Region Headquarters as arranged by the agency:
- a. Fire and Rescue NSW Liaison Officer;
 - b. NSW Rural Fire Service Liaison Officer;
 - c. NSW Ambulance Service Liaison Officer;
 - d. NSW Police Force Traffic Liaison Officer;
 - e. NSW Police Force Specialist Liaison Officer;
 - f. Animal and Agriculture Services Functional Area Liaison Officer;
 - g. Energy and Utilities Functional Area Liaison Officer;
 - h. Environmental Services Functional Area Liaison Officer;
 - i. Department of Education Liaison Officer;
 - j. Department of Corrective Services Liaison Officer;
 - k. Health Services Functional Area Liaison Officer;
 - l. Marine Rescue NSW Liaison Officer;
 - m. NSW Transport Management Centre Liaison Officer;
 - n. Telecommunications Services Functional Area Liaison Officer;
 - o. Transport Services Functional Area Liaison Officer;
 - p. Welfare Services Liaison Officer;
 - q. Water NSW Liaison Officer; and
 - r. Other liaison officers may operate at the Sydney Western Region Headquarters or the SEOC as required.

7.5 OPERATIONAL MANAGEMENT

- 7.5.1 Flood affected areas within the Hawkesbury-Nepean Flood Plans area of operation have been defined into areas known as Sectors for operational control purposes.
- 7.5.2 Where applicable, many of the Sectors have been further divided into Sub-sectors for planning and operational purposes.
- 7.5.3 The Sub-Sectors, and where appropriate the Sectors, are classified into categories based on the impact of flooding on the community. They are categorised as one of the following (refer Section 2.5 Volume 2):
- a. Flood Islands (Low or High);
 - b. Trapped Perimeters (Low or High);
 - c. Areas with Overland Access;
 - d. Areas with Rising Road Access; or
 - e. Indirectly Affected Areas.
- 7.5.4 The complete list of Sectors and Sub-sectors and their classification, including an overview map, are contained in Volume 3 Chapter 2.
- 7.5.5 The Sectors are grouped into the following Divisions for operational control purposes:
- a. Nepean River Division
 - b. South Creek West Division
 - c. South Creek East Division
 - d. Eastern Creek Division
 - e. Hawkesbury Flood Islands Division
 - f. Lower Hawkesbury West Division
 - g. Lower Hawkesbury East Division
 - h. Wisemans Ferry Division
 - i. Hornsby Division (NSW SES Sydney Northern Region)
 - j. Gunderman Division (NSW SES Sydney Northern Region)
- 7.5.6 Flood operations will be controlled using the Divisions and Sectors as outlined in Table 2 and Table 3 (refer also to the Hornsby and Gosford Local Flood Plans).

Table 2: NSW SES Sydney Western Region Operations Control Structure

Local Government Area	Division	Sector	Localities	Relevant Gauge	Controlling NSW SES Unit	Sector Control Centre
Penrith	Nepean River Division	Wallacia Wallacia South Bents Basin	Wallacia, Mulgoa Rd and Bents Basin Road areas	Wallacia	Penrith	Wallacia Shopping Centre
		Emu Plains	Emu Plains, Emu Heights and Leonay areas	Victoria Bridge	Blue Mountains	Intersection of Mitchell's Pass and the Great Western Highway, Blaxland
		Penrith South	Mulgoa, Regentville and Glenmore Park areas	Victoria Bridge	Penrith	Regentville Community Hall Jeanette Street Regentville
		Penrith	Penrith, Jamisontown, Peach Tree Creek	Victoria Bridge	Penrith	NSW SES Penrith Local HQ
		Penrith North	North Penrith, Penrith Lakes (lower Castlereagh) and Cranebrook areas	Victoria Bridge	Penrith	Community Centre Hosking Street Cranebrook
	South Creek West Division	Londonderry	Upper Castlereagh, Agnes Banks (South), Londonderry, Berkshire Park and Llandilo areas	Windsor Bridge	Penrith	Community Centre Hosking Street Cranebrook
		South Creek A	Colyton, Dunheved, Erskine Park, Oxley Park, St Marys, St Clair and Werrington areas	Windsor Bridge	Penrith	NSW SES Penrith Local HQ

Local Government Area	Division	Sector	Localities	Relevant Gauge	Controlling NSW SES Unit	Sector Control Centre
Hawkesbury	Hawkesbury Flood Islands Division	Yarramundi	Yarramundi area		Blue Mountains	Yarramundi Rural Fire Station
		McGraths Hill	McGraths Hill and Vineyard areas	Windsor Bridge	Hawkesbury	McGraths Hill Community Centre
		Windsor	Windsor, Cornwallis, South Windsor	Windsor Bridge	Hawkesbury	St Matthews Church Hall
		Windsor Downs	Windsor Downs	Windsor Bridge	Hawkesbury	TBA
		Bligh Park	Bligh Park	Windsor Bridge	Hawkesbury	Tiningi Community Centre
		Pitt Town	Pitt Town area	Windsor Bridge	Hawkesbury	Pitt Town Public School
		Richmond	Richmond, East Richmond, Hobartville, Agnes Banks and Clarendon areas	Windsor Bridge	Hawkesbury	Richmond Public School
	Lower Hawkesbury West Division	Richmond Lowlands	Agnes Banks Lowlands, Cornwallis	North Richmond	Hawkesbury	NSW SES Hawkesbury Local HQ
		North Richmond	North Richmond and Grose Wold areas	North Richmond	Hawkesbury	NSW SES Hawkesbury Local HQ
		Wilberforce	Wilberforce and surrounding areas	Windsor Bridge	Hawkesbury	NSW SES Hawkesbury Local HQ
		Oakville/ Cattai	Oakville and Cattai areas	Windsor Bridge	Hawkesbury	Oakville Bushfire Brigade Shed
		Colo River	Upper Colo, Central Colo and Colo Heights areas	Colo River (Putty Road)	Hawkesbury	NSW SES Hawkesbury Local HQ
		Webbs Creek	Webbs Creek and Leetsvale West	Webbs Creek (Wisemans Ferry)	The Hills	NSW SES The Hills Local HQ
		Macdonald River	Lower Macdonald, Central Macdonald and St Albans areas	St Albans	The Hills	NSW SES The Hills Local HQ

Local Government Area	Division	Sector	Localities	Relevant Gauge	Controlling NSW SES Unit	Sector Control Centre
The Hills	Lower Hawkesbury East Division	Lower Reaches (South Maroota)	Parts of Maroota	Sackville	The Hills	NSW SES The Hills Local HQ
		Lower Reaches (Sackville North)	Parts of Sackville	Sackville	The Hills	NSW SES The Hills Local HQ
		Lower Reaches (Lower Portland East)	Parts of Lower Portland	Lower Portland	The Hills	NSW SES The Hills Local HQ
		Lower Reaches (Leets Vale South)	Parts of Leets Vale	Lower Portland	The Hills	NSW SES The Hills Local HQ
	Wisemans Ferry Division	Wisemans Ferry West and Wisemans Ferry Central	Wisemans Ferry area west of Old Northern Road	Webbs Creek	The Hills	NSW RFS Station Wisemans Ferry (if flood is predicted to be below 6.7m AHD or 1% AEP at the Webbs Creek gauge) or alternative venue Sth Maroota Community Centre *
Blacktown	South Creek East Division	South Creek B	Shane Park, Ropes Creek and Tregear areas	Windsor Bridge	Mount Druitt	NSW SES Mount Druitt Unit HQ
	Eastern Creek Division	Eastern Creek A	Riverstone area	Windsor Bridge	Blacktown	Riverstone High School
		Eastern Creek B	Marsden Park area	Windsor Bridge	Blacktown	NSW SES Blacktown Local HQ
		Eastern Creek C	Area between Eastern Creek and Bells Creek	Windsor Bridge	Blacktown	Marsden Park Public School
		Vineyard	Vineyard	Windsor Bridge	Blacktown	TBC

Note: * Mobile phone coverage at this location is known to be limited and may potentially impact upon operations.

Table 3: NSW SES Sydney Northern Region Operations Control Structure

Local Government Area	Division	Sector	Localities	Relevant Gauge	Controlling NSW SES Unit	Sector Control Centre
Hornsby	Hornsby	Wisemans Ferry East	Wisemans Ferry east of Old Northern Rd to Canoelands	Wisemans Ferry	Hornsby	NSW RFS Station Wisemans Ferry (if flood is predicted to be below 6.7m AHD or 1% AEP at the Webbs Creek gauge) or alternative venue Sth Maroota Community Centre *
		Singletons Mill	Singleton Rd East of Wisemans Ferry to Singletons Mill	Wisemans Ferry	Hornsby	
Gosford	Gunderman	Gunderman	Gunderman to Spencer	(Webbs Creek (Wisemans Ferry))	Gosford	Mobile Sector Control in Gunderman

Note: * Mobile phone coverage at this location is known to be limited and may potentially impact upon operations

7.6 SELECTING RESPONSE STRATEGIES

- 7.6.1 The NSW SES Sydney Western Region Incident Controller will determine the appropriate response strategy to deal with the expected impact of the flood in each sector and will communicate these operational intentions to the NSW SES State Duty Operations Controller. The impact may vary from sector to sector so a number of different strategies may have to be selected and implemented across the whole operational area. The available strategies are explained in detail in PART 6 -Concept of Operations.
- 7.6.2 To assist with strategy selection the critical flood heights for flood island sectors are summarised in Tables 1 to 4 within Volume 3 Chapter 2 of this Plan.

Public Information

7.7 PROVIDING PUBLIC INFORMATION

Strategy

- 7.7.1 Provide timely, relevant, accurate and tailored information to the community regarding the potential impacts of a flood.

Actions

- 7.7.2 The NSW SES will coordinate public information management strategies, including:
- Providing warnings, information and advice to Hawkesbury-Nepean Valley communities.
 - Informing the communities regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.
- 7.7.3 During flood operations the NSW SES will augment normal arrangements by using a combination of NSW SES Unit, Region and State Call Centre facilities to answer calls from the public to provide:
- Information on current flood levels;
 - Confirmation of evacuation warnings;
 - Advice on what to do during evacuations.
- 7.7.4 The Public Information and Inquiry Centre (operated by the NSW Police Force) will answer calls from the public regarding registered evacuees.
- 7.7.5 Information on the status of roads will be available from:
- The [Live Traffic NSW](#) web site;
 - The Transport Information Line (131500); and
 - Local Councils on their websites.
- 7.7.6 Information on the status of the transport network will be available from:
- The [NSW Transport Info](#) website; and
 - The Transport Information Line (131500);
- 7.7.7 Information on dam operations will be provided by Water NSW. Dam storage levels will be available from the [Water NSW](#) website.
- 7.7.8 The NSW SES State Headquarters will provide written operational updates to all agencies listed under this plan.

7.8 WARNING

Strategy

- 7.8.1 Inform the Hawkesbury-Nepean Valley community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding in accordance with the national Emergency Warning principles.

Actions

- 7.8.2 The Bureau provides flood warning services and warning products to the NSW SES in accordance with the NSW State Flood Plan.
- 7.8.3 The NSW SES will communicate warning information through the development and dissemination of NSW SES Flood Bulletins, which will incorporate:
- a. Bureau flood warning products;
 - b. Dam failure warnings from Water NSW;
 - c. Local Flood Advices;
 - d. Livestock and Equipment Warnings; and
 - e. Media are encouraged to broadcast NSW SES Flood Bulletins.
- 7.8.4 The NSW SES Sydney Western Region Headquarters will coordinate the dissemination of flood information for the Hawkesbury-Nepean Valley, including the sectors in the Wollondilly and Liverpool LGAs that report to the NSW SES Penrith Local Controller. The NSW SES Sydney Northern Region Headquarters will coordinate the dissemination of flood information for the sectors in the Hornsby and Gosford LGAs.

7.9 MEDIA

Strategy

- 7.9.1 Provide a coordinated all agency approach to the provision of Hawkesbury-Nepean flood information via the media.

Actions

- 7.9.2 The Joint Media Information Centre will be established at the Sydney Western Region Headquarters.
- 7.9.3 The Joint Media Information Centre will coordinate the provision of all information to the media relating to the flood event. The assisting emergency services and key supporting agencies will provide media liaison officers to the JMIC.
- 7.9.4 The Public Information Services Functional Area will assist the NSW SES in the operation of the Joint Information Centre.

- 7.9.5 Depending on the scale of concurrent flood and storm operations in Sydney and elsewhere in the State, the NSW SES State Controller may direct that the Joint Media Information Centre coordinate the provision of information to the media for all concurrent flood and storm operations.

Planning

7.10 INFORMATION MANAGEMENT

Strategy

- 7.10.1 Information relating to flooding will be collected, collated, analysed, mapped (where appropriate) and distributed.

Actions

- 7.10.2 The NSW SES Sydney Western Region Headquarters collates Region-wide information for inclusion in NSW SES Region operational updates.
- 7.10.3 Sources of situational information during times of flooding are:
- a. Agency Operational Updates. Agencies and functional areas provide regular operational updates to the NSW SES.
 - b. Active Reconnaissance. The NSW SES Region and Local Incident Controllers are 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).
 - c. The NSW SES Sydney Western Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins and operational updates).
- 7.10.4 The Bureau of Meteorology's Flood Warning Centre will liaise directly with the NSW SES regarding weather conditions, flood predictions, flood watches and flood warnings.
- 7.10.5 The Bureau's Flood Warning Centre provides river height and rainfall information on the Bureau of Meteorology's web site www.bom.gov.au. This includes radar information showing rainfall patterns and intensity.
- 7.10.6 The Bureau of Meteorology Enviromon system provides an automated river watch system. This system provides real time river height and rainfall readings for a number of gauges in the Hawkesbury-Nepean catchment. It also provides information on Warragamba Dam, Nepean Dam, Avon Dam, Cataract Dam and Cordeaux Dam.
- 7.10.7 The NSW SES will establish and operate a Joint Mapping Unit to coordinate the collection, analysis, mapping and distribution of geospatial information. Products from this group will be disseminated to the NSW SES, JMIC, SEOC and other agencies involved in the response and recovery operations.

7.11 RESOURCE PLANNING

Strategy

- 7.11.1 Maintain effective resource allocation for Hawkesbury Nepean flood operations.

Actions

- 7.11.2 The weather systems that produce flooding on the Hawkesbury-Nepean River system may also product concurrent flood operations on the Georges River and Upper Nepean Rivers as well as concurrent large storm operations. As a result the allocation of resources between these concurrent operations will be complex and will need to be considered by the NSW SES State Duty Operations Controller.

Intelligence

7.12 FLOOD INTELLIGENCE

Strategy

- 7.12.1 Coordinate the collection, collation, analysis, interpretation and dissemination of flood intelligence.

Actions

- 7.12.2 The NSW SES will maintain and operate a flood intelligence system. The Flood Intelligence System will be the primary means by which flood consequences can be pro-actively identified at a detailed level.

7.13 RECONNAISSANCE

Strategy

- 7.13.1 Coordinate monitoring, reconnaissance and flood response impact assessment of flood prone areas within the Hawkesbury-Nepean Valley.

Actions

- 7.13.2 Reconnaissance, flood response impact assessments and post flood evaluation will be coordinated by NSW SES and conducted to:
- Develop a holistic assessment of the actual impact of a flood and for the purpose of flood intelligence records; and
 - Inform rapid impact assessment activities undertaken as part of the transition to recovery.

Logistics

Strategy

- 7.13.3 Coordinate logistics support to ensure operational effectiveness.

Actions

- 7.13.4 If local NSW SES and other local resources are insufficient or likely to be exhausted, additional NSW SES resources (people and equipment) within the relevant NSW SES Region may be deployed by the NSW SES Sydney Western Region Headquarters. If further NSW SES resources are required from other Regions, they will be deployed by the NSW SES State Headquarters.
- 7.13.5 The NSW SES may request support directly from a supporting agency whilst keeping the appropriate Emergency Operations Controller informed or request the relevant Emergency Operations Controller to coordinate support to it.
- 7.13.6 As far as possible, supporting agencies are to provide their own logistic support in consultation with NSW SES where appropriate.

Emergency Services

Strategy

- 7.13.7 Protect the community from incidents involving fire, hazardous materials, maintain law and order and care and transport of patients.

Actions

- 7.13.8 Fire and Rescue NSW respond to fire and land based Hazardous Material incidents in the flood affected areas as detailed in the NSW Hazmat Plan.
- 7.13.9 The NSW Rural Fire Service will respond to fire in rural fire districts within flood affected areas.
- 7.13.10 NSW Ambulance will provide:
 - a. Pre-hospital care;
 - b. Ambulance service management of multiple evacuation sites where ambulance assistance in facilities / patient evacuations is necessary; and
 - c. Aero-medical evacuation.
- 7.13.11 NSW Police would maintain policing functions within flood affected areas.
- 7.13.12 In Sectors that will be completely evacuated the emergency services will need to coordinate their operations with the NSW SES Sydney Western Region Headquarters, via their Liaison Officers, so that their personnel and assets can be safely evacuated from the area before evacuation routes are cut.
- 7.13.13 Fire and Rescue NSW, NSW RFS, NSW Police and NSW Ambulance may, after consultation with the Sydney Western Region Incident Controller, leave personnel and assets in flood islands to provide emergency services to any remaining population. However, an emergency relocation plan must be put in place.

Functional Areas and Assistance

- 7.13.14 The Functional Areas identified in State EMPLAN and the NSW State Flood Plan will provide support to the NSW SES in the conduct of flood operations within the Hawkesbury-Nepean Valley. The Functional Areas will provide liaison arrangements to the NSW SES Sydney Western Region Incident Controller as per the Region and State EMPLAN and the NSW State Flood Plan, recognising that there may be concurrent flooding and storm events also requiring support.
- 7.13.15 The NSW SES Sydney Western Region Incident Controller will ensure that the providers of essential services (electricity, water, sewerage and health) are kept advised of the flood situation through arrangements prescribed by the relevant Functional Area Coordinator.
- 7.13.16 Essential service providers will:
- Keep the NSW SES Sydney Western Region Incident Controller abreast of their status and ongoing ability to provide their services; and
 - Coordinate their operations with the NSW SES Sydney Western Region Headquarters, via their Liaison Officers, so that their personnel and assets can be safely evacuated from the area before the evacuation routes are cut.

7.14 AGRICULTURAL AND ANIMAL SERVICES

Strategy

- 7.14.1 Maintain the welfare of animals affected by the impact of a flood.

Actions

- 7.14.2 Agricultural Services and Animal Services Functional Area Coordinator is to activate the Agriculture and Animal Services Supporting Plan (Hawkesbury-Nepean Agriculture and Animal Services Supporting Plan when developed) if required to provide assistance with livestock, pets, companion animals and wildlife.

7.15 ENERGY AND UTILITY SERVICES

Strategy

- 7.15.1 Coordinate Energy and Utility responses to flood events, including support to NSW SES, other combat emergency services and functional areas with the prioritisation of restoration of utility services, as required.

Actions

- 7.15.2 Assist flood operations in accordance with the Energy and Utility Services Functional Area Coordinators Concept of Operations for Floods and:
- Coordinate response to the flood event, including support to NSW SES, other combat agencies and functional areas in the prioritisation of the isolation of utility services;

- b. Coordinate liaison between NSW SES, State Emergency Operations Centre and utility network operators, including the provision of information and reports and the dissemination of operational updates to participating organisations; and
- c. Coordinate the supply of specialist advice to SEOCON, combat agencies and functional areas, from energy and utility providers.

7.16 ENGINEERING SERVICES

Strategy

- 7.16.1 Provide engineering support services for flood affected areas where required.

Actions

- 7.16.2 The Engineering Services Functional Area is to activate the Engineering Services Functional Area Supporting Plan if required to provide coordination of engineering resources.

7.17 ENVIRONMENTAL SERVICES

Strategy

- 7.17.1 Facilitate the protection of the environment during flood emergency response operation within the Hawkesbury-Nepean Valley.

Actions

- 7.17.2 Activate the Environmental Functional Area Supporting Plan (Enviroplan) if required to provide coordination of technical and regulatory advice;
- 7.17.3 Provide scientific support to the Incident Controller and Fire and Rescue NSW for hazardous materials incidents; and
- 7.17.4 Coordinate the clean-up of land and inland waters affected by emergencies impacting, or potentially impacting on the environment.

7.18 HEALTH SERVICES

Strategy

- 7.18.1 Coordinate available and accessible health services for flood affected communities within the Hawkesbury-Nepean Valley.

Actions

- 7.18.2 The Health Services Functional Area will:
- a. Keep the NSW SES informed of the status of health services;
 - b. Coordinate the evacuation of affected health facilities;
 - c. Treat sick and injured people, including the provision of pre-hospital care and transport by Ambulance Service of NSW;

- d. Possible re-allocation of NSW Health resources as required to provide the best health management for multiple evacuation sites / centres;
- e. Provide and coordinate immediate mental health support to persons both directly and indirectly affected;
- f. Assess public health risks; and
- g. Provide environmental health advice.

7.19 TELECOMMUNICATION SERVICES

Strategy

- 7.19.1 Maintain coordinated telecommunication services and support as a consequence of impacts from flooding.

Actions

- 7.19.2 The Telecommunications Services Functional Area will keep the NSW SES informed of the status of critical telecommunications infrastructure and will coordinate the provision of emergency telecommunications support and/or infrastructure.

7.20 TRANSPORT SERVICES

Strategy

- 7.20.1 Coordinate traffic and transport services and traveller information to assist with evacuation and to coordinate transport impacts on roads and transport routes arising from flooding.

Actions

- 7.20.2 The Transport Services Functional Area will keep the NSW SES informed of the status of transport infrastructure and will coordinate the provision of bus transport, rail transport and if required, waterway services or air transport assisting evacuees.

7.21 WELFARE SERVICES

Strategy

- 7.21.1 Maintain the welfare of communities and individuals affected by the impact of a flood through the provision of basic welfare services at evacuation centers.

Actions

- 7.21.2 The NSW SES will provide immediate welfare for evacuees where required but will hand this responsibility over to the Welfare Services Functional Area as soon as possible.

- 7.21.3 The Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the relevant provisions of the NSW Evacuation Management Guideline. The SEOCON will manage Major Evacuation Centres where they are established. The Welfare Services Functional Area is to activate the Welfare Services Functional Area Supporting Plan if required to coordinate welfare services to communities affected.
- 7.21.4 Details of all residents assisted must be available to the Welfare Services Functional Area as early as possible so that they can conduct follow-up.

7.22 DISASTER VICTIM IDENTIFICATION AND REGISTRATION

Strategy

- 7.22.1 Provide services to identify and register disaster victims.

Actions

- 7.22.2 The NSW Police Force, as detailed in the State EMPLAN and the NSW State Flood Plan, are responsible for the identification of the dead and injured, notifying next of kin, establishing temporary mortuaries and coordinating disaster victim registration.

7.23 DEFENCE ASSISTANCE

Strategy

- 7.23.1 Provide Defence Assistance where required to support flood operations.

Actions

- 7.23.2 Arrangements for Defence Assistance to the Civil Community are detailed within the State EMPLAN (section 448).
- 7.23.3 Depending on the severity of expected flooding the Sydney Western Region Incident Controller may provide early advice to the NSW SES State Duty Operations Controller of the need for defence assistance which may include:
- a. Air support;
 - b. Ground transport.
- 7.23.4 Defence Air support operations and refuelling could potentially be staged from RAAF Richmond, however given that this base is subject to flooding itself above 20m AHD, Holsworthy Barracks may need to be utilised instead.

Operations

7.24 COMMUNICATIONS

Strategy

- 7.24.1 Maintain communication systems throughout flood operations.

Actions

- 7.24.2 The normal means of communication during response operations will be the telephone (both PSTN and mobile) and the Government Radio Network (GRN).
- 7.24.3 Backup communications will be provided in two ways:
- The NSW SES has installed a Private Mobile Radio (PMR) network to operate if the GRN fails;
 - To cater for the possible failure of the PSTN or mobile telephone network (primarily within the flooded area) ground station independent satellite telephones are maintained by the NSW SES to provide essential links between Sector Controllers, NSW SES Local Headquarters, NSW SES Region Headquarters and NSW SES State Headquarters.
- 7.24.4 The Telecommunication Services Functional Area is to activate the Telecommunication Services Functional Area Supporting Plan if required.
- 7.24.5 The Telecommunication Services Functional Area will keep the NSW SES informed of the status of telecommunication carrier networks and the Government Radio Network during flood operations.

7.25 CONTROL OF ROAD ACCESS ROUTES

Strategy

- 7.25.1 Road access to flood affected areas will be controlled. The security of evacuated areas will be maintained.

Actions

- 7.25.2 The NSW SES Sydney Western Region Incident Controller may request Police to close any road access route into flood affected areas to reduce traffic congestion in the area of operations or to maintain security of evacuated areas. These are in addition to those roads forming the regional road evacuation routes.
- 7.25.3 In particular the following road access routes into the area may be closed to through traffic:
- Putty Road;
 - Bells Line of Road;
 - Great Western Highway near Springwood;
 - Hawkesbury Road;

- e. Wisemans Ferry Road through to Wollombi Road; and
 - f. Wisemans Ferry Road through to Mangrove Road.
- 7.25.4 Refer to Volume 3 Chapter 4 and the Draft Hawkesbury-Nepean Flood Emergency – Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual for more detailed arrangements on these road closure arrangements (6) (7).

7.26 FLOOD RESCUE OPERATIONS

Strategy

- 7.26.1 Rescue people and domestic animals from floods in accordance with the NSW Flood Rescue Policy including where evacuation operations have not been successfully completed.

Actions

- 7.26.2 The NSW SES will perform flood rescue, where training and equipment is suitable.
- 7.26.3 The NSW SES may request other supporting emergency services to undertake flood rescues on behalf of the NSW SES (refer 7.26.9). Supporting emergency services must supply information regarding rescues performed to the NSW SES.
- 7.26.4 During flood operations the following types of flood rescue may be conducted:
- a. Rescue of people walking, riding or driving through floodwaters;
 - b. Rescue of people or animals stranded in flood waters and from remote areas;
 - c. Rescue of possibly large numbers of stranded people or animals from flood islands when road evacuation routes are cut (selection of rescue strategy);
 - d. Flood Rescue - Emergency Transport; and
 - e. Flood Rescue - Emergency Medical transport.

Flood Rescue Coordination

- 7.26.5 Flood rescues will be coordinated by the Flood Rescue Operations section in the Sydney Western Region Headquarters.
- 7.26.6 NSW SES Local Incident Controllers will control flood rescue operations within their LGAs and use NSW SES flood rescue boats and rescue helicopters as required.
- 7.26.7 Requests for aero-medical transport will be referred to the NSW Ambulance Service.
- 7.26.8 The NSW SES Sydney Western Region Incident Controller may request Fire & Rescue NSW to:
- a. Provide specialist advice regarding hazardous material reports and impacts due to hazardous materials from flooded industrial/commercial premises; and

- b. Provide decontamination facilities for flood rescue teams.

Flood Rescue Resources

- 7.26.9 The NSW SES will marshal Level 1, 2 and 3 flood rescue resources from the NSW SES Sydney Regions in the first instance. These resources will be supplemented by flood rescue resources from other NSW Regions, Fire & Rescue NSW, Marine Rescue NSW and other accredited agencies.
- 7.26.10 The NSW SES has established a fleet of flood rescue boats specifically for large-scale flood operations in the Hawkesbury-Nepean Valley. These are stationed at NSW SES Units throughout NSW SES Sydney Western and Sydney Northern Regions.
- 7.26.11 When road evacuation routes are cut there may be a requirement for the rescue of stranded people from flood islands and the extrication of remaining emergency services personnel. This will be affected by one or more of the following means:
 - a. NSW SES flood rescue boats;
 - b. NSW Marine Area Command, NSW Police Force vessels;
 - c. Marine Rescue NSW vessels via Marine Area Command;
 - d. Private boats (where suitable); or
 - e. Helicopters.

Boats

- 7.26.12 The NSW SES Sydney Western Region Incident Controller will coordinate the allocation of additional flood rescue boats to the NSW SES Hawkesbury and Penrith Units.
- 7.26.13 NSW Marine Area Command, NSW Police Force vessels may be utilised if required.
- 7.26.14 Marine Rescue NSW vessels may be utilised from the Marine Rescue Hawkesbury Base wharf located at Mooney Mooney.
- 7.26.15 Appropriate boats from local boating groups may also be used.
- 7.26.16 Boat landing points will generally be on the regional road evacuation routes to link with bus transport.

Helicopters

- 7.26.17 Helicopters used for ferrying people stranded on flood islands will be tasked from the NSW SES Sydney Western Region Headquarters Air Operations section.
- 7.26.18 Helicopter landing points will be located on high ground near regional road evacuation routes (Refer Volume 3 Chapter 4).

Buses

- 7.26.19 Buses used earlier for evacuation from Sectors and for pickup from broken down vehicles on regional road evacuations routes, will be utilised at boat and helicopter landing points to transport evacuees to activated evacuation centres (Refer Volume 3 Chapter 4).

7.27 AIR OPERATIONS

Strategy

- 7.27.1 Coordinate the provision and allocation of aircraft to assist with Hawkesbury-Nepean flood response operations.

Actions

- 7.27.2 Helicopters may be used to:
- Conduct reconnaissance;
 - Assist with flood rescues;
 - Ferry any remaining people from within evacuated Sectors to landing points on the fringe of the flooded area in the case of people still remaining on flood islands after road evacuation routes are cut;
 - Conduct supply operations.
- 7.27.3 Fixed wing aircraft may be used to:
- Conduct reconnaissance,
 - Move persons from the Richmond Sector via Richmond Air Force base prior to the base and Richmond Township being flood affected (refer 7.28.9).
- 7.27.4 The NSW SES Sydney Western Region Incident Controller will have an Air Operations section to:
- Liaise with the NSW RFS State Air Desk and Transport Services Functional Area Coordination Centre on provision of aircraft;
 - Manage NSW SES Air Bases established;
 - Manage the allocation of aircraft to NSW SES Local Incident Controllers.
- 7.27.5 The protocol for Regions requesting aircraft is as follows:
- Request aircraft from the Air Operations Management Team;
 - Air Operations Management Team assigns aircraft to the Region;
 - The Region tasks the aircraft;
 - At the conclusion the aircraft are released back to the Air Operations Management Team.

7.28 EVACUATION

Strategy

- 7.28.1 Evacuate people pre-emptively from dangerous or potentially dangerous places created by the flood hazard to safe locations away from the hazard.

Actions

- 7.28.2 NSW SES will control evacuations throughout the Hawkesbury Nepean Valley.
- 7.28.3 Evacuations will take place when there is a risk to public safety. Circumstances may include:
- Evacuation of people when their homes or businesses are likely to flood;
 - Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.
- 7.28.4 Evacuation of people where energy and utility services have failed, or are likely to fail and where buildings have been, or may be made uninhabitable. Evacuation is the primary response strategy as isolated properties can lose power, water, phone lines, sewerage services, become a refuge for spiders, snakes and other animals and are at risk of the consequences of secondary emergencies without assistance.
- 7.28.5 The evacuation operation will have the following stages:
- Decision to evacuate;
 - Mobilisation (mobilisation may begin prior to the decision to evacuate);
 - Evacuation Warning delivery;
 - Evacuation Order delivery;
 - Withdrawal;
 - Shelter; and
 - Return.
- 7.28.6 The following means of evacuation will be used alone or in combination. They are listed in order of preferred selection priority.
- Road;
 - Rail (where available); and
 - Fixed wing aircraft from Richmond Air Force Base (only for Richmond Sector).
- 7.28.7 The most effective means of evacuation is via road, using private vehicles and public buses for those who do not have or unable to use their own vehicles. This allows residents more control over their own evacuation.
- 7.28.8 Evacuation by rail for the flood island Sectors in the Hawkesbury LGA is limited since the Richmond railway line is effectively cut at around 12.5 to 13.5 metres near Vineyard.

- 7.28.9 Evacuation by air from Richmond Air Force Base is limited to the Richmond Sector only since road access from the Windsor Sector is cut at 14.2m AHD at Rickaby's Creek. Road access from the Bligh Park Sector is cut at 14m AHD on Richmond Road and at 15m AHD on George Street. The Air Base starts to be inundated from 19m AHD whilst the last road evacuation route for Richmond Sector is cut at 20.2m AHD. As a result this option is of limited use for Richmond Sector and if used will be highly dependent on the availability of suitable aircraft and the operational status of the Air Base.
- 7.28.10 The details of the means of evacuation used for each Sector are contained in the NSW SES Local Flood Plans. Within each sector, evacuation will be by stages based on level of inundation and commencing from the lowest affected areas.
- 7.28.11 The designated regional road evacuation routes for flood operations are:
- a. The Windsor Road Route (closed at 13.5m AHD);
 - b. The Pitt Town Road Route (closed at 16m AHD);
 - c. The George Street Route (closed at 15.0m AHD);
 - d. The Hawkesbury Valley Way Route (closed at 17.3m AHD);
 - e. The Blacktown-Richmond Road Route (closed at 14.2m AHD);
 - f. The Llandilo Road Route (closed at 23.8m AHD);
 - g. The Northern Road Route (closed at 18.1m AHD);
 - h. The Londonderry Road Route (closed at 18m AHD);
 - i. The Castlereagh Road Route (closed at 20.2m AHD);
 - j. The M4 Motorway Route (closed at 32.8m AHD, can also be closed at 28.5m AHD at South Creek);
 - k. The Great Western Highway Route (can also be closed at 25.2m AHD at South Creek);
 - l. The Old Northern Road Route (not closed due to flooding);
 - m. The Park Road Route (closed at 39.8m AHD); and
 - n. The Wallacia Alternative Route (closed at 61.3m AHD).
- 7.28.12 The Regional Evacuation Routes and their associated transport arrangements are further outlined within Volume 3 Chapter 4 of this plan.
- 7.28.13 Evacuees from the Sectors will move along designated regional road evacuation routes to safe areas.
- 7.28.14 Either a Major Evacuation Centre, or else a number of smaller evacuation centres will be established to provide registration, arrangements for emergency accommodation and other services to meet the immediate needs of flood affected people (refer to Volume 3 Chapter 3).

Decision to Evacuate

- 7.28.15 Evacuation decisions are made based on flood risk and the time required to evacuate.
- 7.28.16 The NSW SES Sydney Western Region Incident Controller will determine those Sectors to evacuate based on the predicted flood height and associated evacuation timelines.
- 7.28.17 Tables 1 to 4 in Volume 3 Chapter 2 of the Hawkesbury-Nepean Flood Plan show, in general order of decreasing overall risk, the Sectors to be evacuated and their critical heights. The key Sectors are the flood islands.

Decision Points

- 7.28.18 The NSW SES Sydney Western Region Incident Controller will determine the following key decision points for each Sector:
 - a. The decision to mobilise resources from the emergency services and other supporting agencies to assist with evacuation;
 - b. The decision to commence delivery of evacuation warnings;
 - c. The decision to call off evacuation (selection of alternate strategy);
 - d. The decision to initiate supply operations for the sector;
 - e. The decision to initiate rescue operations for the sector.
- 7.28.19 The NSW SES Sydney Western Region Incident Controller will communicate the operational intentions regarding these decision points to the NSW SES State Duty Operations Controller.
- 7.28.20 The road evacuation routes for the Windsor (initially), Windsor Downs, Bligh Park, Richmond and Londonderry Sectors all merge into the Northern Road route (refer Volume 3 Chapter 4). Therefore the sequencing of traffic flow from these sectors is critical. Decisions to start road evacuation from any of these Sectors will be made by the NSW SES Sydney Western Region Incident Controller.

Evacuation Mobilisation

- 7.28.21 Resources are mobilised to assist with the evacuation of people and their animals within the Hawkesbury-Nepean Valley.
- 7.28.22 The NSW SES Sydney Western Region Incident Controller will decide when to mobilise resources for evacuations for specific sectors based on predictions of sector thresholds being exceeded.
- 7.28.23 The NSW SES State Duty Operations Controller may request the State Emergency Operations Controller to establish restricted airspace over some or all of the Sectors.
- 7.28.24 For each Sector the key mobilisations steps are:
 - a. Activate Sector control arrangements;
 - b. Prepare communication systems;

- c. Prepare warning systems;
- d. Establish road evacuation routes;
- e. Assemble buses;
- f. Initiate rail arrangements;
- g. Activate Evacuation Centres;
- h. Provide early warning to Vulnerable Institutions;
- i. Coordinate utility service isolations, disconnections and shut downs;
- j. Prepare evacuation warnings.

Activate Sector Control Arrangements

7.28.25 The NSW SES Sydney Western Region Incident Controller will advise the relevant NSW SES Local Controller to activate the Sector Control Centre where designated.

Prepare Communication Systems

7.28.26 The NSW SES Sydney Western Region Incident Controller will advise NSW SES Units to implement arrangements for radio communications.

Prepare warning systems

7.28.27 The NSW SES Sydney Western Region Incident Controller will assemble door knock teams from personnel from the NSW State Emergency Service, NSW Rural Fire Service, Fire & Rescue NSW and the NSW Police Force. The NSW SES Sydney Western Region Incident Controller may also request NSW SES State Headquarters to provide additional personnel from outside the Region.

7.28.28 The NSW SES Sydney Western Region Incident Controller will allocate door knock teams to the relevant Sector Control Centre to supplement door knock teams assembled by the NSW SES Local Controller.

7.28.29 The NSW SES Sydney Western Region Incident Controller will prepare other warning systems in the Region for activation.

7.28.30 The NSW SES Sydney Western Region Incident Controller will advise the JMIC that warning systems are being prepared.

Establish Road Evacuation Routes

7.28.31 The NSW SES Sydney Western Region Headquarters, with the assistance of Police Traffic and NSW Transport Management Centre Liaison Officers, will monitor the status of regional road evacuation routes and implement the Flood Evacuation Routes, Traffic and Transport Arrangements in accordance with Volume 3 Chapter 4 of this Plan and the Draft Hawkesbury-Nepean Flood Emergency – Traffic and Transport Operations Procedure and Pre-Plan and Traffic Management Task Manual (6) (7).

7.28.32 If evacuation will occur for the following sectors, the NSW SES Sydney Western Region Incident Controller will direct that traffic management resources be put into place for the following regional road evacuation routes:

- a. McGraths Hill Sector;

- The Windsor Road Route.
 - b. Pitt Town Sector;
 - The Pitt Town Road Route.
 - c. Windsor Sector;
 - The Hawkesbury Valley Way Route,
 - The Blacktown-Richmond Road Route,
 - The Northern Road Route, and
 - The Llandilo Road Route.
 - d. Windsor Downs and Bligh Park Sectors;
 - The Blacktown-Richmond Road Route,
 - The Northern Road Route,
 - The Llandilo Road Route.
 - e. Richmond and Londonderry Sectors;
 - The Castlereagh Road Route,
 - The Londonderry Road Route.
 - f. Emu Plains and Penrith Sectors;
 - M4 Motorway Route,
 - Great Western Highway Route.
 - g. Wallacia Sector;
 - Park Road Route,
 - Wallacia Alternative Route.
 - h. Wisemans Ferry, Lower Reaches, Singletons Mill, Macdonald Valley, Webbs Creek and Gunderman Sectors;
 - Old Northern Road Route.
- 7.28.33 Each of these regional evacuation routes will have:
- a. An Entry Point;
 - b. Traffic Control Points; and
 - c. An Exit Point.
- 7.28.34 Traffic management arrangements will not commence until directed by the NSW SES Sydney Western Region Incident Controller.
- Assemble Buses**
- 7.28.35 Buses are required to:
- a. Transport those people without vehicles from sectors to evacuation centres;

- b. Pick up travellers stranded due to vehicle breakdown on regional evacuation routes.
- 7.28.36 The NSW SES Sydney Western Region Incident Controller will determine the allocation of buses to Sectors in consultation with NSW SES Local Controllers. Note that requests for buses for evacuation might originate from agencies other than the NSW SES (eg Department of Education for evacuation of schools). Requests for bus transport will be passed on by the NSW SES Sydney Western Region Incident Controller direct to the Transport Services Functional Area Control Centre.
- 7.28.37 The Bus Management section of Volume 3 Chapter 4 – Flood Transport and Traffic Management Arrangements contains details of bus management arrangements.

Initiate Rail Arrangements

- 7.28.38 Rail may be used for initial evacuations from the Windsor Sector. However, the rail line is cut relatively early at Vineyard at approximately 12.5 metres AHD.
- 7.28.39 If evacuation from the Windsor Sector is planned:
- a. Road evacuation traffic from the Windsor Sector would cross the Blacktown-Richmond Railway line at the following locations:
 - Cox Street Railway Crossing (at Windsor Railway Station) – where the sector road evacuation route (within Windsor Sector) crosses the rail corridor between Windsor South and Windsor sub-sectors.
 - Railway crossings (south of Mulgrave Railway station) – where the Windsor Evacuation Route crosses the rail corridor between Mulgrave and Vineyard railway stations.
 - b. The NSW SES Sydney Western Incident Controller will advise the Rail Management Centre to mobilise appropriate Protection Officers (PO), as provided in the “How to Access the Rail Corridor – Procedures for use NSW Emergency Services” plan, for the above locations.
 - c. Advise the NSW SES Hawkesbury Local Controller of the advice to the Rail Management Centre.
 - d. The POs will liaise with the NSW SES Hawkesbury Local Controller; check on site arrangements, workgroup safety, and security of the rail corridor at these locations.
- 7.28.40 If flood waters are expected to exceed 13.9m (28m AHD) the Victoria rail bridge between Penrith and Emu Plains is expected to be compromised. In this case the Sydney Western Region Incident Controller, in consultation with the SEOCON and the Transport Functional Area, may place restrictions on the use of the Great Western Railway Line.

Activate Evacuation Centres

- 7.28.41 The NSW SES Sydney Western Region Incident Controller will request Welfare Services to establish and manage Evacuation Centres. Where a Major Evacuation Centre is required this will be established by the SEOCON. The principles for the location of the various types of Evacuation Centres are detailed in Volume 3 Chapter 3 of this plan.
- 7.28.42 Welfare Services, or in the case of a Major Evacuation Centre, the Site Management Group, will provide regular operational updates to the NSW SES Sydney Western Region Headquarters detailing when evacuation centres are established and ready to receive evacuees.

Provide Early Warning to Vulnerable Institutions

- 7.28.43 If there is sufficient time between the activation of this plan and the evacuation of communities, the NSW SES Sydney Western Region Incident Controller will discuss the temporary closure of other appropriate schools with the Regional Director, Western Sydney Region, Department of Education (Kingswood) and a representative of the NSW Association of Independent Schools. This will enable pupils to stay at home or be returned home so they can be evacuated (if required) with their families. Details of schools that may be affected are provided in Local Flood Plans.
- 7.28.44 Note that in the Hawkesbury LGA, school principals may close some schools likely to be affected by flooding in the early stages.
- 7.28.45 Due to the long lead time required to mobilise the required resources, the NSW SES Sydney Western Region Incident Controller will provide an early notice if any of the following facilities may need to be evacuated:
- a. Schools via the Department of Education Schools Security Unit and the NSW Association of Independent Schools;
 - b. Hospitals via the Nepean Blue Mountains Local Health District Functional Area Coordinator;
 - c. Nursing Homes via the Nepean Blue Mountains Local Health District Functional Area Coordinator;
 - d. Aged, disability and other residential care facilities;
 - e. Child care centres via the Welfare Services Functional Area Liaison Officer;
 - f. Correctional facilities via the Department of Corrective Services Control Centre;
 - g. The University of Western Sydney directly;
 - h. National Parks and Wildlife Service via the Environmental Services Functional Area Liaison Officer;
 - i. Licenced premises containing hazardous material via the Environmental Services Functional Area Liaison Officer.

Prepare Evacuation Warnings

- 7.28.46 The NSW SES Sydney Western Region Headquarters will prepare Evacuation Warnings.

Evacuation Warning and Order Delivery

- 7.28.47 Evacuation warnings and orders are disseminated to the population at risk within the Hawkesbury-Nepean Valley.
- 7.28.48 The NSW SES Sydney Western Region Incident Controller will decide when to issue Evacuation Warnings and Evacuation Orders for specific Sectors.
- 7.28.49 The NSW SES Sydney Western Region Incident Controller will distribute Evacuation Warnings and Evacuation Orders to the following:
- a. NSW SES State Operations Centre;
 - b. NSW SES State Forward Control Centre;
 - c. Relevant NSW SES Local Controller;
 - d. Metropolitan media outlets for immediate broadcast; and
 - e. Joint Media Information Centre.
- 7.28.50 The NSW SES Sydney Western Region Incident Controller will advise Police and NSW Transport Management Centre to commence traffic management arrangements on relevant regional evacuation routes (refer Volume 3 Chapter 4).
- 7.28.51 In addition the NSW SES Sydney Western Region Incident Controller will disseminate Evacuation Warnings and Evacuation Orders for Sectors in the Sydney Western Region using the following warning systems where available:
- a. Internet;
 - b. Broadcast fax;
 - c. Email;
 - d. SMS; and
 - e. Automatic telephone dialling with pre-recorded messages (call making) eg Emergency Alert.
- 7.28.52 NSW SES Local Controllers will, as detailed in NSW SES Local Flood Plans, distribute Evacuation Warnings using:
- a. Established Warden systems;
 - b. Emergency Service personnel using public announcement systems in vehicles (mobile PA) to advise residents; and
 - c. Field teams of Emergency Service personnel conducting door to door personal notification (doorknock).

Withdrawal

- 7.28.53 Coordinate the movement of evacuees out of areas at risk of flooding utilising defined road evacuation routes.
- 7.28.54 Sector Controllers will direct evacuees who require accommodation or welfare assistance to designated evacuation centres (listed in Volume 3 Chapter 3). Evacuees who have their own accommodation arrangements do not need to be directed to Evacuation Centres. It is not possible to determine in advance how many will fall into this category, however previous experience have shown around 20% of the population go to the evacuation centres during emergencies.
- 7.28.55 NSW SES Local Controllers, through Sector Controllers, will manage the evacuation of people within each Sector up to the point where people enter the Sector's designated regional road evacuation route
- 7.28.56 Evacuees will:
- a. Move under local traffic arrangements detailed in Local Flood Plans from the relevant Sectors to the route Entry Point;
 - b. Move under traffic management arrangements to the route Exit Points;
 - c. Continue along the suburban road network to allocated Evacuation Centres, or else to their own alternative arrangements.
- 7.28.57 On each regional evacuation route there will be normally one lane set aside for emergency vehicle traffic into and out of the Sectors. These include:
- a. Utility service provider vehicles to disconnect services and make safe utility assets;
 - b. Waste service vehicles to make final collections and make safe waste assets;
 - c. Vehicle breakdown repair and towing vehicles;
 - d. Road maintenance repair crews; and
 - e. Road barricade and traffic signage crews.
- 7.28.58 NSW SES Local Controllers are to provide the following reports to the NSW SES Region Headquarters:
- a. Advice of commencement of the evacuation of each Sector;
 - b. Progress reports (by Sectors) during evacuations;
 - c. Advice of completion of the evacuation of each Sector.
- 7.28.59 The NSW Transport Management Centre is to provide the NSW SES Sydney Western Region Headquarters with:
- a. Advice when each regional road evacuation route is ready;
 - b. Regular status reports for each route.
- 7.28.60 The NSW Transport Management Centre, via the NSW Transport Management Centre Liaison Officer in conjunction with the Welfare Services Liaison Officer, will provide updates to radio stations on the status of:

- a. Regional evacuation routes;
 - b. Routes to activated evacuation centres;
 - c. Relevant evacuation centres and alternate evacuation centres.
- 7.28.61 After delivery of evacuees by bus to an Evacuation Centre, bus drivers will report to their designated dispatch centre for reassignment or release.
- 7.28.62 Livestock at threat from flooding will be evacuated in accordance with the arrangements in the Hawkesbury-Nepean Agriculture and Animal Services Supporting Plan (once developed).

Evacuation Route Maintenance

- 7.28.63 Maintain roads that are critical evacuation routes.
- 7.28.64 NSW SES to liaise with RMS and local governments to ensure that road conditions are monitored and that road repair crews are available for rapid response to maintain evacuation routes.

Securing Evacuated Areas

- 7.28.65 Coordinate the security of evacuated areas.
- 7.28.66 The NSW Police Force will coordinate security for the evacuated areas and will mount security patrols. Using those resources initially committed to evacuations and the clearance, control and security of evacuation routes. Security arrangements will most likely continue into the recovery phase.
- 7.28.67 In addition to maintaining security of evacuated areas, some of the traffic management arrangements for the regional evacuation routes will need to be kept in place.
- 7.28.68 As NSW Police Force resources initially committed to the control of the regional evacuation routes become available, they will be redeployed to form an outer cordon to control traffic moving towards evacuated areas.
- 7.28.69 As part of the State's arrangements a further outer cordon will be established to the north and west as follows:
- a. Putty Road;
 - b. Bells Line of Road;
 - c. Hawkesbury Road;
 - d. Wisemans Ferry through to Wollombi Road;
 - e. Wisemans Ferry through to Mangrove Road.
- 7.28.70 The ground security system may be backed up by aerial and water-borne security measures as arranged by the State Police Commander.

7.29 SHELTER

Strategy

- 7.29.1 Coordinate the temporary provision of shelter for evacuees outside of the flood hazard area.

Actions

- 7.29.2 The Evacuee management arrangements for Hawkesbury-Nepean Valley Floods are further outlined in Volume 3 Chapter 3.
- 7.29.3 The NSW Police Force will ensure that all evacuees arriving at Evacuation Centres, or hospitals in the case of medical evacuees, are registered.
- 7.29.4 The Agriculture and Animal Services Functional Area will, with the support of supporting organisations, provide animal care services for domestic animals and for companion pets of victims evacuated to evacuation centres.
- 7.29.5 The Welfare Services Functional Area will provide operational updates to the NSW SES Sydney Western Region Headquarters detailing:
- a. Advice of the arrival of the first evacuee;
 - b. Hourly totals of arrivals (wherever possible);
 - c. Status of evacuation centre capacity.
- 7.29.6 The Welfare Services Functional Area may request the Transport Services Functional Area Control Centre to provide buses to transport evacuees from Evacuation Centres to other locations.

7.30 ALL CLEAR AND RETURN

Strategy

- 7.30.1 Coordinate the safe return of communities to flood affected areas when the immediate danger to life and property has passed.

Actions

- 7.30.2 As flood waters recede the environment is often characterised by a combination of lack of utility services, extensive debris and hazardous materials and potentially unsafe road infrastructure.
- 7.30.3 The ability for residents to return to their homes in a safe environment will be determined by a number of considerations including:
- a. Cleaning of poles, wires and street transformers prior to re-energising of power lines;
 - b. Electricity safety checks of houses and buildings, prior to reconnection;
 - c. Gas line purging and re-lights of household services;
 - d. Sewer services cleaned and reconnection subject to service availability of the street mains;

- e. Water supply purged and subject to service availability of the street mains;
 - f. Assessment of any damage to roads and bridges;
 - g. Assessment of hazardous materials in buildings or on thoroughfares; and
 - h. Assessment of public health concerns.
- 7.30.4 The NSW SES will assess, in consultation with the relevant EOCON and SERCON, each area affected and specify the level of access as one of the following:
- a. Not suitable for access;
 - b. Limited access by emergency services and response agencies; or
 - c. Limited access by residents and/or business operators.
- 7.30.5 When the immediate danger to life and property has passed the relevant NSW SES Controller will issue an 'All Clear' message for particular areas when recovery operations have commenced or full access is safe. However, declaring an 'All Clear' may take an extended amount of time.
- 7.30.6 Response impact assessment will inform the recovery impact assessment.
- 7.30.7 Response operations will conclude once all of the following conditions are met:
- a. The physical impact of the flood has ceased, and
 - b. All requests for assistance related to the flood have been completed, and
 - c. The need for warning and evacuation no longer exists, and
 - d. There is no further prospect of rescuing people, and
 - e. Response to fire and hazardous material incidents have concluded (not including subsequent clean-up of contaminated sites), and
 - f. All affected areas have had an 'All Clear' issued.
- 7.30.8 Utilities restoration as a response operation may continue for some time beyond the end of emergency service organisations' response operations, depending on the scale and scope of the impacts of the flood.

7.31 AFTER ACTION REVIEWS

Strategy

- 7.31.1 After Action Reviews are to be undertaken following each event.

Actions

- 7.31.2 Undertake After Action Reviews involving all stakeholders to consider the effectiveness of prevention and preparedness activities and response and recovery operations.
- 7.31.3 Findings from significant events are broadly shared and incorporated into improved disaster resilience planning.

PART 8 - RECOVERY OPERATIONS

8.1 RECOVERY COORDINATION

- 8.1.1 This plan describes the initiation of recovery, but not the arrangements for recovery itself.
- 8.1.2 Recovery operations will be initiated and conducted as detailed in the NSW Recovery Plan and informed by the Hawkesbury-Nepean Recovery Strategy (currently in draft).
- 8.1.3 There will often be a need for emergency services to assist in the recovery phase.
- 8.1.4 Recovery is to be initiated concurrently with response operations.
- 8.1.5 The recovery operations associated with floods of the severity for which this Hawkesbury-Nepean Flood Emergency Sub Plan have been written are likely to be of a long duration and be highly complex.
- 8.1.6 The NSW SES will:
 - a. Provide information to flood-affected people on safety matters and the restoration of belongings which have been in contact with flood waters;
 - b. Provide impact information as early as possible following a flood to the SEOCON or delegated Emergency Operations Controller to inform an initial recovery impact assessment;
 - c. Assist with clean-up operations after floods (if sufficient volunteers are available);
 - d. Assist with the return of evacuees to their homes (if sufficient volunteers are available); and
 - e. Provide appropriate representation to the recovery committees if established, or recovery coordination team for the duration of an event and as agreed during the recovery phase.
- 8.1.1 The role of NSW SES on the Recovery Committee may include providing information about any continuing response, guidance on mitigation strategies and general advice and assistance to the committee as a subject matter specialist.

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HAZARD AND RISK IN THE HAWKESBURY-NEPEAN VALLEY

Volume 2 of the Hawkesbury-Nepean Flood Plan

Last Update: September 2015

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VERSION LIST

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

Description	Date
September 2013 as amended June 2014	June 2014

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

The Manager Emergency Risk Management
 NSW State Emergency Service
 PO Box 6126, 6-8 Regent Street Wollongong NSW 2500

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

Amendment Number	Description	Updated by	Date

Document Issue: V20150315

PART 1 THE FLOOD THREAT

1.1 LANDFORMS AND RIVER SYSTEMS

The Hawkesbury-Nepean catchment is around 22,500 square kilometres in size stretching from Goulburn in the south almost to Singleton in the north-west.

The Hawkesbury-Nepean River is around 480 kilometers long. It flows generally in a north easterly direction from its source near Goulburn, until eventually discharging into the Pacific Ocean north of Sydney at Broken Bay.

The Hawkesbury and Nepean Rivers are actually the same river with the Nepean forming the upstream portion, and the Hawkesbury the lower half. There are a number of other large rivers and creeks that flow into the Hawkesbury-Nepean River system. The major ones include the:

- Wollondilly River
- Coxs River
- Grose River
- South Creek
- Colo River and
- Macdonald River

MAP 1 shows an overview of the Hawkesbury-Nepean River basin.

Major Rivers

The Nepean River has its origins in the rugged high rainfall area of the Illawarra escarpment. It is fed by smaller tributaries including the Avon, Cataract and Cordeaux Rivers. The Warragamba River joins the Nepean River just downstream of Wallacia. It continues north along the base of the Blue Mountains through the open plains of Emu Plains and Penrith until it reaches the junction with the Grose River at Yarramundi. At this point it becomes known as the Hawkesbury River.

The Hawkesbury River flows generally North East from Yarramundi through the main urban and agricultural areas of Richmond and Windsor. It continues through rugged

sandstone gorge country before discharging into the ocean at Broken Bay.

The Wollondilly River originates in farm land near Goulburn and is fed by smaller tributaries including the Nattai and Wingecarribee Rivers. The Wollondilly River flows through Sydney's water supply catchment area into the Warragamba River which in turn flows into Lake Burragorang. This lake is formed by the Warragamba Dam. Water that is discharged through the dam flows into the Warragamba River which joins the Nepean River below Warragamba Dam.

The Coxs River originates to the west of the Blue Mountains near the Capertee Valley. It flows in a south easterly direction, initially through farmland, then through rugged bushland valleys to the south of Blue Mountains townships. It eventually flows into Lake Burragorang.

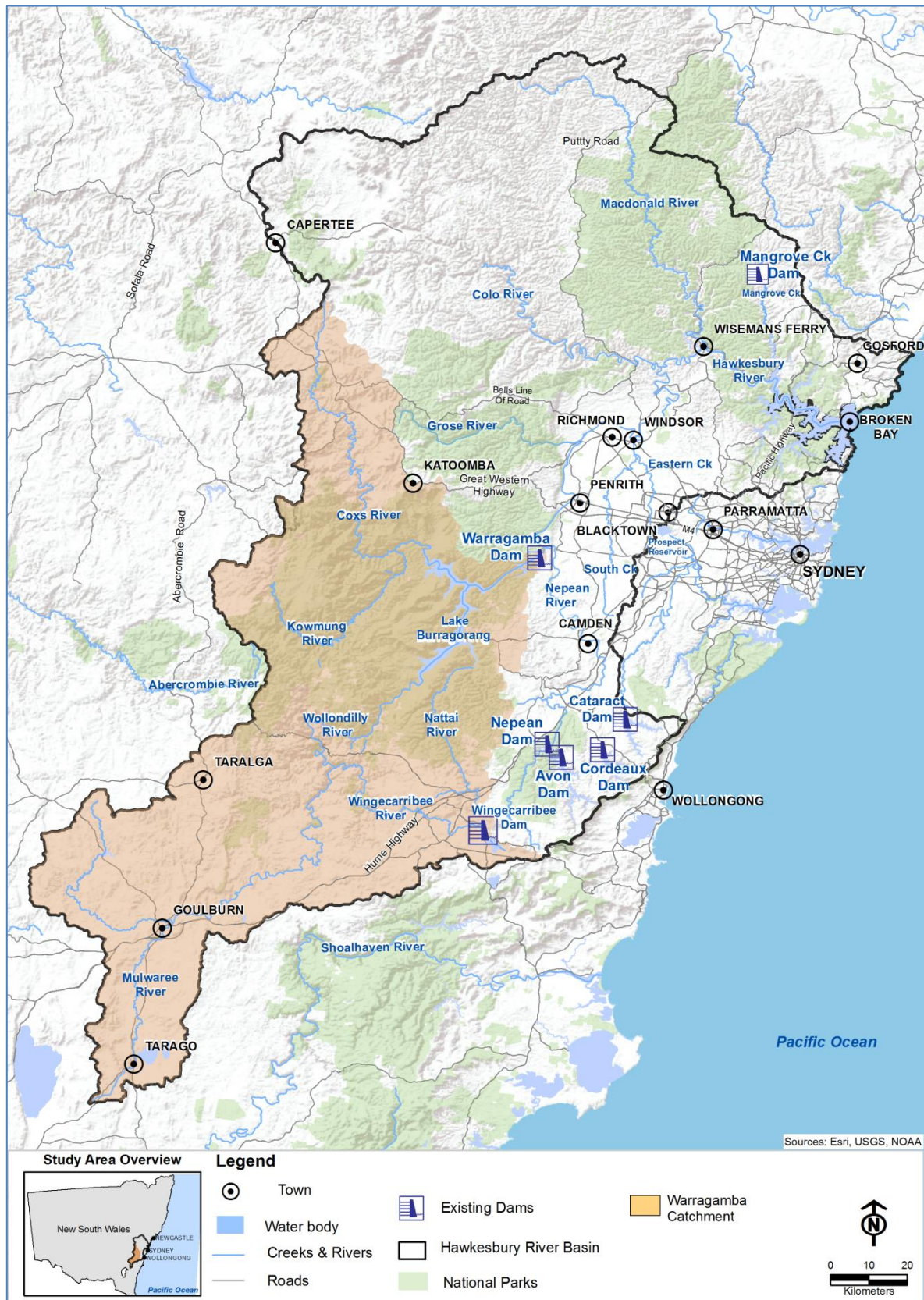
The Grose River originates in the Blue Mountains and travels east through rugged World Heritage Area before joining the Nepean River at Yarramundi near Richmond. This is a relatively small part of the total catchment (650 square km) but drains a high rainfall area.

South Creek joins the Nepean River at Windsor. South Creek drains a 414 square kilometre catchment in Western Sydney. It has its headwaters near Narellan and generally flows in a northerly direction. This catchment contains large urbanised areas including the commercial centres of Penrith and Blacktown. Ropes and Kemps Creek are major tributaries of South Creek (1).

The South Creek catchment receives comparatively less rainfall than the Grose River (2).

The Colo River originates in the Blue Mountains and consists of predominantly natural rugged bushland areas. The Colo River enters the Hawkesbury River downstream of the main agricultural areas where the landscape is predominantly steep vegetated sandstone hill slopes.

The **Macdonald River** originates in rugged bushland at the northern end of the catchment. It joins with the Hawkesbury River near Wisemans Ferry where the river is surrounded by steep vegetated sandstone hill slopes (3).



Map 1: Hawkesbury-Nepean River Basin

1.2 FLOODPLAINS AND GORGES

Floodplains are areas of land beside rivers that can be inundated by floodwaters up to the largest possible flood extent. They are normally reasonably flat fertile areas that are made up by the sediments that have been deposited during past flood events.

Whilst flooding is a natural process bringing with it many benefits, floods can have significant impacts on people living and working on these floodplains, their property and infrastructure.

Within the Hawkesbury-Nepean catchment the major flood risk areas are located on the floodplains and tributaries between Wallacia and Spencer. There are four main identifiable floodplains within this Hawkesbury-Nepean Valley area. These are the:

- Wallacia Floodplain;
- Penrith / Emu Plains / Castlereagh Floodplain;
- Richmond / Windsor / Wilberforce Floodplain; and
- Lower Hawkesbury Floodplain

An overview of these floodplains is shown on Map 2 and are further described below.

Wallacia Floodplain

The Wallacia Floodplain is located within parts of the Penrith, Wollondilly and Liverpool local government areas and includes the township of Wallacia (Refer to Maps 2 and 3).

The Wallacia Floodplain is around 10km in length and is located between Bents Basin and Wallacia. The Nepean River runs through a very narrow sandstone gorge, known as Bents Basin Gorge until it reaches Bent Basin State Conservation Area where the floodplain widens.

Downstream of Wallacia the Nepean River narrows again through the Nepean Gorge to a point just upstream of Emu Plains. The Warragamba River joins the Nepean River in this gorge 3.5km downstream of Warragamba Dam.

Emu Plains / Penrith / Castlereagh Floodplain

From Emu Plains to Castlereagh there is another slightly larger floodplain located within the Penrith local government area.

This floodplain extends into Emu Plains and Leonay on the western side of the river to the foothills of the Blue Mountains (refer to Maps 2 and 4).

On the eastern side of the river the floodplain extends into parts of the Penrith, and the Penrith Lakes area before constricting again near Castlereagh through the Castlereagh Gorge (4).

Richmond / Windsor / Wilberforce Floodplain

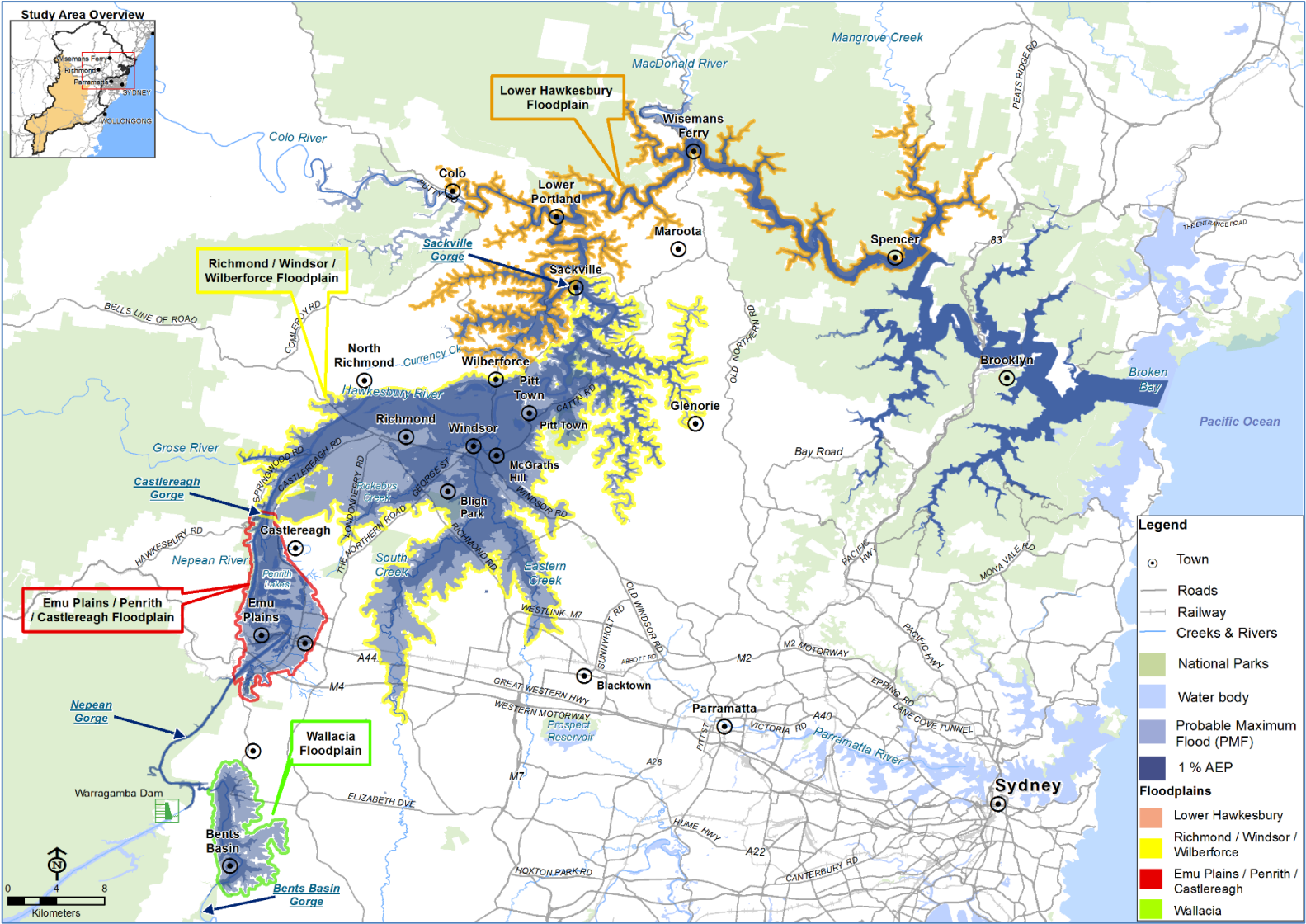
Downstream of the Castlereagh Gorge the River enters a distinct basin extending from North Richmond to Wilberforce. This is the largest of the floodplains covering parts of the Penrith, Hawkesbury, Blacktown and The Hills local government areas (refer to Maps 2 and 5). It encompasses:

- Richmond, Windsor, McGraths Hill, Bligh Park, Wilberforce, Cattai and Pitt Town;
- Rickabys Creek;
- The lower sections of South Creek (incorporating Eastern and Ropes Creek) including Marsden Park; and
- Bushells Lagoon, Wilberforce.

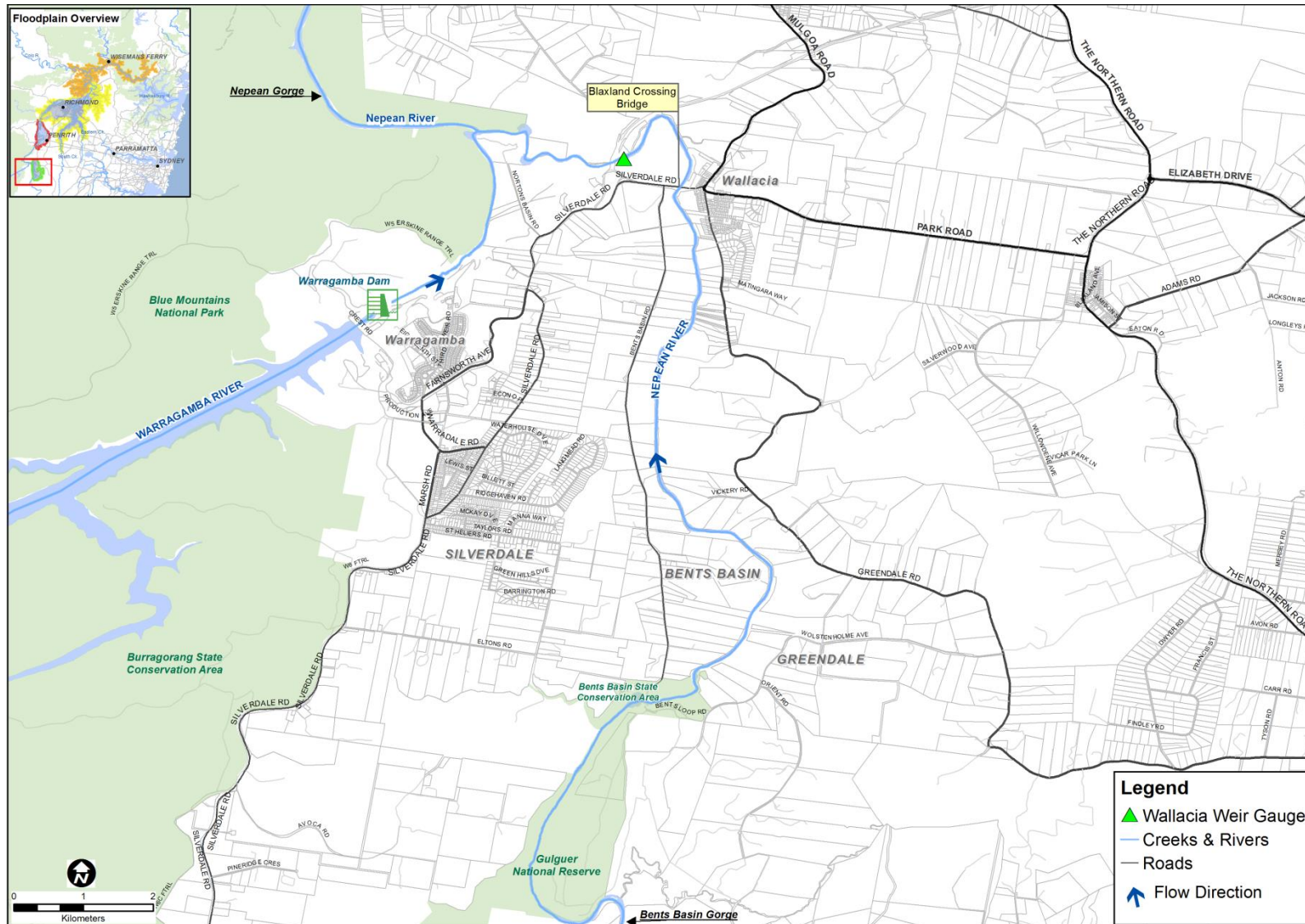
Lower Hawkesbury Floodplain

The remaining floodplain is comparatively narrow. It starts where the river constricts near Ebenezer and takes in the area downstream to Spencer (Refer to Maps 2 and 6).

This area is generally referred to as the Lower Hawkesbury and is located within parts of The Hills, Hornsby and Gosford local government areas.



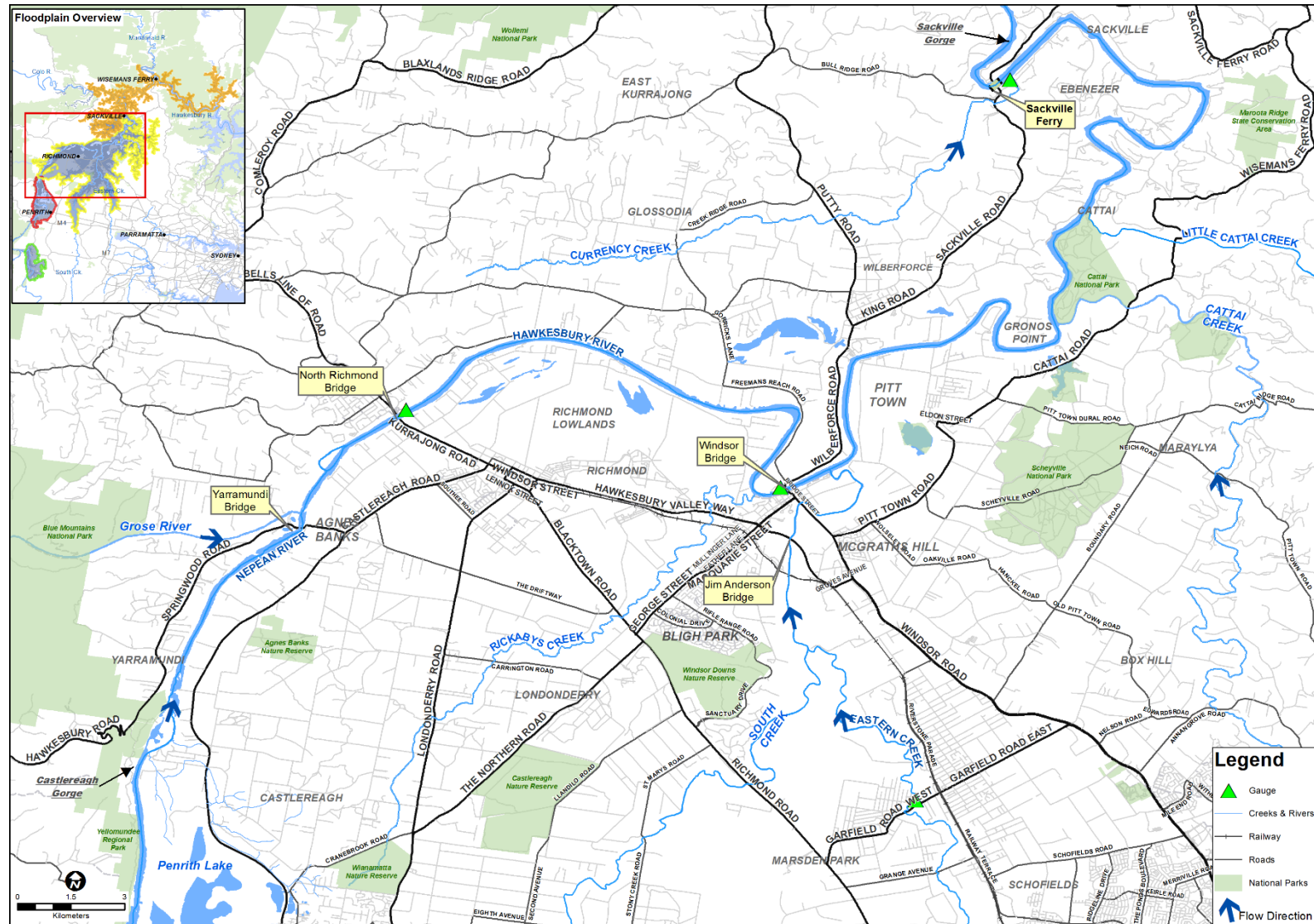
Map 2: Hawkesbury-Nepean Floodplains



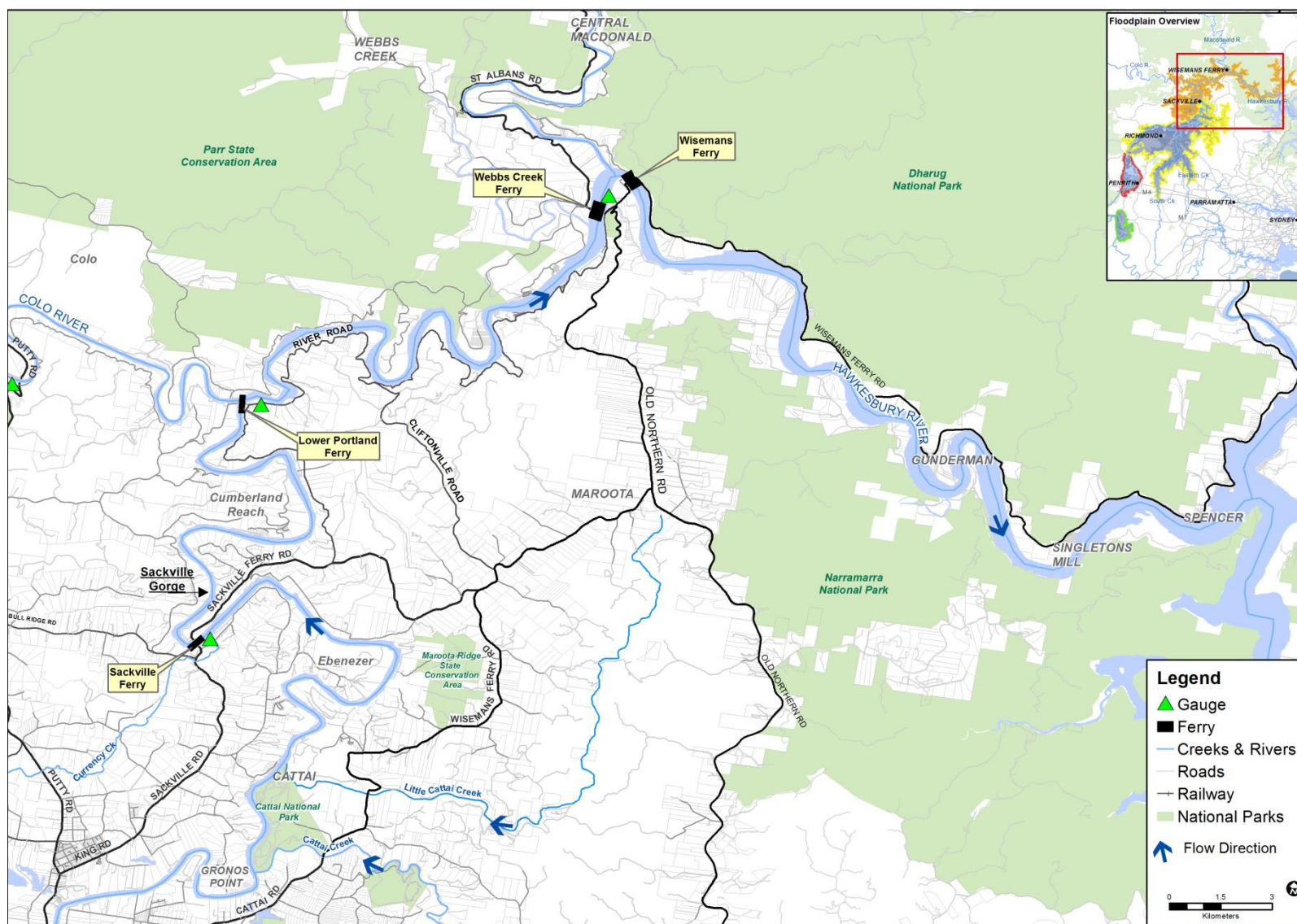
Map 3: Wallacia Floodplain



Map 4: Penrith / Emu Plains / Castlereagh Floodplain



Map 5: Windsor / Richmond / Wilberforce Floodplain



Map 6: Lower Hawkesbury Floodplain

Below Ebenezer the River enters another narrow sandstone gorge known as Sackville Gorge which continues through to Wisemans Ferry and then on to Broken Bay, a river distance of around 100 kilometres. Unlike the upstream constrictions near Wallacia and Castlereagh, which are relatively short, this gorge consists of a long and very narrow waterway.

The Colo River and the Macdonald River join the Hawkesbury River within Sackville Gorge.

After Wisemans Ferry the gorge opens up slightly downstream to Spencer. Below Spencer the valley opens out further into the wide basin of Broken Bay where the Hawkesbury River discharges into the Pacific Ocean.

The area downstream of Spencer is covered by the Gosford and Hornsby Local Flood Plans and is not further detailed within this plan.

1.3 STORAGE DAMS

There are a number of water supply reservoirs on tributaries upstream of Penrith including the Warragamba, Avon, Cataract, Cordeaux Wingecarribee and Nepean Dams. Of these, Warragamba Dam is the largest of the reservoirs with 41% percent (9000 square kilometres) of the entire Hawkesbury-Nepean catchment located upstream of this dam (5).

Mangrove Creek Dam is situated in the lower part of the catchment near the headwaters of Mangrove Creek, North West of Gosford.

Dam locations are shown on Map 1 – Hawkesbury-Nepean River Basin.

Given that their primary purpose is for water supply, these dams are managed to ensure that they are kept as full as possible and therefore have minimal flood mitigation effects.

With the exception of Warragamba Dam, these dams have non-gated overflow spillways and cannot be operated as flood mitigation dams (6) (7) (8) (9) (10).

Although Warragamba Dam has gates, these are currently operated for Dam safety

purposes and are not operated for flood mitigation (11).

The mere presence of Warragamba Dam can mitigate flooding to some extent by capturing early floodwaters, but only if the rainfall occurs upstream of the dam and if not already full. Once the dam begins to spill this can have a major contribution to downstream flood levels (11).

Dam Emergencies

Dam emergencies, particularly concerning the Warragamba and Nepean Dams could have some downstream consequences within the area covered by this plan. However, both dams have no known structural deficiencies, have been upgraded to modern design standards and are capable of catering for extreme flood events. As such, the probability of dam failure is considered to be very low (9) (10).

Dam emergency arrangements are further detailed in Volume 3 Chapter 5 of this plan.

1.4 RIVER CONTRIBUTIONS TO FLOODING

The Warragamba catchment makes up around 70% of the catchment area located upstream of Windsor (Figure 1). Since the dam was constructed in 1960, there have been significant variations in the contribution from the Warragamba Dam catchment to flooding at Windsor ranging from between 73% to only 42% of all floodwaters (see Figure 1) (11).

There are also a number of other tributaries which contribute to flooding in the Richmond / Windsor / Wilberforce floodplain including the Nepean River, Grose River and South Creek. These catchments are smaller than the Warragamba Dam catchment however they generally respond more quickly to rainfall. Typically their flow arrives in the floodplain

before the flow from Warragamba Dam. This means that river levels can rise at Windsor regardless of what is happening upstream of Warragamba Dam (11).

The Grose River in particular drains a high rainfall area in the Blue Mountains and can have a significant effect on flooding at Windsor. Flood flows from this tributary can result in the river level at North Richmond rising markedly before flood water arrives from upstream on the Nepean River or via Warragamba Dam. Flood flows from the Grose River alone can produce moderate to major flooding from Richmond and into the Lower Hawkesbury (12).

Similarly the Colo River is known to have contributed significantly to flood levels in the Lower Hawkesbury (12).

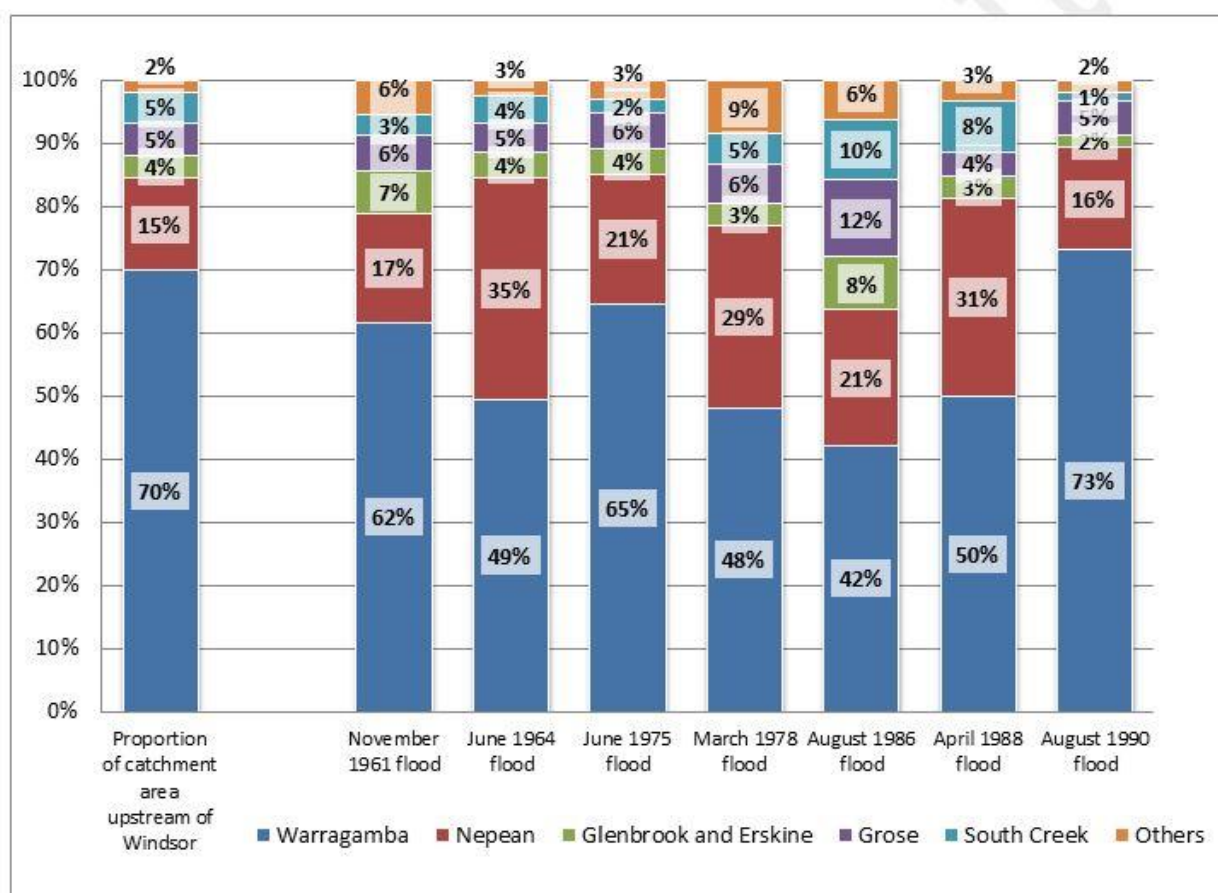


Figure 1: Sub-catchment contributions to flooding at Windsor from recent floods

(Source: Water NSW) (11)

1.5 WEATHER SYSTEMS AND FLOODING

The Hawkesbury-Nepean catchment displays wide variation in rainfall distribution. The annual average rainfall for the whole catchment is approximately 1000 millimetres however the annual average rainfall over the headwaters of the Nepean is 1500 millimetres while on the southern extremity of the basin near Goulburn the figure is about 625 millimetres. The majority of the rainfall occurs in the summer months but floods may be experienced during any part of the year.

There are many localities in the valley that have received 175 millimetres of rainfall in a 24 hour period. Falls in excess of 250 millimetres in a 24 hour period have been recorded at Katoomba, Lawson, Springwood and Rylstone. It should be noted that these rainfall totals can often result from sustained falls of only 10-15 millimetres per hour and can produce severe floods.

The rainfall that produces severe flooding in the Hawkesbury-Nepean Valley will usually come from East Coast Low Pressure Systems. These systems develop off the state's coast, and direct moist winds onto the coast. Usually, but not exclusively, they move in a southerly direction. Once these air masses strike coastal ranges such as the Illawarra escarpment or the Great Dividing Range the resulting uplift of air often produces very high rates of rainfall and heavy rain.

Sea conditions can also influence flooding in the lower river reaches. Along the coast, oceanic storm surges and large waves may result from East Coast Low Pressure Systems and their associated gales and storm-force winds. Such conditions may lead to coastal inundation of seawater and can delay the floodwaters from the Hawkesbury River reaching the Pacific Ocean.

The larger floods that have occurred on the Hawkesbury-Nepean River have often been accompanied by storm surge of 0.1-0.3 metres in Broken Bay. These effects are most apparent if storm surge conditions occur during periods of spring or extreme tides.

Several of the most severe floods experienced on the Hawkesbury-Nepean River have resulted from East Coast Low Pressure Systems. Among these were the flood of record in June 1867, and the second highest flood of record in November 1961. Flooding in 1964, 1978, 1986 and 1990 resulted from similar weather systems.

Several flood-producing East Coast Low Pressure Systems may be experienced annually in New South Wales. During the 1990s for example, there were between two and five such occurrences in most years. This can result in multiple flood events on the same river system within the same year.

Climate Change

Climate change is expected to affect flood behaviour within the Hawkesbury-Nepean catchment through increased severity of flood producing storms or other weather systems. Rainfall is predicted to increase by between 3% and 12% by 2030 (5). These increases in rainfall are likely to have significant effects on flooding in the valley (Refer to Section 1.10 – Flood Frequency for further detail). Climate change is also expected to lead to small increases in peak flood levels downstream of Lower Portland due to sea level rises (5).

1.6 CHARACTERISTICS OF FLOODING

Bathtub Effect

The Hawkesbury-Nepean Valley has a unique feature that dramatically affects the behaviour of floods.

On a typical coastal river the valley progressively widens as it approaches the ocean outflow. However in the Hawkesbury-Nepean the series of wide floodplains, separated by narrow sandstone gorges, causes flood waters to back up on the floodplains behind these natural 'choke points'. Water cannot escape as quickly as it enters and so it fills up like a bathtub. This is known as the 'bathtub effect' and it results in water levels that are well above those typically expected (11) (See Figure 2).

At Windsor for example, the river level could rise from a normal non-flood level of 1.5 metres up to about 26.4 metres in the Probable Maximum Flood (PMF). With most house floor levels built at around 17.3m this means that flood waters can be as high as 9 metres above the floor. This is equivalent to the height of a three story building (5) (See Figure 3).

Flood Islands and Trapped Areas

Another feature of flooding within the Hawkesbury-Nepean Valley is that many roads have low points that flood and are cut off before the higher inhabited areas are inundated creating 'flood islands' (11).

As the flood rises, these flood islands are gradually inundated such that during major flood events they may be completely submerged. Those that aren't fully submerged may only have small patches of flood free land remaining.

Similarly, many areas, particularly within the gorges, can become trapped by flood waters when access roads and ferries are cut with limited means of escape due to the steep and rugged surrounding terrain.

For further information see 2.4 – Flood Emergency Response Classification of Communities.

1.7 TIMEFRAMES

Extreme floods within the Hawkesbury-Nepean Valley with the greatest depths of flooding can develop reasonably quickly. The highest possible flood level is called the Probable Maximum Flood (PMF). The time from the start of rainfall, to peak levels of a PMF can be as little as 24 hours. Historical events to date have tended to develop over 72 hours or more (13) (See section 1.10 – Extreme Flooding for further details).

Rates of water level rise can be variable, with the fastest rises historically experienced in the Richmond / Windsor / Wilberforce area of almost 1 metre per hour prior to the river breaking its banks (13). Once the river breaks its banks and spreads onto the floodplain these rates of rise tend to decrease.

These timeframes have significant implications for the evacuation of the large number of people off the floodplain. Table 1 shows the indicative flood travel times for various locations along the Hawkesbury-Nepean River.

Locations	Travel Time
Menangle to Camden Bridge	5 hours
Camden Bridge to Wallacia Weir	11 hours
Wallacia Weir to Penrith	2hrs
Penrith to North Richmond	4 hrs
North Richmond to Windsor	4 to 10+ hours
Windsor to Sackville	3 to 11 hours
Sackville to Lower Portland	6 hours
Lower Portland to Webbs Creek (Wisemans Ferry)	6 to 11 hours

Table 1: Indicative Flow Travel Times for the Hawkesbury-Nepean River

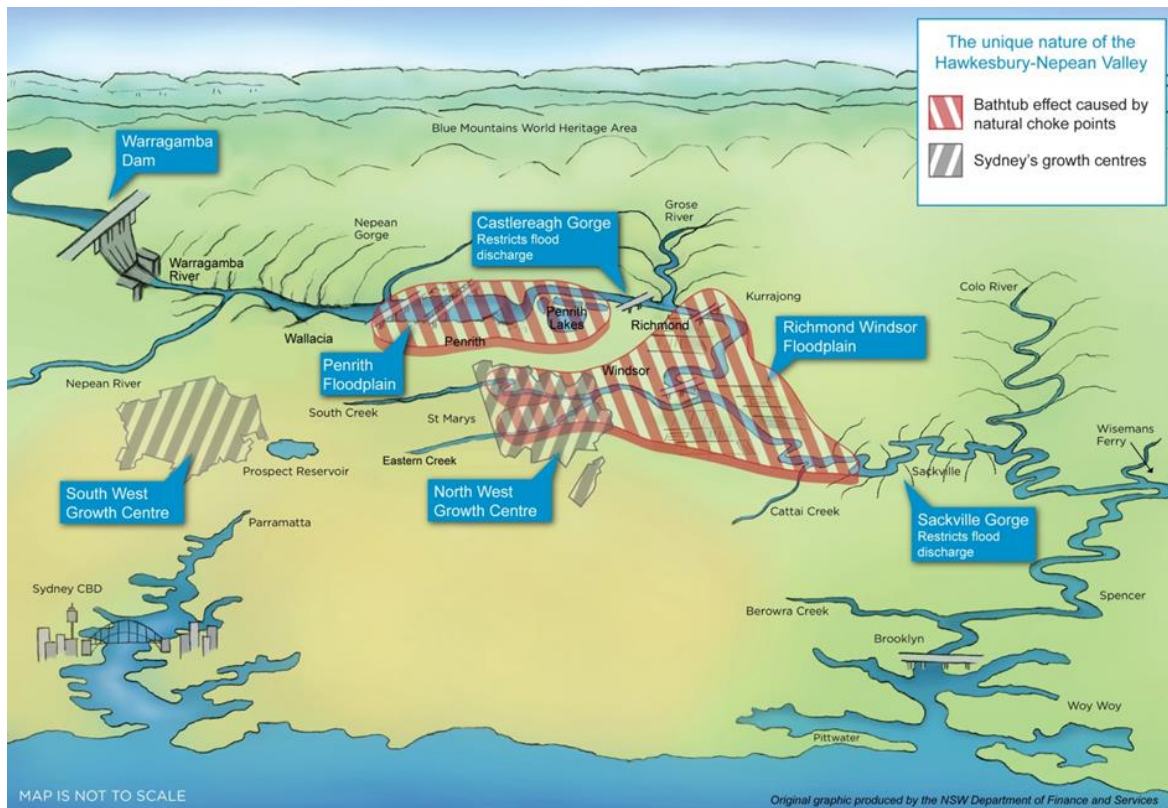


Figure 2: An example of the approximate area of inundation in Probable Maximum Flood (PMF) event due to the 'bathtub effect' caused by some of the natural choke points in the Hawkesbury-Nepean Valley

(Source: adapted from NSW Department of Finance and Services) (11)

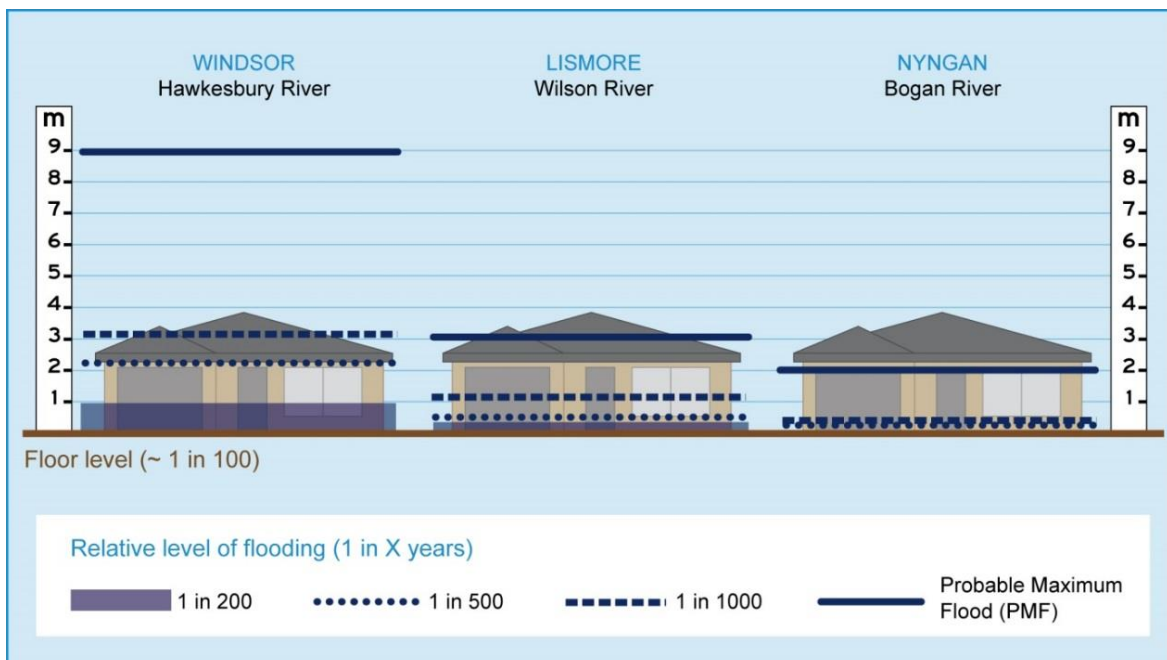


Figure 3: Comparison of chance per year flood levels (from 1 in 100 to Probable Maximum Flood) at three townships on three different NSW floodplains

(Source: Adapted from ERM Mitchell McCotter Pty Ltd (1995) (11) (2))

River Level Gauging

In the monitoring of floods and the planning that takes place to deal with floods, river water levels are related to river gauging stations. These gauges measure the height of the water surface at points along a river. The Australian Bureau of Meteorology (Bureau) provides flood height predictions to several of these gauges such that people can gain an understanding of how large the flood is expected to be.

Gauge Zero

The level of a river gauge "gauge zero" is typically set at the low flow level of the stream. River heights are measured in metres above the gauge zero. For example, a river height reading of 5 metres means that the water level has risen 5 metres above its lowest level (14).

Heights within the landscape are normally measured in relation to mean sea level using Australian Height Datum (AHD). For example, the gauge at Windsor has a gauge zero of 0.15m. This means that if the reading was 1.0m at the Windsor gauge it would be equivalent to 1.15m AHD.

At the Victoria Bridge gauge at Penrith the gauge zero is 14.136m, therefore a reading of 10m at the gauge would be equivalent to 24.136m AHD.

Gauge Reference Area

The slope of a river channel changes along its length, with some sections flatter and others steeper. Because of these changes along the river, flood gauges are only able to be related to particular sections of the river and floodplain known as the "gauge reference area".

Depending on what historical or modelled data is available, the consequences of flooding such as when roads will be cut, and when houses will begin to flood can be inferred from the predicted gauge height for locations within the gauge reference area.

Key Flood Gauges

The key reference flood gauges for the Hawkesbury-Nepean Valley, and for which the Bureau provides flood predictions are listed below. The designated Gauge number is shown in parentheses:

- Menangle (212904);
- Wallacia at Wallacia Weir (212202);
- Penrith at Victoria Bridge (212201);
- Richmond at North Richmond Bridge (212902);
- Windsor at Windsor Bridge (212903);
- Sackville at Sackville Ferry (212406);
- Lower Portland (212407);
- Webbs Creek (Wisemans Ferry) (212408).

Further details on River Level gauges in the Hawkesbury-Nepean Valley are provided in Volume 3 Chapter 1 of this plan.

Flooding of Wallacia Floodplain

Upstream of the Wallacia Floodplain the narrow Bents Basin gorge can cause flood waters to back up just upstream of the Bents Basin Recreation Area. Flood waters gain momentum through the steep gorge before jetting through Bents Basin onto the Wallacia floodplain downstream (6) (Refer to Map 3).

Once on the Wallacia Floodplain, flood waters can back up Jerry's Creek from the Nepean River surrounding the town of Wallacia to the north east and west (15). During a PMF most of Wallacia would be flooded, with only a thin strip of land to the south of town near Greendale Road remaining flood free.

On the western side of the river, the lower lying land along Bents Basin Road can become inundated by flood waters.

Flooding of Emu Plains / Penrith / Castlereagh Floodplain

The upper section of the river near Penrith and Leonay has natural levee banks which help to keep flood waters contained within them to around 1% AEP or 1 in 100 year flood

event (around 11.9m at the Penrith gauge or 26m AHD) (4) (Refer to Map 4).

However some flooding occurs prior to the river breaking its banks where flood waters back up in local creeks including: Cranebrook Creek, Lapstone Creek, Knapsack Creek, Boundary Creek, Peach Tree Creek, Schoolhouse Creek and Mulgoa Creek (4).

Downstream of Victoria Bridge and Penrith Weir, just south of the Penrith Lakes area, the river turns sharply to the west. Flood waters start to bypass this bend and inundate areas of Emu Plains. Flooding of the Emu Heights area is primarily caused by backwater flooding from the Nepean River, while flooding in the Penrith Lakes area develops from a combination of backwater flooding and over bank breakouts (4).

Floodwater also backs up on the southern side of the main Western Rail Line embankment in Emu Plains which is a main flow control in the floodplain (4).

Floodwater can isolate parts of the communities in Emu Plains including Emu Heights, Leonay, Central and East Emu Plains, North Penrith, and the Peach Tree Creek area creating 'flood islands'. Depending on the size of the flood, these islands can gradually become completely covered by flood waters.

During large flood events flood waters meet up on the southern and northern sides of the main Western Rail line in Emu Plains.

During a PMF most of Emu Plains, the Penrith Lakes area and parts of Penrith, extending into part of the Penrith central business district would be flooded.

Flooding of Richmond / Windsor / Wilberforce Floodplain

The natural constriction in the floodplain as the river enters the Sackville Gorge has a marked influence on flood behaviour upstream of this point (Refer to Map 5).

Flood waters flow freely into the Richmond / Windsor / Wilberforce floodplain but cannot escape at the same rate through the Sackville Gorge. As a result, water levels around

Richmond and Windsor can rise to 26.4m with normal river levels being 0.5 to 1m (5).

Low lying farming areas including Richmond Lowlands, Cornwallis, Pitt Town Bottoms and areas along Rickaby's and South Creeks are flooded first.

Depending on the size of the flood, areas that are normally hills or rises in the landscape can become surrounded by flood waters and become isolated 'flood islands'. Depending on the size of the flood event these islands can then become completely covered by flood water. This includes the townships of McGraths Hill, Pitt Town, Windsor, Bligh Park and parts of Richmond.

Grose River

Flood flows from this tributary can result in the river level at North Richmond rising markedly before flood water arrives from upstream on the Hawkesbury River. There is only one rainfall and river level gauging station in the Grose Valley and no river gauge at its junction with the Hawkesbury River. The short travel time from the junction of these two rivers to North Richmond, means that warning time can be short. Flood flows from the Grose River alone can produce moderate to major flooding from Richmond and into the Lower Hawkesbury (12).

South Creek

Normally flooding of South Creek occurs as a result of local catchment run-off. However, during major flooding of the Hawkesbury-Nepean River, the lower reaches of South Creek can 'back-up' South Creek from the Hawkesbury River and flood the surrounding areas (1).

The influence of this Hawkesbury-Nepean backwater flooding on South Creek generally extends as far upstream as Mayo Road or Dunheved Road in Werrington. However during a PMF event these backwaters can extend as far upstream as the Western Motorway (M4) and main Western Rail Line (1).

Flooding of Lower Hawkesbury Floodplain

Flooding along the Hawkesbury River and its tributaries between Sackville and Broken Bay is confined within relatively deep and narrow river gorges. This results in steep flood gradients and very high flow velocities both within the river channel and the limited adjoining floodplains (16) (Refer to Map 6).

The flood behaviour of the Lower Hawkesbury River can be influenced by flooding from the Hawkesbury River upstream of Sackville combined with flooding from the major tributaries below Sackville (12).

Flooding in the lower reaches can also be influenced by the interaction of flood water with tidal variations (5) (12).

Colo River

The Colo River can inject a large flow into the Hawkesbury River at Lower Portland. This can cause backup flooding along the Hawkesbury River towards Sackville (12).

At higher Hawkesbury River flows, the effect can be to slow down the rate of drainage from the primary floodplain which holds up flood levels in the Richmond / Windsor area (12).

Macdonald River

Flooding in the Macdonald River Valley is primarily due to surface runoff generated from the steep vegetated local catchment. However, in the lower reaches, the Macdonald River can be affected by backwater flooding from the Hawkesbury River (3).

It is believed that significant bank erosion occurred within the Macdonald River during previous flood events which caused large amounts of sand to be deposited within the river, and the river to widen. In more recent years some of this sand was flushed out of the system. Further riverbank erosion and widening is considered a possibility during future flood events (3).

1.8 FLOOD HISTORY

The Hawkesbury-Nepean Valley has experienced numerous serious floods since before the earliest days of European settlement. Floods have occurred in all months of the year.

The earliest European explorers noticed evidence of significant floods along the Nepean and Hawkesbury Rivers, with debris lodged in the treetops 30 to 45 feet (9.1m to 13.7m) above the normal river levels (17).

A series of floods in the early 1800's had major implications for the food supply and economy of the Sydney Colony, and eventually led Governor Macquarie to call for the relocation of early settlements along the river to higher ground (17).

Despite a history of significant floods, most of the current population living within the floodplain have only experienced small flood events. During 2012, 2013 and 2015 there was some flooding experienced. The largest of these was in 2012 which still only reached minor flood levels of 6.18m at the Windsor gauge and 4.62m (18.76m AHD) at the Penrith gauge.

The most recent major flood (defined as being above 12.2m at Windsor) was experienced in 1990 when flood levels reached 13.5m at the Windsor gauge.

The highest recorded flood in the Hawkesbury-Nepean Valley occurred in 1867 when a height of 19.7m was reached at Windsor. This flood was also the worst that has occurred in terms of lives lost and the destruction of property and livestock. If this same flood occurred today it would reach 19.3 metres AHD at Windsor because the presence of Warragamba Dam has some flood mitigating effect. The next highest flood was experienced in November 1961 (there was also a lesser flood in 1961). Peak heights recorded in November 1961 were:

- North Richmond (Pump Station 16.33m AHD;
- Windsor Bridge 15.0m AHD;

- Penrith (Victoria Bridge) 23.9m AHD (9.76m at gauge).

A flood of slightly lesser magnitude occurred in June 1964. Peak heights recorded were:

- North Richmond (Pump Station) 15.47 metres AHD;
- Windsor Bridge 14.6 metres AHD
- Penrith (Victoria Bridge) 23.74 metres AHD (9.6m at gauge);

- Camden Bridge 14.10 metres AHD (estimated).

Other major floods in the valley and their height at Windsor and Penrith are shown in Figure 4 (11) (5).

There is some sedimentary evidence that floods larger than the 1867 flood have occurred prior to European settlement (11) (18).

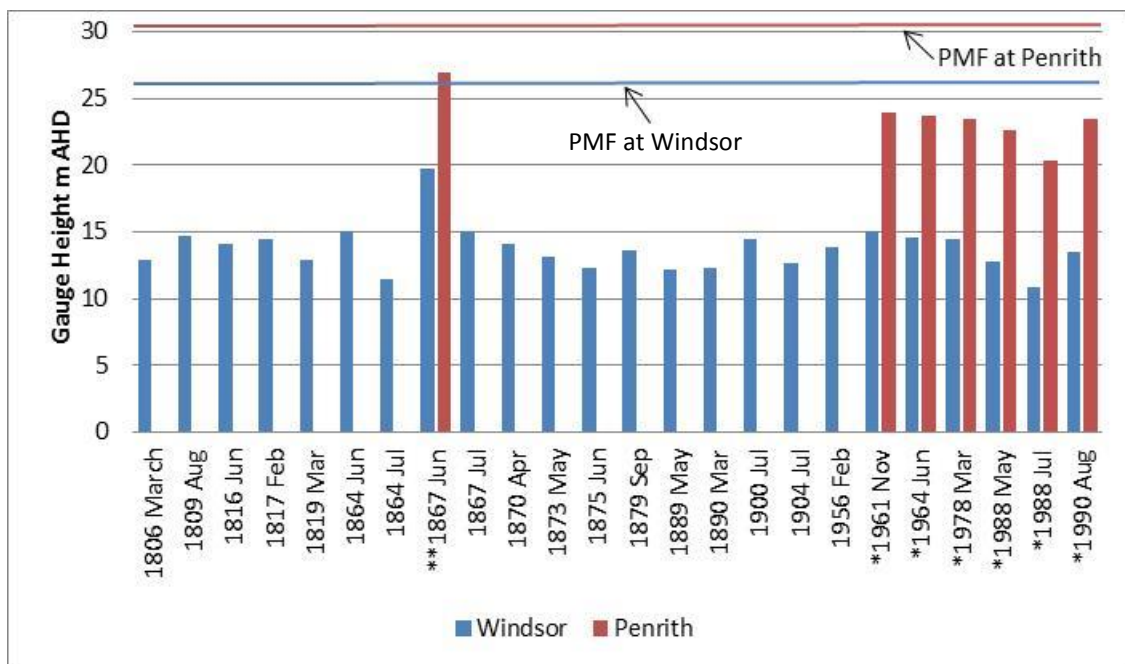


Figure 4: Hawkesbury-Nepean Flood History showing Major Floods at or above 12.2m at Windsor

Notes:

- The PMF level at Windsor is 26.4m AHD, and at Penrith is 31.5m AHD (Flood levels are higher at Penrith due to it being upstream and higher in elevation).
- All readings were taken at either the Windsor Bridge gauge at Windsor or the Victoria Bridge Gauge at Penrith and are in m AHD.
- The gauge zero for the Windsor gauge is 0.15m, and the gauge zero for Victoria Bridge manual gauge Penrith is 14.136m.
- * Indicates that these floods occurred after Warragamba Dam was built. These readings have not been adjusted.
- ** Indicates the Flood of Record which occurred in June 1867.

1.9 FLOOD MITIGATION SYSTEMS

There is currently no significant flood specific mitigation infrastructure within the Hawkesbury-Nepean Valley to reduce risk to property from a Hawkesbury-Nepean River flood (11).

There are a number of small flood mitigation systems that have been constructed further upstream in the South Creek catchment primarily to deal with local catchment flooding in the St Mary's and Werrington areas (1).

There is also a small private levee in a tributary of McKenzie's Creek near Pitt Town which appears to slightly delay water from entering the Pitt Town Bottoms area from South Creek.

There have been a number of investigations of flood mitigation options undertaken for the Hawkesbury-Nepean River flooding which includes the Hawkesbury-Nepean Valley Flood Review (11) which considered options that:

- Store or capture flood waters (e.g. flood mitigation dam, modification of Warragamba Dam Gate operations).
- Drain or divert water away from the valley (e.g. diversions and dredging).
- Provide local protection up to a certain level (e.g. levees).

However investigations into these flood mitigation solutions have found that there is no simple or significant solution or single infrastructure option that can address all of the flood risks in the Hawkesbury-Nepean Valley (11).

Whilst some mitigation options could reduce but not eliminate the risks to property, effective evacuation is considered to be the only measure that can help guarantee to

reduce the risk to life in the Hawkesbury-Nepean Valley (11).

1.10 FLOOD FREQUENCY

The probability of various key floods occurring is summarised in Table 2. This probability is expressed in two ways:

- **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. This is the preferable way to express flood probabilities.
- **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.

Periods of both more frequent and more severe flooding than have been seen in recent times must be expected in the future.

It is expected that with climate change, for the 1% AEP event at Windsor flood levels would rise by 0.5m (for a 5% increase in rainfall) and 0.9m (for a 10% rainfall increase). Another way of looking at it is that the current 1% AEP chance level will occur more frequently and would become (5):

- 1.25% AEP event with a 5% rainfall increase;
- 1.4 To 1.7% to AEP event with a 10% rainfall increase.

Table 2: Hawkesbury-Nepean Flood Frequency at various gauge locations

Probability		Wallacia Flood level (at Blaxland Bridge) m AHD	North Richmond Bridge m AHD	Penrith Flood level (at Victoria Bridge) m AHD	Windsor Flood level (at Windsor Bridge) m AHD	Sackville Ferry m AHD	Lower Portland m AHD	Leets Vale m AHD	Webbs Creek m AHD
AEP %	ARI Chance per year								
20%	1 in 5	36.8	12.5	20.1	11.1	7.4	5.5	3.8	3.2
10%	1 in 10		14.0	21.6	12.3				
5%	1 in 20	42.5	15.3	23.4	13.7	10.2	7.5	5.2	4.4
2%	1 in 50		16.4	24.9	15.7	11.7	9.1	6.5	5.6
1%	1 in 100	45.8	17.5	26.1	17.3	12.9	10.3	7.6	6.7
0.4%	1 in 170			26.1-26.9 *					
0.5%	1 in 200		18.9		18.7				
0.4%	1 in 250				19.3 *				
0.2%	1 in 500		20.4	27.5	20.2				
0.1%	1 in 1000 (c)		22.1	28.6	21.9				
0.002% PMF	1 in 45,000	56.9 (b)	26.5 (b)	32.1 (b)	26.4 (b)	23.0 (b)	22.3 (b)	17.9 (b)	16.3 (b)

Source: Hawkesbury Floodplain risk Management Study and Plan (2012) (5)

Notes:

- * 1867 Flood of record

1.11 EXTREME FLOODING

For planning to be capable of being effective in all circumstances, it must take into account the worst floods that could occur. Information about the full range of possible flooding is obtained from scientific studies that have determined how bad the worst floods are likely to be. The greatest depth of rainfall possible over a given area in a nominated time period (e.g. 24hrs or 72hrs) is called the Probable Maximum Precipitation (PMP).

The highest possible flood level is called the Probable Maximum Flood (PMF). For the Hawkesbury-Nepean Valley it is when the PMP distributed over the whole catchment in a 72 hour period that the greatest depth of flooding results (i.e. the 72 hour PMF). The modelling for the 72 hour PMF in the Hawkesbury-Nepean Valley assumes the following conditions:

- Full storage at the Warragamba Dam;
- A fully saturated (wet) catchment.

The rainfall required is in the order of 790 millimetres across the Warragamba catchment in a 72 hour period (72 hour PMP). Note that this requires an average of only about 11 millimetres/hour.

A PMP in the entire Hawkesbury-Nepean catchment and the resulting PMF is estimated to have 0.002% AEP (one chance in 45,000 each year) of occurring. This means they are very rare probability events. Rainfall heavy enough to support the idea of PMP has been observed in various places around the world including Australia (Wollongong 1984 – 440 millimetres in 6 hours over a 100 square kilometre area). Flood records from around the world demonstrate that PMF events have occurred.

The PMP distributed over other time periods and the resulting floods that they would produce have also been modelled for the Hawkesbury-Nepean Valley and its sub-catchments. For instance, the 24 hour PMP for the Warragamba catchment results in the critical PMF for Warragamba Dam. The rapidly rising water results in the highest water level

in Warragamba Dam (but not the downstream floodplain) and is therefore most critical for dam safety (19).

The 24 hour PMF for the Warragamba catchment would have an estimated peak inflow at Warragamba Dam of approximately 52,100 cubic metres of water each second and an outflow of approximately 42,200 cubic metres per second. It is estimated that this PMF would have a total flood volume of around 6,000 gigalitres (19).

By way of comparison, the November 1961 flood (the largest flood in living memory) had an estimated peak inflow at Warragamba Dam of 9,000 cubic metres per second and an outflow of 7,590 cubic metres per second. The November 1961 flood which reached 23.89m at Penrith and 15.0m at Windsor has been estimated to have a 2.5% AEP (one in 40 chance of occurring in any one year) (19).

Floods much larger than those in living memory, and even larger than the flood of record can occur within the Hawkesbury-Nepean Valley.

Map 2 shows the predicted PMF Flood extent as well as the 1% AEP (1 in 100 year) flood extent for the Hawkesbury-Nepean Valley.

PART 2 EFFECTS OF FLOODING ON THE COMMUNITY

2.1 INFORMATION SOURCES

Data used in this plan has been sourced from the most current published reports. This information is currently being reviewed as part of the Hawkesbury-Nepean Valley Flood Review Stage 2 Taskforce. This plan will be updated accordingly as further information becomes available.

2.2 POPULATION

It is estimated that around 73,000 people are currently living in areas prone to flooding from the Hawkesbury-Nepean River (11). This estimate assumes that dwellings are occupied as they were on census night (2011), however these numbers are likely to vary with higher numbers expected during summer, on weekends and during holiday periods.

Sydney's population is expected to grow significantly into the future, with new development areas including part of the North West Growth Centre located within the Hawkesbury-Nepean floodplain (11). Within the Metropolitan West subregion of Sydney (most of which is located in the Hawkesbury-Nepean Valley) there is an expected increase of 89,000 people by 2031 (11).

2.3 SIGNIFICANCE OF AREA

The Western Sydney Region is one of Australia's largest and most diverse economies with an annual gross regional product of about \$95.6 billion in 2010-2011 (11). Important industries include fresh fruit and vegetables, turf farms, horse studs, eggs and poultry, oyster farms, manufacturing and processing industries, water-ski parks and other forms of tourism.

The Hawkesbury-Nepean catchment is also significant due to its many natural values including the Blue Mountains World Heritage Area. It is the source of drinking water to

around 4 million people in Sydney, the Illawarra and the Blue Mountains (20).

2.4 FLOOD EMERGENCY RESPONSE CLASSIFICATION OF COMMUNITIES

Communities can be affected by flooding either directly, or indirectly. Depending on their location in the landscape, and the roads and services available to them during a flood these communities can have differing needs for assistance during a flood such as information and warning provision, evacuation, resupply and/or rescue. Communities can be classified according to the impact that flooding has on them and the potential assistance they may require. The five classifications are outlined in the Flood Emergency Response Classification Guidelines and are described below (Refer to Figures 5 to 11):

- Flood Islands (High and Low);
- Areas with Overland Escape Routes;
- Areas with Rising Road Access;
- Trapped Perimeters (High and Low); and
- Indirectly affected areas.

Note: These definitions are described in terms of the impact of a PMF. However these classifications may be different at different levels of flooding (e.g. the same community may be isolated during a smaller flood event, but may be completely inundated during a larger event).

Flood Islands

These are inhabited areas of high ground within a floodplain linked to flood free areas by an access road. The access road can be cut by flood water, closing the only evacuation route and creating an island.

After closure of the road the only access to the area is by boat or by aircraft.

Flood islands are further classified according to what can happen after the evacuation route is cut into High Flood Islands and Low Flood Islands.

High Flood Island

The flood island is higher than the limit of flooding (i.e. above the PMF). The island is surrounded by flood water but there is still enough land available to provide a flood free space for people remaining in the area. This flood free space may not be enough to adequately sustain the population. Properties may or may not be flooded.

The area will require resupply by boat or air if not evacuated before the road is cut. Evacuation will have to take place before isolation occurs if it will not be possible to provide adequate support during the period of isolation, if essential services won't be available, or if houses will be flooded.



Figure 5: High Flood Island

Low Flood Island

The flood island is lower than the limit of flooding (i.e. below the PMF). If flood water continues to rise after it is isolated, the island will eventually be completely covered with all properties inundated. People left stranded on the island may drown unless rescued. Evacuation must be completed before roads are inundated.

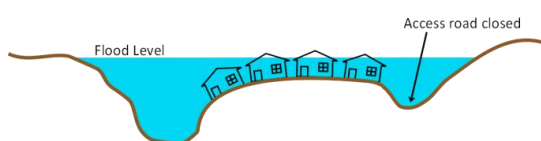


Figure 6: Low Flood Island

Trapped Perimeters

These are similar to flood islands in that they are inhabited or potentially habitable areas of higher ground. They exist at the fringe of the floodplain where the only practical road or overland access is through flood prone land and unavailable during a flood event. In some cases normal access to the area is by boat but

flood conditions may prevent usual boat access.

The ability to retreat to higher ground does not exist due to topography or impassable structures. Trapped perimeter areas are further classified according to what can happen after the evacuation route is cut as follows:

High Trapped Perimeters

These are inhabited areas above the PMF but the only access road/s is across flood prone land. Road access may be closed during a flood.

The area will require resupply by boat or air if not evacuated before the road is cut. Evacuation will have to take place before isolation occurs if it will not be possible to provide adequate support during the period of isolation, if essential services won't be available, or if houses will be flooded.

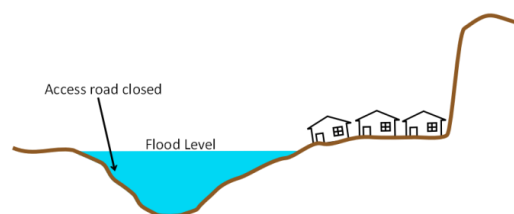


Figure 7: High Trapped Perimeter

Low Trapped Perimeters

The inhabited area is lower than the limit of flooding (i.e. below the PMF) or does not have enough land to cope with the number of people in the area. During a flood event the area is isolated by floodwater and property may be inundated. If flood water continues to rise after the area is isolated it will eventually be completely covered. People left stranded may drown if not rescued. Evacuation must be completed before roads are inundated.

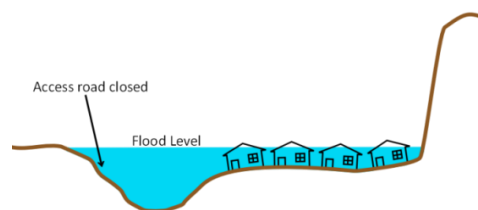


Figure 8: Low Trapped Perimeter

Areas with Overland Escape Routes

These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side. The access road/s cross lower lying flood prone land.

Evacuation can take place by road only until access roads are closed by flood water. Escape from rising flood water will be possible by walking overland to higher ground. Anyone not able to walk out must be reached by using boats and aircraft. If people cannot get out before inundation, rescue will most likely be from rooftops. Pedestrian evacuation must never be relied upon as a primary evacuation strategy. It is only ever a back-up strategy if vehicular evacuation fails.

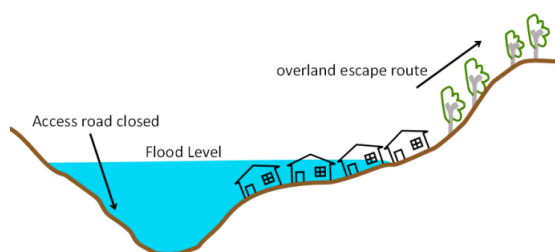


Figure 9: Area with Overland Escape Route

Areas with Rising Road Access

These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side with access road/s rising steadily uphill and away from the rising flood waters. The community cannot be completely isolated before inundation reaches its maximum extent.

Evacuation can take place by vehicle or on foot along the road as flood waters advance. People should not be trapped unless they delay their evacuation. For example people living in two storey homes may initially decide to stay but reconsider after water surrounds them.

These communities contain low-lying areas from which people will be progressively evacuated to higher ground as the level of inundation increases. This inundation could be caused either by direct flooding from the river system or by localised flooding from creeks.

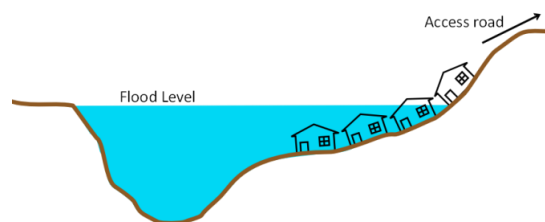


Figure 10: Area with Rising Road Access

Indirectly Affected Areas

There will be areas outside the limit of flooding which will not be inundated and will not lose road access. Never the less they may be indirectly affected as a result of flood damaged infrastructure such as due to the loss of transport links, electricity supply, water supply, sewerage or telecommunications services. They may require resupply or in the worst case, evacuation.

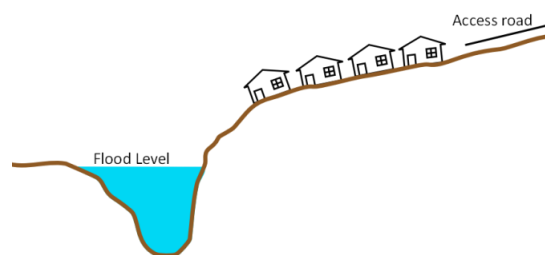


Figure 11: Indirectly affected area

2.5 HAWKESBURY-NEPEAN FLOOD EMERGENCY RESPONSE CLASSIFICATIONS

Within the Hawkesbury-Nepean Valley each area has been classified according to its flood emergency response classification. Some of the most critical areas including those that are classified as Low and High Flood Islands and Trapped Perimeters are shown in Table 3 and Table 4.

These are summarised by floodplain and according to the order that their evacuation routes are cut (See also Volume 3 Chapter 2, Tables 1 to 4 for a full list of Sectors, their Emergency Response Classification and heights at which roads are expected to be cut).

Table 3: The main Hawkesbury-Nepean flood risk areas and the heights at which they are expected to be flood affected in the Richmond Windsor Floodplain

Floodplain	Area (Sector / Sub-sector)	Flood Classification	Last Road Cut m AHD	Submersion Height m AHD	Comments
Richmond / Windsor / Wilberforce	Wilberforce / Grono's Point	High Flood Island	Around 6.5m to 6.75m (at Windsor gauge)	>PMF	Becomes isolated early during a flood at 5.1m AHD locally which is equivalent to around 6.5m to 6.75m at the Windsor gauge (21). Some small flood free area during a PMF (22) (23).
	Richmond Lowlands (RL203 road point ID)	Low Flood Island	10.86m AHD (24)		Properties begin to be flooded by 12.5m AHD at Richmond gauge (5) with most of the surrounding agricultural areas also flooded.
	McGraths Hill (MH1, MH1a, MH1b road point ID)	Low Flood Island	13.5m (25)	16.0 to 18m	Some properties (around 50) are flooded in 5% AEP (13.7m at Windsor), with nearly all properties (around 913) flooded in a 1% AEP (17.3m at Windsor) (5).
	Yarramundi	Trapped Perimeter	15.1 to 15.5m (5)	>PMF	Becomes isolated in less than a 1% AEP event. Some properties flooded in a 2% AEP, with around 35 flooded in a PMF (5).
	Wilberforce / Ebenezer	High Flood Island	15.5m (5)	>PMF	Isolations begin from 9.6m AHD , with properties flooded from 11.1m AHD. During a PMF around 50% (528) of properties would be flooded and 50% isolated (5).
	Pitt Town and Pitt Town Bottoms	Low Flood Island*	16m (24)	>PMF	*There is a very small area of land which remains flood free during a PMF. Some isolations begin from 6.2m (Windsor gauge) in Pitt Town Bottoms (26). Around 60 dwellings in Pitt Town would be flooded by 13.7m AHD (5).
	Windsor (Windsor 1 road point ID)	Low Flood Island	17.3m (27) (14m *)	26.0m	Some properties flooded from 11.1m AHD, with around 110 by 13.7m AHD and over 800 in a PMF (5). *The Windsor North area also becomes a flood island at 14m AHD and is submerged at 22.3m (5).
	Bligh Park	Overland Escape (Low Flood Island)	18.5m (5) (17.2m*)	25.0m (>PMF)	Around 60 properties would be flooded by 17.3m AHD (1% AEP) and 2,285 in a PMF (5). There is some opportunity for overland escape into Windsor Downs Nature Reserve. *Internal road closures occur prior to 18.5m (5) from 17.2m AHD.
	Richmond RAAF	Low Flood Island	20.1m	20.4m	Flooding begins at around 16.4m at North Richmond gauge. 19.3m low point on Windsor St, Richmond affects late evacuations (5).

Floodplain	Area (Sector / Sub-sector)	Flood Classification	Last Road Cut m AHD	Submersion Height m AHD	Comments
Richmond / Windsor / Wilberforce	Richmond (RAO road point ID)	Low Flood Island	20.2m (5)	23.6m (5)	Some properties affected from 15.3m AHD at Richmond gauge, with most unaffected until above the 1% AEP event (17.5m at Richmond gauge). Around 450 flooded in a PMF.
	Windsor Downs	Flood Island (Parts Low parts High)	23.8m (16.7m - 19m internal roads cut) (5)	26.4m (PMF)	About 30 properties are flooded by 17.3m AHD (1% AEP), 260 by 21.9m AHD and 290 in a PMF (5). Some opportunity to escape by foot to the Windsor Downs Nature Reserve.

Note: Not all sectors are shown

Table 4: The main Hawkesbury-Nepean flood risk areas and the heights at which they are expected to be flood affected in other areas

Floodplain	Area (Sector / Sub-sector)	Flood Classification	Last Road Cut m AHD	Submersion Height m AHD	Comments
Lower Hawkesbury	Singletons Mill	Trapped Perimeter	Various locations from 1.2m (24)		Properties will become isolated during smaller flood events, but may be flooded during larger events.
	Gunderman	Trapped Perimeter	1.2 to 2m (24)		Wisemans Ferry Road becomes cut in a number of places between Wisemans Ferry and Spencer.
	Macdonald River	Trapped Perimeter	1.5m to 1.9m (24)		Cut at St Albans Rd (1.5m) and Settlers Rd (1.9m) causing isolations. Also isolated by Ferry Closures. Significant number of properties flooded in a 1% AEP event.
	Lower Reaches	Trapped Perimeter	1.5 to 4m (24)		River Road cut in a number of places from 1.5m AHD. Some caravan parks will become isolated and flood affected during 20% AEP events (5).
	Webbs Creek (ID 297 & 298 road point ID)	Trapped Perimeter	2.05m and 2.28m (24)		Webbs Creek Rd and Chaseling Roads are cut due to flooding (24) and Webbs Creek Ferry closes isolating properties and caravan parks.

Floodplain	Area (Sector / Sub-sector)	Flood Classification	Last Road Cut m AHD	Submersion Height m AHD	Comments
Emu Plains / Penrith / Castlereagh	Penrith / Peach Tree Creek West	Low Flood Island	22.1m at the Penrith gauge (22)		Road cut at Ladbury Avenue. Some possibility to leave by overland route through Tench Reserve, but this way out also gets cut at Jamison Rd close to Anakai Drive at 23.6m AHD.
	Penrith / North Penrith A	Low Flood Island	22.3m at the Penrith gauge (22)		This contains Industrial / Commercial areas.
	Penrith / Regentville (ID 56 road point ID)	Low Flood Island in parts	23.2m at the Penrith gauge (22)		Cut at Factory Road isolating a number of properties near the Nepean River which can be flooded in larger events (22).
	Emu Plains / Emu Heights	High Trapped Perimeter	23.8m at the Penrith gauge (22)	>PMF	Properties become isolated when Wedmore Road close to Alma Crescent is cut (22).
	Emu Plains / East	Low Flood Island	25.7m at the Penrith gauge (22)	28m	River Road is initially cut at Jamison Creek, then along its entire length.
	Emu Plains / Central West	Low Flood Island	25.7m at the Penrith gauge (22)	31m	This area becomes isolated around a 1% event (26m AHD or 11.9m at the Penrith gauge).
	Emu Plains / Leonay E, W, S, N and Central	Overland Escape	34.35m AHD locally (28)		Road evacuation route cut on Leonay Parade at Knapsack Creek culvert.
Wallacia	Wallacia / Bents Basin	Overland Escape	33.9m AHD locally (21)		Bents Basin Road is cut at Baines Ck early during flooding isolating the area. Properties may be flooded during larger flood events. Overland escape may be possible up the hills to the west.
	Wallacia / Sth Wallacia (WA1) (15) and (23) road point ID	High Flood Island	61.5m locally (39.8m main evac route cut)	>PMF	The Park Road Evacuation Route is cut at 39.8m AHD. The alternative route is through a private property on a dirt track. Many properties would be flood affected in a PMF.

Table 5: Estimated number of properties flooded and severely damaged in the Windsor / Richmond / Wilberforce Floodplain during various size flood events related to the Windsor Bridge gauge (29)

River Level m AHD	% AEP (Chance per year)	Number of Properties Flooded	No. Severely Damaged	Number of People Potentially Requiring Accommodation
0.5 -1m	Normal levels	Nil	Nil	Nil
1-11m	33.3% (1 in 3)			Some evacuations from low lying areas and Grono's Point
11-12.5m	10% (1 in 10)	250 rural		750 for one week
13m	7.14 % (1 in 14)	Up to 500		300 for 2 days, 1,200 for one week
14m	4.54% (1 in 22)	Over 1,000		2,800 for 2 days, 2,800 for one week
16m	1.67% (1 in 60)	2,300	550	6,500 for 5 weeks, 1,500 for 3 to 6 months
17.3m	1% (1 in 100)	3,300	850	3,200 for 2 weeks, 6,700 for 5 weeks and 2,400 for 3 to 6 months
18.6m	0.5% (1 in 200)	8,500	900	15,600 for 2 weeks, 21,300 for 5 weeks and 2,500 for 3 to 6 months
20.1m	0.2%(1 in 500)	11,100	1,500	2,000 for 3 months, 25,800 for 6 months and 5,300 up to 12 months
22m	0.07% (1 in 1,500)	18,000	7,800	28,580 for 6 months, 21,840 for 6 to 12 months
26.4m	0.002% (1 in 45,000)	21,300	18,000	9,200 for 6 months, 50,400 for 6 to 12 months

Table 6: Estimated number of properties flooded and severely damaged in the Penrith Floodplain during various size flood events related to the Penrith Victoria Bridge gauge (29)

River Level at gauge m AHD	% AEP (Chance per year)	Number of Properties Flooded	No. Severely Damaged	Number of People Potentially Requiring Accommodation
0.9m (15m AHD)	Usual level	0	0	0
6.9m (21m AHD)	14.3% (1 in 7)	A few	0	Some people would require accommodation
7.9m (22m AHD)	3.12% (1 in 32)	340	15	950 for 1 week, 45 for 3 months
10.4m (24.5m AHD)	2.86% (1 in 35)	450	25	1,250 for 5 weeks, 75 for 3 to 6 months
11.9m (26m AHD)	1% (1 in 100)	2,000	300	5,000 for 5 weeks, 900 for 3 to 6 months
12.9m (27m AHD)	0.5% (1 in 200)	2,600	1,000	4,600 for 3 to 6 months, 3,000 for 12 months
13.9m (28m AHD)	0.11% (1 in 900)	3,200	1,850	3,900 for 3 to 6 months, 5,400 for 12 months
16.9m (31m AHD)	0.005% (1 in 20,000)	4,000	2,000	6,000 for 3 to 6 months, 6,000 for 12 months
17.9m (32m AHD) (PMF)	0.002% (1 in 45,000)	7,200	5,000	6,400 for 3 to 6 months, 14,500 for 12 months

2.6 RISK TO PROPERTY

There is a risk of above floor flooding of properties within the Hawkesbury-Nepean Valley from around a 5% AEP or 1 in 20 year event (13.55m at the Windsor gauge). The number of properties affected by flooding increases markedly with increasing flood size larger than a 1% AEP (1 in 100 chance per year flood) (Tables 5 and 6).

An estimated 28,500 dwellings could be flooded within the Hawkesbury-Nepean Valley during a PMF with over 1000 more isolated (29).

Of the 28,500 properties flooded during a PMF, more than 23,000 or 82% of these are expected to be severely damaged (See tables 5 and 6) (29).

2.7 EVACUATIONS

A PMF flood event would require the evacuation of around 73 000 people from the Hawkesbury-Nepean Valley (Figure 12) (11).

During floods with a 5% chance of occurring each year (AEP) (i.e. 13.7m AHD at Windsor and 23.5m AHD at Penrith) around 2,400 people would require evacuation from flooded properties (11).

This number increases significantly to around 28,000 people requiring evacuation for floods above the 1% AEP (17.3m AHD at Windsor and 26.1m AHD at Penrith) as this is the default planning level at or above which residential floor levels have generally been set by Councils (11).

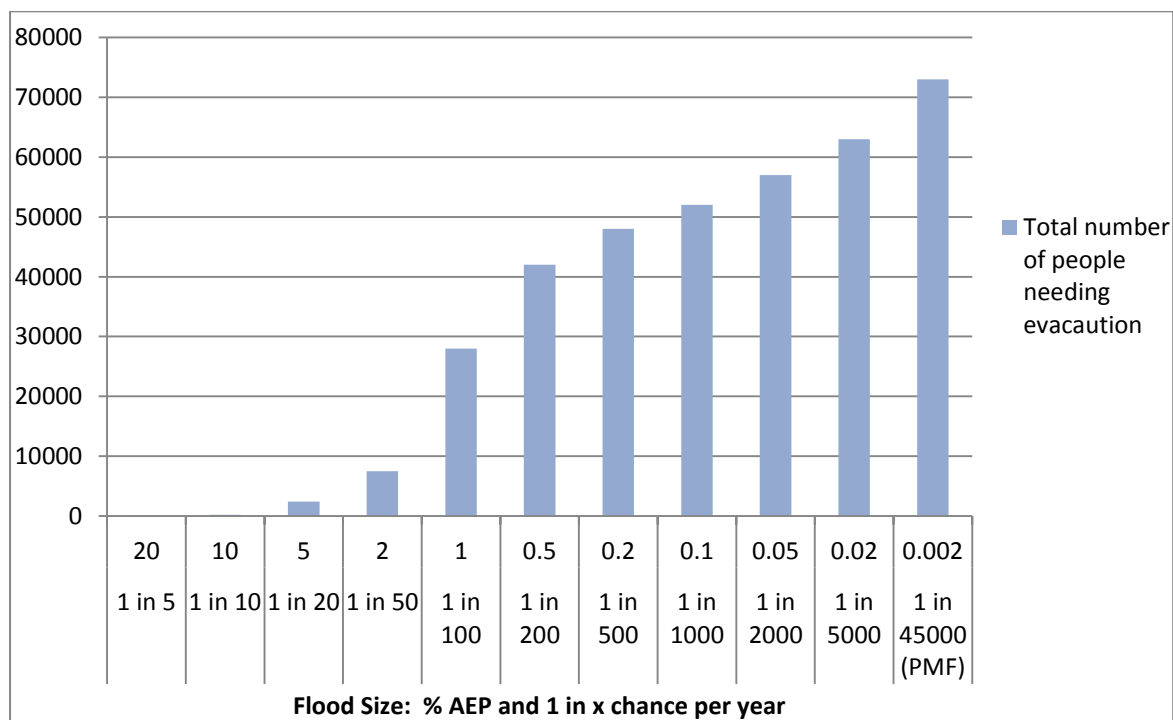


Figure 12: Estimates of the population needing to evacuate in the Hawkesbury-Nepean Valley dependant on flood size

(Source: adapted from NSW Office of Water) (11)

Risk to Life

During Hawkesbury-Nepean Valley floods there is a risk to life from drowning, electrocution and accidents which are mainly related to the depth and velocity of flood waters (29).

The decision point to call an evacuation of people from the Hawkesbury-Nepean Valley may need to be based only on uncertain rainfall predictions. This is due to the amount of time required to evacuate all vehicles, combined with rapid river rises. For example it is expected that the evacuation of Windsor will take around 19hrs (refer to Volume 3 Chapter 2, Table 5).

It means that evacuations may need to be called even before rain has started to fall and when river levels are still contained within the banks (11).

It is anticipated that it may be difficult to convince the community to leave without significant visual cues (29). Because of this people could potentially decide not to leave early enough and may become trapped on shrinking flood islands.

If people fail to evacuate in time there will be an expectation that mass rescues by either boat or helicopter will occur. The community and the government need to be aware that severe weather, resource limitations and the time required to complete such operations may mean that this is not possible and lives may be lost.

2.8 VULNERABLE FACILITIES, PEOPLE AND BUSINESSES

In addition to the evacuations required from residential areas, early evacuation of vulnerable facilities and assistance to other vulnerable people is required during Hawkesbury-Nepean flood events. There are also a number of important facilities located within the floodplain that require early notification of potential flooding.

Hospitals and Aged Care Facilities

There is one public hospital, three private hospitals, and 18 Residential Aged Care Facilities within the Hawkesbury-Nepean Valley (30).

Some facilities including the Hawkesbury Hospital will require evacuation when floods are predicted to reach around 16m AHD at the Windsor gauge and 12.9m (27m AHD) at the Penrith gauge (22).

Others may have to rely on emergency generator power, or consider evacuation if water supply and sewerage were to be disrupted.

Other Vulnerable People

Particular assistance will also be required for the elderly, people living by themselves, those with health related issues, those with disabilities, those from culturally and linguistically diverse communities (CALD) and those who do not have access to their own vehicles.

Schools, Childcare Centres and other Educational Facilities

There are 47 schools and 52 Childcare centres at risk of flooding within the Hawkesbury-Nepean Valley.

The University of Western Sydney and Richmond TAFE are also located within areas that have the potential to be flood affected.

Businesses

There are a large number of businesses potentially affected by flooding within the Hawkesbury-Nepean Valley (29). This includes businesses in town centres and main shopping districts including Windsor, Richmond, Emu Plains and Penrith.

In addition to the main town centres, there are also a number of industrial and commercial precincts including Mulgrave, South Windsor, North Penrith, Peach Tree Creek (Penrith), Jamisontown and Emu Plains that are at risk of flooding.

Caravan Parks

There are approximately 37 caravan parks located within flood prone areas of the Hawkesbury-Nepean Valley. The majority of these caravan parks are located along the banks of the Hawkesbury River downstream of Windsor with a mixture of long term, and short term caravan sites, holiday cabins and camping areas.

Many caravans are owned by people as holiday sites that can live some distance away. Some of these caravan parks are primarily accessed via the Windsor Bridge, and/or car ferries that are cut early during flood events. In the 1% AEP event several parks will be inundated by as much as 9m (5).

Access can be lost early for most of these parks therefore early notification of potential flooding is vital (5).

Correctional Facilities

There are two correctional facilities located within the Hawkesbury-Nepean Valley:

- The Emu Plains Correctional Centre is located on the floodplain at Emu Plains (31).
- The John Morony Correctional Complex incorporating the Dylwynia Correctional Centre (Womens) is located 5 km south of Windsor and is just on the edge of the PMF flood extent (31). Whilst it is not expected to be flooded its access and essential services may be affected.

Royal Australian Air Force Base (RAAF)

The RAAF base located at Richmond is the principal air transport facility for the Royal Australian Air Force. During the day there is expected to be up to 2350 people on the base, with around 800 people at night. However it can have up to 4610 people when at full capacity with Cadets (32). There is also a sewerage treatment plant on site (5).

The RAAF base begins to have some flooding from above a 2% AEP (1 in 50 year) flood event (around 16.4m at the North Richmond gauge).

Most of the base would be flooded in a 0.2% AEP (1 in 500 year) flood event (at around 20.1 to 20.4m at the Nth Richmond gauge) (5).

2.9 HEALTH AND WELFARE

Direct contact with floodwaters can result in people becoming sick due to raw sewage and other contaminants being present in the water (29).

The trauma and stress arising from being evacuated, losing property, cleaning up and having to cope with severely disrupted living conditions can in turn lead to the onset of stress induced illnesses, the aggravation of existing illnesses and in some cases premature death (29).

2.10 UTILITIES AND SERVICES

Flooding can impact on many utilities and services in both the flood affected and surrounding non-flooded areas (Refer to Table 7 and Table 8).

Electricity Supply

Electricity supply to Hawkesbury-Nepean Valley and surrounds is expected to be impacted by flooding due to damage to electricity network infrastructure as well as damage to the actual sub-stations. The amount of damage that is incurred will depend on the depth and velocity of floodwaters involved, as well as the amount of debris build up around them (29).

The first electricity outages to some rural customers are expected at moderate flood levels of around 8m to 10m AHD at Windsor and around 9.9m at Penrith (24m AHD) (29).

Above 14.5m at Windsor, electricity supplies are expected to be cut to the Northern side of the river.

Other electricity outages are expected to occur in both flooded and non-flooded areas as flood levels increase.

Following extreme floods some substations may need to be completely rebuilt, and electricity supplies may be disrupted for a number of months (29).

Communications

During flood events, land telephone systems are expected to be affected in some areas due to loss of electricity as well as inundation of telephone exchanges.

Telephone services will generally be able to be kept operational through the use of battery power for the first 6 hours, then the use of mobile generator power (29). However during major floods of above 22m at Windsor gauge and 13.9m (28m AHD) at Penrith land-line telephone services could potentially be disrupted for up to 2 to 4 weeks (29).

There is also likely to be a reduction of mobile telephone service availability within flooded areas, particularly above 18.6m AHD at the Windsor gauge and above 10.4m (24.5m AHD) at Penrith (29). However, mobile base stations could potentially be used to maintain some level of service if they are available.

Sewerage

There are a number of sewerage pumping stations within the floodplain which could potentially fail due to loss of power supply. This will result in raw untreated sewage being discharged into local waterways until power can be restored (29).

There are eight Sewerage Treatment Plants (STPs) potentially affected by flooding in the Hawkesbury-Nepean Valley. Of these, the Penrith, St Marys, Nth Richmond, Richmond and McGraths Hill STPs are expected to be damaged to such an extent that they will need to be completely rebuilt when flood levels reach 31m AHD at Penrith and 20.1m AHD at Windsor. In these cases reconstruction is expected to take up to 12 months to become fully operational (29).

Water Supply

Water supply could potentially be disrupted by flooding due to damage to pumping stations, loss of electricity or damage to the actual pipelines.

Once the Windsor and North Richmond Bridges are closed, water supplies will be cut off as pipelines over these bridges are closed

as a precaution to protect against damage to the pipes (33).

2.11 TRANSPORT INFRASTRUCTURE

Major road bridge and rail closures within the Hawkesbury-Nepean Valley are detailed in Volume 3 Chapter 4 of this plan and within the relevant local flood plan.

Roads

Road closures including many road evacuation routes will occur throughout the floodplain at various flood levels as listed in Volume 3 Chapter 4. These road closures can isolate people in areas that may subsequently become inundated by flood waters.

Bridges

There are a number of bridges within the Hawkesbury-Nepean Valley that are inundated at various floods heights (ref to Volume 3 Chapter 4). These bridges will likely close prior to the listed heights dependant on debris and engineering assessments. They include (34):

- Blaxlands Crossing Bridge, Wallacia deck height 5.5m at Wallacia gauge (35.13m AHD);
- Yarramundi Bridge (Deck height 6.62m AHD (35));
- Windsor Bridge deck height 7.05m at Windsor gauge (7.2m AHD (35));
- North Richmond Bridge deck height 8.46m at North Richmond gauge (8.8m AHD (35));
- Victoria Bridge at Penrith deck height 15.7m at Penrith gauge (29.83m AHD (35)). However, damage to the Victoria bridge is expected at around 13.9m (28m AHD) at the Penrith gauge (29).
- Regentville Bridge over the M4 Motorway near Penrith deck height 32.79m AHD. Note, due to flood slope this bridge can be flooded during a PMF (35).

Whilst the Yarramundi, Windsor and North Richmond bridges have been designed to be

submerged, the Victoria and Regentville Bridges (Penrith/ Emu Plains) have not.

Rail

There are two main rail lines within the Hawkesbury-Nepean Valley. The Western Rail Line and the Richmond Rail Line. These lines both convey passengers, with the Western Rail Line being important for transporting freight.

Both of these lines can be affected temporarily during minor flooding. The Richmond Rail Line will be closed due to Hawkesbury River flooding west of Schofields when river levels reach around 12.5m (at the Windsor gauge) (5).

If the Victoria Bridge over the Nepean River between Penrith and Emu Plains were to fail it would also take out the rail bridge and the main Western Rail Line affecting rail transport for around 6 months. This will have major implications for commuters as well as freight that are normally transported by rail (29).

The Western Rail Line can also be flooded where it crosses South Creek due to local catchment flooding at a height of 24.8m AHD (1). Refer to Volume 3 Chapter 4 for further details.

Ferries

There are four vehicular ferries at Sackville, Lower Portland, Webbs Creek and Wisemans Ferry. The closure of these ferries result in the isolation of areas with potential difficulties for evacuation. This is particularly the case on the North Western side of the river including the Macdonald Valley, Webbs Creek, Spencer and Gunderman areas.

Ferry closures are dependent on the amount of debris in the flood waters but generally occur when flood levels reach between 3m and 3.5m at the Windsor gauge (Refer to Volume 3 Chapter 4 for further details).

2.12 AGRICULTURE

Much of the lowest lying land within the Hawkesbury-Nepean Valley is rural land used for agricultural purposes including orchards, turf farms, horses and cattle (29).

Direct impacts of flooding include inundation of farm plant and equipment, loss of livestock, damage to livestock fodder reserves and loss of crops in production (29).

There are also many indirect consequences including loss of production during the re-establishment of the business following flooding (29).

In smaller flood events livestock may be able to be moved to higher ground, however moderate and major flooding within the Hawkesbury-Nepean Valley will necessitate large scale movement and where possible evacuation of livestock.

2.13 ENVIRONMENT

Flooding is a natural process bringing with it many environmental benefits including flushing and deposition of rich fertile soils. However, there are numerous potential negative consequences of flooding in the Hawkesbury-Nepean Valley including:

- Significant amounts of debris being deposited within the floodplain including hazardous materials such as asbestos. This build-up of potentially contaminated debris is also expected to have significant waste disposal implications (29).
- Erosion and undermining of riverbanks, which may in turn threaten structures including houses, bridges, weirs, buried pipelines and roads (29).
- Reduced water quality due to sediments, dead livestock and other animals, raw sewage, chemicals and other pollutants from industrial premises and agricultural stores being washed into floodwaters from the catchment (29). If raw sewage continues to be discharged for extended periods of time secondary impacts could include algal blooms and aquatic weed growth.

Table 7: Summary of Utilities and Infrastructure Consequences Richmond / Windsor / Wilberforce Floodplain

Category	Windsor Bridge Gauge	Transport	Power	Telecoms	Sewer	Water
Minor (<3 yr)	Up to 7m	Yarramundi Bridge and Ferries closed causing isolations.				
Moderate (Up to 1 in 3 yr)	Up to 11m	Windsor & Richmond Bridges close	Some outages to rural areas			Loss of water to some areas due to pipes being shut off
Major (1 in 60 yr)	Up to 16m	Evacuation routes closed for Grono's Point, Lowlands, McGraths Hill, Mulgrave, Pitt Town, Yarramundi, Ebenezer and Wilberforce. Richmond train line closed.	Loss of Power to the North of the river for 2 days.	Telephone North of river reliant on battery or generator power. 6,500 properties lose services in evacuated areas.	McGrath Hill Sewerage Treatment Plant (STP) damaged requiring 6 months to be fully operational. Pumping stations fail and raw sewage discharged	Loss of water to some areas. Pump stations flooded but water still available in other areas under water restrictions
Major (1 in 100 yr)	Up to 17.3m	Windsor evacuation route closed	2,400 non-flooded properties without power for 2 weeks		McGrath Hill STP damaged. 6 months to be fully operational. Pumping stations fail and raw sewage discharged	
Major (1 in 1500 yr)	Up to 22m	Richmond and Bligh Park Evacuation Routes closed	No electricity to 20,800 non-flooded properties for >3 months	Loss of services for 2 weeks to some areas. Reduced mobile phone services. GRN reliant on alternate generator power	McGraths Hill STP severely damaged. North Richmond, South Windsor and St Marys STPs also damaged with 12 months to rebuild. Raw sewage discharged	
Extreme (1 in 45000 yr)	Up to PMF 26.4m	Windsor Downs Evacuation Route closed	No electricity to 17,000 non-flooded properties > 3 months			

Table 8: Summary of Utility and Infrastructure Consequences Penrith / Emu Plains Floodplain

Category	Victoria Bridge Gauge, Penrith	Transport	Power	Telecoms	Sewer	Water	Gas
Minor (1 in 7)	Up to 21m AHD (Up to 6.9m at gauge)					Some pumping stations inundated but supplies maintained	
Moderate (Up to 1 in 35)	Up to 24.5m AHD (Up to 10.4m at gauge)	Road closures isolating areas including Peach Tree Ck, Penrith North, Regentville and Emu Heights	Outages to 5,500 non-flooded properties for 2 days	Emu Plains reliant on temporary power. Reduced mobile services	Some pumping systems fail. Raw sewage discharged		
Moderate (Up to 1 in 100)	Up to 26m AHD (Up to 11.9m at gauge)	Road closures isolating additional areas (Emu Plains East and Central)	Outages to around 17,500 properties for between 2 and 14 days	Emu Plains and Penrith reliant on temporary power.	Penrith STP damaged. Shut for 1 week.	Some impacts water restrictions	
Major (Up to 1 in 900)	Up to 28m AHD (Up to 13.9m at gauge)	Victoria Bridge and western rail line are damaged	Penrith sub-station damaged. Outages to non-flooded properties for up to 3 months	Possible reductions in service in and out of Sydney	Many impacts with raw sewage discharged. Around 6 months to repair.	Some damages. Supplies available, under restrictions	No gas supplies west of the Nepean river for three months
Extreme (Up to PMF)	Up to 32m AHD (Up to 17.9m at gauge)	Road closures isolating Leonay. No rail for 6 months	Penrith sub-station destroyed. Without power for 3 to 6 months	Telephone system fails for Penrith and Emu Plains	Many impacts with raw sewage discharged. Around 6 months to repair.		

(Source: Adapted from Molino Stewart Pty Ltd 2012 (29))

- Flooding could potentially impact on the small patches of remaining remnant native vegetation on the floodplain by uprooting or undermining trees and other vegetation, introducing weeds and depleting native fauna populations (29).

2.14 TRANSITION TO RECOVERY

Because of the wide variation in flood behaviour between different flood events, it is difficult to predict how long homes might be inundated or areas isolated. However, an indication for some of the more severe events might be gained from the following:

- During a 1% AEP flood (17.3 metres AHD at Windsor), levels of flooding at Richmond and Windsor (above 10 metres AHD) could last for about 4 to 5 days;
- During a repeat of the 1867 flood (19.3 metres AHD at Windsor), river levels could remain above 25 metres AHD for a day at Penrith and above 16 metres AHD for about three days at Richmond and Windsor. Access to Windsor could be cut for an additional half day;
- During the PMF river levels could remain above 25 metres AHD for up to 3 days at Penrith and above 16 metres AHD for as long as 4 days at Richmond and Windsor. Access to Windsor could be cut for an additional half day.

Once floodwaters have receded, recovery operations and the restoration of services are expected to take some time. Depending on the size of the flood there will potentially be significant repairs that would be required of roads, bridges, utility services such as electricity transmission stations, water supply infrastructure and sewerage treatments plants, some of which may need to be completely rebuilt.

In addition, hundreds to thousands of houses may have been significantly damaged or destroyed (See Tables 5 and 6).

This will mean that large numbers of people could require temporary accommodation whilst their properties are repaired or rebuilt.

- During a 1% AEP flood event around 14,900 people would require temporary accommodation for between 2 and 5 weeks with 3,300 people requiring accommodation for up to 6 months (See Tables 5 and 6).
- Following a PMF, around 15,600 people are expected to require temporary accommodation for up to 6 months, with up to 65,000 people requiring temporary accommodation for up to 12 months (See Tables 5 and 6).

2.15 THE EFFECTS OF A PROBABLE MAXIMUM FLOOD

The Probable Maximum Flood (PMF) is an extremely rare event having a probability of around 0.002% AEP (see Section 1.10 Extreme Flooding) in the Hawkesbury-Nepean Valley. The effects of a flood of this magnitude define the upper limit of what could happen. The PMF would result in an estimated 28,500 homes being flooded, of which 23,000 are expected to be severely damaged (7) (See tables 5 and 6).

In the 72 hour PMF the following river levels could be reached:

- Wallacia – 59.6 metres;
- Penrith – 32.1 metres;
- Richmond – 26.5 metres;
- Windsor – 26.4 metres.

The main impacts at these flood levels are likely to be:

- 100% of Windsor flooded;
- 100% of Bligh Park flooded;
- 100% of Richmond flooded;
- 100% of McGraths Hill flooded;
- 100% of Pitt Town flooded;
- 100% of Agnes Banks flooded;
- 95% of Wallacia flooded;
- 90% of Emu Plains flooded;
- Substantial parts of Penrith, Jamisontown and Regentville flooded;

- 50% of North Richmond flooded;
- 50% of Wilberforce flooded;
- 50% of the Riverstone and Marsden Park area flooded;
- All rural lands on the floodplain inundated.

All electricity supply to the flooded area and surrounds lost for up to 3 months or more (29).

The loss of electricity will mean that water supply pumping stations will need to operate on temporary power supplies to top up local water reservoirs for 3 months or more (29).

Telephone services will be cut to some areas for between 2 to 4 weeks. After this they would be reliant on emergency generator power for 3 to 5 months or more (29).

There is likely to be reduced mobile phone services.

Sewerage treatment plants (STP's) will be inoperable and raw sewage will be discharged into the river. The McGraths Hill, North Richmond, South Windsor, Quakers Hill and Penrith STP's will need to be rebuilt taking between 9 weeks and 1 year before being operable and achieving the required effluent standards (29).

There may be no gas supplies west of the river for around three months.

2.16 THE EFFECTS OF A FLOOD SIMILAR TO THE 1867 FLOOD OF RECORD

In 1867 the most severe flood recorded to date (the flood of record) occurred in the valley. The flood is estimated to have reached levels equivalent to the following gauge heights:

- 19.7 metres on the Windsor Bridge gauge (19.3m adjusted for the dam) with an AEP of between 0.5% (1:200) to 0.33% AEP (1:300) (5);
- 26.1-26.9 metres at Penrith and an 0.6% AEP (1:170);
- No height recorded but at Camden an AEP of only about 6.7% AEP (1:15).

The reason for these differences in probability is that most of the flood flow came out of the Warragamba and Grose River catchments. The 1867 flood was not the most severe flood at all locations.

If a flood similar to the 1867 flood occurred in the present time the main impacts at these flood levels are likely to be:

- Flooding of about 10,500 homes with significant structural damage to about 1,200 of them. A flood of this magnitude would require the evacuation of around 33,000 people (29).
- 100% of McGraths Hill flooded (Low Flood Island), depths up to 3 metres over floor level;
- 80% of Pitt Town flooded and 20% left as a High Flood Island;
- 50% of Windsor flooded, depths up to 3 metres over floor level and 50% left as a High Flood Island;
- 50% of Bligh Park flooded, depths up to 3 metres over floor level;
- 20% of Richmond flooded and 20% left as a High Flood Island;
- 50% of Emu Plains flooded and 15% left as a High Flood Island;
- Backwater flooding up South Creek to Werrington Creek confluence, up Ropes Creek to Forrester Road, and up Eastern Creek to Richmond Road at Quakers Hill;
- Most rural lands on the floodplain inundated;

All electricity supply to the flooded area and surrounds lost for up to 3 months or more (29);

The loss of electricity will mean that water supply pumping stations will need to operate on temporary power supplies to top up local water reservoirs (29);

Telephone services will be reliant on temporary power supplies with services potentially lost to some areas (29);

There will likely be disruption to mobile phone services (22);

The McGraths Hill and Penrith Sewerage Treatment Plants will be damaged. It will take around 1 week for Penrith STP and up to 6 months for McGraths Hill STP to be fully operational and achieve the required effluent standards. A number of sewerage pumping stations will also fail and raw sewage will be discharged into the river (29);

There may be no gas supplies west of the river for around three months.

2.17 THE IMPACT OF LESS SEVERE FLOODS

For floods that are predicted to peak no higher than around 13.5 metres AHD (<5% AEP) at Windsor there will be no need to completely evacuate the major population centres in the valley. The main effects of floods from this level in the areas downstream of Richmond are:

- Around 500 homes in the Hawkesbury LGA would be flooded to ground level including Pitt Town Bottoms, Pitt Town, Richmond Lowlands, Freemans Reach, Ebenezer, Cornwallis, Cattai, McGraths Hill, Mulgrave, North Richmond, Oakville, Sackville, South Windsor, Vineyard, Wilberforce and Windsor (5);
- Windsor Rd, the only evacuation route for McGraths Hill, is cut at 13.5 m AHD;
- Many Caravan and Water Ski Parks would be affected by flooding and will need to be evacuated;
- The Yarramundi, Windsor and Richmond Bridges as well as the four car ferries will be closed with lengthy diversions in place to get across the Hawkesbury River;
- The Richmond Rail Line will be closed due to flooding west of Schofields;
- There may be electricity outages in some areas;
- Some sewerage pumping stations are likely to be flooded with raw sewage being discharged into the floodwaters.

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NSW SES RESPONSE ARRANGEMENTS FOR HAWKESBURY-NEPEAN VALLEY

Volume 3 of the Hawkesbury Nepean Flood Plan

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Chapter 1: Flood Warning Gauges

Chapter 2: Sectors and Evacuation Strategy Selection Considerations

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VERSION LIST

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

Description	Date
Chapter 2 Evacuee Management Arrangements (previously Annex D)	June 2014 (Amended)
Chapter 3 Land Transport Arrangements (previously Annex E)	June 2014 (Amended)

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

Manager, Emergency Risk Management Branch
NSW State Emergency Service, State Headquarters
PO Box 6126, Wollongong, NSW, 2500

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

Amendment Number	Description	Updated by	Date

HAWKESBURY-NEPEAN VALLEY: FLOOD WARNING GAUGES

**Chapter 1 of Volume 3 (NSW SES Response Arrangements for
Hawkesbury-Nepean Valley) of the Hawkesbury Nepean Flood Plan**

Last Update: September 2015

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1. GAUGES MONITORED WITHIN THE HAWKESBURY-NEPEAN VALLEY

- 1.1.1. The gauges monitored within the Hawkesbury-Nepean Valley are listed in Table 1. The key warning gauges for the Hawkesbury Nepean Valley are shaded light grey in the table.
- 1.1.2. Some gauges in Table 1 are warning gauges for which the NSW SES holds flood intelligence cards. Others are automatic gauges that are used by the Bureau to predict flood heights at the key warning gauges.
- 1.1.3. The following symbols are indicated in the Forecast Location column:
 - a. The Bureau of Meteorology provides flood warnings for the gauges marked with an asterisk (*).
 - b. The NSW SES holds a Flood Intelligence Card for the gauges marked with a double cross (‡).
 - c. These proxy gauges are key locations for downstream predictions, critical for the provision of a quantitative flood forecasting service to downstream sites (+).
- 1.1.4. **Real-time data system available at**
 - a. [Bureau Latest River Heights for the NSW Central Coast](#)
 - b. [Department of Primary Industries, Office of Water - Real-Time Data.](#)

Table 1: Gauges monitored within the Hawkesbury-Nepean Valley

Bureau No.	AWRC No.	Forecast location	Station owner	Gauge type	Flood Classification (m)			Flood Warnings provided by the Bureau	Flood Intelligence Card Held	Gauge Zero (m)	Target warning lead time		70% of peak forecasts within	Comments
					Min	Mod	Maj				Time (hrs)	Trigger height (m)		
068216	212904	Menangle *‡	Water NSW	Automatic	5.2	9.2	12.2	Yes	Yes	58.47	6hrs	>5.2m	+/- 0.3m	
568154	212216	Camden Weir +	Water NSW	Automatic	6.8	8.3	13.8			55.284	12hrs	>6.8m	+/- 0.3m	Used as a proxy to predict to 212900
68214	212900	Camden Bridge *‡	Bureau	Manual	6.8	8.3	13.8	Yes	Yes	55.672				212216 is used to predict to this gauge. They read roughly the same.
067093	212202	Wallacia Weir *‡	Water NSW	Automatic	5.0	8.7	11.0	Yes	Yes	29.646	12hrs	>0.5m	+ / - 0.3m	
567047	212201	Penrith *‡	Water NSW	Automatic	3.9	7.9	10.4	Yes	Yes	14.136	6hrs	>8.9m	+/- 0.3m	
											8hrs	>11.3m		
567098	212200	North Richmond WPS +	Water NSW	Automatic						0.326 (STD) 0m AHD	6hrs	>16m	+ / - 0.3m	Used as a proxy to predict to 212902
											15hrs	>18m	+ / - 0.3m	

Bureau No.	AWRC No.	Forecast location	Station owner	Gauge type	Flood Classification (m)			Flood Warnings provided by the Bureau	Flood Intelligence Card Held	Gauge Zero (m)	Target warning lead time		70% of peak forecasts within	Comments
					Min	Mod	Maj				Time (hrs)	Trigger height (m)		
063282	212902	North Richmond Bridge *‡	Bureau	Manual	4.3	8.4	11.0	Yes	Yes	0.34 (STD)				This gauge reads approx. 0.5m higher than the automatic gauge 212200
567044	212426	Windsor PWD+	OEH	Automatic						(Gauge zero is 0 AHD TBC)	6hrs if peak>16	9.6m	+/- 0.3m	Used as a proxy to predict to 212903.
											15hrs if peak>16m	13.7m		
											12-18 hrs	Peak		

Bureau No.	AWRC No.	Forecast location	Station owner	Gauge type	Flood Classification (m)			Flood Warnings provided by the Bureau	Flood Intelligence Card Held	Gauge Zero (m)	Target warning lead time		70% of peak forecasts within	Comments
					Min	Mod	Maj				Time (hrs)	Trigger height (m)		
067095	212903	Windsor *‡	Bureau	Manual	5.8	7.0	12.2	Yes	Yes	0.15				<p>The Bureau predicts for this manual gauge using the automatic gauge 212426.</p> <p>This gauge reads around 0.15m lower than the automatic gauge 212426.</p> <p>Note: There is also another gauge owned by Water NSW with the same AWRC number equivalent to 212426.</p>

Bureau No.	AWRC No.	Forecast location	Station owner	Gauge type	Flood Classification (m)			Flood Warnings provided by the Bureau	Flood Intelligence Card Held	Gauge Zero (m)	Target warning lead time		70% of peak forecasts within	Comments
					Min	Mod	Maj				Time (hrs)	Trigger height (m)		
063280	212406	Sackville *‡	OEH – Manly Hydraulics Laboratory	Automatic	4.6	7.3	9.7	Yes	Yes		18hrs	>4.6	+/- 0.3m	
067094	212407	Lower Portland *‡ (also known as Colo Junction)	OEH – Manly Hydraulics Laboratory	Automatic	4.6	6.1	7.6	Yes	Yes		18hrs	>4.6	+/- 0.3m	
063288	212908	Putty Road *‡	Bureau	Manual	2.7	5.7	10.7	Yes	Yes		12hrs	>5.7	+/- 0.3m	
563033	212290	Upper Colo+	Water NSW	Automatic										Used as a proxy to predict to 212908 with average travel time around 6hrs.
561004	212408	Webbs Creek (Wisemans Ferry) *‡	OEH – Manly Hydraulics Laboratory	Automatic	n/a	3.5	4.2	Yes	Yes	- 0.153	12hrs	>3.5m	+/- 0.3m	

HAWKESBURY-NEPEAN VALLEY: NSW SES SECTORS AND EVACUATION STRATEGY SELECTION CONSIDERATIONS

**Chapter 2 of Volume 3 (NSW SES Response Arrangements for
Hawkesbury-Nepean Valley) of the Hawkesbury Nepean Flood Plan**

Last Update: September 2015

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1 HAWKESBURY-NEPEAN SECTORS AND SUB-SECTORS

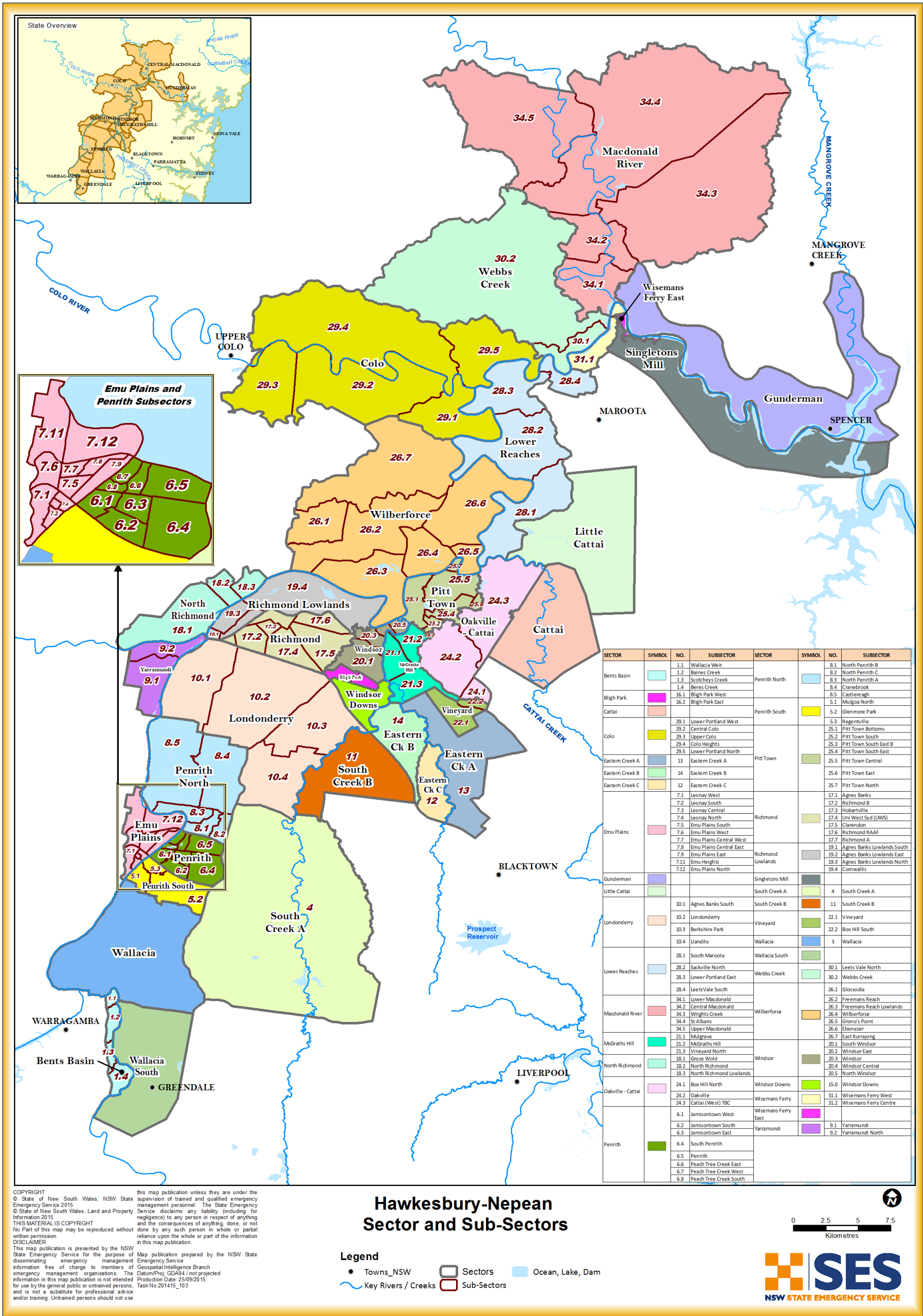
- 1.1.1 The Hawkesbury-Nepean Valley has four main flood plain areas within the area of operation covered by this plan (refer Volume 2: Section 1.2 and Map 2 for further details). These are the:
 - a. Wallacia Floodplain;
 - b. Emu Plains / Penrith Floodplain;
 - c. Richmond / Windsor / Wilberforce Floodplain; and
 - d. Lower Hawkesbury Floodplain.
- 1.1.2 All Sectors and Sub-sectors within the area of operation of this plan are shown in Map 1.
- 1.1.3 The complete list of Sectors and Sub-Sectors is shown below in Tables 1 to 4.

2 SUMMARY OF CRITICAL FLOOD HEIGHTS FOR STRATEGY SELECTION

- 2.1.1 To assist with strategy selection for each Sector / Sub-sector (refer Volume 1 Section 6.7), Tables 1 to 4 below show, in general order of predicted flood height and decreasing overall risk, the Sectors and Sub-sectors to be evacuated according to the floodplain that they are located in.
- 2.1.2 The tables provide the following for each Sector and Sub-sector:
 - a. Flood classification (refer to Volume 2 Section 2.4);
 - b. Height at which the last evacuation route is inundated; and
 - c. Submersion height (where applicable).
- 2.1.3 The key Sectors are the Flood Islands and Trapped Perimeters.

3 EVACUATION TIMINGS

- 1.1.1 Table 5 below summarises the information used to make decisions about the conduct of evacuation operations for various flood island Sectors in a PMF scenario. However, note that in determining decision timings the following will need to be taken into account:
 - a. the actual flood heights achieved prior to the decision point;
 - b. the predicted heights;
 - c. the expected rates of rise over the subsequent time period; and
 - d. any changes to the number of dwellings and vehicles.



Map 1: Sectors and Sub-sectors within the Hawkesbury-Nepean Flood Plan area of Operation

Table 1: Summary of Critical Flood Heights for Strategy Selection – Wallacia Floodplain

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m at Wallacia gauge	Comments
Bents Basin	Baines Creek	Overland Escape Route	33.9m ⁽¹⁾		Bents Basin Road is cut at Baines Creek in a 20% AEP (1 in 5 year) event. This isolates these three sub-sectors with the only escape route overland up a steep hill.
	Scotchcys Creek	Overland Escape Route			
	Beres Creek	Overland Escape Route			
	Wallacia Weir	Overland Escape Route	39.0m ⁽¹⁾	4.25m	People can escape for a time along Silverdale Road until it is also cut at 39.0m AHD in which case they have overland access to the west. Blaxlands Crossing Bridge will also be closed due to flooding.
Wallacia	NA	Rising Road Access (However access out is through South Wallacia High Flood Island)	*39.8m AHD ⁽¹⁾		* The primary evacuation route Park Road is cut at 39.8m AHD in a 5% AEP (1 in 20 year) event. It may be possible to use the Wallacia Alternative Route in an emergency, however part of this route consists of a dirt track through a private property which may not be suitable for vehicles. Greendale Road forming part of the Wallacia alternative route is cut at 61.28m during a PMF event. Mulgoa Road will also be closed due to flooding preventing evacuation to the north.
South Wallacia	NA	High Flood Island and Rising Road Access	* 39.8m AHD ⁽¹⁾ (61.28m) ⁽¹⁾		

Table 2: Summary of Critical Flood Heights for Strategy Selection – Emu Plains / Penrith / Castlereagh Floodplain

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m (At Penrith gauge)	Submersion Height m AHD	Comments
Penrith	Peach Tree Creek West	Low Flood Island	22.1m at Penrith gauge ⁽²⁾	8.0m	32.2 AHD	Cut at Ladbury Avenue as well as High Street and Memorial Ave.
Penrith North	North Penrith A	Low Flood Island	22.3m at Penrith Gauge ⁽²⁾	8.2m	Around 30m AHD	Cut at Castlereagh Rd 0.2% AEP (1 in 500 year) event. Various flood islands form around 30m AHD.
	Cranebrook	Low Flood Island	TBC		28.3m AHD	Area starts to form Low Flood Island in 0.2% AEP (1 in 500 year) event. Waterside Boulevard is cut at (TBC).
	Castlereagh	Rising Road Access (TBC)	TBC			Proposed area for Penrith Lakes development. Cut on Old Castlereagh Road.
Penrith South	Regentville	Low Flood Island in part of sub-sector the rest has Rising Road Access	23.2m at Penrith gauge ⁽²⁾	9.1m	34.2m AHD	Cut at Factory Road (2).
Emu Plains	Emu Plains North	Low Flood Island	23.2m to 23.4m AHD ⁽¹⁾		>PMF	During a 1% event Old Bathurst Road is cut in three places and the area is isolated. Some very small areas of land are flood free in a PMF. Most areas are flooded in a 0.1% AEP (1 in 1000 year) event.
Penrith	Peach Tree Creek South	Low Flood Island	23.6m at Penrith gauge ⁽²⁾	9.5m	28.4m AHD	Cut at Jamison Rd close to Anakai Drive in a 2% AEP (1 in 50 year) event.
	Jamisontown West	Effectivley a Low Flood Island	24.8m AHD ⁽¹⁾		28.9m AHD	Blaike Rd near the intersection with Jamison Road is cut in a 1% AEP event.
Emu Plains	Emu Heights	High Trapped Perimeter	23.8m at Penrith gauge ⁽²⁾	9.7m	>PMF	Wedmore Rd close to Alma Crescent is cut in a 2% AEP (1 in 50 year) event. Able bodied people may be able to climb the hill to the west to escape overland.
Penrith South	Mulgoa North	Overland Escape	25.7m AHD ⁽¹⁾			Mulgoa Road is cut however as last resort people could get out by walking overland to the south or east.
Emu Plains	Emu Plains East	Low Flood Island	25.7m at Penrith gauge ⁽²⁾	11.6m	29.5m	Isolations begin from 1% AEP event.

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m (At Penrith gauge)	Submersion Height m AHD	Comments
	Emu Plains Central West	Low Flood Island	25.7m at Penrith gauge ⁽²⁾	11.6m	> PMF Note: Mostly submerged by 31.9m AHD	Russel Street near Pyramid Street is cut and the area is isolated in a 1% event. A very small area of land is still remaining in a PMF.
	Emu Plains Central East	Overland Escape	25.7m at Penrith gauge ⁽²⁾	11.6m		The Great Western Hwy is cut in 2% AEP (1 in 50 year) event with overland escape possible to the south, however the surrounding sub-sectors may themselves be flooded.
Penrith	Peach Tree Creek East	Low Flood Island	27.1m at Penrith gauge ⁽²⁾	13.0m	32.2m AHD	Mulgoa Road is closed at numerous locations in a 1% (1 in 100 year) event.
	Jamisontown South	Rising Road Access	27.1m at Penrith gauge ⁽²⁾	13.0m		
Emu Plains	Leonay North	Overland Escape	34.2 m AHD ⁽³⁾ (Note: individual sub-sectors are cut at different heights)			The last evacuation route out of all these sub-sectors is via Leonay Parade where it joins with Russel St and the M4 Western Motorway. Overland escape is possible to the west during a PMF.
	Leonay West	Overland Escape				
	Leonay Central	Overland Escape				
	Leonay South	Overland Escape				
South Creek A	South Creek A	Rising Road Access	Not Applicable			
Penrith South	Glenmore Park	Rising Road Access	Not Applicable			
Penrith	Jamisontown South	Rising Road Access	Not Applicable			

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m (At Penrith gauge)	Submersion Height m AHD	Comments
	Jamisontown East	Rising Road Access	Not Applicable			Mulgoa Road becomes cut, evacuation routes via Preston Street and Batt Street.
	South Penrith	Rising Road Access	Not Applicable			
	Penrith	Rising Road Access	Not Applicable			Mulgoa Road is first cut in 1% AEP (1 in 100 year) event.
Emu Plains	Emu Plains South	Rising Road Access	Not Applicable			Gough Street is first cut in a 1% AEP at 26.5m AHD.
	Emu Plains West	Rising Road Access	Not Applicable			
Penrith North	North Penrith B	Rising Road Access	Not Applicable			
	North Penrith C	Rising Road Access	Not Applicable			

Table 3: Summary of Critical Flood Heights for Strategy Selection – Richmond Windsor Wilberforce Floodplain

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Windsor Gauge Height m	Submersion Height m AHD	Sustainability Height m AHD and comments
Wilberforce	Grono's Point	High Flood Island	5.1m AHD locally ⁽¹⁾	6.5m to 6.75m	>PMF	Progressively inundated. Most properties flooded in a PMF. Way out is by road only. Grono Farm Road is cut in 1 in 2 year event.
Richmond Lowlands	Cornwallis	Low Flood Island	8.34m ⁽⁴⁾		23.1m AHD ⁽¹⁾	Numerous isolated islands between 17 and 23m AHD. Various roads cut prior to 8.34m within this sub-sector.
Wilberforce	Freemans Reach Lowlands	Low Flow Island	9.7m AHD ⁽¹⁾	9.5m ⁽²⁾		Hibberts Lane is cut in 20% AEP (1 in 5 year) event.
Richmond Lowlands	Agnes Banks Lowlands North	Low Flood Island	11.9m AHD ⁽¹⁾		18.9m AHD ⁽¹⁾	
	Agnes Banks Lowlands South	Low Flood Island	13.0m AHD ⁽¹⁾		18.3m AHD ⁽¹⁾	Way out is by road only.
	Agnes Banks Lowlands East	Low Flood Island	15.7m AHD ⁽¹⁾		24.3m AHD	Drift Road cut near Inalls Lane at 15.7m AHD in a 2% (1 in 50) event.
North Richmond	North Richmond Lowlands	Low Flood Island	11.6m at the Windsor Bridge ⁽²⁾		20.2m AHD in a 1 in 500 year event.	Terrace Road is first cut at (1 in 5 year event at 11.5m AHD near Redbank Creek (1). Then Terrace Road is cut near Beamont Ave in a 1 in 500 year event at 19.3m AHD (1).
McGraths Hill	McGraths Hill	Low Flood Island	13.5m ⁽⁵⁾		16.0 to 18m ⁽⁵⁾	Around 50 properties flooded by 13.7m AHD. Nearly all 923 houses flooded in a 1% AEP event (6).
	Mulgrave	Low Flood Island				
Eastern Creek C	Eastern Creek C	Low Flood Island	13.5m ⁽⁴⁾			Multiple roads cut from 9.8m AHD (4).
Windsor	North Windsor	Low Flood Island	14m ⁽⁶⁾			Submerged in a 5% AEP (1 in 20 year) event.
Yarramundi	Yarramundi and	Trapped Perimeter	15.1 to 15.5m ⁽⁶⁾		>PMF	Springwood Road is cut.
	Yarramundi North	Trapped Perimeter				

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Windsor Gauge Height m	Submersion Height m AHD	Sustainability Height m AHD and comments
Wilberforce	Ebenezer	High Flood Island		15.5m ⁽²⁾	>PMF	Properties flooded from 11.1m AHD, 50% in a PMF (6).
Pitt Town	Pitt Town Bottoms	Low Flood Island	6.35m AHD locally ⁽⁴⁾	6.2m		Isolations begin when Pitt Town Bottoms Rd is cut (4).
	Pitt Town North	Low Flood Island	7.35m AHD locally ⁽⁴⁾	7.2m		Becomes isolated when Hall Street closes (4).
	Pitt Town Central	High Flood Island	16.0m AHD ⁽²⁾⁽⁶⁾ (Note: individual sub-sectors are cut at different heights)	15.85m	>PMF	The Regional Evacuation Route out of the Pitt Town Sector is cut at 16.0m AHD. 16m sustainability height. Around 60 properties flooded by 13.7m AHD. There is a small high point in Pitt Town that is just above the PMF level (6).
	Pitt Town East	TBC				
	Pitt Town South	Overland Escape				
	Pitt Town South East	TBC				
	Pitt Town South East B	TBC				
Windsor	South Windsor	Low Flood Island	17.3m ⁽⁷⁾ (Note: individual sub-sectors are cut at different heights)	17.15m	26.8m ⁽⁶⁾	The last regional evacuation route out is cut at 17.3m AHD. 17.3m AHD sustainability height. Around 110 properties flooded by 13.7m (6).
	Windsor East	Low Flood Island				
	Windsor	Low Flood Island				
	Windsor Central	Low Flood Island				
Bligh Park	Bligh Park West	Overland escape	18.5m (17.2*) ⁽⁶⁾	18.35m	25.0m (>PMF)	16.0m sustainability height. Around 60 properties flooded by 17.3m AHD (6). Internal road closures from 17.2m (6). Thorley Street exit closed at 18.5m. Some possibility for overland escape.
	Bligh Park East	Overland Escape			Overland flood free in PMF	
North Richmond	North Richmond	Rising Road Access		17.6m ⁽²⁾		

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Windsor Gauge Height m	Submersion Height m AHD	Sustainability Height m AHD and comments
Richmond	Richmond RAAF	Low Flood Island	20.1m ⁽⁶⁾		20.4m ⁽⁶⁾	Flooding begins at around 16.4m at the Richmond gauge.
	Hobartville	TBC (Rising Road Access)	20.2m ⁽⁶⁾		23.6m ⁽⁶⁾	Progressively inundated from 17.5m (at Richmond gauge) (6).
	Clarendon	TBC (Overland Access)				
Windsor Downs	Windsor Downs	Flood Island (Parts are Low parts High)	23.8m	23.65m	26.4m (PMF)	Progressively inundated from 16m. Llandilo evacuation route is cut at 23.8m AHD.
Eastern Creek A	Eastern Creek A	TBC	Not applicable			
Eastern Creek B	Eastern Creek B	TBC	Not applicable			
Cattai	NA	Rising Road Access	Not applicable			Flooding mostly affects along the creek lines. May result in some isolations, however overland escape is possible.
Little Cattai	NA	Rising Road Access	Not applicable			Mostly affects along the creeks lines. Evacuation is via Wisemans Ferry or Halcrows Roads.
Londonderry	Agnes Banks South	TBC (Rising Road Access)	Not applicable			
	Londonderry	TBC (Rising Road Access)	Not applicable			
	Berkshire Park	Rising Road Access	Not applicable			
	Llandilo	TBC (Rising Road Access)	Not applicable			
South Creek B	South Creek B	TBC (Rising Road Access)	Not applicable			
Richmond	Agnes Banks	TBC (Rising Road Access)	Not applicable			

Sector	Sub-sector	Flood Classification	Last Road Cut m AHD	Windsor Gauge Height m	Submersion Height m AHD	Sustainability Height m AHD and comments
	Uni Western Sydney	Low Flood Island	Not applicable		>PMF (Two small islands)	Londonderry Road is the last road access out. Two small islands flood free in a PMF at the eastern side of the sub-sector.
	Richmond A	Low Flood Island	Not applicable			
	Richmond B	Low Flood Island	Not applicable			
North Richmond	Grose Wold	Rising Road Access	Not applicable			
McGraths Hill	Vineyard North	TBC (Rising Road Access)	Not applicable			
Vineyard	Vineyard	Rising Road Access	Not applicable			
Vineyard	Box Hill South	Rising Road Access	Not applicable			
Oakville-Cattai	Box Hill North	Rising Road Access	Not applicable			
Oakville Cattai	Oakville	Rising Road Access	Not applicable			
	Cattai (West) TBC	Rising Road Access	Not applicable			
Wilberforce	Glossodia	Rising Road Access	Not applicable			Largely unaffected by flooding. More indirect affects.
	Freemans Reach	TBC (Rising Road Access)	Not applicable			Last Roads out via Stannix Park Road and Creek Ridge Road.
	Wilberforce	TBC (Rising Road Access)	Not applicable			Last Road out via Kurmond Road.
	East Kurrajong	TBC (Rising Road Access)	Not applicable			Some properties flood affected on West Portland Road with some possibility of overland escape.

Table 4: Summary of Critical Flood Heights for Strategy Selection – Lower Hawkesbury Floodplain

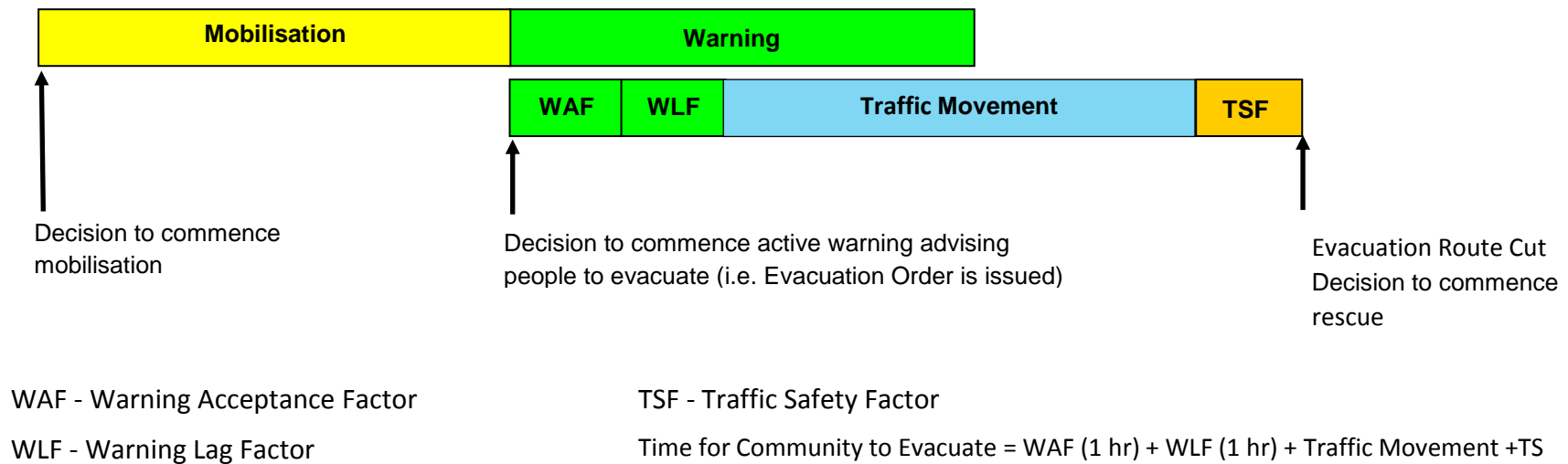
Sector	Sector / Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m	Submersion Height m AHD	Comments
Singeltons Mill	NA	TBC (Trapped Perimeter)	From 1.2m ⁽⁴⁾			Various locations cut along Singelton Mills Rd.
Gunderman	NA	TBC (Trapped Perimeter)	1.2 to 2m ⁽⁴⁾			Various locations cut along Wisemans Ferry Rd.
Macdonald River	Lower Macdonald	TBC (Trapped Perimeter)	1.5m to 1.9m ⁽⁴⁾			Roads cut at various locations including St Albans Road cut at 1.5m AHD and Settlers Rd cut at 1.9m AHD. Wollombi Road is also often affected by local flooding isolating the Macdonald Valley area.
	Central Macdonald	TBC (Trapped Perimeter)				
	Wrights Creek	TBC (Trapped Perimeter)				
	St Albans	TBC (Trapped Perimeter)				
	Upper Macdonald	TBC (Trapped Perimeter)				
Lower Reaches	South Maroota	TBC (Parts High Flood Island)	1.5 to 4m ⁽⁴⁾			River Road is cut in a number of places from 1.5m AHD ⁽⁴⁾ .
	Sackville North	Rising Road Access				
	Lower Portland East	TBC (Trapped Perimeter)				
	Leets Vale South	TBC (Trapped Perimeter)				

Sector	Sector / Sub-sector	Flood Classification	Last Road Cut m AHD	Gauge Height m	Submersion Height m AHD	Comments
Webbs Creek	Leets Vale North	TBC (Trapped Perimeter)	1.78m ⁽⁴⁾			Cut on Chaseling Rd. Parts may be isolated during minor flood events between 1-7m at the Windsor Gauge (2). Others have Rising Road Access out to the west.
Webbs Creek	Webbs Ck	TBC (Trapped Perimeter)	2.28m ⁽⁴⁾			Cut on Webbs Ck Rd. May be isolated during minor flood events between 1-7m at the Windsor Gauge (2).
Colo	Lower Portland West	TBC (Most have RRA, some Overland Escape)		Exact heights not available. Between 1-7m at the Windsor gauge ⁽²⁾		May become isolated during minor flood events between 1-7m at the Windsor Gauge (2).
	Central Colo	TBC (Overland Escape / Trapped Perimeter)				The Lower Colo Road is cut during a 10% AEP (1 in 10 year) event. Able bodied people may be able to climb the hills behind to escape.
	Upper Colo	TBC (Trapped Perimeter)				Upper Colo Road is cut. Evacuation Route out is via Comleroy Road which is also cut.
	Colo Heights	Rising Road Access				Evacuations via the Putty Road
	Lower Portland North	TBC (Trapped Perimeter)				Greens road is cut.
Wisemans Ferry	Wisemans Ferry West	Rising Road Access	Not Applicable			
	Wisemans Ferry Centre	Rising Road Access	Not Applicable			
Wisemans Ferry East	Wisemans Ferry East	TBC (Trapped Perimeter)	Not Applicable			

TBC: These classifications are undergoing further review taking into account further flood modelling and analysis.

Table 5: Flood Islands in Hawkesbury LGA – Indicative Evacuation Timings

Sector	Estimated No. of Vehicles Requiring Evacuation (1)	Estimated time required for Community to Evacuate (2) (3)	Estimated time required for Warning (4) (5)	Level at which evacuation route is cut (AHD) (6)
McGraths Hill	2756	8.09 hrs	5.46 hrs	13.5m
Pitt Town	1071	4.77 hrs	3 hrs	16.0m
Windsor	8494	19.16 hrs	14.77 hrs	17.3m
Bligh Park	5611	13.85 hrs	10.18 hrs	18.5m
Richmond	9088	20.65 hrs	15.79 hrs	20.2m



1. The estimated number of vehicles is based on studies by Molino Stewart (9) which estimated the number of dwellings and businesses requiring evacuation and used a conversion factor to estimate the number of vehicles. These calculations assume that there will be on average 1.8 vehicles per dwelling and 2 vehicles per business. In addition to this there is a provision for buses.
2. The estimated time required for the community to evacuate is the time taken by the community to evacuate once a warning (i.e. evacuation order) is issued and when the last vehicle is expected to be out (assuming mobilisation has already occurred). It is based on an assumed vehicle movement of 600 vehicles per hour travelling on a single lane, plus a 1 hour allowance for acceptance of warnings (WAF) + a 1 hour warning lag factor to account for packing (WLF) + a traffic safety factor to cater for vehicle breakdowns/road crashes (TSF). In order to generate vehicle movements of 600 vehicles per hour or more, a minimum number of 28 doorknocking teams are required for each sector. However this may need to be varied if these vehicle movement rates are not being achieved. An average doorknock rate of 5 minutes per dwelling is used in calculating the time taken to warn.
3. Warnings (i.e. Evacuation Orders) will be disseminated concurrently with expected traffic movement and therefore do not affect the total time required for evacuation. The time taken to warn is the time taken to doorknock the sector plus a warning lag factor (WLF) of 1 hour to allow time for people to pack their essential items.
4. A 6 hour time allowance (i.e. Mobilisation time) is assumed to cater for the mobilisation for emergency resources as well as for the evacuation decision process. This time precedes the commencement of the concurrent warning and traffic movement phases.
5. Levels where evacuation routes are cut are quoted to the Australian Height Datum (AHD). Note that The Windsor Bridge Gauge has its zero point (Datum) set at 0.15 metres AHD (i.e. Land near the gauge at a height of 7.15mAHD would be equivalent to a height of 7.0 metres on the gauge).
6. Note that traffic movement rates will be slower on some road segments due to convergence of road evacuation routes so the time frames estimated above should be considered to be indicative only.
7. Health facilities will normally require much longer to evacuate so early notification is vital.

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HAWKESBURY-NEPEAN VALLEY: NSW SES EVACUEE MANAGEMENT ARRANGEMENTS

**Chapter 3 of Volume 3 (NSW SES Response Arrangements for
Hawkesbury-Nepean Valley) of the Hawkesbury Nepean Flood Plan**

Last Update: September 2015

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1 EVACUEE MANAGEMENT ARRANGEMENTS

- 1.1.1 The Evacuee Management Arrangements outlined within this chapter deal with all levels of flooding where this plan applies.
- 1.1.2 Evacuation centres will be established and managed in accordance with the relevant provisions of the:
 - a. NSW State Emergency Management Plan Evacuation Management Guidelines (1).
 - b. NSW State Emergency Management Plan Major Evacuation Centre Guidelines (2).
- 1.1.3 Evacuation Centres are established to meet the immediate needs of disaster affected people and their companion animals following evacuation. This may include travellers (commuters and tourists), who are unable to complete their journey (1).
- 1.1.4 When an evacuation is ordered, evacuees will be encouraged to take their pets and companion animals with them. Arrangements for the care and accommodation of animals are determined by the Agriculture and Animal Services Functional Area.
- 1.1.5 Ideally, animal holding facilities will be co-located with evacuation centres.
- 1.1.6 Evacuation Centres provide facilities and services including but not limited to (1):
 - a. Food and water;
 - b. Personal support;
 - c. Basic health assistance and disability support;
 - d. Information regarding general welfare support;
 - e. Emergency financial assistance;
 - f. Emergency accommodation;
 - g. Material aid;
 - h. Disaster victim registration.
- 1.1.7 When an evacuation order is issued evacuees will be advised to go to friends or relatives outside of the flood affected area, or else to an evacuation centre.
- 1.1.8 Experience in past flood operations in NSW shows that most evacuees make their own accommodation arrangements with family, friends or motels/hotels.
- 1.1.9 There may be a greater demand for evacuation centres during major Hawkesbury-Nepean Floods if people fail to evacuate in time using their own vehicles and instead require rescue by either boat or helicopter.

1.2 ACTIVATION OF EVACUATION CENTRES

- 1.2.1 The Welfare Services Functional Area Coordinator will coordinate the establishment and management of evacuation centres with the exception of Major Evacuation Centres (refer to 1.2.3).
- 1.2.2 The establishment of evacuation centres would also require the involvement of the following liaison officers based at the NSW SES Sydney Western Region Headquarters:
 - a. Welfare Services Liaison Officer;
 - b. Health Services Liaison Officer;
 - c. Transport Services Liaison Officer; and
 - d. Animal and Agriculture Services Liaison Officer.
- 1.2.3 Where the scale and duration of the emergency is anticipated to be beyond the capability and capacity of the established local / regional evacuation centre arrangements the need for the establishment of a Major Evacuation Centre is to be assessed (2). This assessment will be done by the NSW SES Sydney Western Region Incident Controller and the State Emergency Operations Controller (SEOCN) in consultation with the (2):
 - a. Welfare Services Functional Area;
 - b. Health Services Functional Area;
 - c. Animal and Agriculture Services Functional Area;
 - d. Transport Services Functional Area; and
 - e. State Emergency Recovery Controller (SERCON).
- 1.2.4 If a Major Evacuation Centre is required, this will be established and managed within the Sydney Metropolitan area by the SEOCN (2).
- 1.2.5 Not all evacuees will be able to access a Major Evacuation Centre located in the Sydney Metropolitan area due to bridge, road and ferry closures. As such one or two small evacuation centres may also need to be established in areas to the West and/or North West of the Hawkesbury-Nepean River where resources allow (Refer to Table 1).

1.3 EVACUATION CENTRE LOCATIONS

- 1.3.1 The principles to be followed in establishing Evacuation Centres include:
 - a. They are to be established outside the area bounded by the upper limit of flooding (PMF).
 - b. They are to be established in areas that are not anticipated to be affected by the loss of essential services such as electricity, water and sewage.

- c. They are to be established in areas with infrastructure capable of dealing with the anticipated numbers of evacuees that may require assistance.
 - d. In floods that are predicted to reach a moderate or major level or higher (Above 11m at the Windsor Bridge gauge and above 7.9m / 22m AHD at the Victoria Bridge gauge, Penrith) the need for a Major Evacuation Centre in Sydney, with possible small evacuation centres on the west and/or north western side of the Hawkesbury-Nepean River should be considered.
- 1.3.2 A major evacuation centre in Sydney should be located in accordance with the Major Evacuation Centre Guideline (2).
- 1.3.3 Potentially suitable facilities that may be chosen from for use during minor to moderate flood events are listed in Table 1. Only one or two of these evacuation centres would be opened at any one time based on the requirements for the event.

Table 1: Potential facilities that may be able to be used as evacuation centres during minor to moderate Hawkesbury-Nepean flood events

LGA	Location	Address	Relevant Sectors
Penrith	Penrith High School	High St, Penrith	Penrith Penrith South
	Jamison High School	Evan & Maxwell Sts, Penrith	Penrith Penrith South
	Nepean College of TAFE – Kingswood	12-44 O’Connell St, Kingswood	Penrith Penrith South
	Nepean Campus UWS	O’Connell St and Second Ave	Penrith Penrith South
	Kingswood High School	Corner of Bringelly Rd and Smith St, Penrith	Penrith Penrith South Wallacia
	Colyton High School	Carpenter St, St Marys	South Creek A
	Cambridge Park High School	Harrow Rd, Cambridge Park	South Creek A
	Cranebrook High School	Hosking St Cranebrook	Penrith North
Blue Mountains	Glenbrook Bowling Club	8 Hare St, Glenbrook	Emu Plains
	Blaxland High School	Coughlan St, Blaxland	Emu Plains
	Winmalee High School	High School Drive, Winmalee	Emu Plains Yarramundi
Blacktown	Rooty Hill RSL	55 Sherbrooke St, Rooty Hill	Windsor Londonderry Wallacia
	Blacktown RSL	Second Ave, Blacktown	Windsor

LGA	Location	Address	Relevant Sectors
Blacktown	Blacktown Workers Club	55 Campbell St, Blacktown	Windsor Bligh Park Richmond
	Seven Hills/Toongabbie RSL	Best Rd, Seven Hills	Windsor
The Hills	Castle Hill RSL	77 Castle St, Castle Hill	Pitt Town Oakville/Cattai
	Dural Country Club	662A Old Northern Rd, Dural	Cattai to Lower Portland
	Glenorie RSL	Post Office Road, Glenorie	Pitt Town Oakville/Cattai
	Dural Sport & Leisure Centre (Round Corner Dural)	1 Pellitt Lane, Dural	Wisemans Ferry Lower Reaches Singletons Mill
	Castle Hill Showground (Harvey Lowe Pavilion)	Doran Drive, Castle Hill	Prior to ferries closing: Macdonald Valley Webbs Creek Gunderman
	Rouse Hill Community Centre	Clower Avenue, Rouse Hill	
	South Maroota Community Centre	Cnr Pauls and Wisemans Ferry Roads, South Maroota	
	Wrights Road Community Centre	Wrights Road Castle Hill	
Hawkesbury	Colo High School	218 Bells Line of Rd, North Richmond	North Richmond
	Hawkesbury High School	Hibberts Lane, Freemans Reach	Wilberforce
Parramatta	Parramatta Leagues Club	13-15 O'Connell St, Parramatta	McGraths Hill Eastern Creek A Eastern Creek B Eastern Creek C South Creek B
	Wentworthville Leagues	50 Smith St, Wentworthville	Windsor
Gosford	Mangrove Mountain Memorial Golf Club and Golf Course	18 Hallards Road, Central Mangrove	Macdonald Valley Gunderman Webbs Creek

Note: Only one or two would operate at any one time

1.4 EVACUATION WARNING AND ORDER DELIVERY

- 1.4.1 People within specific areas (sectors) will be advised to prepare to evacuate through the dissemination of Evacuation Warnings by the NSW SES as detailed in Volume 1 Section 7.28.

- 1.4.2 The NSW SES will issue Evacuation Orders to specific areas (Sectors) to notify people that they will need to commence evacuation as detailed in Volume 1 Section 7.28.
- 1.4.3 Evacuation orders will provide advice to people about which evacuation route they should take and the location of any Evacuation Centres and animal holding areas they may wish to access. Further details regarding these evacuation routes, and which area (sector) should use which route is provided in Volume 3 Chapter 4.

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<http://www.emergency.nsw.gov.au/home.html>.
2. **SEMC Evacuations Working Group.** *State Emergency Management Plan: Major Evacuation Centre Guideline.* s.l. : NSW Government, June 2014. <http://www.emergency.nsw.gov.au/home.html>.

HAWKESBURY-NEPEAN VALLEY: NSW SES FLOOD EVACUATION ROUTES, TRAFFIC AND TRANSPORT ARRANGEMENTS

**Chapter 4 of Volume 3 (NSW SES Response Arrangements) of the
Hawkesbury Nepean Flood Plan**

Last Update: September 2015

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1 INTRODUCTION

1.1 SCOPE

1.1.1 This chapter covers:

- a. **Transport and traffic management arrangements for infrastructure impacts** - that apply within the Hawkesbury-Nepean Valley when the main bridges ferries and rail lines are cut by flooding.
- b. **Evacuation** management requirements including:
 - Management of evacuation of people using their own vehicles;
 - Management of buses for evacuation.
- c. **Rescue** – transport arrangements for transferring people being rescued from isolated areas, using flood boats and helicopters, to other transport options.
- d. **All Clear and return** – Transport and traffic management arrangements supporting people to re-enter areas that have been affected by flooding.

1.2 RELATIONSHIP BETWEEN PLANS

- 1.2.1 The emergency management requirements for traffic management on regional evacuation routes are detailed in this Chapter.
- 1.2.2 The Draft Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2) (prepared and maintained by Transport for NSW) provides the detailed traffic management arrangements for the Regional evacuation routes.
- 1.2.3 Traffic management arrangements for sector evacuation routes are detailed in Local Flood Plans. Traffic Control Plans (TCP) for each location specified in the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2) are developed by the RMS, TMC and/or Council. The TCPs describe the detailed traffic management arrangements and resources required for that specific location.

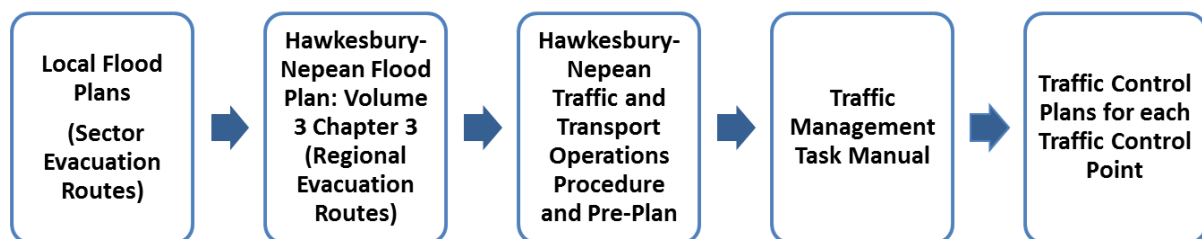


Figure 1: Relationship between Plans outlining the Flood Transport and Traffic Management Arrangements

2 TRANSPORT MANAGEMENT ARRANGEMENTS

2.1 INTRODUCTION

- 2.1.1 The Transport Services Functional Area will coordinate the provision of bus transport resources including:
- a. Movement of emergency service personnel.
 - b. Buses in support of transport infrastructure impacts:
 - Richmond and Western rail line closures.
 - c. Buses in support of evacuation:
 - Assisting in the evacuation of residents who do not have their own vehicles.
 - Assisting the Health Services Functional Area in evacuating nursing homes, aged care facilities and hospitals (note that health facilities would generally require more specialised transport than buses).
 - The evacuation of critical facilities including schools where other transport is not available.
 - Pick up stranded people from broken down vehicles on regional road evacuation routes.
 - Possible transport of evacuees from evacuation centres to other locations.
 - d. Buses in support of rescue operations:
 - Assist with the transport of people that have been rescued via flood boat or helicopter.
- 2.1.2 Requests for aero-medical transport will be referred to the NSW Ambulance Service as outlined in Volume 1 of this plan.

2.2 BUS REQUIREMENTS AND ARRANGEMENTS

Sourcing of Resources

- 2.2.1 The Transport Services Functional Area has agreements in place for the use of privately owned resources during emergencies. The Functional Area holds detailed lists of both Government and privately owned bus operators. For effective coordination of the available resources, requests for bus transport should be made through the NSW SES Sydney Western Region Headquarters to the Transport Liaison Officer.
- 2.2.2 School buses will be organised separately under existing arrangements between bus companies and schools (3). Schools will be provided with early advice regarding the need to evacuate as detailed in Volume 1 of this plan.

- 2.2.3 Sydney Trains also has arrangements in place for the replacement of rail services with buses should they be required.

Tasking

- 2.2.4 The Transport Liaison Officer at the EOC will coordinate the allocation of buses where there are competing bus resource needs. The rationale to be used for the tasking will be the best use of available resources to meet the needs and requirements of the NSW SES and other agencies.
- 2.2.5 A mixture of strategies can be deployed to allow the successful evacuation of affected people. Planning will need to take into consideration variants such as, bus availability, number of people to be evacuated, timeframe available to execute the evacuation and distance/time taken including the return trip to travel.

Bus Requirements

- 2.2.6 It is expected that up to 3% of the population would require bus transport as they do not have their own vehicle access (3). During an extreme PMF event up to 44 bus journeys are expected to be required to transport these people. This estimate is based on a population of approximately 73,000 people requiring evacuation (4), and assumes that each bus would hold 50 people (3).
- 2.2.7 Buses may also be required to assist stranded motorists within evacuation routes where a mechanical breakdown of their vehicle has occurred.

3 TRANSPORT INFRASTRUCTURE IMPACTS

3.1 INTRODUCTION

- 3.1.1 Some of the first noticeable impacts of floods within the Hawkesbury-Nepean Valley are those that result in the closure of traffic and transport routes including:
- a. Bridge Closures;
 - b. Ferry Closures; and
 - c. Rail line closures.
- 3.1.2 At minor flood levels these closures can cause inconvenience and some isolations. However during larger flood events some of these closures can affect the ability of people to evacuate from flooded areas and can have long term implications during the recovery phase.

3.2 BRIDGES

- 3.2.1 During minor to moderate Hawkesbury-Nepean Floods (Below 12.2m at the Windsor Gauge) a number of key bridges will close resulting in significant road diversions in order to cross the Hawkesbury River.
- 3.2.2 The main bridge closures during minor to moderate floods include:
- a. Yarramundi Bridge, Yarramundi;
 - b. North Richmond Bridge, North Richmond;
 - c. Windsor Bridge, Windsor; and
 - d. Cattai Road Bridge, Cattai
- 3.2.3 During 'major' flood events (above 12.2m at the Windsor Gauge / and above 10.4m (24.5m AHD) at the Penrith Gauge) additional bridges may also be closed due to flooding including some that are on Regional and Sector Evacuation Routes. These include:
- a. Richmond Road Bridge over South Creek on the Blacktown - Richmond Road Evacuation Route;
 - b. The Jim Anderson Bridge over South Creek, Windsor on the Hawkesbury Valley Way Evacuation Route;
 - c. Victoria Bridge, over the Nepean River between Penrith and Emu Plains on the Great Western Highway sector evacuation route.
- 3.2.4 Flooding of the South Creek catchment from local catchment flooding could also result in the temporary closure of bridges on the M4 Western Motorway and Great Western Highway Regional Evacuation Routes (5).
- 3.2.5 The deck height of these bridges and the responsible agency for managing bridge closures are detailed in Table 1.

- 3.2.6 Bridge closure heights are dependent on a range of factors including the amount of debris present within floodwaters, the rate of rise of floodwaters and water velocity. Bridges will be monitored by the responsible agency and the decision to close them will be made by these agencies dependant on the individual circumstances surrounding each flood event.
- 3.2.7 More detailed arrangements for the closure of these bridges are outlined in the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2) as well as their associated Traffic Control Plans.

3.3 FERRIES

- 3.3.1 During initial low level flooding the closure of ferries at Sackville, Lower Portland, Webbs Creek and Wisemans Ferry causes local inconvenience and diversions.
- 3.3.2 When combined with local road closures due to flooding, ferry closures can result in some areas becoming isolated. This isolation occurs particularly on the North western side of the Hawkesbury River including the Macdonald Valley and Webbs Creek areas.
- 3.3.3 The Wisemans Ferry, Sackville, and Webbs Creek ferry closures are managed by the Roads and Maritime Services (RMS), whilst the Lower Portland Ferry is managed by Hawkesbury City Council.
- 3.3.4 Ferry closures are dependent on the velocity of floodwaters as well as the amount of debris present in the floodwaters.
- 3.3.5 The heights at which these ferries are likely to be closed are detailed in Table 2. However these heights are a guide only, and will be different for each flood event.

Table 1: Major Bridge Closures due to Flooding

Bridge Name	Closure location	Consequence of closure	Alternate Route	Bridge Deck level (Note: Will close prior to this height)	Agency Responsible for Closure
Cattai Creek Bridge (Cattai1) (6)	Cattai Creek crossing at Cattai Rd	Forces people to take longer alternative routes	Via Pitt Town Rd, Dural Rd, Old Northern Rd and Wisemans Ferry Rd	3.2m AHD deck height (Approx 3.05m at the Windsor gauge)	RMS (contractors)
Yarramundi Bridge (YA0) (7)	Hawkesbury-Nepean River crossing at Yarramundi, Springwood Road	Forces people to take longer alternative routes	Via M4 Western motorway (Regentville Bridge)	6.62m AHD deck level	RMS (contractors)
Windsor Bridge (WN0) (7)	Hawkesbury River crossing at Windsor, Bridge St	Forces people to take longer alternative route	Via Bells Line of Road (North Richmond Bridge) or M4 Motorway	Deck height is 7.2m AHD (7.05m at Windsor gauge).	RMS (contractors)
North Richmond Bridge (NR0) (7)	Hawkesbury River crossing at North Richmond, Bells Line of Road / Kurrajong Rd	Forces people to take much longer alternative route	Via Bells Line of Road, Blue Mountains then M4 Western Motorway (Regentville Bridge)	8.80m AHD deck level (8.46m at Richmond gauge)	RMS (contractors)
Richmond - Blacktown Road Bridge (WN16) (8)	Blacktown Road where it crosses South Creek	Forces people to take much longer alternative route	The Northern Road or Llandilo Road Evacuation Routes	14.2m AHD deck level (Approx 14.05m at Windsor gauge)	RMS (contractors)
Jim Anderson Bridge, Windsor (Windsor1) (9)	Hawkesbury Valley Way Evacuation Route over South Ck	Last evacuation route out of Windsor	None	17.3m AHD (17.15m at the Windsor gauge)	RMS (contractors)
Victoria Bridge, Penrith (Nepean 0) (7) (10)	Great Western Highway, Nepean River Penrith / Emu Plains	Bridge and rail line expected to be damaged. Cuts direct access between	Via Regentville Bridge on the M4 Western Motorway	29.83m AHD Bridge deck height (15.7m at Penrith gauge). Is expected to be	Penrith City Council

Bridge Name	Closure location	Consequence of closure	Alternate Route	Bridge Deck level (Note: Will close prior to this height)	Agency Responsible for Closure
		Penrith and Emu Plains		damaged around 13.9m (28m AHD) at the Penrith gauge	
M4 Motorway Bridge at Regentville (Penrith 1) (7)	M4 Motorway crossing of the Nepean River	Last available crossing of the Nepean River	None	32.79m AHD deck level Note: This bridge can be flooded in a PMF due to the flood slope upstream of the Penrith gauge.	RMS (contractors)
Bridge over South Creek on Great Western Highway (5)	South Creek crossing of the Great Western Hwy near St Mary's	Temporarily closes Regional Evacuation Route for up to 5.5 hours during a PMF (5)	M4 motorway, however it is also likely to be flooded at the same time.	Around 25.2m AHD due to local catchment flooding	RMS (contractors)
M4 Western Motorway (South Creek Crossing) (5)	South Creek crossing near St Mary's	Temporarily closes major flood evacuation route for up to 4 hours during a PMF (5)	The Great Western Highway, however this is also likely to be flooding at the same time.	Around 28.5m AHD due to local catchment flooding	RMS (contractors)
M4 Western Motorway (Ropes Creek Crossing) (5)	Ropes Creek crossing near Erskine Park	Temporarily closes major flood evacuation route for up to 4 hours during a PMF (5)	The Great Western Highway, however this is also likely to be flooding at the same time.	Around 44.2m AHD due to local catchment flooding	RMS (contractors)
Blaxlands Crossing Bridge (Nepean River at Wallacia) (11)	Silverdale Road, Wallacia (Nepean River crossing)	Access cut between Wallacia and western side of the river	Silverdale Road (West side) and Park Road or Wallacia Alternative Route (East side)	Deck height 35.13m AHD, (Approx 5.5m at Wallacia weir gauge) but will be closed prior to this height.	Wollondilly Council

Table 2: Ferry Closures due to Flooding Impacts

Ferry	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Responsible Agency
Sackville Ferry (12)	Between Sackville Road and Sackville Ferry Rd	Cuts access between Sackville and Sackville North	Via Wisemans Ferry Rd and Sackville Ferry Rd or via East Kurrajong Rd	3.0 to 3.5m depending on debris (a)	RMS
Lower Portland (13)	Between River Road, Lower Portland	Cuts access between West Portland Road and River Road	Via Webbs Ck Ferry (if still open) or for eastern bank through Maroota	3.0 to 3.5m depending on debris (a)	Hawkesbury City Council
Webbs Creek	Between River Rd, Wisemans Ferry and St Albans Road	Cuts access to St Albans Rd and isolates the North West side of river (assuming ferries are also closed)	Use Wisemans Ferry (if still open) and Settlers Rd.	3.0 to 3.5m depending on debris(a)	RMS
Wisemans Ferry	Between Old Northern Rd, Wisemans Ferry and Wisemans Ferry Road	Cuts access between the north and south sides of the river.	None. Access to Gosford is via Brooklyn, but only if Wisemans ferry Rd is still open.	3.0 to 3.5m (a)	RMS

Notes:

(a) Related to the Windsor Bridge Gauge at Windsor

3.4 TRAINS AND RAIL LINES

- 3.4.1 Both the Richmond and Western Rail Lines are at risk of closure due to flooding. The flood heights around which they are expected to be closed are provided in Table 3.
- 3.4.2 The Richmond Rail Line is likely to be closed first due to flooding to the west of Schofields.
- 3.4.3 The Western Rail Line at Penrith could potentially be closed for an extended period of time if its bridge over the Nepean River at Penrith is damaged and/or needs to be rebuilt during floods around 13.9m (28m AHD) or greater at Penrith.
- 3.4.4 During evacuations from Windsor onto the Hawkesbury Valley Way Route, evacuation traffic needs to cross the Richmond Rail Line in a number of locations as detailed in Table 3 and the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2).
- 3.4.5 If not already closed due to flooding, this Richmond Rail Line will need to be closed to allow for the evacuation of vehicle traffic. Rail line closures are the responsibility of NSW Trains.
- 3.4.6 Buses to replace trains will be organised through the Transport Functional (See also Section 2.2.3).
- 3.4.7 The Transport Liaison Officer will assist with the coordination of the allocation of buses where there are competing bus resource requirements.
- 3.4.8 Transport arrangements for the movement of freight by truck instead of rail will need to be considered by the Transport Functional Area, the SERCON and Recovery Committees during the Recovery phase.

3.5 COMMUNICATION OF TRANSPORT INFRASTRUCTURE IMPACTS

- 3.5.1 Public communication of Transport Infrastructure impacts to Bridges, Ferries, Rail and Road Closures can be divided into:
 - a. Pre-warning of possible flood impacts;
 - b. Actual closure details when they occur.

Pre-warning of Possible Impacts

- 3.5.2 This would involve the issuing of a Flood Bulletin by the NSW SES, which could include the notification of the likely closures of major bridges, ferries, rail and roads.
- 3.5.3 The NSW SES will advise of likely closure based on the Bureau predicted flood height rather than specifying when and at what height these will be closed.

Communication of Actual Impacts

3.5.4 The communication of actual impacts including most major bridge, ferry or road closures is the responsibility of the Transport Functional Area through their existing communication channels as outlined in Section 5.3.

3.5.5 Local road, bridge and some ferry closure notifications are the responsibility of the relevant Council.

Table 3: Rail Closures due to Flooding Impacts and for Evacuation Purposes

Floodplain	Rail Impact	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Richmond / Windsor / Ebenezer	Richmond Rail Line (14)	West of Schofields	Closure of rail line	Via Road	12.5m (a)
Richmond / Windsor / Ebenezer	Richmond Rail Line	Cox Street Emergency Rail Crossing, Windsor	Allow evacuation traffic from South Windsor to access Hawkesbury Valley Way Route	None	The Hawkesbury Valley Way Evacuation route will operate if floods are predicted to be above 15m AHD or 14.85m at the Windsor gauge (a)
Richmond / Windsor / Ebenezer	Richmond Rail Line	Railway Road North to Railway Road South Emergency Rail Crossing, Vineyard	Allow evacuation traffic to use Hawkesbury Valley Way Route	None	
Richmond / Windsor / Ebenezer	Richmond Rail Line	Rail crossing at Level Crossing Road, Vineyard	Allow evacuation traffic to use Hawkesbury Valley Way Route	None	
Penrith	Western Rail Line (14)	Victoria Bridge Penrith / Emu Plains	Closure of rail line. Main link between Sydney, the Blue Mountains and Western NSW. Major transport implications	Via Road	Bridge is expected to be significantly damaged around 13.9m (b) (28m AHD)
South Creek	Western Rail Line (5)	Where it crosses South Creek	Closure of rail line for up to 5 hours due to local catchment flooding (5)	Via Road	Around 24.8m AHD (c)

Notes:

- (a) Related to the Windsor Bridge Gauge at Windsor
- (b) Related to the Victoria Bridge Gauge at Penrith
- (c) Not related to a flood gauge

4 EVACUATION ROUTES

4.1 OVERVIEW

- 4.1.1 The most effective means of evacuation from the Hawkesbury-Nepean Valley is via road, using private vehicles and public buses.
- 4.1.2 Road evacuations routes are defined in this Plan and supporting plans as one of the following:
 - a. **Sector evacuation routes** - road evacuation routes within Sectors with traffic management primarily carried out by Councils;
 - b. **Regional evacuation routes** – road evacuation routes from Sectors to areas well outside the extent of the PMF with a high level of traffic management carried out by Police, TMC and RMS or their agents with some assistance from Councils.
- 4.1.3 Routes to evacuation centres will be dependant on which evacuation centres are activated as part of the flood event (refer to Volume 3 Chapter 3).

4.2 SECTOR EVACUATION ROUTES

- 4.2.1 Sector evacuation routes are indicative routes within a Sector to show the main traffic pattern leading to the exit from the Sector on to one or more Regional Evacuation Routes. These are further detailed within Local flood Plans.
- 4.2.2 Sector evacuation routes do not necessarily require controlled traffic management arrangements.

4.3 REGIONAL EVACUATION ROUTES

- 4.3.1 A number of Regional Evacuation Routes have been identified for Hawkesbury-Nepean Valley. These routes require controlled traffic management arrangements.
- 4.3.2 The designated regional road evacuation routes for Hawkesbury Nepean flood operations are listed and described in detail in Section 8 of this Chapter.
- 4.3.3 Regional Evacuation Routes are further classified in this Plan as one of the following:
 - a. **Initial** used during the initial stages of flooding or low levels of flooding until the Primary evacuation route is activated;
 - b. **Primary** the main evacuation route used by that area (i.e. sector);
 - c. **Secondary** used if the Primary or Initial evacuation routes become unavailable for use due to factors such as local catchment flooding.

- 4.3.4 Each Regional Evacuation Route has:
- An **Entry Point** from which controlled traffic management arrangements apply;
 - A number of **Traffic Management Points** as detailed within the Hawkesbury-Nepean Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2);
 - An **Exit Point** that is beyond the PMF flood extent and at a point where the route enters the wider traffic network and normal traffic arrangements apply.
- 4.3.5 Refer to Map 1 for an overview of the flood evacuation route network. More detailed maps of the Regional Evacuation Routes are also provided in Section 5.8 (See Maps 2 to 12).

4.4 SIGNAGE ON EVACUATION ROUTES

Fixed signs

- 4.4.1 Large fixed signs identifying Regional Evacuation Routes are located at the entry point to most Regional Evacuation Routes. The location of these signs is detailed in the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2).

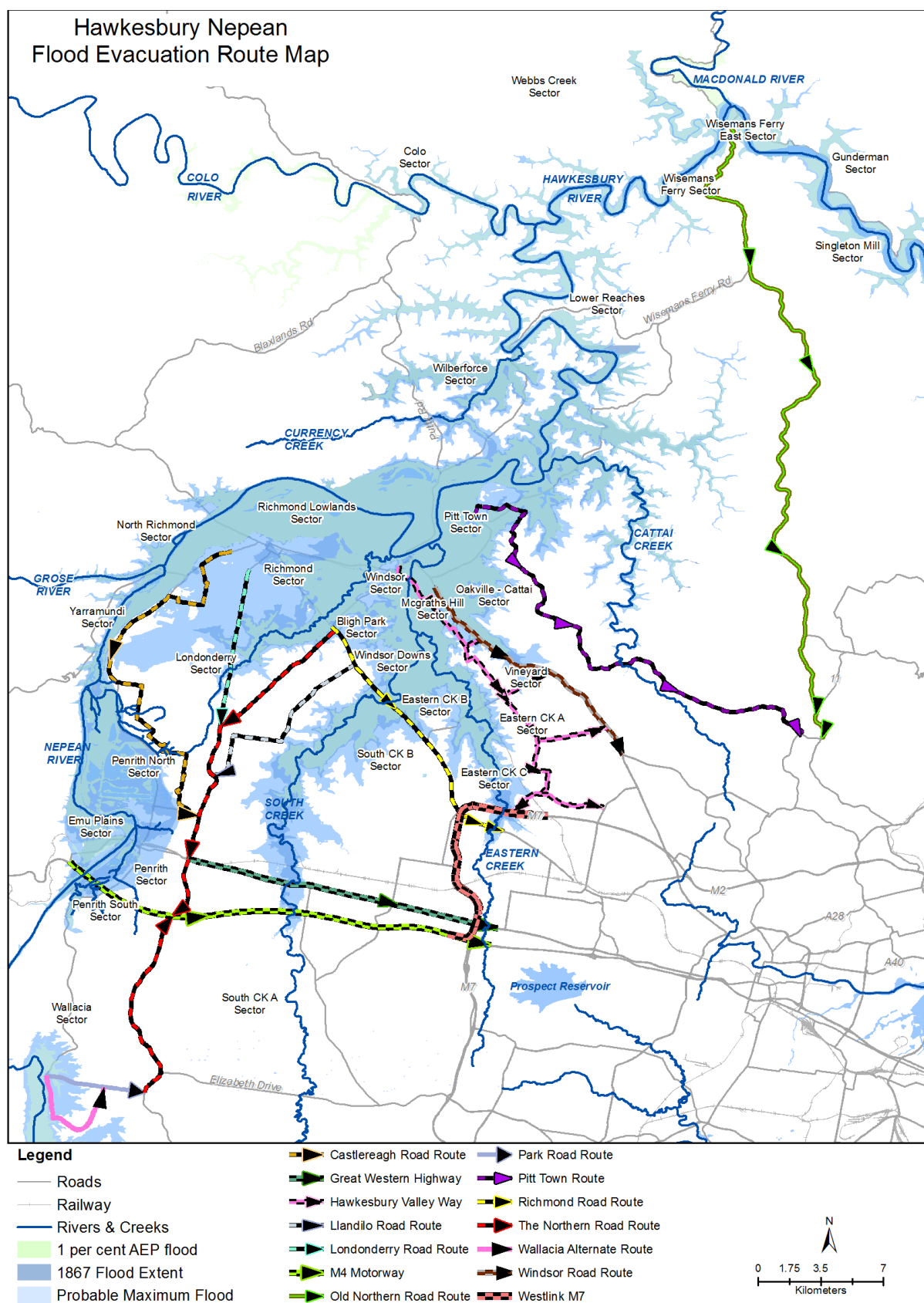


Figure 2: Example of Regional Evacuation Route Signage

- 4.4.2 On the Regional Evacuation Routes the RMS may add evacuation route indicators to existing road signage. These would be normally covered up and uncovered when the regional road evacuation route is activated.

VMS and Portable VMS

- 4.4.3 Fixed Variable Message Signs (VMS) will be used where available to provide information to evacuation traffic and other motorists. The location of VMS signage is detailed within the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2).



Map 1: Regional Evacuation Routes within the Hawkesbury-Nepean Valley

4.5 CRITICAL FLOODING POINTS ON EVACUATION ROUTES

- 4.5.1 The regional and sector evacuation routes can be cut by mainstream flooding from the Nepean and Hawkesbury Rivers as well as from local flooding due to localised storms.

Mainstream Flooding

- 4.5.2 The critical locations at which mainstream flooding from the Hawkesbury River cuts Regional Evacuation Routes are provided in Table 4 (15) (16).

Local Flooding

- 4.5.3 Most of the regional road evacuation routes have a number of local flooding points that may cut the route due to localised catchment flooding.
- 4.5.4 A number of the critical points have been upgraded to cope with up to 0.2% AEP (1 in 500 year) local flood event (as distinct from the Hawkesbury River flooding).
- 4.5.5 However there are several critical local flooding points that still exist including:
- a. The Northern Road between Fourth Avenue and Seventh Avenue, Llandilo;
 - b. The Northern Road between the Richmond Road and Londonderry Road intersection;
 - c. Blacktown-Richmond Road between The Northern Road and Llandilo Road;
 - d. Llandilo Road;
 - e. Hinxman Road on the Castlereagh Evacuation Route.
- 4.5.6 The traffic management arrangements in this chapter try to take into account many of the key local flooding points, however there are still locations where no alternative currently exists.

Table 4: Regional Evacuation Routes and Critical Points at which they are cut by Mainstream River Flooding

Evacuation Route	Height Cut (m AHD)	Gauge Height (m)	Relevant Gauge	Sectors using this route
Windsor Road Route (MH1, MH1a, MH1b) (17)	13.5	13.35	Windsor Bridge	McGraths Hill (P)
Blacktown-Richmond Road Route (Bridge over Sth Creek) (WN16) (8)	14.2	14.05	Windsor Bridge	Windsor (I) Bligh Park (I) Windsor Downs (I) Eastern Ck B (P) Eastern Creek C (P) South Creek B (P)
Pitt Town Road Route (RL2032) (18)	16m	15.85	Windsor Bridge	Pitt Town (P)
Hawkesbury Valley Way Route (Windsor1) (10) (9)	17.3	17.15	Windsor Bridge	Windsor (P)
Northern Road (WN4c) (19) (17)	18.1	17.95	N/A	Windsor (I) Penrith North (P)
Old Northern Road Route	Not flooded	N/A	N/A	Wisemans Ferry and surrounds (P)
Londonderry Road Route (R4) (17)	18.0	17.85	Windsor Bridge	Londonderry (P) Richmond (S)
Castlereagh Road Route (RA0) (10)	20.2	20.05	Windsor Bridge	Richmond (P)
Llandilo Road Route (WN14A) (17) (19)	23.8	23.65	Windsor Bridge	Bligh Park (P) Windsor Downs (P)
M4 Western Motorway Route (5)	28.5m and 32.8m		NA	Emu Plains (P) and various
Great Western Highway (5)	25.2m		NA	Penrith (P), Windsor (S) Bligh Park (S), Richmond (S)
Park Road Route, Wallacia (WA1) (20)	39.8m		Wallacia	Wallacia (P)
Wallacia Alternative Route(GreendaleRDDEM2 015) (19)	61.3m		Wallacia	Wallacia (S)

- (a) I – Initial Evacuation Route used during lower levels of flooding
- (b) P – Primary Evacuation Route
- (c) S – Secondary Evacuation Route used if local flooding cuts either the Initial or Primary Evacuation Route
- (d) Unless otherwise indicated, gauge height relates to the Windsor Bridge gauge

5 TRAFFIC MANAGEMENT ARRANGEMENTS FOR EVACUATION

5.1 TRAFFIC MANAGEMENT PRINCIPLES FOR REGIONAL EVACUATION

ROUTES

5.1.1 All designated regional road evacuation routes are to be managed using the following principles:

a. Outbound Traffic:

- When floodwaters reach the road level, then evacuation traffic will be stopped from crossing the flooded point (this is for safety reasons due to flow velocity, stalled vehicles, buoyancy issues for different type of vehicles, aquaplaning and to minimise road pavement damage) (See Section 4.5).
- Once an evacuation route has been closed, and where alternative routes exist, traffic will be redirected onto these alternative routes.
- On advice from the Transport Liaison Officer at the NSW SES Sydney Western Region Headquarters, traffic updates for Regional evacuation routes will be provided by TMC Traffic Information Officers, using existing arrangements, to television stations, radio stations and the Live Traffic web site. This may involve some coordination with the Joint Media Information Centre (See Section 5.3).
- Fixed and portable VMS signs will be used to primarily provide advisory messages to outbound traffic on evacuation routes to provide directions to outside of the PMF area and secondly if available to evacuation centres.
- TMC Traffic Emergency Patrols may be used to supplement traffic management at key points.
- TMC will coordinate provision and allocation of tow trucks (light and heavy). Broken down vehicles will be relocated to the nearest safe location off the evacuation route.
- Buses will be despatched (regularly or as required) for people and their companion animals to collect those who do not have their own vehicles and to pick up the occupants of broken down vehicles.
- Buses will transport people either to a transport hub, or else to the allocated evacuation centre/s.

b. Inbound traffic:

- Police will coordinate overall security of evacuated areas. This includes where necessary support to RMS, TMC and Councils to

manage inbound traffic at key points on the outer perimeter of the traffic control area.

- Inbound traffic (mostly residents) will be allowed into the area until the NSW SES Sydney Western Region Incident Controller determines that inbound traffic will cease.
- At that time access to the route is to be denied to all traffic except emergency vehicles, buses being used for evacuation and supporting services as per the list below.
- Normally one inbound lane is to be kept clear at all times for use by:
 - ◆ Emergency vehicles,
 - ◆ Utility service provider vehicles,
 - ◆ Waste service vehicles,
 - ◆ Vehicle breakdown repair and towing vehicles,
 - ◆ Road maintenance and repair crews; and
 - ◆ Road barricade and traffic signage crews.

5.2 CONTROL AND COORDINATION

- 5.2.1 The security, control and keeping clear of the Regional Evacuation Routes are the joint responsibility of the Police Greater Metro Region Commander, via the Police Traffic Co-ordinator, and the NSW Transport Management Centre (TMC).
- 5.2.2 Management responsibilities are as follows:
- a. Council will manage specified locations on local roads and local roads connecting to RMS roads used as part of Regional Evacuation Routes.
 - b. TMC will manage State roads used as part of Regional Evacuation Routes and at specified locations on those roads.
 - c. Police will oversee the management of key locations on the Regional Evacuation Routes supported by TMC, RMS and/or Council.
- 5.2.3 Resources for the designated locations will be provided by the relevant authority as details in the TCP for each location on a priority basis.
- 5.2.4 Overall coordination of the regional road evacuation routes will be conducted from the Evacuation Coordination Desk at the NSW SES Sydney Western Region Headquarters (Figure 3). The evacuation coordination desk will include:
- a. An Evacuation Coordinator provided by the NSW SES;
 - b. A Transport liaison officer provided by the Transport for NSW;
 - c. A Police Traffic liaison officer provided by the Police North West Region Commander.

- 5.2.5 The Evacuation Desk will work closely with the Welfare Services Liaison Officer at the NSW SES Sydney Western Region Headquarters.
- 5.2.6 TMC and/or RMS will provide barriers for state roads. Barriers for local roads in the Hawkesbury, Penrith, Blacktown, The Hills, Gosford, Hornsby, Wollondilly and Liverpool LGAs will be provided as detailed in the relevant TCPs whilst resources are available.
- 5.2.7 Additional traffic management resources, beyond local arrangements, may be requested by Council Liaison Officers at NSW SES Local Headquarters from the Evacuation Coordination Desk. These additional resources may include:
 - a. Barriers;
 - b. Traffic management personnel from other local councils.
- 5.2.8 The Evacuation Coordination Desk will liaise with the NRMA Road Service control centre regarding response to vehicle breakdowns in evacuation areas and along regional road evacuation routes.

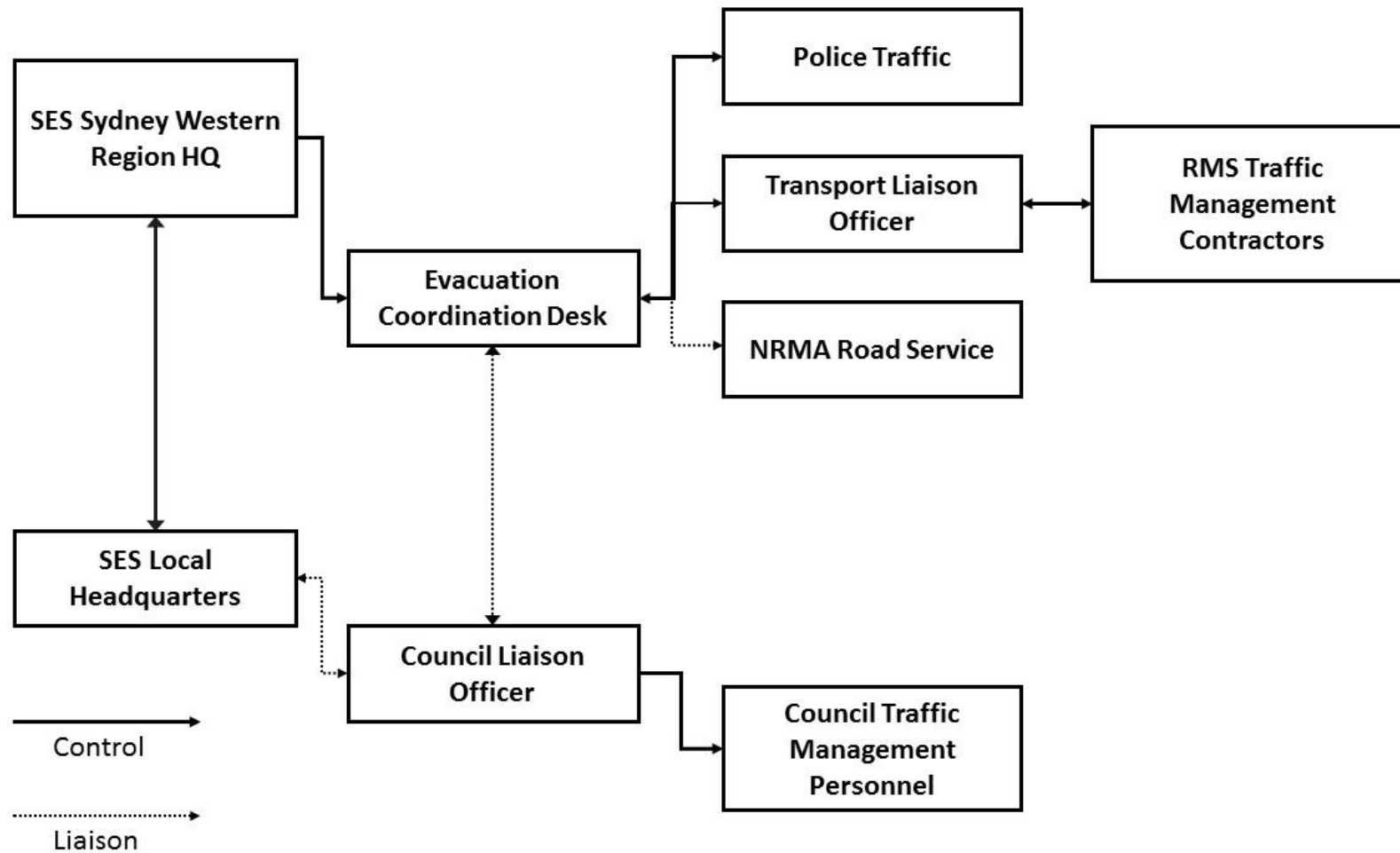


Figure 3: Evacuation Coordination Desk Control Arrangements

5.3 COMMUNICATIONS

- 5.3.1 Information on the status of roads will be available from:
- The Live Traffic NSW web site (www.livetraffic.com);
 - The Transport Information Line (131 500);
 - The relevant Council web-sites.
- 5.3.2 Police, TMC and RMS will allocate working channels from their radio networks (GRN or UHF) for the traffic management of the Regional Evacuation Route network.
- 5.3.3 Back up communications will be provided by:
- Private Mobile Radio (PMR) network should the GRN fail;
 - Ground station independent satellite phones to provide essential links between Sector controllers, NSW SES Local Headquarters, NSW SES Region Headquarters and NSW SES State Headquarters.
- 5.3.4 See also Volume 1 of this plan.

5.4 NOTIFICATIONS

- 5.4.1 For each regional road evacuation route, the NSW SES Sydney Western Region Incident Controller will advise the Transport Liaison Officer and Police Liaison Officer when:
- Traffic management resources are to be positioned during the mobilisation phase for relevant sectors.
 - Traffic management arrangements are to be put into effect when evacuation is commenced.
 - Inbound traffic to particular sectors is to cease.
- 5.4.2 The Police Traffic Liaison Officer and Transport Liaison Officer will advise the NSW SES Sydney Western Region Incident Controller:
- When the traffic management structure is established and ready for each of the Regional Evacuation Routes.
 - Once traffic management arrangements are put into effect, the status of traffic movement on evacuation routes. This would include:
 - if traffic is flowing steadily, or
 - if traffic movement becomes impeded.
 - When each of the regional road evacuation routes is clear of evacuation traffic.
 - When normal traffic management arrangements for the evacuation route have been reinstated.

5.5 ADVISING OF EVACUATION CENTRES

- 5.5.1 If a major evacuation centre is established it will be located within the Sydney Metropolitan area, as detailed in Volume 3 Chapter 3. Fixed and portable VMS may be used if available to advise evacuation traffic to proceed to this major evacuation centre.
- 5.5.2 During smaller flood events evacuees will be directed to one or more of the evacuation centres listed in Volume 3 Chapter 3. Advisory messages for outbound evacuation traffic may be displayed on both fixed and portable VMS.

5.6 KEY TRAFFIC CONTROL POINTS

- 5.6.1 Whilst the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2) outlines the control arrangements at all traffic control points, there are a number of key locations which are important for the overall co-ordination and management of evacuations within the Hawkesbury-Nepean Valley. These include:
 - a. **Key Directional Control Points** which determine the sequencing and use of the alternate regional evacuation route options at that point;
 - b. **Key Convergence Points** where traffic management arrangements will be required to control converging traffic streams;
 - c. **Inbound Traffic Control Points** to prevent re-entry into the flood effected areas and allow for the staged re-entry of people following a flood event.

Key Directional Control Points

- 5.6.2 The key directional points for the control of these various evacuation routes are provided in Table 5, with further descriptions of the arrangements for each sector provided in Section 5.7 and on Maps 2 to 12. Detailed descriptions of each evacuation route are provided in Section 8.
- 5.6.3 The NSW SES Sydney Western Region Incident Controller will determine which regional evacuation route traffic is to be directed onto based on:
 - a. Which Sector evacuation streams are active at that point;
 - b. The prevailing conditions on the regional evacuation routes such as local flooding.

Key Traffic Convergence Points

- 5.6.4 The key traffic convergence points for the various Regional Evacuation Routes are provided in Table 6, with further descriptions of the arrangements for each sector provided in Section 5.7 and on Maps 2 to 12. The details of each evacuation route are further described in Section 8.

Inbound Traffic Control Points

5.6.5 The key inbound traffic control points are detailed in the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2).

Table 5: Key Directional Points for the Control of Evacuation Routes

Key Directional Control Point	Available Regional Evacuation Routes	Comment
Intersection of Richmond Road and The Northern Road	Northern Road Evacuation Route; Llandilo Road Evacuation Route	To direct vehicles either onto The Northern Road Evacuation Route or the Llandilo Road Evacuation Route.
George St near Rifle Range Road, South Windsor	Northern Road Evacuation Route; Hawkesbury Valley Way Evacuation Route	Once George St, Windsor is cut, traffic from Windsor will need to be directed onto the Hawkesbury-Valley Way Evacuation Route instead of the Northern Road Evacuation Route.
Intersection of Llandilo Road and Richmond Road	Blacktown-Richmond Road Route; Llandilo Road Evacuation Route; Northern Road Evacuation Route	Once the Blacktown-Richmond Rd is cut at South Creek (14.2m AHD) evacuation traffic will need to be directed onto either The Northern Road Evacuation Route or the Llandilo Road Evacuation Route dependent on local flooding.
Intersection of Parker Street and the Great Western Highway	Northern Road Evacuation Route and Great Western Highway Evacuation Route	Evacuation traffic from the Northern Road Evacuation Route can be directed either onto the Great Western Highway Evacuation route or the M4 Western Motorway route depending on if Emu Plains is being evacuated.
Roundabout at the intersection of Mulgoa Road, Silverdale Road and Greendale Road, Wallacia	Park Road Evacuation Route and Wallacia Alternative Route	To direct people either onto the Park Road or Wallacia Alternative Evacuation Routes for Wallacia.
Intersection of Riverstone Parade and Bandon Road	Hawkesbury Valley Way Evacuation Route	If there is no flooding on Bandon Road it can be used, however if it is flooded evacuation traffic will be directed to continue along Riverstone Parade.
Intersection of Garfield Road East and McCulloch St, Riverstone	Hawkesbury Valley Way Evacuation Route	If there is no flooding on Garfield Road East it can be used, however if it is flooded evacuation traffic will be directed to continue south east on McCulloch Street.
Intersection of Schofields Road,	Hawkesbury Valley Way Evacuation	If there is no flooding on Schofields Road it can be used. However if there is flooding on

Key Directional Control Point	Available Regional Evacuation Routes	Comment
Boundary Road and Alex Avenue	Route	evacuation traffic will be directed to continue south on Alex Avenue.
Intersection of Londonderry Road and Southee Road	Londonderry Road Route, Castlereagh Road Route	Once Londonderry Road is cut at (18m AHD), evacuation traffic will need to be redirected onto the Castlereagh Road Evacuation Route.

Table 6: Key Traffic Convergence Points for the control of Evacuation Routes

Evacuation Routes Affected	Key Convergence Point	Comment
The Northern Road Evacuation Route and Londonderry Road Evacuation Route	The roundabout located at the intersection of Londonderry Road, The Northern Road and Cranebrook Road.	The Londonderry Road evacuation route mainly used if there is an issue that prevents the use of the Castlereagh Road Evacuation Route.
The Northern Road Evacuation Route and Llandilo Road Evacuation Route	The intersection of The Northern Rd and Ninth Ave, Llandilo.	Only two traffic lanes are available between Ninth Ave Llandilo and Andrews Rd, Castlereagh. If the Llandilo Rd is activated, traffic convergence issues will need to be managed for Windsor sector traffic, and Bligh Park Sector traffic.
The Northern Road Evacuation Route and Castlereagh Road Evacuation Route	The intersection of Andrews Rd and The Northern Road / Richmond Road, Castlereagh	There are two southbound and two northbound lanes from Borrowdale Way to the Great Western Highway and the M4 Western Motorway. However, there is only single lanes on The Northern Road north of the intersection with Borrowdale Way. If the Castlereagh Road Route is activated (in addition to The Northern Road and Llandilo Road routes), then the convergence of these traffic streams will need to be managed.
The Northern Road Evacuation Route and the M4 Western Motorway	M4 Western Motorway and the M4 motorway	Evacuation traffic from both the southern and northern sections of The Northern Road Evacuation Route will converge onto the M4 Western Motorway.

5.7 SEQUENCING OF SECTORS ONTO REGIONAL ROAD EVACUATION

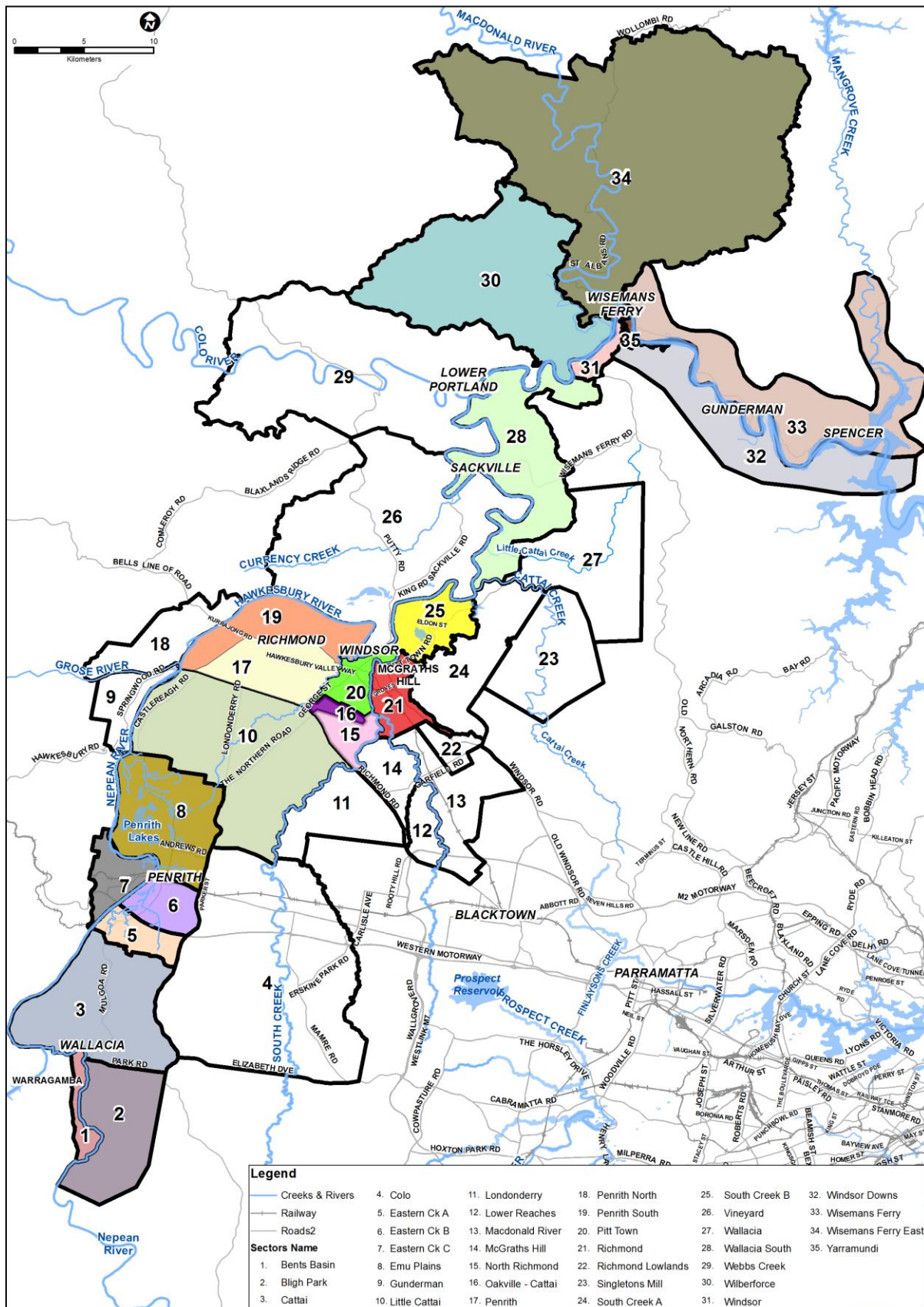
ROUTES

- 5.7.1 The traffic management arrangements for directing traffic onto Regional Evacuation Routes are complex.
- 5.7.2 All potentially flood effected areas within the Hawkesbury-Nepean Valley have been defined by areas known as Sectors based on their flood classification as shown on Map 2.

- 5.7.3 In each sector, vehicles will be advised to proceed via Sector Evacuation Routes either:
- Directly outside of the flood affected area, or
 - Onto their relevant Regional Evacuation Route.
- 5.7.4 However, for some sectors the evacuation route that is used may vary dependant on:
- The predicted flood height;
 - What other sectors are also being evacuated at the same time;
 - If there are issues of evacuation traffic converging onto the same evacuation routes;
 - Any local flooding on the Regional Evacuation Route;
 - When the Regional Evacuation Route has been closed due to riverine flooding.
- 5.7.5 Where this occurs people coming from specific sectors will be directed onto various alternative Regional Evacuation Routes as outlined in Table 7 and Table 8 and as further described in Section 5.8.
- 5.7.6 There are particular traffic management and convergence issues where a number of Regional Evacuation Routes merge onto the Northern Road Evacuation Route and the M4 Western motorway.
- 5.7.7 Due to convergence of Regional Evacuation Routes, the NSW SES Sydney Western Region Incident Controller will determine the sequencing of sectors onto the relevant regional road evacuation routes as outlined in Tables 7 and 8 and as shown in Maps 2 to 12.
- 5.7.8 Note that some sectors, particularly on the Western side of the Hawkesbury-Nepean River use sector evacuation routes rather than Regional Evacuation Routes. These sectors and their sector evacuation routes are further described within the relevant local flood plans (i.e These are the uncoloured sectors in Map 2).

5.8 REGIONAL EVACUATION ROUTE ARRANGEMENTS BY SECTOR

- 5.8.1 Dependant on the predicted flood height not every sector will need to be evacuated and not every evacuation route activated.
- 5.8.2 Each Regional Evacuation Route will be activated as described below. These are generally listed in the order that they are likely to be required.
- 5.8.3 Note that earlier evacuations may be required from individual properties within each sector as they are gradually inundated.



Map 2: Hawkesbury-Nepean Valley Emergency Management Sector Map

Table 7: Sectors using Regional Road Evacuation Routes on the Windsor /Richmond / Wilberforce Floodplain

Sequence	Sector	Flood Classification	Regional Road Evacuation Route	Type	Comments
1st	McGraths Hill	Low Flood Island	Windsor Road Route	Primary	Used as primary evacuation route until cut at 13.5m AHD. No alternative route.
2nd	Pitt Town	Low Flood Island	Pitt Town Road Route	Primary	Used as primary evacuation route until cut at 16m AHD. No alternative route.
3rd	Windsor	Low Flood Island	The Northern Road Route	Initial	Used initially until George St is cut at 15m AHD or until it is itself cut at 18.1m AHD.
			Llandilo Road Route	Secondary	Used as alternative if there is local flooding on the Northern Road until cut at 23.8m AHD.
			Hawkesbury Valley Way Route	Primary	This is the last evacuation route for Windsor and is cut at 17.3m AHD.
4th	Bligh Park Sector and Windsor Downs Sector	Low Flood Island	Blacktown-Richmond Road	Initial	Used initially until this road is cut at 14.2m AHD at South Creek.
			Llandilo Road Route	Primary	Used once the Blacktown-Richmond Road is cut. It is cut itself at 23.8m AHD
			The Northern Road Route	Secondary	Used if Llandilo Road is cut by local flooding. Is itself cut at 18.1m AHD. Traffic convergence issues.
6th	Richmond Sector	Low Flood Island	Castlereagh Road Route	Primary	Used until cut at 20.2m AHD.
			Londonderry Road Route	Secondary	Used as an alternative to Castlereagh Rd if required until cut at 18.0m AHD.
7th	Londonderry Sector	Overland Access	Londonderry Road Route Northern Road Route Llandilo Road Route	Primary	The Londonderry Sector crosses a number of Regional Evacuation Routes. Different subsectors will use different routes.

Table 8: Sectors using Regional Road Evacuation Routes on Emu Plains/Penrith, Wallacia and Lower Floodplains

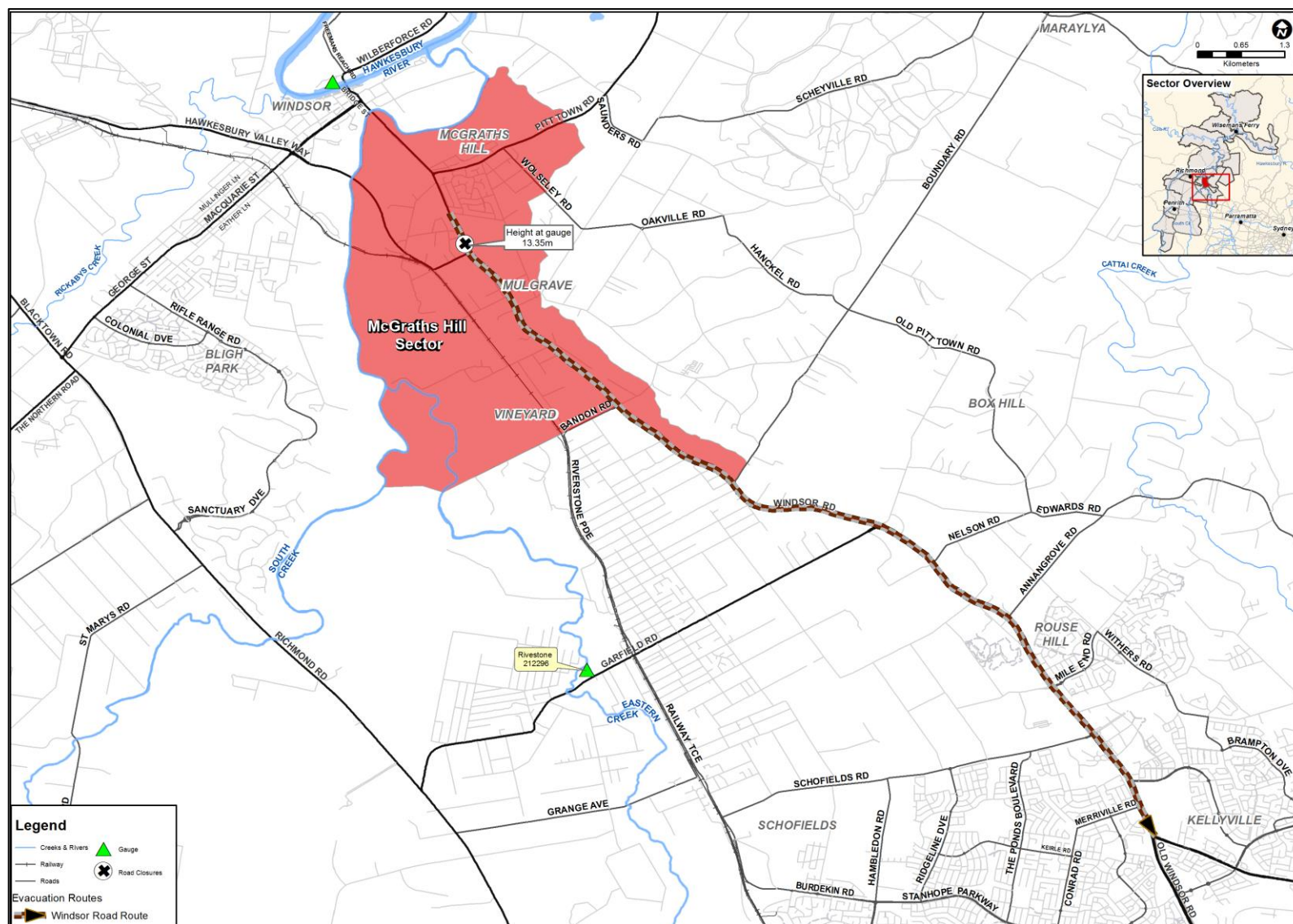
Floodplain	Sector	Flood Area Type	Regional Road Evacuation Route	Type	Comments
Emu Plains / Penrith	Emu Plains Sectors	Low Flood Island	M4 Motorway Route	Primary	This route may experience localised catchment flooding
	Penrith and others from Northern Rd Route	Rising Road Access / Other	Great Western Highway Route	Primary / Secondary	Evacuation Traffic from the Northern Road Route can be directed onto the Great Western Highway Route instead of the M4 if Emu Plains is also being evacuated. This is in order to ease congestion on the M4.
Wallacia	Wallacia Sector	High Flood Island	Park Road Route	Primary	Used initially until cut at 39.8m AHD
			Wallacia Alternative Route	Secondary	Used only if required / able. Note that this is an unsealed road through private property. Road condition may not be suitable. Cut at around 61.3m AHD.
Lower Hawkesbury	Webbs Creek, Gunderman and MacDonald Valley	Trapped Perimeter	Old Northern Road Route	Primary	Sectors must evacuate early before the ferries are closed and local roads are flooded. Alternative access out is via Wisemans Ferry Road or Wollombi Road, however these roads are cut early during floods.
	Lower Reaches, Wisemans Ferry, Singeltons Mill	Trapped Perimeter	Old Northern Road	Primary	Local roads leading onto the Regional Evacuation Route including River Road are cut early by flooding (from 1.54m AHD) and Singelton Rd (1.3m AHD) The Old Northern Road itself is not affected by mainstream flooding.

McGraths Hill Sector

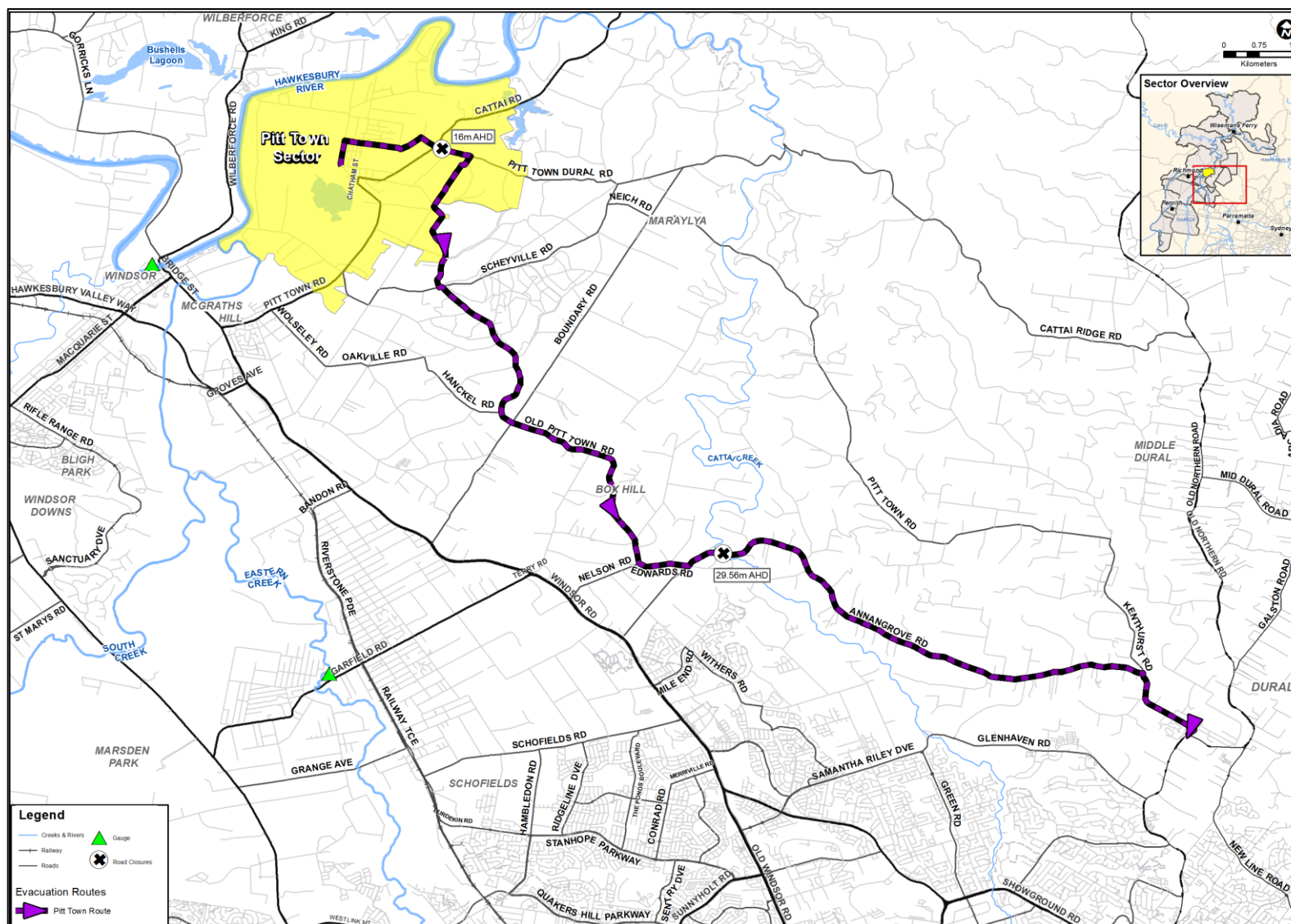
- 5.8.4 The **McGraths Hill** Sector including McGraths Hill and Mulgrave will need to be completely evacuated if the predicted flood height exceeds 13.35m at the Windsor gauge (13.5m AHD).
- 5.8.5 This will cause the activation of the Windsor Road Evacuation Route as shown in Map 3. The details of the Windsor Road Evacuation Route are further described in Section 8.2.
- 5.8.6 Two streams of evacuation traffic are able to utilise this route, with one stream from the Mulgrave subsector and one stream from the McGraths Hill subsector travelling along the two allocated lanes.
- 5.8.7 The Windsor Road Evacuation Route is cut by mainstream flooding at 13.35m at the Windsor Bridge gauge (13.5 metres AHD) at a number of points between Curtis Road, Mulgrave and Park Road, Vineyard.
- 5.8.8 There are no alternative evacuation routes for McGraths Hill and Mulgrave.

Pitt Town Sector

- 5.8.9 The **Pitt Town** Sector will need to be completely evacuated if the predicted flood height exceeds 15.85m at the Windsor gauge (16m AHD).
- 5.8.10 Traffic from the Pitt Town Sector including Pitt Town Bottoms and Pitt Town will utilise the Pitt Town Road Evacuation Route as shown in Map 4.
- 5.8.11 The details of the Pitt Town Road Evacuation Route are further described in Section 8.3.
- 5.8.12 The Pitt Town Road Evacuation Route is cut by riverine flooding at 15.85m (16m AHD) at the Windsor gauge.
- 5.8.13 There is a chance that local flooding could affect the Pitt Town evacuation route at Murphy's Bridge on Annangrove Road over Cattai Creek. If this occurs, traffic may be:
 - a. Rediverted to Windsor Road depending on the other evacuation traffic using this route.
 - b. Alternativley, given that this road closure point is outside of the PMF, people may be re-directed to temporary shelter in the vicinity.
- 5.8.14 This is the last evacuation route for Pitt Town.



Map 3: McGraths Hill – Windsor Road Evacuation Route



Map 4: Pitt Town - Pitt Town Road Evacuation Route

Windsor Sector

- 5.8.15 The Northern Road Evacuation Route is activated if the predicted flood level will exceed 15m AHD resulting in the need to evacuate the **Windsor** Sector.
- 5.8.16 Traffic from the Windsor Sector will:
- Initially be directed from George Street to Blacktown-Richmond Road then to the Northern Road Route.
 - However, if flooding cuts the Northern Road between Richmond Road and the roundabout at Londonderry Road, then traffic may be redirected to the Llandilo Road Route via the Blacktown-Richmond Road depending on the expected duration of local flooding (See Figure 4 and Map 5 and Section 8.4).
 - When George Street is inundated at 14.85m at the Windsor gauge (15m AHD) near Rifle Range Road at Bligh Park, evacuation traffic will be directed onto the Hawkesbury Valley Way route (See Figure 4, Map 6 and Section 8.6).

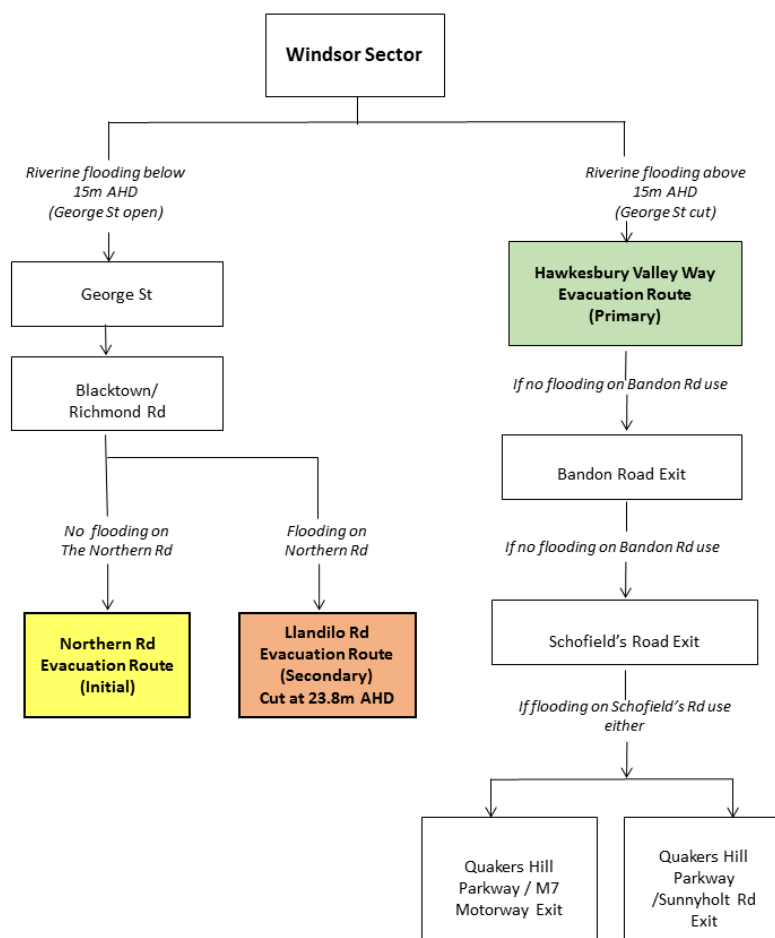


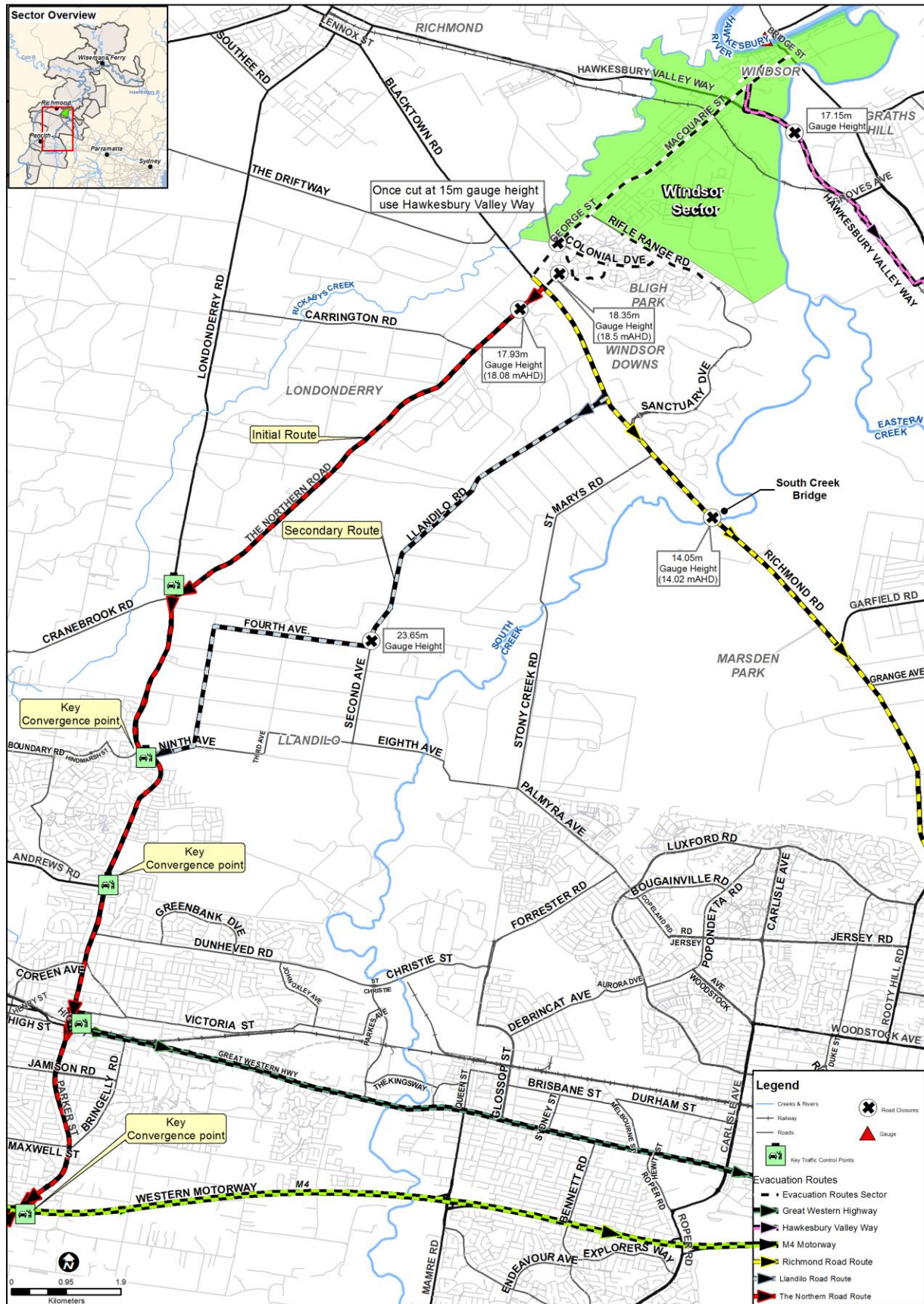
Figure 4: Windsor Sector Evacuation Route Sequencing

The Northern Road Evacuation Route

- 5.8.17 The Northern Road Evacuation route is cut at 17.95m at the Windsor gauge (18.1m AHD) near Toorah Road, Llandilo opposite the John Morony Correctional Complex.
- 5.8.18 Local flooding can also affect the Northern Road between:
 - a. Richmond Road and the roundabout at Londonderry Road;
 - b. Fourth Avenue and Ninth Avenue.
- 5.8.19 If flooding cuts the Northern Road between Richmond Road and the roundabout at Londonderry Road, then traffic may be redirected onto the Llandilo Route (refer to Section 5.8.24 of this Chapter).
- 5.8.20 If local flooding cuts Northern Road between Fourth Avenue and Ninth Avenue then southbound traffic on The Northern Road may be diverted via the following alternate route:
 - a. Off the Northern Road to Fourth Avenue;
 - b. Terrybrook Road;
 - c. Ninth Avenue to the Northern Road.
- 5.8.21 Note that the normal southbound lane on Terrybrook Road may contain traffic from the Llandilo Road Route (if activated for evacuation from the Bligh Park Sector).
- 5.8.22 If an emergency vehicle lane is required then the Northern Road traffic stream will need to be merged with the Llandilo Road traffic stream into one southbound lane on Terrybrook Road.
- 5.8.23 Regional Evacuation Routes from a number of other sectors including Richmond, Bligh Park, Windsor Downs and Penrith North also converge onto the Northern Road Evacuation Route.

The Llandilo Road Evacuation Route

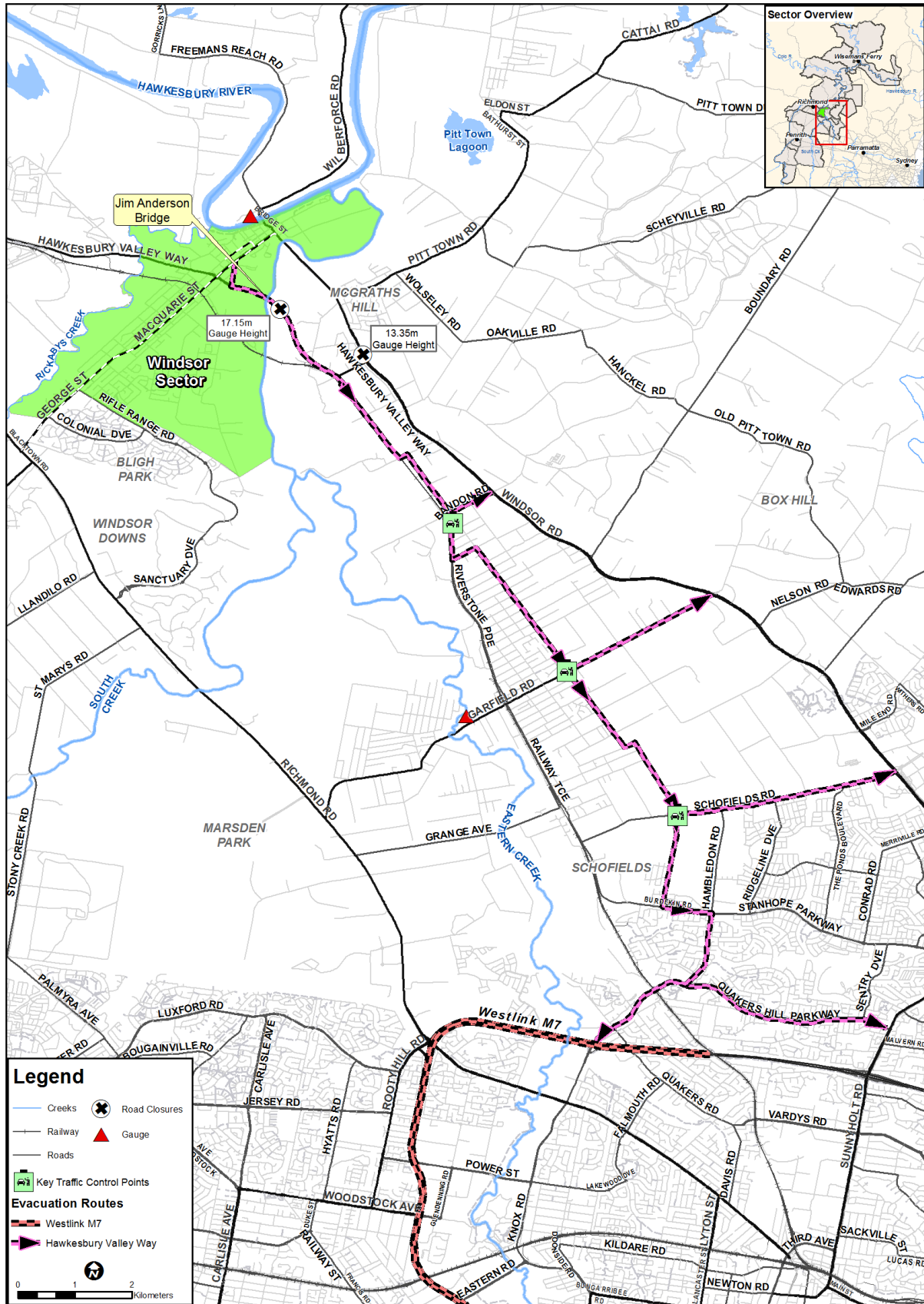
- 5.8.24 The route is cut near the corner of Second Avenue and Forth Avenue by mainstream flooding originating from South Creek at 23.65m at the Windsor gauge (23.8 m AHD).
- 5.8.25 Local flooding can also affect this evacuation route at numerous locations.



Map 5: Windsor - Windsor Evacuation Route – Floods below 15m AHD

Hawkesbury Valley Way Evacuation Route

- 5.8.26 Once George Street is closed evacuation traffic from Windsor will be directed onto the Hawkesbury Valley Way Evacuation Route (refer to 8.6).
- 5.8.27 To cater for possible local flooding there are several alternate routes for Windsor traffic travelling along the Hawkesbury Valley Way Evacuation Route to the south of Bandon Road. The alternative exit points include the:
- a. Intersection of Garfield Road and Windsor Road;
 - b. Intersection of Schofield Road and Windsor Road;
 - c. Intersection of Quakers Hill Parkway and Sunnyholt Road; and the
 - d. Intersection of Quakers Hill Parkway and the M7 Motorway.
- 5.8.28 The Hawkesbury Valley Way Evacuation Route is cut at the Jim Anderson Bridge by mainstream flooding at 17.15m at the Windsor gauge (17.3 metres AHD). This is the last evacuation route for the Windsor Sector.
- 5.8.29 Local flooding can potentially cut Bandon Road, Garfield Road East and Schofields Road.



Map 6: Windsor – Hawkesbury Valley Way Evacuation Route – Floods above 15m AHD

Bligh Park Sector

- 5.8.30 If the predicted flood level is expected to exceed 17.05m to 18.35m (16) at the Windsor gauge (17.2m AHD to 18.5m) the Bligh Park Sector will need to be evacuated.
- 5.8.31 Traffic leaving the Bligh Park Sector via the Thorley Street exit will use (See Figure 5 and Map 7):
- The Blacktown-Richmond Road Evacuation Route until cut by mainstream backup flooding at South Creek at 14.05m on the Windsor Bridge gauge (14.2m AHD);
 - Blacktown-Richmond Road and then onto the Llandilo Road Evacuation Route;
 - Blacktown-Richmond Road between Northern Road and Llandilo Road has a local flooding capacity up to a 0.2% AEP (1 in 500) local storm event. If the road is cut by local flooding then traffic will be directed onto the Northern Road Route however this itself will be cut by 17.95m at the Windsor gauge (18.1m AHD) (See Section 8 for detailed route descriptions).

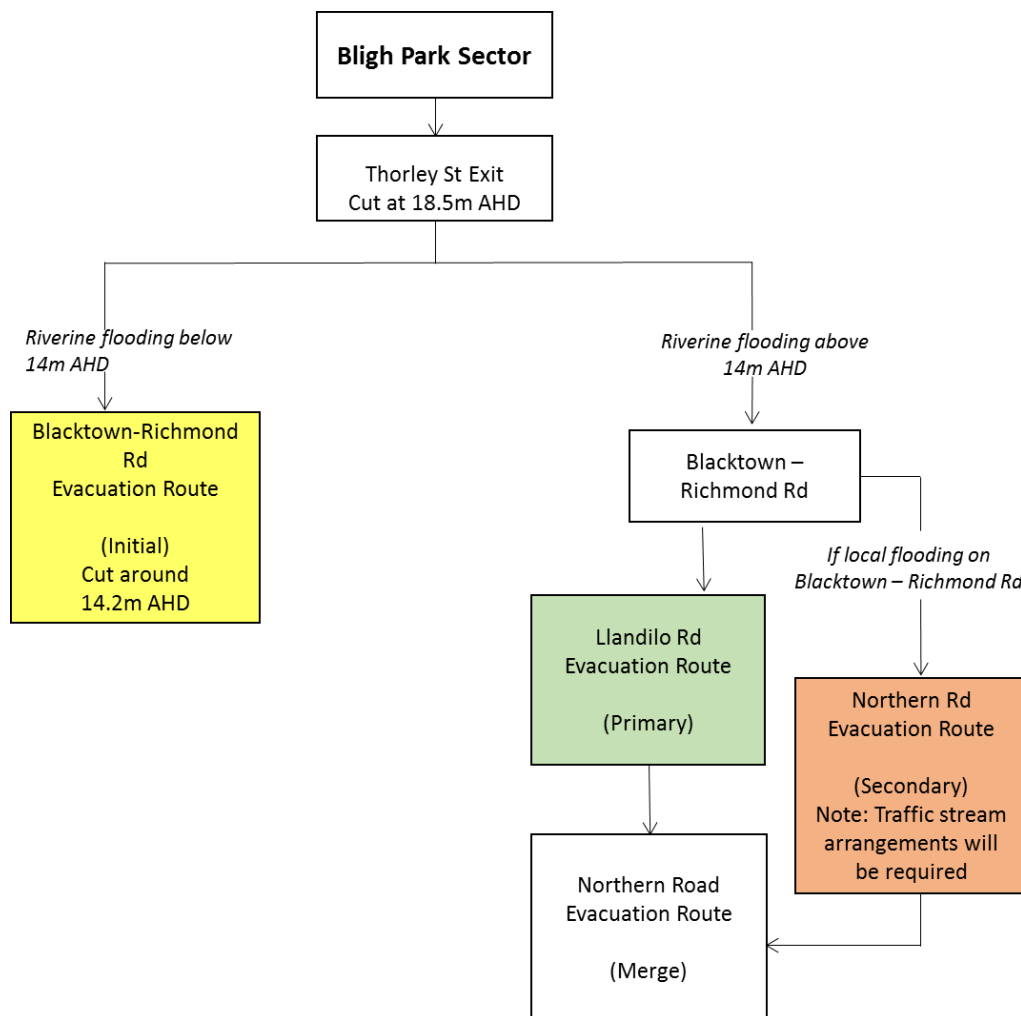


Figure 5: Bligh Park Sector Evacuation Route Sequencing

The Blacktown-Richmond Road Route

- 5.8.32 The route is cut by mainstream flooding at 14.05m at the Windsor gauge (14.2m AHD) at the bridge over South Creek.
- 5.8.33 The road is also cut at Rickaby's Creek at around 14.15m at the Windsor gauge (14.3m AHD) (18)).
- 5.8.34 Once the Blacktown-Richmond Road is cut at South Creek, traffic from the Bligh Park and Windsor Downs Sectors is directed onto the Llandilo Road Evacuation Route.

The Northern Road Evacuation Route

- 5.8.35 In the case that traffic is directed onto the Northern Road route the NSW SES Sydney Region Incident Controller will:
 - a. Direct that the two traffic streams (from Windsor Sector and Bligh Park Sector) are merged into one southbound lane on The Northern Road leaving the Northbound lane free for emergency vehicles.
- 5.8.36 Note that the Windsor Sector traffic stream will cease when George Street is cut by mainstream backup flooding near Rifle Range Road at 14.85m at the Windsor gauge (15m AHD). Once this occurs Bligh Park traffic is able to be directed to proceed straight ahead from Thorley Street onto the Northern Road Route.
- 5.8.37 The Northern Road Route will be cut at around 17.95m at the Windsor gauge (18.1m AHD).
- 5.8.38 The Bligh Park Sector traffic stream will cease when the Thorley Street exit is cut at 18.35m at the Windsor gauge (18.5m AHD).

Windsor Downs Sector

- 5.8.39 If the predicted flood level is expected to exceed 23.65m at the Windsor gauge (23.8m AHD) the Windsor Downs Sector will need to be completely evacuated.
- 5.8.40 Note that this sector will be progressively inundated from around 16m AHD. Some internal roads will be cut isolating parts of Windsor Downs from around 16.7m AHD.
- 5.8.41 Traffic from the **Windsor Downs Sector** will be directed to Blacktown-Richmond Road then to the Llandilo Road Route (Figure 6 and Map 7).

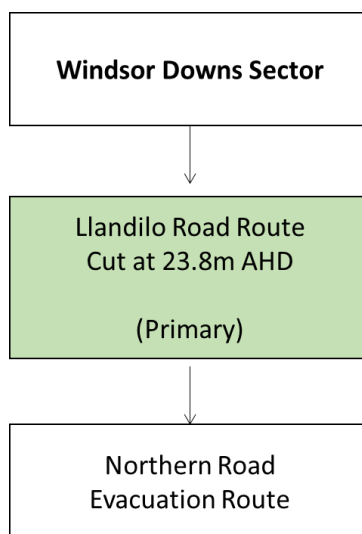
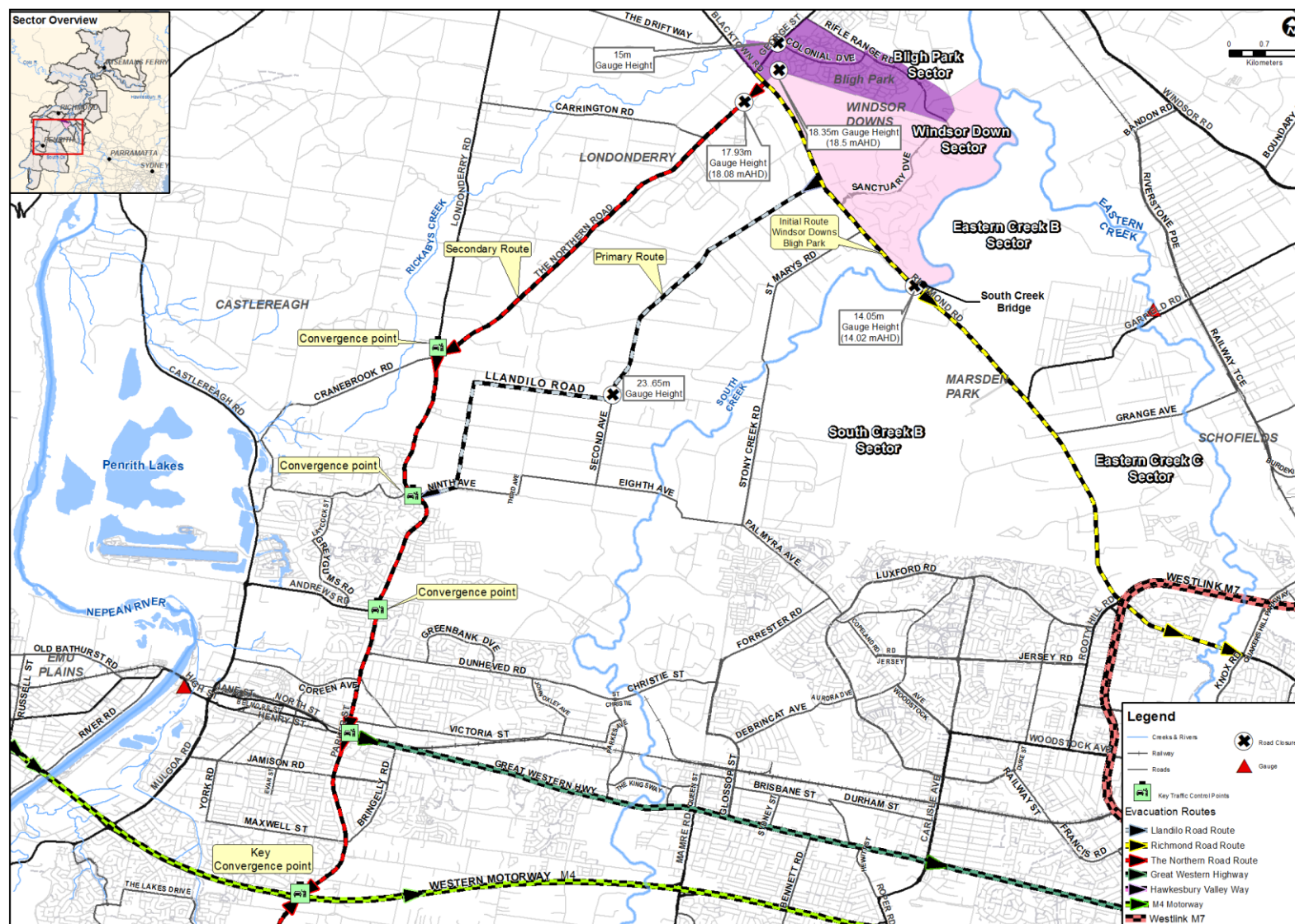


Figure 6: Windsor Downs Sector Evacuation Route Sequencing



Map 7: Bligh Park and Windsor Downs – Evacuation Routes

Richmond and Richmond Lowlands Sectors

- 5.8.42 The Richmond Sector will need to be completely evacuated if the predicted flood level will exceed 20.2m AHD. Note that the Richmond Lowlands Sector will begin to flood from 7m (at the Windsor gauge) and will already need to have evacuated into Richmond prior to becoming isolated at around 8.2 to 8.5m (Windsor gauge).
- 5.8.43 The Richmond Sector will use the Castlereagh Road Route as the primary evacuation route as shown in Figure 7 and Map 8.
- 5.8.44 The Londonderry Road Route is available for use as the secondary route if required. Note that the:
- Londonderry Road is cut between Wilshire Road and Spencer Street when floodwaters reach 17.85m (18m AHD) at the Windsor Bridge gauge.
 - Castlereagh Road Route is cut on The Driftway near Agnes Banks when the floodwaters reach 20.2m AHD.

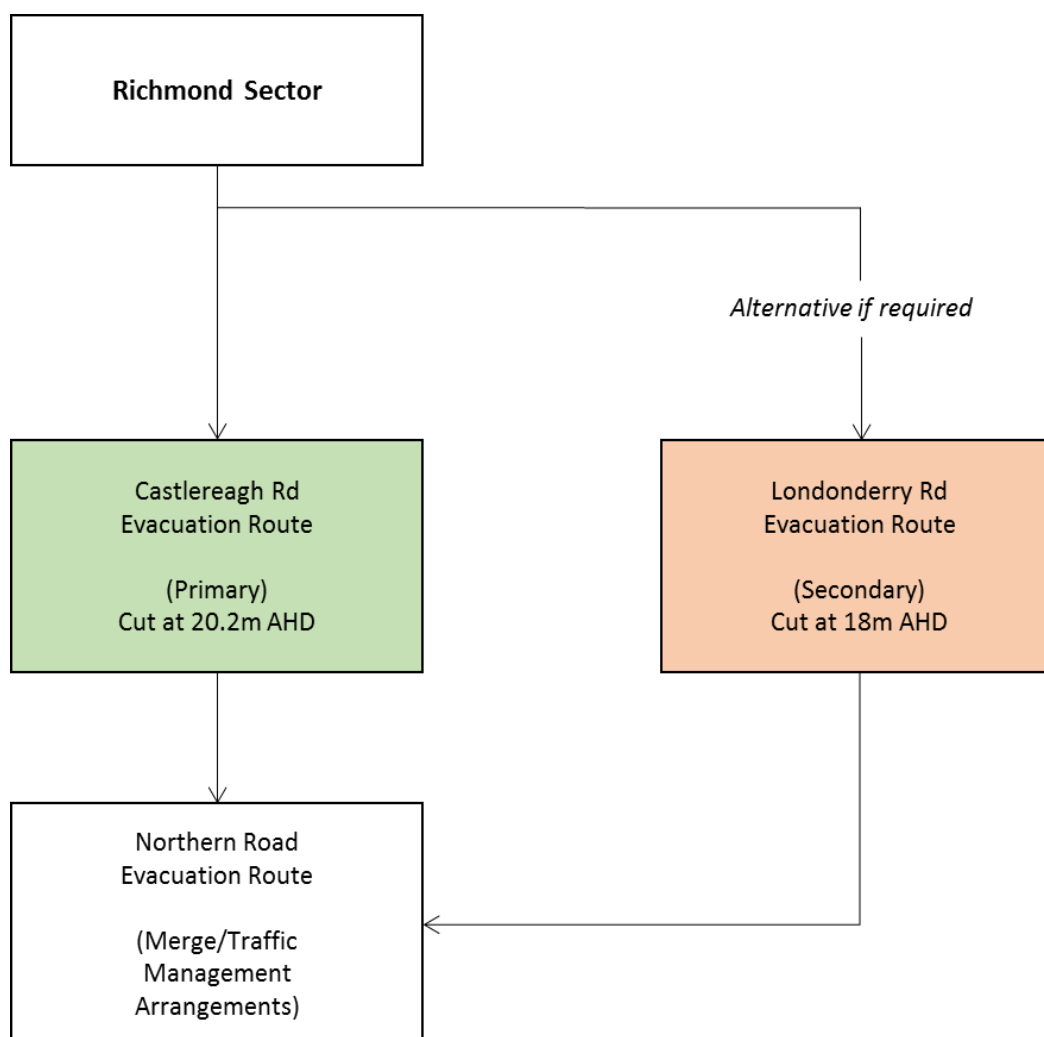
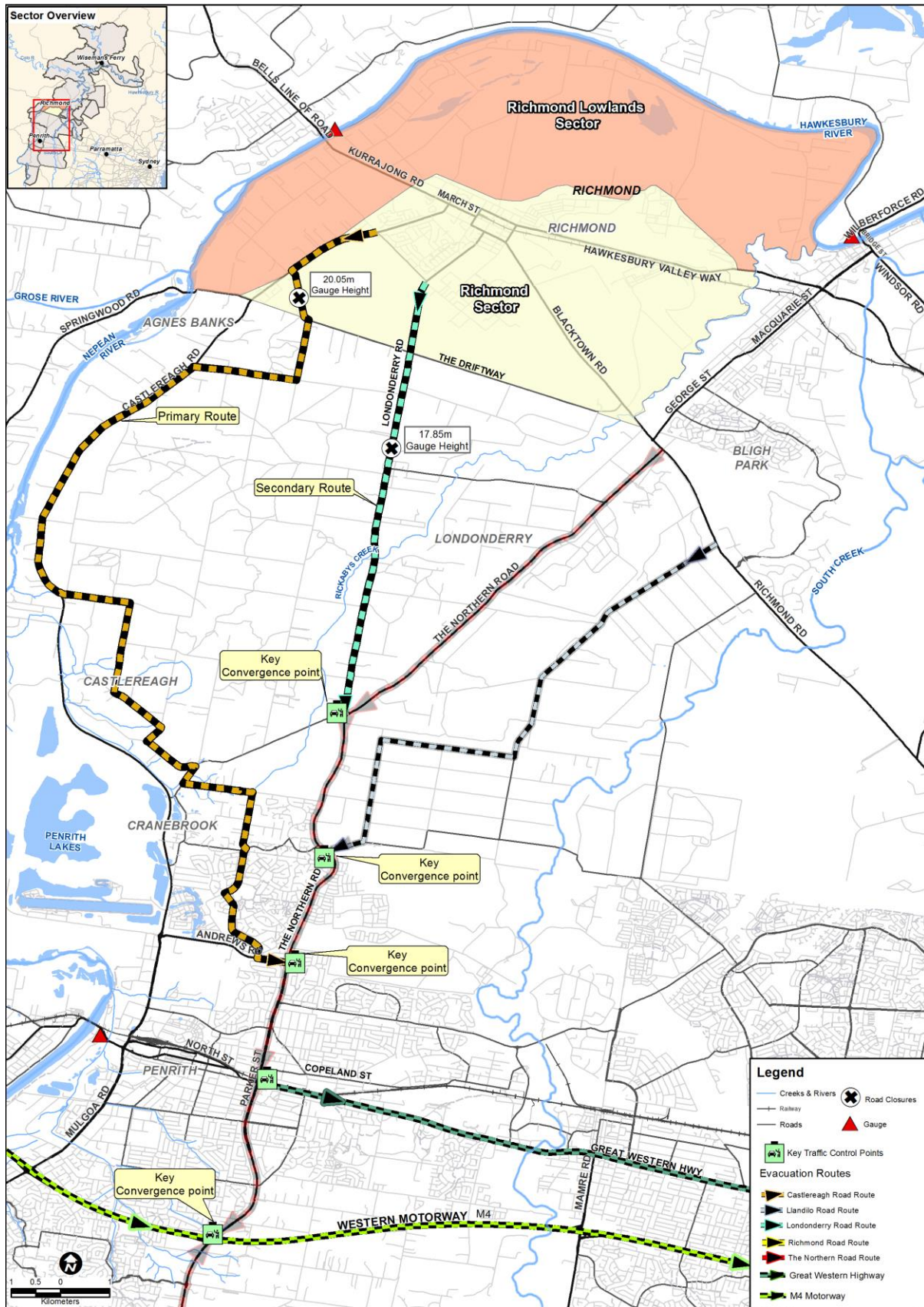


Figure 7: Richmond Sector Evacuation Route Sequencing

- 5.8.45 The Castlereagh Road Route merges onto the Northern Road Route at the intersection of Andrews Road and Northern Road.
- 5.8.46 The Northern Road has four lanes (two Northbound and two southbound) from Borrowdale Way to the Great Western Highway.
- 5.8.47 If both the Northern Road Evacuation Route and the Llandilo Road evacuation routes are already operating they will be already using these two southbound lanes.
- 5.8.48 If the Castlereagh Road Route is also activated at the same time then that evacuation traffic stream will need to be merged with traffic from the Northern Road Evacuation Route and/or the Llandilo Road evacuation routes from the intersection of Borrowdale Way and Northern Road to the intersection of Copeland Street and Parker Street (note that Northern Road becomes Parker Street between these two intersections). This will leave one Northbound lane on the Northern Road/Parker Street for use by inbound emergency vehicles.



Map 8: Richmond – Castlereagh Road and Londonderry Road Evacuation Routes

Londonderry Sector

- 5.8.49 The Londonderry Sector is a large Sector that crosses a number of Regional Evacuation Routes including (See Map 9):
- a. Castlereagh Road Evacuation Route;
 - b. Londonderry Road Evacuation Route;
 - c. Llandilo Road Evacuation Route.
- 5.8.50 These evacuation routes all eventually merge onto the Northern Road Evacuation Route.
- 5.8.51 The choice of evacuation route will be dependent on where within the sector the people evacuating live. This sector is broken into sub-sectors. The sub-sector level evacuation arrangements for the Londonderry Sector are provided within the Penrith City Local Flood Plan.
- 5.8.52 These Regional Evacuation Routes are each further described in Section 8 of this Chapter.

Penrith North Sector

- 5.8.53 The Penrith North Sector will need to be completely evacuated if the predicted flood level will exceed 8.2m (22.3m AHD) at the Penrith gauge.
- 5.8.54 Traffic from the Penrith North Sector will utilise the Northern Road Evacuation Route as shown in Map 9 and as is further described in Section 8.4 of this Chapter.
- 5.8.55 From the Northern Road Evacuation Route the Penrith North Sector will either be directed onto the Great Western Highway Evacuation Route or the M4 Western Motorway Evacuation Route. This will depend on what other sectors are also being evacuated at the same time.

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Emu Plains Sector

- 5.8.56 A number of Emu Plains sub-sectors will need to be evacuated at different predicted flood heights as outlined within the Penrith City Local Flood Plan. The internal sector evacuation routes will begin closing from around 23.8m AHD (9.7m) at the Penrith gauge (14).
- 5.8.57 Traffic from the Emu Plains Sector will use the M4 Western Motorway Evacuation Route and be directed east towards Sydney (See Figure 8 and Map 10).

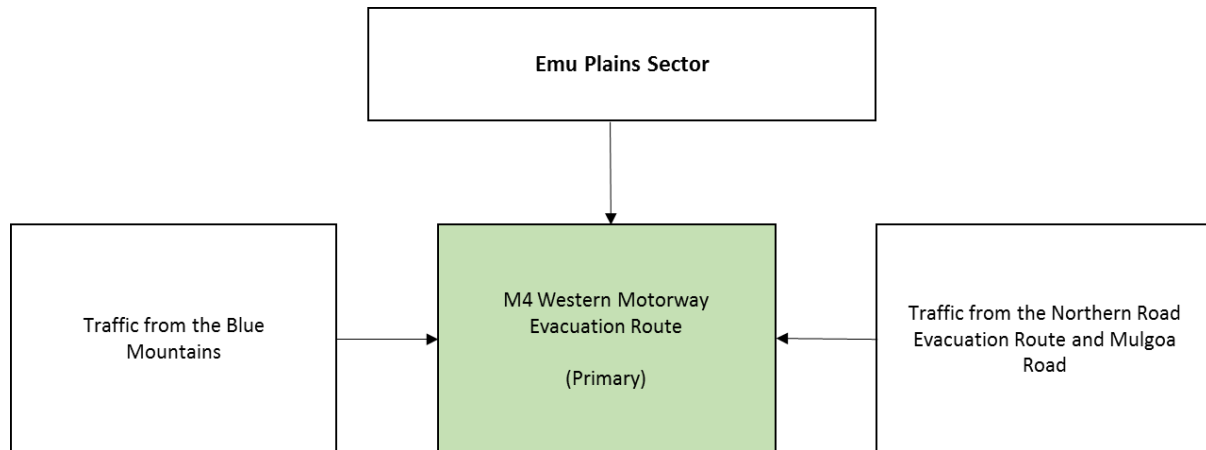
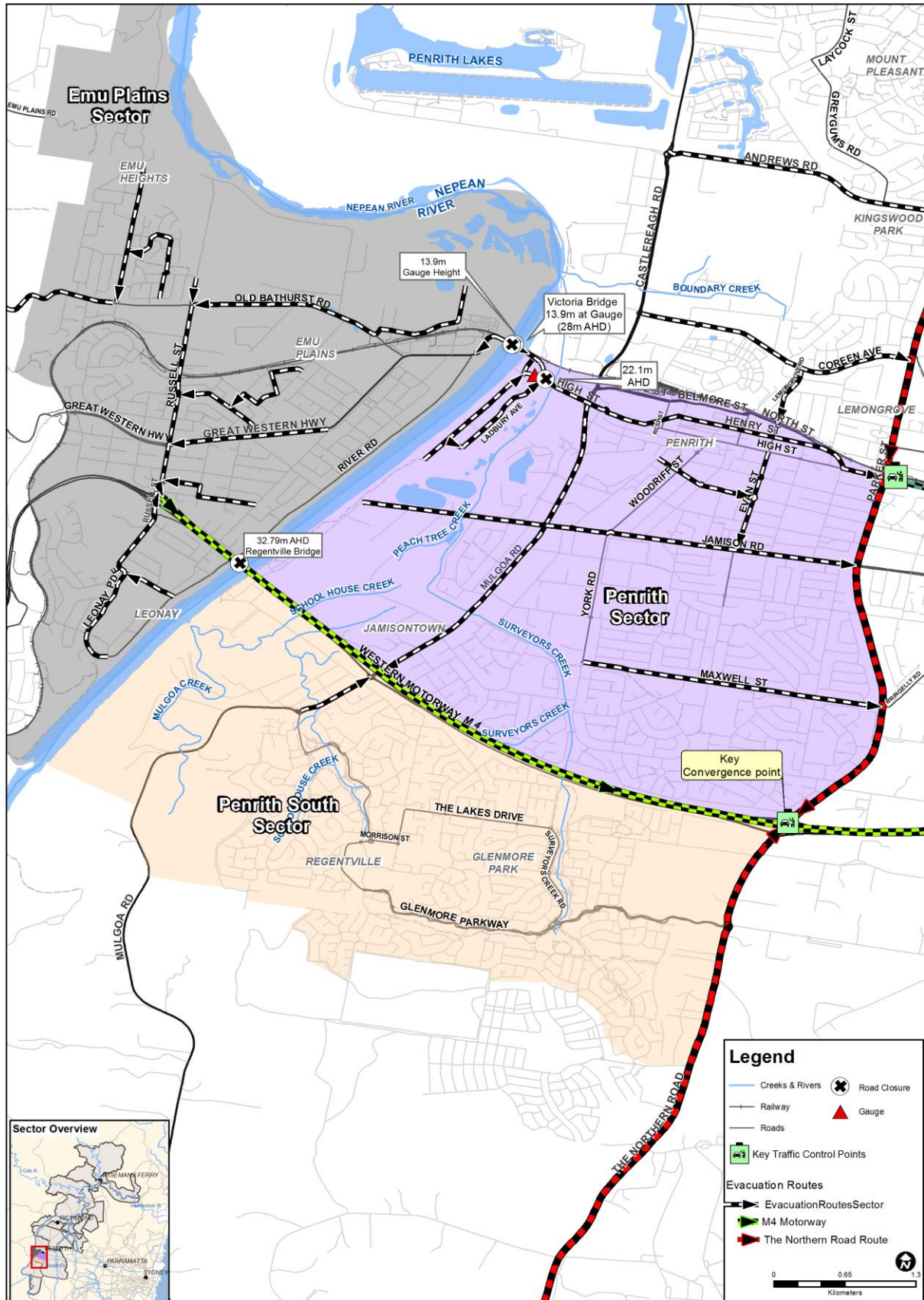


Figure 8: Emu Plains Sector Evacuation Route Sequencing

- 5.8.58 Evacuation traffic will converge onto the M4 Western Motorway from:
- Emu Plains M4 Western Motorway Evacuation Route;
 - The Northern Road Evacuation Route (North) from Richmond, Londonderry, Bligh Park and South Windsor;
 - Mulgoa Road Sector Evacuation Route for South Penrith;
 - The Northern Road Evacuation Route (South) from Wallacia.
- 5.8.59 There will also be general traffic heading east from the Blue Mountains.
- 5.8.60 Whilst people will be directed to stay with friends and family in the first instance, those heading to a Major Evacuation Centre will be directed onto the M4 Western Motorway east towards Sydney (Volume 3 Chapter 3).
- 5.8.61 The M4 Western Motorway may be temporarily inundated by local catchment flooding where:
- It crosses South Creek near St Mary's (25.2m AHD) and also
 - Ropes Creek near Erskine Park (28.5m AHD) (See Table 1).



Map 10: Emu Plains and Penrith - Evacuation Routes

Wallacia Sectors

- 5.8.62 Wallacia will need to be evacuated if floods are predicted to be above 39.8m to 61.3m AHD. The Bents Basin Sector will become isolated unless evacuated prior to Bents Basin Road closing around 33.9m AHD.
- Traffic from the **Wallacia, Wallacia South and Bents Basin Sectors** will (refer to Figure 9 and Map 11):
 - Initially be directed onto the Park Road Route until cut by backwater flooding from the Nepean River up local creeks at 39.8m AHD. From Park Road evacuation traffic will be directed North along the Northern Road and then east onto the M4 Western Motorway (M4).
 - Once Park Road is cut at 39.8m AHD traffic will be directed onto the Wallacia Alternative Route. This route consists of travelling south along Greendale Road, then traversing an unsealed road through a private property before meeting up with Park Road and onto the Northern Rd.
 - Traffic is then directed North on the Northern Road and onto the M4.
 - The Wallacia Alternative Route may itself be cut during an extreme flood event at 61.3m AHD or by local flooding.
 - Traffic from the Bents Basin Sector can use this route until either Bents Basin Road or Blaxland's Crossing Bridge is cut by floodwaters.

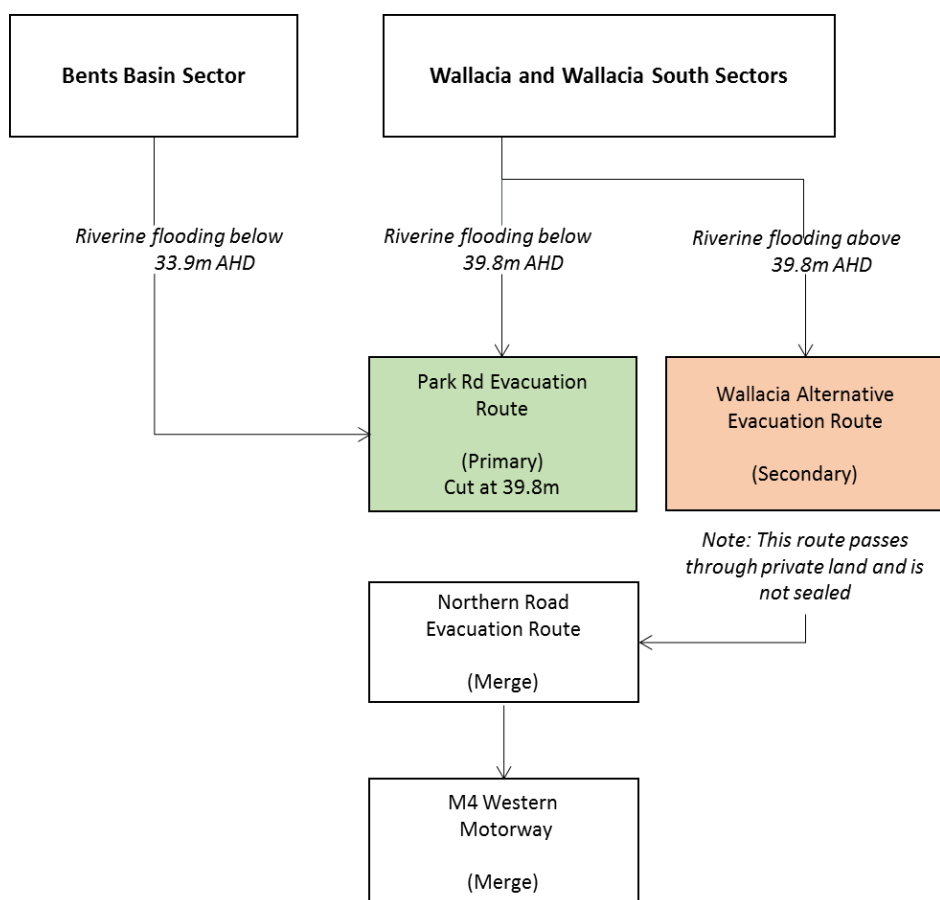


Figure 9: Wallacia Sectors Evacuation Route Sequencing

Lower Hawkesbury Sectors

- 5.8.63 Sectors in the Lower Hawkesbury will need to be evacuated early or else risk being isolated. Many properties in these sectors could also become flooded during larger flood events.
- 5.8.64 The Old Northern Road Route is the Regional Evacuation Route for the **Wisemans Ferry, Singeltons Mill** and **Lower Reaches** Sectors. It can also service those sectors on the Northern side of the Hawkesbury River whilst the Webbs Creek and Wisemans Ferry vehicles ferries are still operating including (refer Figure 10 and Map 12):
- Macdonald River;
 - Webbs Creek;
 - Gunderman.
- 5.8.65 River Road is the sector evacuation route for the Wisemans Ferry and Lower Reaches Sectors. It can be cut in numerous place from around 1.54m AHD. It is also subject to rock falls and slumping into the river at various locations along its length. Properties along this road will need to be evacuated early.
- 5.8.66 Once the Webbs Creek and Wiseman Ferry ferries have ceased operation at around 3m to 3.5m at the Windsor gauge, the sectors on the Northern side of the river will need to evacuate using local roads such as River Road, Wisemans Ferry Road and Wollombi Road. However these roads are also cut at low levels of flooding (around 1.2 to 1.5m AHD).
- 5.8.67 The Old Northern Road Evacuation Route is shown on Map 12 and is further described in Section 8.10.

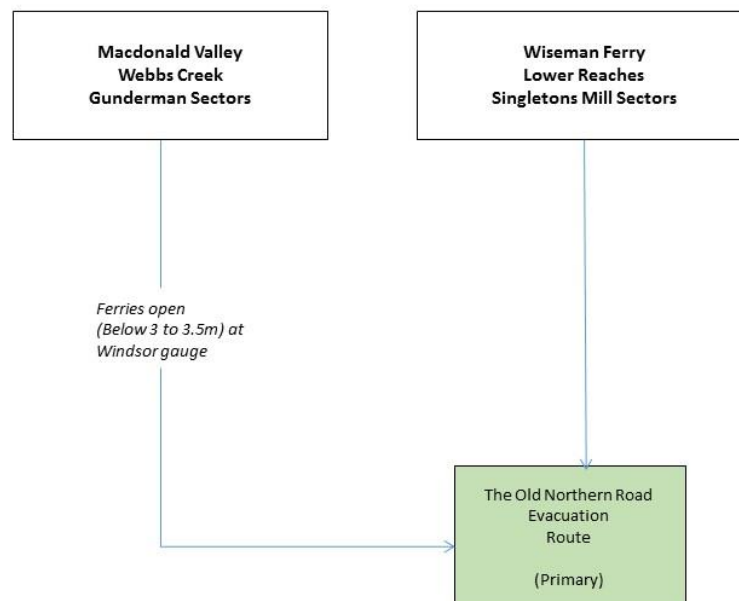
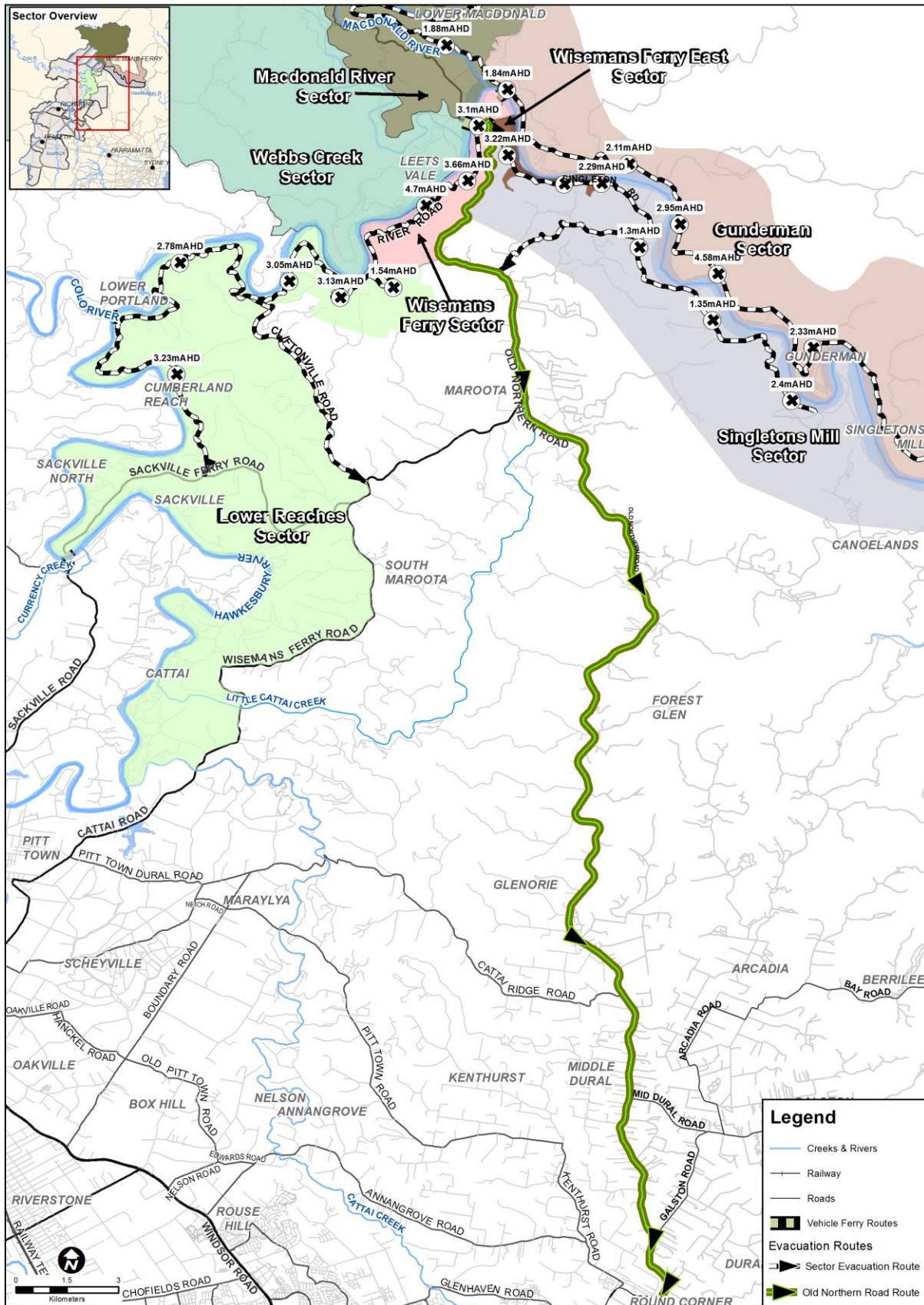


Figure 10: Lower Hawkesbury Evacuation Route Sequencing



Map 12: Lower Hawkesbury – Old Northern Road Evacuation Route

6 TRANSPORT ARRANGEMENTS FOR RESCUE

- 6.1.1 Whilst every effort will be made to evacuate people via road before evacuation routes are cut, there may still be the need to rescue people that have been unable to evacuate in time or that have become trapped.
- 6.1.2 This could potentially involve large numbers of people trapped on shrinking flood islands.
- 6.1.3 Where weather and conditions permit, the rescue of people will be initially done via flood boat or else helicopter (refer also to Volume 1 of this plan).
- 6.1.4 Flood rescues will be coordinated by the Flood Rescue Operations section in the NSW SES Sydney Western Region Headquarters as outlined in Volume 1 Section 7.26.5.
- 6.1.5 Helicopters used for ferrying people stranded on flood islands will be tasked from the NSW SES Sydney Western Region Headquarters Air Operations section as outlined in Volume 1 Section 7.26.17 and 7.27.
- 6.1.6 Requests for aero-medical transport will be referred to the NSW Ambulance Service.
- 6.1.7 Buses used to transport people from boat and helicopter landing points will be coordinated by the Transport Functional Area.

Flood Boats

- 6.1.8 Wherever possible flood rescue boats will transport people to landing points on Regional Evacuation Routes where assembly areas will be established. At these locations they will be met by road transport options including buses and where required ambulances.
- 6.1.9 These landing points may need to be moved progressively along these Regional Evacuation Routes as flood levels rise or fall.
- 6.1.10 The following Regional Evacuation Routes are considered to be most appropriate for this purpose due to their width, location and proximity to other services:
 - a. Windsor Road;
 - b. Hawkesbury-Valley Way.

Helicopters

- 6.1.11 Assembly areas will also be established at locations where helicopters are landing to reduce the distance that helicopters need to travel.
- 6.1.12 At these assembly areas those people that have been rescued will be met by other transport options including buses and where required ambulances.
- 6.1.13 People will then be transported to medical facilities, evacuation centres and/or transport hubs.

6.1.14 The following locations may be potentially used as helicopter landing points during a flood event:

- a. Hawkesbury-Nepean Valley area of operations
 - Nepean Hospital;
 - Castle Hill Showground;
 - Blacktown Showground;
 - Reserve next to South Maroota Community Centre, crn Wisemans Ferry Rd and Pauls Rd.
- b. Lower Hawkesbury area of operations:
 - Hornsby Rifle Club, Rosamond St Hornsby;
 - Rofe Park, Galstone Road Hornsby Heights;
 - National Parks and Wildlife Service, Ku-ring-gai Chase Rd, Mt Colah;
 - Oliver's Garage helipad, Pacific Highway Brooklyn;
 - The Old Wisemans Ferry Tip;

Buses

6.1.15 Where possible mini-buses will be organised to collect people from assembly areas where flood rescue boats or helicopters have dropped them off. From these assembly areas, people will be taken to either key transport hubs or evacuation centres.

7 TRAFFIC MANAGEMENT ARRANGEMENTS FOR RETURN

7.1 TRAFFIC MANAGEMENT PRINCIPLES FOR RETURN

- 7.1.1 Following the flood, traffic will only be allowed back into flood affected areas when an 'All clear' has been given, or under controlled staged return arrangements as outlined in Volume 1 Section 7.30 of this plan.
- 7.1.2 Traffic management at the key traffic control points will need to be managed to enable this staged return.

8 REGIONAL ROAD EVACUATION ROUTE DESCRIPTIONS

8.1.1 The designated regional road evacuation routes for flood operations are:

- a. The Windsor Road Route;
- b. The Pitt Town Road Route;
- c. The Hawkesbury Valley Way Route;
- d. The Blacktown-Richmond Road Route;
- e. The Llandilo Road Route;
- f. The Northern Road Route;
- g. The Londonderry Road Route;
- h. The Castlereagh Road Route;
- i. The Great Western Highway Route;
- j. The M4 Motorway Route;
- k. The Old Northern Road Route;
- l. The Park Road Route;
- m. The Wallacia Alternative Route.

8.1.2 This section provides the detailed specification of these designated regional road evacuation routes for prevention, preparedness and response purposes.

8.2 THE WINDSOR ROAD EVACUATION ROUTE

8.2.1 The Windsor Road Evacuation Route is shown pictorially in Map 3 in this Chapter and is further described below.

8.2.2 The Windsor Road Evacuation Route is the Regional Evacuation Route for the McGraths Hill Sector which includes the areas of McGraths Hill and Mulgrave.

8.2.3 The Entry Point for the Windsor Road Evacuation Route is located at the intersection of McGraths Road and Windsor Road, McGraths Hill.

8.2.4 Use of this evacuation route would involve travelling:

- a. South east along Windsor Road McGraths Hill, past the intersection of the Bandon Road Evacuation Route, along Windsor Road, Vineyard;
- b. South East along Windsor Road Vineyard to Windsor Road, Riverstone, past the intersection of Garfield Road East (Hawkesbury Valley Way Evacuation Route);
- c. South East along Windsor Road via Box Hill and Rouse Hill passing the intersection of Schofields Road (alternate Hawkesbury Valley Way Evacuation Route);

- d. South East on Windsor Road via Kellyville Ridge and Beaumont Hills.
- 8.2.5 The Exit Point for the Windsor Road Evacuation Route is the intersection of Windsor Road and Old Windsor Road, Kellyville. From that point people are able to access the M2/M7 if required.

8.3 THE PITT TOWN ROAD EVACUATION ROUTE

- 8.3.1 The Pitt Town Road Evacuation route is shown pictorially in Map 4 and is further described below.
- 8.3.2 The Pitt Town Road Evacuation Route is the Regional Evacuation Route for the Pitt Town Sector.
- 8.3.3 The Entry Point for the Pitt Town Road route is located at the intersection of the Bathurst Street and Buckingham Street, Pitt Town.
- 8.3.4 The Pitt Town Road Evacuation Route continues:
- a. North along Bathurst Street to the intersection of Bootles Lane;
 - b. East along Bootles Lane, then continues North East along Redfern Place;
 - c. South East at the intersection of Redfern Place and Mitchell Road Pitt Town;
 - d. At the intersection of Mitchell Road and Cattai Road continues North East along Cattai Road;
 - e. At the intersection of Cattai Road continues East along Pitt Town Dural Road;
 - f. At the intersection of Pitt Town Dural Road and Old Stock Route Road continues South West to the intersection of Old Pitt Town Road;
 - g. South East on the intersection of Old Stock Route Road and Old Pitt Town Road;
 - h. South along Old Pitt Town Road to the intersection with Scheyville Rd;
 - i. East along Scheyville Road, Scheyville until the intersection of Old Pitt Town Road;
 - j. South East along Old Pitt Town Road, Oakville crossing over Boundary Road;
 - k. South East along Old Pitt Town Road, Box Hill to the intersection of Nelson Road and Edwards Road;
 - l. East along Edwards Road to the intersection of Annangrove Road, Annangrove;
 - m. East along Annangrove Road to the intersection of Kenthurst Road;
 - n. South east along Kenthurst Road to the roundabout at the intersection of Kenthurst and Maple Street;

- o. South West along Kenthurst Road to the intersection of Old Northern Road, Dural.
- 8.3.5 The Exit point for the Pitt Town Road evacuation route is at the intersection of Kenthurst Road and Old Northern Road, Dural.

8.4 THE NORTHERN ROAD EVACUATION ROUTE

- 8.4.1 The Northern Road Evacuation Route is shown pictorially in Map 5, Map 7 and Map 9 and is further described below.
- 8.4.2 The Northern Road Evacuation Route is the initial Regional Evacuation Route for the **Windsor** Sector which can be used before George Street is closed due to flooding at around 14.85m at the Windsor gauge (15m AHD).
- 8.4.3 The Entry Point for the The Northern Road Evacuation Route is located at the intersection of The Northern Road and Blacktown-Richmond Road.
- 8.4.4 The Northern Road Evacuation route continues:
- a. South west along The Northern Road via Berkshire Park, Llandilo, Londonderry to the roundabout at Londonderry Road and Cranebrook Road;
 - b. South along The Northern Road, Llandilo past the intersection of Ninth Ave, where the Llandilo Evacuation Route ends at McGarritys Hill;
 - c. South on the The Northern Road at McGarritys Hill via Jordan Springs to the intersection with Andrews Road, where the Castlereagh Evacuation Route ends at Cambridge Gardens. The road now is known as Richmond Road;
 - d. South along Richmond Road, via Cambridge Gardens, Cambridge Park, Kingswood, to the intersection with Coreen Avenue where the road now known as Parker Street; and
 - e. South along Parker Street, Cambridge Park until the intersection with the Great Western Highway, Kingswood where the Great Western Highway Evacuation Route begins.
- 8.4.5 The Exit Point for the Route is the intersection of Parker Street and the Great Western Highway, Kingswood.
- 8.4.6 However, the Exit Point may be extended from the intersection of the Great Western Highway and Parker Street, Kingswood to the intersection of The Northern Road Kingswood, and the M4 Western Motorway at South Penrith depending on traffic conditions and if the Emu Plains Sector is also being evacuated.
- 8.4.7 From these points normal traffic management arrangements will apply.
- 8.4.8 To assist with the evacuations from the Wallacia floodplain traffic will be directed along The Northern Road Evacuation Route to the M4 Western Motorway. Entry Point for The Northern Road Evacuation Route from

Wallacia is located at the intersection of The Northern Road and Park Road at Luddenham.

- 8.4.9 The Northern Road Evacuation route from Wallacia continues:
- a. North East along The Northern Road to the roundabout at Elizabeth Drive;
 - b. North East through the roundabout to continue along The Northern Road at Luddenham;
 - c. North along The Northern Road via Orchard Hills and Mulgoa; and
 - d. North along The Northern Road to intersection of the M4 Western Motorway.
- 8.4.10 The Exit Point for the Route is the intersection of The Northern Road and the M4 Western Motorway, Mulgoa.

8.5 THE LLANDILO ROAD EVACUATION ROUTE

- 8.5.1 The Llandilo Road Evacuation route is shown pictorially in Map 5 and Map 7 and is further described below.
- 8.5.2 The Llandilo Road Evacuation Route is the Primary Regional Evacuation Route for the Bligh Park and the Windsor Downs Sectors.
- 8.5.3 The Entry Point for the Llandilo Road Evacuation Route is located at the intersection of Llandilo Road and Blacktown-Richmond Road, Windsor Downs.
- 8.5.4 The Llandilo Road Evacuation route continues:
- a. South west along Llandilo Road, Berkshire Park until intersection of Llandilo Road and Fourth Avenue;
 - b. West along Fourth Avenue until intersection of Terrybrook Road;
 - c. South along Terrybrook Road until intersection of Ninth Avenue, Jordan Springs; and
 - d. South west along Ninth Avenue until it meets The Northern Road Evacuation Route at McGarritys Hill.
- 8.5.5 Evacuation traffic from the Llandilo Evacuation Route will then merge onto The Northern Road Evacuation Route.

8.6 THE HAWKESBURY VALLEY WAY EVACUATION ROUTE

Evacuation Route (Bandon Road)

- 8.6.1 The Hawkesbury Valley Way Route is shown pictorially in Map 6 and is further described below.
- 8.6.2 The Hawkesbury Valley Way Evacuation Route is the Regional Evacuation Route for the Windsor Sector which includes the areas of Windsor, North Windsor and South Windsor.

- 8.6.3 The Entry Point for the Hawkesbury Valley Way Evacuation Route is located at the intersection of Macquarie Street and Day Street, Windsor.
- 8.6.4 The Hawkesbury Valley Way Evacuation route continues:
- a. South onto Day Street, Windsor until the intersection of Hawkesbury Valley Way;
 - b. South east along the Hawkesbury Valley Way across the Jim Anderson Bridge over South Creek at McGraths Hill;
 - c. South East from the Jim Anderson Bridge continuing along the Hawkesbury Valley Way, until the road is known as Railway Road North at Mulgrave;
 - d. South West from Railway Road West, across the emergency rail crossing to the southern side of the railway line, continue South East along Railway Road South;
 - e. South east along Railway Road South via Mulgrave and Vineyard, until the intersection of Level Crossing Road at Vineyard;
 - f. North East along Level Crossing Road, across the rail line heading North east along Level Crossing Road until the intersection of Wallace Road at Vineyard;
 - g. South east along Wallace Road, Vineyard until the intersection of Bandon Road; and
 - h. North East onto Bandon Road continue to the intersection of Windsor Road.
- 8.6.5 At the corner of Bandon Road and Windsor Road the Hawkesbury Valley Way Evacuation Route joins with the Windsor Road Evacuation Route.

Alternative Routes

- 8.6.6 To cater for possible local flooding there are several alternate routes for Windsor traffic travelling along the Hawkesbury Valley Way Evacuation Route to the south of Bandon Road. The alternative exit points include the:
- a. Intersection of Garfield Road and Windsor Road;
 - b. Intersection of Schofield Road and Windsor Road;
 - c. Intersection of Quakers Hill Parkway and Sunnyholt Road; and the
 - d. Intersection of Quakers Hill Parkway and the M7 Motorway.
- 8.6.7 From these Exit points normal traffic management arrangements apply.

Garfield Road Alternative Route

- 8.6.8 If there is local flooding on Bandon Road then evacuation traffic will continue:
- a. South on Riverstone Parade to the intersection of Otago Street;
 - b. North East on Otago Street to the intersection of Hamilton Street;

- c. South East on Hamilton Street, Riverstone to the intersection of Garfield Road East; and
- d. North East on Garfield Road East to Windsor Road.

Schofields Road Alternative Route

- 8.6.9 If there is local flooding on Garfield Road East then evacuation traffic will continue:
- a. South East on to McCulloch Street, Riverstone to the intersection of Kensington Park Road;
 - b. North East on Kensington Park Road to the intersection of Boundary Road;
 - c. South East on Boundary Road to the intersection of Schofields Road; and
 - d. East on Schofields Road, via Rouse Hill and The Ponds to connect with Windsor Road.

Quakers Hill Parkway Alternative Route

- 8.6.10 If there is local flooding on Schofields Road then evacuation traffic will continue:
- a. South on Alex Avenue to the intersection of Burdekin Road;
 - b. East on Burdekin Road to the intersection of Hambeldon Road, Quakers Hill;
 - c. South west on Hambeldon Road to the intersection of Quakers Hill Parkway; and
 - d. East or West on the Quakers Hill Parkway to continue onto either Sunnyholt Road, Parklea or the M7 Motorway, Quakers Hill.

8.7 THE BLACKTOWN-RICHMOND ROAD EVACUATION ROUTE

- 8.7.1 The Blacktown-Richmond Road Evacuation route is shown pictorially in Map 7 and is further described below.
- 8.7.2 The Blacktown Richmond Road Evacuation Route is used as the Initial Evacuation Route for the **Bligh Park** Sector until it is cut at around 14.2m AHD at the bridge crossing over South Creek.
- 8.7.3 East of the South Creek Bridge, the Blacktown-Richmond Road Evacuation Route will be used as the Primary Evacuation Route by the following sectors once they are developed:
- a. Eastern Creek B (Marsden Park);
 - b. Eastern Creek C (Colebee and Dean Park); and
 - c. South Creek B (Marsden Park).

- 8.7.4 Part of the Blacktown-Richmond Road Evacuation Route is also used by the following sectors to access The Northern Road and Llandilo Road Evacuation Routes once the road is cut at South Creek:
- Windsor; and
 - Windsor Downs.
- 8.7.5 The Entry Point for the Blacktown-Richmond Road route is located at the roundabout at intersection of Blacktown Road and George Street.
- 8.7.6 The Blacktown-Richmond Road Route continues:
- South East at the roundabout along Richmond Road past The Northern Road Evacuation Route at Berkshire Park;
 - South East on Richmond Road past the Evacuation Route for Llandilo Road, Windsor Downs;
 - South East along Richmond Road via Windsor Downs, Marsden Park, Colebee and across the Westlink M7; and
 - South East along Richmond Road at Dean Park to the intersection with the Quakers Hill Parkway at Glendenning.
- 8.7.7 The Exit Point for the route is located at the intersection of Richmond Road and Quakers Hill Parkway. From this point normal traffic management arrangements apply.

8.8 THE LONDONDERRY ROAD EVACUATION ROUTE

- 8.8.1 The Londonderry Evacuation Route is shown pictorially in Map 8 and is further described below.
- 8.8.2 The Londonderry Road Evacuation Route is used as an alternative evacuation route for **Richmond** if the Castlereagh Evacuation Route is not able to be used. It is also an evacuation route for the **Londonderry** Sector.
- 8.8.3 The Entry point for the Londonderry Evacuation Point is located at the intersection of Vines Drive and Londonderry Road, Richmond.
- 8.8.4 The Londonderry Road Route continues:
- South along Londonderry Road Richmond and across the Driftway; and
 - South along Londonderry Road, Londonderry to the point at which the route merges with The Northern Road Route at the intersection of Londonderry Road and The Northern Road at Llandilo.

8.9 THE CASTLEREAGH ROAD EVACUATION ROUTE

- 8.9.1 The Castlereagh Road Evacuation Route is shown pictorially in Map 8 and is further described below.
- 8.9.2 The Castlereagh Road Route is the primary evacuation route for the Richmond Sector.

- 8.9.3 The Entry Point for the Castlereagh Road Evacuation Route is located at the intersection of Southee Street and Castlereagh Road, Hobartville.
- 8.9.4 This route extends through the following roads:
- a. South west along Castlereagh Road, Richmond to the intersection of The Driftway at Richmond;
 - b. South East along The Driftway at Agnes Banks to the intersection of Jockbet Street;
 - c. South along Jockbet Street, Agnes Banks to the intersection of Wilshire Road;
 - d. West along Wilshire Road, Agnes Banks to the intersection of Brooks Lane;
 - e. North then West along Brooks Lane, Agnes Banks to the intersection of Castlereagh Road;
 - f. South along Castlereagh Road, Agnes Banks to the intersection of Hinxman Road, Castlereagh;
 - g. East along Hinxman Road, Castlereagh to the intersection of Sheredan Road;
 - h. South along Sheredan Road, Castlereagh to the intersection of East Wilchard Road;
 - i. South East along East Wilchard Road, Castlereagh to the intersection of Church Street, Castlereagh;
 - j. South west along Church Street, Castlereagh to the intersection of Church Lane;
 - k. South east along Church Lane, Cranebrook to the intersection of Cranebrook Road;
 - l. South West along Cranebrook Road, Cranebrook to the intersection of Vincent Road, Cranebrook;
 - m. East along Vincent Road, Cranebrook to the roundabout at the intersection of Grays Lane Cranebrook;
 - n. South at roundabout along Grays Lane, Cranebrook to the intersection of Hindmarsh Street, Cranebrook;
 - o. South west along Hindmarsh Street, Cranebrook to roundabout at Dulhunty Court, Cranebrook;
 - p. South at roundabout to Laycock Street, to intersection of Greygums Road, Cranebrook;
 - q. South east along Greygums Road, Cranebrook to intersection of Andrews Road, Cranebrook; and
 - r. East along Andrews Road, Cranebrook to The Northern Road.

- 8.9.5 The Exit Point for the Castlereagh Road Route is the intersection of Andrews Road and Parker Street at Cambridge Gardens, at which point the Castlereagh Road Evacuation Route merges with The Northern Road Evacuation Route.

8.10 THE OLD NORTHERN ROAD EVACUATION ROUTE

- 8.10.1 The Old Northern Road Route is shown pictorially in Map 12, and is further described below.
- 8.10.2 The Old Northern Road Route is the Regional Evacuation Route for the Wisemans Ferry and Lower Reaches Sectors. It can also service those sectors on the northern side of the Hawkesbury River whilst the Webbs Creek and Wisemans Ferry vehicles ferries are still operating including:
- a. Macdonald River;
 - b. Webbs Creek; and
 - c. Gunderman.
- 8.10.3 The entry point for the Old Northern Road Evacuation Route is located at the intersection of River Road, Singleton Road and Old Northern Road, Wisemans Ferry.
- 8.10.4 The Old Northern Road Evacuation Route continues:
- a. South West along the Old Northern Road via Metherringhams Hill, Wisemans Ferry, Maroota, past the intersection of Wisemans Ferry Road; and
 - b. South East along Old Northern Road via Forest Glen, Glenorie, Middle Dural, and Dural.
- 8.10.5 The Exit Point is located on the Old Northern Road at the roundabout where it becomes New Line Road near Dural.

8.11 THE M4 WESTERN MOTORWAY EVACUATION ROUTE

- 8.11.1 The M4 Western Motorway Route is shown pictorially on Map 10 and is further described below.
- 8.11.2 The M4 Western Motorway Route is the Regional Evacuation Route for the **Emu Plains Sector**. Other sectors are also directed onto the M4 evacuation route from various other Regional Evacuation Routes that converge onto The Northern Road.
- 8.11.3 The entry point for the M4 Western Motorway Regional Evacuation Route is located at the roundabout located on Russell Street / Leonay Parade, Emu Plains.
- 8.11.4 Additional evacuation traffic also joins the M4 motorway further to the east from Mulgoa Road and also The Northern Road Regional Evacuation Route.
- 8.11.5 The M4 Western Motorway Evacuation Route continues:

- a. South East at the roundabout at Leonay across the bridge over the Nepean River, continues via Regentville, Jamisontown and Glenmore Park, then crosses the Evacuation Route for The Northern Road at South Penrith; and
 - b. East along the M4 Western Motorway via Orchard Hills, Caddens, Claremont Meadows, St Clair, Colyton and Minchinbury.
- 8.11.6 The Exit point for the M4 Western Motorway is located just beyond where the M4 Motorway meets with the M7 Motorway at Eastern Creek. From here people are able to take either the M7 or M4 motorways.

8.12 THE GREAT WESTERN HIGHWAY EVACUATION ROUTE

- 8.12.1 The Great Western Highway Regional Evacuation Route is shown pictorially on Map 8 and Map 9 and is further described below.
- 8.12.2 The Great Western Highway Regional Evacuation Route may be used to direct traffic from the North on The Northern Road towards Sydney to ease congestion on the M4 Western Motorway. This would be particularly the case if Emu Plains is being evacuated in addition to Bligh Park, Windsor and Richmond.
- 8.12.3 The Entry Point for the Great Western Highway Evacuation Route is located at the roundabout at the intersection of Parker Street and the Great Western Highway.
- 8.12.4 The Great Western Highway Regional Evacuation Route continues:
 - a. East via Kingswood, Caddens, Claremont Meadows, St Marys, Oxley Park, Colyton, Mount Druitt and Minchinbury.
- 8.12.5 The Exit Point for the Great Western Highway Evacuation Route is just beyond where the Great Western Highway meets with the M7 Motorway at Eastern Creek. From here people are able to take either the M7 or M4 motorways.

8.14 THE PARK ROAD EVACUATION ROUTE

- 8.14.1 The Park Road Evacuation Route is shown pictorially in Map 11 and is further described below.
- 8.14.2 The Park Road Evacuation Route is the Regional Evacuation Route for Wallacia including the sectors of **Wallacia**, **Wallacia South** and **Bents Basin**.
- 8.14.3 The Entry Point for the Park Road Evacuation Route is located at the roundabout intersection of Park Road, Greendale Road, Silverdale Road and Mulgoa Road.
- 8.14.4 The Park Road Evacuation Route continues:
- South East along Park Road past the intersection of Wallacia Alternate Evacuation Route, Wallacia; and
 - East along Park Road until it meets The Northern Road Evacuation Route at Luddenham.
- 8.14.5 The Exit Point for the Park Road Evacuation Route is the intersection of Park Road and The Northern Road, Luddenham.
- 8.14.6 From that point on traffic will be directed north along The Northern Road Evacuation Route. Where The Northern Road meets the M4 Western Motorway traffic will be directed east along the M4 Western Motorway Evacuation Route.

8.15 THE WALLACIA ALTERNATIVE EVACUATION ROUTE

- 8.15.1 The Wallacia Alternative Route is shown pictorially on Map 11 and is further described below.
- 8.15.2 The Wallacia Alternative Route is the Regional Evacuation Route for Wallacia once the Park Road Route is no longer viable.
- 8.15.3 The Entry Point for the Wallacia Alternative Route is located at the roundabout intersection of Park Road, Greendale Road, Silverdale Road and Mulgoa Road, Wallacia.
- 8.15.4 The Wallacia Alternative Evacuation Route continues:
- South along Greendale Road Wallacia;
 - South East along Greendale Road, Wallacia, then continues along an unsealed road through a private property; and
 - North along the unsealed road, Wallacia and continues along to join up with Park Road Evacuation Route.
- 8.15.5 The Exit Point for the Wallacia Alternative Route is at this point where the private road meets up with Park Road. From there, evacuation traffic will be directed onto The Northern Road Evacuation Route and the M4 Western Motorway.

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HAWKESBURY-NEPEAN: NSW SES DAM EMERGENCY ARRANGEMENTS

**Chapter 5 of Volume 3 (NSW SES Response Arrangements for
Hawkesbury Nepean Valley) of the Hawkesbury Nepean Flood Plan**

Last Update: September 2015

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1 HAWKESBURY-NEPEAN DAM EMERGENCIES

There are a number of water supply reservoirs that could have some impacts within the Hawkesbury-Nepean Valley during dam emergencies including the Warragamba, Avon, Cataract, Cordeaux, Nepean and Mangrove Creek Dams.

Dam Safety Emergency Plans (DESPs) have been prepared for each of these dams by the dam owners and should be followed during dam emergencies.

Emergencies at Warragamba Dam could have significant implications downstream in the area covered by this plan. As such the details of NSW SES response arrangements for dam emergencies at Warragamba Dam are further described in this chapter.

Summary information about the Avon, Cataract, Cordeaux, Nepean and Mangrove Creek dams can also be found within Volume 2 of the relevant Local Flood Plans.

2 DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR WARRAGAMBA DAM

This section describes the downstream consequences and specific notification and warning arrangements for Warragamba Dam emergencies. It should be read in conjunction with the response arrangements detailed in Volume 1 of this plan and the Warragamba Dam Safety Emergency Plan (DSEP) (1).

2.1 INTRODUCTION

- 2.1.1 Warragamba Dam is built across the Warragamba River, 3.4 km upstream of the Nepean River junction, approximately 65 km West of Sydney. It is the primary water source for Sydney and the Blue Mountains. It has a catchment area of 9050km² and impounds Lake Burragorang, which is fed by the Cox's and Wollondilly Rivers and their tributaries, the Kowmung, Nattai and Wingecarribee Rivers (1).
- 2.1.2 Warragamba Dam was completed in 1960 with a gated spillway. It was designed and constructed in accordance with prevailing engineering practice at the time and built to withstand floods with an AEP of 0.1 % (one chance in 700 of happening in any year). Since then, flood estimation methods have improved and dam design standards have changed. A review in the early 1980s found that the original spillway could not pass the volume of water thought to be possible in the biggest floods (the Probable Maximum Flood – PMF).
- 2.1.3 The dam has now been upgraded to highest standards by constructing an auxiliary (bypass) spillway system. This new spillway consists of five small embankments known as fuse plugs. These are like individual earth and rock dam walls. Each fuse plug has a different crest height and they are designed

to progressively overtop and erode away during a large flood where the original gated dam becomes so full that the original gated spillway capacity would be exceeded.

- 2.1.4 The combination of the original spillway gates and the auxiliary fuse plug spillway is expected to safely cater for extreme flood events. The fuse plugs would not begin to operate until a large flood of the magnitude of AEP 0.08 % (likely to occur approximately once in 1 200 years) is experienced. This means that by the time this level of flooding is reached, almost the entire valley downstream will have already been evacuated and the additional flood water that flows through the dam as the fuse plugs operate will have no impact on the evacuation process.
- 2.1.5 Warragamba Dam is categorised as an Extreme Consequence Category Dam by the NSW Dams Safety Committee. There are currently no confirmed deficiencies in this dam that could lead to dam failure (1).
- 2.1.6 Although the dam is currently in good condition, an unsafe or emergency condition could still occur at any time due to extreme natural events. Dam failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.
- 2.1.7 Some scenarios have been considered for the purpose of emergency planning including (refer 2.2 for further details):
 - a. Earthquake damage to part of the dam wall / damage to flood gates with the dam full;
 - b. Sudden failure of a fuse plug due to earthquake damage;
 - c. Sudden opening of a gate during non-flood conditions with the dam full;
 - d. Failure of one or more gates to open during flood conditions.

2.2 CONSEQUENCES OF DAM EMERGENCIES

- 2.2.1 These dam emergencies if they were to occur could result in minor to moderate flooding downstream of Warragamba Dam including:
 - a. Inundation of downstream areas between Wallacia (8km), Penrith / Emu Plains (24km), North Richmond (48km) and Windsor (61km) (1).
 - b. Impacts to some roads and infrastructure (1).
 - c. Some risk to downstream river uses (e.g. boating, water skiing, kayaking) (1).
- 2.2.2 Sunny Day dam emergencies, that is those that occur outside of flood conditions (e.g. earthquake), are considered to have the most potential for loss of life. This is because they are likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

Earthquake Damage to Dam Wall and Gates

- 2.2.3 The assumed mode for a sunny day failure for emergency planning is by earthquake. Under severe earthquake loading the upper portion of the dam wall and the Drum Gate and Radial Gates are assumed to fail by displacement and rotation (1).
- 2.2.4 Sunny day failure due to an earthquake under this assumed failure scenario would result in minor to moderate flooding downstream with peak flood heights exceeding normal river bank levels as far downstream as Windsor (1).
- 2.2.5 The greatest heights above normal riverbank level would be expected at Wallacia where flooding would reach minor levels (7.85m at the Wallacia gauge or 37.5m AHD) and North Richmond (13.7m AHD or around 1.7m above the typical bank level) (1).
- 2.2.6 At Penrith the main river is not expected to break its banks due to the natural levee banks being higher in this area, however some local flooding could still occur due to back up flooding of creeks (8.77m at Penrith gauge or 22.9m AHD) (1).

Sunny Day Failure of Fuse Plugs

- 2.2.7 Sunny day failure of any of the five fuse plugs located on the Auxiliary Spillway would result in river rises of between 0.6m and 0.8m at Penrith, Richmond and Windsor.
- 2.2.8 These river level rises are within the normal riverbank levels and are below minor flood levels. No properties are at risk, but river users may be impacted.
- 2.2.9 Extreme earthquakes are considered to be the only sunny day hazard that could threaten multiple fuse plugs simultaneously, however failure of multiple fuse plugs resulting in the release of stored water is considered to be unrealistic (1).

Sudden Opening of Gates

- 2.2.10 During non-flood conditions, and assuming the dam is full at the time, the sudden opening of one or more of the dams gates could result in flooding up to minor levels at Penrith (up to 6m at the Penrith gauge or 20.1m AHD) and moderate levels at Windsor (up to 11.25m at the Windsor gauge or 11.4m AHD).
- 2.2.11 The levels of flooding expected is dependent on the number and type of gates that fail (1).

Failure of Gate to Open During Flood

- 2.2.12 If a gate fails to open during flood conditions the capacity for the dam wall to pass a flood would be reduced. The storage level in Warragamba Dam would rise higher than would have otherwise been the case (1).

2.3 NOTIFICATION PROCEDURES

- 2.3.1 The primary contact for dam emergency notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES Sydney Western Incident Controller and the NSW SES Sydney Western Region and the NSW SES Sydney Southern Region Headquarters duty officers who will contact the relevant NSW SES Local Controllers. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.
- 2.3.2 A flow chart illustrating the notification arrangements for potential dam emergencies is shown in Attachment 1.

2.4 WARNING

- 2.4.1 Dam emergency alerts will be issued by Water NSW to NSW SES and are used to trigger appropriate response actions. Responses escalate as the alert level migrates from white to red. The conditions that define each of the alert levels (as identified in the DSEP) are listed in Table 1.
- 2.4.2 The meaning of each alert level is as follows:
- White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.
 - Amber:** Alert level necessitating the warning of the population at risk to prepare for evacuation.
 - Red:** Alert level requiring the immediate evacuation of the downstream population at risk.
- 2.4.3 Actions indicated as occurring at particular alert levels may be brought forward if the development of a flood warrants it.

Table 1: Warragamba Dam Emergency Alert levels

Alert	Defining Conditions - Flood	Defining Conditions - Other
White Alert	Full Supply Level (FSL) + 9.0m and rising (FSL = 116.72m AHD)	Structural defect detected (e.g. crack, piping)
Amber Alert	Full Supply Level (FSL) + 11m and rising (FSL = 116.72m AHD)	Failure possible if storage continues rising or structural defect not fixed.
Red Alert	Full Supply Level (FSL) + 13m and rising (FSL = 116.72m AHD)	Failure imminent or occurred (e.g. Due to earthquake damage).

- 2.4.4 The NSW SES will disseminate dam failure warnings to the public based on advice from Water NSW.
- 2.4.5 Water NSW staff will keep the NSW SES informed of the emergency, its severity and most likely consequences. The dam alerts will be activated in

sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

- 2.4.6 The following tables outline the notification, warning and evacuation arrangements for dam emergencies at Warragamba Dam (Tables 2, 3 and 4).

Table 2: Notification, Warning and Evacuation Arrangements for a potential failure of Warragamba Dam – White Alert

WHITE ALERT	
Flood: Full Supply Level (FSL) (116.72m AHD) + 9.0m and rising; or Sunny Day: Structural defect detected (e.g. crack, piping) or heavy rainfall event.	
Stakeholder	Arrangements and Actions
Dam Owner (Water NSW)	<ul style="list-style-type: none"> Advise NSW SES Operations Communications Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
SES OCC	<ul style="list-style-type: none"> Receive notification from dam operator. Advise the NSW SES Sydney Western Incident Controller and NSW SES Regions (Sydney Western, Sydney Southern and Sydney Northern). Advise SEOC.
NSW SES Region / or Incident Controller	<ul style="list-style-type: none"> Receive notification from NSW SES SHQ. Advise NSW SES Local Incident Controller, NSW SES Units and NSW SES Local Headquarters. Advise the Regional Emergency Management Officer (REMO), other agencies and functional areas as detailed in Volume 1 of this plan including those listed in Section 7.4. Consider the need for outside of area assistance for warning and evacuation operations.
NSW SES Local Controllers	<ul style="list-style-type: none"> Confirm NSW SES Region HQ (Sydney Western, Sydney Southern and Sydney Northern) has been notified. Activate Local Flood Plans. Refer to Local Flood Plans for agencies to notify that the White Alert Level has been reached. (See Dam Failure Alert Notification Arrangements Flowchart – Attachment 1).
LEOCON/Other Agencies	<ul style="list-style-type: none"> When requested by NSW SES Local Incident Controller, coordinate support.
People at Risk	<ul style="list-style-type: none"> No action required. Some evacuations may be necessary due to mainstream riverine flooding.

Table 3: Notification, Warning and Evacuation Arrangements for a potential failure of Warragamba Dam - Amber Alert

AMBER ALERT	
Defining Conditions: Full Supply Level (FSL) (116.72m AHD) + 11.0m and rising Failure possible if storage continues rising or structural defect not fixed.	
Stakeholder	Arrangements and Actions
Dam Owner (Water NSW)	<ul style="list-style-type: none"> Advise NSW SES Operations Communications Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. Closely monitor the condition of Warragamba Dam and implement preventative measures to return it to a safe condition as soon as possible.
NSW SES OCC	<ul style="list-style-type: none"> Receive notification from dam operator. Advise the NSW SES Sydney Western Region Incident Controller and NSW SES Regions (Sydney Western, Sydney Southern and Sydney Northern). Advise SEOC.
NSW SES Region / Incident Controller	<ul style="list-style-type: none"> Notify NSW SES Local Incident Controller, NSW SES units and NSW SES LHQ. Provide NSW SES Flood Bulletins and Evacuation Warnings to the media. Coordinate provision of out of area assistance for warning and evacuation operations. Coordinate the notification of other agencies as listed in Volume 1 of this plan including those listed in Section 7.4.
NSW SES Local Controllers	<ul style="list-style-type: none"> Confirm NSW SES Region Headquarters (Including Sydney Western, Sydney Southern and Sydney Northern) have been notified. Coordinate the delivery of Evacuation Warning to at-risk residents. Coordinate the notification of other agencies as listed in the Local Flood Plans.
LEOCON/Other Agencies	<ul style="list-style-type: none"> When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	<ul style="list-style-type: none"> Prepare homes for inundation, pack valuables, mementos and pets and prepare to evacuate. Notify NSW SES doorknockers if transport to evacuation centres will be required. Some evacuations may be necessary due to mainstream riverine flooding.

Table 4: Notification, Warning and Evacuation Arrangements for a potential failure of Warragamba Dam - Red Alert

RED ALERT	
Defining Conditions: Full Supply Level (FSL) (116.72m AHD) + 13.0m and rising Failure imminent or occurred.	
Stakeholder	Arrangements and Actions
Dam Owner	<ul style="list-style-type: none"> Advise NSW SES Operations Communications Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
SES OCC	<ul style="list-style-type: none"> Advise NSW SES State Controller, who has defined functions in section 7.1.4 of Volume 1 of the HNFESP. Receive notification from dam operator. Advise the Hawkesbury-Nepean Incident Controller and NSW SES Regions (Sydney Western, Sydney Southern and Sydney Northern). Advise SEOC and notifications as per section 7.1.4 of Volume 1.
NSW SES Region / Incident Controller	<ul style="list-style-type: none"> Notify NSW SES Local Incident Controller, NSW SES Units and NSW SES Local headquarters. Advise the REMO. Coordinate the notification of other agencies as listed in Volume 1 of this plan including those listed in Section 7.4. Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. Activate the Standard Emergency Warning Signal (SEWS) and ensure that Evacuation Orders are broadcast over the radio stations Coordinate provision of out of area assistance for evacuation operations. Ensure that evacuation centres are ready to receive evacuees. Coordinate transport of evacuees without their own vehicles.
NSW SES Local Controller	<ul style="list-style-type: none"> Confirm NSW SES State and Region Headquarters have been notified. Evacuate at-risk residents. Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles.
LEOCON/Other Agencies	<ul style="list-style-type: none"> When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	<ul style="list-style-type: none"> Evacuate to friends and family or else to the nearest evacuation centre or assembly area.

Table 5: Dam Emergency Alert Cancellation

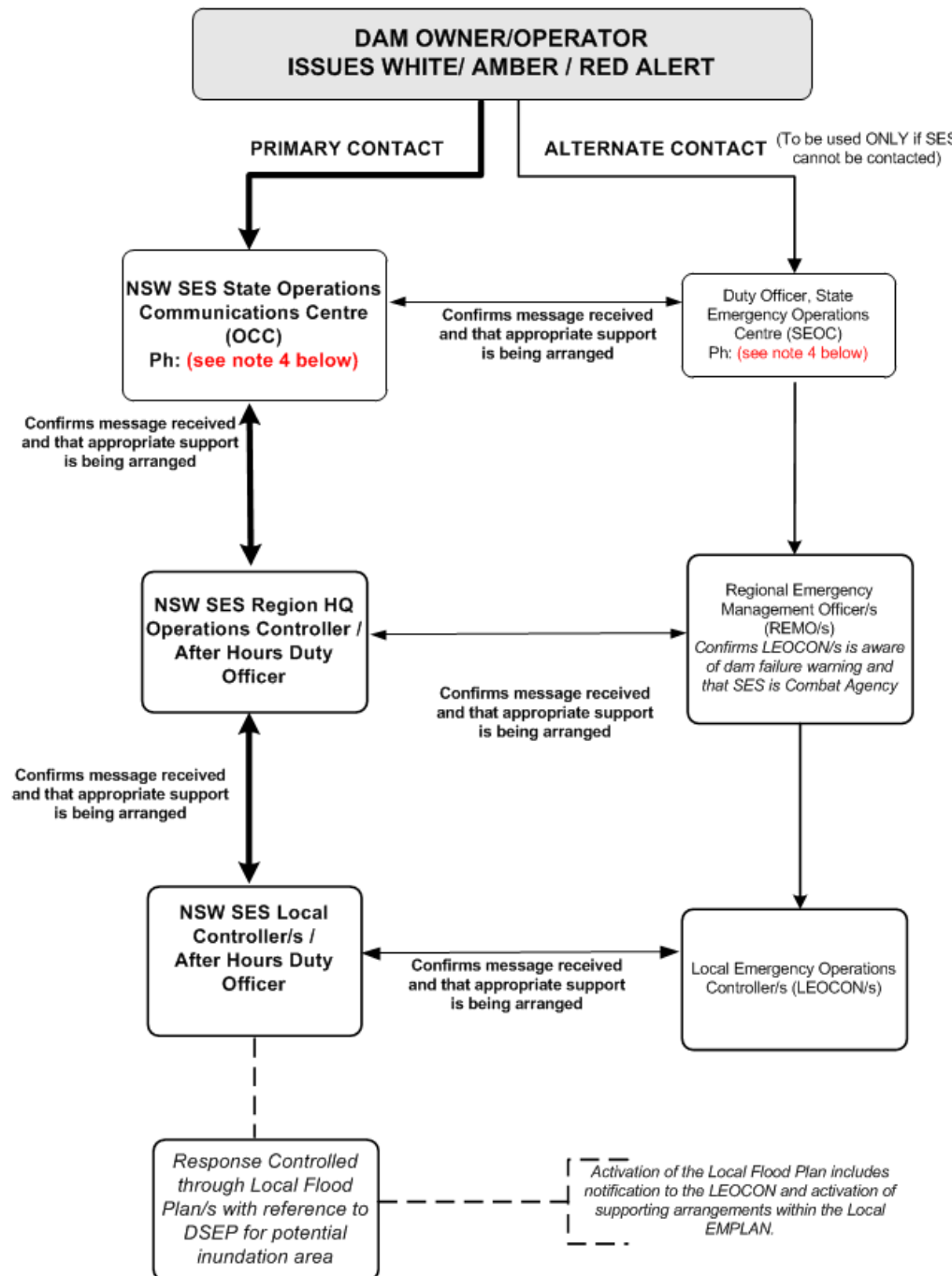
DAM EMERGENCY ALERT CANCELLATION	
Defining Conditions: Dam owner assesses threat and advises whether the risk to the dam structure has passed.	
Stakeholder	Arrangements and Actions
Dam Owner	<ul style="list-style-type: none"> Advise NSW SES OCC of the outcome of the risk assessment
SES OCC	<ul style="list-style-type: none"> Receive notification from dam operator. Advise the NSW SES Sydney Western Incident Controller and NSW SES Regions (Sydney Western, Sydney Southern and Sydney Northern). Advise SEOC.
NSW SES Region / Incident Controller	<ul style="list-style-type: none"> Following risk assessment of the dam, decide in consultation with NSW SES Local and State Incident Controller whether to issue an 'All Clear'. Issue 'All Clear' message to NSW SES Local Incident Controller, NSW SES units, NSW SES Local HQ and NSW SES State HQ. Advise the REMO that 'All Clear' has been issued. Issue 'All Clear' message via media including radio stations internet (e.g. Facebook, Twitter). Coordinate issue of 'All Clear' message at evacuation centres or by phone/doorknock. Deliver 'All Clear' message to other agencies and functional areas as listed in Volume 1 of this plan including those listed in Section 7.4.
NSW SES Local Controller	<ul style="list-style-type: none"> Coordinate issue of 'All Clear' message at the local level (e.g. by phone/doorknock). Deliver 'All Clear' message to other agencies as necessary.
LEOCON/Other Agencies	<ul style="list-style-type: none"> When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	<ul style="list-style-type: none"> Stay home, return home or await further advice.

LIST OF REFERENCES

1. **SCA.** *Warragamba Dam Safety Emergency Plan*. s.l. : Sydney Catchment Authority, October 2013. CD 2001/00106.

ATTACHMENT 1

Notification Arrangements for Potential Dam Failure



NOTES:

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