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**Submission to the 2016 Tasmania**

**Government Flood Review**

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SES Northern Regional HQ, June 2016

**The effectiveness of the strategies, preparedness and plans related to managing flood risk in Tasmania that were in place prior to the June 2016 floods occurring; including existing and potential levee systems.**

Managing Flood Risk

The Tasmania State Emergency Management Committee recognises the guidance provided by the *National Strategy for Disaster Resilience*. Accordingly, managing the risks associated with flooding in Tasmania is a shared responsibility amongst governments, individuals, businesses and communities.

In Tasmania risks associated with emergency events are managed by applying comprehensive and integrated prevention, preparedness, response and recovery controls. These controls are delivered at State, regional and local levels.

The effectiveness of these controls is reviewed and evaluated through post-incident reviews and on a periodic basis as part of natural disaster risk assessments. The SES conducted an after-action review after the June 2016 floods; the recommendations of which are currently being assessed. A copy has been provided to the Flood Review team separately.

The *2012 Tasmanian State Natural Disaster Risk Assessment* evaluated existing state level controls for risks associated with floods, assessed the risks and identified new treatment options for risks that required additional measures to reduce them to tolerable levels. The treatment options were evaluated and the State Emergency Management Committee (SEMC) approved a number of treatments to form the basis of the *Tasmanian State Natural Disaster Risk Treatment Plan*.

The *2016 Tasmanian State Natural Disaster Risk Assessment* reassessed the risks and existing controls, including implemented treatments arising from 2012, and identified additional treatment options to reduce the risks to tolerable levels. The treatment options were once again evaluated and a number of treatments were included into an updated *Tasmanian State Natural Disaster Risk Treatment Plan*.

A number of the flood related treatments contained in the *Tasmanian State Natural Disaster Risk Treatment Plan* were allocated to the SES for implementation. Progress on the implementation of the treatments is monitored by SEMC and reported upon separately. The ability of the SES to progress significant bodies of work necessary to address these treatment options is generally dependent on the availability of Commonwealth funding provided by the *National Partnership Agreement on Natural Disaster Resilience.*

Local flood related risks and treatments are specified in Municipal level all-hazards risk registers. Treatments are implemented by a range of stakeholders including Municipal Councils and SES, often with support from Australian Government grants.

To assist with the management of risks at the local level, Flood Studies and Floodplain Studies can be conducted to inform the development of risk treatment options that can then be specified in Floodplain Management Plans for implementation.

Flood Studies detail the nature of flood scenarios across the landscape and generally include information on flow rates, heights, peak travel times and peak extents. Flood Studies have been periodically conducted by DPIPWE, Municipal Councils and Hydro Tasmania for numerous water courses across Tasmania, which have generally been funded with support from Australian Government grants programs. A list of Flood Studies is included as Appendix 1.

The information in Flood Studies can be used to assist the development of a Floodplain Management Study. Floodplain Management Studies assess the risks associated with flood scenarios and identify options to treat unacceptable levels of risk. The State Emergency Service in partnership with the University of Tasmania and RMIT University recently completed a pilot project to trial the delivery of a Floodplain Management Study for Huonville and develop a set of guidelines to assist with the delivery of future studies. This project was supported by the Huon Valley Council and actively engaged local stakeholders in the process.

To date no Floodplain Management Plans have been developed in Tasmania, instead treatments are currently integrated into all-hazards risk registers and treatment plans.

Plans

In Tasmania the governance, arrangements, roles and responsibilities for managing risks and applying controls are detailed in the *Emergency Management Act* *2006*, Tasmanian Emergency Management Plan, Regional Emergency Management Plans, Municipal Emergency Management Plans, Special Emergency Management Plans, and other Acts and Regulations.

The nature of the controls and their application is often detailed in additional plans, agreements and other documents. There are a number of plans that can be used to inform and support the response to flood events in Tasmania, some of which are listed in Appendix 2.

The arrangements within the plans are designed to be scalable which allows for flexibility in their implementation to cater for a variety of potential operational situations.

SES supports Regional Emergency Management Committees and Municipal Emergency Management Coordinators to ensure plans are reviewed regularly and remain contemporary.

In the context of the June floods, the plans across the effected regions were assessed as satisfactory, though clearly the North West region was less practiced in the execution of the plans (versus Launceston / North where flood risk is a major facet of the Community focus). Additionally, internal SES plans such as regional readiness strategies, media engagement and State Headquarters SOPs were generally assessed as robust.

Preparedness

All organisations exposed to flood related risks and with a role in flood response and recovery should undertake appropriate measures to adequately prepare for a flood event.

Each Management Authority and Support Agency maintains a range of specific capabilities aligned to their roles and responsibilities. Each organisation is responsible for ensuring appropriate workforce planning, development and training programs and asset management systems are in place to maintain their capabilities.

The SES maintains the following capabilities (with funding support provided from Municipal Councils to most municipal volunteer units):

* 132 500 Request For Assistance telephone service supported by TASPOL Radio Dispatch Services. People who are deaf or have a hearing impairment or speech impairment can contact the SES via the National Relay Service. People who do not speak English can contact the SES via the National Translating and Interpretation Service;
* Website, Facebook Page and Twitter account;
* 3 x Regional ICC Facilities with back up electricity generators;
* Personnel trained in IMT roles, including specialised Regional IMT Units;
* 29 Municipal and Regional Units with personnel trained in general rescue, and storm and flood response; and equipped with flood response equipment; and
* Stockpiles of flood response consumables including sand and sandbags.

The SES response capabilities work in concert with other capabilities maintained by the Bureau of Meteorology, Municipal Councils, Tasmania Police, Tasmania Fire Service, DPFEM, DPIPWE, DPAC, Dam Operators, DHHS, Tasmanian Health Service, Ambulance Tasmania and a range of other organisations.

Between September and November each year Tasmanian Government Agencies prepare a consolidated State of Readiness Report that is presented to Cabinet by the State Controller and TFS Chief Officer and is provided to the Australian Attorney General’s Department. The report focuses on Public information; Planning, exercises and plans; Technical and hardware capability improvements; organisational and structural changes; and people aspects.

The SES in conjunction with other key stakeholders including the Bureau of Meteorology, Launceston City Council, Launceston Flood Authority and TASPOL periodically conduct a major exercise in the “Wet Feet” series to test preparedness, response and recovery arrangements against a major flood scenario in the Launceston City area. These exercises test a range of multi-agency and internal agency arrangements and capabilities at state, regional and local levels.

The SES is continuing to work with Councils and the Bureau of Meteorology to identify appropriate levels for the issue of warnings and to refine trigger points for evacuation. In recent years flood studies have been dependent on Commonwealth funding provided through the Natural Disaster Resilience Program.

Specific to the flood event, SES preparedness was assessed as satisfactory. In the North and South, teams were identified, postured and resourced appropriately to the forecasted threat. The North West was not postured to the same extent and was warned out for a largely support role to the North based on the forecast. Additionally, NW teams were fully committed to an unrelated search and rescue prior to the flood event at Latrobe, and fatigue was an issue that required close management.

Levee Systems

The Longford Levee System, Launceston Levee System and Forth flood stop barrier were all activated during the June 2016 flood events by the Northern Midlands, Launceston City and Central Coast Councils. The SES will defer to the relevant Councils to provide comment on the effectiveness of the levee systems during the June Floods. Flood intelligence obtained after the June floods will inform any future reviews of the levee systems.

The Bushfire and Natural Hazards Cooperative Research Centre is conducting a review of the economic costs and benefits of the Launceston Levee System given its construction cost of around $30M that was financed by the Launceston City Council and grants from the Tasmanian Government and Australian Government.

**Community preparation, resilience and awareness, including awareness of insurance matters, relating to major flood events in Tasmania.**

SES and Municipal Councils are primarily responsible for delivering community awareness and education programs relating to flood. These programs are aligned with the National Strategy for Disaster Resilience, SEMC Strategic Directions Framework 2013-2018, and national initiatives and campaigns such as FloodSafe.

SES is actively engaged at national and state levels to develop and deliver national best practice community flood resilience and awareness programs, but lacks some capacity in this area; particularly at regional or local levels. The proposal under the Emergency Management Reforms Project for additional human resources to deliver community development and community protection planning specifically for hazards such as flood and storm is strongly supported. This follows the successes of equivalent resources within the TFS who have delivered community development and protection planning for the bushfire hazard since 2012.

Launceston City Council and Northern Midlands Council have ongoing community education programs for Launceston and Longford that focus on flood awareness; household preparedness, response and recovery advice and information on the levees’ operation and evacuation arrangements in place of those communities. The effectiveness of awareness programs has been demonstrated by an increase in proactive behaviour of residents and business owners (e.g. an increase in the number of requests for sandbags well in advance of flooding).

The SES Northern Regional Manager has recommended raising awareness of responsibility, roles and arrangements for flood prone areas. Councils in some rural areas in the North have advised that some confusion exists regarding these matters with the view to seeking clarity into the future.

Councils with known flood risks such as the Huon Valley, Clarence City, and Central Coast provide information on the specific flood risks and generic household level advice on their websites.

Rural landowners generally have a high level of awareness and preparedness, but the significant and extreme event of the June floods exceeded the capacity of many farmers to deal with the consequences.

Notwithstanding this, more can and should be done with respect to Community flood education. The SES is working closely with Tasmania Fire Service to ensure an aligned Community Safety education program moving forward.

**The causes of the floods which were active in Tasmania over the period 4 – 7 June 2016 including cloud-seeding, State-wide water storage management and debris management.**

The SES, as a Response Management Authority, is not the appropriate agency to provide commentary on this.

**The use and efficacy of forecasting, community alerts, warnings and public information by authorities in responding to flood events.**

The BoM and SES share a positive and cooperative relationship. BoM advice is provided in the lead up to all significant weather events and preparedness arrangements are subsequently implemented by the SES, Councils and other agencies as required.

BoM warnings for the Northern event were considered effective. Notably, BoM gave SES a very early heads up of the event permitting SES to undertake important readiness arrangements in advance of forecast flooding. That said, during the event the magnitude of the flood seemed to escalate very quickly.

Where intelligence from the BoM was limited, forecast confidence was discussed with SES officers so that a clear understanding was obtained to inform response requirements.

BoM predictions for the NW Region did not identify the extent of the rainfall prior to the event; which did lead to the deployment of SES crews in an unrelated search and rescue activity for the two days prior to the weather event (which impacted on fatigue management levels in the NW region). Some lack of flood intelligence during the height of the flood was potentially caused by the loss of telemetry systems/monitoring sites.

Owners of river gauges vary and not all are placed for the purpose of assessing flood behaviour and generating flood warnings. Those that have been installed by the BoM for the purpose of flood warning are not necessarily owned by the BoM and replacement or maintenance responsibilities for these particular gauges remains unclear.

It is also apparent that the network of river gauges used to generate flood warnings could be expanded. The major barrier for this work to proceed appears to be the lack of funding, and to some extent the lack of clarity over which agency or which level of government would be responsible.

The SES and BoM are currently working on contingencies for manual gauges through an NDRP submission. Future consideration may be given to SES developing its own flood intelligence system, similar to that utilised by the NSW SES.

SES will launch its flood warning system in February 2017. The system is designed to complement the BoM warning system. Whilst BoM will continue to provide warnings relating to flood risk at a catchment level, SES will warn at a localised level regarding impact (including a call to action for protective actions/behaviours). It is believed that this system has significant potential in terms of enhancing community awareness, preparedness and response to flooding.

Preformed polygons for Emergency Alert (EA) are now in place for future use and activation in the Ouse, Mersey and Meander catchments. Polygons for other catchments can be rapidly created as required.

Community alerts and warnings during the June floods were varied and multi-faceted. For the first time, SES used the TasAlert system to promulgate a warning to Invermay, and evacuation procedures were assessed as effective. All media outlets, social media and conventional information distribution methods were used throughout the event to promulgate warnings, community messages and warnings.

**The effectiveness of transition from response to recovery in the week following the June floods; including capacity and priorities for infrastructure repair, and immediate assistance payments.**

Rapid activation and establishment of evacuation centres were effective, with mutual support between local councils.

The establishment of a recovery centre based in Latrobe, but extending services to the broader NW community, was well managed and attended. Although its formation was somewhat adhoc, and without precedent for the NW Region, it performed well and agency representatives were clearly committed to service their clients. This provided ready access and payments for eligible recipients and the cooperative collaborative staff enabled referrals to be easily transferred to other agencies within the venue. Formalisation of procedures would assist future recovery efforts.

The Regional Emergency Coordination Centre’s (RECC) played a key role in identifying issues, collating extent of damage and contributing to consequence management. The value of effective coordination at a regional level to inform upwards to the state level of broader issues should not be underestimated. There is a potential for duplication of effort where communication and reporting lines are not clearly established.

There was a strong commitment of interaction, support and cooperation between councils and government agencies, in prioritising works (particularly road, bridge repair).

The SES acknowledges the efforts of the State Recovery Coordinator, Commander Peter Edwards, and the Tasmania Flood Recovery Task Force.

**Consideration of the detrimental environmental effects of the flooding upon the landscape, and what effective mitigation measures may be necessary to avoid similar events.**

SES will defer to the final report of the Tasmania Flood Recovery Task Force, which will include key lessons learned.

**And any other matters relevant to the terms of reference.**

Response Agency Inter-operability

It was noted in the SES After-Action Review (AAR) that for a protracted event, SES lacks sufficient staff and volunteers to effectively manage an ROC without external support. This support was given freely by Tasmania Fire Service, and others throughout the flood event.

The level of inter-operability across multiple agencies and services was assessed as excellent; noting improvements can always be sought. Coming off the experience of a protracted fire campaign, relationships were clearly established and a combined approach was clearly demonstrated; regardless of uniform.

Notwithstanding this, the SES AAR identified the need to better link with emergency management committees and to engage with other stakeholders such as local government. There would be benefit in seeking a multi-agency exercising program to this affect. In general, personnel from the Tasmania Fire Service did not feel their services were fully used, and interoperability arrangements could be improved through combined training, flood awareness provision etc.

The SES notes that the Emergency Management Reforms Project is currently planning the implementation of the recommendations arising from the 2015 Department of Justice Review into the Emergency Management arrangements for Tasmania; several of the recommendations relate to enhancing exercise management arrangements for multiple agencies within Tasmania.

Ouse

A substantial amount of work was undertaken at Ouse by SES volunteers which included:

* providing support to Police in the search for missing farmer, Trevor Foster;
* sandbagging houses;
* managing the evacuation of some residents; and
* the road closure of the Lyell Highway as a result of rising river levels in the Ouse River.

The Ouse River flow peaked at around 480 cumecs at 7 pm on Monday 6 June. There is no specific flood plan for the Ouse River and before the river level exceeded 6 metres at the Ouse River Bridge the flood gauge was not visible.

A total of seven houses were evacuated at Ouse and a number of outlying rural properties were also inundated. It was noted that a plan for evacuation of vulnerable people might have been beneficial for better situational awareness and efficient evacuation at Ouse.

General

Under successive *National Partnership Agreements on Natural Disaster Resilience* the State Emergency Service administers the provision of financial grants to eligible organisations to undertake a range of activities intended to build the resilience of Tasmanian communities to natural disasters.

Since 2009 seventeen (17) grants totalling $0.9M have been made to recipients that directly relate to flood resilience building activities. An additional twenty (20) grants totalling $1.3M with an all-hazards focus have also been made. These grants are made on a dollar for dollar basis, with recipients required to contribute an equal amount to each project either in cash or in kind. Within Tasmania the total investment in these thirty seven (37) natural disaster resilience building projects has a value of $4.4M. The nature of these grants is summarised in Appendix 3.

**Huon River Flood - 15 July 2016**

Preparedness and Plans

Strategies exist within the Huon Valley area that directly address the issue of potential flooding impact, particularly on the Huonville Township. The Huon Valley council is well versed in dealing with localised flooding and have a number of plans, and subsequently systems, in place to tackle flooding issues. These include, but are not limited to:

* Huon Valley Emergency Management Plan
* Huon River Flood Evacuation Plan
* Relevant Council Standard Operating Procedures
* Contact network of emergency management stakeholders.

Reviews of plans are directly supported by the SES Regional Manager with consultation and endorsement provided through the Municipal Emergency Management Committee.

The Huonville community awareness of flooding varies considerably due to the infrequent occurrences of major flooding and new members to the community, particularly in the business sector. The Huonville community would benefit from an expanded state level community engagement/education strategy for flood.

Forecasting / Alerts / Warnings

BoM flood warnings were issued in a timely manner and are generally initiated as soon as the models indicate trigger points will be reached. First warnings occurred 24 hours prior to peak time. A potential preparation issue was the final peak height estimation not being provided until 6 hours before the peak arrived.

Huon Valley council, as with local SES and Police, are highly interactive with community warnings. The Council set-up a community information site at the Huonville Town Hall. Door knocking successfully occurred over several periods in a timely manner. Information fliers were developed to deal with a range of issues.

Standard information packs specific for flooding could be developed covering potential flood related issues such as power, health, clean-up and general safety.

Transition from response to recovery –

Recovery issues were discussed from the outset with regular meetings conducted to deliberate on the need for recovery centres, communication to DHHS personnel of potential evacuations, activating social workers during the event, etc.

Council also initiated flood clean-up support immediately after the event on the same day. TasNetworks began re-energising isolated areas and buildings as soon as flood waters receded. Information pamphlets on flood clean-up were provided by Red Cross and sanitation kits were distributed to affected properties by council Environmental Health Officers during the event.

Detrimental Environmental Effects

Future discussions may need to occur with State and Local Government relating to the responsibilities for in-stream flood debris removal under the Water Management Act 1999.

General

Consideration could be given to the following:

* Review of the primary flood classification levels state-wide (processes are currently being put in place).
* Review of state-wide flood inundation for contemporary relevance due to infrastructure/housing changes in impact areas.
* Review of power systems in flood zones to increase flood resilience. For safety reasons, when the power was switched off it affected distribution feeds impacting on areas that were not inundated. Power kiosks along roads were inundated due to their relatively low physical location and low flood resilience.

**Tasmania Fire Service Comment**

Preparedness and Plans

Northern Emergency planning was appropriate. Councils were prepared and efficient with good strategies in place to manage the levy systems.

Community Preparation

Northern councils have done considerable work with their communities in preparing for such an event. The Newstead area did have some minor issues however this was due to a different communication strategy employed by the NREMC that the residents were not used to.

Community Alerts and Public Information

The community alerts and public information would have been more efficient, timely and accurate if managed at a local level; state coordination can be utilised for information affecting multiple regions.

Transition from Response to Recovery

This would have been dealt with better if the regional committees had established their recovery structures as per the State and regional plans rather than wait for the state to establish a structure and apply it to the regions. The regional structures could easily have reported up into a state structure once established.

Future effective mitigation measures

Identify options for improving debris management for both forestry operations (private and public) and water storage.

Appendix 1: Tasmanian Flood Studies

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| **Municipal Area** | **Waterway** | **Locality** | **Date** | **Study name** | **Author or citation** | **Commissioning org** |
| Break O'Day | Lower george | St Helens | 2013 | Lower George River Floodplain Risk Management Plan | pitt&sherry | Break O'Day Council |
| Brighton | Jordan River | Pontville and Brighton | 1993 | Jordan River Flood Study | HEC | Department Primary Industries, Water and Environment |
| Burnie | Cooee Creek | Cooee | 2011 | Cooee Creek | Entura | Burnie City Council |
| Burnie | Shorwell Creek | Burnie | 2011 | Shorewell Creek Flood Study | Entura | Burnie City Council |
| Burnie | Whale Bone Creek | Burnie | 2009 | Whale Bone Creek Flood Study | Entura | Burnie City Council |
| Burnie | Romaine Creek | Burnie | 2009 | Romaine Creek Flood Study | Entura | Burnie City Council |
| Burnie | Pet and Guide Rivers | Burnie | 2004 | Pet & Guide Dam Break and Flood Study |  | Burnie City Council |
| Central Coast | Forth | Forth, Turners Beach, Leith | 2011 | Climate Futures for Tasmania: Flood Inundation Mapping | Entura | SES |
| Clarence | Kangaroo Bay Rivulet | Warrane | 2005 | Kangaroo Flood Study | Hobart Water | Hobart Water |
| Clarence | Kangaroo Bay Rivulet | Warrane | 2004 | Flood Inundation & Hazard Mapping Study for Kangaroo Bay Rivulet vol 1-4 | HEC | Hobart Water |
| Clarence | Risdon Brook | Risdon | 2004 | Flood Inundation & Hazard Mapping Study for Risdon Brook vol 1-4 | HEC | Hobart Water |
| Clarence | Coal River | Richmond | 1995 | Richmond Floodplain Study | Parkyn RMJ (199x) Richmond Flood Plain Study - HEC Water Resources Department Report No. 001-0546-CR-001 | DPIF |
| Derwent Valley | River Derwent | New Norfolk | 2011 | Climate Futures for Tasmania: Flood Inundation Mapping | Entura | SES |
| Derwent Valley | River Derwent | New Norfolk |  | Flood Inundation Map - Derwent River at New Norfolk |  | DPIF |
| Glamorgan Spring Bay | Saltwater Creek | Swansea | 2005 | Saltwater Creek - Flood Study | GHD 2005 | Glamorgan Spring Bay Council |
| Glenorchy City | Humphreys Rivulet | Greater Hobart, paricularly Glenorchy | 2008 | Final Report on the Review of Mineral Resources Tasmania Landslide Hazard Zoning Mt Wellington- Hobart Area Debris Flow | University NSW & Coffey Geotechnic | HCC,GCC, State Govt, KC, Hobart Water. |
| Glenorchy City | Humphreys Rivulet | Glenorchy | 2005 | Humphreys Rivulet - Flood Inundation and Hazard Mapping 2002 | Thompson & Brett - Cardno Willing | GCC & Hobart Water |
| Glenorchy City | Humphreys Rivulet | Glenorchy | 2005 | Flood Inundation and Hazard Mapping Study for Humphreys Rivulet - Vol 1 Hydrology and hydraulics Report 2005 | Hydro Tasmania | Hobart Water |
| Glenorchy City | Humphreys Rivulet | Glenorchy | 2005 | Flood Inundation and Hazard Mapping Study for Humphreys Rivulet - Vol 2 Flood Inundation and Hazard Maps | Hydro Tasmania | Hobart Water |
| Glenorchy City | Humphrys Rivulet | Glenorchy | 2004 | Humphries Rivulet | Hobart Water | Hobart Water |
| Glenorchy City | Barossa Creek | Glenorchy | 1999 | Barossa Creek Flooding Analysis | Thompson & Brett - Willing & Partners Consulting Group | Glenorchy City Council |
| Glenorchy City | Humphreys Rivulet | Glenorchy | 1997 | Analysis of the Humphreys Rivulet Catchment and Concept Design of Flood Protection Measures | Thompson & Brett - Willing & Partners Consulting Group | Glenorchy City Council |
| Glenorchy City | Islet Rivulet | Glenorchy | 1997 | Analysis of the Islet Rivulet Catchment and Concept Design of Flood Protection Measures | Thompson & Brett - Willing & Partners Consulting Group | Glenorchy City Council |
| Glenorchy City and Hobart City | New Town Rivulet | New Town/ Moonah | 1998 | New Town Rivulet Flood Study 1998 | HECEC Australia Pty Ltd | HCC & GCC |
| Hobart City | Hobart Rivulet | Hobart, South Hobart | 2010 | Hobart Rivulet Flood Study: Extension |  | Hobart City Council |
| Hobart City | Maypole Creek | New Town | 2008 | Maypole Rivulet Flood Study |  | Hobart City Council |
| Hobart City | Sandy Bay Rivulet | Sandy Bay | 2002 | Sanby Bay Rivulet Dam Break and Flood | Hobart Water | Hobart Water |
| Hobart City | Sandy Bay Rivulet | Sandy Bay | 1999 | Sandy Bay Rivulet Flood Study | HEC | Hobart City Council |
| Hobart City | New Town Rivulet, Maypole Ck, and Brusy Ck | New Town, Moonah, Lenah Valley | 1999 | New Town Flood Study: Extension |  | Hobart City Council |
| Hobart City | Hobart Rivulet | Hobart, South Hobart | 1997 | Hobart Rivulet Flood Study | HEC | Hobart City Council |
| Hobart City | Sandy Bay Rivulet | Sandy Bay |  |  |  |  |
| Hobart City | New Town Rivulet | New Town |  |  |  |  |
| Hobart City | Hobart Rivulet | Hobart |  |  |  |  |
| Huon Valley | Huon River | Tahune to Port Huon | 2016 | Floodplain Risk Assessment process for Tasmania : Huonville Case study - Flood Study Report | Enura | SES |
| Huon Valley | Huon River | Huonville | 2016 | Floodplain Risk Assessment process for Tasmania : Huonville Case study -Huonville Floodplain Study | Entura | SES |
| Huon Valley | Huon River | Huonville | 2011 | Climate Futures for Tasmania: Flood Inundation Mapping | Entura | SES |
| Huon Valley | Mountain River | Huonville | 1993 | Mountain River Flood Study | GHD (1993) Mountain River Flood Plain Study [for DPIFE] | DPIFE |
| Huon Valley | Huon River | Huonville | 1992 | Huon River Floodplain Study - Stage 2 Report |  | Department Primary Industries, Water and Environment |
| Huon Valley | Huon River | Huonville | 1991 | Huon River Floodplain Study - Stage 1 Report |  | Department of Infrastructure, Energy and Resources; Rivers and Water Supply Commission |
| Kentish | Redwater Creek | Railton | 2014 | Review of Railton Flood Mitigation Options | SEMF | Kentish Council |
| Kentish | Redwater Creek | Railton | 2004 | Redwater Creek, Railton Flood Study |  | Kentish Council |
| Latrobe | Kings Creek | Latrobe | 2003 | Latrobe Regional Flood Mitigation Program |  | Latrobe Council |
| Latrobe | Mersey River; Kings Creek | Latrobe | 1994 | Latrobe Floodplain Study |  | Latrobe Council |
| Latrobe/Kentish/Devonport City | Mersey River | Latrobe, Kimberley, Liena | 2011 | Climate Futures for Tasmania: Flood Inundation Mapping | Entura | SES |
| Latrobe/Kentish/Devonport City | Mersey River | Latrobe, Kimberley, Liena | 2009 | Mersey River |  | Hydro Tasmania |
| Launceston City | North Esk River; Tamar River | Launceston | 2004 | Invermay Flood Levee Study |  | Launceston City Council |
| Launceston City | North Esk River | Launceston | 1994 | Launceston Flood Protection Scheme North Esk Reassessment |  | Launceston City Council |
| Launceston City | Tamar River; South Esk River; North Esk River | Launceston | 1994 | Launceston Flood Protection Scheme Reassessment |  | Launceston City Council |
| Launceston City | South Esk River | Launceston | 1984 | Launceston Flood Protection Scheme Flood Levels in the Evandale Area |  | Launceston City Council |
| Meadner Valley | Meander River | Deloraine | 1997 | Deloraine Flood Study | Parkyn RMJ (199x) Deloraine Flood Study - HEC Water Resources Department Report No. 001-089-CR001 | DPIF |
| Meander Valley | Meander River | Deloraine | 2016 |  |  | Meander Valley Council |
| Northen Midlands | South Esk River and Back Creek | Longford | 2002 | Longford Flood Mapping | Hydro Tasmania | Northern Midlands Council |
| Northern Midlands | South Esk | Longford and Hadspen | 2016 |  |  | Northern Midlands Council |
| Northern Midlands | South Esk | Perth | 1994 | Perth Floodplain Study | Wilson DR (1992) Perth - Longford Flood Plain Study HEC Water Resources Department Report WR92/02 and Ratcliffe S (1994) Perth - Evandale Floodplain Study Hydraulic Analysis | DPIF |
| Northern Midlands | Macquaire River, South Esk River, Back Creek | Longford | 1994 | Longford Flood Plain Study | Parkyn RMJ (1994) Longford Floodplain Study - HEC Water Resources Department Report No. 001-0529-CR-001 and Wilson DR (1992) Perth - Longford Flood Plain Study HEC Water Resources Department Report WR92/02 | DPIF |
| Sorell | Sorell Rivulet | Sorell | 2006 | Sorell Rivulet Flood Study |  | Sorell Council |
| West Coast | Pieman River | Pieman Heads, Corinna, Rosebery, Tullah | 2013 | Pieman River Flood Evacuation Plan | Entura | West Coast Council |

Appendix 2: Tasmanian flood plans

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| **Plan** | **Plan Owner** |
| Dam Safety Emergencies State Special Emergency Management Plan Issue 2 2016 | DPIPWE |
| Hydro Tasmania Dam Safety Emergency Plan (2012) | Hydro Tasmania |
| Ford Road Brighton [Jordan River] | Brighton Council |
| Lower Derwent River Flood Evacuation Plan | Derwent Valley Council |
| Lower Forth Flood Evacuation Plan 2002 | Central Coast Council |
| Lower Forth Flood Response and Recovery Plan 2008 | Central Coast Council |
| Mersey River Flood Survey 2011 [Evacuation Plan] | Latrobe Council |
| Huon River Flood Evacuation Plan | Huon Valley Council |
| Hobart Rivulet Flood Action Plan | Hobart City Council |
| Sandy Bay Rivulet Flood Action Plan | Hobart City Council |
| Glenorchy CBD Evacuation Plan | Glenorchy City Council |
| Flood Governance Plan | Launceston City Council |
| Flood Warning Plan | Launceston City Council |
| Flood Levee Response Plan | Launceston City Council |
| Flood Levee Patrol Plan | Launceston City Council |
| Flood Levee River Gauge Reading Plan | Launceston City Council |
| Launceston Flood Evacuation Plan | North REMC |
| Longford Flood Protection Action Plan | Northern Midlands Council |

Appendix 3: Summary of grants under the National Partnership Agreement on Natural Disaster Resilience grouped by Review Terms of Reference.

***The effectiveness of the strategies,  preparedness and plans related to managing flood risk in Tasmania that were in place prior to the June 2016 floods occurring; including existing and potential levee systems***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fund Year** | **Organisation** | **Project Name** | **Project Summary** | **Funding** | **Region** |
| 2012-13 | Hobart City Council | Major Rivulets Flood Map Recalibration and Climate Change Upgrade | Major Rivulets Flood Map Recalibration and Climate Change Upgrade - A recalibration and climate change upgrades on the existing flood maps for two major rivulets. | $45,000 | South |
| 2014-15 | Hobart City Council | Major Rivulets Flood Map Recalibration and Climate Change Upgrade | (granted funding in 2012-13 round) | $45,000 (year 2) | South |
| 2014-15 | Kingborough Council | Kingborough is Getting Ready | The project will: 1. Assist to develop the capacity of residents and businesses to respond and recover from disasters; 2. Undertake a detailed capacity and communication assessment for Bruny Island; and 3. Create land use planning solutions for hazard management for Kingston Beach to explore limits to planning for resilience. | $127,062 | South |
| 2014-15 | Northern Midlands Council | Longford – Hadspen flood risk study | The Project will: 1. Conduct a hydrological review that will estimate new flood frequency estimates for gauging stations on the South Esk, Meander, Macquarie and Back Creek including concurrent flow estimation; and 2. Undertake 2D hydrodynamic modelling of the Longford Hadspen basin to convert hydrological hydrograph inputs into flood levels, extents and flood maps. A number of components of the Project will be used as inputs into emergency management plans of both Northern Midland Council and Meander Valley Council | $75,000 | North |
| 2014-15 | University of Tasmania | Development of Floodplain Risk Assessment Process for Tasmania | The Project will develop a methodological process for the assessment of floodplain risks in Tasmania. The proposed process will be consistent with the Australian Emergency Handbook 7 and the National Emergency Risk Assessment Guidelines. The process will be demonstrated through four case studies representing a range of diverse geographical contexts within Tasmania and trialled to produce assessment of existing, future and residual risks for the four case study areas. The outputs from the assessments will be able to be integrated into all-hazards municipal level risk assessments and associated emergency risk management process | $94,244 | State |
| 2014-15 | University of Tasmania | Natural Disaster Risk Assessment for Tasmania | The Project will provide Tasmania with a revised state-wide natural disaster risk assessment in line with the new National Emergency Risk Assessment Guidelines. | $111,000 | State |
| 2014-15 | Volunteering Tasmania | Building Natural Disaster Resilience through Volunteers | The Project will focus on recruiting and managing spontaneous volunteers in an emergency through the implementation of the Emergency Volunteering CREW (Community Response for Extreme Weather) service. | $98,600 | State |
| 2012-13 | State Emergency Service | New Norfolk SES training and operational; facilities upgrade | The Derwent Valley SES provides an invaluable Road Crash Rescue, Storm and Flood response to their local community however the current unit building facility is aging and run-down. To ensure the appropriate people are recruited to the unit, and then after considerable training are retained, a full refurbishment of the facility, including training areas, is required. | $15,000 | New Norfolk |

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| 2012-13 | Department of Police and Emergency Management | Emergency Services Volunteer Recruitment Campaign | While spontaneous volunteerism is on the rise, most frontline emergency service agencies are unable to provide the required training while managing the initial response to a disaster. The high level of public interest in people volunteering their services immediately after the announcement of a major disaster risks a significant backlash from people who's volunteering expectations cannot be met at the time. To counteract this, and raise public awareness of the difficulties with spontaneous volunteering, the Emergency Services Volunteer Working group seek to develop a comprehensive recruitment campaign entitled. "Don't Wait for Disaster to Happen - join up and learn valuable skills now". | $49,350 | State |
| 2012-13 | Kentish Council | Railton Flood Mitigation Survey | Railton Flood Mitigation Survey | $72,891 | Nth West |
| 2012-13 | Burnie City Council | Burnie Municipality Emergency Management Risks Review/Assessment | A review of Burnie's emergency risks identified in the Burnie Emergency Management Plan in accordance with NERAG | $10,000 | Nth West |
| 2012-13 | Department of Premier and Cabinet | Emergency Alert Website | - | $60,000 | State |
| 2011-12 | Central Coast Council | Flood Catchment Mapping Central Coast | - | $20,000 | Central Coast |
| 2011-12 | Northern Midlands Council | Installation of penstock valves on culvert penetrations through the Longford Flood Levee | - | $35,000 | North |
| 2011-12 | Meander Valley Council | Meander River Flood Survey | - | $40,000 | North |
| 2011-12 | Break O’Day | St Helens & Immediate Surrounds – Stormwater Management Plan | - | $42,500 | Break O’Day |
| 2011-12 | Burnie City Council | Cooee Creek Flood Study | - | $21,500 | North |
| 2011-12 | Burnie City Council | Romaine Dam Rising | - | $100,000 | North |
| 2009-10 | Derwent Valley Council | Lower Derwent Flood Warning Upgrade Project | Install and upgrade rainfall and river monitoring sites in the lower Derwent Valley to assist with riverine flood forecasting. | $60,000.00 | South |
| 2009-10 | Glenorchy City Council | Evacuation Plan for Glenorchy CBD and affected residential areas | This project seeks to identify an appropriate early warning system for those affected by flooding and a process for the safe evacuation of residents, commercial properties and itinerant workers in the Glenorchy CBD and surrounding areas. | $65,000 | South |
| 2009-10 | Northern Midlands Council | Longford Flood Protection Training Facility | To establish a permanent Temporary Flood Protection Training facility to train new staff and refresh existing staff at the Longford storage shed. The training facility would entail purchasing one additional complete section of the Temporary Flood Protection System, install two base concrete foundations/mounting plates, purchase additional rubber seals and erection tools. | $9,000 | North |

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| 2009-10 | State Emergency Service | Launceston Flood Siren | Launceston is a flood prone municipality, with the suburbs of Invermay/Inveresk being particularly at risk of major flooding. In the event of a 1:50 year (ARI) flood, approximately 4000 residents require evacuation from Inveresk /Invermay. In the event that an evacuation is required, a siren is used to warn residents. The siren is sounded for one minute every fifteen minutes. At present, there is one flood siren in the area. Recent tests show that this siren alone is not adequate to warn residents, particularly those living in the northern end of the suburbs. To this end a second siren is required. | $4,000 | North |
| 2009-10 | Parks and Wildlife Service | The Arthur-Pieman Integrated Emergency Management Initiative | To develop a better relationship and understanding with emergency services and develop a natural disaster and emergency management plan. There is a need to improve the knowledge and safety of people within the APCA from floods, fire, tsunami, storms and other emergency events. Currently there is are no special area emergency management plans for the APCA. The project will include 4 components which will be integrated into APCA management planning, including; information signage, Natural Disaster Mitigation and Emergency Management Plan, public consultation and awareness program and a multi agency emergency training exercise. | $59,000 | Nth West |
| 2009-10 | Department of Premier and Cabinet | Implementation of a State Framework for Mitigating Natural Hazards through Land Use Planning and Building Regulation | This initiative will directly build community resilience to natural disasters through the implementation of an integrated framework that provides a vehicle for consideration of natural hazards and risks in the planning system building regulatory system. | $125,000 | State |

***Community preparation, resilience and awareness, including awareness of insurance matters, relating to major flood events in Tasmania***

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| **Fund Year** | **Organisation** | **Project Name** | **Project Summary** | **Funding** | **Region** |
| 2014-15 | Australian Red Cross | Adapting REDIplan Household Emergency Preparedness for Tasmania | The Project will produce a range of Tasmanian-specific emergency preparedness materials that includes a house hold level tool for individuals and families to identify and address their disaster vulnerabilities. | $18,915 | State |
| 2014-15 | Dept. of Primary Industry, Parks and Wildlife and the Environment | Animal Welfare in Emergencies | The Project will provide consistent and contemporary advice from the Department Primary Industry, Parks and Wildlife and the Environment Animal Welfare staff to Councils in relation to accounting for animal welfare in the evacuation context. The Project also provides an opportunity for Council staff to adapt the advice in a practical manner to suit their community's needs. | $30,000 | State |
| 2014-15 | State Emergency Service | Tasmanian Community Flood Resilience Project – Stage 2 | The Project will develop state-wide flood management policies, plans and guidelines that: specify and assign flood PPRR roles; detail how the roles will be undertaken; and the processes and standards to be followed. | $98,375 | State |
| 2014-15 | Dept. of Premier and Cabinet | Compiling and Sharing Hazard Information with the Community | The Project will improve community resilience by supporting individuals and communities to take appropriate risk mitigation action by providing households with detailed information about their exposure to natural hazards. | $117,000 | State |
| 2012-13 | State Emergency Service | State Emergency Service | Development of Emergency Management Arrangements for Vulnerable Members of Tasmanian Communities - The development of emergency management arrangements for vulnerable members of Tasmanian communities | $100,200 | State |
| 2012-13 | State Emergency Service | Tasmanian Flood Resilience Project | -To enhance community resilience by developing a better understanding of flood risk and flood management decision tools such as flood maps, plans, warning systems and systems that support flood intelligence and improve public awareness , education and self-help capacity in relation to flood and storm events | $60,000 | State |
| 2011-12 | Australian Red Cross | Emergency Preparedness for Culturally & Linguistically Diverse Communities in Tasmania |  | $13,500 |  |
| 2012-13 | Migrant Resource Centre (Southern Tasmania) Inc | Inclusive Disaster resilience Responses for Culturally and Linguistically Diverse Communities in Southern Tasmania - year 2 of a 2011-12 project | I | $13,200 | Southern |

***The causes of the floods which were active in Tasmania over the period 4 – 7 June 2016 including cloud-seeding, State-wide water storage management and debris management***

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***The use and efficacy of forecasting, community alerts, warnings and public information by authorities in responding to flood events***

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| **Fund Year** | **Organisation** | **Project Name** | **Project Summary** | **Funding** | **Region** |
| 2012-13 | Department of Police and Emergency Management | Emergency information Management and Sharing Project (EIMSP | The acquisition of a software tool that can be used by agencies for the management of information relating to prevention, preparedness, response and recovery. | $196,190 | State |
| 2014-15 | Department of Police and Emergency Management | Emergency Information Management and Sharing Project | (granted funding in 2012-13 round) | $55,898 (year 2) | State |
| 2014-15 | Tasmanian Visitor Information Network | Emergency Preparedness Program | The project will enable Tasmanian Visitor Information Centre staff to acquire the knowledge and be better equipped to effectively deliver emergency and disaster related information to visitors to the State. | $34,817 | State |
| 2014-15 | Dept. of Premier and Cabinet | Enhancements to TasALERT | The Project will focus on delivering improvements through a second phase of development to TasALERT. The Project is a result of a series of recommendations that came from use in recent minor emergencies and a specifically designed exercise to evaluate the first phase of TasALERT. | $80,000 | State |

***The effectiveness of transition from response to recovery in the week following the June floods; including capacity and priorities for infrastructure repair, and immediate assistance payments***

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| **Fund Year** | **Organisation** | **Project Name** | **Project Summary** | **Funding** | **Region** |
| 2014-15 | Dept. of Premier and Cabinet | Disaster Planning and Recovery for Tasmanian Businesses | This project will develop Tasmanian specific disaster planning and recovery resources including checklists, industry-specific information and guidance materials that will be housed on www.business.tas.gov.au. The Project also includes workshops with relevant stakeholders to assist them with using and promoting the resources. | $30,000 | State |