



Australian Government
Bureau of Meteorology

Service Level Specification for Flood Forecasting and Warning Services for South Australia – Version 3.1



This document outlines the Service Level Specification for Flood Forecasting and Warning Services provided by the Commonwealth of Australia through the Bureau of Meteorology for the State of South Australia in consultation with the South Australian Flood Warning Consultative Committee.

Service Level Specification for Flood Forecasting and Warning Services for South Australia

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Cover image: Awaiting the flood peak, Light River at Lower Light, December 2010. Photo Patrick Rocca, ABC News, <http://www.abc.net.au/news/2010-12-02/floods-wash-through-se-australia/2360332>.

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1 Introduction

- 1.1 The purpose of this Service Level Specification is to document and describe the flood forecasting and warning services provided by the Bureau of Meteorology (the Bureau) in South Australia.
- 1.2 The Bureau's flood forecasting and warning services are provided within the context of the Total Flood Warning System as defined in the Australian Emergency Manuals Series, Manual 21 Flood Warning (Australian Government, 2009 and illustrated in Figure 1).

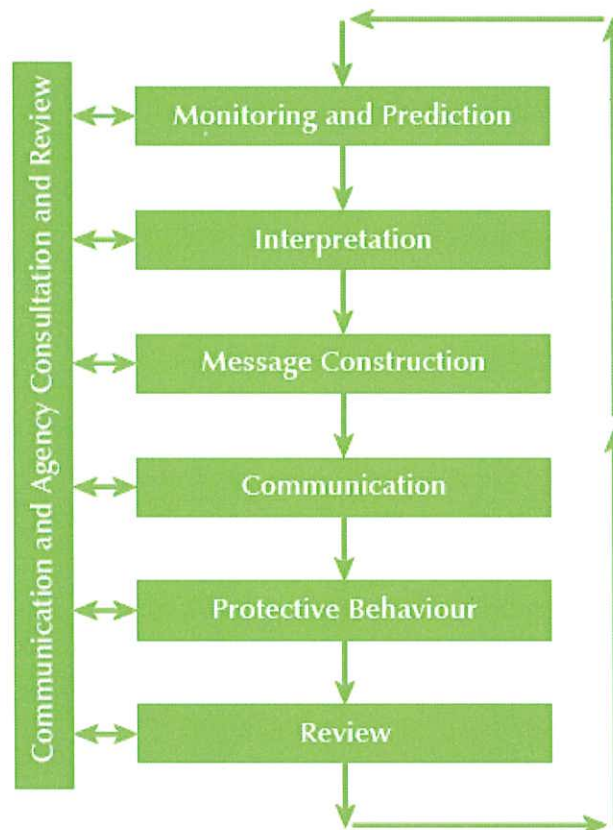


Figure 1: The components of the Total Flood Warning System (Australian Emergency Manual Series, Manual 21 Flood Warning, Australian Government 2009)

- 1.3 The Total Flood Warning System recognises that a fully effective flood warning service is multi-faceted in nature and its development and operation involves input from a number of agencies each with specialised roles to play. It is vital that the agencies involved work in close cooperation through all stages of developing and operating the system. The services described here are the Bureau's contribution to the Total Flood Warning System.
- 1.4 The Bureau's main role in the Total Flood Warning System is focussed on monitoring and prediction, and to a lesser extent interpretation, message construction, and communication components (see Appendix A for descriptions). The Bureau also contributes to review activities and takes a role in the planning and coordination activities associated with ensuring that the activities of all agencies and appropriate linkages are well coordinated. The roles and responsibilities of all key stakeholders involved in the provision of a flood warning

service in South Australia are described in the National Arrangements for Flood Forecasting and Warning (Bureau of Meteorology, 2015)¹.

- 1.5 This Service Level Specification is concerned with describing the Bureau's role in the Total Flood Warning System and its interaction with other stakeholders as described in the National Arrangements. This is to ensure that the service the Bureau is providing in support of each of the relevant components of the Total Flood Warning System is understood by the Bureau and other stakeholders.
- 1.6 A description of the activities that make up the Bureau's flood forecasting and warning services for South Australia is given in Section 3. This set of activities, associated products and target levels of service constitute the current standard services provided freely by the Bureau. The Bureau also provides supplementary services on a commercial or cost recovery basis but they are not covered in the document.

¹ The National Arrangements for Flood Forecasting and Warning (2015) is available on the Bureau's website: <http://www.bom.gov.au/water/floods/index.shtml>

2 Flood Warning Consultative Committee

- 2.1** The South Australian Flood Warning Consultative Committee provides the Bureau's key stakeholder's with a consultation mechanism for its flood forecasting and warning services. As such, the committee is responsible for reviewing this Service Level Specification on an annual basis or as required.

- 2.2** The overall role of the South Australian Flood Warning Consultative Committee is to coordinate the development and operation of flood forecasting and warning services in South Australia, acting as an advisory body to the Bureau and participating State and local government agencies. Membership and terms of reference for this committee in South Australia are detailed in Schedule 1.

- 2.3** The Bureau chairs and provides the secretariat support to the South Australian Flood Warning Consultative Committee, which meets six monthly depending on need and activity.

3 Bureau flood forecasting and warning services

3.1 The scope of services covered by this Service Level Specification is confined to those dealing with riverine flooding caused by rainfall where typical rain-to-flood times are six hours or more. Flash flooding (rain-to-flood times less than six hours) and flooding caused purely by elevated sea levels are not covered, nor are the weather forecasting and other services the Bureau provides that contribute to the flood forecasting and warning service, including Severe Weather, Severe Thunderstorm Warnings, Tropical Cyclone Warnings, provision of radar data and rainfall forecasts.

3.1.1 However, a number of locations have been included in Schedule 2 where the forecast lead times are less than six hours due to them being located in the upper reaches of the catchments.

3.1.2 The schedules listing stations being used for flood forecasting and warning include a number of locations which have been installed primarily for monitoring flash flooding by the councils because of their use in enhancing situational awareness and modelling.

3.2 The nature of the services covered by this Service Level Specification include undertaking the routine catchment monitoring and river height prediction activities necessary for operation of the Total Flood Warning System, as well as issuing and publishing specific warning and data products. These activities are listed below with further detail and associated performance measures provided in subsequent sections.

- Collect and publish rainfall and river level data
- Routine monitoring of flood potential
- Flood modelling and prediction
- Automated information and alerting
- Issue flood watches
- Issue flood warnings
- Communication of flood warnings and flood watches
- Data networks, communications and storage
- Operations
- Maintain systems to collect data and flood information
- Planning and liaison
- Support for emergency management training and exercises

3.3 Collect and publish rainfall and river level data

3.3.1 The collection and publishing of rainfall and river levels is an important component of the overall service. Apart from use by the Bureau for data analysis and its hydrological modelling for flood predictions, the data is also used by the emergency service agencies, numerous operational agencies, businesses and the public to monitor rainfall and river conditions. To assist in describing the service, the locations where river height; dam, weir or lake level; and tidal observations are made are categorised into three types; namely forecast location (Schedule 2), information location (Schedule 3) and data location (Schedule 4).

- **Forecast location** is a location for which the Bureau provides a forecast of future water level either as the class of flood that is predicted (minor, moderate or major) or as a level and class – refer to Appendix A for definitions. At these locations observed data, flood classifications and additional qualifying information will also be available (Schedules 2).

- **Information location** is a location at which flood classifications are defined and observations of water level data are provided. At these locations forecasts of future water level are not produced. Other key thresholds may be defined and reported against (Schedule 3).
- **Data location** is a location for which just the observed water level data is provided. Flood classifications are not available for these locations and forecasts of future water level are not produced (Schedule 4).

3.3.2 An indicative level of priority has been assigned to each observing site and key communication infrastructure such as radio repeaters (Schedules 2-4 and 7-9) based on a three tiered scheme (Table 1). The priority level was defined by Bureau forecasters based on the expected impact to the Bureau’s services. The impacts identified are the expected outcome of a service outage at that site during a flood emergency. Impact is described in terms of forecast performance and the Bureau’s ability to provide a flood warning service. Note that the scope of this priority scheme is limited to consideration of the requirements of forecasting and prediction only and should not be confused with any other priority assigned to that site by third party owners or other users.

Table 1 Site priority

Priority Level	Impact on performance	Impact on service delivery	Description
High	Very difficult to meet target	Direct and significant high level impact for the site and/or downstream locations	Degradation of service highly likely.
Medium	Difficult to meet target	Some impact for the site and/or downstream locations.	Possible degradation of service.
Low	Not likely to affect meeting targets	Little impact on the site and/or downstream location	No change in service. Lower possibility of degradation of service.

Note: Multiple outages within a given network will lead to a higher impact levels and greater service degradation. Table 1 indicates the effect of a single site failure within an otherwise functional network.

3.4 Routine monitoring of flood potential

3.4.1 The Bureau will maintain an awareness of catchment conditions and monitor the potential for riverine flooding. This monitoring activity will be supported by the Bureau’s weather services as required and is an activity undertaken to plan future flood operations.

3.5 Flood modelling and prediction

3.5.1 The Bureau will develop and maintain prediction systems for the forecast locations listed in Schedule 2a.

3.5.2 The Bureau prediction systems can include real-time hydrologic models, simple peak to peak correlations and other hydrologic techniques as appropriate.

3.5.3 The Bureau prediction systems will be maintained and updated following significant events or when new data becomes available.

- 3.5.4 The target level of performance for the prediction at each forecast location is given in Schedules 2a and 2b.
- 3.5.5 The responsibility for flood modelling and prediction services for the Lower Murray rests with the Department of Environment, Water and Natural Resources (DEWNR). DEWNR's flood forecasting and warning locations are listed in Schedule 2b.
- 3.5.6 The Bureau's flood modelling and prediction services for locations downstream of SA Water major controlled storages are dependent on communication of release activities to the Bureau. Forecast locations impacted by SA Water dam release activities are detailed in Schedule 2c.

3.6 Automated information and alerting

- 3.6.1 In South Australia, the Bureau currently provides a threshold-based rainfall and river alarming service for riverine flooding for Torrens, Gawler and Onkaparinga.

3.7 Issue flood watches

- 3.7.1 The Bureau will issue flood watches when the combination of forecast rainfall and catchment conditions indicates flooding is possible. The catchments and basins covered by flood watches include all those listed in Schedule 10. Note that flood watches may cover catchments that do not have established flood warning services.
- 3.7.2 The primary purpose of a flood watch is to provide early advice to communities and the relevant emergency service organisations of the potential flood threat from a developing weather situation. Typically, a flood watch is issued 1 to 4 days before an anticipated flood event depending on the confidence in rainfall forecasts.
- 3.7.3 Flood watches will be communicated by the Bureau using the dissemination methods detailed in section 3.9.

3.8 Issue flood warnings

- 3.8.1 In general flood warnings are issued based on the following criteria:
 - The river level of at least one forecast location (listed in Schedule 2) is expected to reach and or exceed or has exceeded the minor flood level;
 - The flood class levels or trigger heights defined at forecast locations are expected to be exceeded (refer to Schedule 2a);
 - River levels above the minor levels are expected at widespread information locations(refer to Schedule 3).

The specific initiating criteria, if any, for each flood warning product is listed in Schedule 10.

- 3.8.2 Flood warnings may include either **qualitative** or **quantitative** predictions at forecast locations or a statement about future flooding in more **generalised** terms as outlined in Table 2. The type of prediction included is commensurate with user requirements, the availability of real time rainfall and river level data, and the capability of available flood prediction systems. A flood warning may contain **generalised**, **quantitative** and **qualitative** predictions and typically start with more **generalised** information and become more specific as data becomes available as

the event develops and progresses.

3.8.3 Quantitative predictions include expected flood class (minor, moderate or major) with more specific information on the height and time of water levels at the forecast locations identified in Schedules 2a and 2b. A **quantitative** prediction can be a specific level or a range of levels, and detailed timing down to blocks of a minimum of 3-6 hours. **Quantitative** predictions are based on all available information at the time of warning issue. The target lead time of the river height prediction for each forecast location where **quantitative** predictions are provided is given in Schedules 2a and 2b. For an example of a **quantitative** prediction refer to Table 2.

3.8.3.1 For the Bureau to be able to provide a **quantitative** prediction at a location, it is essential to have a suitable network of rainfall and river level sites upstream with data coming in real time, sufficient historical data to calibrate the flood forecasting model, a reliable rating table and documented flood impacts and flood classifications.

3.8.4 Qualitative predictions include expected flood class (minor, moderate or major) and timing of flooding at the forecast locations identified in Schedules 2a and 2b. The timing is indicated in blocks of six, 12 or 24 hours, using the terms such as early morning, afternoon or overnight. Such predictions are based on all available information at that time and may include advice on the peak classification that is expected or has occurred at that location. The target lead time for each forecast location where only **qualitative** predictions are provided are given in Schedules 2a and 2b. For an example of a **qualitative** prediction refer to Table 2.

3.8.4.1 For the Bureau to be able to provide **qualitative** prediction at a location, it is essential to have at least some rainfall and river level sites upstream of the location with data coming in real time, at least some historical flood data to calibrate the flood forecasting model, a reasonable rating table and documented flood impacts and flood classifications.

3.8.5 The Bureau may also issue flood warnings with more **generalised** predictions and information when there are not enough data to make specific predictions or in the developing stages of a flood. These warnings contain generalised statements advising that flooding is expected and may include forecast trend (rising or falling) (for examples refer to Table 2).

3.8.6 The typical target accuracy of a **quantitative** water level prediction is that 70% are within 0.3 or 0.6 metres of the observed water level. Specific accuracy targets by location are defined in Schedules 2a and 2b. Achievement of these targets is not possible in all floods or at all locations. In general predictions of a flood peak are more accurate than “reach” or “exceed” predictions that are issued during the developing stages of a flood. This is due to uncertainty of future rainfall rates and/or upstream floodplain behaviour that are used when making those predictions.

3.8.7 A list of the flood warnings issued in South Australia, along with the basin/river to which they apply is included in Schedule 10. Details about forecast locations in each basin/river are included in Schedules 2a and 2b.

3.8.8 Flood warning summaries – A summary of watches and warnings that are current is provided to help media and other users readily access information.

3.8.9 Schedule 10 includes the River Murray warning product for which flood predictions are provided by the Department of Environment, Water and Natural Resources.

Table 2. Prediction type description

Prediction type	Height prediction	Time of prediction	Example
Quantitative	Numerical prediction - Any Height - Peak Height Can refer to flood class	More specific, typically in blocks of 3 to 6 hours	The Gawler River at Gawler West is expected to peak near 8.0 metres (major flooding) about 6pm Sunday. The Onkaparinga River at Verdun is predicted to reach 4.5m (minor flooding) between 2pm and 3pm Friday afternoon.
Qualitative	Refers to flood class (minor, moderate or major)	Range of times (6, 12 or 24 hour blocks)	Minor flooding is expected in the North Para River at Penrice during Saturday afternoon. The North Para River at Yaldara is expected to peak above the Major Flood Level during Sunday evening.
Generalised	No height prediction - forecast trend (rising or falling)	Range of times (24 hour blocks)	Flooding is expected in Bremer River at Wanstead Rd during Saturday.

3.9 Communication of flood warnings and flood watches

3.9.1 Flood watches and warnings will be issued directly to a list of stakeholders with emergency management responsibilities. This list is maintained by the Bureau but is not detailed in this document. The direct dissemination methods supported include email, fax and the internet protocols such as File Transfer Protocol (FTP).

3.9.2 The format of messaging in flood related products will conform to a nationally consistent standard determined by the Bureau, in consultation with the Flood Warning Consultative Committee.

3.9.3 Flood watches and warnings are also communicated by the Bureau via:

3.9.3.1 Radio: Radio stations, particularly the ABC, broadcast flood warning information as part of their news bulletins, or whenever practicable. This form of broadcast may be covered in separate agreements between the Bureau and broadcasters.

3.9.3.2 Weather warning service: Flood warning information is recorded on a contracted telephone information service. Calls to this service incur a fee-for-service charge.

3.9.3.3 Internet: Flood watches and warnings are published on the Bureau's public web site and available by File Transfer Protocol (FTP) and Rich Site Summary (RSS) along with related rainfall and river level information (see 3.12).

3.9.3.4 Social Media: The Bureau endeavours to issue Tweets related to flood watches, flood warnings and relevant information, subject to operational constraints and in connection with other weather information. The Bureau website remains the main platform for the publishing of flood information.

3.9.4 Emergency management partners² and media can also access flood level and warning information directly from the Bureau Flood Warning Centre and Bureau National Operations Centre, subject to operational constraints. The Bureau does not

² Emergency management partners include those organisations that have an emergency management responsibility for the wider community (e.g. State Emergency Services)

publish contact details for the Flood Warning Centres and Bureau National Operations Centre.

3.10 Data networks, communications and storage

- 3.10.1** The services to be provided by the Bureau under this Service Level Specification depend on provision of data from networks of stations owned and operated by the Bureau and partner agencies. Permanent or temporary loss of real time data may necessitate a downgrading of the flood warning service from **quantitative** predictions to **qualitative** or **generalised**.
- 3.10.2** The Bureau contribution to this network of stations includes:
- The operation and maintenance of equipment at the sites which are fully owned and maintained by the Bureau as listed in Schedule 7.
 - Assisting with maintenance of equipment for other agencies at the sites listed in Schedule 8.
 - Operating and maintaining Bureau-owned equipment at sites where this equipment is co-located at a site owned by another agency Schedule 9.
- 3.10.3** Where the site is owned or operated by other parties, installation, maintenance and repairs of Bureau equipment will depend on adequate access being provided to the Bureau and any of its contractors. The Bureau will confirm access arrangements with relevant land owners before entering the premises. The Bureau also requires that the site operators provide timely advice regarding any possible faults or other issues affecting the performance of the data network.
- 3.10.4** The flood forecasting and warning service for South Australia also depends on the provision of data from partner agency data networks. The provision of these data for each of the agencies concerned is detailed in a Data Sharing Agreement between the Bureau and each partner (Schedule 6).
- 3.10.5** The Bureau will maintain the essential set of metadata describing the network of stations and related infrastructure regarding the Bureau's component of the data network, along with metadata required to inform the data ingest process for partner agency related networks and sites.
- 3.10.6** The Data Sharing Agreements are intended to reflect operational arrangements and are not legally binding and allow multiple agreements between individual and/or multiple agencies.
- 3.10.7** The parties agree to the provision of data as set out in the Data Sharing Agreements during periods of routine site operation and increased frequency during flood periods.
- 3.10.8** Data transfer protocols and conditions regarding fitness for purpose as provided by each stakeholder will be adhered to as set out in the Data Sharing Agreements for data provision.
- 3.10.9** The sharing of data as set out in the Data Sharing Agreements can be amended by following the process described in the agreement.

- 3.10.10** The Bureau has developed special purpose software (Enviromon) for collecting, alarming, storing, on-forwarding and display of data from Event-reporting Radio Telemetry Systems (ERRTS) (field equipment) based on Automated Local Evaluation in Real Time (ALERT) data protocol.
- 3.10.11** The Bureau provides a range of supplementary services associated with Enviromon, including: installation of Enviromon software; the commissioning of an Enviromon base station or maintenance and support; and onsite Enviromon training. Software licensing and limited support for Enviromon base stations listed in Schedule 5 is currently a standard service (free of charge).

3.11 Operations

- 3.11.1** The Bureau will use reasonable endeavours to provide a 24 hours a day, seven days a week operational systems capability necessary to support flood warning operations. This will include on-line computer and data ingestion systems, along with appropriate communications infrastructure.
- 3.11.2** The Bureau operates a regional Flood Warning Centre in each capital city and a Bureau National Operations Centre in Melbourne on an as required basis.
- 3.11.3** Through the regional Flood Warning Centre and Bureau National Operations Centre, the Bureau will provide operational coverage for up to 24 hours per day during flood events, subject to event requirements and operational constraints. The Bureau will advise its key emergency management clients of any impact in services if it is unable to provide sufficient staff coverage to meet the service levels set out in this Service Level Specification (see also 4.2).
- 3.11.4** Staff in the Bureau National Operations Centre will support regional operations either remotely or by providing additional capacity to a regional Flood Warning Centre where reasonably possible during significant and long duration events. When necessary, staff from regional offices in areas not impacted by current flooding will endeavour to assist.
- 3.11.5** The Bureau will maintain an internal catchment directive for each catchment where a warning service is provided. The catchment directive documents and describes the forecast process for the particular catchment and includes flood intelligence information, flood history, contact details for partners with local knowledge and warning issue criteria.
- 3.11.6** The operation of the Flood Warning Centres will endeavour to be compliant with the fatigue management guidelines developed under the Bureau's Work Health and Safety Procedures. Particular attention to fatigue management will be provided during the management of extreme events. The requirement to comply with these guidelines applies to all personnel present at these centres.
- 3.11.7** The Bureau will assist in meeting the needs of the Australian Government's National Crisis Coordination Centre. The Bureau will use reasonable endeavours to support and participate in relevant critical event briefings as resources permit.

3.12 Maintain systems to collect data and flood information

- 3.12.1** The Bureau will maintain the systems to ingest all data being gathered through the special purpose flood warning data network.
- 3.12.2** The river height and rainfall data received by the Bureau will be published as soon as practicable (the data are supplied at different frequencies and by various methods) upon receipt into Bureau operational systems. The data will be published in the form of tables, maps and plots and will also be included in warnings and alerting messages and used in modelling systems.
- 3.12.3** Data collected in Bureau systems will be available for use by the Bureau as it requires and for distribution to the public on suitable open source licence terms.³
- 3.12.4** The Bureau will continue to collect and update the flood background information contained on its website. These include survey information, flood history and flood event reports, catchment maps and brochures.

3.13 Planning and liaison

- 3.13.1** The Bureau undertakes a range of routine planning, maintenance and liaison activities that support the Total Flood Warning System. This includes contributing to related flood risk management activities within the State or Territory impacting on, or related to flood warning along with the ongoing coordination and liaison activities essential to the smooth operation of the Total Flood Warning System.

3.14 Support for emergency management training and exercises

- 3.14.1** The Bureau will, within operational constraints, endeavour to support and participate in relevant disaster management activities outside of flood operational periods including training exercises and flood response planning.

³ Please refer to the Creative Commons License:
<http://www.bom.gov.au/water/regulations/dataLicensing/ccLicense.shtml>

4 Level of service and performance reporting

- 4.1** Achievable levels of service provided by the Bureau are dependent on many factors including adequate access to Bureau equipment where located on sites owned by other agencies, data availability in near real time from Bureau and partner agencies, modelling and prediction capability, geomorphology of the catchment and meteorological considerations such as rainfall patterns.
- 4.2** If during a flood event the achievable service level is expected to be reduced, for any reason, below the target level as stated in this Service Level Specification, the Bureau will inform the key emergency management clients in South Australia of the reduced service level via email and phone.
- 4.3** The Bureau's performance of service will be reviewed and reported on within the context of the Total Flood Warning System annually using a standard report performance structure based on the performance indicators and the service levels defined in Schedule 2.
- 4.4** The annual performance of service report will be tabled at the last Flood Warning Consultative Committee meeting of the calendar year. This report will be published on the Bureau website.
- 4.5** Event based performance reports with more detailed technical information may also be produced for significant and high profile events.

5 Limitations of service

5.1 Performance of services provided under this document are subject to:

- (a) The availability of funds and human resources of the Bureau and its partner agencies and changes to organisational policies that may affect the terms and conditions of the Service Level Specification.
- (b) Circumstances beyond the control of the Bureau including where the performance is the responsibility of another entity.
- (c) The existence of a reliable and ongoing supply of quality real time rainfall, water level and flow data.
- (d) The reliable and ongoing availability of the computing and communication infrastructure required for the performance of the services.
- (e) Adequate communication between the Bureau and all relevant partners under this Service Level Specification and related Data Sharing Agreements and any other agreement relevant to it including on any faults or issues.

5.2 In South Australia there are several other documents and agreements that describe the State's arrangements for flood warning and flood risk management. This Service Level Specification does not replace or reduce the value of these documents. The documents include:

- (a) Emergency Management Act.
- (b) State Emergency Management Plan, Government of South Australia;
- (c) Flood Hazard Plan, Government of South Australia.
- (d) State Flood Risk Assessment

6 Service Level Specification consultation, review and updating

6.1 The initial and annual process for acceptance of this Service Level Specification will be:

6.1.1 The Flood Warning Consultative Committee members will be provided with the draft or amended Service Level Specification in advance of a special or scheduled committee meeting.

6.1.2 The members of the Flood Warning Consultative Committee will distribute the draft or amended Service Level Specification within their organisations and provide feedback from their organisation at the committee meeting.

6.1.3 After consultation and discussion at the Flood Warning Consultative Committee meeting, the Bureau will update the Service Level Specification.

6.1.4 The Chair of the Flood Warning Consultative Committee (Bureau's Regional Director) will accept and sign the document on behalf of the committee.

6.1.5 The Assistant Director Water Forecasting Services will sign the Service Level Specification on behalf of the Director of Meteorology.

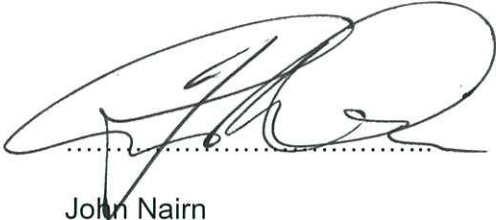
6.1.6 The Bureau will then distribute the Service Level Specification to all members of the Flood Warning Consultative Committee and publish a copy on the Bureau website.

6.2 The schedules of this Service Level Specification will be reviewed annually and either updated following review, or when a significant change is made that impacts on the level of services described in this document. Updates to this document will be recorded in Schedule 11.

6.3 Any changes to the categorisation of a location into data, information or forecast location or to the level of services described in this document will be through a consultative process using agreed arrangements in South Australia and when required coordinated by the Flood Warning Consultative Committee.

7 Signature of parties

7.1 This Service Level Specification has been prepared by the Bureau of Meteorology in consultation with the South Australian Flood Warning Consultative Committee.

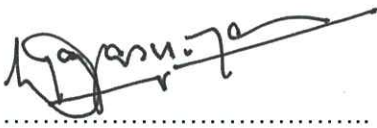


John Nairn

Chair of South Australian Flood Warning Consultative Committee, and
Regional Director – South Australia
Bureau of Meteorology

20/4/2017

Date



Dr Dasarath (Jaya) Jayasuriya
Assistant Director
Water Forecasting Services
Bureau of Meteorology

28th April 2017

Date

Schedule 1: Flood Warning Consultative Committee

The South Australian Flood Warning Consultative Committee was formed in 1988. The Committee's role is to coordinate the development and operations of the State's flood forecasting and warning services. It is an advisory body and reports to the Bureau and participating State and local government agencies twice each year. The membership includes:

- Bureau of Meteorology;
- South Australian State Emergency Service (SES)
- South Australia Police (SAPOL)
- Department for Environment and Water (DEW)
- SA Water
- Department of Planning, Transport and Infrastructure
- Natural Resources Adelaide and Mt Lofty Ranges
- Local Government Association
- South Australian Fire and Emergency Services Commission (SAFECOM)

The nationally consistent Terms of Reference for Flood Warning Consultative Committees are:

1. Identify requirements and review requests for new and upgraded forecasting and warning services
2. Establish the priorities for the requirements that have been identified using risk based analyses of the Total Flood Warning System.
3. Review and provide feedback on the Service Level Specification for the Bureau's Flood Forecasting and Warning services on an annual basis
4. Coordinate the implementation of flood warning systems in accordance with appropriate standards.
5. Promote effective means of communication of flood warning information to the affected communities
6. Monitor and review the performance of flood forecasting and warning services.
7. Build awareness and promote the Total Flood Warning System concept.

Schedule 2a: Forecast locations and levels of service

Column definitions:

Bureau number: Refers to the unique number assigned to a particular station by the Bureau

Forecast location: Is the specific location that will be referred to in flood warnings (refer 3.3.1)

Station owner: Refers to the owning and operating agency of the station. The Bureau may co-own stations. (refer Schedules 7 and 8)

Gauge type: Either manual (read by human) or automatic (consisting of either ALERT or telemeter gauges)

Flood classification: For definitions please refer to Appendix A.3.

Prediction type: The type of warning service that particular location can expect. (refer 3.8)

Target warning lead time: The minimum lead time that will be provided before the height or the flood class level given is exceeded (refer 3.8)

Target peak accuracy: The error within which peak river level height is predicted (refer 3.8.7)

Priority: The impact a temporary or permanent loss of a site will have on service delivery and in meeting performance targets (refer 3.3.2)

Bureau number	Forecast location	Station owner	Gauge type	Flood Classification			Forecast type	Lead Time (hours)	Trigger height (m)	70% of peak forecasts within	Priority
				Minor	Moderate	Major					
503 – Onkaparinga River											
523714	Onkaparinga River at Woodside	Bureau	Automatic	2.0	2.4	2.6	Qualitative	N/A	Minor	N/A	Medium
523717	Onkaparinga River at Oakbank (Oakwood Rd)	Bureau	Automatic	2.1	3.6	4.5	Qualitative	1	Minor	N/A	High
523730	Onkaparinga River at Verdun (S E Freeway)	SA Water	Automatic	4.0	4.6	5.6	Qualitative	2-3	Minor	N/A	High
523724	Onkaparinga River at Clarendon Weir	SA Water	Automatic	11.2	11.9	12.4	Quantitative	4	Minor	+/- 0.6 m	High
523770	Onkaparinga River at Old Noarlunga	DEW	Automatic	TBA	TBA	TBA	Generalised	8	TBA	N/A	High

Service Level Specification for Flood Forecasting and Warning Services for South Australia

Bureau number	Forecast location	Station owner	Gauge type	Flood Classification			Forecast type	Lead Time (hours)	Trigger height (m)	70% of peak forecasts within	Priority
				Minor	Moderate	Major					
504 – Torrens River											
523755	Torrens River at Gumeracha Weir	SA Water	Automatic	11.4	12.2	12.7	Quantitative	2	Minor	+/- 0.6 m	High
523733	Kangaroo Creek Dam	SA Water	Automatic	47.5	48.6	50.2	Quantitative	3	Minor	+/- 0.9 m	High
523742	Torrens River at Gorge Weir	SA Water	Automatic	11.3	11.6	12.0	Quantitative	3	Minor	+/- 0.6 m	High
523746	First Creek at Waterfall Gully Road	Bureau	Automatic	1.50	1.80	2.10	Generalised	N/A	1.5	N/A	Medium
505 – Gawler River											
023357	North Para River at Nuriootpa	Bureau	Automatic	2.5	2.9	3.3	Quantitative	2	Minor	+/- 0.6 m	High
523312	North Para River at Yaldara	DEW	Automatic	3.1	3.5	3.8	Qualitative	8	Minor	N/A	Medium
023141	North Para River at Turrefield Dam	Gawler R Floodplain Management Authority	Automatic	72.0 (AHD)	81.0 (AHD)	82.7 (AHD)	Quantitative	8	Minor 72.0 (AHD)	+/- 0.9 m	High
523311	South Para Reservoir	SA Water	Automatic	30.7	30.9	31.1	Qualitative	2	Minor	N/A	Medium
523048	South Para River at South East Gawler	DEW	Automatic	2.9	3.5	3.8	Qualitative	4	Minor	N/A	High
023107	Gawler River at Gawler West (Gosford St)	Bureau	Automatic	5.4	6.5	7.3	Qualitative	6	Minor	N/A	High
023111	Gawler River at Heaslip Road (Angle Vale)	Bureau	Automatic	5.8	7.0	8.5	Qualitative	12	Minor	N/A	High
523038	Gawler River at Virginia (Pt Wakefield Rd)	DEW	Automatic	TBA	TBA	TBA	Generalised	N/A	Minor	N/A	Medium
426 – Bremer River											
524528	Bremer River at Wanstead Rd	DEW	Automatic	3.1	3.8	4.5	Qualitative	2	Minor	N/A	High
524550	Bremer River US of Langhorne Creek	DEW	Automatic	4.8	TBA	TBA	Generalised	3	4.8	N/A	High
426 – Angas River											
524523	Angas River DS Willyaroo	DEW	Automatic	TBA	TBA	TBA	Generalised	N/A	Minor	N/A	High
506 – Wakefield River											
521010	Wakefield River at Rhynie	DEW	Automatic	TBA	TBA	TBA	Generalised	N/A	Minor	N/A	High

Service Level Specification for Flood Forecasting and Warning Services for South Australia

Bureau number	Forecast location	Station owner	Gauge type	Flood Classification			Forecast type	Lead Time (hours)	Trigger height (m)	70% of peak forecasts within	Priority
				Minor	Moderate	Major					
505 – Light River											
523315	Light River at Mingays	DEW	Automatic	TBA	TBA	TBA	Generalised	N/A	Minor	N/A	High

Notes:

- All water levels are in metres to local gauge datums unless indicated otherwise.
- All levels indicate flooding in the local reaches of the stream
- TBA indicates flood class levels are not yet determined which need to be provided by SES and relevant councils in consultation with the Bureau.
- N/A indicates this parameter is not relevant for the prediction type
- AHD - Australian Height Datum. See [Geoscience Australia](#) for further information. Brochure
- DEWNR: Dept. of Environment, Water and Natural Resources

Schedule 2b: Forecast locations where predictions are dependent on SA Water storage releases (from Mt Bold Dam)

Bureau number	Forecast location	Station owner	Gauge type	Flood classification (m)			Priority
				Minor	Moderate	Major	
503 – Onkaparinga River							
523724	Onkaparinga River at Clarendon Weir	SA Water	Automatic	11.2	11.9	12.4	High
523770	Onkaparinga River at Old Noarlunga	DEW	Automatic	TBA	TBA	TBA	High

Notes:

- All water levels are in metres to local gauge datums unless indicated otherwise.
- All levels indicate flooding in the local reaches of the stream
- TBA indicates flood class levels are not yet determined which need to be provided by SES and relative councils in consultation with the Bureau
- N/A indicates this parameter is not relevant for the prediction type
- AHD - Australian Height Datum. See [Geoscience Australia](#) for further information.

Schedule 3: Information locations with flood class levels defined

Bureau number	Station name	Station owner	Gauge type	Flood classification (m)			Priority
				Minor	Moderate	Major	
504 – Torrens River							
23852	Sixth Creek at Castambul (Corkscrew Road)	Bureau	Automatic	0.8	1.4	2.0	Medium
023094	Fifth Creek at Athelstone	Councils	Automatic	1.5	1.8	2.1	Medium
023132	Third Creek at Magill (Lorne Ave)	Councils	Automatic	1.0	1.3	1.6	Medium
523782	First Creek at Cleland (Waterfall)	DEW	Automatic	1.5	1.8	2.1	Medium
523044	Torrens River at Holbrooks Road	DEW	Automatic	TBA	TBA	TBA	Important
504 – Port Adelaide Basin							
523004	Pt Adelaide (Osborne)	Councils	Automatic	3.0	3.5	3.7	Low
504 – Brownhill Keswick Creeks							
523010	Keswick Creek at Victoria Park	Councils	Automatic	1.1	1.4	1.9	Low
023119	Keswick Creek at Unley (Roberts Place)	Councils	Automatic	1.6	1.9	2.2	Medium
023115	Keswick Creek at Army Barracks	Councils	Automatic	2.0	2.4	2.9	Medium
523769	Brown hill Creek at Mitcham	DEW	Automatic	1.8	2.0	2.2	High
523101	Brown hill Creek at Hawthorn (Cross Road)	Councils	Automatic	1.5	1.6	1.8	Medium
523046	Brown hill Creek at Adelaide Airport	DEW	Automatic	2.0	2.3	2.9	Medium
504 – Sturt River							
523748	Minno Creek at Coromandel Valley	Councils	Automatic	1.6	1.9	2.2	Low
523750	Sturt River at Coromandel Valley (Main Rd)	Councils	Automatic	1.1	1.25	1.4	Medium
523766	Sturt River below Minno Creek	DEW	Automatic	TBA	TBA	TBA	TBA
023136	Sturt Dam	SA Water	Automatic	6.0	24.0	24.7	High
023140	Sturt Creek at Marion (Marion Rd)	Councils	Automatic	2.8	3.1	3.2	Low
503 – Onkaparinga River							
023907	Onkaparinga River at Charleston	Bureau	Automatic	3.1	3.3	3.5	High
523715	Aldgate Creek at Aldgate	Bureau	Automatic	1.5	2.1	2.4	Medium
426 – Lower Murray							
524031	River Murray DS Lock 5	DEW	Automatic	17.3	17.6	18.3	Medium
524027	River Murray at Lyrup Pump Station	DEW	Automatic	16.1	16.5	17.4	Medium
524008	River Murray at Berri Irrigation Pump Station	DEW	Automatic	15.5	15.7	16.3	Medium
524030	River Murray DS Lock 4	DEW	Automatic	14.9	15.1	15.7	Medium

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Bureau number	Station name	Station owner	Gauge type	Flood classification (m)			Priority
				Minor	Moderate	Major	
426 – Lower Murray (continued)							
524028	River Murray DS Lock 3	DEW	Automatic	11.8	12.3	13.6	Medium
524007	River Murray - Overland Corner	DEW	Automatic	11.3	11.8	13.2	Medium
524033	River Murray DS Lock 2	DEW	Automatic	9.0	9.6	10.5	Medium
524507	River Murray DS Lock 1	DEW	Automatic	5.2	5.8	7.5	Medium

Notes:

- All Water levels are in metres to local gauge datums unless indicated otherwise.
- All levels indicate flooding in the local reaches of the stream
- TBA indicates flood class levels are not yet determined which need to be provided by SES and relative councils in consultation with the Bureau
- N/A indicates this parameter is not relevant for the prediction type
- AHD - Australian Height Datum. See Geoscience Australia for further information.
- DEWNR: Dept. of Environment, Water and Natural Resources

Schedule 4: River data locations

Bureau number	Station name	Owner	Gauge type	Priority
503 – Onkaparinga River				
523716	Western Branch Creek at Tiers Rd	Bureau of Meteorology	Automatic	Medium
024583	Inverbrackie Creek	Bureau of Meteorology	Automatic	Low
523743	Lenswood Creek at Swamp Rd	Bureau of Meteorology	Automatic	Medium
523776	Hahndorf Creek US Onkaparinga River	Department for Environment and Water	Automatic	Medium
523772	Onkaparinga River DS Hahndorf Ck	Department for Environment and Water	Automatic	Medium
523744	Cox Creek at Swamp Rd	Department for Environment and Water	Automatic	Low
523726	Onkaparinga River at Bradbury (Houlgraves)	SA Water	Automatic	High
523055	Burnt Out Creek US Mt Bold	Department for Environment and Water	Automatic	Low
523765	Mt Bold Reservoir	SA Water	Automatic	High
523725	Scott Creek (1)	SA Water	Automatic	Medium
523775	Scott Creek (2)	Department for Environment and Water	Automatic	Medium
523771	Onkaparinga River below Clarendon weir	Department for Environment and Water	Automatic	Medium
523774	Onkaparinga River at Baker Gully	Department for Environment and Water	Automatic	Medium
504 – Torrens River				
524026	Torrens River DS Glen Devon Rd	Department for Environment and Water	Automatic	Medium
523778	Torrens River at Mt Pleasant	Department for Environment and Water	Automatic	High
523732	Torrens River at Mt Pleasant	SA Water	Automatic	High
523735	Angas Creek at Birdwood (Muellers Rd)	Bureau of Meteorology	Automatic	High
523709	Millar's Creek at Forreston	Bureau of Meteorology	Automatic	Low
523700	Cudlee Creek at Lobethal Rd	Bureau of Meteorology	Automatic	Medium
523763	Millbrook Reservoir	SA Water	Automatic	High
523777	Torrens River DS Hollands Ck	Department for Environment and Water	Automatic	High
023145	Second Creek at Stonyfell	Councils	Automatic	Medium
523041	First Creek at Botanic Gardens	Department for Environment and Water	Automatic	Medium
523040	Torrens River at Walkerville	Department for Environment and Water	Automatic	Medium
523042	Torrens River at Seaview Rd	Department for Environment and Water	Automatic	Medium
504 – Port Adelaide Basin				
523058	Dry Creek at Valley View	Department for Environment and Water	Automatic	Medium
523059	Dry Creek at Pooraka (Bridge Rd)	Department for Environment and Water	Automatic	Medium
523112	Little Para Reservoir	SA Water	Automatic	Medium
523057	Little Para River US Fault	Department for Environment and Water	Automatic	Low
504 – Sturt River				
523766	Sturt Creek below Minno Creek	Department for Environment and Water	Automatic	Medium

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Bureau number	Station name	Owner	Gauge type	Priority
504 – Sturt River (continued)				
523045	Sturt River at Novar Gardens	Department for Environment and Water	Automatic	Low
505 – Gawler River				
523737	Warren Reservoir	SA Water	Automatic	Medium
523784	Malcolm Creek	SA Water	Automatic	Low
523308	North Para River at Mt McKenzie	Department for Environment and Water	Automatic	Medium
523314	North Para River at Penrice	Department for Environment and Water	Automatic	High
523053	Duckponds Creek at Stockwell	Department for Environment and Water	Automatic	Medium
523313	Tanunda Creek at Bethany	Department for Environment and Water	Automatic	Medium
023376	Jacobs Creek at Barossa HW	Bureau of Meteorology	Automatic	Medium
023348	Greenock Creek at Shea-Oak Log	Bureau of Meteorology	Automatic	Medium
523012	North Para River below Turretfield Dam	Department for Environment and Water	Automatic	High
Mid North/Far North				
521008	Hutt River at Clare	Department for Environment and Water	Automatic	Medium
517001	Cooper Creek at Cullyamurra Waterhole	Department for Environment and Water	Automatic	Medium
517001	Cooper Creek NW Ch US Coongie Lakes	Department for Environment and Water	Automatic	Medium
538005	Diamantina River at Birdsville	Department for Environment and Water	Automatic	Medium
517013	Warburton River at Poothapoota Waterhole	Department for Environment and Water	Automatic	Medium
516001	Neales River South Stewart WH	Department for Environment and Water	Automatic	Medium
517014	Neales River Algebuckina WH	Department for Environment and Water	Automatic	Medium
426 – Angas River				
523773	Angas Weir	Department for Environment and Water	Automatic	High
524534	Angas River at Windermere Rd	Department for Environment and Water	Automatic	Medium
426 – Bremer River				
524530	Bremer River Opp. Tennis Court at Harrogate	Department for Environment and Water	Automatic	Medium
524529	Bremer River DS Harrogate Rd (pool)	Department for Environment and Water	Automatic	Medium
524519	Mt Barker Creek DS Mt Barker (Springs)	Department for Environment and Water	Automatic	Medium
524520	Dawesley Creek at Dawesley	Department for Environment and Water	Automatic	Medium
524516	Bremer River U/S Mt Barker Ck	Department for Environment and Water	Automatic	High
524517	Mt Barker Creek U/S Bremer R	Department for Environment and Water	Automatic	High
524518	Bremer River near Hartley	Department for Environment and Water	Automatic	High
524522	Bremer River US Ballandown Rd	Department for Environment and Water	Automatic	Medium
505 – Light River				
523043	Light River at Port Wakefield	Department for Environment and Water	Automatic	Medium
501 – Fleurieu Peninsula				
523767	Pedlar Creek at Moana	Department for Environment and Water	Automatic	Low

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Bureau number	Station name	Owner	Gauge type	Priority
426 – Lower Murray				
547006	River Murray DS Lock 9	Department for Environment and Water	Automatic	Low
547005	River Murray DS Lock 8	Department for Environment and Water	Automatic	Low
576002	River Murray DS Lock 7	Department for Environment and Water	Automatic	Low
524032	River Murray DS Lock 6	Department for Environment and Water	Automatic	Low
524505	River Murray DS Morgan	Department for Environment and Water	Automatic	Low
524526	River Murray at Swan Reach (3km DS ferry)	Department for Environment and Water	Automatic	Low
524531	Marne Gorge	Department for Environment and Water	Automatic	Low
524527	River Murray at Walker Flat	Department for Environment and Water	Automatic	Low
524525	River Murray at Mannum Town Wharf	Department for Environment and Water	Automatic	Low
524524	River Murray US Long Island (Murray Br.)	Department for Environment and Water	Automatic	Low
524532	River Murray DS Wellington ferry	Department for Environment and Water	Automatic	Low

Schedule 5: Enviromon base stations installed in South Australia

Owner	City/town	License number	Number of users	Date of registration	License version
Bureau	Adelaide Airport	TBA	10	TBA	3

Schedule 6: List of Data Sharing Agreements for data provision

A Data Sharing Agreement for data provision has been set up or is in development for the following agencies.

Agency	Status	Date of completion	Number of sites
SA Water	Complete	23 June 2015	16
Department for Environment and Water	Complete	9 August 2017	107

Schedule 7: List of sites owned and maintained by the Bureau

Bureau number	Station name	Gauge type	Data type	Priority
503 – Onkaparinga River				
523718	Nitschke Hill	Automatic	Rainfall	High
023907	Onkaparinga River at Charleston	Automatic	Water level	High
023862	Lobethal	Automatic	Rainfall	Medium
523714	Onkaparinga River at Woodside	Automatic	Water level	High
523716	Western Branch Creek at Tiers Rd	Automatic	Water level	Medium
023801	Lenswood	Automatic	Rainfall	Medium
024583	Inverbrackie Creek	Automatic	Water level & Rainfall	Medium
023920	Wicks Estate	Automatic	Rainfall	High
523717	Onkaparinga River at Oakbank (Oakwood Road)	Automatic	Water level	High
023866	Verdun	Automatic	Rainfall	Medium
023787	Killara Park	Automatic	Rainfall	High
523715	Aldgate Creek at Aldgate	Automatic	Water level & Rainfall	Medium
023108	Longwood	Automatic	Rainfall	Medium
23911	Biggs Flat	Automatic	Rainfall	Medium
23910	Saddlebags	Automatic	Rainfall	Medium
504 – Torrens River				
523735	Angas Creek at Birdwood (Muellers Rd)	Automatic	Water level	Medium
523709	Millar's Creek at Forreston	Automatic	Water level	Medium
023922	Forreston Alert	Automatic	Rainfall	High
523700	Cudlee Creek at Lobethal Rd	Automatic	Water level & Rainfall	Medium
023090	Kent Town (AWS)	Automatic	Rainfall	Medium
023786	McVitties Hill	Automatic	Rainfall	High
023860	Greenhill	Automatic	Rainfall	Medium
023865	Stringybark	Automatic	Rainfall	High
023867	Ashton	Automatic	Rainfall	High
023877	Kersbrook	Automatic	Rainfall	Medium
023879	O'Deas Road	Automatic	Rainfall	Medium
023880	Ironstone Road	Automatic	Rainfall	Medium
023881	Cromer Road	Automatic	Rainfall	Medium
023882	Maidment Road	Automatic	Rainfall	Medium
023892	Montacute	Automatic	Rainfall	High
023896	Black Hill	Automatic	Rainfall	Medium
023901	Mt Lofty	Automatic	Rainfall	High
024579	Mt Torrens	Automatic	Rainfall	High
123700	Inglewood	Automatic	Rainfall	Medium
505 – Gawler River				
023372	Duckponds Creek	Automatic	Rainfall	Medium
023357	North Para River at Nuriootpa (Park Ave)	Automatic	Water level & Rainfall	High
023382	Milton Park (Cornbrook)	Automatic	Rainfall	High
023376	Jacobs Creek at Barossa HW	Automatic	Water level	Medium
023369	Greenock	Automatic	Rainfall	Medium
023146	Steingarten	Automatic	Rainfall	High
523305	Kies Estate	Automatic	Rainfall	Medium
023878	Mt Crawford (AWS)	Automatic	Rainfall	Medium
523307	Freeling	Automatic	Rainfall	High
023107	Gawler River at Gawler West (Gosford St)	Automatic	Water level & Rainfall	High
023111	Gawler River at Heaslip Rd (Angle Vale)	Automatic	Water level	High
505.4 – Light River				
021140	Waterloo East (Schutz Road)	Automatic	Rainfall	High
023381	Ngapala	Automatic	Rainfall	High
023323	Tarnma	Automatic	Rainfall	High
023379	Mt Rufus (Dutton)	Automatic	Rainfall	High
023374	Hansborough	Automatic	Rainfall	High
023380	Kapunda West (Kaplee)	Automatic	Rainfall	High

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Bureau number	Station name	Gauge type	Data type	Priority
505.4 – Light River (continued)				
023349	Saddleworth	Automatic	Rainfall	High
023365	Hazelton	Automatic	Rainfall	High
023135	Hamley Bridge	Automatic	Rainfall	Medium
023129	Dolaghans Crossing	Automatic	Rainfall	Low
506 – Wakefield River				
021076	Cooinda	Automatic	Rainfall	High
023147	Mt Horrocks	Automatic	Rainfall	Medium
021130	Rhynie	Automatic	Rainfall	High
023128	Donaleen	Automatic	Rainfall	Medium
426 – Bremer River				
024591	Mt Beevor South	Automatic	Rainfall	High
023864	Burwood	Automatic	Rainfall	High
023863	Millbrae	Automatic	Rainfall	High
024592	Callington Hill (Colrae)	Automatic	Rainfall	High
426 – Angas River				
023728	Macclesfield	Automatic	Rainfall	High
426 – Lower Murray				
024575	Sedan Hill	Automatic	Rainfall	Low
024585	Ponderosa	Automatic	Rainfall	Low
024586	Mt Mary	Automatic	Rainfall	Low

Notes:

- Does not include automatic weather stations and other Bureau synoptic stations.

Schedule 8: List of Water sites where the Bureau assists other agencies with maintenance

Bureau number	Station name	Owner	Gauge type	Data type	Priority
NIL	NIL	NIL	NIL	NIL	NIL

Notes:

- Does not include rainfall, automatic weather stations and other Bureau synoptic stations.

Schedule 9: List of Water sites where the Bureau co-locates equipment and the site is owned by another agency

Bureau number	Station name	Owner	Gauge type	Data type	Priority
503 – Onkaparinga River					
523743	Lenswood Creek at Swamp Rd	Department for Environment and Water	Automatic	Water level	Medium
023914	Clarendon weir	SA Water	Automatic	Water level	High
504 – Torrens River					
023912	Kangaroo Creek Dam	SA Water	Automatic	Water level	High
523708	Gumeracha Weir	SA Water	Automatic	Water level	High
023852	Sixth Creek at Castambul	Department for Environment and Water	Automatic	Water level	Medium
023909	Torrens River at Gorge Weir	SA Water	Automatic	Water level	High
505 – Gawler River					
023348	Greenock Creek at Shea-Oak Log	Department for Environment and Water	Automatic	Water level	Medium

Notes:

- Does not include rainfall, automatic weather stations and other Bureau synoptic stations.

Schedule 10: List of flood warning related products issued by the Bureau in South Australia (warnings, watches, bulletins, river alerts)

Flood warnings

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS20360	Gawler River	To be issued when the minor flood level is expected to be exceeded at forecast locations.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling, approaching minor flood level and no further heavy rainfall is expected.
IDS20362	Torrens River	To be issued when the minor flood level is expected to be exceeded at forecast locations.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling, approaching minor flood level and no further heavy rainfall is expected.
IDS20364	Onkaparinga River	To be issued when the minor flood level is expected to be exceeded at forecast locations.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling, approaching minor flood level and no further heavy rainfall is expected.
IDS20370	Inland Rivers	To be issued when any flooding is expected due to upstream flows (in QLD).	Daily – weekly depending on the situation.	A flood warning should only be finalised when all river heights are falling and no further flooding is expected.
IDS20373	Angas River (Generalised)	To be issued when any flooding is expected due to significant rain or upstream flows.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling and no further flooding is expected.
	Bremer River (Qualitative)	To be issued when the minor flood level is expected to be exceeded at forecast locations.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling, approaching minor flood level and no further heavy rainfall is expected.
IDS20372	Light and Wakefield Rivers	To be issued when any flooding is expected due to significant rain or upstream flows.	Every 6-12 hours or where a change in flood classification is predicted.	A flood warning should only be finalised when all river heights are falling and no further flooding is expected.
IDS20367	River Murray	To be issued when the minor flood level is expected to be exceeded at forecast locations (currently, flood warning for River Murray is provided by Dept. of Environment and Water).	Daily – weekly depending on the situation.	A flood warning should only be finalised when all river heights are falling, approaching minor flood level and no further heavy rainfall is expected.

Flood watches

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS20374	Flood Watch 1	Issued when meteorological forecasts for the next 24 to 96 hours indicate that rainfall sufficient to cause flooding may occur.	The Flood Watch message must be updated every 24 hours, and more often if significant changes occur.	The flood watch product remains current until all flood warnings have been finalised or when the risk of future flooding is no longer expected.
IDS20375	Flood Watch 2	Issued when meteorological forecasts for the next 24 to 96 hours indicate that rainfall sufficient to cause flooding may occur.	The Flood Watch message must be updated every 24 hours, and more often if significant changes occur.	The flood watch product remains current until all flood warnings have been finalised or when the risk of future flooding is no longer expected.

Notes:

Flood watch title (Flood Watch 1/Flood Watch 2) will be adjusted to reflect the catchments at risk of flooding by the particular weather event.

Areas covered by flood watch service in SA are available at:

http://www.bom.gov.au/water/floods/image/BOM_Flood_Watch_Areas_map_SouthAustralia_2017.pdf?v3

Flood Summary

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS20371	South Australia	The Flood Summary is issued when a flood watch or warning product is issued or any additional information regarding flooding hazards within the State needs to be communicated.	The Flood Summary must be updated every time a flood watch or warning product is reissued or there is a need to further communicate additional information regarding flooding hazards within the State.	N/A

River and rainfall bulletins

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS60147	Latest River Heights for the Onkaparinga and Southern Creeks River	None	Hourly	Never
IDS60148	Latest River Heights for the Torrens, Port Adelaide and Patawolonga Rivers	None	Hourly	Never
IDS60149	Latest River Heights for the North Para, South Para and Gawler Rivers	None	Hourly	Never
IDS60164	Latest River Heights for the Angas and Bremer Rivers	None	Hourly	Never
IDS60165	Latest River Heights for the Light and Wakefield Rivers	None	Hourly	Never
IDS60166	Latest River Height for the Murray River	None	Hourly	Never
IDS60150	Latest River Heights for the Mid North, Flinders and Far North Rivers	None	Hourly	Never
IDS60151	Latest River Heights for the All South Australian Rivers	None	Hourly	Never

Rainfall bulletins – 1 Hourly

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS60152	Onkaparinga, Southern creeks	None	Hourly	Never
IDS60153	Torrens, Port Adelaide, Patawolonga	None	Hourly	Never
IDS60154	North Para, South Para, Gawler	None	Hourly	Never
IDS60167	Angas, Bremer	None	Hourly	Never
IDS60185	Light, Wakefield	None	Hourly	Never
IDS60191	Murray	None	Hourly	Never
IDS60155	Mid North, Flinders, Far North	None	Hourly	Never

Rainfall bulletins – 3 Hourly

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS60156	Onkaparinga, Southern creeks	None	3 Hourly	Never
IDS60157	Torrens, Port Adelaide, Patawolonga	None	3 Hourly	Never
IDS60158	North Para, South Para, Gawler	None	3 Hourly	Never
IDS60168	Angas, Bremer	None	3 Hourly	Never
IDS60188	Light, Wakefield	None	3 Hourly	Never
IDS60192	Murray	None	3 Hourly	Never
IDS60159	Mid North, Flinders, Far North	None	3 Hourly	Never

Rainfall bulletins – 24 Hourly

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS60160	Onkaparinga, Southern creeks	None	Daily	Never
IDS60161	Torrens, Port Adelaide, Patawolonga	None	Daily	Never
IDS60162	North Para, South Para, Gawler	None	Daily	Never
IDS60169	Angas, Bremer	None	Daily	Never
IDS60189	Light, Wakefield	None	Daily	Never
IDS60193	Murray	None	Daily	Never
IDS60163	Mid North, Flinders, Far North	None	Daily	Never

Rainfall bulletins – Long term

Product ID	Product name	Initiating criteria	Updated	Finalising
IDS60128	Daily Rainfall Bulletin for South Australia	None	Daily	Never
IDS60130	Weekly Rainfall Bulletin for South Australia	None	Weekly	Never
IDS65005	Monthly Rainfall Bulletin for South Australia	None	Monthly	Never

Schedule 11: List of changes to this Service Level Specification

Version	Date	Name	Update
1.0	23/07/2014	Nicole Pana	Version 1.0 signed
2.0	March 2015	Nicole Pana	Additional sentence to clause 1.6 highlighting supplementary services
			Addition of priorities to stations in schedules 2-4 and 7-9. This is defined in clause 3.3.2 and Table 1 which are also new additions.
			Quantitative and Qualitative clauses better described (3.8.3 and 3.8.4)
3.0	June 2016	Nicole Pana	Additional clause added to include the Bureau's social media service
			Update various network changes throughout schedules

Appendix A: Glossary of terms

A.1. General

Bureau Flood Warning Centre: an operational area set aside in each capital city to fulfil the Bureau's role in the Total Flood Warning System specifically flood forecasting and warning.

Bureau National Operations Centre: The principal role of the National Operations Centre is to augment regional flood forecasting teams during major floods and to provide operational system support. The National Operations Centre is also responsible for leading new initiatives to enhance the quality of operations and services.

Catchment Directive: A catchment directive provides guidance specific to a catchment to help develop forecasting and warning products.

Flood warning: A written product to provide advice on impending flooding so people can take action to minimise its negative impact. This will involve some people taking action on their own behalf and others doing so as part of agency responsibilities.

Flood watch: A written product that alerts when the combination of forecast rainfall and catchment conditions indicates the flooding is likely.

National Crisis Coordination Centre: The Australian Government Crisis Coordination Centre has been designed to connect relevant Australian Government, State and Territory agencies to centralise Australian Government actions during complex national crises, to develop a single, timely and consistent picture or understanding of a crisis, its implications and the national capacity to respond.

National Flood Warning Arrangements: The National Arrangements outline the general roles and responsibilities of each level of Government in providing and supporting an effective flood warning service and includes separate chapters describing the specific arrangements and agency roles that apply in each jurisdiction.

Protective behaviour: generating appropriate and timely actions and behaviours from the agencies involved and from the threatened community.

Severe Thunderstorm: A thunderstorm is characterised by sudden electrical discharges, each manifested by a flash of light (lightning) and a sharp rumbling sound. Thunderstorms are associated with convective clouds (cumulonimbus) and are usually accompanied by precipitation. Thunderstorms are often short-lived and impact on only a small area. Severe thunderstorms may last for an hour or more and can have a more widespread impact.

A severe thunderstorm will also have one or more of the following phenomena:

- Tornado
- Wind gust of 90 km/h (49 knots) or more
- Hailstones with diameter of 2 cm or larger
- Very heavy rain sufficient to cause flash flooding

Weather warnings: Weather warnings are messages sent out by the Bureau to warn the community of potentially hazardous or dangerous weather conditions. Such warnings include but are not limited to: road weather alerts, severe thunderstorm warnings, severe weather warnings for heavy rain, strong or gale force winds, marine wind warnings, warnings for sheep graziers and frost warnings. More information on weather terms is given in the [Bureau's glossary](#).

A.2. The Components of the Total Flood Warning System

Based on the Manual 21 Australian Emergency Manual Series, Australian Government 2009 (see the Manual for more details).

Communication: disseminating warning information in a timely fashion to people and organisations likely to be affected by the flood (see Chapter 6).

Interpretation: identifying in advance the impacts of the predicted flood levels on communities at risk (see Chapter 4).

Message construction: devising the content of the message which will warn people of impending flooding (see Chapter 5).

Monitoring and prediction: detecting environmental conditions that lead to flooding, and predicting river levels during the flood (see Chapter 3),

Review: examining the various aspects of the system with a view to improving its performance (see Chapter 7).

A.3 Flood classifications

The classification of minor, moderate and major flood levels at key river height stations is based upon the effect of flooding for some distance upstream and downstream of that station. These levels are determined using the following descriptive categories of flooding, historical data or relevant local information.

The process for establishing flood class levels involves determining local flood effects, review and endorsement by relevant stakeholders and passing recommendations to the Bureau for inclusion in forecast and warning procedures. The process for establishment of flood class levels specific to each State and Territory is documented in the National Arrangements.

- Minor flooding - 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 - In addition to the above, 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.
- Major flooding - In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted.

Appendix B: References

1. Emergency Management Australia 2009, *Flood Warning Manual*, Series 21.
2. Bureau of Meteorology 2013, *National Flood Warning Arrangements*
3. Bureau of Meteorology 2013, *National Flood Directive* (unpublished - internal use)
4. Bureau of Meteorology 2013, *Catchment Flood Directives* (unpublished - internal use)
5. Data Sharing Agreements