

# Document 1

## CSG Detailed Severe Thunderstorm Warnings

Instructions on how to prepare and issue a Detailed Severe Thunderstorm Warning, including warning escalations and concurrent warnings.

Document type	Work Instructions
Document Status	Approved
Process Group	4.2 Produce & Deliver Products
Process	4.2.1 Produce & Deliver Products
Activities (Process Level 4)	4.2.1.2 Produce and Issue Products
Approved by	[REDACTED]
Date Approved	9/11/2023
Process Owner	EPS GM
Process Leader	< Program > < Role >
Review Date	1/09/2024

RELEASED UNDER FREEDOM OF INFORMATION

# Contents

<b>CSG Detailed Severe Thunderstorm Warnings</b> .....	<b>1</b>
1. Systems & Tools .....	4
2. Work Instructions.....	4
2.1. Severe Thunderstorm Service .....	4
2.2. Detailed Severe Thunderstorms Warnings .....	4
2.3. Prepare and Issue Detailed Severe Thunderstorm Warnings .....	4
2.3.1. Region and Product Selection .....	4
2.3.2. Cell Identification .....	5
2.3.2.1. Thunderstorm Interactive Forecasting System .....	5
2.3.2.2. Manual Cell Creation and Tracking .....	6
2.3.3. Immediate Threat Areas .....	7
2.3.3.1. Autogenerated Immediate Threat Areas.....	7
2.3.3.2. Manual Immediate Threat Areas .....	8
2.3.4. Detailed Severe Thunderstorm Warning Content.....	8
2.3.5. Issuing Detailed Severe Thunderstorm Warnings .....	9
2.3.6. Cancelling Detailed Severe Thunderstorm Warnings .....	9
2.3.7. Suspension of Detailed Severe Thunderstorm Warnings .....	10
2.3.8. Very Dangerous Storm .....	10
2.3.8.1. Issue Criteria .....	10
2.3.8.2. Including Label .....	11
2.3.8.3. Excluding Label .....	11
2.3.9. Emergency Warning Escalations.....	12
2.3.9.1. Standard Emergency Warning Signal.....	12
2.3.9.1.1. Requesting the use of the Standard Emergency Warning Signal .....	13
2.3.9.1.2. Cancelling the Standard Emergency Warning Signal Request.....	13
2.3.9.2. Emergency Weather Alerts.....	14
2.3.10. Concurrent Warnings.....	14
2.3.10.1. Severe Thunderstorm Warnings and Severe Weather Warnings .....	14
2.3.10.1.1. Separate Severe Thunderstorm Warnings .....	14
2.3.10.1.2. Issue Criteria .....	14
2.3.10.1.3. Cancellations .....	15
2.4. Communication .....	15
2.4.1. Heads Up .....	15
2.4.2. Brief and Advise .....	16
2.4.3. Formal Sign Off .....	16
2.5. Appendix .....	17
2.5.1. Warning Content.....	17
2.5.1.1. Title.....	17
2.5.1.2. Issuance Time .....	17
2.5.1.3. Headline Statement .....	17
2.5.1.4. Graphical Warning Content .....	17
2.5.1.5. Weather Situation .....	17
2.5.1.6. Warning Details .....	17
2.5.1.7. Observations .....	17
2.5.1.8. Action Statements .....	18
2.5.1.9. Warning Updates.....	18
2.5.1.10. Warning Accessibility.....	18
2.5.2. Product Examples .....	19
3. Related Documents .....	21
4. Document Control .....	21

RELEASED UNDER FREEDOM OF INFORMATION

4.1. Approvals .....**Error! Bookmark not defined.**

4.2. Version Control.....**Error! Bookmark not defined.**

RELEASED UNDER FREEDOM OF INFORMATION

# 1. Systems & Tools

1. Interactive Forecasting System (TIFS).
2. Visual Weather (VW).
3. Microsoft Teams (MS Teams).

## 2. Work Instructions

### 2.1. Severe Thunderstorm Service

The Severe Thunderstorm Warning (STW) service is used whenever there is sufficient meteorological evidence to suggest one or more of the following:

- Severe thunderstorm development is likely
- Severe thunderstorm is likely to move into the STW domain
- Severe thunderstorm has been directly reported or observed
- Severe thunderstorm is inferred through various observational datasets

Occasionally, deep moist convective cells that are not producing lightning will be capable of producing severe or even high-end severe phenomena. Although such cells are not technically thunderstorms, the use of the STW service is still appropriate. For the purposes of this document, “severe thunderstorm” can be taken to mean “severe deep, moist convective cell” whether or not lightning is present.

Phenomena definitions associated with severe thunderstorms (STS) are listed in the [Thunderstorm and Severe Weather Service Level Specifications](#).

### 2.2. Detailed Severe Thunderstorms Warnings

The Bureau provides Detailed STW for all capital cities and surrounding areas. They provide time and location-specific information about the STS threat. The yellow shaded area represents a current Regional STW area that may consist of all, or part of one, or several weather forecast districts, or local government areas (LGA). The red shaded ellipses correspond to existing STS with red arrows overlain by red arcs indicating forecast direction and position at 10-minute intervals. Areas under immediate threat from the existing STS are represented by orange-hashed shaded polygons. Multiple examples of Detailed STW are listed in Appendix 2.5.2.

Detailed STW are issued when one or more STS are detected within the warning domain, or an existing thunderstorm is forecast to become severe within the next 30 or 60 minutes. They are also issued when an STS outside the warning domain is expected to move into the area.

A Detailed STW can only be issued if there is a Regional STW current over the respective Detailed STW domain. If there is only one cell or the immediate threat area is small, a Regional STW is still required. The exception to this rule applies when high-end severe phenomena are occurring or expected to occur within a Severe Weather Warning (SWW) area that resides over the detailed STW region. For more information on concurrent warnings, see Section 2.3.10.1.

Detailed STW are valid for 60 minutes from the issuance time and should be updated at least every 30 minutes.

If a current Detailed STW does not adequately describe the situation, it should be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

Detailed STW should be cancelled when STS move offshore or out of the detailed STW warning domain, or dissipate, and no further STS development is expected.

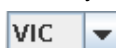
### 2.3. Prepare and Issue Detailed Severe Thunderstorm Warnings

Detailed STW are to be prepared and issued by Thunderstorm and Heavy Rainfall (TSHR) and National Production (NP) using TIFS.

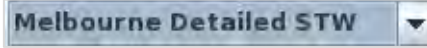
In TIFS, a Detailed STW consists of a variety of sections that highlight threat areas and potential phenomena in a graphical and textual format. Manual intervention is required for the headline statement, graphical warning content, selection of phenomena, observations, and if required, relevant Standard Emergency Warning Signal (SEWS) text, or warning details when Very Dangerous Storms (VDS) are occurring or expected to occur. The remaining sections are autogenerated by TIFS or not required.

#### 2.3.1. Region and Product Selection

1. Click Region to Load and select your respective state or territory.



2. Click Product and select Detailed STW.



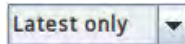
### 2.3.2. Cell Identification

For any cells identified on the [Graphical Editor](#) that warrants a warning, their shape and orientation should represent the thunderstorm on radar as closely as possible. The cell's forecast track should also accurately represent what is currently occurring and what may take place over the next 60 minutes. On days where left or right-moving supercells are anticipated, it is recommended to incorporate the estimated Bunkers storm motion vectors (SMV) into warning strategies to establish a more likely cell motion.

Thunderstorm Identification, Tracking, Analysis and Nowcasting (TITAN) output is to be used when it appropriately identifies and represents the cell on the [Graphical Editor](#). Otherwise, manual cell creation via the [Cell Property Editor](#) is recommended.

#### 2.3.2.1. Thunderstorm Interactive Forecasting System

1. Click Age of Cells and select Latest Only to view the latest location of all cells that are detected within the radar network.



2. Select the GPATS [Feature](#) to view the most recent lightning data.

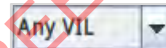
Features	
Name	Arrival Time
GPATS	04:46 UTC

3. Filter out Cells you do not wish to warn for by adjusting the following tools:

- Click Height of Cells of Display and select minimum thunderstorm height.



- Click Any VIL and select minimum vertical integrated liquid (VIL) associated with the thunderstorm or thunderstorms. VIL of 50 kg/m<sup>2</sup> is typically used for thunderstorms during the warm season, particularly across the tropics and subtropics.

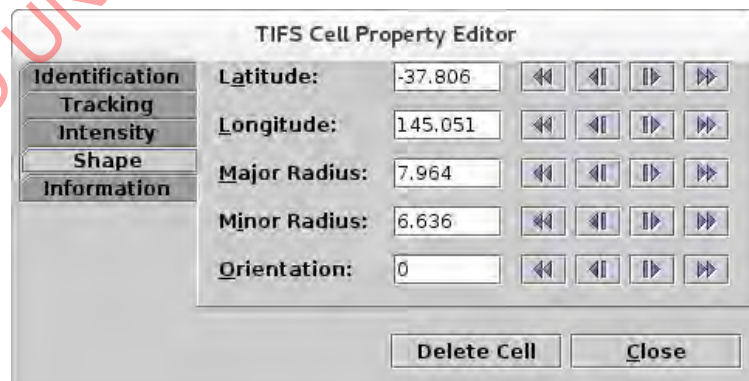


4. Delete all remaining unwanted cell by using one of the following options:

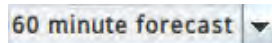
- Select the unwanted cells on the [Graphical Editor](#) or listed [Storm Guidance](#) then click the **Delete** button.



- Select the unwanted cell on the [Graphical Editor](#) or [Storm Guidance](#) then click **Delete Cell** within the [Cell Property Editor](#).



5. Click and select the intended Forecast Length. Detailed STW will use the default cell forecast track length of 60 minutes. If high uncertainty on the evolution of the cell exists, or the cell is confidently expected to weaken before the 60-minute period, then the forecast track length can be shortened to 30 minutes.



6. If the cell's shape, orientation, and forecast track are not adequately represented on the [Graphical Editor](#), utilise [Track Sources](#) to generated more accurate representations of each cell.

- Under [Track Sources](#), select Radar 35 for broader cells and tracks.
- Under [Track Sources](#), select Radar 40 for more compact cells and tracks.
- Under [Track Sources](#), select Radar 45 for more compact and detailed cells and tracks.

Track Sources	
Name	Arrival Time
Serpentine 35	00:59 UTC
Serpentine 40	00:59 UTC
Serpentine 45	00:59 UTC
Halls Creek 35	00:59 UTC
Halls Creek 40	00:59 UTC
Halls Creek 45	00:59 UTC

### 2.3.2.2. Manual Cell Creation and Tracking

- When TITAN does not represent a cell adequately, click Add Cell to add a new cell on the [Graphical Editor](#).



- Manually adjust the cell's position and forecast track by using the cursor.
  - Drag the cell to the appropriate location on the [Graphical Editor](#).
  - On the [Graphical Editor](#), select the forecast track and drag it until it represents a more suitable forecast track, this includes adjustments to direction and speed.



- If the cursor adjustment process outline above in step 2 is not preferred, adjust the cell's intensity, position and forecast track in the [Cell Property Editor](#).
  - Select [Tracking](#) and enter (or manually adjust using the arrow buttons) the Speed (km/h) to adjust the cell's forecast speed. Similarly, enter (or manually adjust using the arrow buttons) the Direction to adjust the cell's forecast direction.

TIFS Cell Property Editor

Identification	Speed (Km/hr):	13.273	◀◀ ◀ ▶ ▶▶
Tracking	Direction:	90	◀◀ ◀ ▶ ▶▶
Intensity	lifetime	60 Min Fcst	▼
Shape			
Information			

Delete Cell Close

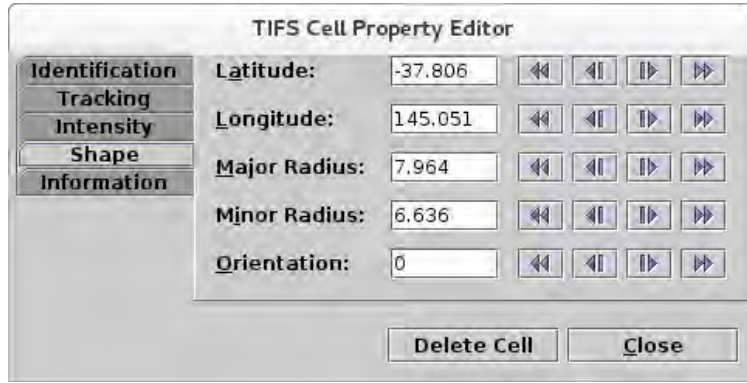
- Select [Intensity](#) and manually adjust the cell's VIL, Height of Top and/or Max Reflectivity.

TIFS Cell Property Editor

Identification	VIL	60
Tracking	top	10
Intensity	max_dbz	50
Shape		
Information		

Delete Cell Close

- Select [Shape](#) and manually adjust the cell's Latitude and Longitude (Location), Major Radius and Minor Radius (Shape), and Orientation.



4. Delete all remaining unwanted cell by using one of the following options:

- Select the unwanted cells on the [Graphical Editor](#) or listed [Storm Guidance](#) then click the Delete button.



- Select the unwanted cell on the [Graphical Editor](#) or [Storm Guidance](#) then click Delete Cell within the [Cell Property Editor](#) (above).

### 2.3.3. Immediate Threat Areas

The immediate threat area should always cover the red shaded ellipse that symbolises the cell. In addition, it should only cover the red arcs that corresponds to the cell's forecast track.

Autogenerated immediate threat area is now the preferred method in producing immediate threat areas in TIFS. In the rare event where the meteorologist is required to manually draw the immediate threat area, as outlined below in Section 2.3.3.2., the following scenarios should be avoided to prevent erroneous and confusing warning graphics:

- An immediate threat area that is behind the cell and not bounded by the cell's red shaded ellipse.
- A large immediate threat area for a comparatively small cell.
- An unrealistic cell size that covers a large portion of the Detailed STW domain. There may be cases where a lengthy squall line or quasi-linear convective system is crossing or expected to move into the Detailed STW domain and require a large cell. In such instances, there are usually fragments within the mesoscale convective system (MCS) that can be highlighted and warned for instead of the whole MCS itself.

#### 2.3.3.1. Autogenerated Immediate Threat Areas

1. Click the Add Area button then click again on the cell in question on the [Graphical Editor](#) to draw an immediate threat area around the cell and prescribed forecast track.



2. Click the Filter Storms Outside of Threat Areas button to remove all cells that do not reside within an immediate threat area.



3. To undo the removal of cells and re-show all deleted cells (in the event of mistakes or if one wishes to include subsequent cells in the warning), click the Show all Cells button. *Undo can also be used to revert a single step such as the manual deletion of a cell or any mistakes made in defining threat areas.*

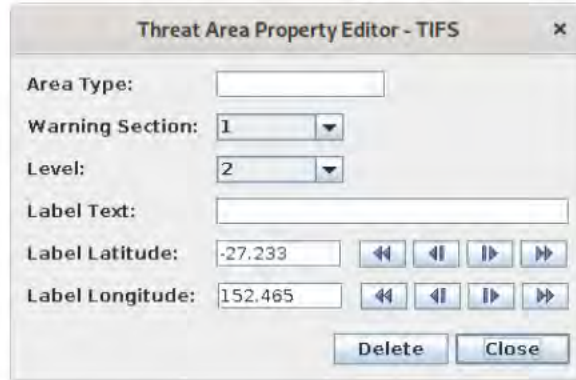


4. Delete all remaining unwanted immediate threat areas by using one of the following options:

- Select the unwanted immediate threat area on the [Graphical Editor](#) or [Threat Area Guidance](#) then click the Delete button.



- Select the unwanted immediate threat area on the [Graphical Editor](#) or [Threat Area Guidance](#) then click Delete within the [Threat Area Property Editor](#).



### 2.3.3.2. Manual Immediate Threat Areas

1. Click the Add Area button then click again and hold on the [Graphical Editor](#) to draw an immediate threat area.



2. Click the Edit Area button then click again in an existing immediate threat area to edit.

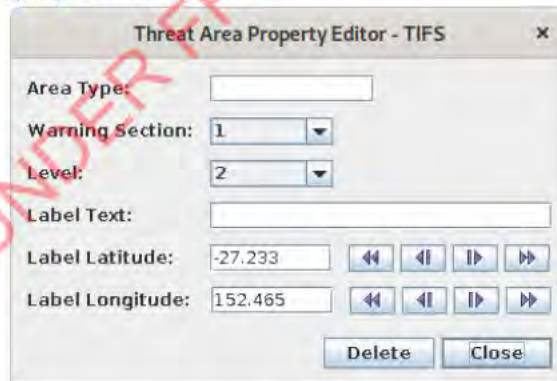


3. Click the Selection/Manipulation button to move the existing immediate threat area. This button can also be used to select other areas.



4. Delete all unwanted immediate threat areas by using one the following options:

- Select the unwanted immediate threat area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click the Delete button.
- Select the unwanted immediate threat area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click Delete within the [Threat Area Property Editor](#).



### 2.3.4. Detailed Severe Thunderstorm Warning Content

The following information highlights what sections within a Detailed STW may require attention and manual intervention. Guidance on the written content is in Appendix 2.5.1.

1. Click on a Phenomenon to add a severe and/or high-end severe threat.

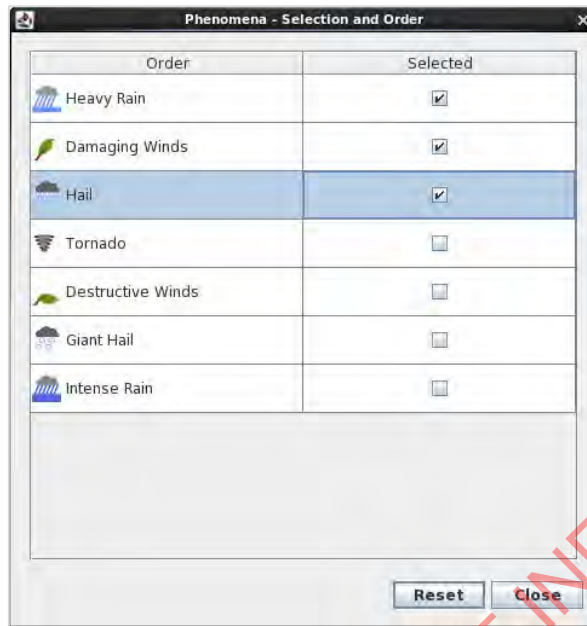


Phenomenon	Text
H	large hailstones
H+	giant hailstones
H/H+	large, possibly giant hailstones
W	damaging winds
W+	destructive winds
W/W+	damaging, locally destructive winds
R	heavy rainfall
R+	intense rainfall
R/R+	heavy, locally intense rainfall
T	Tornadoes and destructive winds

Table 1: Autogenerated text for phenomena selection



- If multiple phenomena are to be included in the Detailed STW, order the phenomena by the forecast level of threat from highest to lowest. Under the Options menu, click Phenomena and drag individual phenomena up or down the pop-up table.



- Write an appropriate [Headline Statement](#) in the Headline section.

**Headline**

- Check the list of locations and if required, manually modify and/or change the level of detail.
  - Click the Detailed More button (up arrow) to increase the number of places mentioned in the warning text and graphic.
  - Click the Detailed Less button (down arrow) to decrease the number of places mentioned in the warning text and graphic.



- List all significant weather [Observations](#) in the Observations/Other section.

**Obs/Other**

### 2.3.5. Issuing Detailed Severe Thunderstorm Warnings

- If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product.



- Click the Issue button to send the STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when updates or cancellations are required.



### 2.3.6. Cancelling Detailed Severe Thunderstorm Warnings

- Click the Cancel Warning button to cancel the Detailed STW.



- If applicable, contextualise or delete the [Headline Statement](#) in the Headline section.

<b>Headline</b>	
-----------------	--

- If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product.



- Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.3.7. Suspension of Detailed Severe Thunderstorm Warnings

When the threat of STS has eased within a metropolitan area but further development is possible within the next 60 minutes, and the Regional STW which includes the Detailed STW area remain current, the Detailed STW will be suspended. This will exclude cells and immediate threat areas while the text of the suspended warning will advise that STS have eased but the situation will be closely monitored.

Only once no further STS are anticipated, the Detailed STW will be cancelled, following an update of the Regional STW to remove the Detailed STW area.

- Click the Suspend Warning button to momentarily delay the cancellation of the Detailed STW. *Autogenerated text will arise in the Situation ([Weather Details](#)) section where some modifications will be required – see step 3 below for the relevant text.*



- If applicable, contextualise or delete the [Headline Statement](#) in the Headline section.

<b>Headline</b>	
-----------------	--

- If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product.



- Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.3.8. Very Dangerous Storm

#### 2.3.8.1. Issue Criteria

If there is an expectation or a report of one or more high-end severe phenomena, a label that states '**This thunderstorm is very dangerous**' will be added to the Detailed STW graphic. The warning details section will also declare that a VDS has been detected on the weather radar with an updated list of high-end severe phenomena. An example is listed in Appendix 2.5.2.

The following radar evidence may be used to justify the inclusion of the VDS label:

- supercell signatures
- destructive (>34 m/s) or near-destructive winds below 1000m on Doppler
- a moderate or strong mesocyclone
- a persistent area of significant Rainfields accumulation values coinciding with high to very high Specific Differential Phase (KDP)
- sufficiently high Maximum Estimated Size of Hail (MESH) values, considering the structure of the thunderstorm, radar characteristics and the environment

Once the threat of high-end severe phenomena has passed, the label and corresponding text will be excluded from the graphic.

### 2.3.8.2. Including Label

1. To include the VDS label in the Detailed STW, navigate to the [Cell Property Editor](#) and select [Identification](#) then tick **VERY DANGEROUS STORM**.



2. Enter (or manually adjust using the arrow buttons) the **Label xPos** and **Label yPos** to shift the position of the VDS label. **IMPORTANT:** Ensure the that the label does not impede the view of any warned cells and their forecast tracks and immediate threat areas.
3. If included (optional), contextualise, and uppercase the [Headline Statement](#) in the Headline section.

Headline

4. If text has been added or autogenerated text has been modified, click the Check Spelling button.



5. Click the Save button to save all graphical and text data.



6. Click the Preview button to preview how the warning will look online as a live product.



7. Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



8. Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.3.8.3. Excluding Label

1. To exclude the VDS label from the Detailed STW, navigate to the [Cell Property Editor](#) and click on [Identification](#) then untick **VERY DANGEROUS STORM**.
2. If included (optional), contextualise, and lowercase the [Headline Statement](#) in the Headline section.

Headline

3. If text has been added or autogenerated text has been modified, click the Check Spelling button.



4. Click the Save button to save all graphical and text data.



5. Click the Preview button to preview how the warning will look online as a live product.



6. Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



7. Click Auto Refresh to monitor product. Turn off when new warnings are required.



## 2.3.9. Emergency Warning Escalations

The Bureau has two major emergency warning escalations; The SEWS and Emergency Weather Alerts (EWA). These warning escalations vary depending on state or mainland territory agreements. Each warning has its specific purpose, designed to obtain an appropriate response from our customers and the community, as well as promote the dispersion of the urgent safety messages through media and Hazard Management Agency (HMA) channels.

### 2.3.9.1. Standard Emergency Warning Signal

The SEWS is a wailing siren sound used as an alerting signal in Queensland, Victoria, and Tasmania. The SEWS is designed to alert the community to the broadcast of an urgent safety message relating to a VDS with **one or more confirmed high-end severe phenomena** on the Australian Broadcasting Corporation (ABC) radio stations. The signal is sounded immediately prior to an emergency warning message being played on ABC broadcasts, in the potential or likely impacted areas. As part of a coordinated national emergency plan, the SEWS is used to attract attention to emergency warnings.

The Bureau of Meteorology can request the use of the SEWS by including a standardise SEWS statement in a STW. In the event where a request is warranted, SEWS text will be added above the title section on either or both Regional and Detailed Severe Thunderstorm Warnings. It will explicitly state the major towns, suburbs, cities or LGA where the SEWS will be directed, transmitted, and broadcast on the ABC.

The official activation of the SEWS is at the discretion of the ABC.

#### Issue Criteria

The following criteria is to be satisfied before requesting the use of the SEWS:

- A confirmed report of one or more high-end severe phenomena by a reliable source such as a Bureau observer, automatic weather station, storm spotter and/or trustworthy social media outlet
- It is of sufficient scale where a significant number of people will be warned. This includes all towns and cities that have a designated Bureau forecast (Queensland, Victoria and Tasmania), and all areas within the respective Detailed STW domain
- Is expected to continue for 30 minutes or more

Once the SEWS has been requested, the SEWS will continue until all VDS convective regions that can be identified and tracked using radar and/or satellite has ceased, even when all VDS convective regions have moved away from all towns and cities that have a designated Bureau forecast, or areas within the respective Detailed STW domain.

#### Responsible Officers and Request Authority

In the event where a SEWS request is warranted, the TSHR Operational Lead (Op-Lead) must obtain approval from the National Production Operational Lead (NPOL).

In the rare event that a SEWS request is warranted and no TSHR Op-Leads are onsite and/or online, the NPOL will have the authority to unilaterally request the use of the SEWS. The NPOL will monitor the situation until a TSHR Op-Lead is onsite and/or online.

#### Pre-approval

When the National TS Outlook indicates possible high-end severe phenomena over Queensland, Victoria, or Tasmania, the TSHR Op-Lead is to seek pre-approval from the NPOL. Pre-approval can be requested in the morning's [National Collaboration Meeting](#) or via MS Teams in the [EPS\\_TSHR](#) channel.

#### In Office Hours

The TSHR Op-Lead must inform Decision Support Services (DSS) when requesting the use of the SEWS, preferably before issuing the STW. In Queensland, DSS is to call the State Disaster Coordination Centre (SDCC), Queensland Police Service (QPS) and the ABC to undertake emergency procedures and broadcasts.

Once all conditions warranting the use of the SEWS request have eased, the TSHR Op-Lead must provide a notification of cancellation to DSS. In Queensland, a subsequent call to the SDCC, QPS and the ABC should then be made by DSS.

For contact details for all emergency services, navigate to the [TSHR Contacts](#) SharePoint page.

**Out of Office Hours**

In the absence of DSS, the TSHR Op-Lead will call the NPOL after requesting the use of the SEWS and provide a summary on the unfolding situation. This will enable NPOL to liaise with respective state-based customers and emergency services.

TSHR Op-Lead or NPOL should contact HPR managers by either a phone call or text to advise them on the unfolding situation.

In the rare event that a SEWS request is warranted and TSHR and DSS are not onsite and/or online, the NPOL will assume all duties.

**2.3.9.1.1. Requesting the use of the Standard Emergency Warning Signal**

If the confirmed VDS threat is confined to the Detailed STW domain, then the SEWS statement should only be included on the Detailed STW. If the confirmed VDS threat extends outside the Detailed STW domain (e.g., a VDS moving into or out of the Detailed STW domain), then the SEWS notification should appear on both the Detailed and Regional STW.

1. Click the SEWS button in the [Warning Text Editor](#) to request the use of the SEWS and the inclusion of the corresponding statement in the Detailed STW.



2. Overwrite the 11 consecutive dots by listing all major towns, suburbs, cities, or local government areas in the SEWS section.

<b>SEWS</b>	Transmitters serving the area ..... are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.
-------------	--

3. Contextualise and uppercase the [Headline Statement](#) in the headline section.

<b>Headline</b>	
-----------------	--

4. List all significant weather [Observations](#) in the **Observations/Other** section, including the high-end severe observation or report that warranted the activation of the SEWS.

<b>Obs/Other</b>	
------------------	--

5. If text has been added or autogenerated text has been modified, click the Check Spelling button.



6. Click the Save button to save all graphical and text data.



7. Click the Preview button to preview how the Detailed STW will look online as a live product.



8. Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



9. Click Auto Refresh to monitor product. Turn off when new warnings are required.



**2.3.9.1.2. Cancelling the Standard Emergency Warning Signal Request**

1. Click the SEWS button to cancel the SEWS request and exclude the **SEWS** statement from the Detailed STW. All SEWS text in the [Warning Text Editor](#) will be automatically deleted.



2. Contextualise and lowercase (if all high-end severe threats have ceased) the [Headline Statement](#) in the headline section.

<b>Headline</b>	
-----------------	--

3. If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product.



- Click the Issue button to send the Detailed STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.3.9.2. Emergency Weather Alerts

An EWA is a verbal notification provided to the QPS and the SDCC in Queensland. It is done at the forecaster's discretion when they believe there are special circumstances requiring notification of emergency services but there is insufficient evidence such as a confirmed high-end severe report to trigger a request of the SEWS. An EWA should never be used with SEWS concurrently.

An EWA can be invoked for any area across Queensland, irrespective of known population or designated Bureau forecasts.

#### Issue Criteria

- Radar evidence suggests one or more high-end severe phenomena is likely to be occurring.

#### Responsible Officers and Invocation

When an EWA is warranted, the TSHR Op-Lead authorises its use.

#### In office hours

TSHR is to inform DSS that an EWA is to be invoked. DSS is to call the SDCC and QPS to alert them using the specific phrase "Emergency Weather Alert". The potential high-end severe phenomena and their impacts should also be mentioned during this brief call.

Once all conditions warranting the use of an EWA have eased, the TSHR must provide a notification of cancellation to DSS. A subsequent call to the SDCC and QPS should then be made by DSS.

#### Out of office hours

In the absence of DSS, TSHR or NP will assume all duties outlined above.

In the rare event that an EWA is warranted and TSHR and DSS are not onsite and/or online, the NPOL will assume all duties.

### 2.3.10. Concurrent Warnings

#### 2.3.10.1. Severe Thunderstorm Warnings and Severe Weather Warnings

##### 2.3.10.1.1. Separate Severe Thunderstorm Warnings

A separate STW is a Detailed or Regional STW that is issued over an accompanying SWW. This overlapping product is used to warn for a hazard that is not included in an accompanying SWW or provide increased geographical detail for areas under effect of a high-end severe hazard.

If a severe or high-end severe hazard is expected to remain exclusively within the Detailed STW domain, a Detailed STW will be issued without an accompanying Regional STW. If outside the Detailed STW domain, a Regional STW will be issued. If the severe or high-end severe hazard extends outside the Detailed STW domain (e.g., Very Dangerous Thunderstorm) moving into or out of the Detailed STW domain), then both Detailed and Regional STW will be issued until one of the products can be cancelled.

##### 2.3.10.1.2. Issue Criteria

If either of the following conditions are satisfied, a separate STW will be issued over the accompanying SWW.

- A hazard, other than those already included in the SWW, is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar and/or satellite. For example:
  - Large or giant hail
  - Tornadoes (supercell, shear zone and QLCS mesovortices)

2. A high-end severe hazard is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar and/or satellite. For example:
  - Destructive wind gusts
  - Intense rainfall
  - Tornadoes (supercell, shear zone and QLCS mesovortices)

In the rare situation where only a high-end severe hazard is included in a SWW (e.g., significant cold front over southwestern Western Australia that produces widespread destructive wind gusts), a separate STW is not required.

### 2.3.10.1.3. Cancellations

1. When cancelling a standard STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Severe thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of severe thunderstorms has passed. The situation will continue to be monitored closely and further severe thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

2. When cancelling a high-end STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Very dangerous thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of very dangerous thunderstorms has passed. The situation will continue to be monitored closely and further very dangerous thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

3. In the event where a SWW is cancelled and there is a risk of STS, the following text is to be used.

Severe weather is no longer occurring over [state / districts / area]. The immediate threat of widespread severe weather has passed, and the situation will continue to be closely monitored.

There remains a risk of severe thunderstorms over [state / districts / area] [describe timing]. A separate Severe Thunderstorm Warning will be issued, if required.

## 2.4. Communication

### 2.4.1. Heads Up

The TSHR meteorologist overseeing the Detailed STW is to message the respective DSS team on MS Teams via the [EPS\\_TSHR](#) channel to provide a 'heads up' about the upcoming Detailed STW. The message should briefly state and outline the technical rationale informing the warning decision and meteorological insight into the short-term prognosis. They should also inform when an emergency warning escalation such as a VDS, EWA or SEWS has been activated or deactivated.

Heads up messages are required for the following Detailed STW:

- **New**                      New STW
- **Escalation**              STW upgraded to high-end severe phenomena
- **De-escalation**          STW downgraded from high-end severe phenomena
- **Cancellation**          Cancelled STW
- **Suspension**              Suspended STW
- **Continuation**          STW with no change in status

The following are heads up examples for Detailed STW:

#### New Detailed STW

Hi @DSS\_VIC, a Detailed STW for R and W will be issued shortly for the slow-moving multicell northwest of Melbourne Airport. Sunbury's observations and Rainfields indicate that 30-minute rainfall are approaching 10% AEP with KDP on the rise. As outlined in the TS Outlook, high LCL with moderate DMAPE will pose a risk for W.

### Continuation Detailed STW

Hi @DSS\_NSW\_ACT, a Detailed STW for R will be updated shortly for the training convection around Newcastle and Williamtown. Most recent reflectivity and observations indicate that rainfall rates are starting to ease from the south with a clearance and likely STW cancellation looking probable in approximately 40 minutes.

### Escalation Detailed STW

Hi @DSS\_QLD, a VDS Detailed STW for H+ and W+ will be issued shortly for the long-track supercell moving NNE towards Ipswich. The moderate to strong mesocyclone with rotational velocity around 45kts in combination with MESH > 11 cm and ZDR < -1 is indicative of potential H+ and W+. Due to minimal activity ahead of the supercell and very favourable conditions, expect this VDS STW to be in effect for the next hour or two.

TSHR would like to invoke an EWA for Ipswich, Highvale, and Narangba. SEWS will be activated if criteria are met.

### 2.4.2. Brief and Advise

The DSS Operational Lead (Op-Lead) or Outposted Meteorologist will be responsible for briefing emergency services. Outside of DSS operational hours, the responsibility transfers to NP who may delegate to TSHR (workload dependent). If TSHR is not operational, NP takes over responsibility for briefing emergency services.

### 2.4.3. Formal Sign Off

At the end of the PM shift or agreed restriction duty, the TSHR Op-Lead or delegate is to formally transfer responsibility of the severe thunderstorm and severe weather services to NP and sign off within the [EPS\\_TSHR](#) channel using the template below. The message is to include all current warnings and/or watch points.

The following are formal sign off examples:

#### No Activation

Hi @NP\_Ops - TSHR signing off.

#### Status:

- No current warnings.

#### Watch Points:

- WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.

#### Restriction Activated

Hi @NP\_Ops - TSHR signing off.

#### Status:

- Regional STW current for N NSW and S Qld.
- SWW current for NSW Alpine areas - 12:00 UTC SWW TN (OpsTools)

#### Watch Points:

- NSW/QLD: W can be excluded from the next Regional STW update due to the risk easing around midnight.
- WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.



## 2.5. Appendix

### 2.5.1. Warning Content

#### 2.5.1.1. Title

The autogenerated title will state the warning type and all, or part of one, or several weather forecast districts. It will also list the potential phenomena.

#### 2.5.1.2. Issuance Time

Autogenerated issuance time and date of the STW.

#### 2.5.1.3. Headline Statement

The aim of a headline statement is to focus the attention on the key message in the warning. The warnings can be long and sometimes the information can be lost.

This statement should be a punchy and succinct one-line statement that describes the 'what when and where' of key severe thunderstorm threats. Warning cancellations do not require a headline statement.

This statement does not always need to cover all elements of the warning but must cover those parts we want to emphasise. For example, if there is a period of particularly intense rain inside the broader event, use the headline statement to put a spotlight on it – using the where, when and what principle.

A repetition of the header of the STW most often will not serve this purpose.

For Regional STW that include high-end severe phenomena, the headline statement must be uppercase. Otherwise, the headline statement is to be lowercase.

Example headline statements:

- Severe thunderstorms with heavy rainfall are currently developing across the central interior.
- VERY DANGEROUS STORMS WITH DESTRUCTIVE WIND GUSTS LIKELY OVER THE DALY COAST.

#### 2.5.1.4. Graphical Warning Content

[Detailed STW graphic](#)

#### 2.5.1.5. Weather Situation

This section is not required for Detailed STW.

#### 2.5.1.6. Warning Details

Autogenerated text including a list of selected phenomena and affected LGA and locations. If there are two or more warning sections, Warning Section 1 will always be at the top of the warning details section. As such, VDS threats should always be prioritised as Warning Section 1.

TIFS autogenerated text states that hazards have an implied 'likely' probability e.g., " Damaging winds and large hailstones are likely. ..." Hazard management agencies however assign Australian Warning System (Advice, Watch and Act, Emergency) based on several inputs including probability. The probability of hazards should be manually modified to best represent the confidence of the hazards occurring, consisting of the following terminology:

- Possible                    lower confidence in the occurrence of the hazard
- Likely                      higher confidence in the occurrence of the hazard

All warnings need to have at least one hazard as 'likely'.

*Example: " Damaging winds are likely with large hail stones possible..."*

#### 2.5.1.7. Observations

Confirmed severe and high-end severe reports and observations are to be manually inserted in the observation section, listing the location, official or estimated time of occurrence (local time), and the significant weather observations. High-end severe reports and observations are to be uppercase.

*Unit of measurement: rainfall, wind and hail reports and observations are to be listed in mm, km/h, and cm respectively.*

Example observations listing:

- 56 mm was recorded at Melbourne Airport in 30 minutes to 4:24 pm.
- 3 cm hailstones were observed in Brisbane City at 4:45 pm.
- 118 km/h wind gust was recorded at Darwin Airport at 7:14 pm.
- CONFIRMED REPORTS OF GIANT HAIL UP TO 13.8 CM AT BORANA HEIGHTS AT 4:10 PM.
- CONFIRMED REPORT OF A TORANDO IN BEAUDESERT AROUND 4:30 PM.

#### **2.5.1.8. Action Statements**

Autogenerated action statements that have been agreed upon by state and territory-based emergency services.

#### **2.5.1.9. Warning Updates**

Autogenerated update time of the next Regional STW

#### **2.5.1.10. Warning Accessibility**

Autogenerated accessibility text that provides brief statement on the additional channels where the Regional STW is broadcasted.

RELEASED UNDER FREEDOM OF INFORMATION

### 2.5.2. Product Examples

Standard

IDD21035

Australian Government Bureau of Meteorology

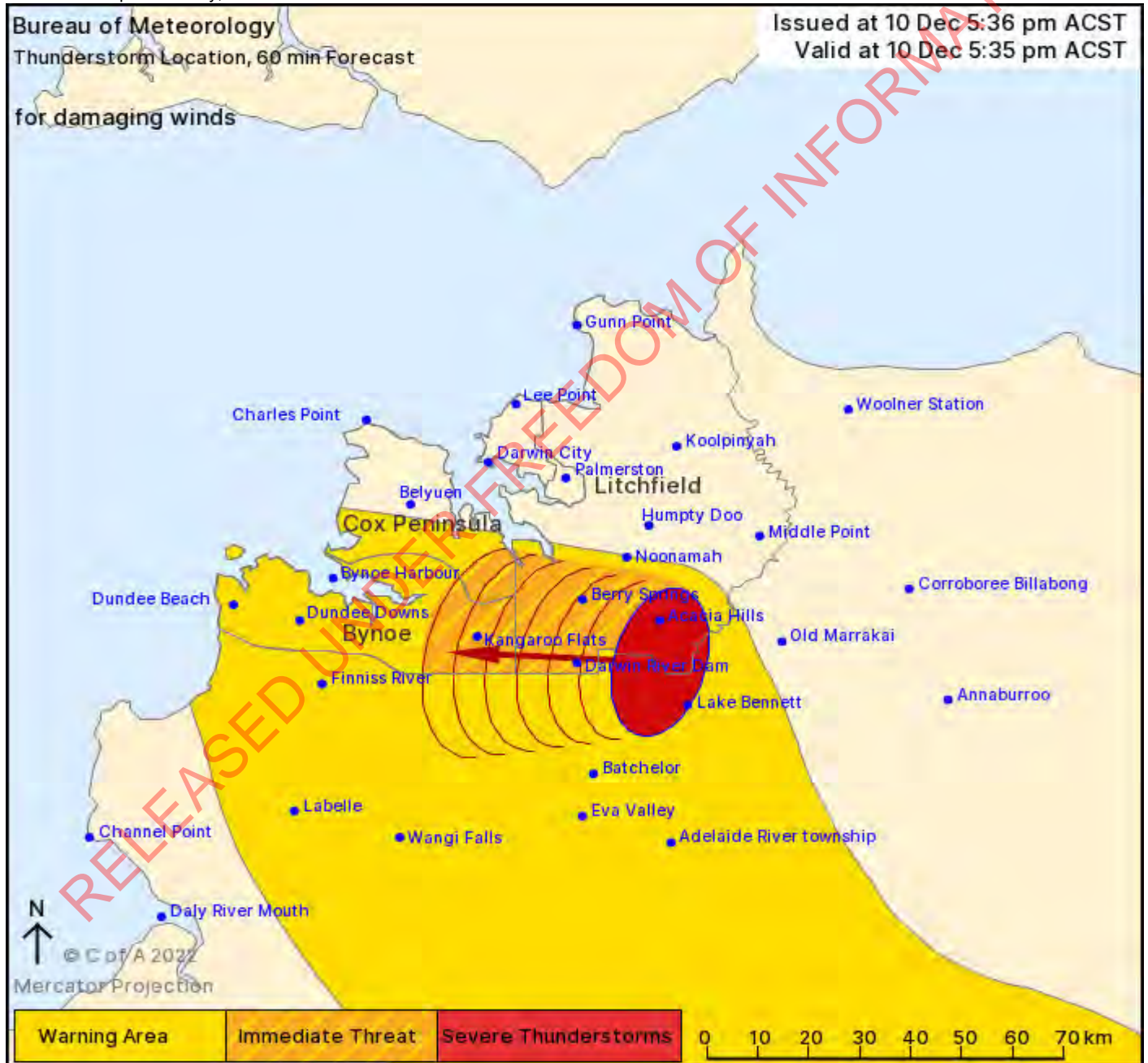
TOP PRIORITY FOR IMMEDIATE BROADCAST

Severe Thunderstorm Warning - Darwin City and Outer Darwin

for DAMAGING WINDS

For people in parts of Bynoe, Cox Peninsula and Litchfield areas.

Issued at 5:36 pm Saturday, 10 December 2022.



The Bureau of Meteorology warns that, at 5:35 pm, potential severe thunderstorms were detected on the weather radar near Acacia Hills and Manton Dam. They are forecast to affect Berry Springs, Darwin River Dam and Darwin River by 6:05 pm and Kangaroo Flats, Middle Arm and the base of Cox Peninsula by 6:35 pm.

Damaging winds are likely.

**Standard Emergency Warning Signal**

IDQ21035

Australian Government Bureau of Meteorology

Transmitters serving the area for Gatton, Ipswich, Greenbank, Jimboomba, Beenleigh and Logan area are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.

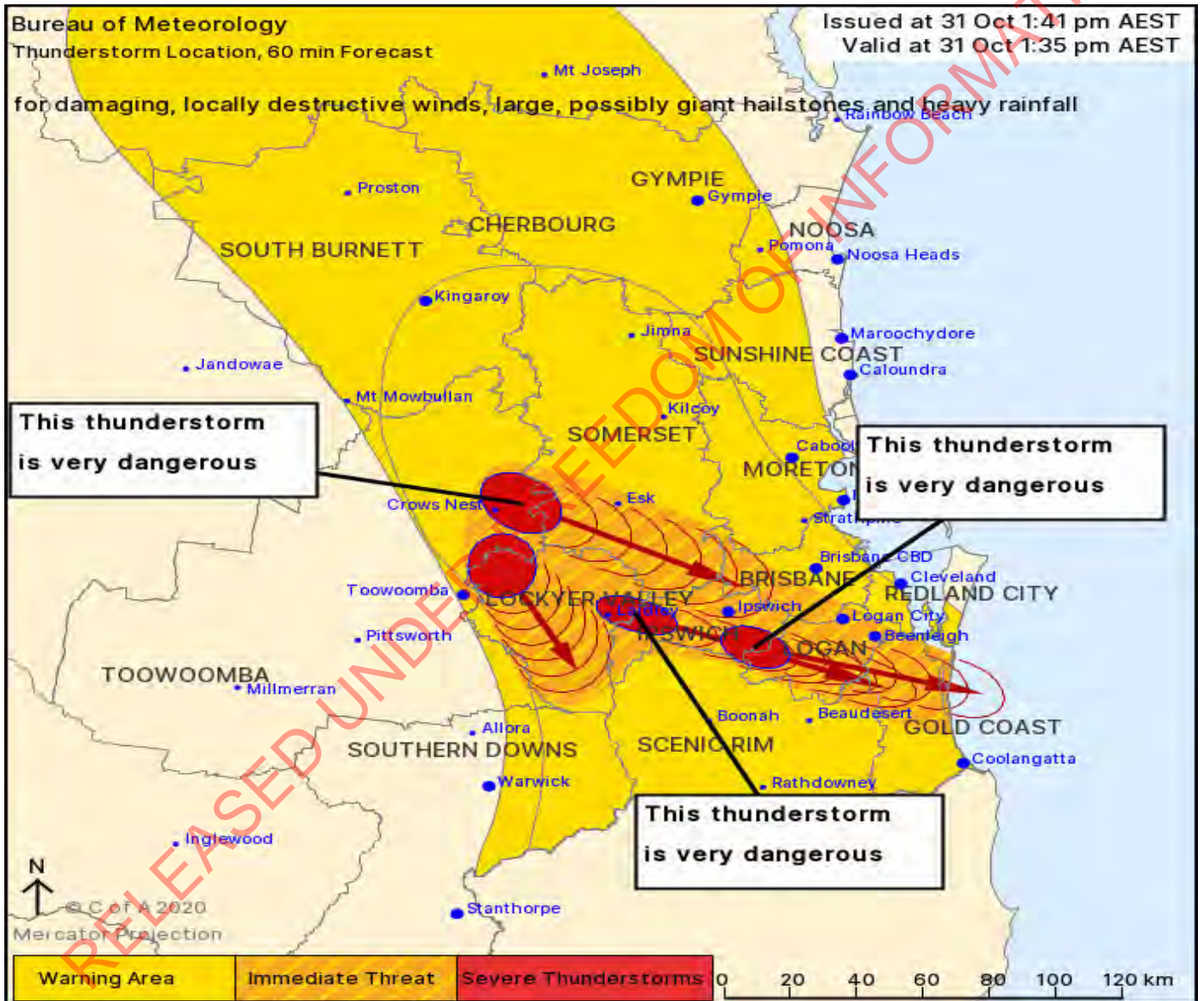
TOP PRIORITY FOR IMMEDIATE BROADCAST

Severe Thunderstorm Warning - Southeast Queensland

for DAMAGING, LOCALLY DESTRUCTIVE WINDS, LARGE, POSSIBLY GIANT HAILSTONES and HEAVY RAINFALL

For people in Ipswich, Logan, Lockyer Valley and parts of Somerset, Scenic Rim, Toowoomba, Gold Coast and Brisbane City Council Areas.

Issued at 1:41 pm Saturday, 31 October 2020



The Bureau of Meteorology warns that, at 1:35 pm, very dangerous thunderstorms were detected on the weather radar near Laidley, Crows Nest and Bundamba Lagoon. These thunderstorms are moving towards the east to southeast. Very dangerous thunderstorms are forecast to affect the area south of Esk, the area southwest of Esk and the area west of Esk by 2:05 pm and Ipswich, Mount Nebo and southern Lake Wivenhoe by 2:35 pm.

Other severe thunderstorms were detected on the weather radar near Helidon, Hampton and Murphy's Creek. They are forecast to affect Gatton, Grantham and the area south of Helidon by 2:05 pm and Mulgowie and the area northwest of Cunninghams Gap by 2:35 pm.

Damaging, locally destructive winds, large, possibly giant hailstones and heavy rainfall that may lead to flash flooding are likely.

4-7cm has been observed around Gatton and Adare around 12:30pm

5cm hail has been recorded around Seventeen Mile around 1pm

4cm hail has been reported just northeast of Toowoomba around 1pm

### 3. Related Documents

CSG RACI	<a href="#">CSG RACI</a>
CSG Process Maps	< Include as hyperlinks > Remove and add rows as required
CSG Work Instructions	< Include as hyperlinks > Remove and add rows as required
CSG Master Glossary	<a href="#">CSG Master Glossary</a>

### 4. Document Control

#### 4.1. Approvals

Date Approved	Version No.	Name	Position	Signature (electronic)
Nov 2023	V4.0		Manager Severe Weather	

#### 4.2. Version Control

Version No.	Version date	Author	Comments
V1.0	26/07/2022		Initial draft
V2.0	05/08/2022		Updated instructions and format
V2.0	02/09/2022		Updated shading to grey as the blue for accessibility reasons
V3.0	Nov 2022	EPS team members	General updates
V4.0	Nov 2023	EPS team members	Updates for 23/24

## CSG Regional Severe Thunderstorm Warnings

Instructions on how to prepare and issue a Regional Severe Thunderstorm Warning, including warning escalations and concurrent warnings.

Document type	Work Instructions
Document Status	Ready for approval
Process Group	4.2 Produce & Deliver Products
Process	4.2.1 Produce & Deliver Products
Activities (Process Level 4)	4.2.1.2 Produce and Issue Products
Approved by	Manager Severe Weather
Date Approved	9/11/2023
Process Owner	EPS GM
Process Leader	< Program > < Role >
Review Date	1/09/2024

RELEASED UNDER FREEDOM OF INFORMATION

# Contents

<b>CSG Regional Severe Thunderstorm Warnings .....</b>	<b>1</b>
1. Systems & Tools .....	4
2. Work Instructions.....	4
2.1. Severe Thunderstorm Service .....	4
2.2. Severe Thunderstorm Warning Type.....	4
2.2.1. Standard Severe Thunderstorm Warning .....	4
2.2.2. Reactive Severe Thunderstorm Warning.....	4
2.2.3. Proactive Severe Thunderstorm Warning.....	4
2.3. Regional Severe Thunderstorms Warnings.....	4
2.4. Prepare and Issue Regional Severe Thunderstorm Warnings .....	5
2.4.1. Region and Product Selection in TIFS.....	5
2.4.2. Creating Regional Severe Thunderstorm Warning Areas.....	5
2.4.2.1. Visual Weather .....	5
2.4.2.1.1. Loading EPS_TSHR Role .....	5
2.4.2.1.2. Opening Regional Severe Thunderstorm Warning Task .....	5
2.4.2.1.3. Drawing Regional Severe Thunderstorm Warning Areas .....	5
2.4.2.1.4. Sending Regional Severe Thunderstorm Warning Areas to TIFS .....	6
2.4.2.1.5. Loading Regional Severe Thunderstorm Warning Areas in TIFS .....	6
2.4.2.2. Thunderstorm Interactive Forecasting System (TIFS).....	7
2.4.3. Regional Severe Thunderstorm Warning Content.....	8
2.4.4. Issuing Regional Severe Thunderstorm Warnings .....	9
2.4.5. Cancelling Regional Severe Thunderstorm Warnings.....	10
2.4.6. Emergency Warning Escalations.....	10
2.4.6.1. Standard Emergency Warning Signal.....	10
2.4.6.1.1. Requesting the Use of the Standard Emergency Warning Signal .....	11
2.4.6.1.2. Cancelling the Standard Emergency Warning Signal Request.....	12
2.4.6.2. Emergency Weather Alerts.....	12
2.4.7. Concurrent Warnings.....	13
2.4.7.1. Severe Thunderstorm Warnings and Severe Weather Warnings.....	13
2.4.7.1.1. Separate Severe Thunderstorm Warnings .....	13
2.4.7.1.2. Issue Criteria .....	13
2.4.7.1.3. Cancellations.....	13
2.5. Communication .....	14
2.5.1. Heads Up .....	14
2.5.2. Brief and Advise .....	14
2.5.3. Formal Sign Off .....	14
2.6. Appendix .....	15
2.6.1. Warning Content.....	15
2.6.1.1. Title.....	15
2.6.1.2. Issuance Time .....	15
2.6.1.3. Headline Statement .....	15
2.6.1.4. Graphical Warning Content .....	15
2.6.1.5. Weather Situation .....	15
2.6.1.6. Warning Details .....	15
2.6.1.7. Observations .....	16
2.6.1.8. Action Statements .....	16
2.6.1.9. Warning Updates.....	16
2.6.1.10. Warning Accessibility.....	16
2.6.2. First Issue of a Regional Severe Thunderstorm Warning .....	16
2.6.3. Collaboration Tool .....	17

2.6.4. Product Examples ..... 18

3. Related Documents ..... 21

4. Document Control ..... 21

4.1. Approvals ..... **Error! Bookmark not defined.**

4.2. Version Control..... **Error! Bookmark not defined.**

RELEASED UNDER FREEDOM OF INFORMATION



# 1. Systems & Tools

1. Interactive Forecasting System ([TIFS](#)).
2. Visual Weather (VW).
3. Microsoft Teams (MS Teams).

## 2. Work Instructions

### 2.1. Severe Thunderstorm Service

The Severe Thunderstorm Warning (STW) service is used whenever there is sufficient meteorological evidence to suggest one or more of the following:

- Severe thunderstorm development is likely
- Severe thunderstorm is likely to move into the STW domain
- Severe thunderstorm has been directly reported or observed
- Severe thunderstorm is inferred through various observational datasets

Occasionally, deep moist convective cells that are not producing lightning will be capable of producing severe or even high-end severe phenomena. Although such cells are not technically thunderstorms, the use of the STW service is still appropriate. For the purposes of this document, "severe thunderstorm" can be taken to mean "severe deep, moist convective cell" whether or not lightning is present.

Phenomena definitions associated with severe thunderstorms (STS) are listed in the [Thunderstorm and Severe Weather Service Level Specifications](#).

### 2.2. Severe Thunderstorm Warning Type

#### 2.2.1. Standard Severe Thunderstorm Warning

A STW is issued once STS signatures have been identified on radar (reflectivity, velocity, dual-polarisation fields) and/or satellite imagery.

Standard STW typically occur when the National Thunderstorm Outlook (National TS Outlook) indicates **STS Possible** and **STS Likely**.

#### 2.2.2. Reactive Severe Thunderstorm Warning

A STW that is issued immediately after an official or reliable ground observation or report.

Reactive STW typically occur when unexpected STS have been reported or observed. This scenario generally takes place when the pre-event forecast probability is low, either (a) just above 10% with the National TS Outlook indicating STS Possible with the risk rated as 'marginal'; or (b) below 10% and there is no STS Possible area depicted.

#### 2.2.3. Proactive Severe Thunderstorm Warning

A STW that is issued when convective initiation is taking place in an environment favourable for STS (up to one hour of lead time for the first STS), or at the latest just prior to the development of likely STS (up to 10 minutes of lead time).

- Tier 1 STW issued as soon as deep, moist convection (DMC) is realised and there is high confidence for STS over the validity period.
- Tier 2 STW issued as soon as strong and/or organised DMC is detected, and STS are imminent.

Proactive STW typically occur when the National TS Outlook indicates **STS Likely**.

### 2.3. Regional Severe Thunderstorms Warnings

The Bureau provides Regional STW for all states and mainland territories. The area covered by a warning is shaded yellow and represents the area where there is a potential threat for STS. The area may consist of all, or part of one, or several weather forecast districts. Multiple examples of Regional STW are listed in Appendix 2.6.4.

Regional STW are valid for a three-hour period from the issuance time and will be updated routinely every one to two hours but may be updated more frequently during rapidly evolving situations.

If a current Regional STW does not adequately describe the situation, it should be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

Regional STW should be cancelled when STS move offshore or dissipate, and no further STS development is expected over the next three hours.

Operational guidance on when to issue the first Regional Severe Thunderstorm Warning is in Appendix 2.6.2

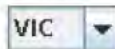
## 2.4. Prepare and Issue Regional Severe Thunderstorm Warnings

Regional STW are to be prepared and issued by Thunderstorm and Heavy Rainfall (TSHR), and National Production (NP) using TIFS in conjunction with VW.

In TIFS, a Regional STW product consists of a variety of sections that highlight warning areas and expected phenomena in a graphical and textual format. Manual intervention is required for the headline statement, weather situation, graphical warning content, selection of phenomena, observations, and if required, relevant Standard Emergency Warning Signal (SEWS) text, or warning details when Very Dangerous Storms (VDS) are occurring or expected to occur. The remaining sections are autogenerated in TIFS.

### 2.4.1. Region and Product Selection in TIFS

1. Click Region to Load and select your respective state or territory.



2. Click Product and select Regional STW. If the STS threat is confined to a particular area of the state or territory, the appropriate preset zoomed area should be select.



### 2.4.2. Creating Regional Severe Thunderstorm Warning Areas

There are two methods for producing Regional STW areas. The preferred method is to create warning areas in VW and subsequently send the shapefile to TIFS. If this is not possible due to time constraints or technical issues, the method of manually drawing the warning areas in TIFS can be used.

#### 2.4.2.1. Visual Weather

##### 2.4.2.1.1. Loading EPS\_TSHR Role

1. In VW Main Panel, click on Role Selector button

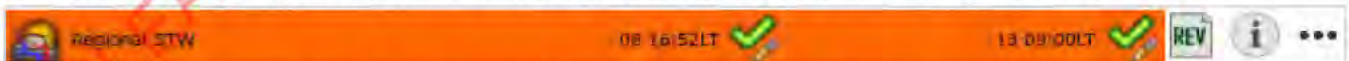


2. In the window that lists all available roles select the EPS\_TSHR role and press OK.



##### 2.4.2.1.2. Opening Regional Severe Thunderstorm Warning Task

1. The EPS\_TSHR role will appear in the My Roles selection. Once the role is selected, the 'Regular Tasks' pane populates with the STW task (orange). Left mouse button (LMB) on the hyperlink text buttons or icons to open the Regional STW.



The hyperlink text buttons or icons appearing on the right-hand side of the tasks listed consists of the default 'create' and 'import from latest'. These options change as follows:

Left Link Button	Right Link Button	Description
Create	Import from latest	No product has been created.
Amend/Revise		A product has been created and sent.
Edit		A product has been created, but not yet sent.

Table 1: A list of possible actions for each task.

##### 2.4.2.1.3. Drawing Regional Severe Thunderstorm Warning Areas

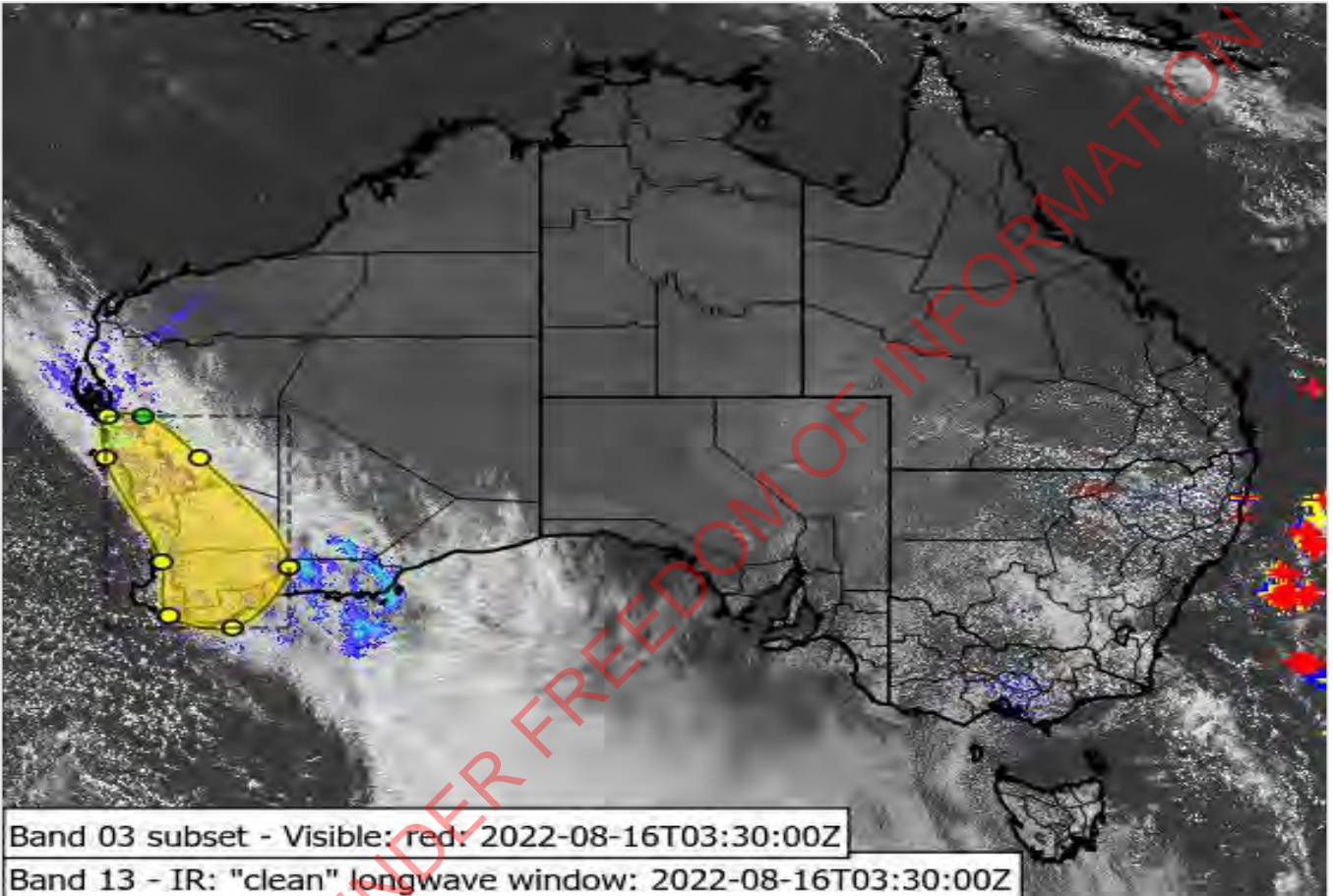
1. On the right-hand side of the Forecaster application within the Feature Editor pane, click the Favourites button.



2. Double click on the State STS Warning to activate the feature editor in collaboration mode. If you do not have session ownership, see Appendix 2.6.3.



3. Draw the Regional STW area by strategically clicking the LMB at various points, defining 'anchor' points before finally clicking on the first anchor point to close the contour (hovering over the final anchor point will display a multi-coloured donut near the cursor). IMPORTANT: Be careful not to cross over contour lines. This could happen when creating a single contour, i.e., creating a 'figure 8' shape, or when drawing a contour within or around a second contour.



4. Click the Save button on the Feature Editor Toolbar.



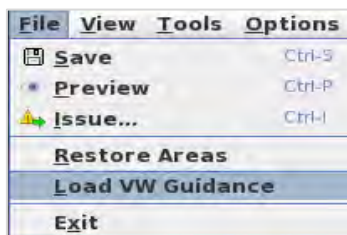
#### 2.4.2.1.4. Sending Regional Severe Thunderstorm Warning Areas to TIFS

1. Click the Issue button on the Feature Editor Toolbar. Once issued, all the features will then go grey indicating the product has been issued and the shapefile generation commenced.



#### 2.4.2.1.5. Loading Regional Severe Thunderstorm Warning Areas in TIFS

1. Navigate to File menu in the top left and select Load VW Guidance. Note that there may be a delay of up to 30-60 seconds depending on the current load on the Visual Weather server, possibly longer in certain regions.



2. Once areas have been ingested into TIFS, go to Section 2.4.3.

### 2.4.2.2. Thunderstorm Interactive Forecasting System (TIFS)

1. Select the GPATS [Feature](#) to view the most recent lightning data.

Features	
Name	Arrival Time
GPATS	04:46 UTC

2. Click the Add Area button then click again and hold on the [Graphical Editor](#) to draw a warning area.



3. Click the Edit Area button then click again in an existing warning area to edit.



4. Click the Reshape button to modify the shape of the existing area.



5. Click the Resize button to modify the size of the existing area.



6. Click the Selection/Manipulation button to move the existing area. This button can also be used to select other areas.



7. Delete all unwanted warning areas by using one the following options:

- Select the unwanted warning area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click the Delete button.



- Select the unwanted warning area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click Delete within the [Threat Area Property Editor](#).

**Threat Area Property Editor - TIFS** x

Area Type:

Warning Section:  ▼

Level:  ▼

Label Text:

Label Latitude:

Label Longitude:

8. In the [Threat Area Property Editor](#), a second or third warning area with different phenomena sets can be added by changing the number in the Warning Section.

When VDS are detected or expected to develop, a new warning area should be created and overlaid on top of the original STW area to distinguish where exactly STS and VDS are located or may develop. These segregated areas will become more discernible to the end-user where a thin black contour will be added to the graphic and a new section outlining the VDS threats will be included in the warning details.

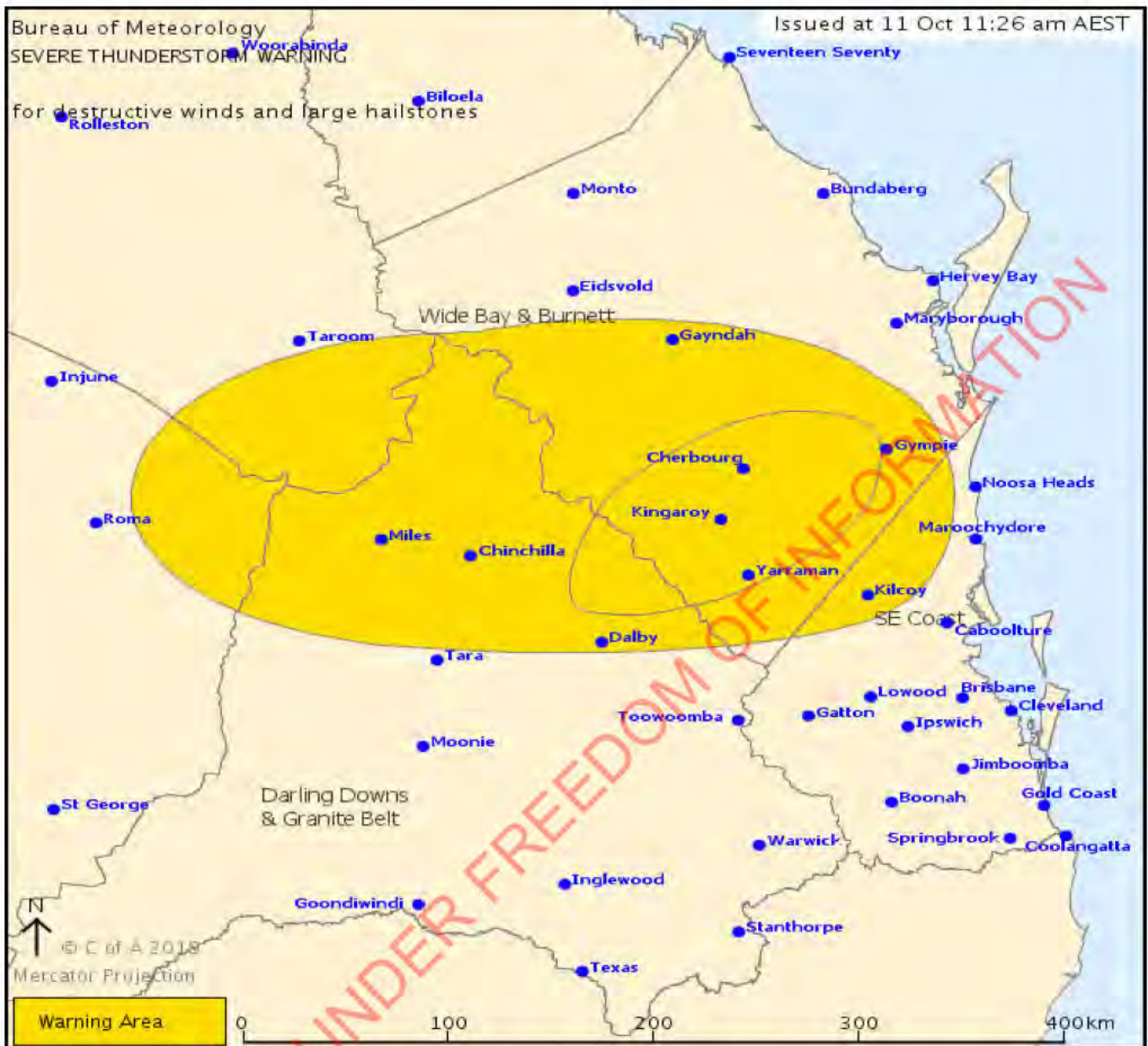


Table 2: Example of a Regional STW with STS and VDS.

### 2.4.3. Regional Severe Thunderstorm Warning Content

The following information highlights what sections within a Regional STW may require attention and manual intervention. Guidance on the written content in Regional STW can be found in Appendix 2.6.1.

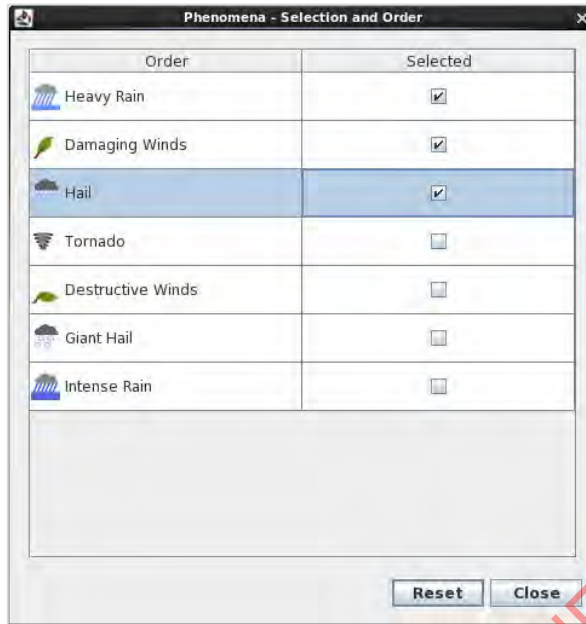
1. Click on a Phenomenon to add a severe and/or high-end severe threat.



Phenomenon	Text
H	large hailstones
H+	giant hailstones
H/H+	large, possibly giant hailstones
W	damaging winds
W+	destructive winds
W/W+	damaging, locally destructive winds
R	heavy rainfall
R+	intense rainfall
R/R+	heavy, locally intense rainfall
T	Tornadoes and destructive winds

Table 3: Autogenerated text for phenomena selection.

2. If multiple phenomena are to be included in the Regional STW, order the phenomena by the forecast level of threat from highest to lowest. Under the Options menu, click Phenomena and drag individual phenomena up or down the pop-up table.



3. Write an appropriate [Headline Statement](#) in the Headline section.

<b>Headline</b>	<input style="width: 700px; height: 30px;" type="text"/>
-----------------	--

4. Write an appropriate [Weather Situation](#) in the Situation section.

<b>Situation</b>	Weather Situation: <input style="width: 700px; height: 60px;" type="text"/>
------------------	--

5. Check the list of locations and if required, manually modify and/or change the level of detail.

- Click the Detailed More button (up arrow) to increase the number of places mentioned in the warning text and graphic.
- Click the Detailed Less button (down arrow) to decrease the number of places mentioned in the warning text and graphic.



6. List all significant weather [Observations](#) in the Observations/Other section.

<b>Obs/Other</b>	<input style="width: 700px; height: 50px;" type="text"/>
------------------	--

### 2.4.4. Issuing Regional Severe Thunderstorm Warnings

1. If text has been added or autogenerated text has been modified, click the Check Spelling button.



2. Click the Save button to save all graphical and text data.



3. Click the Preview button to preview how the warning will look online as a live product.



4. Click the Issue button to send the STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



5. Click Auto Refresh to monitor product. Turn off when updates or cancellations are required.



## 2.4.5. Cancelling Regional Severe Thunderstorm Warnings

1. Click the Cancel Warning button to cancel the Regional STW.



2. If applicable, contextualise or delete the [Headline Statement](#) in the Headline section.

<b>Headline</b>	
-----------------	--

3. Contextualise or delete the [Weather Situation](#) in the Situation section.

<b>Situation</b>	Weather Situation:
------------------	--------------------

4. If text has been added or autogenerated text has been modified, click the Check Spelling button



5. Click the Save button to save all graphical and text data.



6. Click the Preview button to preview how the warning will look online as a live product.



7. Click the Issue button to send the Regional STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



8. Click Auto Refresh to monitor product. Turn off when new warnings are required.



## 2.4.6. Emergency Warning Escalations

The Bureau has two major emergency warning escalations; the SEWS and Emergency Weather Alerts (EWA). These warning escalations vary depending on state or mainland territory agreements. Each warning has its specific purpose, designed to obtain an appropriate response from our customers and the community, as well as promote the dispersion of the urgent safety messages through media and Hazard Management Agency (HMA) channels.

### 2.4.6.1. Standard Emergency Warning Signal

The SEWS is a wailing siren sound used as an alerting signal in Queensland, Victoria, and Tasmania. The SEWS is designed to alert the community to the broadcast of an urgent safety message relating to a VDS with **one or more confirmed high-end severe phenomena** on the Australian Broadcasting Corporation (ABC) radio stations. The signal is sounded immediately prior to an emergency warning message being played on ABC broadcasts, in the potential or likely impacted areas. As part of a coordinated national emergency plan, the SEWS is used to attract attention to emergency warnings.

The Bureau of Meteorology can request the use of the SEWS by including a standardise SEWS statement in a STW. In the event where a request is warranted, SEWS text will be added above the title section on either or both Regional and Detailed Severe Thunderstorm Warnings. It will explicitly state the major towns, suburbs, cities or LGA where the SEWS will be directed, transmitted, and broadcast on the ABC.

The official activation of the SEWS is at the discretion of the ABC.

#### Issue Criteria

The following criteria is to be satisfied before requesting the use of the SEWS:

- A confirmed report of one or more high-end severe phenomena by a reliable source such as a Bureau observer, automatic weather station, storm spotter and/or trustworthy social media outlet
- It is of sufficient scale where a significant number of people will be warned. This includes all towns and cities that have a designated Bureau forecast ([Queensland](#), [Victoria](#) and [Tasmania](#)), and all areas within the respective Detailed STW domain
- Is expected to continue for 30 minutes or more

Once the SEWS has been requested, the SEWS will continue until all VDS convective regions that can be identified and tracked using radar and/or satellite has ceased, even when all VDS convective regions have moved away from all towns and cities that have

a designated Bureau forecast, or areas within the respective Detailed STW domain.

**Responsible Officers and Request Authority**

In the event where a SEWS request is warranted, the TSHR Operational Lead (Op-Lead) must obtain approval from the National Production Operational Lead (NPOL).

In the rare event that a SEWS request is warranted and no TSHR Op-Leads are onsite and/or online, the NPOL will have the authority to unilaterally request the use of the SEWS. The NPOL will monitor the situation until a TSHR Op-Lead is onsite and/or online.

**Pre-approval**

When the National TS Outlook indicates possible high-end severe phenomena over Queensland, Victoria, or Tasmania, the TSHR Op-Lead is to seek pre-approval from the NPOL. Pre-approval can be requested in the morning's [National Collaboration Meeting](#) or via MS Teams in the [EPS\\_TSHR](#) channel.

**In Office Hours**

The TSHR Op-Lead must inform Decision Support Services (DSS) when requesting the use of the SEWS preferably before issuing the STW. In Queensland, DSS is to call the State Disaster Coordination Centre (SDCC), Queensland Police Service (QPS) and the ABC to undertake emergency procedures and broadcasts.

Once all conditions warranting the use of the SEWS request have eased, the TSHR Op-Lead must provide a notification of cancellation to DSS. In Queensland, a subsequent call to the SDCC, QPS and the ABC should then be made by DSS.

**Out of Office Hours**

In the absence of DSS, the TSHR Op-Lead will call the NPOL after requesting the use of the SEWS and provide a summary on the unfolding situation. This will enable NPOL to liaise with respective state-based customers and emergency services.

TSHR Op-Lead or NPOL should contact HPR managers by either a phone call or text to advise them on the unfolding situation.

In the rare event that a SEWS request is warranted and TSHR and DSS are not onsite and/or online, the NPOL will assume all duties.

For contact details for all emergency services, navigate to the [TSHR Contacts](#) SharePoint page.

**2.4.6.1.1. Requesting the Use of the Standard Emergency Warning Signal**

If the confirmed VDS threat is confined to the Detailed STW domain, then the SEWS statement should only be included on the Detailed STW. If the confirmed VDS threat extends outside the Detailed STW domain (e.g., a VDS moving into or out of the Detailed STW domain), then the SEWS notification should appear on both the Detailed and Regional STW.

1. Click the SEWS button in the [Warning Text Editor](#) to request the use of the SEWS and the inclusion of the corresponding statement in the Regional STW.



2. Overwrite the 11 consecutive dots by listing all major towns, suburbs, cities, or local government areas in the SEWS section.

<b>SEWS</b>	Transmitters serving the area ..... are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.
-------------	--

3. Contextualise and uppercase the [Headline Statement](#) in the headline section.

<b>Headline</b>	
-----------------	--

4. List all significant weather [Observations](#) in the **Observations/Other** section, including the high-end severe observation or report that warranted the activation of the SEWS.

<b>Obs/Other</b>	
------------------	--

5. If text has been added or autogenerated text has been modified, click the Check Spelling button.



6. Click the Save button to save all graphical and text data.



7. Click the Preview button to preview how the Regional STW will look online as a live product.





- Click the Issue button to send the Regional STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.4.6.1.2. Cancelling the Standard Emergency Warning Signal Request

- Click the SEWS button to cancel the SEWS request and exclude the **SEWS** statement from the Regional STW. All SEWS text in the [Warning Text Editor](#) will be automatically deleted.



- Contextualise and lowercase (if all high-end severe threats have ceased) the [Headline Statement](#) in the headline section.

<b>Headline</b>	
-----------------	--

- If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product.



- Click the Issue button to send the Regional STW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



- Click Auto Refresh to monitor product. Turn off when new warnings are required.



### 2.4.6.2. Emergency Weather Alerts

An EWA is a verbal notification provided to the QPS and the SDCC in Queensland. It is done at the forecaster's discretion when they believe there are special circumstances requiring notification of emergency services but there is insufficient evidence such as a confirmed high-end severe report to trigger a request of the SEWS. An EWA should never be used with SEWS concurrently.

An EWA can be invoked for any area across Queensland, irrespective of known population or designated Bureau forecasts.

#### Issue Criteria

- Radar evidence suggests one or more high-end severe phenomena is likely to be occurring.

#### Responsible Officers and Invocation

When an EWA is warranted, the TSHR Op-Lead authorises its use.

#### In office hours

TSHR is to inform DSS that an EWA is to be invoked. DSS is to call the SDCC and QPS to alert them using the specific phrase "Emergency Weather Alert". The potential high-end severe phenomena and their impacts should also be mentioned during this brief call.

Once all conditions warranting the use of an EWA have eased, the TSHR must provide a notification of cancellation to DSS. A subsequent call to the SDCC and QPS should then be made by DSS.

#### Out of office hours

In the absence of DSS, TSHR or NP will assume all duties outlined above.

In the rare event that an EWA is warranted and TSHR and DSS are not onsite and/or online, the NPOL will assume all duties.

## 2.4.7. Concurrent Warnings

### 2.4.7.1. Severe Thunderstorm Warnings and Severe Weather Warnings

#### 2.4.7.1.1. Separate Severe Thunderstorm Warnings

A separate STW is a Detailed or Regional STW that is issued over an accompanying SWW. This overlapping product is used to warn for a hazard that is not included in an accompanying SWW or provide increased geographical detail for areas under effect of a high-end severe hazard.

If a severe or high-end severe hazard is expected to remain exclusively within the Detailed STW domain, a Detailed STW will be issued without an accompanying Regional STW. If outside the Detailed STW domain, a Regional STW will be issued. If the severe or high-end severe hazard extends outside the Detailed STW domain (e.g., Very Dangerous Thunderstorm moving into or out of the Detailed STW domain), then both Detailed and Regional STW will be issued until one of the products can be cancelled.

#### 2.4.7.1.2. Issue Criteria

If either of the following conditions are satisfied, a separate STW will be issued over the accompanying SWW.

1. A hazard, other than those already included in the SWW, is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar and/or satellite. For example:
  - Large or giant hail
  - Tornadoes (supercell, shear zone and QLCS mesovortices)
2. A high-end severe hazard is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar and/or satellite. For example:
  - Destructive wind gusts
  - Intense rainfall
  - Tornadoes (supercell, shear zone and QLCS mesovortices)

In the rare situation where only a high-end severe hazard is included in a SWW (e.g., significant cold front over southwestern Western Australia that produces widespread destructive wind gusts), a separate STW is not required.

#### 2.4.7.1.3. Cancellations

1. When cancelling a standard STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Severe thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of severe thunderstorms has passed. The situation will continue to be monitored closely and further severe thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

2. When cancelling a high-end STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Very dangerous thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of very dangerous thunderstorms has passed. The situation will continue to be monitored closely and further very dangerous thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

3. In the event where a SWW is cancelled and there is a risk of STS, the following text is to be used.

Severe weather is no longer occurring over [state / districts / area]. The immediate threat of widespread severe weather has passed, and the situation will continue to be closely monitored.

There remains a risk of severe thunderstorms over [state / districts / area] [describe timing]. A separate Severe Thunderstorm Warning will be issued, if required.

## 2.5. Communication

### 2.5.1. Heads Up

The TSHR meteorologist overseeing the Regional STW is to message the respective DSS team on MS Teams via the [EPS\\_TSHR](#) channel to provide a 'heads up' about the upcoming Regional STW. The very brief message should outline the warning area and hazards while leaving all technical rationale and meteorological insight for the official [STW Technical Notes](#).

Heads up messages are required for the following Regional STW:

- **New** New STW
- **Escalation** STW upgraded to high-end severe phenomena
- **De-escalation** STW downgraded from high-end severe phenomena
- **Cancellation** Cancelled STW
- **Continuation** Change in hazard and/or area only

The following are heads up examples for Regional STW:

#### New Regional STW

Hi @DSS\_VIC, a Regional STW for R and W will be issued shortly for the slow-moving thunderstorms over eastern Gippsland. STW TN to be issued shortly.

#### Continuation Regional STW

Hi @DSS\_WA, the current Regional STW for W will be updated shortly with the warning area now covering the western half of the Southern Interior district. STW TN to be issued shortly.

#### Escalation Regional STW

Hi @DSS\_QLD, TSHR will be upgrading the Regional STW to include H+ and W+ for the long-track supercells over the Southeast Coast. STW TN to be issued shortly.

### 2.5.2. Brief and Advise

The DSS Operational Lead (Op-Lead) or Outposted Meteorologist will be responsible for briefing emergency services. Outside of DSS operational hours, the responsibility transfers to NP who may delegate to TSHR (workload dependent). If TSHR is not operational, NP takes over responsibility for briefing emergency services.

### 2.5.3. Formal Sign Off

At the end of the PM shift or agreed restriction duty, the TSHR Op-Lead or delegate is to formally transfer responsibility of the severe thunderstorm and severe weather services to NP and sign off within the [EPS\\_TSHR](#) channel using the template below. The message is to include all current warnings and/or watch points.

The following are formal sign off examples:

#### No Activation

Hi @NP\_Ops - TSHR signing off.

#### Status:

- No current warnings.

#### Watch Points:

- WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.

#### Restriction Activated

Hi @NP\_Ops - TSHR signing off.

#### Status:

- Regional STW current for N NSW and S Qld.
- SWW current for NSW Alpine areas - 12:00 UTC SWW TN (OpsTools)

#### Watch Points:

- NSW/QLD: W can be excluded from the next Regional STW update due to the risk easing around midnight.
- WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.

## 2.6. Appendix

### 2.6.1. Warning Content

#### 2.6.1.1. Title

The autogenerated title will state the warning type and all, or part of one, or several weather forecast districts. It will also list the potential phenomena.

#### 2.6.1.2. Issuance Time

Autogenerated issuance time and date of the STW.

#### 2.6.1.3. Headline Statement

The aim of a headline statement is to focus the attention on the key message in the warning. The warnings can be long and sometimes the information can be lost.

This statement should be a punchy and succinct one-line statement that describes the 'what, when and where' of key severe thunderstorm threats. Warning cancellations do not require a headline statement.

This statement does not always need to cover all elements of the warning but must cover those parts we want to emphasise. For example, if there is a period of particularly intense rain inside the broader event, use the headline statement to put a spotlight on it – using the where, when and what principle.

A repetition of the header of the STW most often will not serve this purpose.

For Regional STW that include high-end severe phenomena, the headline statement must be uppercase. Otherwise, the headline statement is to be lowercase.

Example headline statements:

- Severe thunderstorms with heavy rainfall are currently developing across the central interior.
- VERY DANGEROUS STORMS WITH DESTRUCTIVE WIND GUSTS LIKELY OVER THE DALY COAST.

#### 2.6.1.4. Graphical Warning Content

Regional STW graphic

#### 2.6.1.5. Weather Situation

The weather situation is to include a brief description on the current and/or developing STS situation. It should list the synoptic drivers producing the STS and may provide an overview on the spatial and temporal extent of the activity. This section should not cover standard, non-severe thunderstorm activity.

Example weather situations:

- A cold front and pre-frontal trough will combine with a strong upper trough to produce widespread severe thunderstorms over southern New South Wales this afternoon and early evening.
- A slow-moving coastal trough is linking up with a very moist and unstable airmass to produce slow-moving thunderstorms over the South Coast this morning.
- A southeasterly change and an inland trough will produce a few severe thunderstorms over the Southeast Coast this afternoon. The threat of severe thunderstorms will increase into the afternoon as a strong upper trough moves across Southeast Queensland.

#### 2.6.1.6. Warning Details

Autogenerated text including a list of selected phenomena and affected weather forecast districts and locations. If there are two or more warning sections, Warning Section 1 will always be at the top of the warning details section. As such, VDS threats should always be prioritised as Warning Section 1.

TIFS autogenerated text states that hazards have an implied 'likely' probability e.g., "Severe thunderstorms are likely to produce damaging winds and large hailstones over the next several hours..." Hazard management agencies however assign Australian Warning System (Advice, Watch and Act, Emergency) based on several inputs including probability. The probability of hazards should be manually modified to best represent the confidence of the hazards occurring, consisting of the following terminology:

- Possible lower confidence in the occurrence of the hazard
- Likely higher confidence in the occurrence of the hazard

All warnings need to have at least one hazard as 'likely'.

*Example: "Severe thunderstorms are likely to produce damaging winds with possible large hailstones over the next several hours...Observations*

Confirmed severe and high-end severe reports and observations are to be manually inserted in the observation section, listing the location, official or estimated time of occurrence (local time), and the significant weather observations. High-end severe reports and observations are to be uppercase.

*Unit of measurement: rainfall, wind and hail reports and observations are to be listed in mm, km/h, and cm respectively.*

Example observations listing:

- 56 mm was recorded at Melbourne Airport in 30 minutes to 4:24 pm.
- 3 cm hailstones were observed in Brisbane City at 4:45 pm.
- 118 km/h wind gust was recorded at Darwin Airport at 7:14 pm.
- CONFIRMED REPORTS OF GIANT HAIL UP TO 13.8 CM AT BORANA HEIGHTS AT 4:10 PM.
- CONFIRMED REPORT OF A TORANDO IN BEAUDESERT AROUND 4:30 PM.

### 2.6.1.7. Action Statements

Autogenerated action statements that have been agreed upon by state and territory-based emergency services.

### 2.6.1.8. Warning Updates

Autogenerated update time of the next Regional STW

### 2.6.1.9. Warning Accessibility

Autogenerated accessibility text that provides brief statement on the additional channels where the Regional STW is broadcasted.

## 2.6.2. First Issue of a Regional Severe Thunderstorm Warning

The following is operational guidance on when to issue the first Regional STW when the **Day 0 National TS Outlook** indicates STS Possible, STS Likely, or nil STS.

### STS Possible

- **Standard STW** or **Reactive STW** that captures likely development and cell motion for the next three hours (standard validity period).
- The size of the warning polygon is dictated by the confidence that STS will sustain themselves or whether fresh development will continue.
- The warning polygon should remain within the STS Possible area unless the following is expected or occurring:
  - STS to move outside the STS Possible area
  - STS to develop outside the STS Possible area

### STS Likely

- **Proactive STW** that captures likely development and cell motion for the next three hours (standard validity period).
- The size of the warning polygon is typically larger than that in the 'STS Possible' and 'Nil STS' scenarios due to greater confidence in occurrence and/or sustainment.
- The warning polygon should remain within the STS Possible forecast area unless the following is expected or occurring:
  - STS to move outside the STS Possible area
  - STS to develop outside the STS Possible area

### Nil STS

- **Reactive STW** that captures likely development and cell motion for the next three hours (standard validity period).
- The size of the warning polygon is typically much smaller than that in the 'STS Possible' and 'STS Likely' scenarios due to lower confidence in the development, sustainment, and motion of the STS.

## Guidance and Considerations

- STW polygons can be determined by using and considering the following:
  - NWP guidance – Identify appropriate areas where DMC (convective precipitation, lightning flash rate, significant updraft helicity and speeds) will occur during the validity period.
  - Storm motion can be approximated by using storm motion vectors (SMV), Bunkers SMV, deep layer mean (DLM), or Mesoscale Convective System (MCS) Motion – Downshear (Corfidi).
  - Radar and satellite – Identify existing STS signatures and areas where strong DMC is occurring or starting to unfold.
  - Synoptic – Identify where the greatest risk of STS exists on a synoptic scale. STS are likely to develop and/or be sustained along synoptic features such as fronts, troughs, and surges.
  - Observations – Identify where STS are likely to develop by using nowcasting tools (real-time instability and shear) and finding such features as the theta-e ridge or dryline bulge. hi

- A STW can be cancelled at any point when STS are not considered likely within the validity period. It is acceptable to reissue a STW after a cancellation, particularly when it is an environment marginally favourable for STS.

*Example: If a STW is issued mid-afternoon, it does not mean the meteorologist has to continue with the STW through till evening when all TS have weakened.*

- Check the National TS Outlook in conjunction with Nowcasting tools to determine whether TS outside the current STW are worthy of an inclusion.

*Example: If TS are occurring outside the current STW polygon, this does not necessarily mean they should be included in the subsequent STW. In the absence of viable STS signatures, cross-check the National TS Outlook to confirm whether the environment was considered favourable for STS along with confirming that available nowcasting guidance agrees with this risk.*

### 2.6.3. Collaboration Tool

When the Regional STW is launched correctly from the Main Panel 'Regular Tasks' in VW, it will automatically enable the Collaboration Tool where multiple people can edit the product at the same time.

Towards the bottom left-hand side of the map area within the Forecaster application, the meteorologists currently editing the product are listed. The username corresponding to the meteorologist currently viewing the forecast product locally on their workstation will be indicated by an asterisk, \*. The username highlighted in bold font indicates the meteorologist who has 'session ownership' and typically coincides with the meteorologist who first loaded the product and still has the product active on their workstation (has not closed the instance of Forecaster).

When meteorologist (1) is editing the Regional STW Weather Warning area, the warning area will appear as normal with the forecast area appearing with the correct fill and displaying the 'anchor' points for editing. If another meteorologist (2) is in this product, they will see the edits undertaken by meteorologist (1) in real-time, but the area will be "greyed out" and not able to be edited. When the meteorologist (1) finishes editing the forecast area and LMB clicks off of the forecast area, such that the 'anchor' points are no longer visible on their workstation, the Regional STW area will appear with the correct fill and will be able to be selected on the meteorologist's (2) workstation.

#### Session Ownership

When preparing the Regional STW areas in collaboration mode, if the 'Save' button appears "greyed out", this is likely the result of not being the "session owner". As outlined above, the session owner is indicated by the username highlighted in bold font towards the bottom left-hand side of the map area within the Forecaster application. If this is the case, navigate to the 'Feature Editor' menu towards the top of the Forecaster application, and click on 'Take session ownership'. Upon doing so, your username should now appear bold and with the asterisk.

2.6.4. Product Examples

Standard

DD21033

Australian Government Bureau of Meteorology

TOP PRIORITY FOR IMMEDIATE BROADCAST

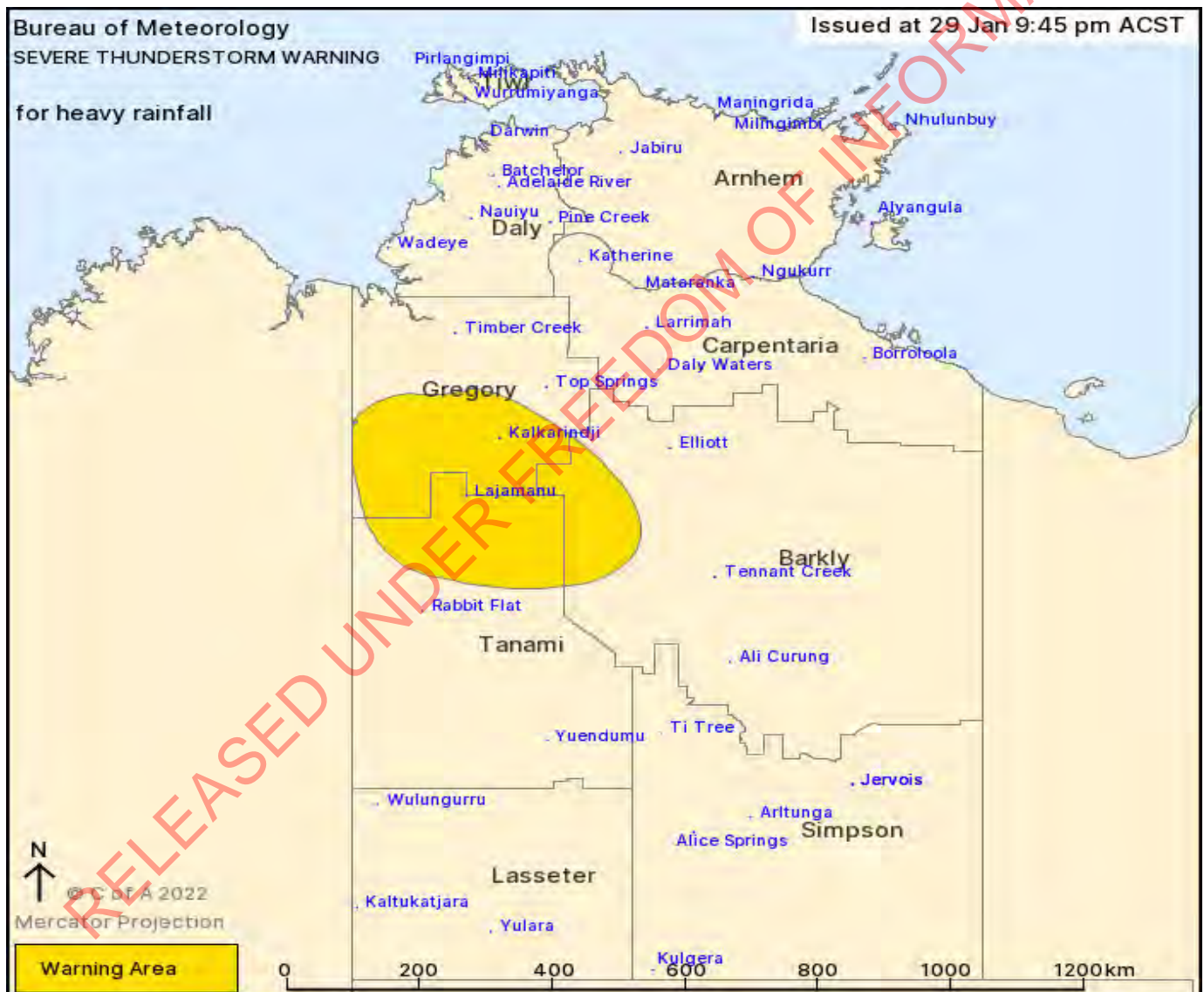
Severe Thunderstorm Warning

for HEAVY RAINFALL

For people in parts of Gregory, Barkly and Tanami districts.

Issued at 9:45 pm Saturday, 29 January 2022.

Heavy falls expected over areas between Top Springs and Rabbit Flat.



Weather situation: A monsoon trough over the Barkly, southern Gregory and northern Tanami Districts is leading to slow-moving thunderstorms across central districts.

Severe thunderstorms are likely to produce heavy rainfall that may lead to flash flooding in the warning area over the next several hours. Locations which may be affected include Lajamanu and Kalkarindji.

Severe thunderstorms are no longer occurring in the Simpson district and the warning for this district is CANCELLED.

The Northern Territory Emergency Service advises that people should:

Multiple Warning Areas

Q21033

Australian Government Bureau of Meteorology

**TOP PRIORITY FOR IMMEDIATE BROADCAST**

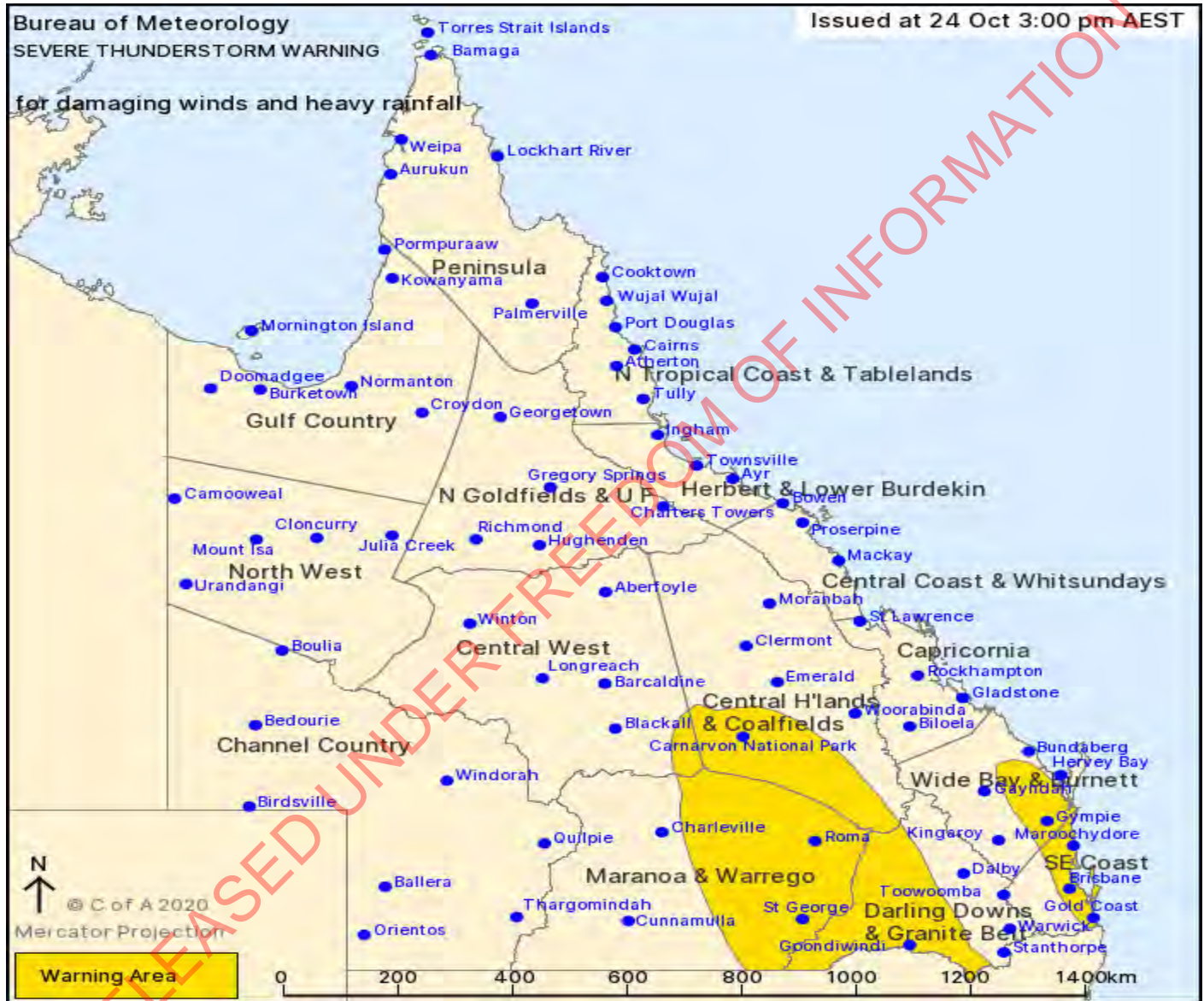
**Severe Thunderstorm Warning**

**for DAMAGING WINDS and HEAVY RAINFALL**

**For people in parts of Central Highlands and Coalfields, Central West, Wide Bay and Burnett, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast Forecast Districts.**

Issued at 3:00 pm Saturday, 24 October 2020.

Gusty and potentially severe thunderstorms over the southeastern interior, slow-moving and heavy activity over the southeast coast.



Weather Situation: A cold front and pre-frontal trough will combine with a very moist and unstable airmass to trigger severe thunderstorms across parts of Southeast Queensland this afternoon and evening.

Severe thunderstorms are likely to produce damaging winds over the next several hours in parts of the Central Highlands and Coalfields, Central West, Maranoa and Warrego and Darling Downs and Granite Belt districts. Locations which may be affected include Roma, Goondiwindi, St George, Carnarvon National Park, Mungindi and Tara.

Severe thunderstorms are likely to produce heavy rainfall that may lead to flash flooding over the next several hours in parts of the Wide Bay and Burnett and Southeast Coast districts. Locations which may be affected include Gold Coast, Brisbane, Maroochydore, Gympie, Coolangatta and Jimboomba.

**Overlain Warning Areas**

DQ21033

Australian Government Bureau of Meteorology

Queensland

**TOP PRIORITY FOR IMMEDIATE BROADCAST**

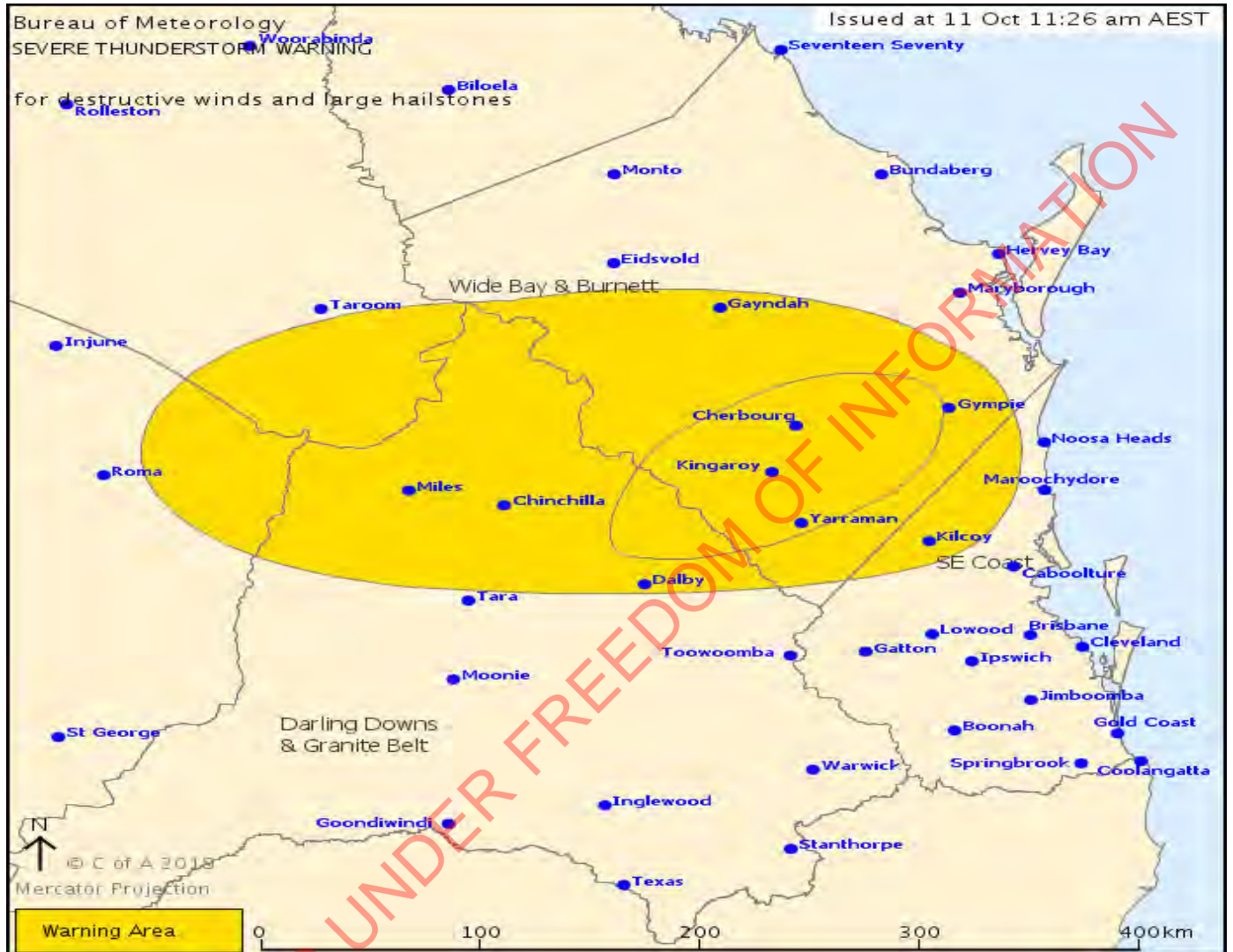


**Severe Thunderstorm Warning**

for **DESTRUCTIVE WINDS** and **GIANT HAILSTONES**

Issued at 11:26 am Thursday, 11 October 2018.

VERY DANGEROUS THUNDERSTORM NORTHEAST OF KINGAROY WITH TENNIS BALL SIZE HAIL OBSERVED AT KUMBIA.



Weather Situation: A very dangerous thunderstorm northeast of Kingaroy is expected to continue its northeast track towards Gympie. Another developing thunderstorm northeast of Chinchilla is also expected to intensify further as it moves towards Cherbourg and Gayndah. Giant hail is expected within the core of these cells.

Very dangerous thunderstorms are likely to produce destructive winds and giant hailstones over the next several hours in parts of the Wide Bay and Burnett and Darling Downs and Granite Belt districts. Locations which may be affected include Kingaroy, Cherbourg, Wondai, Murgon and Nanango.

Severe thunderstorms are likely to produce damaging winds and large hailstones over the next several hours in parts of the Central Highlands and Coalfields, Wide Bay and Burnett, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast districts. Locations which may be affected include Dalby, Gympie, Kingaroy, Cherbourg, Nambour and Nanango.

Severe thunderstorms are no longer occurring in the Maranoa and Warrego district and the warning for this district is CANCELLED.

Tennis ball size hail (up to 7cm) was reported at Kumbia around 11am.

### 3. Related Documents

CSG RACI	<a href="#">CSG RACI</a>
CSG Process Maps	< Include as hyperlinks > Remove and add rows as required
CSG Work Instructions	< Include as hyperlinks > Remove and add rows as required
CSG Master Glossary	<a href="#">CSG Master Glossary</a>

### 4. Document Control

#### 4.1. Approvals

Date Approved	Version No.	Name	Position	Signature (electronic)
Nov 2023	V4.0		Manager Severe Weather	

#### 4.2. Version Control

Version No.	Version date	Author	Comments
V1.0	26/07/2022		Initial draft
V2.0	05/08/2022		Updated instructions and format
V2.0	02/09/2022		Updated shading to grey as the blue for accessibility reasons
V3.0	Nov 2022	EPS team members	General updates
V4.0	Nov 2023	EPS team members	Updates for 23/24

# Document 3

## CSG Severe Weather Warnings

Instructions on how to prepare and issue a Severe Weather Warning, including warning escalations and concurrent warnings.

Document type	Work Instructions
Document Status	In review
Process Group	4.2 Produce & Deliver Products
Process	4.2.1 Produce & Deliver Products
Activities (Process Level 4)	4.2.1.2 Produce and Issue Products
Approved by	Manager Severe Weather
Date Approved	9 November 2023[Approved Date]
Process Owner	EPS GM
Process Leader	< Program > < Role >
Review Date	1/09/2024

RELEASED UNDER FREEDOM OF INFORMATION

# Contents

<b>CSG Severe Weather Warnings</b> .....	<b>1</b>
1. Systems & Tools .....	4
2. Work Instructions.....	4
2.1. Severe Weather Warning Service .....	4
2.2. Severe Weather Warnings .....	4
2.3. Prepare and Issue Severe Weather Warnings .....	5
2.3.1. Region and Product Selection in TIFS.....	5
2.3.2. Creating Severe Weather Warning Areas .....	5
2.3.2.1. Visual Weather .....	5
2.3.2.1.1. Loading EPS_TSHR Role .....	5
2.3.2.1.2. Opening Severe Weather Warning Task .....	5
2.3.2.1.3. Drawing Severe Weather Warning Areas .....	5
2.3.2.1.4. Sending Severe Weather Warning Areas to TIFS .....	6
2.3.2.1.5. Loading Severe Weather Warning Areas in TIFS .....	6
2.3.2.2. Thunderstorm Interactive Forecasting System (TIFS).....	7
2.3.3. Severe Weather Warning Content.....	8
2.3.4. Issuing Severe Weather Warnings .....	9
2.3.5. Cancelling Severe Weather Warnings.....	10
2.3.6. Concurrent Warnings.....	11
2.3.6.1. Land and Marine Based Severe Weather Warnings.....	11
2.3.6.1.1. Cancellations .....	11
2.3.6.2. Severe Thunderstorm Warnings and Severe Weather Warnings.....	11
2.3.6.2.1. Separate Severe Thunderstorm Warnings .....	11
2.3.6.2.2. Issue Criteria .....	11
2.3.6.2.3. Cancellations .....	11
2.3.6.3. Tropical Cyclone Advices and Severe Weather Warnings .....	12
2.3.6.4. Tropical Cyclone Watches and Severe Weather Warnings .....	12
2.3.6.5. Tropical Cyclone Warnings and Severe Weather Warnings .....	12
2.3.6.6. Transition from Tropical Cyclone Warnings to Severe Weather Warnings .....	12
2.4. Communication .....	12
2.4.1. Heads Up .....	12
2.4.2. Brief and Advise .....	13
2.4.3. Formal Sign Off .....	13
2.5. Appendix .....	13
2.5.1. Warning Content.....	13
2.5.1.1. Title.....	14
2.5.1.2. Issuance Time .....	14
2.5.1.3. Headline Statement.....	14
2.5.1.4. Warning Graphic.....	14
2.5.1.5. Weather Situation .....	14
2.5.1.6. Warning Details .....	14
2.5.1.7. Locations .....	14
2.5.1.8. Observations .....	15
2.5.1.9. Action Statements .....	15
2.5.1.10. Warning Updates.....	15
2.5.1.11. Warning Accessibility.....	15
2.5.2. Phenomena Selection in TIFS.....	16
2.5.3. Collaboration Tool .....	16
3. Related Documents .....	17
4. Document Control .....	17

RELEASED UNDER FREEDOM OF INFORMATION

4.1. Approvals ..... 17

4.2. Version Control..... 17

RELEASED UNDER FREEDOM OF INFORMATION

# 1. Systems & Tools

- Interactive Forecasting System ([TIFS](#)).
- Visual Weather (VW).
- Microsoft Teams (MS Teams).
- Microsoft SharePoint (MS SharePoint).
- [Operational Tools](#) (OpsTools).

## 2. Work Instructions

### 2.1. Severe Weather Warning Service

The Severe Weather Warning (SWW) service is used whenever there is sufficient meteorological evidence to suggest either of the following:

- severe weather development is possible or likely
- severe weather has been directly reported or observed
- severe weather is inferred through various observational datasets

The SWW service alerts the community, emergency services and other organisations about the threat of severe weather.

Phenomena definitions associated with severe weather are listed in the [Thunderstorm and Severe Weather Service Level Specifications](#).

### 2.2. Severe Weather Warnings

The Bureau provides graphical SWW that cover all Australian states and mainland territories. The area covered by a warning is shaded yellow and represents the area where there is a potential threat for severe weather. The area may consist of all, or part of one, or several weather forecast districts. The Bureau also provides text based SWW for Lord Howe Island and Norfolk Island.

If a current SWW does not adequately describe the situation, it should be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat, or a change in the communities expected to be impacted.

A SWW should be cancelled when severe weather moves offshore or dissipates, and no further development is expected.

SWW do not have a prescribed validity period, this is described in general terms within the warning details section. Once a SWW is issued, routine updates will be issued, at least, every six hours. They are to be updated at the standard times of 4:30 - 5:00 am, 10:30 - 11:00 am, 4:30 - 5:00 pm and 10:30 - 11:00 pm in local time, but may be updated more frequently during rapidly changing situations or periods of high-impact severe weather.

The lead-time will depend on the nature of the event, the ability to forecast it with reasonable certainty and the time of day. In general, severe weather events will fall into two categories:

Synoptic scale	Local scale
Tropical lows	Orographic lift: Heavy and/or intense rainfall
Subtropical lows	Topography: Downslope winds
Extratropical lows	
East coast lows	
Monsoon/equatorial trough	
Cold fronts	

Table 1: Synoptic and local drivers to severe weather in Australia.

For synoptic-scale severe weather events, SWW will aim to be issued 24 to 36 hours ahead of the expected onset of severe weather conditions. Depending on forecast confidence and the level of threat, SWW may be issued with longer or shorter lead times.

Local-scale severe weather events are more difficult to forecast with significant lead-time, and in some instances, a SWW may only be issued after observations or reports of severe weather are received. A SWW should be issued as early as possible prior to the event, however, lead-times are likely to be less than for synoptic-scale phenomena.

As a guideline, a SWW should not be used to warn for severe thunderstorms (STS). Events such as warm-sector outbreak or prolonged thunderstorm activity in a moist and unstable airmass should utilise the Severe Thunderstorm Warning (STW) service, not the SWW service. This is particularly important for heavy rainfall associated with thunderstorms. The uncertainty in placement, duration and occurrence means that the utilisation of a SWW will regularly result in over-warning given the localised nature of heavy rainfall associated with convection.

Conversely, SWW is often more appropriate with vigorous cold fronts of the typical cool-season archetype over central and southern Australia, even if they produce thunderstorm activity.

## 2.3. Prepare and Issue Severe Weather Warnings

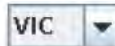
SWW are to be prepared and issued by Environmental Prediction Services (EPS) - Thunderstorm and Heavy Rainfall (TSHR), EPS-Marine and Antarctic, and National Production (NP) using TIFS in conjunction with VW.

In TIFS, a SWW product consists of a variety of sections that highlight warning areas and expected phenomena in a graphical and textual format. Manual intervention is required for the headline statement, weather situation, graphical warning content and warning details. It may also be necessary for the Locations and Obs/Other sections. The remaining sections are autogenerated in TIFS.

To formulate all manually inserted sections, including recommended styles and structures, refer to the [SWW Pro Forma](#) page.

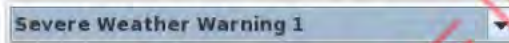
### 2.3.1. Region and Product Selection in TIFS

1. Click Region to Load and select your respective state or territory.



2. Click Product and select Severe Weather Warning. If severe weather is confined to a particular area of the state or territory, the appropriate preset zoomed area should be select.

- Severe Weather Warning 1 is for EPS-TSHR and NP
- Severe Weather Warning 2 is for EPS-TSHR and NP
- Severe Weather Warning 3 is for EPS-Marine and Antarctica, and NP



Use SWW 1 for the first SWW in a state or territory, and only use SWW 2 for a well-separated warning area within a state or territory that is driven by a different weather system with an overlapping time period. For example, in Western Australia, use SWW 1 for a cold front in the south and SWW 2 for a tropical low in the north.

### 2.3.2. Creating Severe Weather Warning Areas

There are two methods for producing SWW. The preferred method is to create warning areas in VW and subsequently send the shapefile to TIFS. If this is not possible due to time constraints or technical issues, the traditional method of manually drawing the warning areas in TIFS can be used.

#### 2.3.2.1. Visual Weather

##### 2.3.2.1.1. Loading EPS\_TSHR Role

1. In VW Main Panel, click on Role Selector button.

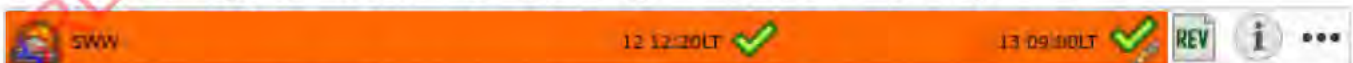


2. In the window that lists all available roles, select the EPS\_TSHR role and press OK.



##### 2.3.2.1.2. Opening Severe Weather Warning Task

1. The EPS\_TSHR role will appear in the My Roles selection. Once the role is selected, the 'Regular Tasks' pane populates with the SWW task (orange). Left mouse button (LMB) on the hyperlink text buttons or icons to open the SWW.



The hyperlink text buttons or icons appearing on the right-hand side of the tasks listed consists of the default 'create' and 'import from latest'. These options change as follows:

Left Link Button	Right Link Button	Description
Create	Import from latest	No product has been created.
Amend/Revise		A product has been created and sent.
Edit		A product has been created, but not yet sent.

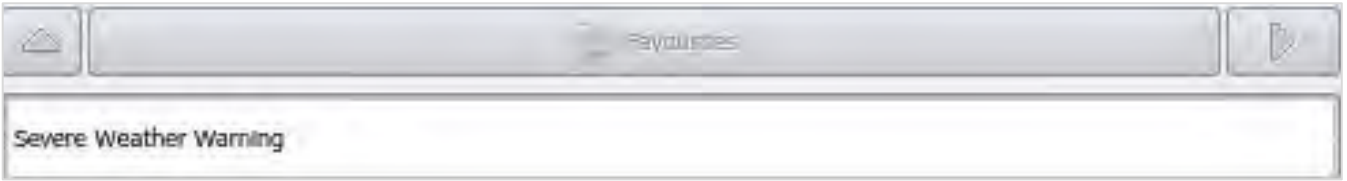
Table 2: A list of possible actions for each task.

##### 2.3.2.1.3. Drawing Severe Weather Warning Areas

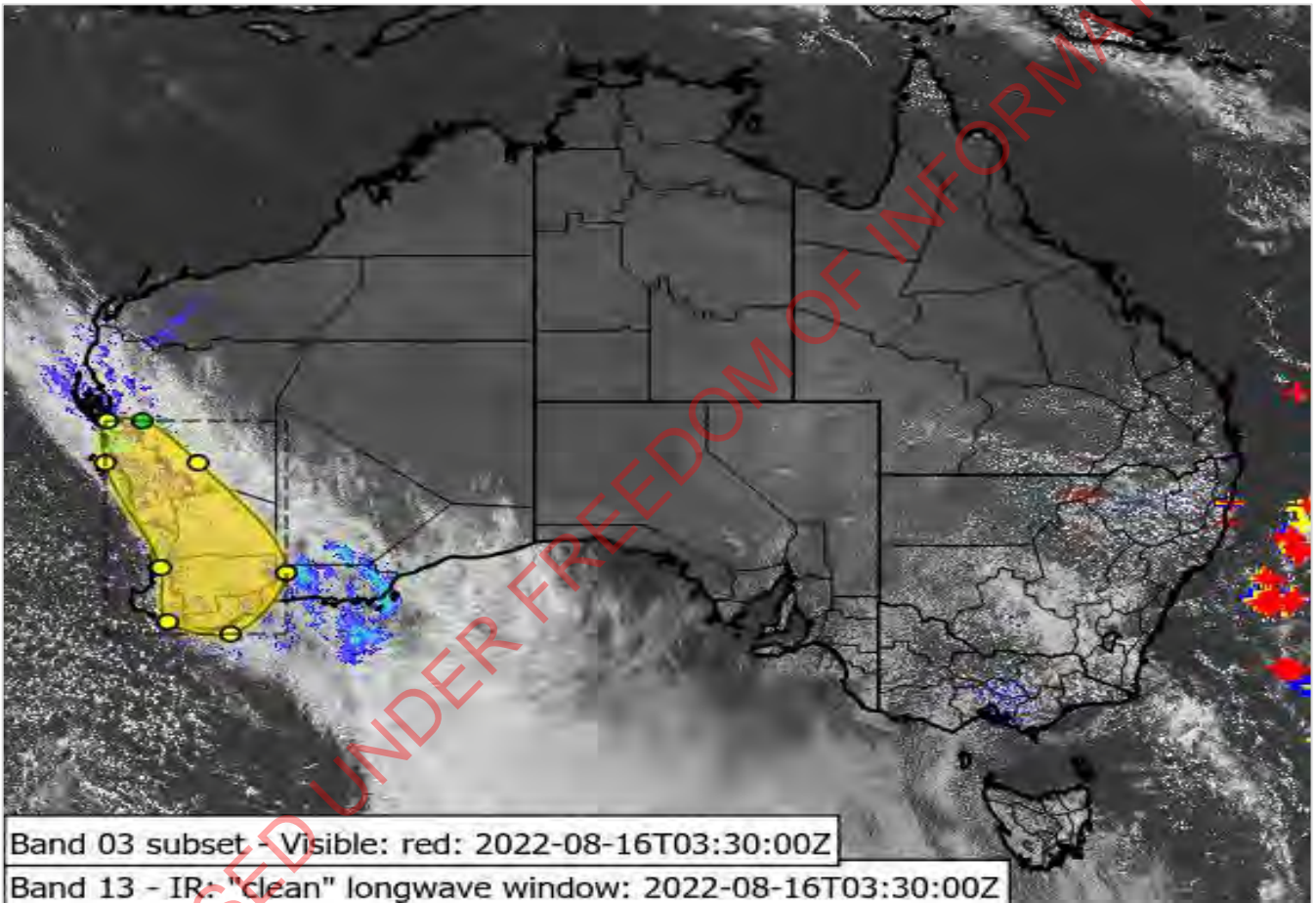
1. On the right-hand side of the Forecaster application within the Feature Editor pane, click the Favourites button.



2. Double click on the Severe Weather Warning to activate the feature editor in collaboration mode. If you do not have session ownership, see Appendix 2.5.3.



3. Draw the SWW area by strategically clicking the LMB at various points, defining 'anchor' points before finally clicking on the first anchor point to close the contour (hovering over the final anchor point will display a multi-coloured donut near the cursor). If multiple new areas are required, be sure to select Severe Weather Warning from the Favourites menu before starting to draw each separate closed contour area. IMPORTANT: Be careful not to cross over contour lines. This could happen when creating a single contour, i.e., creating a 'figure 8' shape, or when drawing a contour within or around a second contour.



4. Click the Save button on the Feature Editor Toolbar.



#### 2.3.2.1.4. Sending Severe Weather Warning Areas to TIFS

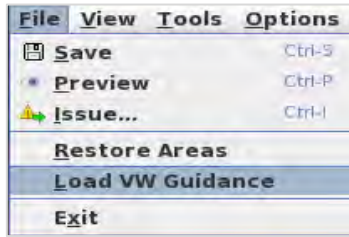
1. Click the Issue button on the Feature Editor Toolbar. Once issued, all the features will then go grey indicating the product has been issued and the shapefile generation commenced.



#### 2.3.2.1.5. Loading Severe Weather Warning Areas in TIFS

1. Navigate to File menu in the top left and select Load VW Guidance. Note that there may be a delay of up to 30-60 seconds depending on the current load on the Visual Weather server, possibly longer in certain regions - TIFS will produce a popup notification if the most recent shapefile received is more than an hour old.





2. Once areas have been ingested into TIFS, go to Section 2.3.3.

### 2.3.2.2. Thunderstorm Interactive Forecasting System (TIFS)

1. Click the Add Area button then click again and hold on the [Graphical Editor](#) to draw a warning area.



2. Click the Edit Area button then click again in an existing warning area to edit.



3. Click the Reshape button to modify the shape of the existing area.



4. Click the Resize button to modify the size of the existing area.



5. Click the Selection/Manipulation button to move the existing area. This button can also be used to select other areas.

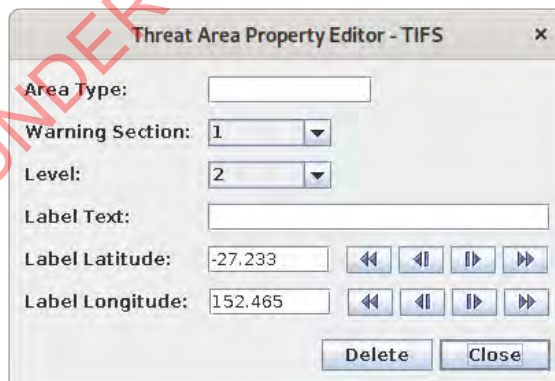


6. Delete all unwanted warning areas by using one the following options:

- Select the unwanted warning area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click the Delete button.



- Select the unwanted warning area on the [Graphical Editor](#) or listed [Threat Area Guidance](#) then click Delete within the [Threat Area Property Editor](#).



7. In the [Threat Area Property Editor](#), a second (2) or third (3) warning area with different phenomena sets can be added by changing the number in the Warning Section.

### 2.3.3. Severe Weather Warning Content

The following information highlights what sections within a SWW may require attention and manual intervention. Guidance on the written content in SWW can be found in Appendix 2.5.1.

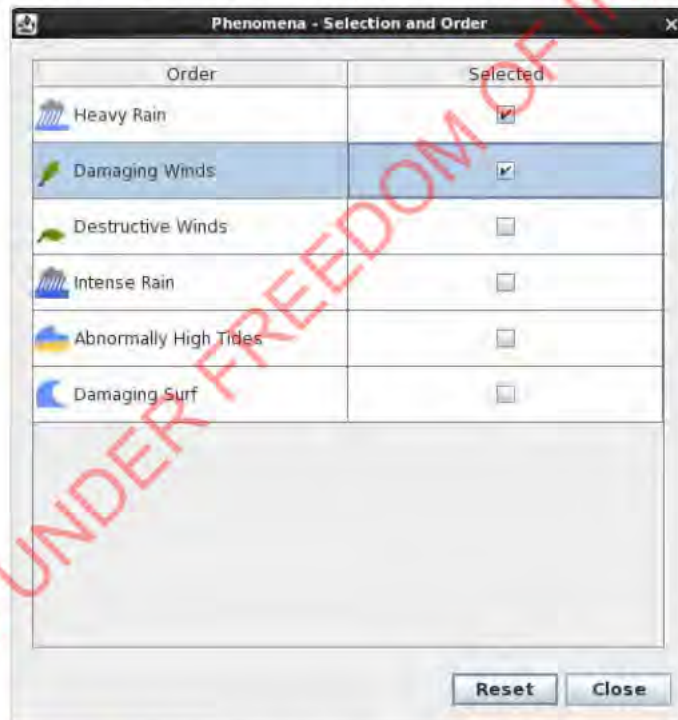
1. Click on a Phenomenon to add a severe and/or high-end severe threat. For guidance on when to select severe and high-end severe phenomena, see Appendix 2.5.2.



Phenomenon	Text
W	<i>damaging winds</i>
W+	<i>destructive winds</i>
W/W+	<i>damaging, locally destructive winds</i>
R	<i>heavy rainfall</i>
R+	<i>intense rainfall</i>
R/R+	<i>heavy, locally intense rainfall</i>
AHT	<i>Abnormally high tides</i>
DS	<i>Dangerous/damaging surf</i>

Table 3: Autogenerated text for phenomena selection.

2. If multiple phenomena are to be included in the SWW, order the phenomena by the forecast level of threat from highest to lowest. Under the Options menu, click Phenomena and drag individual phenomena up or down the pop-up table.



3. Write an appropriate [Headline Statement](#) in the Headline section.

<b>Headline</b>	
-----------------	--

4. Write an appropriate [Weather Situation](#) in the Situation section.

<b>Situation</b>	Weather Situation:
------------------	--------------------

5. Write all appropriate [Warning Details](#) in the Detail - Condition section.



- Click the Lock button to ensure no changes are made in the [Warning Details](#) section. Click again to unlock this textbox.



- Check the list of [Locations](#) and if required, manually modify and/or change the level of detail.



- Click the Detailed More button (up arrow) to increase the number of places mentioned in the warning text and graphic.
- Click the Detailed Less button (down arrow) to decrease the number of places mentioned in the warning text and graphic.



- Click on the Lock button to ensure no changes are made to the list of locations. Click again to unlock this textbox.



- List all significant weather [Observations](#) in the Observations/Other section.



### 2.3.4. Issuing Severe Weather Warnings

- Change the Issuance Frequency to indicate when the next update will be issued. Change to 3hr if severe weather is rapidly clearing from a major area (capital city and/or Detailed Severe Thunderstorm Warning domain) or if conditions are high-end severe and require more frequent updates. For an initial issue or an update/correction at non-standard time (e.g., 8 am), if the auto-generated Next Issue Time is more than 6 hours in the future, the Issuance Frequency should be changed to 3hr for that issue, then back to 6hr for subsequent issues if moving back to 6-hour mode.



- If text has been added or autogenerated text has been modified, click the Check Spelling button.



- Click the Save button to save all graphical and text data.



- Click the Preview button to preview how the warning will look online as a live product. Make every attempt to have a second pair of eyes review the warning prior to issue. Where possible, the Operational Lead (Op-Lead) should review the warning if Ops or Support are producing the warning. Use draft products ([TIFS Draft Products](#) via Australian Integrated Forecast System) to review.



- Click the Issue button to send the SWW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



### 2.3.5. Cancelling Severe Weather Warnings

1. Click the Cancel Warning button to cancel the SWW.



2. If applicable, contextualise or delete the [Headline Statement](#) in the Headline section.

<b>Headline</b>	
-----------------	--

3. Contextualise or delete the [Weather Situation](#) in the Situation section.

<b>Situation</b>	Weather Situation:
------------------	--------------------

4. Either use standard autogenerated text or write appropriate [Warning Details](#) in the Detail Condition section.

<b>Detail</b>	<div style="border: 1px solid #ccc; padding: 5px;"> <div style="display: flex; border-bottom: 1px solid #ccc;"> <div style="border-right: 1px solid #ccc; padding: 2px 5px;">Warning Section 1</div> <div style="border-right: 1px solid #ccc; padding: 2px 5px;">Warning Section 2</div> <div style="border-right: 1px solid #ccc; padding: 2px 5px;">Warning Section 3</div> <div style="padding: 2px 5px; background-color: #f00;">Cancelled Locations</div> </div> <div style="padding: 5px;"> <p><b>Condition</b></p> <div style="border: 1px solid #ccc; height: 100px; width: 100%;"></div> </div> </div>
---------------	--

5. If text has been added or autogenerated text has been modified, click the Check Spelling button.



6. Click the Save button to save all graphical and text data.



7. Click the Preview button to preview how the warning will look online as a live product.



8. Click the Issue button to send the SWW. Be sure to double check pre-selected address zones before pressing Issue in the pop-up box.



RELEASED UNDER FREEDOM OF INFORMATION

## 2.3.6. Concurrent Warnings

### 2.3.6.1. Land and Marine Based Severe Weather Warnings

#### 2.3.6.1.1. Cancellations

1. When cancelling a land based SWW when an adjacent marine based SWW is still in effect, the following text is to be used.

[Cancelled phenomenon or phenomena] [is / are] no longer occurring across [state / districts / area]. However, a separate Severe Weather Warning for [damaging or dangerous surf / abnormally high tides] remains current over [coastal areas / districts]. Please refer to <http://www.bom.gov.au/warnings/>

### 2.3.6.2. Severe Thunderstorm Warnings and Severe Weather Warnings

#### 2.3.6.2.1. Separate Severe Thunderstorm Warnings

A separate STW is a Detailed or Regional STW that is issued over an accompanying SWW. This overlapping product is used to warn for a hazard that is not included in an accompanying SWW or provide increased geographical detail for areas under effect of a high-end severe hazard.

If a severe or high-end severe hazard is expected to remain exclusively within the Detailed STW domain, a Detailed STW will be issued without an accompanying Regional STW. If outside the Detailed STW domain, a Regional STW will be issued. If the severe or high-end severe hazard extends outside the Detailed STW domain (e.g., Very Dangerous Thunderstorm) moving into or out of the Detailed STW domain, then both Detailed and Regional STW will be issued until one of the products can be cancelled.

#### 2.3.6.2.2. Issue Criteria

If either of the following conditions are satisfied, a separate STW will be issued over the accompanying SWW.

1. A hazard, other than those already included in the SWW, is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar, satellite and/or real-time observations. For example:
  - Large or giant hail
  - Tornadoes (supercell, shear zone and QLCS mesovortices)
2. A high-end severe hazard is occurring, or expected to occur and is linked to convective regions that can be identified and tracked using radar and/or satellite. For example:
  - Destructive wind gusts
  - Intense rainfall
  - Tornadoes (supercell, shear zone and QLCS mesovortices)

In the rare situation where only a high-end severe hazard is included in a SWW (e.g., significant cold front over southwestern Western Australia that produces widespread destructive wind gusts), a separate STW is not required.

#### 2.3.6.2.3. Cancellations

1. When cancelling a standard STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Severe thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of severe thunderstorms has passed. The situation will continue to be monitored closely and further severe thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

2. When cancelling a high-end STW when a SWW is still in effect, the following text is to be used in the STW cancellation to convey the continued risk of severe weather within the warning area.

Very dangerous thunderstorms are no longer occurring over [state / districts / area].

The immediate threat of very dangerous thunderstorms has passed. The situation will continue to be monitored closely and further very dangerous thunderstorm warnings will be issued, if necessary. A separate Severe Weather Warning for [heavy rainfall / damaging winds / heavy rainfall and damaging winds] remains current over [state / districts / area]. Please refer to <http://www.bom.gov.au/warnings/>

3. In the event where a SWW is cancelled and there is a risk of STS, the following text is to be used.

Severe weather is no longer occurring over [state / districts / area]. The immediate threat of widespread severe weather has passed, and the situation will continue to be closely monitored.

There remains a risk of severe thunderstorms over [state / districts / area] [describe timing]. A separate Severe Thunderstorm Warning will be issued, if required.

### 2.3.6.3. Tropical Cyclone Advices and Severe Weather Warnings

Developing tropical lows near the coast or decaying tropical cyclones over land are common synoptic patterns leading to the onset or continuation of severe weather. Therefore, as the event evolves, EPS-severe weather (SW) may be required to transition from SWW to Tropical Cyclones (TC) Advices or vice versa.

The following sections describe how the severe weather and TC warning service can interact with each other in order to provide the clearest message to the public. It is imperative that all services within CSG are proactive and maintain effective communication during such events, particularly EPS-SW TSHR and EPS-SW TC.

### 2.3.6.4. Tropical Cyclone Watches and Severe Weather Warnings

A SWW and TC Watch can be current for overlapping areas as the validity period of each product is different. The SWW describes current or forecast hazardous phenomena for the next 24 hours, while the TC Watch forecasts gales and associated severe weather impacts with a TC developing within 24-48 hours.

For example, a SWW for strong monsoonal flow north of a developing tropical low affecting a large area of coast may be supplemented with a TC Watch for a tropical low, covering a smaller or overlapping area of coast.

In this situation, the TC Watch and SWW must cross reference each other. An example statement that could be added into the warning details section within the SWW is:

A Tropical Cyclone Advice is also current for this system.

### 2.3.6.5. Tropical Cyclone Warnings and Severe Weather Warnings

#### 2.3.6.5.1. Overlapping Areas

If a SWW is current for an area overlapping with a TC Watch area and the TC Watch is upgraded to a TC Warning, the SWW is cancelled. This is to ensure that the same phenomena are not being mentioned in two separate warning products and that there is a consistent weather narrative.

When the SWW is to be cancelled, the TC Warning is referenced within the warning details section using the following statement:

This is the final Severe Weather Warning for this system – refer to Tropical Cyclone Advice number [XX] issued at hh:mm am/pm.

#### 2.3.6.5.2. Adjacent Areas

If severe weather not directly related to the TC such as a shear zone or strong (background) monsoonal flow is occurring or expected to occur, a separate SWW will be issued. The SWW should avoid overlap with the TC Advice warning zone to ensure that people at any given location only need to refer to one warning product.

### 2.3.6.6. Transition from Tropical Cyclone Warnings to Severe Weather Warnings

A weakening or transitioning system over land may require a transition from a TC Warning to a SWW. Standard practice is for EPS-SW TC to use referral statements on the TC Advice product, one within the body of the text and another on the graphic. In such instances, EPS-SW TSHR is to work closely with EPS-SW TC to align warning strategies and obtain confirmation that no further TC warnings will be issued for the system.

## 2.4. Communication

### 2.4.1. Heads Up

The TSHR meteorologist overseeing the SWW is to message the respective DSS team on MS Teams via the [EPS\\_TSHR](#) channel to provide a 'heads up' about the upcoming SWW. The message is to link to the draft warning ([TIFS Draft Products](#)) with a formal notification that the corresponding Severe Weather Technical Notes (Log ID) are ready, or that they will be ready shortly. There is no requirement to link the SWW draft for a Cancellation SWW.

Heads up messages are required for the following SWW:

- **New**                      New SWW
- **Escalation**              SWW upgraded to high-end severe phenomena
- **De-escalation**          SWW downgraded from high-end severe phenomena
- **Cancellation**          Cancelled SWW

- **Continuation** Change in hazard and/or area only

The following are heads up examples for SWW:

#### **New SWW**

Hi @DSS\_VIC, here is the [SWW TIFS Draft](#) that will be issued around 5 pm AEDT. 07:00 UTC Warning SWW TN (Log ID 290) are now available in OpsTools.

#### **Escalation SWW**

Hi @DSS\_QLD, here is the [SWW TIFS Draft](#) that will be issued within the next 30 minutes. SWW TN (Log ID 291) will be ready shortly in OpsTools and will highlight the new risk of R+ later this evening over the Wide Bay and Burnett.

#### **Cancellation SWW**

Hi @DSS\_WA, the SWW will be cancelled around 8:30 am AWST. 01:30 UTC Warning SWW TN (Log ID 291) will be ready shortly.

### **2.4.2. Brief and Advise**

The DSS Op-Lead or Outposted Meteorologist will be responsible for briefing emergency services. Outside of DSS operational hours, the responsibility transfers to NP who may delegate to TSHR (workload dependent). Navigate to the [TSHR Contacts](#) SharePoint page for contact details for all emergency services.

If TSHR is not operational, NP takes over responsibility for briefing emergency services.

### **2.4.3. Formal Sign Off**

At the end of the PM shift or agreed restriction duty, the TSHR Op-Lead or delegate is to formally transfer responsibility of the severe thunderstorm and severe weather services to NP and sign off within the [EPS\\_TSHR](#) channel using the template below. The message is to include all current warnings and/or watch points.

The following are formal sign off examples:

#### **No Activation**

Hi @NP\_Ops - TSHR signing off.

#### **Status:**

- No current warnings.

#### **Watch Points:**

- WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.

#### **Restriction Activated**

Hi @NP\_Ops - TSHR signing off.

#### **Status:**

- Regional STW current for N NSW and S Qld.
- SWW current for NSW Alpine areas - 12:00 UTC SWW TN (OpsTools)

#### **Watch Points:**

- NSW/QLD: W can be excluded from the next Regional STW update due to the risk easing around midnight.

WA: Non-severe elevated thunderstorms expected to continue over the South Interior overnight tonight.

## **2.5. Appendix**

### **2.5.1. Warning Content**

The following sections cover all graphical and textual information required for a SWW. Please refer to the [SWW Pro Forma](#) for guidance and instructions on how to complete each section of the warning.

### 2.5.1.1. Title

The autogenerated title will state the warning type and all, or part of one, or several weather forecast districts. It will also list the potential phenomena.

### 2.5.1.2. Issuance Time

Autogenerated issuance time and date of the SWW.

### 2.5.1.3. Headline Statement

The headline statement is a punchy, succinct one-line statement that describes the 'what, where, and when' of key severe weather threats. The aim of a headline statement is to focus the attention on the key message in the warning. The warnings can be long and sometimes the information can be lost.

Warning cancellations do not require a headline statement.

This statement does not always need to cover all elements of the warning but must cover those parts we want to emphasise. For example, if there is a period of particularly intense rain inside the broader event, use the headline statement to put a spotlight on it – using the where, when and what principle.

A repetition of the header of the SWW most often will not serve this purpose.

For SWW that include high-end severe phenomena, the headline statement must be uppercase. Otherwise, the headline statement is to be lowercase.

Example headline statements:

- Heavy rainfall and damaging wind gusts to develop over the Pilbara this evening.
- INTENSE RAINFALL OCCURRING OVER COASTAL AREAS BETWEEN NEWCASTLE AND SYDNEY.

### 2.5.1.4. Warning Graphic

SWW graphic

### 2.5.1.5. Weather Situation

The weather situation is to include a brief description on the current and/or developing severe weather situation. It should list the synoptic drivers and may provide an overview on the spatial and temporal extent of the synoptic drivers and associated phenomena. For prolonged events, a general statement of the evolution of the system including uncertainty may be appended.

Example weather situations:

- A surface trough over southeast Queensland is forecast to deepen into a low over the Wide Bay and Burnett in response to a strong upper low later tonight. This low is expected to track southward over the Southeast Coast and into northeastern New South Wales during Sunday producing further heavy rainfall with embedded thunderstorms. The evolution of this system and its relatively slow movement will continue to cause significant and prolonged impacts across southeast Queensland over the weekend.
- A strong cold front is expected to move eastwards across the southwest of the state during Wednesday. Unstable conditions and very strong winds aloft associated with this feature are likely to produce widespread damaging winds.

### 2.5.1.6. Warning Details

The main body of the warning is to list all potential phenomena and describes their upper limits or ranges, probability, and temporal and spatial characteristics.

Major statements that may also be required in this section of the SWW:

- [Custom action statements](#) may be required for Queensland, New South Wales, Victorian or Tasmanian SWW during or after severe weather with heavy rainfall. The use of these action statements is a joint decision between TSHR and DSS.
- [Climatological statements](#) are to be added to this section for all Western Australian SWW, including both cool and warm season. Please refer to the [SWW Pro Forma](#) page for a comprehensive overview of conditions when to include these climatological statements.
- [Separate STW referral statements](#) are to be added to this section for all SWW at any time where high-end severe hazards that can be identified and tracked using radar and/or satellite are considered possible or likely. This statement is not required for SWW where identification and tracking are not possible (e.g., central Northern Territory where there is no radar network).

### 2.5.1.7. Locations

Autogenerated summary of locations which may be affected by the severe weather event.



Although this section is autogenerated in TIFS, manual intervention may be needed to explicitly list the potentially impacted towns, cities, or coastal communities that TIFS does not automatically populate. Take particular care when there is more than one warning area within the single SWW product.

#### **2.5.1.8. Observations**

Confirmed severe and high-end severe reports and observations are to be manually inserted in the observation section, listing the location, official or estimated time of occurrence (local time), and the significant weather observations. High-end severe reports and observations are to be uppercase.

*Unit of measurement: rainfall, wind and hail reports and observations are to be listed in mm, km/h, and cm respectively.*

Example observations listing:

- 56 mm was recorded at Melbourne Airport in 30 minutes to 4:24 pm.
- 118 km/h wind gust was recorded at Darwin Airport at 7:14 pm.
- CONFIRMED REPORT OF A TORANDO IN BEAUDESERT AROUND 4:30 PM.

#### **2.5.1.9. Action Statements**

Autogenerated action statements that have been agreed upon by state and territory-based emergency services.

#### **2.5.1.10. Warning Updates**

Autogenerated update time of the next SWW.

#### **2.5.1.11. Warning Accessibility**

Autogenerated accessibility text that provides brief statement on the additional channels where the SWW is broadcasted.

RELEASED UNDER FREEDOM OF INFORMATION

## 2.5.2. Phenomena Selection in TIFS

1. Phenomena should be ordered from most likely to least likely.
2. When a high-end severe phenomenon is considered **possible** (Weather Detail section states that the phenomenon is possible), the phenomenon is to be selected so it is listed in the SWW Title and Graphic.
3. Due to the localised and often unpredictable nature of intense rainfall within a broader system, it is recommended that both heavy and intense rainfall are selected so the SWW Title and Graphic will list heavy, locally intense rainfall. This should limit over-warning and the perception of scaremongering.
4. When destructive winds are considered **likely** (Weather Detail section states that the phenomenon is likely) and is not expected to be entirely linked to convective regions, destructive winds can be selected only.

Typical scenarios where destructive winds can be selected only:

- A significant cold front with low-level winds near or in excess of 65 knots over southwestern Western Australia that produces widespread destructive winds from the west.
- A deep low over the Tasman Sea that produces destructive winds over Victoria and Tasmania from the east to southeast.

## 2.5.3. Collaboration Tool

When the SWW is launched correctly from the Main Panel 'Regular Tasks' in VW, it will automatically enable the Collaboration Tool where multiple people can edit the product at the same time.

Towards the bottom left-hand side of the map area within the Forecaster application, the meteorologists currently editing the product are listed. The username corresponding to the meteorologist currently viewing the forecast product locally on their workstation will be indicated by an asterisk, \*. The username highlighted in bold font indicates the meteorologist who has 'session ownership' and typically coincides with the meteorologist who first loaded the product and still has the product active on their workstation (has not closed the instance of Forecaster).

When meteorologist (1) is editing the Severe Weather Warning area, the warning area will appear as normal with the forecast area appearing with the correct fill and displaying the 'anchor' points for editing. If another meteorologist (2) is in this product, they will see the edits undertaken by meteorologist (1) in real-time, but the area will be "greyed out" and not able to be edited as illustrated in the image on the right. When the meteorologist (1) finishes editing the forecast area and LMB clicks off of the forecast area, such that the 'anchor' points are no longer visible on their workstation, the Severe Weather Warning area will appear with the correct fill and will be able to be selected on the meteorologist's (2) workstation.

### Session Ownership

When preparing the Severe Weather Warning areas in collaboration mode, if the 'Save' button appears "greyed out", this is likely the result of not being the "session owner". As outlined above, the session owner is indicated by the username highlighted in bold font towards the bottom left-hand side of the map area within the Forecaster application. If this is the case, navigate to the 'Feature Editor' menu towards the top of the Forecaster application, and click on 'Take session ownership'. Upon doing so, your username should now appear bold and with the asterisk.

### 3. Related Documents

CSG RACI	<a href="#">CSG RACI</a>
CSG Process Maps	< Include as hyperlinks > Remove and add rows as required
CSG Work Instructions	< Include as hyperlinks > Remove and add rows as required
CSG Master Glossary	<a href="#">CSG Master Glossary</a>

### 4. Document Control

#### 4.1. Approvals

Date Approved	Version No.	Name	Position	Signature (electronic)
Nov 2023	V4.0		Manager Severe Weather	

#### 4.2. Version Control

Version No.	Version date	Author	Comments
V1.0	26/07/2022		Initial draft
V2.0	05/08/2022		Updated instructions and format
V2.0	02/09/2022		Updated shading to grey as the blue for accessibility reasons
V3.0	31/10/2022	EPS team members	General updates
V4.0	Nov 2023	EPS team members	Updates for 23/24

## Detailed Work Instruction – Heatwave Warnings

### Purpose

This detailed work instruction provides a step-by-step process to generate and issue the Heatwave Warnings. The [Best Practice](#) and [Examples](#) sections towards the bottom of this document can be used as a guide when formulating the warning text that accompanies this product.

Note this does not cover the process of forecasting the temperature grids in GFE and publishing them for the heatwave algorithm, these processes are covered in the [Detailed Work Instruction – GFE Forecasting and Publishing for Heatwave Products](#).

Heatwave Warnings are issued by 15:00 local time each day, but slightly earlier at 14:00 local time in Western Australia. Warnings are issued daily during heatwave events and then cancelled at the end of the event. The warning covers 4 three-day periods, extending out to 3 days in the future.

### 1. Generate the warnings from VW

- 1.1 In Visual Weather Mainpanel change "My Roles" to "Heatwave" by clicking the pencil to select heatwave from the list of roles.
- 1.2 Once the GFE grids have been published the heatwave algorithm can take approximately 45 minutes to run and identify which districts reach warning criteria (at least 10% of the district is severe or extreme). Note this is longer than it takes to just produce the maps given it has to tally up the percentages of each district over all days.
- 1.3 Once the algorithm has run and identified which districts have reached warning criteria, VW will generate an alert to identify which States and Territories require a warning. This will appear in the My Notifications section of VW.
- 1.4 Send a message in the EPS\_FHAQ Operational Channel to alert the relevant DSS teams that a heatwave warning will be issued for their state. (e.g. @DSS\_NT a heatwave warning will be issued for the NT today). Also tag in DSS\_HPR\_Nat.
- 1.5 **Note that full cancellations are not identified through this process so one must be aware of what warnings are current and, if not continuing, will require a cancellation.** See [cancelling a warning section](#) below.
- 1.6 You can cross reference the details supporting the heatwave warning (find out % of districts affected and towns impacted) by looking at the Heatwave Decision Support Product on the [Heatwave Product Viewer \(bom.gov.au\)](http://bom.gov.au) and the EHF Map in Visual Weather (that includes town names across the country).
- 1.7 The Heatwave Warnings will appear in the "My tasks" window (click the "Regular Tasks" Tab).
- 1.8 A separate warning is issued for each state and territory.
- 1.9 Click on the "create" icon (sheet of paper)
- 1.10 Once a warning has been issued, all subsequent warnings in the event for that state/territory need to be issued by using the renew button. **To access the "Renew"**

button click on the Warning for each state under “My Active Warnings & Forecasts”.



- 1.11 Use the [FHAQ Technical Info OneNote](#) to save/copy drafted text.
- 1.12 Type a description in the text box. Consider the [Best Practice](#) and [Examples](#) sections below. Please avoid using the following characters which will cause errors in the xml version of the warning ", ' , < , > , & .
- 1.13 Check the list of impacted locations and edit, if needed. See the [Best Practice](#) section below for further guidance.
- 1.14 Preview (magnifying glass) the PDF then Issue the Warning using the Send button (paper plane).
- 1.15 Check the [Bureau Heatwave website](#) to ensure the warning has been issued correctly. A PDF version will also be emailed to [EPS\\_SW\\_FireHeatwaveAQ@bom.gov.au](mailto:EPS_SW_FireHeatwaveAQ@bom.gov.au).
- 1.16 If you later spot an error in the warning text, you can issue a correction by selecting the warning from the “My Active Forecasts and Warnings” box then clicking the Correct (COR) button.

## 2. Cancelling a warning

**2.1 Note that VW does not produce an alert when full cancellations are required, so always compare the warnings current with the VW notification about which states/territories require a warning to confirm if any cancellations are required.**

2.2 Warnings need to be cancelled when there is no longer any severe or extreme heatwave areas in that weather district – this will be automatically completed in the system if there are continuing severe or extreme heatwaves in other weather districts.

2.3 Warnings are also cancelled when there is no longer any severe or extreme heatwave areas in that state/territory.

2.4 Press the Cancel button, then follow the steps 1.9-1.11 for renewing the warning.



2.5 Action statements for a cancellation situation will be automatically included in the Safety Advice section.

2.6 You can include the statement about affected locations if that makes sense in the context of the weather situation, for example if Severe heatwave will continue but below the 10% threshold.

2.7 If the cancellation gets sent late it may ingest the wrong data/day. This following process can be used if a cancellation needs to be corrected. Go to VisWx> Message

Editor > Select Heatwave Warning State > Adjust the time to the previous day and the original cancellation form will be provided and can be sent.

### 3. Renewing or cancelling an expired heatwave warning

If the Heatwave Warning product that you wish to renew or cancel has expired and disappeared from the "My Active Warnings & Forecasts" section on Main Panel (Figure 1), there are still steps that can be taken to send out the update, these are as follows.

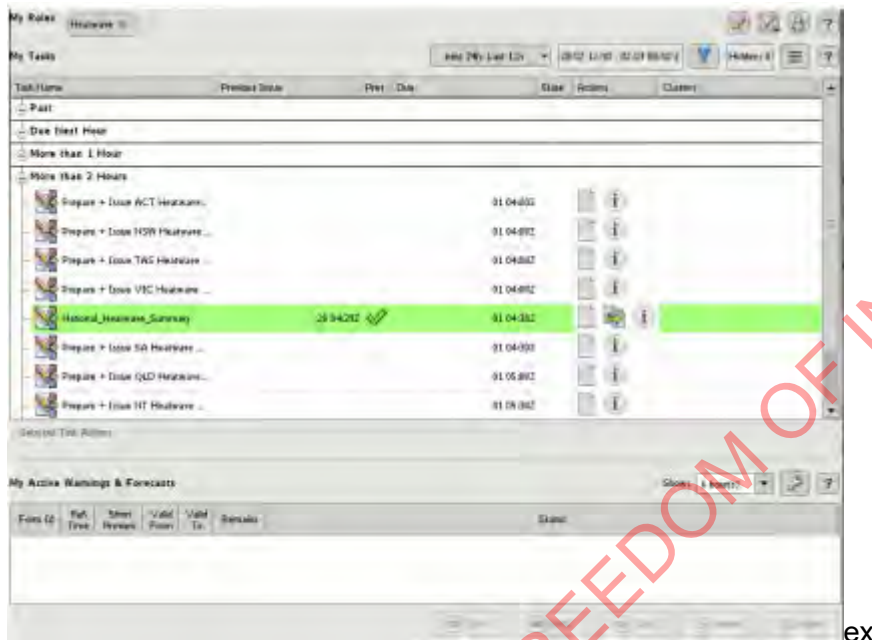


Figure 1 The warning has expired and disappeared from "My Active Warnings & Forecasts on Main Panel.

From the Main Panel "Main Window" you can manually open the Message Editor application clicking on the Icon next to the Message Editor header in the top quick launch bar (Figure 2).

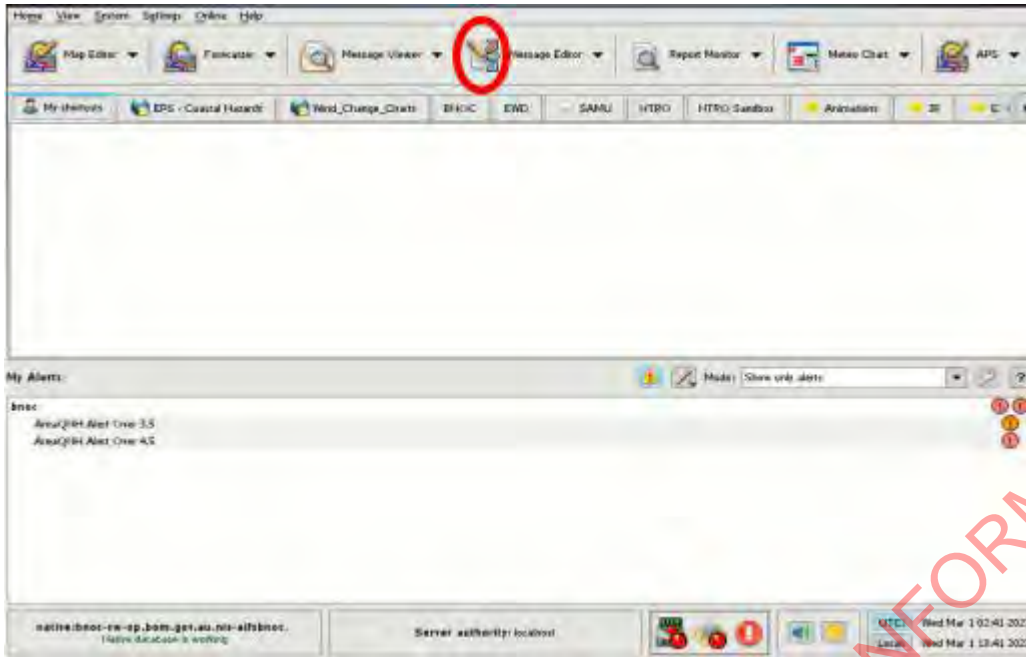


Figure 2: Message Editor application icon located next to the Message Editor header in the top quick launch bar.

Once the Message Editor application is open you can select the warning that you wish to renew or cancel by clicking on the open product folder icon (Figure 3).

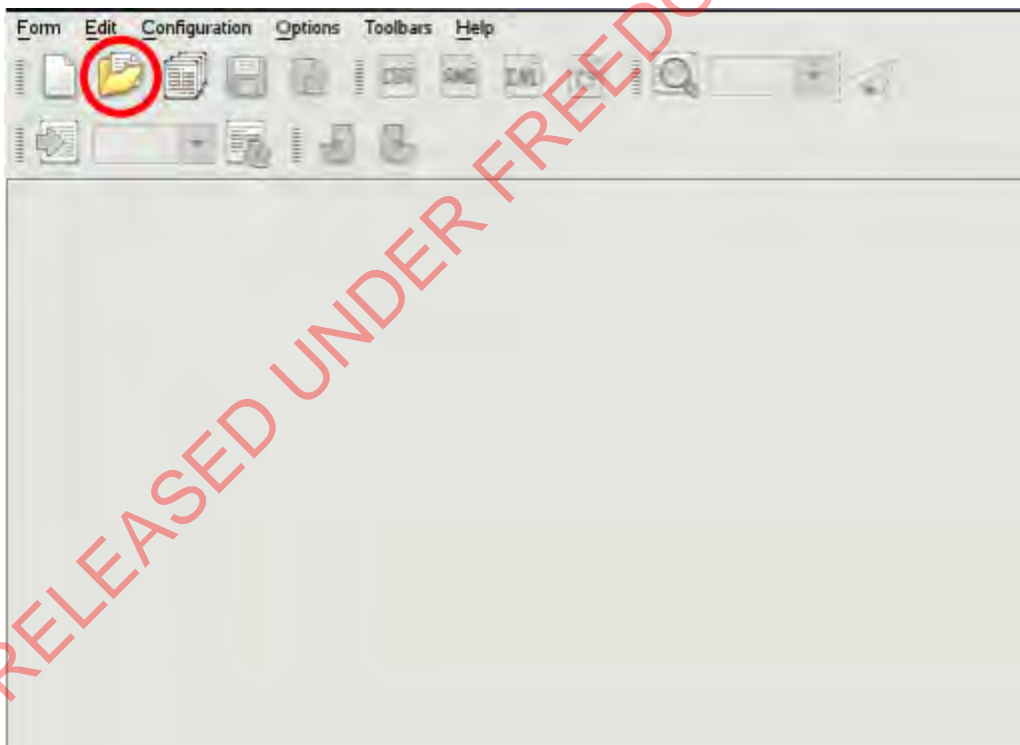


Figure 3 Open product folder icon location in Message Editor.

Then selecting the form / product you wish to renew or cancel from the left-hand side of the window and the appropriate product for a set date and time from the right-hand side of the window. You can then select the required option of "CNL" (Cancel) or "Renew". When you

click on these options the product will then open for you to edit and issue as required (Figure 4).

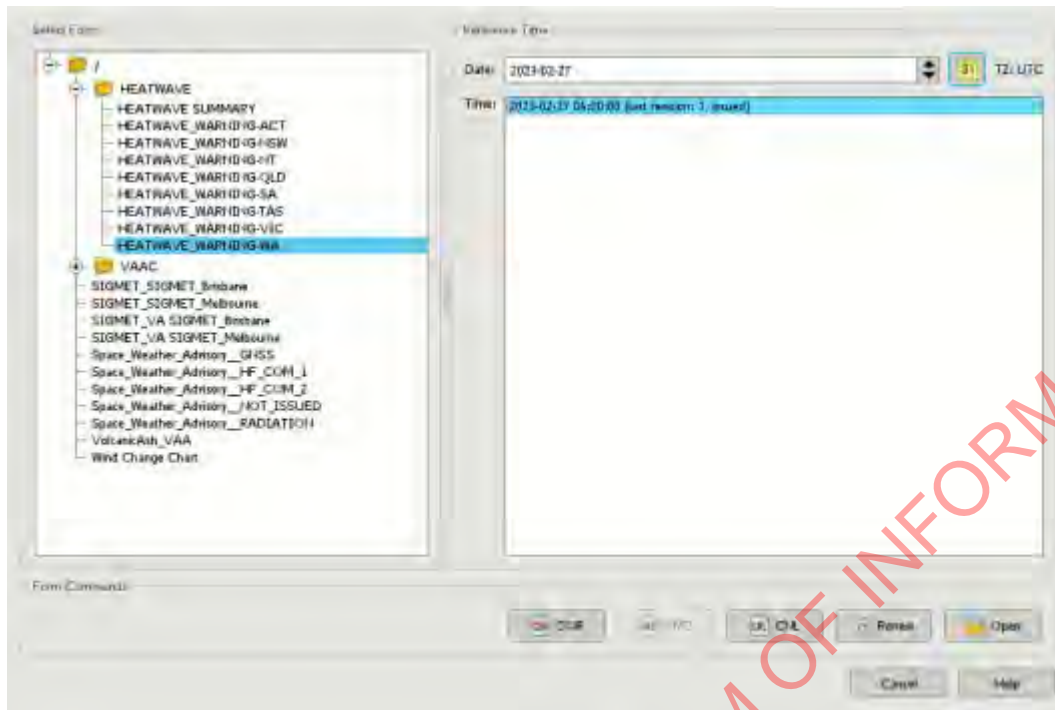


Figure 4 Dialog box to select the form / product and reference time to CNL or Renew the product.

#### 4. Correcting a cancelled warning

If you have issued a heatwave warning cancellation and then need to issue a correction for this, you unfortunately cannot do this via the "My Active Forecasts and Warnings" section on Main Panel. This will only open the previous active warning and try to correct that, and not the cancellation message. Correcting the cancelled warning can be done by following the steps above, but at step 3 you select the "COR" option when opening the product (Not CNL or Renew). This will correct the most recent version of the product that was issued, which will be the cancellation.

#### 5. Best Practice

5.1 Given the districts and their forecast severity has been detailed at the beginning of the warning, use the "Forecast Summary" section to focus on the temperatures driving the heat, and when heatwave conditions are expected to peak or ease.

5.2 Points to include:

- A description on the maximum and minimum temperatures over the warning area (it's important to spell out "mid forties" as opposed to "mid-40s" for better TTS results).
- When the heat will peak throughout the heatwave, if identifiable.



- When the heatwave is expected to ease. This may be well after the outlook period but is still useful to try to indicate when the current heat will ease.

5.3 The **Impacted Locations** section (i.e., list of town names) will automatically populate below the Forecast Summary text.

- This section is editable in the case of adding a town within the edit area that wasn't automatic populated, but has something significant going on there (e.g., a festival, etc) or if the surrounding area is at heatwave warning level, but not at that specific location.
- Discuss with DSS which locations are important to include.
- This could help with message continuity during a heatwave event.
- If there are no pre-defined locations impacted within the warning area, you can delete this statement from the warning message.

5.4 Use separate sentences rather than just one block of text. White space makes it easier to see this information on the web.

5.5 Use the phrase "expected to ease" rather than a heatwave will cease because impacts can linger for a few days afterwards or it may stay in low-intensity heatwave for a period.

5.6 If heatwave conditions continue beyond the warning period, reference when the heatwave will continue until. E.g., "Severe heatwave conditions will continue until early next week".

5.7 If heatwave conditions ease below warning criteria within the warning period, reference when the heatwave will ease. E.g., "Severe heatwave conditions will ease from the weekend".

5.8 In full cancellations the statement "*No further warnings will be issued for this event, but the situation will continue to be monitored and further warnings issued if necessary*" appears at the bottom of the warning, so just focusing on the temperature forecast should be sufficient in the "Forecast Summary" of a cancellation warning.

5.9 If a heatwave eases then restarts within the outlook period, reference the period of reprieve and when it will expect to recommence. E.g., " a period of reprieve from the current heatwave is expected due to milder temperatures over the weekend, however higher temperatures will redevelop leading to severe heatwave conditions from Monday".

## 6. Examples

For the below examples, assume current day is Wednesday.

6.1 Heatwave conditions not current but developing in the outlook period, and easing after the outlook period:

Maximum Temperatures in the high thirties and overnight minimum temperatures in the low twenties across Victoria from Saturday.

The heat will peak Monday and Tuesday with maximum temperatures in the low forties and overnight minimum temperatures in the high twenties.

A cooler change from the west will ease heatwave conditions during the middle of next week.

## 6.2 Heatwave conditions current and easing in the outlook period:

Maximum Temperatures in the low forties and overnight minimum temperatures in the mid twenties over eastern NSW will continue until Friday.

Severe heatwave conditions will ease from the south with a cooler change developing late Thursday and extending throughout the warning area during Friday.

6.3 Cancellation in part of the state/territory (note that this type of cancellation will not trigger the automatic text "*No further warnings will be issued for this event, but the situation will continue to be monitored and further warnings issued if necessary*" so try and mention within the text where heatwave conditions have eased):

Maximum temperatures in the mid forties and overnight minimum temperatures in the mid twenties over southern and central parts of the NT for the outlook period.

Severe heatwave conditions are likely to persist in the south until the middle of next week.

Severe heatwave conditions have eased in the northern part of the NT, including the Arnhem and Daly districts.

## 6.4 Full cancellation:

Maximum temperatures in the mid thirties with overnight minimum temperatures in the low twenties throughout southern parts of WA.

## 6.5 Heatwave eases then redevelops:

Maximum temperatures in the low forties and overnight minimum temperatures in the mid twenties in the east of SA ahead of a cooler change developing from the west during Friday.

Milder maximum temperatures in the high twenties and overnight minimum temperatures in the high teens behind the change will bring some reprieve from current heatwave conditions over the weekend.

Severe heatwave conditions will redevelop throughout SA next week with a return of elevated temperatures.

## 6.6 Extended heatwave period, detailing when the heatwave will peak within warning period:

A prolonged period of heat is forecast over southern Queensland for the next week or so. Maximum temperatures in the high thirties and overnight minimum temperatures in the low twenties will be experienced most days.

The severe heatwave will peak over the weekend with maximum temperatures reaching the low forties and overnight minimum temperatures in the mid twenties.

The severe heatwave is expected to continue through most of next week with milder temperatures possible from later in the week.

## 6.7 Two separate heatwave areas over a large state with different trends:


Maximum temperatures in the high thirties to low forties and overnight minimum temperatures in the mid to high twenties over the Kimberley.

Maximum temperatures in the mid thirties to low forties and overnight minimum temperatures in the high teens to mid twenties over the Central West and Lower West.

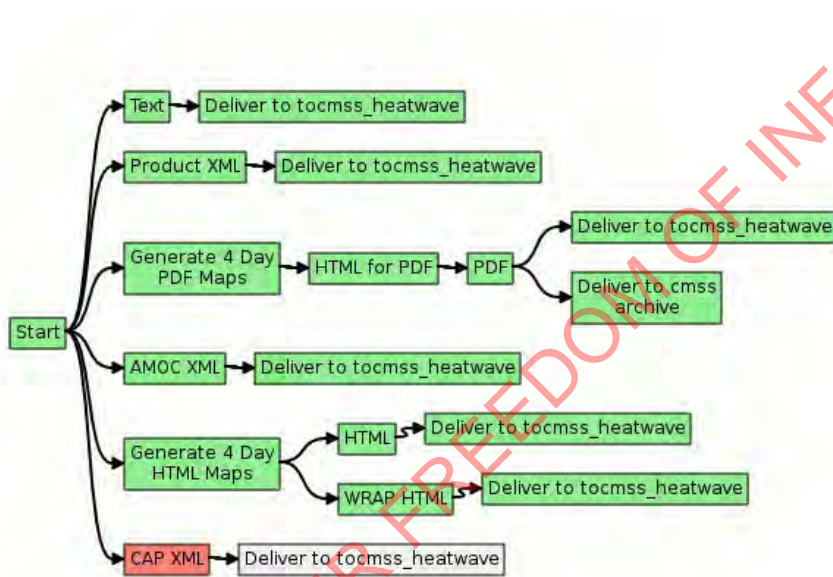
Severe heatwave conditions in the Kimberley are expected to ease over the coming days.

Heatwave conditions over the west coast are expected to increase in intensity and extend further south over the coming days.

## 7. Troubleshooting Tips


7.1 When you issue the warning, ensure that the pipeline shows as a green tick. 

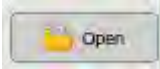
If some part of the process has not worked (no green tick), click on the pipeline icon to see what worked and what didn't. The parts that didn't work will show up in red.



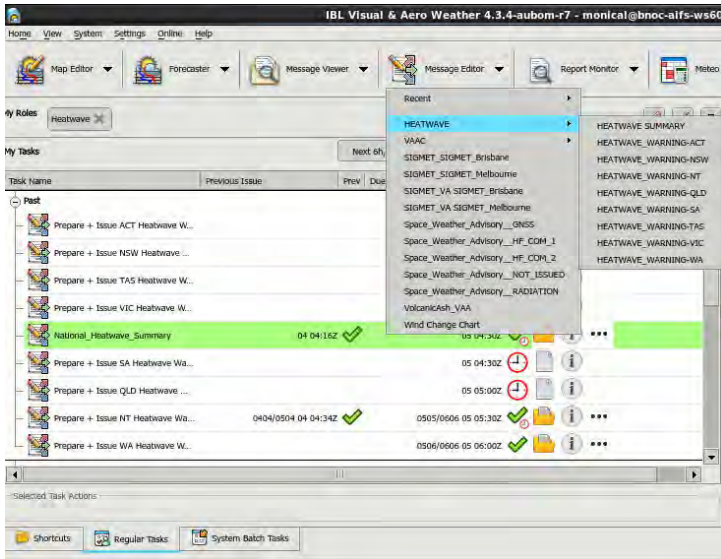
part

Figure 5. Pipeline details showing that the CAP XML component did not work, but all other components did work.

7.2 If a failure in the pipeline occurs, rerun the pipeline by clicking on the send icon.  Do not start a new form.

7.3 To open an existing warning without changing anything, select the warning from the list of My Active Warnings and Forecasts and use the Open button. 

7.4 If the pipeline keeps failing, the only option may be to reset the form by creating a new warning from scratch. Do this from the Message Editor menu. Select Heatwave then select the relevant jurisdiction's heatwave warning.



RELEASED UNDER FREEDOM OF INFORMATION



# Heatwave Service Level Specification

Season 2023 – 2024



**Revision history**

Date	Version	Author	Description
24/06/2022	0.1		Initial Draft
29/08/2022	0.2		Updated to respond to feedback from Bureau teams
27/03/2023	0.3		Updated to include example products from the 2022-2023 season
21/06/2023	0.4		Converted to new Bureau template
8/09/2023	0.5		Added 2 new tables to visualise the heatwave validity periods.
23/10/2023	0.6		Incorporating internal feedback

**Review status**

Date	Version	Reviewer	Description
2/2/2024	1.0		Endorsed for release

**Release history**

Date	Version	Status	Approval
9/12/2024	1.0	Approved	GM EPS



Unless otherwise noted, all images in this document are licensed under the Creative Commons Attribution Australia Licence.

© Commonwealth of Australia 2024

Published by The Bureau of Meteorology

Cover image: People at a fair on a hot day in Eungella, Queensland, in October 2021 purchased under licence from iStockphoto.com.

## Table of contents

<b>Season 2023 – 2024</b> .....	<b>1</b>
Revision history .....	2
Review status .....	2
Release history.....	2
<b>Table of contents</b> .....	<b>3</b>
<b>1. Introduction</b> .....	<b>7</b>
1.1. Purpose .....	7
1.2. Scope.....	8
1.3. Authority.....	8
1.4. Distribution .....	8
<b>2. National Heatwave Services</b> .....	<b>9</b>
2.1. Partnerships.....	9
2.2. Heatwave Season .....	10
2.3. Area of Responsibility.....	10
2.4. Dissemination of products .....	10
2.5. Briefing Services .....	10
2.6. Outposted Meteorologists .....	10
2.7. Communication and adoption activities .....	10
2.8. Service Continuity .....	11
<b>3. Quality Assurance and Performance</b> .....	<b>11</b>

3.1. Hazard Services Forum.....11

3.2. National Heatwave Advisory Group .....11

3.3. Performance Statistics and Reporting.....11

3.4. Post Event Review.....12

3.5. Meteorologist Training .....12

4. National Heatwave Product Schedule.....12

4.1. Routine Services .....12

4.1.1. Geospatial Data Products .....12

4.1.1.1. Purpose .....12

4.1.1.2. Issue times and validity .....13

4.1.1.3. Accessing geospatial data products .....13

4.1.2. Web-based Heatwave Map Product .....13

4.1.2.1. Purpose .....13

4.1.2.2. Issue times and validity .....13

4.1.2.3. Accessing the web-based heatwave map product .....14

4.1.3. Heatwave Decision Support Product.....14

4.1.3.1. Purpose .....14

4.1.3.2. Issue times and validity .....14

4.1.3.3. Accessing the Heatwave Decision Support Product.....15

4.2. Non-Routine Services .....15

4.2.1. Heatwave Warning.....15



4.2.1.1. Purpose ..... 15

4.2.1.2. Issue times and validity ..... 15

4.2.1.3. Accessing Heatwave Warnings ..... 16

5. Appendix 1: Excess Heat Factor Calculation ..... 17

5.1. Excess Heat Factor ..... 17

6. Appendix 2: Public Weather District Maps ..... 19

6.1. Western Australia Public Weather Districts ..... 19

6.2. Northern Territory Public Weather Districts ..... 20

6.3. Queensland Public Weather Districts ..... 21

6.4. New South Wales and Australian Capital Territory Public  
Weather Districts ..... 22

6.5. Victoria Public Weather Districts ..... 23

6.6. Tasmania Public Weather Districts ..... 24

6.7. South Australia Public Weather Districts ..... 25

7. Appendix 3: Product Samples ..... 26

7.1. Web-based Heatwave Map Product ..... 26

7.2. Heatwave Decision Support Product ..... 28

7.3. Heatwave Warning ..... 30

8. Appendix 4: List of Product Identifiers ..... 31

9. Navigation aids ..... 33

9.1. List of figures ..... 33



**OFFICIAL**

**9.2. List of tables .....33**

**9.3. List of acronyms .....33**

RELEASED UNDER FREEDOM OF INFORMATION

**OFFICIAL**

# 1. Introduction

## 1.1. Purpose

The purpose of the Service Level Specification (SLS) is to document the heatwave services provided by the Bureau of Meteorology (the Bureau).

The Total Warning System<sup>1</sup> recognises that a fully effective warning service is multi-faceted in nature. Therefore, its development and operation requires input from several agencies, each with specialised roles to play. It is vital that the agencies involved work collaboratively through all stages of developing and operating the system. The services described here are the Bureau's contribution to the Total Warning System for heatwave services.

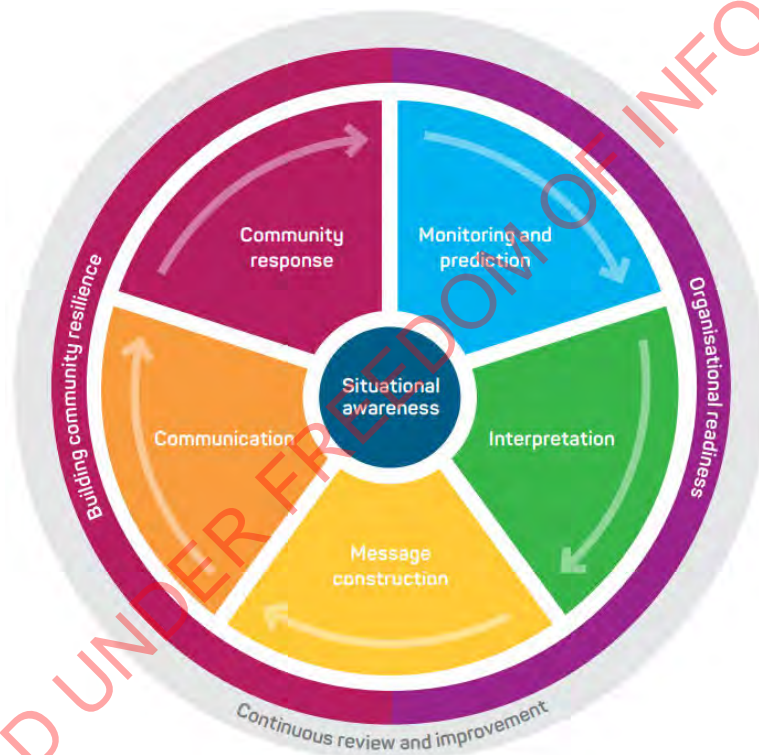


Figure 1. Total Warning System

As detailed in the [National Heatwave Warning Framework](#) the Bureau's role in the heatwave warning system is focussed on: (i) monitoring and prediction; (ii) message construction; and, (iii) communicating threats associated with weather conditions that influence heatwave impacts. The Bureau's role is to provide this service to Government, industry, and the community.

The Bureau also contributes to activities designed to strengthen organisational readiness and build community resilience. The Bureau achieves this through participating in the planning and coordination of activities with health and emergency services agencies.

<sup>1</sup> <https://knowledge.aidr.org.au/media/5972/warnings-handbook.pdf>, pg. 10

## 1.2. Scope

The scope of the SLS is the Bureau's publicly available heatwave services and additional heatwave services provided to support health and emergency management agencies.

The SLS details what the Bureau does and when it does it, to provide heatwave services. How the Bureau produces heatwave services is addressed in internal Bureau documents.

## 1.3. Authority

The *Meteorology Act, 1955* (Cth) provides the Bureau a number of functions including to take observations, forecast the weather and issue warnings for weather conditions likely to endanger life or property, including heatwaves. The Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories (IGA) confirms the roles and responsibilities of the Bureau and State and Territory governments and local governments. The Bureau has responsibility for the provision of forecasting and warning services for heatwaves. The responsibility for heatwave preparation, response and providing more detailed warnings of heatwave impacts lies with State and Territory governments and local governments.

The Bureau of Meteorology Heatwave Service Level Specification is issued by the General Manager Environmental Prediction Services under the authority of the Director of Meteorology.

## 1.4. Distribution

This document will be distributed to members of the National Heatwave Advisory Group including members from the agencies listed in Table 1

Jurisdiction	Agency Name
National	National Health and Emergency Management Standing Committee (NHEMS)
National	National Emergency Management Agency (NEMA)
National	Department of Health
WA	Department of Fire and Emergency Services (DFES)
WA	Department of Health
QLD	Fire and Emergency Services (QFES)
QLD	Department of Health
NT	Police, Fire and Emergency Services (PFES)
NT	Department of Health
NSW	Resilience NSW

Jurisdiction	Agency Name
NSW	Department of Health
ACT	Emergency Services Authority (ACT ESA)
ACT	Department of Health
ACT	Ambulance Service
SA	State Emergency Service (SES)
SA	Department of Health
TAS	Department of Health
VIC	Emergency Management Victoria (EMV)
VIC	Department of Health

Table 1. Heatwave SLS distribution list by jurisdiction

## 2. National Heatwave Services

The Bureau's heatwave services provide the Australian community and health and emergency services agencies with essential heatwave forecasts and warnings that are timely and accurate.

The heatwave service is designed to inform the community and response organisations of weather conditions that will lead to heatwave conditions. An important secondary role is to assist local media and state or territory health and emergency services with public education programs, and to advise on meteorological aspects of heatwave disaster preparedness and planning.

### 2.1. Partnerships

Partnerships underpin the delivery of effective heatwave services to the Australian community. The Bureau has formed partnerships with health and emergency management organisations, other government authorities and media across the country to ensure that products are fit-for-purpose and are broadly distributed in a timely manner.

The partnerships with State and Territory Governments and local government are formalised through the [National Heatwave Warning Framework](#) and the IGA which clarifies and confirms responsibilities across the total warning system. As described in the framework, partner health and emergency services agencies at the state and territory level issue heatwave messaging aligned with the Australian Warning System.

Importantly, the Bureau, States and Territories agree to work together to mutually develop and maintain national standards for warnings of heatwaves. This is coordinated through the National Heatwave Advisory Group.

## 2.2. Heatwave Season

The heatwave season starts in early October and continues until the end of March. The season can be extended if periods of significant heat are expected to occur earlier in the year or continue past the end of March. Routine heatwave products are issued daily during the heatwave season, but heatwave warnings are issued as required throughout the year.

## 2.3. Area of Responsibility

The Bureau's heatwave services cover all Australian states, mainland territories and nearby offshore islands.

## 2.4. Dissemination of products

Publicly available Bureau heatwave products are transmitted via the Bureau's website and app. Products for health and emergency services agencies are transmitted by email, registered user web services and file transfer protocol (ftp).

## 2.5. Briefing Services

The Bureau will provide briefings to Health and Emergency Management partners to assist planning, response, and coordination. The format, timing and frequency of briefings will be agreed through arrangements with each agency.

## 2.6. Outposted Meteorologists

The Bureau has arrangements with several emergency services agencies to provide services through an outposted meteorologist to support operational awareness and communication. In each instance, the services provided will be agreed between the Bureau and the relevant agency and are provided on a cost recovery basis.

## 2.7. Communication and adoption activities

In addition to issuing products through standard communication channels (e.g., website, app), the Bureau undertakes a range of complementary communication and adoption activities in partnership with emergency management agencies. These activities are aimed to increase the uptake and effectiveness of the forecasts and warnings and ensure consistent weather safety messages are provided to the community.

This includes community, industry and government preparedness briefings, social media campaigns, targeted community engagement activities and the Bureau's [Heatwave Knowledge Centre](#) web pages. During the season this extends to joint press conferences and media interviews, as well as continuing social media public safety campaigns and community and industry briefings.

## 2.8. Service Continuity

The Bureau maintains service continuity through its Business Continuity Plan. Most pertinent to heatwave services is the built-in redundancy of being able to transfer operations between offices as required.

To maintain service continuity, the Bureau uses a large and diverse range of observational and forecast data in the delivery of its heatwave services. This provides redundancy if any data source is unavailable during operations and ensures all products and services are based on the best available information at all times.

## 3. Quality Assurance and Performance

### 3.1. Hazard Services Forum

The IGA established the Hazards Services Forum (HSF) in 2018. The HSF facilitates consultation with State and Territory operational emergency service agencies to guide current and future strategic development of the Bureau of Meteorology's hazard services.

The forum enables the states and territories to request and prioritise changes to the Standard Services and to refer services that could be considered Supplementary Services to the Bureau for consideration. The HSF also assist with the process of consulting on modifications to Services Schedules.

### 3.2. National Heatwave Advisory Group

The National Heatwave Advisory Group (NHAG) will oversee the implementation, evaluation and review of the National Heatwave Warning Framework (the Framework), and the Bureau of Meteorology's (the Bureau's) heatwave service.

As an advisory group, the NHAG will consolidate and share heatwave related information and provide feedback and recommendations on the Bureau's heatwave service. Feedback and recommendations will be formally reported to the Hazards Services Forum (HSF) as the strategic body to discuss national resource prioritisation for the provision of the Bureau's hazards services to the states and territories.

### 3.3. Performance Statistics and Reporting

Bureau Heatwave products are verified against available observations and compiled into routine reports

In circumstances where heatwaves are deemed to have had a significant impact on community safety and/or livelihoods, the Bureau may prepare an event report. The purpose of the report is to provide an overview of the meteorological aspects surrounding the event, as well as forecast and warning performance. This forms part of the Bureau's post event review process.

### 3.4. Post Event Review

The Bureau conducts an internal post event reviews after heatwave events that have had a significant community or operational impact.

The insights and recommendations gained from these post event reviews are used to improve processes, systems and services delivered by the Bureau.

Depending on the impact from a heatwave event, this process may include a debrief with external partners. Upon request, the Bureau also contributes to post incident reviews conducted by health and emergency services agencies and government.

### 3.5. Meteorologist Training

The Bureau delivers a heatwave training program for meteorologists. This program ensures that staff involved in analysing and forecasting heatwaves have the training and demonstrated ability to provide a high standard of heatwave services to the Australian community.

## 4. National Heatwave Product Schedule

Heatwave services provided by the Bureau utilise gridded forecast data covering the entire Australian domain. The service utilises the Excess Heat Factor (EHF) to provide a measure of heatwave severity.

Detailed information on how the Excess Heat Factor is calculated is included in Appendix 1: Excess Heat Factor Calculation. For a complete listing of Public Weather Districts used for Heatwave Warnings, see Appendix 2: Public Weather District Maps.

Unless otherwise noted, all issue times in this document are quoted as local time for the relevant jurisdiction and time of year.

### 4.1. Routine Services

#### 4.1.1. Geospatial Data Products

##### 4.1.1.1. Purpose

Geospatial data products provide gridded heatwave data. The highest spatial resolution data is available in the NetCDF grids. These are at a 5km resolution across Australia and available for download via FTP. There are 4 different data products available:

1. Excess Heat Factor (EHF)
2. Excess Heat Factor – Severity (EHFsev)
3. Heat Stress Acclimatisation (EHI accl)
4. Significant Excess Heat (EHI sig)

A sample of these is available at <ftp://ftp.bom.gov.au/anon/sample/catalogue/Heatwave/>





**OFFICIAL**

The user guide is available at <http://reg.bom.gov.au/catalogue/heatwave.pdf> (which also describes the smoothing of heatwave areas for the WMS product).

The heatwave WMS layer is a smoothed version of the data in the NetCDF grids. Due to the smoothing algorithm, some small areas of heatwave get smoothed out and don't appear on this product. Page 10 of the user guide describes the Heatwave WMS layer  
<http://reg.bom.gov.au/catalogue/GIS2Web.pdf>

Metadata information for the GIS layer is available at  
<http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900601?template=full>

#### **4.1.1.2. Issue times and validity**

The heatwave geospatial data products are issued at around 14:15 AEST/AEDT daily during heatwave season. The information is valid for 7 three-day periods.

#### **4.1.1.3. Accessing geospatial data products**

Agencies will need to set up separate FTP and GIS2Web accounts to access all geospatial products. The Real Time Data Services team manages all account set up and administration:  
[webreg@bom.gov.au](mailto:webreg@bom.gov.au)

### **4.1.2. Web-based Heatwave Map Product**

#### **4.1.2.1. Purpose**

National Heatwave Assessment and Forecast maps show a broadscale picture of where the significant heatwaves are expected to occur across Australia over the coming seven days.

The national maps of heatwave areas are accompanied by a text description of the heatwave areas shown on the map, for accessibility purposes.

#### **4.1.2.2. Issue times and validity**

The Web-based Heatwave Map Products are issued at around 15:30 AEDT daily during heatwave season. The information is valid for 7 three-day periods.

Day – 2	Day – 1 (yesterday)	Day +0 (today)	Day +1 (tomorrow)	Day +2	Day +3	Day +4	Day +5	Day +6
Heatwave Assessment Map 1								
	Heatwave Assessment Map 2							
		Heatwave Forecast Map 1						
			Heatwave Forecast Map 2					
				Heatwave Forecast Map 3				
					Heatwave Forecast Map 4			
						Heatwave Forecast Map 5		

Table 2. Visualisation of the validity of the 7 heatwave maps that are issued each day.

#### 4.1.2.3. Accessing the web-based heatwave map product

The Heatwave Assessment and Forecast maps are available at the following web link <http://www.bom.gov.au/australia/heatwave/>. The areas of extreme, severe and low-intensity heatwaves on these maps have been smoothed for display purposes.

#### 4.1.3. Heatwave Decision Support Product

##### 4.1.3.1. Purpose

The Heatwave Decision Support Product (HDSP) is provided to Health and Emergency Service agencies, and includes aggregated information to the weather district and town level based on the EHFsev gridded heatwave data. It covers 7 three-day periods with the date listed in the tables being the first of the three days

The District severity summary forecast section shows the heatwave severity category for each district based on the highest severity affecting at least 10% of that district.

The District severity detailed forecast section shows the % area covered by each severity category. This allows users to understand how widespread the heatwave is in the area of interest.

The Town Excess Heat Factor (EHF) detailed forecast section shows the numerical EHFsev values at each location. This provides information about the severity of the heatwave.

The HDSP should be used in conjunction with the geospatial data products and maps to understand where the heatwave risk is within the weather district.

Note that because of the smoothing with the web-based national maps, it is possible that the HDSP will show significant heatwaves in a weather district that do not appear on the national map. The information in the HDSP is correct as it is based on the higher-resolution NetCDF grids.

##### 4.1.3.2. Issue times and validity

The HDSP is issued at around 14:45 AEDT daily. The information is valid for 7 three-day periods.



**OFFICIAL**

### **4.1.3.3. Accessing the Heatwave Decision Support Product**

The HDSP is available on the registered user webpage:

[https://reg.bom.gov.au/reguser/by\\_prod/HWDecisionSupport/#/](https://reg.bom.gov.au/reguser/by_prod/HWDecisionSupport/#/)

Health and Emergency Services agencies responsible for heatwave response have been provided the username and password details to access this page.

The HDSP is also available in xlsx and csv formats via the FTP platform.

Agencies require an account to access FTP. The Real Time Data Services team manages all account set up and administration, and can be contacted at [webreg@bom.gov.au](mailto:webreg@bom.gov.au)

## **4.2. Non-Routine Services**

### **4.2.1. Heatwave Warning**

#### **4.2.1.1. Purpose**

The Heatwave Warning is issued when Severe or Extreme heatwaves are expected to affect at least 10% of a weather district. A Severe heatwave is defined as 10% or greater of a weather district meeting the EHFsev threshold:  $\text{EHFsev} \geq 1$  and  $\text{EHFsev} < 3$ . An Extreme heatwave is defined as 10% or greater of a weather district meeting the EHFsev threshold:  $\text{EHFsev} \geq 3$ .

A warning can be issued up to one day in advance of the heatwave starting, to allow time for agencies and the public to take protective actions.

Agreed action statements will appear in the warning, depending on warning severity and timing. There is also a link to further information from the relevant state/territory authority.

The warning will include a description of the expected maximum and minimum temperatures, the timing of when the heatwave will peak and/or ease and affected towns and communities within the warning area.

#### **4.2.1.2. Issue times and validity**

Heatwave Warnings are issued by around 15:00 local time, but slightly earlier in Western Australia (14:00 local time). Warnings are updated daily during heatwave events and then cancelled at the end of the event.

The warning covers 4 overlapping three-day periods, extending out to 3 days in the future. A severe or extreme rating on one or more of those 4 periods will trigger a warning.

**OFFICIAL**

Day - 2	Day - 1 (yesterday)	Day +0 (today)	Day +1 (tomorrow)	Day +2	Day +3	Day +4	Day +5	Day +6
Heatwave Assessment Map 1								
	Heatwave Assessment Map 2							
		Heatwave Forecast Map 1						
			Heatwave Forecast Map 2					
				Heatwave Forecast Map 3				
					Heatwave Forecast Map 4			
						Heatwave Forecast Map 5		
Heatwave Warning Map 1								
	Heatwave Warning Map 2							
		Heatwave Warning Map 3						
			Heatwave Warning Map 4					

Table 3. Visualisation of the validity of the 4 maps included in the heatwave warning.

**4.2.1.3. Accessing Heatwave Warnings**

Heatwave warnings will appear on the web alongside other Bureau warnings at <http://www.bom.gov.au/australia/warnings/index.shtml> and on the Bureau's mobile app. Subscribers to the App can choose to receive push notifications when a heatwave warning is issued for their weather district.

A voice version of the heatwave warning will be available on the Bureau's telephone weather service.

Partner agencies will receive heatwave warnings via email.

Heatwave Warnings will also be included in the All Warnings Bundle for registered subscribers.

## 5. Appendix 1: Excess Heat Factor Calculation

### 5.1. Excess Heat Factor

The Excess Heat Factor (EHF) is calculated based on average daily temperatures over three consecutive days. This is measured in relation to the local long-term climate (by comparing the three days to a climatological threshold for that particular location) and to the local recent past (by comparing the three days to observed temperatures over the previous thirty days at that particular location).

Details of the EHF Calculation as described by [Nairn and Fawcett \(2013\)](#) are shown below.

**Significant excess heat** ( $EHI_{sig}$ ) is the three-day mean temperature anomaly relative to the 95th percentile climatology value at each location. The daily mean temperature ( $T$ ) is calculated as the average of the maximum and minimum temperatures recorded across the 24-hour period (9am to 9am local time) for each grid cell where the maximum temperature usually precedes the minimum temperature. Units are °C.

The significant excess heat index at a given grid cell for a particular date is calculated as

$$EHI_{sig} = \frac{T_i + T_{i+1} + T_{i+2}}{3} - T_{95}$$

where  $i$  is the day in the three-day heatwave period and  $i = 1$  is the first day in the sequence.  $T_{95}$  is the 95th percentile of daily mean temperature  $T_i$  for a grid cell for the climate reference period 1971-2000 across all days of the year.

**Heat Stress (Acclimatisation)** ( $EHI_{accl}$ ) for a given grid cell on a particular date is the three-day mean temperature anomaly relative to the previous 30-day mean temperature value. This is calculated as:

$$EHI_{accl} = \frac{T_i + T_{i+1} + T_{i+2}}{3} - \frac{T_i + T_{i-1} + \dots + T_{i-30}}{30}$$

where  $i = 1$  is the first day in the 3 day heatwave period.

**Excess heat factor** (EHF) is the combined effect of  $EHI_{sig}$  and  $EHI_{accl}$  and is calculated as:

$$EHF = EHI_{sig} \times \max(1, EHI_{accl})$$

Heatwave conditions exist when EHF is positive.

#### Excess Heat Factor – Severity ( $EHF_{sev}$ )

The EHF threshold for a severe heatwave varies by location and is taken to be the 85th percentile ( $EHF_{85}$ ) at each grid cell for all positive EHF values during the reference period 1958-2016.



**OFFICIAL**

To categorise heatwave severity, EHF is compared to the 85th percentile value at that grid cell. The  $EHF_{sev}$  is calculated as:

$$EHF_{sev} = \frac{EHF}{EHF_{85}}$$

Heatwaves are classified into three severity levels (low-intensity, severe, extreme), based on EHF values exceeding  $EHF_{sev}$  thresholds within an event.

**Low-Intensity Heatwave**

$EHF_{sev} > 0$  and  $EHF_{sev} < 1$  – i.e., greater than zero but less than one  
Most common  
Most people can cope

**Severe Heatwave**

$EHF_{sev} \geq 1$  and  $EHF_{sev} < 3$  – i.e., between one and three  
Less frequent  
Can impact vulnerable people

**Extreme Heatwave**

$EHF_{sev} \geq 3$  – i.e., three or greater  
Rarest  
Capable of causing widespread health issues  
Can impact infrastructure such as power and transport

RELEASED UNDER FREEDOM OF INFORMATION

## 6. Appendix 2: Public Weather District Maps

### 6.1. Western Australia Public Weather Districts



Figure 2. Map showing WA public weather districts.

## 6.2. Northern Territory Public Weather Districts



Figure 3. Map showing NT public weather districts.



### 6.3. Queensland Public Weather Districts



Figure 4. Map showing QLD public weather districts.

### 6.4. New South Wales and Australian Capital Territory Public Weather Districts

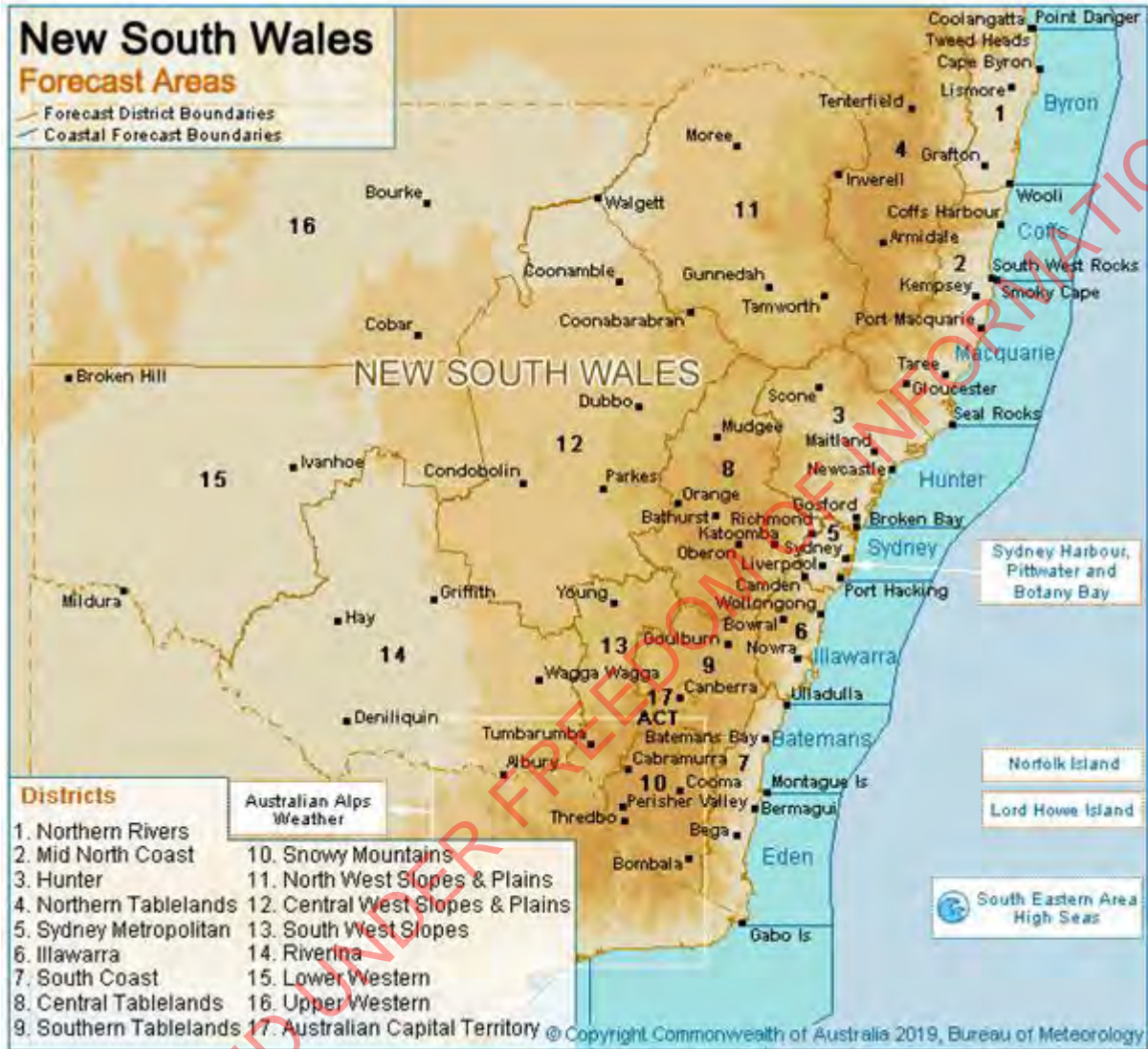


Figure 5. Map showing NSW and ACT public weather districts.

### 6.5. Victoria Public Weather Districts



Figure 6. Map showing VIC public weather districts.

### 6.6. Tasmania Public Weather Districts



Figure 7. Map showing TAS public weather districts.

### 6.7. South Australia Public Weather Districts



Figure 8. Map showing SA public weather districts.

## 7. Appendix 3: Product Samples

### 7.1. Web-based Heatwave Map Product

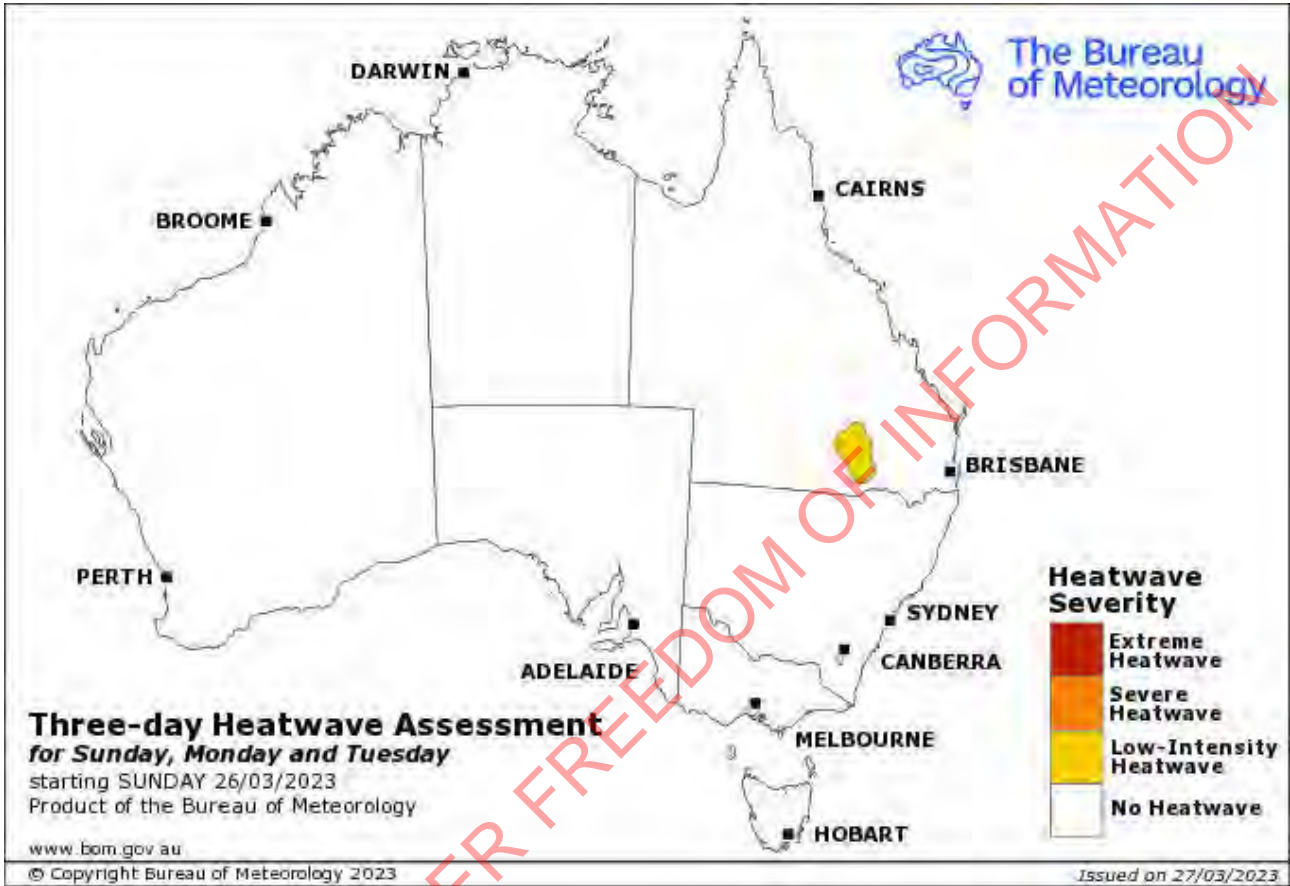


Figure 9. Heatwave Assessment Map

OFFICIAL

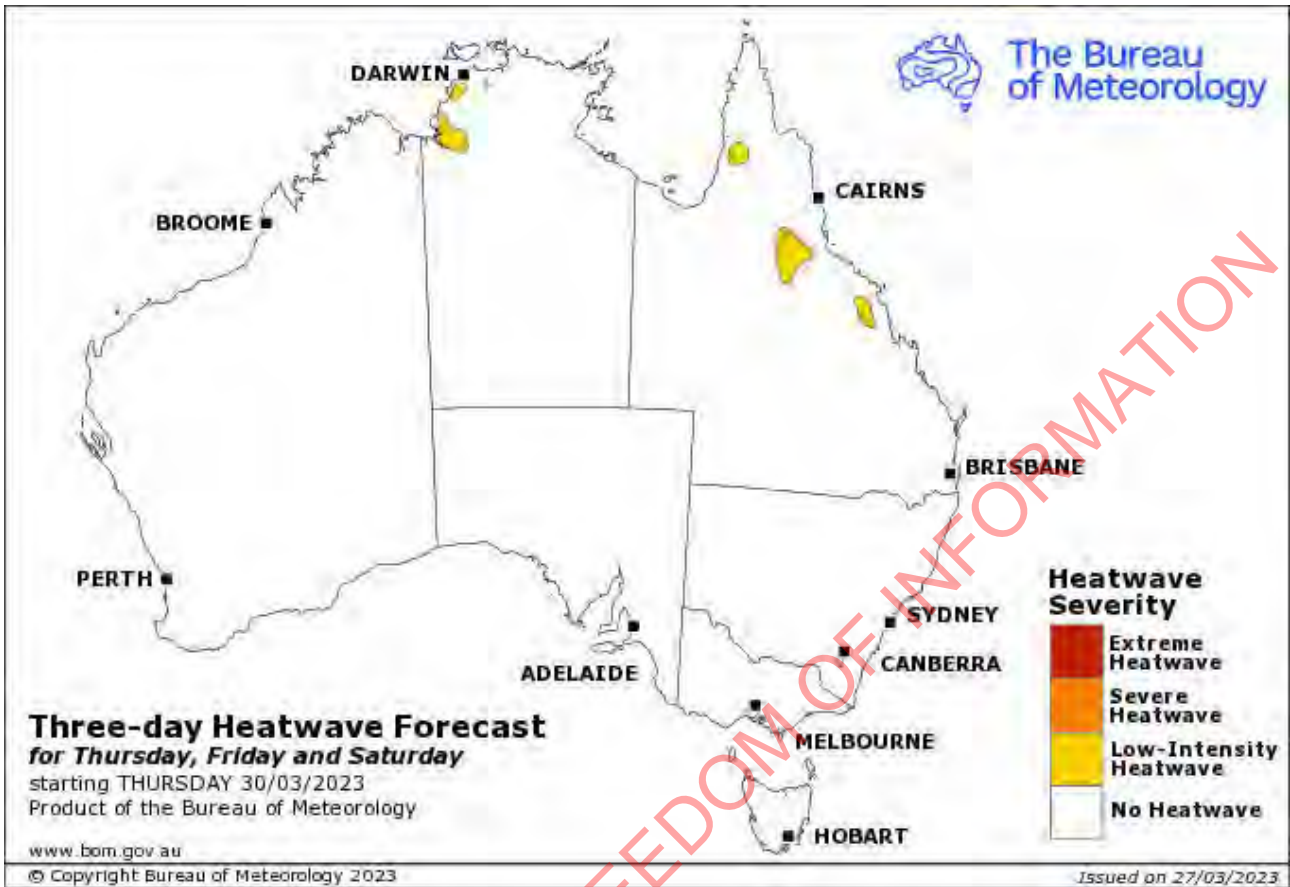


Figure 10. Heatwave Forecast Map

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

## 7.2. Heatwave Decision Support Product

District severity summary forecast

District

Show all

District	Sat 7 Jan	Sun 8 Jan	Mon 9 Jan	Tue 10 Jan	Wed 11 Jan	Thu 12 Jan	Fri 13 Jan
<a href="#">Central</a>	No heatwave	No heatwave	No heatwave	Low	Low	Low	Low
<a href="#">East Gippsland</a>	No heatwave	No heatwave	Low	Low	Low	Severe	Low
<a href="#">Mallee</a>	No heatwave	Low	Low	Low	Low	Low	Low
<a href="#">North Central</a>	No heatwave	No heatwave	Low	Low	Low	Severe	Low
<a href="#">North East</a>	No heatwave	Low	Low	Low	Severe	Severe	Severe
<a href="#">Northern Country</a>	No heatwave	Low	Low	Low	Severe	Severe	Severe
<a href="#">South West</a>	No heatwave	No heatwave	No heatwave	No heatwave	Low	Low	Low
<a href="#">West and South Gippsland</a>	No heatwave	No heatwave	No heatwave	Low	Low	Severe	Low
<a href="#">Wimmera</a>	No heatwave	No heatwave	No heatwave	Low	Low	Low	Low

Last updated

1 hour ago, 2:38 pm AEDT

Figure 11. District summary component of the HDSP showing heatwave severity categories. Example from product issued for Victoria on 9 January 2023.

The categories shown in the first four columns of the District Summary section are used to determine whether a heatwave warning is required for each weather district. The highest heatwave category in the 4 three-day periods is assigned for warning purposes.



Northern Country

Severity breakdown (%)

Severity	Sat 7 Jan	Sun 8 Jan	Mon 9 Jan	Tue 10 Jan	Wed 11 Jan	Thu 12 Jan	Fri 13 Jan
Low	0	10	81	100	75	52	84
Severe	0	0	0	0	25	48	16
Extreme	0	0	0	0	0	0	0

Figure 12. Detailed district section of the HDSP showing the percentage of the weather district in each heatwave severity category. Example from product issued for Victoria on 9 January 2023.

Northern Country

Town Excess Heat Factor

Town	Sat 7 Jan	Sun 8 Jan	Mon 9 Jan	Tue 10 Jan	Wed 11 Jan	Thu 12 Jan	Fri 13 Jan
Bendigo	-0.1	0.0	0.2	0.5	1.1	1.3	0.7
Cobram	-0.3	-0.2	0.0	0.2	0.5	0.7	0.7
Echuca	-0.2	-0.1	0.1	0.2	0.7	1.0	0.6
Kyabram	-0.2	-0.1	0.2	0.4	0.9	1.2	0.7
Redesdale	-0.1	-0.1	0.0	0.2	0.8	0.9	0.3
Shepparton	-0.2	0.0	0.4	0.7	1.4	1.7	1.3
Tatura	-0.2	-0.1	0.2	0.5	1.2	1.5	1.1
Yarrawonga	-0.3	-0.1	0.3	0.5	0.9	1.1	1.0

Figure 13. Town forecasts component of the HDSP showing numerical EHFsev values. Example from product issued for Victoria on 9 January 2023.

### 7.3. Heatwave Warning

#### Heatwave Warning For South Australia

Issued at 02:59pm CDT on Wednesday 22 February 2023

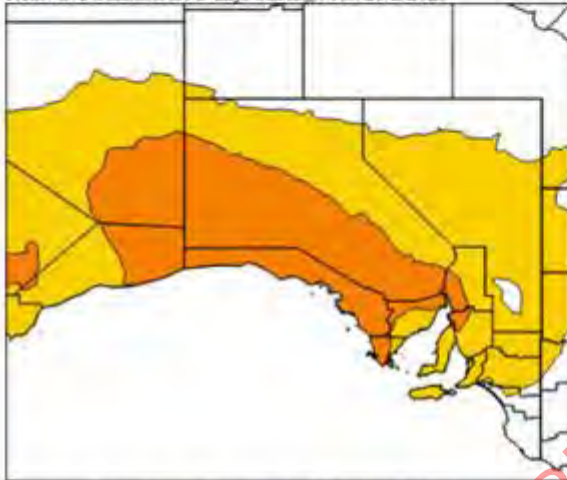
Valid for Wednesday 22 February 2023 to Friday 24 February 2023

**Extreme Heatwave Warning for:** Kangaroo Island and Lower Eyre Peninsula Districts

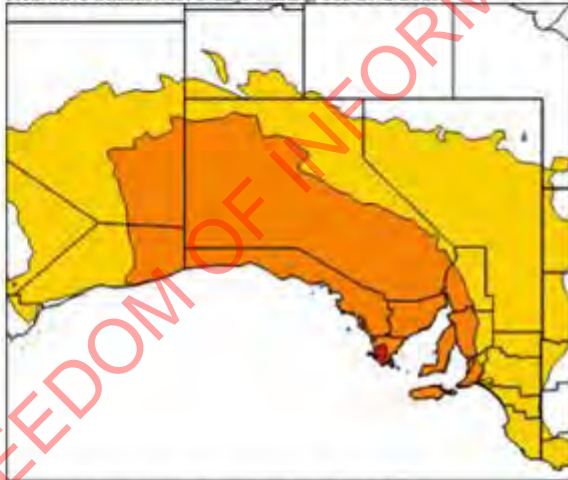
**Severe Heatwave Warning for:** Adelaide Metropolitan, Yorke Peninsula, Upper South East, Lower South East, Murraylands, Mid North, Flinders, West Coast, Eastern Eyre Peninsula, North West Pastoral and Mount Lofly Ranges Districts

**Cancelled Heatwave Warning for:** Riverland District

Heatwave Situation for 3 days starting Mon 20/2/2023



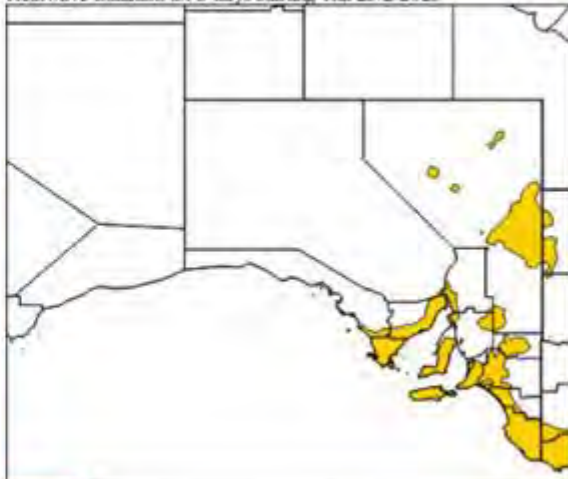
Heatwave Situation for 3 days starting Tue 21/2/2023



Heatwave Situation for 3 days starting Wed 22/2/2023



Heatwave Situation for 3 days starting Thu 23/2/2023



No Heatwave	Low-Intensity Heatwave	Severe Heatwave	Extreme Heatwave
-------------	------------------------	-----------------	------------------

RELEASED UNDER FREEDOM OF INFORMATION

**Safety Advice**

- Extreme heatwaves can be dangerous for everyone.
- Severe heatwaves can be dangerous for many people, especially older people, babies, children, pregnant and breastfeeding women, people with medical conditions and people who are unwell.
- Seek a place to keep cool, such as your home, a library, community centre or shopping centre.
- Close your windows and draw blinds, curtains or awnings early in the day to keep the heat out of your home.
- If available, use fans or air-conditioners to keep cool.

For information on staying safe during a heatwave go to the [2020 heatwave safety page](#).

**Weather Situation**

Maximum temperatures in the low to mid forties with minimum temperatures in the mid to high twenties moving from the west through southern parts of the State.

Severe to extreme heatwave conditions extending eastwards over the coming days, then easing following the passage of a cold front during Friday.

Locations likely to be impacted include Adelaide Metropolitan Area, Ceduna, Clare, Maitland, Mount Gambier, Mount Barker, Murray Bridge, Naracoorte, Port Lincoln and Port Pirie.

The next heatwave warning will be issued by 3:00pm CDT on Thursday 23 February 2023.

Figure 14. Heatwave Warning including the heading, image and text components. Example from product issued for South Australia on 22 February 2023.

## 8. Appendix 4: List of Product Identifiers

Product Identifier	Description	Coverage
IDY11001	Heatwave Grid – Excess Heat Factor (EHF)	National
IDY11002	Heatwave Grid – Excess Heat Factor – Severity (EHFsev)	National
IDY11003	Heatwave Grid – Heat Stress (Acclimatisation) (EHI accl)	National
IDY11004	Heatwave Grid – Significant Excess Heat (EHI sig)	National
IDBY1100	Heatwave Grids - Bundle	National
IDY10008	Australian Heatwave Warning Summary (BNOC)	National
IDW10015	Heatwave Decision Support Product (WA)	WA
IDD10015	Heatwave Decision Support Product (NT)	NT
IDQ10015	Heatwave Decision Support Product (QLD)	QLD
IDN10115	Heatwave Decision Support Product (NSW & ACT)	NSW & ACT
IDV10015	Heatwave Decision Support Product (VIC)	VIC
IDT10015	Heatwave Decision Support Product (TAS)	TAS
IDS10015	Heatwave Decision Support Product (SA)	SA
IDW21013	Heatwave Warning (WA)	WA



**OFFICIAL**

Product Identifier	Description	Coverage
IDD21013	Heatwave Warning (NT)	NT
IDQ21013	Heatwave Warning (QLD)	QLD
IDN21013	Heatwave Warning (NSW)	NSW
IDN21014	Heatwave Warning (ACT)	ACT
IDV21013	Heatwave Warning (VIC)	VIC
IDT21013	Heatwave Warning (TAS)	TAS
IDS21013	Heatwave Warning (SA)	SA

Table 4. Product identifiers for all heatwave products.

RELEASED UNDER FREEDOM OF INFORMATION

## 9. Navigation aids

### 9.1. List of figures

Figure 1. Total Warning System.....	7
Figure 2. Map showing WA public weather districts. ....	19
Figure 3. Map showing NT public weather districts. ....	20
Figure 4. Map showing QLD public weather districts. ....	21
Figure 5. Map showing NSW and ACT public weather districts. ....	22
Figure 6. Map showing VIC public weather districts. ....	23
Figure 7. Map showing TAS public weather districts. ....	24
Figure 8. Map showing SA public weather districts. ....	25
Figure 9. Heatwave Assessment Map.....	26
Figure 10. Heatwave Forecast Map .....	27
Figure 11. District summary component of the HDSP showing heatwave severity categories. Example from product issued for Victoria on 9 January 2023. ....	28
Figure 12. Detailed district section of the HDSP showing the percentage of the weather district in each heatwave severity category. Example from product issued for Victoria on 9 January 2023. .	29
Figure 13. Town forecasts component of the HDSP showing numerical EHFsev values. Example from product issued for Victoria on 9 January 2023. ....	29
Figure 14. Heatwave Warning including the heading, image and text components. Example from product issued for South Australia on 22 February 2023.....	31

### 9.2. List of tables

Table 1. Heatwave SLS distribution list by jurisdiction.....	9
Table 2. Visualisation of the validity of the 7 heatwave maps that are issued each day.....	14
Table 3. Visualisation of the validity of the 4 maps included in the heatwave warning.....	16
Table 4. Product identifiers for all heatwave products. ....	32

### 9.3. List of acronyms

ACT	Australian Capital Territory
ADFD	Australian Digital Forecast Database
AFAC	Australasian Fire and Emergency Service Authorities Council
BMTC	Bureau of Meteorology Training Centre
EHF	Excess Heat Factor
FTP	File Transfer Protocol
GIS	Graphical Information System
HDSP	Heatwave Decision Support Product
HMA	Hazard Management Agency



**OFFICIAL**

HSF	Hazard Services Forum
ID	Identification (numbers or codes)
NEMA	National Emergency Management Agency
NetCDF	Network Common Data Form
NHAG	National Heatwave Advisory Group
NSW	New South Wales
NT	Northern Territory
NWP	Numerical Weather Prediction
PERM	Post Event Review Management
QLD	Queensland
SA	South Australia
SES	State Emergency Service
SLS	Service Level Specification
SOP	Standard Operating Procedures
TAS	Tasmania
VIC	Victoria
WA	Western Australia

RELEASED UNDER FREEDOM OF INFORMATION



OFFICIAL

# Thunderstorm and Severe Weather Service Level Specification

Community Services Group

Season 2023-2024



90 sever

OFFICIAL

## Revision history

Date	Version	Author	Description
10/08/2023	0.1		Initial draft template
14/10/2023	0.2		Final internal draft
	0.3		Draft sent for internal consultation
9/11/2023	0.4		External consultation

## Review status

Date	Version	Reviewer	Description
Oct 2023	1.0		Endorsed for further release



Unless otherwise noted, all images in this document are licensed under the Creative Commons Attribution Australia Licence.

© Commonwealth of Australia 2023

Published by The Bureau of Meteorology

Cover image: Adelaide River, Northern Territory, Christopher Kent, 12 December 2019.





OFFICIAL

# Contents

1. Introduction ..... 8

1.1. Purpose ..... 8

1.2. Scope ..... 9

1.3. Authority ..... 9

1.4. Distribution ..... 9

2. National Thunderstorm and Severe Weather Services ..... 11

2.1. Partnerships ..... 11

2.2. Definitions ..... 11

2.2.1. Thunderstorm ..... 11

2.2.2. Severe Thunderstorm ..... 11

2.2.3. Severe Weather ..... 13

2.3. Severe Weather Seasonality ..... 15

2.4. Area of Responsibility ..... 15

2.5. Dissemination of Products ..... 15

2.6. Briefing Services ..... 16

2.7. Embedded Meteorologists ..... 16

2.8. Communication and Adoption Activities ..... 16

2.9. Service Continuity ..... 16

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

3. Quality Assurance and Performance ..... 17

3.1. Hazards Services Forum ..... 17

3.2. Commonwealth, State and Territory Liaison and Consultation..... 17

3.3. Performance Statistics and Reporting..... 17

3.3.1. Verification..... 17

3.3.2. Damage Assessments..... 17

3.4. Lessons Management ..... 18

3.5. Meteorologist Training and Competency ..... 18

4. National Thunderstorm and Severe Weather Routine Product Suite ..... 19

4.1. Real-time Data Services & Australian Digital Forecast Database ..... 19

4.2. Thunderstorm Forecasts..... 19

4.2.1. Issue Criteria, Times, and Validity ..... 19

4.2.2. Content..... 20

4.2.3. Amendment Criteria..... 21

5. National Thunderstorm and Severe Weather Non-Routine Product Suite..... 21

5.1. Severe Thunderstorm Warnings ..... 21

5.1.1. Warning Content..... 21

5.1.2. Regional Severe Thunderstorm Warnings ..... 22

5.1.3. Detailed Severe Thunderstorm Warnings ..... 23

5.2. Severe Weather Warnings..... 24

5.2.1. Issue Criteria and Validity ..... 24

5.2.2. Warning Content..... 25

5.3. Warning Escalations..... 26

RELEASED UNDER FREEDOM OF INFORMATION

5.3.1. Very Dangerous Storm (VDS)..... 26

5.3.2. Standard Emergency Warning Signal..... 26

5.3.3. Emergency Weather Alerts..... 27

6. Appendices ..... 28

6.1. Weather Forecast District Maps..... 28

6.2. Detailed Severe Thunderstorm Warning Domains ..... 34

6.3. Product Samples ..... 42

6.3.1. Thunderstorm Forecast Map..... 42

6.3.2. Regional Severe Thunderstorm Warning ..... 44

6.3.3. Detailed Severe Thunderstorm Warning ..... 45

6.3.4. Severe Weather Warning ..... 47

6.3.5. Severe Weather Warning ..... 48

6.3.6. Severe Weather Warning for offshore Islands ..... 50

6.4. Product Identifiers..... 50

7. Navigation aids..... 53

7.1. List of figures..... 53

7.2. List of tables ..... 53

RELEASED UNDER FREEDOM OF INFORMATION

## List of acronyms used in this Service Level Specification

ACT	Australian Capital Territory
ADFD	Australian Digital Forecast Database
AEP	Annual Exceedance Probability
BMTC	Bureau of Meteorology Training Centre
NEMA	National Emergency Management Agency
EWA	Emergency Weather Alert
HAT	Highest Astronomical Tide
HMA	Hazard Management Agency
HSF	Hazard Services Forum
ID	Identification (numbers or codes)
IGA	The Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories
LAT	Lowest Astronomical Tide
NSW	New South Wales
NT	Northern Territory
NWP	Numerical Weather Prediction
PERM	Post Event Review Management
PSG	Predictive Services Group
QLD	Queensland
QPF	Quantitative Precipitation Forecast
SA	South Australia
SES	State Emergency Service
SEWS	Standard Emergency Warning Signal
SLS	Service Level Specification
SOP	Standard Operating Procedures
SWH	Significant Wave Height
TAS	Tasmania

VIC Victoria  
VDS Very Dangerous Storm  
WA Western Australia

RELEASED UNDER FREEDOM OF INFORMATION

# 1. Introduction

## 1.1. Purpose

The purpose of the Service Level Specification (SLS) is to document the thunderstorm and severe weather services provided by the Bureau of Meteorology (the Bureau).

The Total Warning System<sup>1</sup> recognises that a fully effective warning service is multi-faceted in nature and its development and operation involves input from several 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 Warning System for thunderstorms and severe weather.

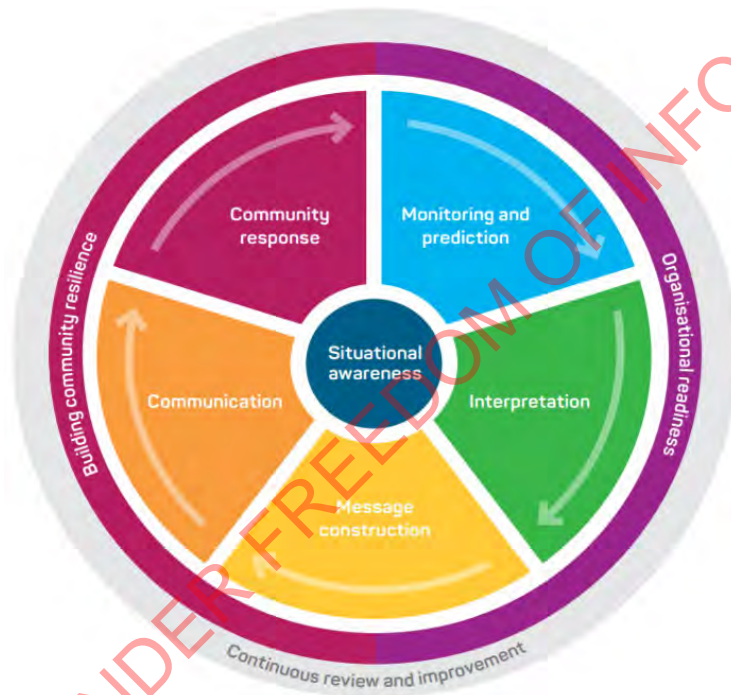


Figure 1: Total Warning System

---

<sup>1</sup> <https://knowledge.aidr.org.au/media/5972/warnings-handbook.pdf> pg. 10

The Bureau's role in the thunderstorm and severe weather warning system is focussed on monitoring and prediction, message construction and communicating threats and impacts associated with these hazards to Government, industry, and the community.

The Bureau also contributes to activities designed to strengthen organisational readiness and build community resilience and participates in the planning and coordination of activities with disaster mitigation agencies.

## 1.2. Scope

The scope of the SLS is the Bureau's publicly available thunderstorm and severe weather services and additional services provided to support emergency management.

The SLS details **what** the Bureau does and **when** it does it, to provide thunderstorm and severe weather services. **How** the Bureau produces these services is addressed in internal Bureau documentation.

## 1.3. Authority

The Meteorology Act, 1955 provides the Bureau a number of functions including but not limited to the taking and recording of observations, forecasting the weather, and issuing of warnings for weather conditions likely to endanger life or property. The [Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories](#) (IGA) confirms the roles and responsibilities of the Bureau and State and Territory governments and local governments.

The Bureau has historical and statutory responsibility for the issue of warnings of gales, storms, and other weather conditions likely to endanger life or property (Meteorology Act 1955 - Sect 6). This includes the provision of forecast and warning services for severe thunderstorms and severe weather. The responsibility for preparation for and response to thunderstorm and severe weather impacts lies with state and territory governments and local governments.

The Bureau of Meteorology Thunderstorm and Severe Weather SLS is issued by the General Manager Environmental Prediction Services under the authority of the Director of Meteorology.

## 1.4. Distribution

This document will be distributed to the agencies listed in Table 1.

Jurisdiction	Agency Name
National	National Emergency Management Agency (NEMA)
National	Australasian Fire and Emergency Services Authorities Council (AFAC)

QLD	Queensland Fire and Emergency Services (QFES)
QLD	Queensland Police Services (QPS)
QLD	Queensland Inspector General Emergency Management
NSW	New South Wales State Emergency Service (NSW SES)
ACT	Australian Capital Territory Emergency Services Authority (ACT ESA)
ACT	Australian Capital Territory Parks and Conservation (ACT PCS)
VIC	Emergency Management Victoria (EMV)
VIC	Victoria State Emergency Service (Vic SES)
VIC	Victoria Department of Environment, Land, Water and Planning (DELWP)
VIC	Victoria Police (VicPOL)
TAS	Tasmania State Emergency Service (Tas SES)
TAS	Tasmanian Parks and Wildlife Service
SA	South Australian State Emergency Service (SA SES)
SA	South Australian Country Fire Service (SA CFS)
SA	South Australia Department for Environment and Water (DEW)
SA	South Australia Police (SAPOL)
WA	Western Australia Department of Fire and Emergency Services (DFES)
NT	Northern Territory Police, Fire and Emergency Services (PFES)
Norfolk Is	Emergency Management Norfolk Island

Table 1: Bureau of Meteorology Thunderstorm and Severe Weather SLS distribution list by jurisdiction



## 2. National Thunderstorm and Severe Weather Services

The Bureau's thunderstorm and severe weather services provide the Australian community and emergency management with essential thunderstorm and severe weather forecasts and warnings that are timely and accurate.

Thunderstorm and severe weather services are designed to inform the community and emergency management organisations of the occurrence of, or potential for, severe thunderstorms or other severe weather conditions.

An important secondary role is to assist media and state or territory emergency services with community engagement programs, and to advise on meteorological aspects of severe thunderstorm and severe weather-related disaster preparedness and planning.

### 2.1. Partnerships

The Bureau has formed partnerships with emergency management organisations, other government authorities and media across the country to ensure that forecasts and warnings are fit-for-purpose and are broadly distributed in a timely manner.

Partnerships underpin the delivery of effective thunderstorm and severe weather services to the Australian community. The partnerships with Commonwealth, State and Territory Governments and local government are formalised through the IGA, which clarifies and confirms responsibilities across the Total Warning System. Specifically, the Bureau and States and Territories agree to work together to mutually develop and maintain national standards for warnings of severe thunderstorms and severe weather.

### 2.2. 1Definitions

#### 2.2.1. Thunderstorm

A thunderstorm is a localised atmospheric disturbance that produces lightning and thunder. There are various types of thunderstorms, and each type has a distinct structure and set of characteristics, affecting thunderstorm motion, intensity, and longevity as well as the type of weather phenomena that they produce. Thunderstorms may evolve through various thunderstorm types during their life cycle.

#### 2.2.2. Severe Thunderstorm

The Bureau of Meteorology defines a severe thunderstorm as a thunderstorm which produces one or more of the following phenomena:

- Damaging wind gusts
- Large hailstones
- Heavy rainfall which may lead to flash flooding
- Tornadoes

A severe thunderstorm is categorised as a very dangerous storm (VDS) if it produces one or more of the following high-end severe phenomena:

- Destructive wind gusts
- Giant hailstones
- Intense rainfall which may lead to dangerous and life-threatening flash flooding
- Tornadoes

These weather phenomena are defined as in Table 2:

Phenomenon	Definition
<b>Damaging Wind Gusts</b>	Wind gusts $\geq$ 90 km/h (49 knots)
<b>Destructive Wind Gusts</b>	Wind gusts $\geq$ 125 km/h (68 knots)
<b>Large Hailstones</b>	Hailstones $\geq$ 2 cm in diameter * Large accumulations of small hail may be included in the text of an existing warning for Large Hail in NSW when conditions are favourable.
<b>Giant Hailstones</b>	Hailstones $\geq$ 5 cm in diameter
<b>Heavy Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 10% AEP <sup>2</sup> depth
<b>Intense Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 2% AEP depth  <b>Exception - NSW</b> As above or if lower than 2% AEP depth, $\geq$ 70 mm in 1 hour or less $\geq$ 150 mm in 3 hours or less
<b>Tornado</b>	Any tornado occurrence

Table 2: Phenomena definitions associated with severe thunderstorms

<sup>2</sup> The Annual Exceedance Probability (AEP) is the probability that a rainfall amount over a given period will be exceeded in any one year. The [Design Rainfall Data System](#) (2016) provides the national datasets for 10% and 2% AEP used in Bureau services.

### 2.2.3. Severe Weather

The Bureau of Meteorology defines severe weather as hazardous or dangerous weather that is not the direct consequence of thunderstorms, tropical cyclones or bushfires that consists of one or more of the following phenomena:

- Damaging and/or destructive winds
- Heavy rainfall which may lead to flash flooding and/or intense rainfall which may lead to dangerous and life-threatening flash flooding
- Damaging surf
- Abnormally high tides
- Blizzards

These weather phenomena are defined in Table 3 and Table 4.

Land Phenomenon	Definition
<b>Damaging Winds</b>	<p>Wind gusts <math>\geq</math> 90 km/h (49 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p><b>Exception - Tasmania</b> Wind gusts <math>\geq</math> 100 km/h (54 knots) for westerly winds or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p>Wind gusts <math>\geq</math> 80 km/h (43 knots) for easterly winds or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p><b>Exception - NSW</b> For elevations <math>\geq</math> 1900 metres: Wind gusts <math>\geq</math> 125 km/h (68 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 80 km/h (43 knots).</p>
<b>Destructive Winds</b>	<p>Wind gusts <math>\geq</math> 125 km/h (68 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 89 km/h (48 knots)</p> <p><b>Exception - Tasmania</b> Wind gusts <math>\geq</math> 110 km/h (59 knots) for easterly winds</p>
<b>Heavy Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 10% AEP depth
<b>Intense Rainfall</b>	<p>Rainfall over a period between 30 minutes and 6 hours which exceeds the 2% AEP depth</p> <p><b>Exception - NSW</b> As above or if lower than 2% AEP depth, <math>\geq</math> 70 mm in 1 hour or less <math>\geq</math> 150 mm in 3 hours or less</p>
<b>Blizzards</b>	NSW and Victoria for elevations $\geq$ 1200 metres

	* Included in text of existing warning when conditions are identified as favourable.
--	--

Table 3: Land phenomena definitions associated with severe weather.

Coastal Phenomenon	Definition	
<b>Damaging Surf</b>	Qld	SWH $\geq$ 4 metres, when from directions 0 to 150 degrees
	NSW	SWH $\geq$ 5 metres in surf zone and from onshore directions.
	Vic	SWH $\geq$ 7.5 metres at Portland
	Tas	Cape Grim clockwise to South East Cape ONLY SWH $\geq$ 6 metres and from onshore directions or Southeast coasts when primary swell is from S to SE and SWH $\geq$ 7 metres at Cape Bruny
	WA	SWH $\geq$ 5 metres or SWH $\geq$ 7 metres for locations south of North West Cape when primary direction from W to S
	NT	SWH $\geq$ 2 metres
	SA	No service
<b>Abnormally High Tides</b>	Qld	Sea levels > 0.5 metres above HAT or Sea levels > HAT Torres Strait Islands
	NSW	Sea levels > 0.5 metres above HAT
	Vic	No service
	Tas	Sea levels $\geq$ 1.9 metres above LAT at Battery Point (Hobart) or and $\geq$ 4.0 metres above LAT at Burnie
	WA	Sea levels > 0.5 metres above HAT
	NT	Sea levels > HAT
	SA	For Gulf St Vincent and Spencer Gulf coastlines, sea levels $\geq$ 3.75 metres above LAT at Outer Harbor (Adelaide)

Table 4: Coastal severe weather phenomena definitions

\* SWH, HAT and LAT correspond to Significant Wave Height, Highest Astronomical Tide, and Lowest Astronomical Tide respectively. Damaging surf is referred to as 'dangerous surf' in Queensland.

## 2.3. Severe Weather Seasonality

There is no distinct severe weather season in Australia. Severe weather can occur across Australia throughout the year, with some types of severe weather more seasonal than others.

Severe thunderstorms can occur at any time of the year. However, for most parts of the country, they are more common during the warmer months between October and March.

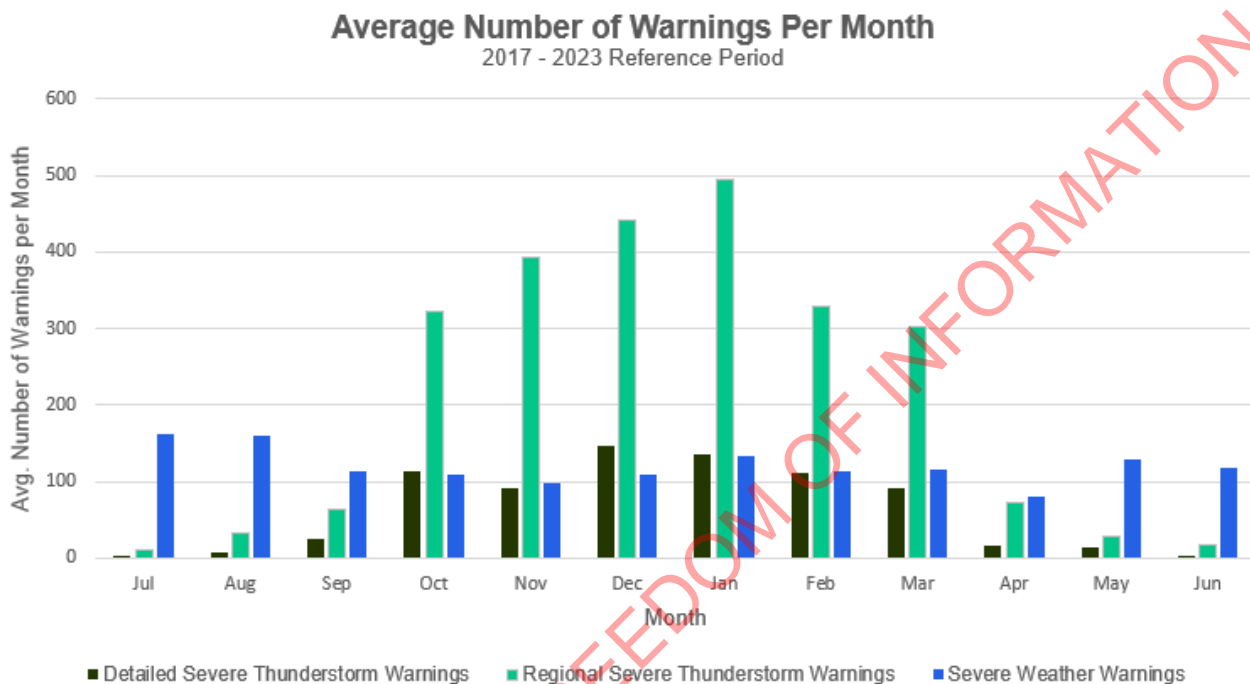


Figure 2: Average number of warnings per month across all mainland states and territories of Australia for the 2017-2023 reference period

## 2.4. Area of Responsibility

The Bureau's thunderstorm and severe weather services cover all Australian states and mainland territories. Severe weather services are also provided for Lord Howe Island and Norfolk Island.

## 2.5. Dissemination of Products

The Bureau's thunderstorm and severe weather products are disseminated primarily through the Bureau's website and app. Products are also disseminated via email and are available as a recorded voice via the Bureau's telephone weather service.

Severe Thunderstorm and Severe Weather Warnings are 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 internet protocols such as File Transfer Protocol (FTP).

## 2.6. Briefing Services

The Bureau provides briefings to emergency management partners to assist planning, response, and coordination. The format, timing and frequency of briefings is agreed through national, state and territory-based arrangements.

## 2.7. Embedded Meteorologists

The Bureau has arrangements with several emergency service organisations to provide services through an embedded meteorologist to support operational awareness and communication. In each instance, the services provided are agreed between the Bureau and the organisation and provided on a cost recovery basis.

## 2.8. Communication and Adoption Activities

In addition to issuing products through standard communication channels such as the website, app and via email, the Bureau undertakes a range of complementary communication and adoption activities in partnership with emergency management agencies. The purpose of these activities is to increase the uptake and effectiveness of the forecasts and warnings, and to ensure consistent weather safety messages are provided to the community.

Activities include community and industry preparedness briefings, social media campaigns and the Bureau's "[Severe Weather Knowledge Centre](#)" web pages. Ahead of, during and following significant severe thunderstorm and severe weather occurrences, this extends to joint press conferences and media interviews, as well as continuing social media public safety campaigns and additional community and industry briefings.

## 2.9. Service Continuity

The Bureau maintains service continuity through its Business Continuity Plans. Most pertinent to thunderstorm and severe weather services is the built-in redundancy of being able to transfer operations between offices, as required.

To maintain service continuity the Bureau uses a large and diverse range of observational and forecast data in the delivery of all its thunderstorm and severe weather services. This provides redundancy if any data source is unavailable during operations and ensures all products and services are based on the best available information at the time.

As per 2.6(2) of the IGA, the Bureau will aim to provide a continuity of services across the nation subject to the Bureau's available resources, operational limitations and any applicable policy considerations.

## **3. Quality Assurance and Performance**

### **3.1. Hazards Services Forum**

The IGA established the Hazards Services Forum (HSF) in 2018. The HSF facilitates consultation with state and territory operational emergency service agencies to guide current and future strategic development of the Bureau of Meteorology's hazard services.

The forum provides a pathway for states and territories to request and prioritise changes to the standard services and to refer services that could be considered supplementary services to the Bureau for consideration. The HSF also assists with the process of consulting on modifications to services schedules.

### **3.2. Commonwealth, State and Territory Liaison and Consultation**

The Bureau maintains ongoing liaison and engagement at a Commonwealth, state and territory level with emergency management organisations to ensure all parties maintain awareness of thunderstorm and severe weather operations and procedures. This occurs through regular meetings between team leaders and operations managers in the Bureau and the emergency service. The format, timing and frequency of these meetings is agreed through state and territory-based arrangements.

### **3.3. Performance Statistics and Reporting**

#### **3.3.1. Verification**

All official forecast and warning products are verified against available observations and compiled into routine reports. Key performance measures are reported in the Bureau's Annual Report.

#### **3.3.2. Damage Assessments**

The Bureau may choose to undertake damage assessments after severe thunderstorm and/or severe weather events, to advance knowledge and understanding of these high impact occurrences, and for verification and reporting purposes. At times, the Bureau may ask emergency service organisations and local governments (councils) to provide additional information, reports, and intelligence about a specific event, which may ultimately improve the final damage assessment. The Bureau of Meteorology will liaise with the relevant emergency service organisation if access is desired to any restricted areas impacted by severe weather and will always respect the directions of emergency services.

### **3.4. Lessons Management**

The Bureau conducts an internal debrief and lessons management process after the occurrence of severe thunderstorms and severe weather which have had a significant community or operational impact.

The insights and recommendations gained from these post event reviews are used to improve processes, systems and services delivered by the Bureau.

Depending on the impact from the severe thunderstorm or severe weather event, the process may include a debrief with external partners. Upon request, the Bureau also contributes to post incident reviews conducted by emergency services and government.

### **3.5. Meteorologist Training and Competency**

The Bureau undertakes competency-based training and assessment programs for qualified meteorologists involved in forecast, warning, and decision support operations.

This includes a public weather warning training and assessment program, and a specific severe thunderstorm training and competency-based assessment program. These programs ensure that staff involved in analysing, forecasting, and warning for severe thunderstorms and severe weather have the qualifications, training and demonstrated ability to provide a high standard service to the Australian community.

ELEASSED UNDER FREEDOM OF INFORMATION



## 4. National Thunderstorm and Severe Weather Routine Product Suite

Unless otherwise noted, all issue times are quoted as local time for the relevant jurisdiction and time of year.

### 4.1. Real-time Data Services & Australian Digital Forecast Database

The Bureau's real-time data services provide tailored delivery of real-time Bureau of Meteorology products including datasets such as numerical output grids, satellite and radar data and web map service layers.

Part of these services is the Australian Digital Forecast Database (ADFD), which provides detailed forecast information across all states and mainland territories, including grids that are relevant to thunderstorms. These grids are available all year round.

The ADFD files are updated routinely twice per day at approximately 6:00 am and 6:00 pm local time and updated at other times, as required. If the forecasts are updated, the ADFD grids are not necessarily updated at the same time as the changes to the forecasts. Priority is given to updating the forecasts and warnings issued directly to the public through the media or internet.

Further details on real-time data services and the ADFD, including information on data bundles, can be found at <http://reg.bom.gov.au/reguser/> or <http://reg.bom.gov.au/catalogue/adfdUserGuide.pdf>.

### 4.2. Thunderstorm Forecasts

The Bureau routinely provides geospatial thunderstorm forecasts to emergency services as a planning and operational decision support resource. These thunderstorm forecasts provide a graphical depiction of the geospatial areas which may be affected by thunderstorms and severe thunderstorms for the remainder of the current day (Day 1) and the following day (Day 2).

Thunderstorm forecasts are published to various Bureau registered user websites, from where they can be accessed by emergency services and are also provided to specific registered users by email.

Thunderstorm forecasts are published via social media from respective state or territory Bureau accounts, typically when severe thunderstorms are considered possible or likely and/or there is potential for significant community impact.

#### 4.2.1. Issue Criteria, Times, and Validity

Thunderstorm forecasts are issued routinely, once a day, during selected periods of the year, as listed in Table 5. In some jurisdictions, forecasts may be issued outside this period when severe thunderstorms are considered possible and/or likely and/or there is potential for significant community impact.

Separate forecasts are issued for each state and mainland territory (ACT are included in NSW thunderstorm forecasts).

The issue times for thunderstorm forecasts are set to meet the needs of emergency services, and account for Bureau workflow processes and priorities.

State/Territory	Seasonal Coverage	Day 1 Issue Time	Day 2 Issue Time
Queensland	All year round	09:45 am (23:45 UTC)	11:30 am (01:30 UTC)
NSW/ACT	All year round	By 11:00 am (00:00 UTC)	By 11:00 am (00:00 UTC)
Victoria	All year round	By 7:00 am, updated by 11:30 am (00:30 UTC), if required	1:45 pm (02:45 UTC)
Tasmania	Not provided		
South Australia	1/10 to 30/04, ad hoc at other times	12:00 pm (01:30 UTC)	12:00 pm (01:30 UTC)
Western Australia	1/10 to 30/04	10:30 am (02:30 UTC)	10:30 am (02:30 UTC)
Northern Territory	1/10 to 30/04, ad hoc at other times	12:00 pm (02:30 UTC)	2:00 pm (04:30 UTC)

Table 5: The seasonal coverage and local issue times for the thunderstorm forecasts for each state and mainland territory

#### 4.2.2. Content

The thunderstorm forecast comprises of a national map and accompanying text description. The map uses shaded polygons that depicts geospatial areas where thunderstorms are possible as well as areas where severe thunderstorms are considered possible or likely, as defined in Table 6.

Forecast polygon category	Definition
Thunderstorms Possible	10% to 30% probability of lightning within 10 km of a point
Severe Thunderstorms Possible	If a thunderstorm occurs, the probability of it being severe is 10% to 30% within 10 km of a point
Severe Thunderstorms Likely	If a thunderstorm occurs, the probability of it being severe is $\geq 30\%$ within 10 km of a point

Table 6: Definition and shading of polygon categories on the thunderstorm forecast

### 4.2.3. Amendment Criteria

There is no requirement to update thunderstorm forecasts after issue. However, at times, it may be beneficial to do so, to ensure significant changes to the thunderstorm forecast policy can be effectively communicated to emergency services, and possibly to the community via social media.

## 5. National Thunderstorm and Severe Weather Non-Routine Product Suite

### 5.1. Severe Thunderstorm Warnings

A Severe Thunderstorm Warning is issued whenever there is sufficient meteorological evidence to suggest that severe thunderstorm development is likely, or when a severe thunderstorm has been directly reported or observed, or inferred through various observational datasets, and a Severe Thunderstorm Warning is not already current.

The Bureau issues two types of Severe Thunderstorm Warnings that alert the community, emergency services and other organisations about the threat of severe thunderstorms.

- Regional Severe Thunderstorm Warnings
- Detailed Severe Thunderstorm Warnings

If severe thunderstorms develop within an area that is already described by a Severe Weather Warning (refer Section 5.2), a separate Severe Thunderstorm Warning will only be issued if a hazard (as defined by section 2.2.2) other than those already included in the Severe Weather Warning is occurring or expected to occur. This may include escalations of hazards mentioned in the Severe Weather Warning, e.g., Severe Thunderstorm Warning for intense rainfall associated with thunderstorms within a broader Severe Weather Warning for heavy rainfall.

#### 5.1.1. Warning Content

A Severe Thunderstorm Warning consists of information that highlight threat areas and potential phenomena in a graphical and textual format.

##### **Title**

The title states the warning type and lists potential phenomena and the affected weather forecast districts.

##### **Issuance Time**

The issuance time and date of the severe thunderstorm warning.

##### **Headline Statement**

A succinct one-line statement that describes the '*where, what, and when*' of key severe thunderstorm threats.

### **Graphical Warning Content**

Displays a geospatial map of weather forecast district boundaries overlain with one or more yellow shaded polygons depicting the spatial extent of the warning.

### **Weather Situation**

A brief description on the current and/or developing severe thunderstorm situation. It lists the synoptic drivers producing the severe thunderstorms and may provide an overview on the spatial and temporal extent of the severe thunderstorm activity.

### **Warning Details**

The main body of the warning lists potential phenomena and affected locations.

### **Observations**

Any significant observations recorded relevant to the hazards listed in the warning.

### **Action Statements**

Automatically generated action statements that have been agreed upon by state and territory-based emergency services.

### **Warning Updates**

The update time of the next severe thunderstorm warning.

### **Warning Accessibility**

Automatically generated text that provides a brief statement on the additional channels where the severe thunderstorm warning is broadcast.

## **5.1.2. Regional Severe Thunderstorm Warnings**

The Bureau provides Regional Severe Thunderstorm Warnings for all states and mainland territories. Warning areas are based on one or more weather forecast districts and/or parts of weather forecast districts.

### ***Issue Criteria and Validity***

Regional Severe Thunderstorm Warnings are issued whenever there is sufficient meteorological evidence to suggest that severe thunderstorm development is likely within the next 3 hours. They are also issued when a severe thunderstorm has been observed, or when a severe thunderstorm outside the warning domain is expected to move into the area.

Regional Severe Thunderstorm Warnings are valid for a three-hour period from the issuance time and will be updated routinely every one to two hours but may be updated more frequently during rapidly evolving situations. Depending on forecast confidence and the level of threat, Regional Severe Thunderstorm Warnings may be issued with shorter lead times.

If a current Regional Severe Thunderstorm Warning does not adequately describe the situation, it will be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

Once the threat of severe thunderstorms has passed, the Regional Severe Thunderstorm Warning will be cancelled.

### **5.1.3. Detailed Severe Thunderstorm Warnings**

The Bureau provides Detailed Severe Thunderstorm Warnings for all capital cities and surrounding areas, as shown in Appendix [6.2](#). They provide time and location-specific information about the severe thunderstorm threat.

#### ***Issue Criteria and Validity***

Detailed Severe Thunderstorm Warnings are issued when one or more severe thunderstorms are detected within the warning domain, or an existing thunderstorm is forecast to become severe within the next 60 minutes. They are also issued when a severe thunderstorm outside of the detailed severe thunderstorm warning domain is expected to move into the area.

Detailed Severe Thunderstorm Warnings are valid for 30 or 60 minutes from the issuance time and will be updated routinely every 30 to 60 minutes. If a current Detailed Severe Thunderstorm Warning does not adequately describe the situation, it will be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

When the threat of severe thunderstorms has eased within a metropolitan area but further development is possible within the next 60 minutes, and the Regional Severe Thunderstorm Warning which includes the metropolitan area remains current, the Detailed Severe Thunderstorm Warning will be suspended. The text of the suspended warning will advise that severe thunderstorms have eased but the situation will be closely monitored. Only once no further severe thunderstorms are anticipated, the Detailed Severe Thunderstorm Warning will be cancelled, following an update of the Regional Severe Thunderstorm Warning to remove the metropolitan area.

#### **Additional Graphical Warning Content**

If a Regional Severe Thunderstorm Warning is in effect over parts of the relevant Detailed Severe Thunderstorm Warning domain, the Detailed Severe Thunderstorm Warning graphic will include the area of the Regional Severe Thunderstorm Warning as well as a depiction of the areas under immediate threat from individual severe thunderstorm cells.

The graphic transmitted to the emergency services contains additional information and shows all thunderstorms (severe or otherwise) and automated tracks depicting the past movement of these thunderstorms.

#### **Additional Warning Text Details**

In addition to the information described in Section [5.1.1](#), the warning will also specify current and future impacted locations that correspond to an existing severe thunderstorm (red shaded ellipses) and an immediate threat area (orange-hashed shaded polygons).

## 5.2. Severe Weather Warnings

The Bureau issues Severe Weather Warnings that alert the community, emergency services and other organisations about the threat of severe weather. They are issued whenever there is sufficient meteorological evidence to suggest that severe weather, that is not the direct consequence of thunderstorms, is occurring or expected to develop.

Severe Weather Warnings are issued for all states and mainland territories where all warning areas are based on one or more weather forecast districts and/or parts of weather forecast districts.

Severe Weather Warnings for Lord Howe Island and Norfolk Island are issued for the whole island and are text-based warnings.

### 5.2.1. Issue Criteria and Validity

Severe Weather Warnings are issued when severe weather is occurring or is expected to develop. Note that in addition to the definitions of severe weather provided in Section 2.2, some discretion may be applied based on input from emergency management agencies to drive an appropriate response in the community to the weather event.

The lead-time provided for a Severe Weather Warning will depend on the nature of the event, the ability to forecast it with reasonable certainty and the time of day. In general, severe weather events will fall into two categories:

- Broad-scale phenomena such as east coast lows, recently decayed tropical cyclones, widespread land gales or vigorous cold fronts
- Local-scale phenomena such as localised heavy rain or damaging wind gusts caused by topography

For broad-scale phenomena, Severe Weather Warnings will aim to be issued 24 to 36 hours ahead of the expected onset of severe weather conditions. Depending on forecast confidence and the level of threat, Severe Weather Warnings may be issued with shorter lead times.

Local-scale phenomena are more difficult to forecast with significant lead-time and in some instances, Severe Weather Warnings will be issued with shorter lead times.

Severe Weather Warnings do not have a prescribed validity period, this is described in general terms within the warning details section.

Once a Severe Weather Warning is issued, routine updates will be issued at least every six hours until the threat has passed. They are typically updated at the standard times of 4:30 - 5:00 am, 10:30 - 11:00 am, 4:30 - 5:00 pm and 10:30 - 11:00 pm in local time, but may be updated more frequently, during rapidly evolving situations or periods of high-impact severe weather.

Severe Weather Warnings are provided for abnormally high tides and damaging/dangerous surf (for most states and territories - refer to Table ) in a dedicated Severe Weather Warning for coastal hazards. As a result, there may be two Severe Weather Warnings in place for overlapping areas for

concurrent severe weather phenomena. In this instance, one warning would be covering land-based phenomena while the second warning would be covering coastal-based phenomena. When concurrent Severe Weather Warnings for coastal-based phenomena and land-based phenomena occur, the warning products will reference each other.

Once the threat of severe weather has passed the Severe Weather Warning will be cancelled.

### **5.2.2. Warning Content**

A Severe Weather Warning consists of various sections that highlight threat areas and potential phenomena in a graphical and textual format.

#### **Title**

The title states the warning type and lists potential phenomena and the affected weather forecast districts.

#### **Issuance Time**

The issuance time (local time) and date of the severe weather warning.

#### **Headline Statement**

A succinct one-line statement that describes the 'where, what, and when' of key severe weather threats.

#### **Graphical Warning Content**

Displays a geospatial map of weather forecast district boundaries overlain with one or more yellow shaded polygons depicting the spatial extent of the warning.

#### **Weather Situation**

A description of the current and/or developing severe weather situation. It generally covers the current and future synoptic pattern along with the major weather systems that will produce the severe weather.

#### **Warning Details**

The main body of the warning lists potential phenomena and describes their upper limits or ranges, probability, and temporal characteristics. It may describe the current situation and the spatial distribution of the weather indicated by radar and satellite.

#### **Locations**

A summary of locations which may be affected by the severe weather event.

#### **Observations**

Any significant observations recorded relevant to the hazards listed in the warning.

#### **Action Statements**

Automatically generated action statements that have been agreed upon by state and territory-based emergency services.

## Warning Updates

The update time of the next severe weather warning in local time.

## Warning Accessibility

Automatically generated text that provides brief statement on the additional channels where the severe weather warning is broadcasted.

## 5.3. Warning Escalations

### 5.3.1. Very Dangerous Storm (VDS)

If there is an expectation or a report of one or more high-end severe phenomena listed in the VDS criteria from Section 2.2.2, a label that states **'This thunderstorm is very dangerous'** will be added to the Detailed Severe Thunderstorm Warning graphic. An example has been provided in Section [6.3.3](#).

The warning details will also declare that a very dangerous storm has been detected on the weather radar with an updated list of destructive phenomena.

Once the threat of high-end severe phenomena listed in the VDS criteria from Section 2.2.2 has passed, the label will be excluded from the warning graphic.

### 5.3.2. Standard Emergency Warning Signal

The Standard Emergency Warning Signal (SEWS) is a siren sound used as an alerting signal in Queensland, Victoria, and Tasmania. The SEWS is designed to alert the community to the broadcast of an urgent safety message relating to a VDS with one or more confirmed high-end severe phenomena from Section 2.2.2 on the Australian Broadcasting Corporation (ABC) radio stations.

The signal is sounded immediately prior to an emergency warning message being played on ABC broadcasts, in the potential or likely impacted areas. As part of a coordinated national emergency plan, the SEWS is used to attract attention to emergency warnings.

The Bureau can request the use of the SEWS by including a standardised SEWS statement in a Severe Thunderstorm Warning. In the event where a request is warranted, SEWS text will be added above the title section on either or both Regional and Detailed Severe Thunderstorm Warnings. It will explicitly state the major towns, suburbs, cities or local government areas where the SEWS should be directed, transmitted, and broadcast on the ABC. An example has been provided in Section [6.3.3](#).

The official activation of the SEWS is at the discretion of the ABC.

Once the threat of high-end severe phenomena listed from Section 2.2.2 has passed, the SEWS request will be cancelled by excluding the associated text from the warning.

The following criteria is to be satisfied before requesting the use of the SEWS:



- A confirmed report of **one or more high-end severe phenomena** listed in the VDS criteria from Section 2.2.2 by a reliable source such as a Bureau observer, automatic weather station, storm spotter and/or trustworthy social media outlet.
- It is of sufficient scale where a significant number of people will be warned. This includes all towns and cities that have a designated Bureau forecast (see Figure 4, 6 and 7 in Appendix 6.1), and all areas within the respective Detailed Severe Thunderstorm Warning domain.
- Is expected to continue for 30 minutes or more.

### 5.3.3. Emergency Weather Alerts

An Emergency Weather Alert (EWA) is a verbal notification provided to Queensland Fire and Emergency Services (QFES) and Queensland Police Service (QPS). It is done at the meteorologist's discretion when they believe there are special circumstances requiring notification but there is insufficient evidence such as a confirmed high-end severe report to trigger a request of the SEWS, as described in Section [5.3.2](#).

An EWA can be invoked for any area across Queensland, irrespective of known population.

Once the threat of high-end severe phenomena listed from Section 2.2.2 has passed, the meteorologist will provide a verbal notification of cancellation to QFES and the QPS.

RELEASED UNDER FREEDOM OF INFORMATION

## 6. Appendices

### 6.1. Weather Forecast District Maps



Figure 3: Weather Forecast Districts for Queensland

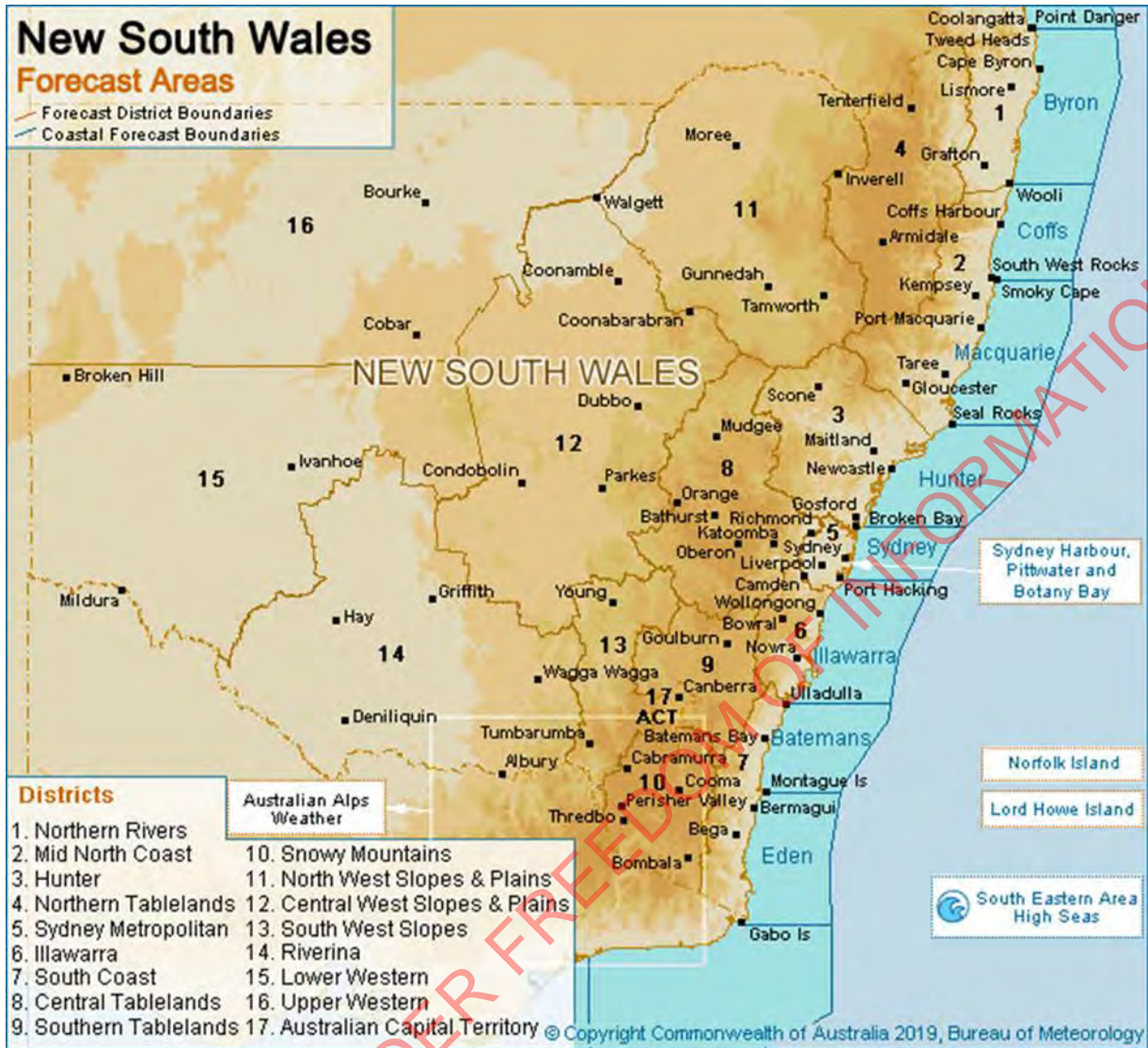


Figure 4: Weather Forecast Districts for New South Wales



Figure 5: Weather Forecast Districts for Victoria

RELEASED UNDER FREEDOM OF INFORMATION

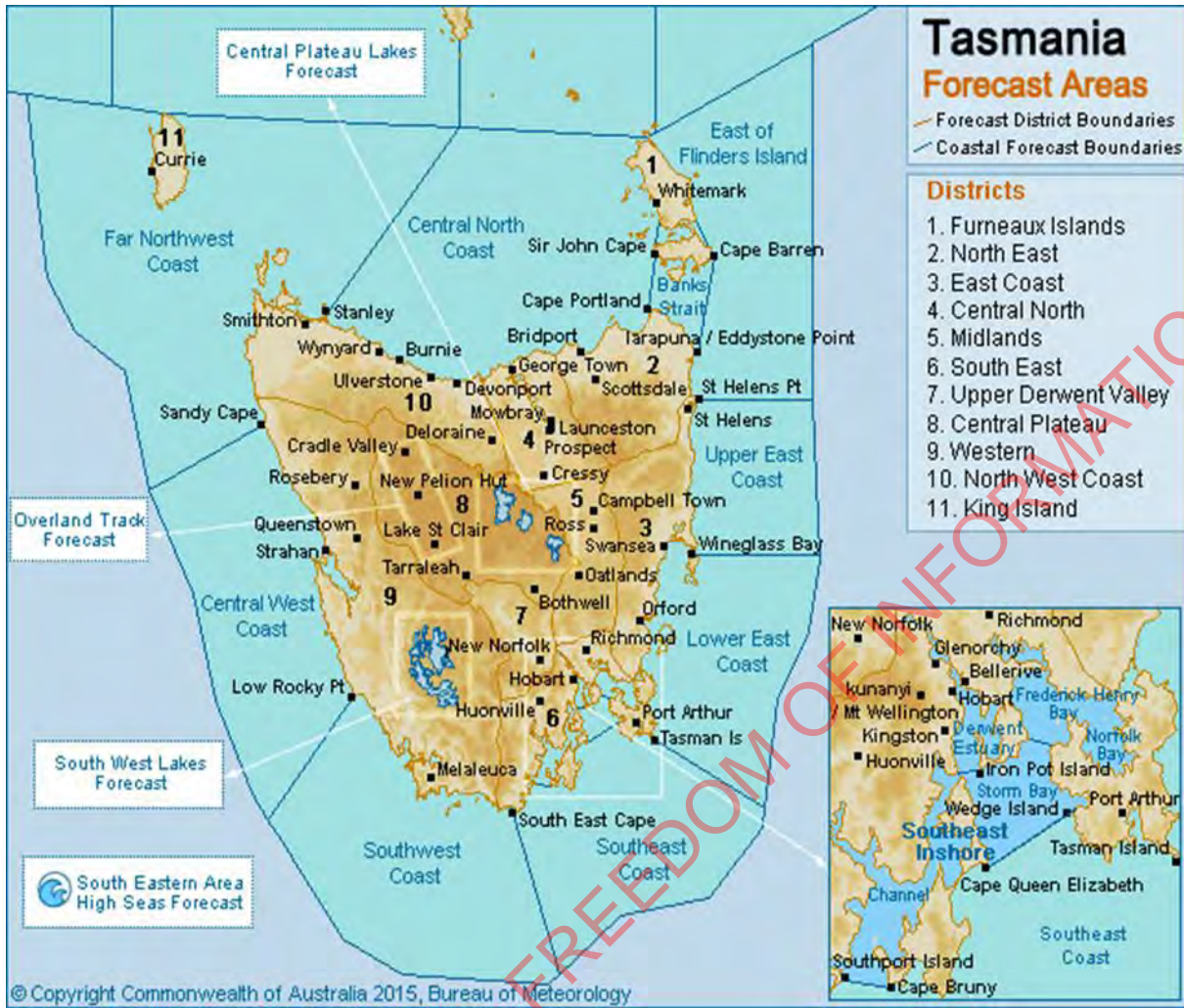


Figure 6: Weather Forecast Districts for Tasmania

RELEASED UNDER FREEDOM OF INFORMATION



Figure 7: Weather Forecast Districts for South Australia



Figure 8: Weather Forecast Districts for Western Australia







Figure 10: Detailed Severe Thunderstorm Warning domain – Brisbane and Southeast Queensland



Figure 11: Detailed Severe Thunderstorm Warning domain – Sydney, Newcastle, Wollongong

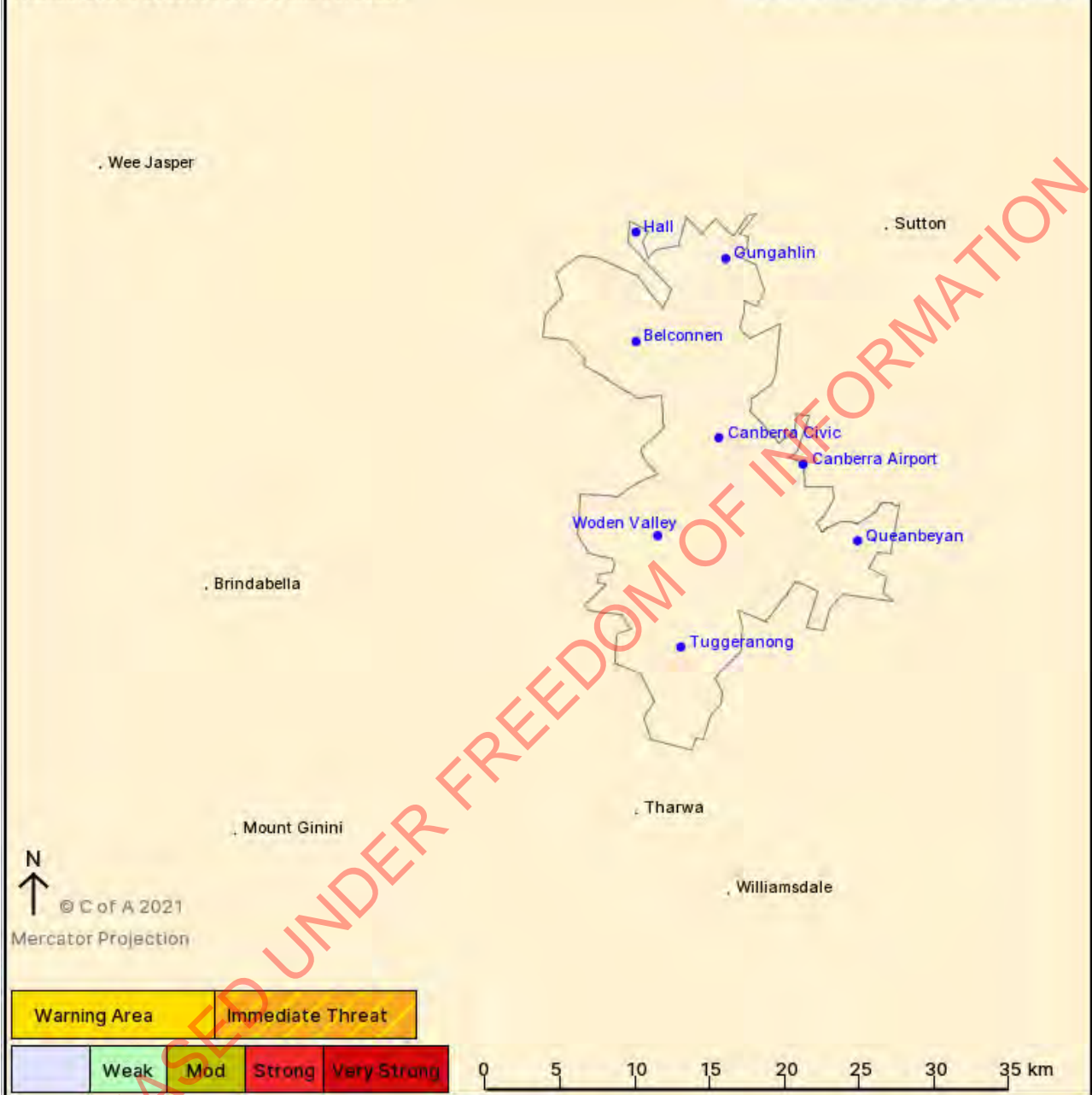


Figure 12: Detailed Severe Thunderstorm Warning domain – Canberra

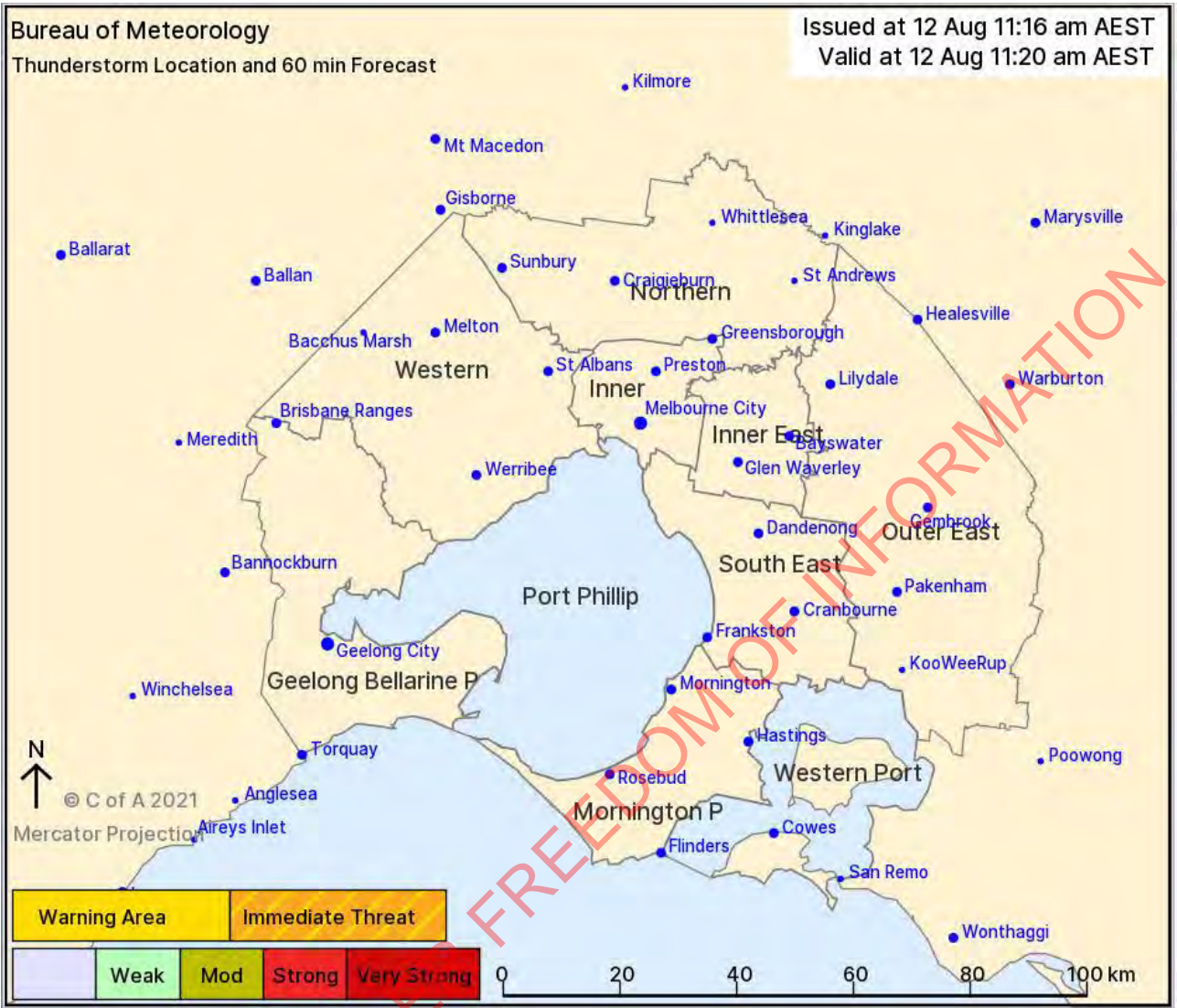


Figure 13: Detailed Severe Thunderstorm Warning domain – Melbourne

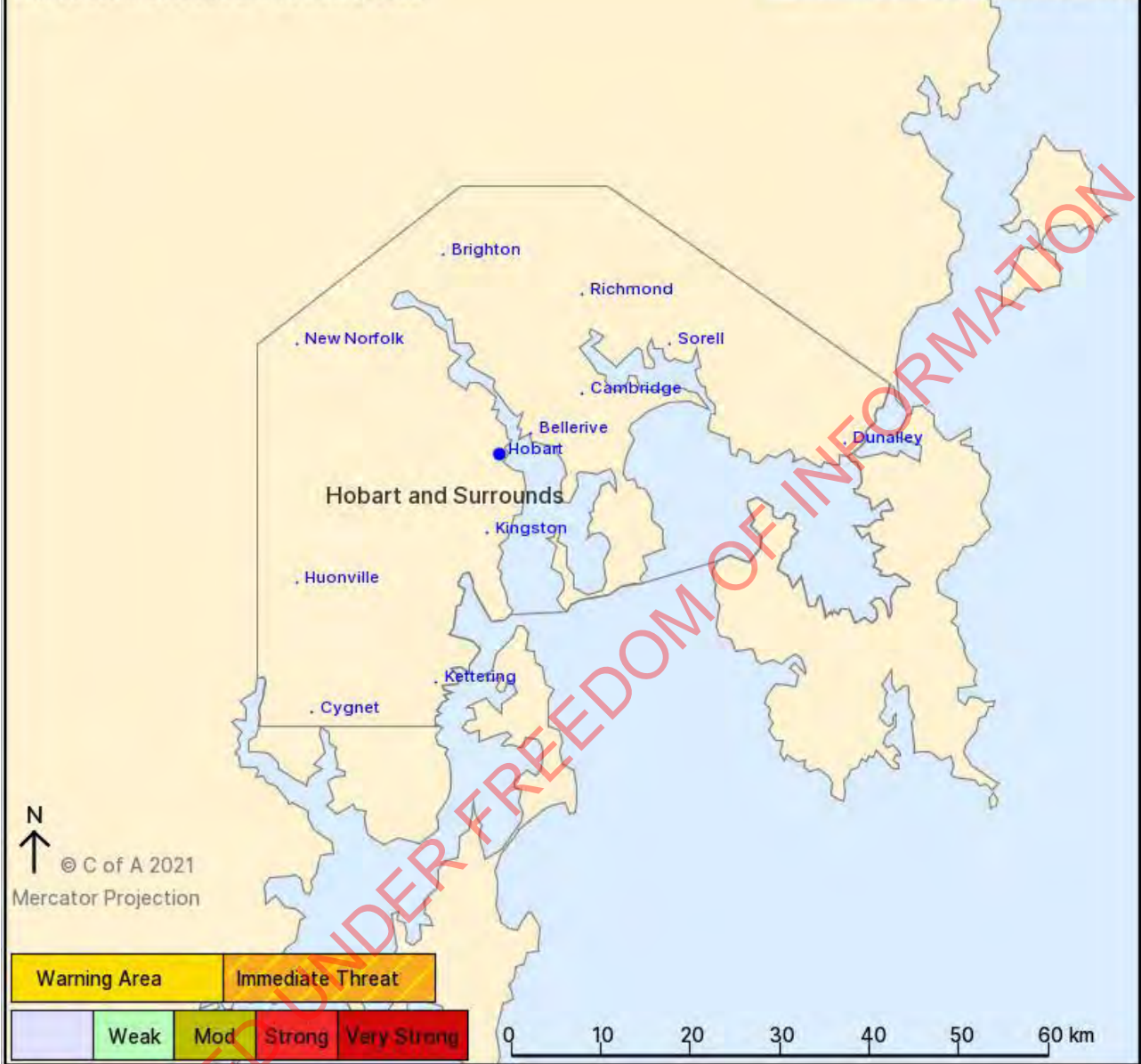


Figure 14: Detailed Severe Thunderstorm Warning domain – Hobart

RELEASE UNDER FREEDOM OF INFORMATION



Figure 15: Detailed Severe Thunderstorm Warning domain – Adelaide

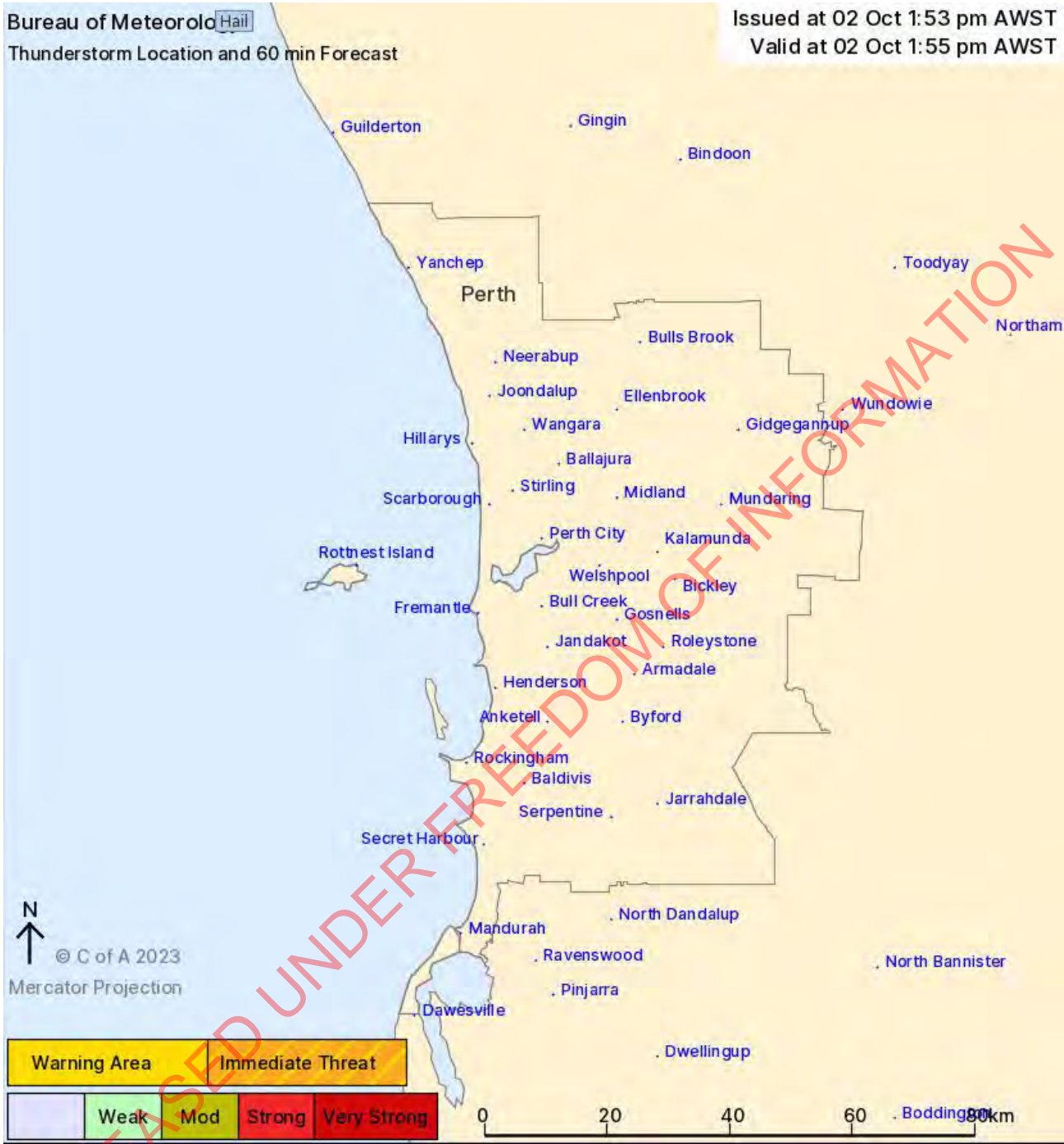


Figure 16: Detailed Severe Thunderstorm Warning domain – Perth

**OFFICIAL**

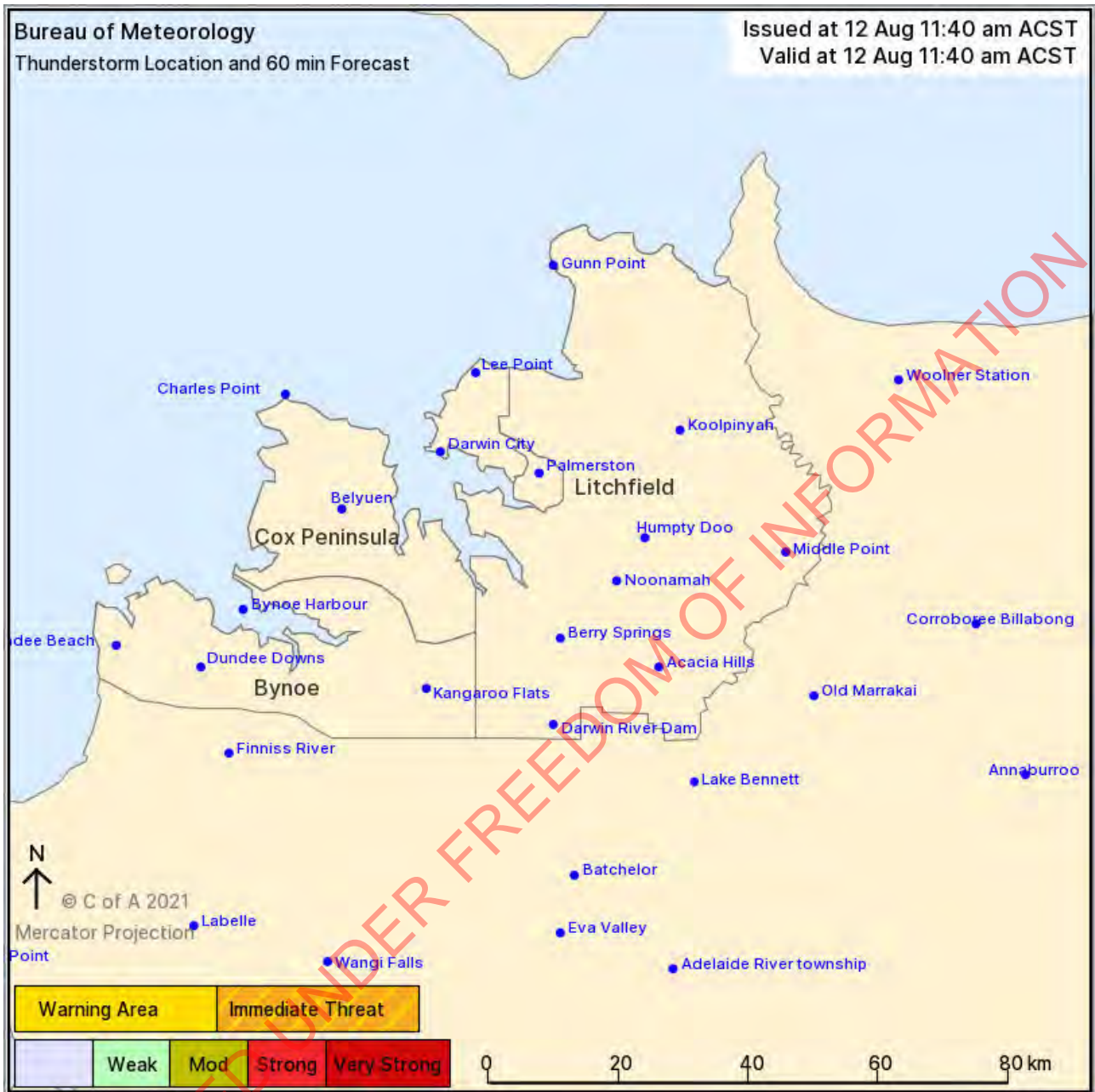


Figure 17: Detailed Severe Thunderstorm Warning domain – Darwin

## 6.3. Product Samples

### 6.3.1. Thunderstorm Forecast Map

IDS21032

Australian Government Bureau of Meteorology  
South Australia

OFFICIAL

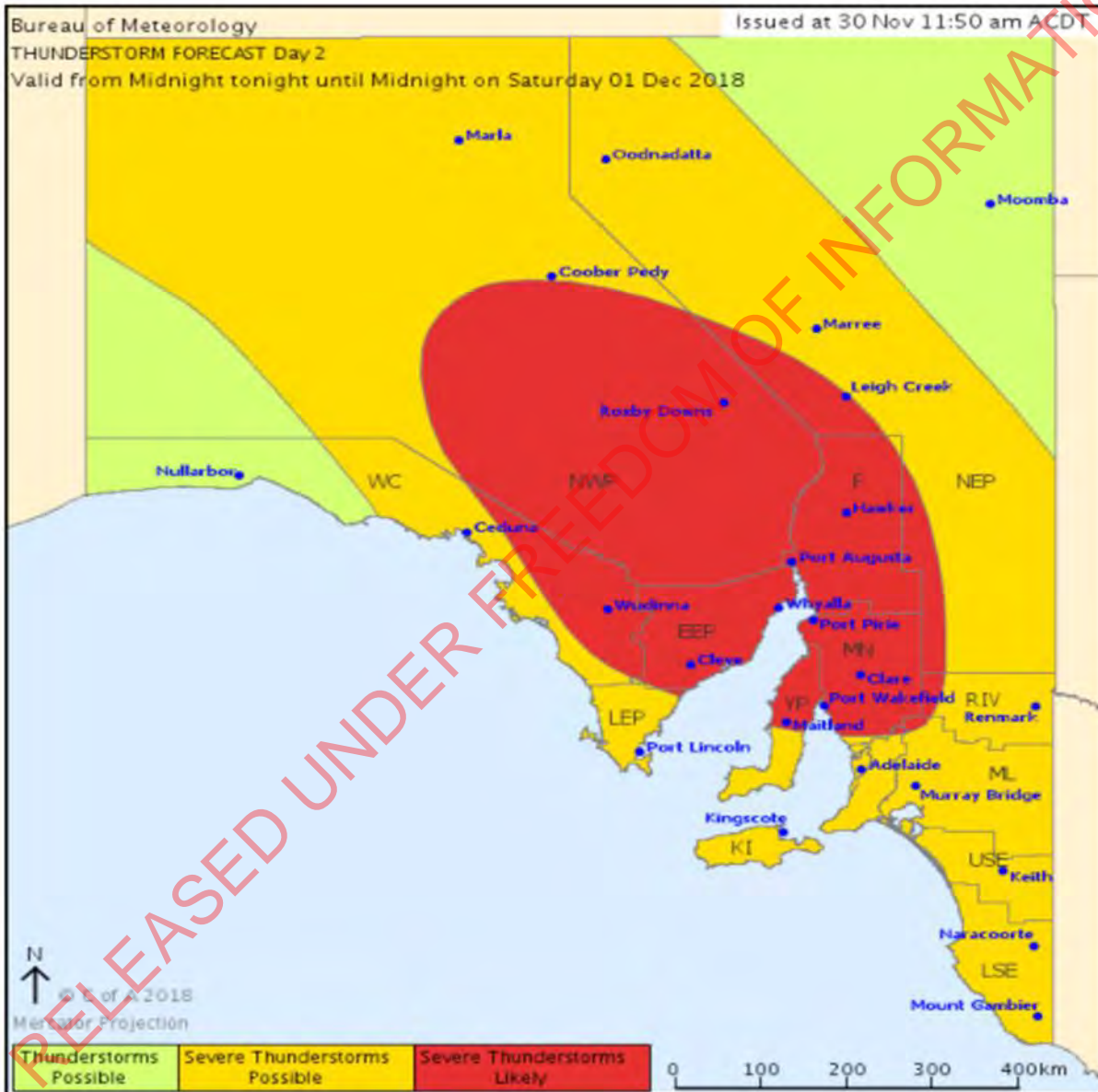


### Day 2 Thunderstorm Forecast

Issued at 11:00am Friday, 30 November 2018,

Valid from midnight tonight until midnight on Saturday, 1 December 2018.

Thunderstorms are possible across SA on Saturday with severe thunderstorms possible across a broad swathe. There is a slight risk of damaging winds from the morning in the west and south. In the afternoon, severe thunderstorms are forecast to develop near the front over the Eyre Peninsula and the North West Peninsula district, moving eastward across central parts late afternoon and evening. Damaging to destructive wind gusts are possible. Large hailstones are also possible, particularly in the severe likely area.



OFFICIAL



Queensland Fire and Emergency Services advises that people should:

- \* Move your car under cover or away from trees.
- \* Secure loose outdoor items.
- \* Never drive, walk or ride through flood waters. If it's flooded, forget it.
- \* Seek shelter, preferably indoors and never under trees.
- \* Avoid using the telephone during a thunderstorm.
- \* Beware of fallen trees and powerlines.
- \* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 2:50 pm.

If severe thunderstorms develop in the Southeast Queensland area (east of Dalby from Rainbow Beach to Stanthorpe), a more detailed Severe Thunderstorm Warning will be issued to people in this area. Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

### **6.3.3. Detailed Severe Thunderstorm Warning**

DQ21035

Australian Government Bureau of Meteorology

**Transmitters serving the area Ipswich, Greenbank, Logan area are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.**

#### **TOP PRIORITY FOR IMMEDIATE BROADCAST**

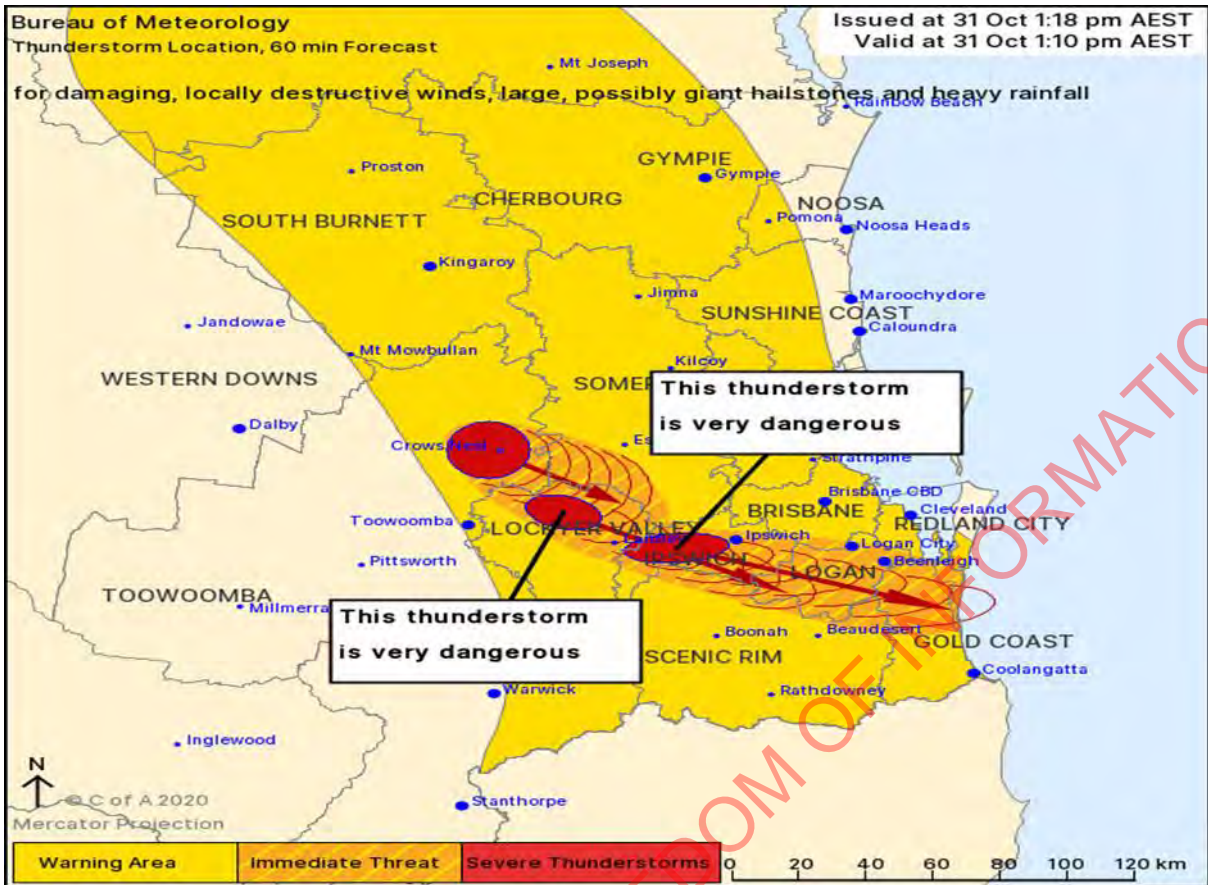
#### **Severe Thunderstorm Warning - Southeast Queensland for DESTRUCTIVE WINDS, GIANT HAILSTONES and HEAVY RAINFALL**

For people in Ipswich, Logan and parts of Scenic Rim, Lockyer Valley, Gold Coast, Redland City and Brisbane City Council Areas.

Issued at 1:18 pm Saturday, 31 October 2020.

**VERY DANGEROUS STORMS WITH GIANT HAIL LOCATED OVER AND NEAR GATTON AND IPSWICH.**

RELEASED UNDER FREEDOM OF INFORMATION



The Bureau of Meteorology warns that, at 1:10 pm, very dangerous thunderstorms were detected on the weather radar near Gatton, Rosewood and Grandchester. These thunderstorms are moving towards the east to southeast. Very dangerous thunderstorms are forecast to affect Laidley, Redbank Plains and Hatton Vale by 1:40 pm and Hope Island, Jimboomba and South Stradbroke Island by 2:10 pm.

Other severe thunderstorms were detected on the weather radar near Crows Nest and Hampton. They are forecast to affect the area southwest of Esk by 1:40 pm and the area south of Esk and the area west of Esk by 2:10 pm.

Damaging, locally destructive winds, large, possibly giant hailstones, and heavy rainfall that may lead to flash flooding are likely.

4-7cm has been observed around Gatton and Adare around 12:30pm

Queensland Fire and Emergency Services advises that people should:

- \* Move your car under cover or away from trees.
- \* Secure loose outdoor items.
- \* Never drive, walk or ride through flood waters. If it's flooded, forget it.
- \* Seek shelter, preferably indoors and never under trees.
- \* Beware of fallen trees and powerlines.
- \* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 2:20 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

### 6.3.4. Severe Weather Warning

IDQ21037

Australian Government Bureau of Meteorology

Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST

#### Severe Weather Warning for HEAVY RAINFALL

For people in parts of North Tropical Coast and Tablelands, and Herbert and Lower Burdekin Forecast Districts.

Issued at 1:00 pm Wednesday, 30 January 2019.

#### HEAVY, LOCALLY INTENSE, RAINFALL CONTINUING ACROSS THE HERBET AND LOWER BURDEKIN.



OFFICIAL

Weather Situation: A convergent zone embedded along the monsoon trough has developed to the west of Townsville, producing a swath of very heavy, locally intense, rainfall across the Herbert and Lower Burdekin district. The convergence zone is expected to remain near-stationary for the remainder of the day.

Heavy rainfall, which is likely to lead to flash flooding, will continue for the remainder of today and into Friday across the warning area. Six-hourly rainfall totals between 150mm to 200mm are likely, with locally intense rainfall totals up to 300mm possible.

Locations which may be affected include Townsville, Palm Island, Ingham, Cardwell, Woodstock and Lucinda. Rainfall totals between 9am to 1pm on Wednesday:  
274mm at Upper Black River  
202mm at Blue Water

Queensland Fire and Emergency Services advises that people should:

- \* Never drive, walk or ride through flood waters. If it's flooded, forget it.
- \* Keep clear of creeks and storm drains.
- \* For emergency assistance contact the SES on 132 500.

The next Severe Weather Warning will be issued by 5:00 pm AEST Wednesday.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 219. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

### **6.3.5. Severe Weather Warning**

IDT21137

**Australian Government Bureau of Meteorology  
TOP PRIORITY FOR IMMEDIATE BROADCAST**

**Severe Weather Warning  
for ABNOMRALLY HIGH TIDES  
For people in parts of Western, South East and East Coast Forecast Districts.**

Issued at 1:00 pm Wednesday, 30 January 2019.

RELEASED UNDER FREEDOM OF INFORMATION



**Abnormally high tides are expected along western, southern, and lower eastern Tasmania coasts**

Weather Situation: High astronomical tides over the coming days are expected to coincide with a low pressure system, resulting in abnormally high tides that may lead to localised inundation.

ABNORMALLY HIGH TIDES, which may cause sea water flooding of low-lying areas, are expected along western, southern and lower eastern Tasmania coasts and tidal rivers during Friday, Saturday and Sunday. The high tides along the southeast and lower east coasts are expected during the evening on all three days. The high tides along the west coast are expected during the afternoon on all three days.

The highest tides will occur during Saturday and will bring the highest risk of inundation. Tides are expected to be about 40 to 50 cm higher than the standard astronomical tides during this time and may be the highest experienced across southeastern Tasmania since 1994.

Locations which may be affected include Orford, Strahan, Hobart, and Dover.

The State Emergency Service advises that people should:

- \* Supervise children closely.
- \* Manage pets and livestock.
- \* Be prepared in case of power outages and report any outages to TasNetworks on 132 004.
- \* Do not walk, ride, or drive through flooded waters.
- \* For emergency assistance contact the SES on 132 500.

The next Severe Weather Warning will be issued by 11:00 pm AESR Friday.

Warnings are also available through TC and Radio broadcasts, and Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and State Emergency would appreciate warnings being broadcast regularly.

### 6.3.6. Severe Weather Warning for offshore Islands

IDN28504

Australian Government Bureau of Meteorology  
New South Wales

#### Severe Weather Warning for DAMAGING SURF for Lord Howe Island

Issued at 10:54 pm LHST on Thursday 5 August 2021

#### LARGE AND POWERFUL SURF ON THURSDAY

##### Weather Situation

Large and powerful southwesterly swell has been generated by a deep complex low pressure system over the southern Tasman Sea and will slowly decrease as the low moves further east.

Damaging surf conditions, with waves exceeding 5 metres in the surf zone, may produce significant beach erosion for southwest facing beaches during Thursday evening and early Friday morning. Surf conditions are expected to ease during Friday morning.

The State Emergency Services advises that people should:

- \* Check your property regularly for erosion or inundation by sea water, and if necessary, raise goods and electrical items.
- \* Stay out of the water and stay well away from surf-exposed areas.

For emergency help in floods and storms, ring the Lord Howe Island Police on [02] 6563 2199

The next warning will be issued by 5:00am LHST on Friday 6<sup>th</sup> August 2021.

### 6.4. Product Identifiers

Product ID	Description
<b>New South Wales</b>	
IDN21031	Thunderstorm Forecast Day 1
IDN21032	Thunderstorm Forecast Day 2
IDN21033	Regional Severe Thunderstorm Warning
IDN21035	Detailed Severe Thunderstorm Warning - Sydney, Wollongong, Newcastle
IDN21036	Detailed Severe Thunderstorm Warning - Canberra
IDN21037	Severe Weather Warning - 1
IDN21038	Severe Weather Warning - 2
IDN21137	Severe Weather Warning - 3
IDN28503	Severe Weather Warning – Norfolk Island



IDN28504	Severe Weather Warning – Lord Howe Island
<b>Northern Territory</b>	
IDD21031	Thunderstorm Forecast Day 1
IDD21032	Thunderstorm Forecast Day 2
IDD21033	Regional Severe Thunderstorm Warning - 1
IDD21034	Regional Severe Thunderstorm Warning - 2
IDD21035	Detailed Severe Thunderstorm Warning – Darwin City and Outer Darwin
IDD21037	Severe Weather Warning - 1
IDD21038	Severe Weather Warning - 2
IDD21137	Severe Weather Warning - 3
<b>Queensland</b>	
IDQ21031	Thunderstorm Forecast Day 1
IDQ21032	Thunderstorm Forecast Day 2
IDQ21033	Regional Severe Thunderstorm Warning -1
IDQ21035	Detailed Severe Thunderstorm Warning – Southeast Queensland
IDQ21037	Severe Weather Warning - 1
IDQ21038	Severe Weather Warning - 2
IDQ21137	Severe Weather Warning - 3
	Thunderstorm Tracker – Southeast Queensland
<b>South Australia</b>	
IDS21031	Thunderstorm Forecast Day 1
IDS21032	Thunderstorm Forecast Day 2
IDS21033	Regional Severe Thunderstorm Warning -1
IDS21035	Detailed Severe Thunderstorm Warning – Adelaide Region
IDS21037	Severe Weather Warning - 1
IDS21038	Severe Weather Warning - 2
IDS21137	Severe Weather Warning - 3
<b>Tasmania</b>	
IDV21031	Thunderstorm Forecast Day 1
IDV21032	Thunderstorm Forecast Day 2
IDV21033	Regional Severe Thunderstorm Warning -1
IDV21035	Detailed Severe Thunderstorm Warning – Melbourne Area
IDV21037	Severe Weather Warning - 1
IDV21038	Severe Weather Warning - 2
IDV21137	Severe Weather Warning - 3
<b>Victoria</b>	
IDV21031	Thunderstorm Forecast Day 1
IDV21032	Thunderstorm Forecast Day 2

IDV21033	Regional Severe Thunderstorm Warning -1
IDV21035	Detailed Severe Thunderstorm Warning – Melbourne Area
IDV21037	Severe Weather Warning - 1
IDV21038	Severe Weather Warning - 2
IDV21137	Severe Weather Warning - 3
<b>Western Australia</b>	
IDW21031	Thunderstorm Forecast Day 1
IDW21032	Thunderstorm Forecast Day 2
IDW21033	Regional Severe Thunderstorm Warning - 1
IDW21034	Regional Severe Thunderstorm Warning - 2
IDW21035	Detailed Severe Thunderstorm Warning – Greater Perth
IDW21037	Severe Weather Warning - 1
IDW21038	Severe Weather Warning - 2
IDW21137	Severe Weather Warning - 3

Table 7: Product Identifiers

RELEASED UNDER FREEDOM OF INFORMATION

## 7. Navigation aids

### 7.1. List of figures

Figure 1: Total Warning System.....	8
Figure 2: Average number of warnings per month across all mainland states and territories of Australia for the 2017-2023 reference period .....	15
Figure 3: Weather Forecast Districts for Queensland.....	28
Figure 4: Weather Forecast Districts for New South Wales.....	29
Figure 5: Weather Forecast Districts for Victoria .....	30
Figure 6: Weather Forecast Districts for Tasmania .....	31
Figure 7: Weather Forecast Districts for South Australia .....	32
Figure 8: Weather Forecast Districts for Western Australia .....	33
Figure 9: Weather Forecast Districts for Northern Territory .....	34
Figure 10: Detailed Severe Thunderstorm Warning domain – Brisbane and Southeast Queensland .....	35
Figure 11: Detailed Severe Thunderstorm Warning domain – Sydney, Newcastle, Wollongong ...	36
Figure 12: Detailed Severe Thunderstorm Warning domain – Canberra .....	37
Figure 13: Detailed Severe Thunderstorm Warning domain – Melbourne .....	38
Figure 14: Detailed Severe Thunderstorm Warning domain – Hobart .....	39
Figure 15: Detailed Severe Thunderstorm Warning domain – Adelaide .....	40
Figure 16: Detailed Severe Thunderstorm Warning domain – Perth.....	41
Figure 17: Detailed Severe Thunderstorm Warning domain – Darwin .....	42

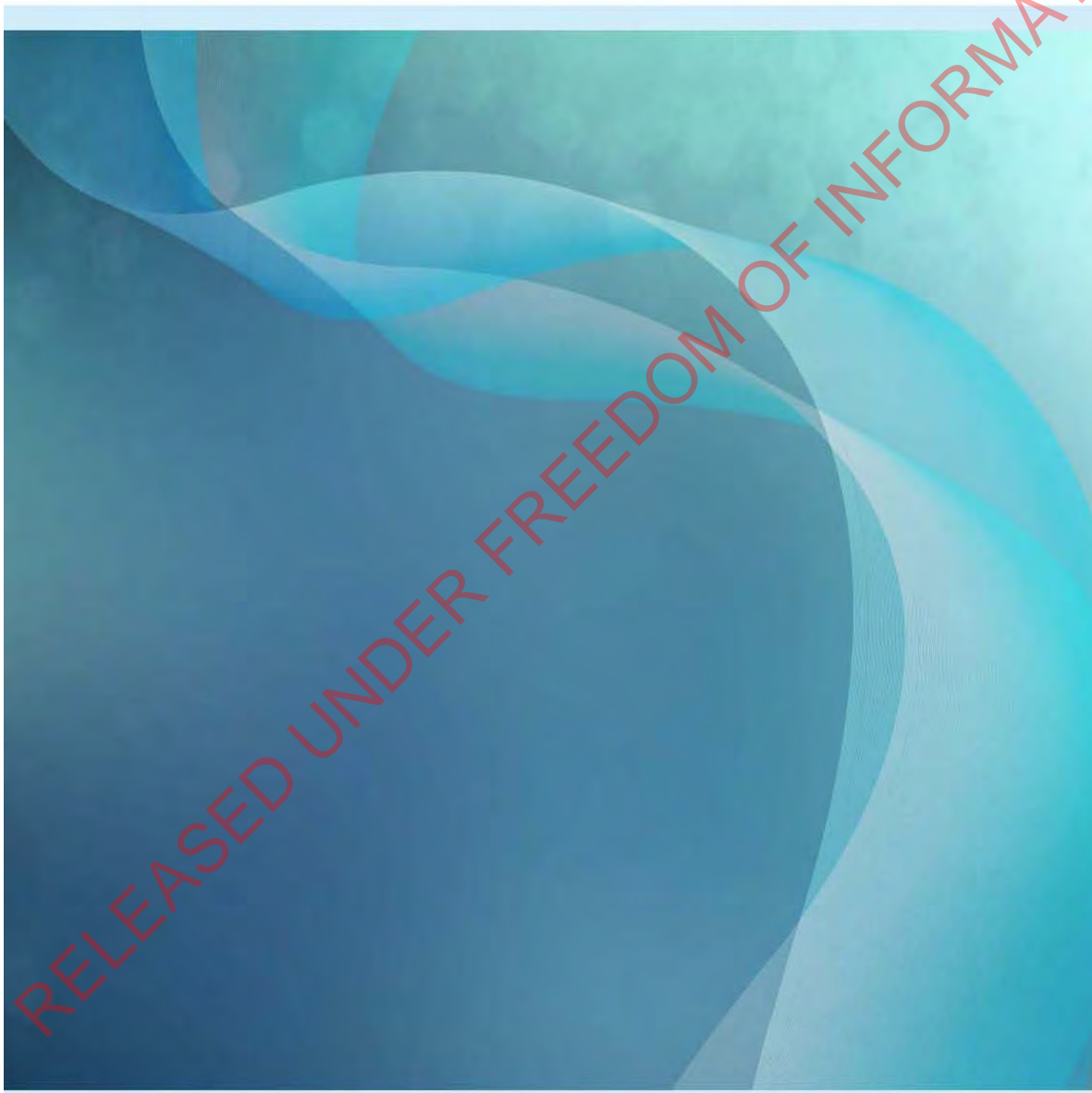
### 7.2. List of tables

Table 1: Bureau of Meteorology Thunderstorm and Severe Weather SLS distribution list by jurisdiction.....	10
Table 2: Phenomena definitions associated with severe thunderstorms.....	12
Table 3: Land phenomena definitions associated with severe weather. ....	14
Table 4: Coastal severe weather phenomena definitions .....	14
Table 5: The seasonal coverage and local issue times for the thunderstorm forecasts for each state and mainland territory ..	20
Table 6: Definition and shading of polygon categories on the thunderstorm forecast .....	20
Table 7: Product Identifiers .....	52



The Bureau  
of Meteorology

# Tropical Cyclone Service Level Specification



## Revision history

Date	Version	Author	Description
18/12/2023	V5.0		<ul style="list-style-type: none"> <li>Updated Area of Responsibility</li> <li>Replaced Tropical Cyclone Outlook with Tropical Cyclone Forecast</li> <li>Added Real-Time Event Data</li> <li>Changes to Storm Tide Advice products</li> <li>Changes to requirements for Solomon Islands Advisory</li> <li>Updated broken hyperlinks</li> </ul>
4/10/2022	v4.0		<ul style="list-style-type: none"> <li>Removed Special Advisory for Timor Leste</li> <li>5.2.3 – TC Track Map – changed the "Cone of uncertainty" to "Forecast Confidence Cone".</li> <li>Appendix 3 – remove products that are internal, fax and SIMS despatch bundles</li> </ul>
24/12/2021	v3.0		<ul style="list-style-type: none"> <li>2021/22 release</li> <li>Added TC Wind Hazard Forecast service.</li> </ul> <p>Minor changes to issue criteria for Satellite Analysis Bulletins</p>
23/12/2020	v2.0		<ul style="list-style-type: none"> <li>2020/21 release.</li> <li>Storm tide appendix updated by Andy Taylor</li> </ul>
25/8/2020	v1.1		<ul style="list-style-type: none"> <li>PST change statement included in 2.1.1</li> <li>Figure 2 replaced.</li> <li>Reworded 3.4 around post-tropical cyclones.</li> <li>SEWS description included in 3.7.</li> <li>Briefing services added in 3.9.</li> <li>Included update on landfall process in 5.2.2</li> <li>Addition of three Qld storm tide forecast locations.</li> <li>TCA section in 6.3 revised to align with ASH.</li> </ul>

OFFICIAL

			<ul style="list-style-type: none"> <li>• TCWC naming convention change included in product examples.</li> <li>• Changed the remarks section in the Ocean Wind Warning</li> <li>• Reference to ATCAG included in section 4</li> </ul>
30/7/2019	v1.0		<p>30 July 2019</p> <ul style="list-style-type: none"> <li>• removed 41-knot rule</li> <li>• 6 Aug 2019</li> <li>• Standard Operating Procedures (SOP) content removed.</li> </ul> <p>13 Aug 2019</p> <ul style="list-style-type: none"> <li>• Table of Contents decided.</li> <li>• Product Schedule created.</li> <li>• Merged contents from the Qld Storm Tide Handbook</li> </ul> <p>27 Aug 2019</p> <ul style="list-style-type: none"> <li>• Replaced W, N and E Regions with Australian TCWC</li> <li>• Copied Product Samples from 2018-19 directives.</li> </ul> <p>23 September 2019</p> <ul style="list-style-type: none"> <li>• Moved samples to appendix, reviewed category and naming sections. Included time zone and conversions.</li> </ul> <p>30 October 2019</p> <p>Dissemination and Communication and Adoption sections added</p>

Review status

Date	Version	Reviewer	Description
11 Jan 2024	5.0		Annual review
22 Nov 2022	4.0		Annual review
16 Dec 2021	3.0		Annual review
9 Dec 2020	2.0		Annual review

OFFICIAL

### Release history

Date	Version	Status	Approval
Feb 2024	5.0	Official	GM_EPS
24 Nov 2022	4.0	Official	GM_EPS
24 Dec 2021	3.0	Official	GM_EPS
23 Dec 2020	2.0	Official	GM_EPS



Unless otherwise noted, all images in this document are licensed under the Creative Commons Attribution Australia Licence.

© Commonwealth of Australia 2023

Published by the Australian Bureau of Meteorology

OFFICIAL

<b>1. Introduction</b> .....	<b>9</b>
<b>1.1. Purpose</b> .....	<b>9</b>
<b>1.2. Scope</b> .....	<b>10</b>
<b>1.3. Authority</b> .....	<b>10</b>
<b>1.4. Distribution</b> .....	<b>10</b>
<b>2. International Tropical Cyclone services</b> .....	<b>11</b>
<b>2.1. World Meteorological Organization Tropical Cyclone Programme</b> .....	<b>11</b>
<b>2.1.1. Region V Tropical Cyclone Committee</b> .....	<b>11</b>
<b>2.1.2. Region I Tropical Cyclone Committee</b> .....	<b>12</b>
<b>3. National Tropical Cyclone Services</b> .....	<b>14</b>
<b>3.1. Tropical Cyclone Season</b> .....	<b>14</b>
<b>3.2. Area of Responsibility</b> .....	<b>14</b>
<b>3.3. Tropical Cyclone Definition</b> .....	<b>15</b>
<b>3.4. Extra-tropical and sub-tropical cyclones</b> .....	<b>15</b>
<b>3.5. Tropical Cyclone Naming Policy</b> .....	<b>16</b>
<b>3.6. Tropical Cyclone Categories</b> .....	<b>16</b>
<b>3.7. Standard Emergency Warning Signal (SEWS)</b> .....	<b>17</b>
<b>3.8. Dissemination of products</b> .....	<b>18</b>
<b>3.9. Briefing Services</b> .....	<b>18</b>
<b>3.10. Communication and adoption activities</b> .....	<b>18</b>



<b>3.11. Service Continuity .....</b>	<b>18</b>
<b>4. Quality Assurance and Performance .....</b>	<b>19</b>
<b>4.1. Australian Tropical Cyclone Advisory Group.....</b>	<b>19</b>
<b>4.2. Best Tracking .....</b>	<b>19</b>
<b>4.3. Performance Statistics and Reporting.....</b>	<b>19</b>
<b>4.4. Post Event Review .....</b>	<b>19</b>
<b>4.5. Forecaster Training and Competency.....</b>	<b>19</b>
<b>5. National Tropical Cyclone Product Schedule.....</b>	<b>21</b>
<b>5.1. Routine Services.....</b>	<b>21</b>
<b>5.1.1. Australian Tropical Cyclone Seasonal Outlook .....</b>	<b>21</b>
<b>5.1.2. Weekly Tropical Climate Note.....</b>	<b>22</b>
<b>5.1.3. Tropical Cyclone Forecast .....</b>	<b>23</b>
<b>5.2. Tropical Cyclone Wind Hazard Forecast .....</b>	<b>23</b>
<b>5.3. Non-Routine Services.....</b>	<b>24</b>
<b>5.3.1. Tropical Cyclone Information Bulletin .....</b>	<b>24</b>
<b>5.3.2. Tropical Cyclone Advice .....</b>	<b>25</b>
<b>5.3.3. Tropical Cyclone Forecast Track Map .....</b>	<b>28</b>
<b>5.3.4. Tropical Cyclone Technical Bulletin .....</b>	<b>29</b>
<b>5.3.5. Storm Tide Advice .....</b>	<b>31</b>
<b>5.3.6. Real-Time Event Data .....</b>	<b>32</b>
<b>5.3.7. CAP Tropical Cyclone Advice.....</b>	<b>33</b>

5.3.8. GML Track .....34

6. International Tropical Cyclone Product Schedule .....36

6.1. Ocean Wind Warning .....36

6.2. CREX Bulletin.....37

6.3. Tropical Cyclone Advisory (Aviation) .....38

6.4. Satellite Analysis Bulletin .....40

6.5. Special Advisory for the Solomon Islands .....42

7. Appendix 1: Storm Tide Advice Locations .....44

7.1. Storm Tide Advice location list.....44

7.2. Storm Tide Advice location maps .....47

7.3. Interpretation of advice content .....59

7.3.1. Communication risks association with vertical datums.....59

7.3.2. Forecaster mediation of numerical model data.....60

7.3.3. Importance of tidal range .....60

7.3.4. Tidal plane comparison graph .....60

7.3.5. Highlighted locations with mismatched tidal plane data....62

7.3.6 Highlighted locations with no standard tide table .....66

8. Appendix 2: Product Samples .....68

8.1. Tropical Cyclone Forecast .....68

8.2. Tropical Cyclone Wind Hazard Forecast .....70

8.3. Tropical Cyclone Information Bulletin .....71



OFFICIAL

8.4. Tropical Cyclone Advice .....72

8.5. Tropical Cyclone Forecast Track Map .....74

8.6. Tropical Cyclone Technical Bulletin .....76

8.7. Storm Tide Advice .....77

8.8. Graphical Storm Tide Advice .....80

8.9. Ocean Wind Warning .....81

8.10. CREX Bulletin.....83

8.11. Satellite Analysis Bulletin .....84

8.12. Special Advisory for the Solomon Islands .....85

9. Appendix 3: Product Identifiers.....86

10. Navigation aids .....96

10.1. List of figures .....96

10.2. List of tables.....96

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

# 1. Introduction

## 1.1. Purpose

The purpose of the Service Level Specification (SLS) is to document the tropical cyclone forecast and warning services provided by the Bureau of Meteorology (the Bureau).

The Total Warning System<sup>1</sup> recognises that a fully effective warning service is multi-faceted in nature and its development and operation involves input from several 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 Warning System for tropical cyclones.



Figure 1 Total Warning System

<sup>1</sup> <https://knowledge.aidr.org.au/media/5972/warnings-handbook.pdf>, pg. 10

The Bureau’s role in the tropical cyclone warning system is focussed on monitoring and prediction, message construction and communicating threats and impacts associated with tropical cyclones to Government, industry and the community.

The Bureau also contributes to activities designed to strengthen organisational readiness and build community resilience and participates in the planning and coordination of activities with disaster mitigation agencies.

## 1.2. Scope

The scope of the SLS is the Bureau's publicly available tropical cyclone services within the Australian Region (**Error! Reference source not found.**) and a limited number of additional services provided to support emergency management, aviation, and meteorological services in neighbouring countries.

The SLS details **what** the Bureau does and **when** it does it, in order to provide tropical cyclone services. **How** the Bureau produces tropical cyclone services is addressed in an internal Bureau document *National Tropical Cyclone Standard Operating Procedures (SOP)*.

## 1.3. Authority

The Bureau of Meteorology Tropical Cyclone Service Level Specification is issued by the General Manager Environmental Prediction Services under the authority of the Director of Meteorology.

## 1.4. Distribution

Table 1 National Tropical Cyclone SLS Distribution List

<p><b>National and State agencies</b></p> <ul style="list-style-type: none"> <li>• Western Australia Department of Fire and Emergency Services (DFES)</li> <li>• Queensland Fire and Emergency Services (QFES)</li> <li>• Northern Territory Emergency Service (NTES)</li> <li>• Queensland Department of Environment and Science (Coastal Impacts Unit)</li> <li>• Emergency Management Australia (EMA)</li> <li>• Qld Inspector General Emergency Management</li> <li>• New South Wales State Emergency Service</li> </ul>
<p><b>International agencies</b></p> <ul style="list-style-type: none"> <li>• Meteo France La Reunion, Regional Specialised Meteorological Centre</li> <li>• Mauritius Meteorological Services</li> <li>• Indonesian Meteorological and Geophysical Agency</li> <li>• Fiji Meteorological Service</li> <li>• Meteo France New Caledonia and French Polynesia</li> <li>• Papua New Guinea Meteorological Service</li> <li>• Solomon Islands Meteorological Service</li> <li>• Timor-Leste National Directorate of Meteorology and Geophysics</li> <li>• Vanuatu Meteorological Service</li> <li>• New Zealand National Meteorological Service</li> <li>• Joint Typhoon Warning Centre</li> </ul>

## 2. International Tropical Cyclone services

### 2.1. World Meteorological Organization Tropical Cyclone Programme

The Tropical Cyclone Programme<sup>2</sup> (TCP) is run out of the World Meteorological Organization's (WMO's) Weather and Disaster Risk Reduction Services Department. This department is tasked with establishing national and regional coordinated systems to ensure that the loss of life and damage caused by tropical cyclones globally are reduced to a minimum.

The programme is implemented on both national and regional levels through cooperative action. It covers activities of Members, WMO regional associations, other international and regional bodies and the WMO Secretariat.

Australia is member of the WMO Regional Association V (RA V), which covers the South Pacific and South East Indian Ocean. Within RA V, international tropical cyclone warning services are predominantly coordinated through the RA V Tropical Cyclone Committee (RA V TCC).

#### 2.1.1. Region V Tropical Cyclone Committee

The Region Association V Tropical Cyclone Committee<sup>3</sup> (RA V TCC) has an operational plan<sup>4</sup> which describes the agreed upon existing internationally coordinated systems and arrangements.

The committee currently meets every two years with representatives invited from both WMO and non WMO member nations in the region.

Within the RA V area, there are five Tropical Cyclone Warning Centres (TCWC's) which are responsible for continuous monitoring of tropical cyclones and the issuing of forecasts, warnings, advisories and bulletins to the general population and for international marine and aviation sector. These are Regional Specialised Meteorological Centre (RSMC) Nadi, and TCWCs Melbourne, Jakarta, Port Moresby, and Wellington. The area of responsibility for each of these centres is shown in **Error! Reference source not found.**

---

<sup>2</sup> <https://public.wmo.int/en/programmes/tropical-cyclone-programme>

<sup>3</sup> <https://community.wmo.int/en/ra-v-tropical-cyclone-committee-south-pacific-and-south-east-indian-ocean>

<sup>4</sup> <https://community.wmo.int/en/tropical-cyclone-operational-plans> or direct link

[https://wmoomm.sharepoint.com/:b:/s/wmocpdb/EbCr66kNzIRHoUSUgvdBI\\_sB5eUjz9dP8OUsbZdrLbZb5A?e=RnDIOD](https://wmoomm.sharepoint.com/:b:/s/wmocpdb/EbCr66kNzIRHoUSUgvdBI_sB5eUjz9dP8OUsbZdrLbZb5A?e=RnDIOD)

**OFFICIAL**

The Bureau has a responsibility to provide the following tropical cyclone related services for the international community in its area of responsibility (see

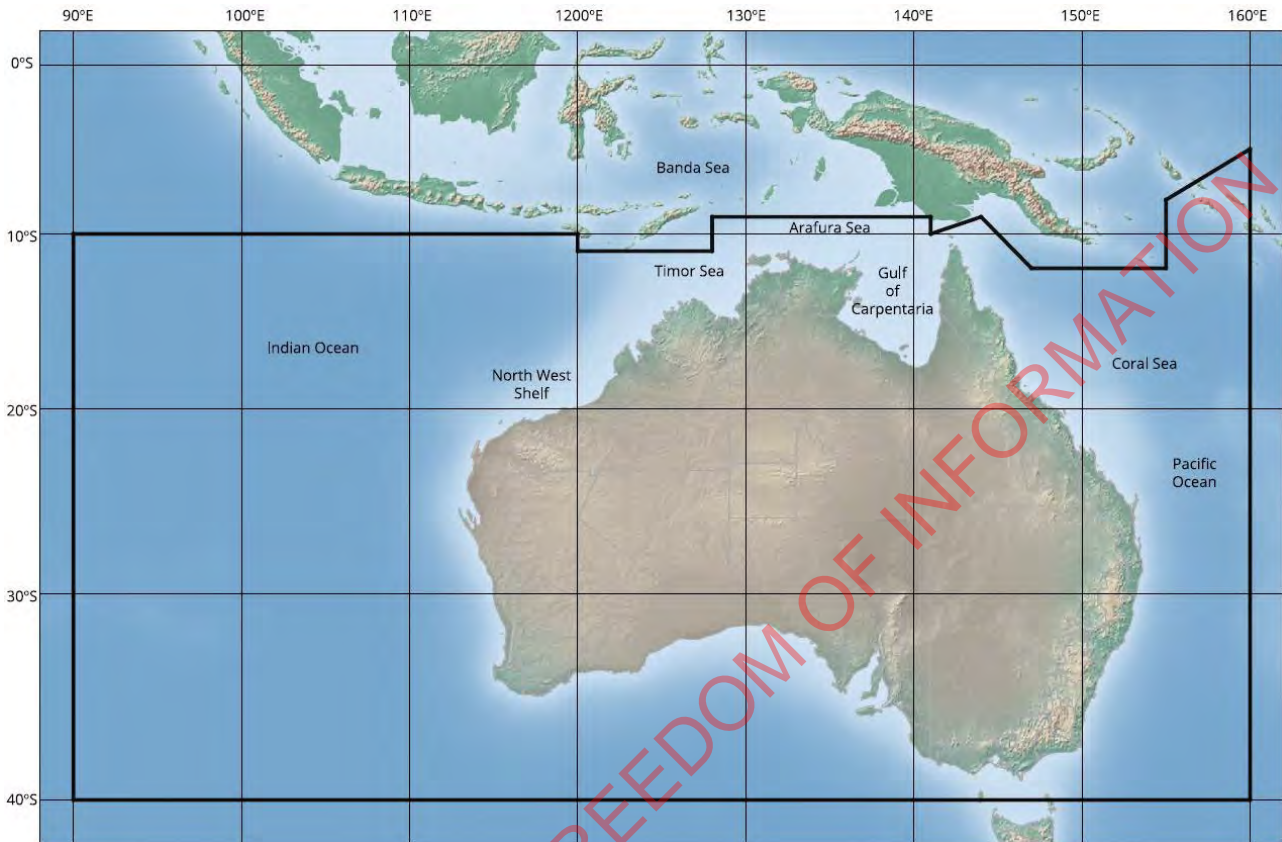


Figure 3 Australian area of responsibility for providing tropical cyclone services

and Table 2):

- Ocean Wind Warning (Shipping)
- Tropical Cyclone Advisory (Aviation)
- SIGMET (Aviation)
- CREX Bulletin

The Bureau also provides guidance and tropical cyclone products to neighbouring TCWC's and RSMC's to ensure the maintenance of a satisfactory tropical cyclone monitoring and warning service from the Central Indian Ocean to Central Pacific Ocean, south of the Equator. These products include:

- Satellite Analysis Bulletin
- Special Advisory for the Solomon Islands

Within the RAV-TCC Operational Plan, procedures for maintaining tropical cyclone surveillance and issue of warnings is described for the instance where one of the TCWCs is, for any reason, unable to meet its responsibility.



**OFFICIAL**

### 2.1.2. Region I Tropical Cyclone Committee

The Region I Tropical Cyclone Committee (RAI-TCC) for Southwest Indian Ocean also has an [operational plan](#)<sup>5</sup> that deals with warning service arrangements in their Region. An Australian representative occasionally attends the RAI-TCC meetings to ensure liaison processes for tropical weather systems near 90°E are up-to-date and understood by all National Meteorological and Hydrological Services (NMHSs) in the region.

RELEASED UNDER FREEDOM OF INFORMATION

---

<sup>5</sup> <https://community.wmo.int/tropical-cyclone-operational-plans> or direct link: <https://wmoomm.sharepoint.com/:b:/s/wmocpdb/EYITpV0sKLFajl1s8ktbVBgBLNG3v60mFBTQ9TXnOcZZUw?e=GfpWcm>

**OFFICIAL**



OFFICIAL

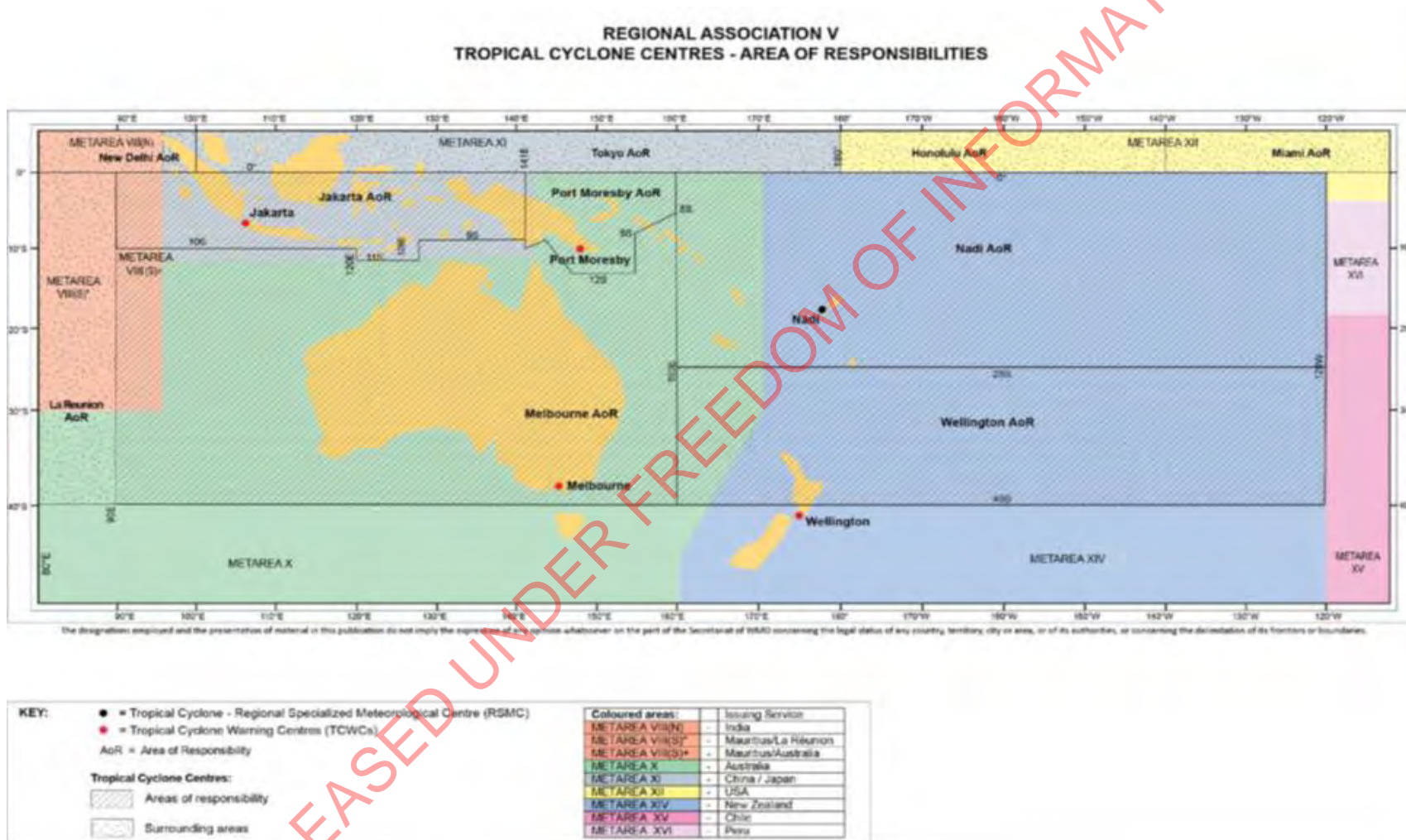


Figure 2 Tropical Cyclone Warning Centre areas of responsibility (AoR) in the South Pacific and South East Indian Ocean

OFFICIAL

### 3. National Tropical Cyclone Services

The Bureau's tropical cyclone warning service provides the Australian community and other users (e.g., aviation and marine) with essential tropical cyclone warnings that are timely and accurate.

To do this, the Bureau has partnerships with emergency management organisations, other government authorities, media, and industry in tropical cyclone prone areas to ensure that warnings are fit-for-purpose and are broadly distributed in a timely manner.

The tropical cyclone warning service is designed to alert the community and counter-disaster organisations to impending tropical cyclone threats, and to provide advice and warnings until the threat has passed. An important secondary role is to assist local media and state or territory emergency services with public education programs, and to advise on meteorological aspects of tropical cyclone disaster preparedness and planning.

#### 3.1. Tropical Cyclone Season

The Australian tropical cyclone season is defined as the period from 1 November to 30 April, inclusive. Tropical cyclones can occur outside this period and in such an event the Bureau will issue tropical cyclone products as would normally occur within the cyclone season.

RELEASED UNDER FREEDOM OF INFORMATION

### 3.2. Area of Responsibility

The Bureau is responsible for the issue of all warnings and related advices and information for tropical cyclones affecting the Australian area of responsibility (See Table 2 and

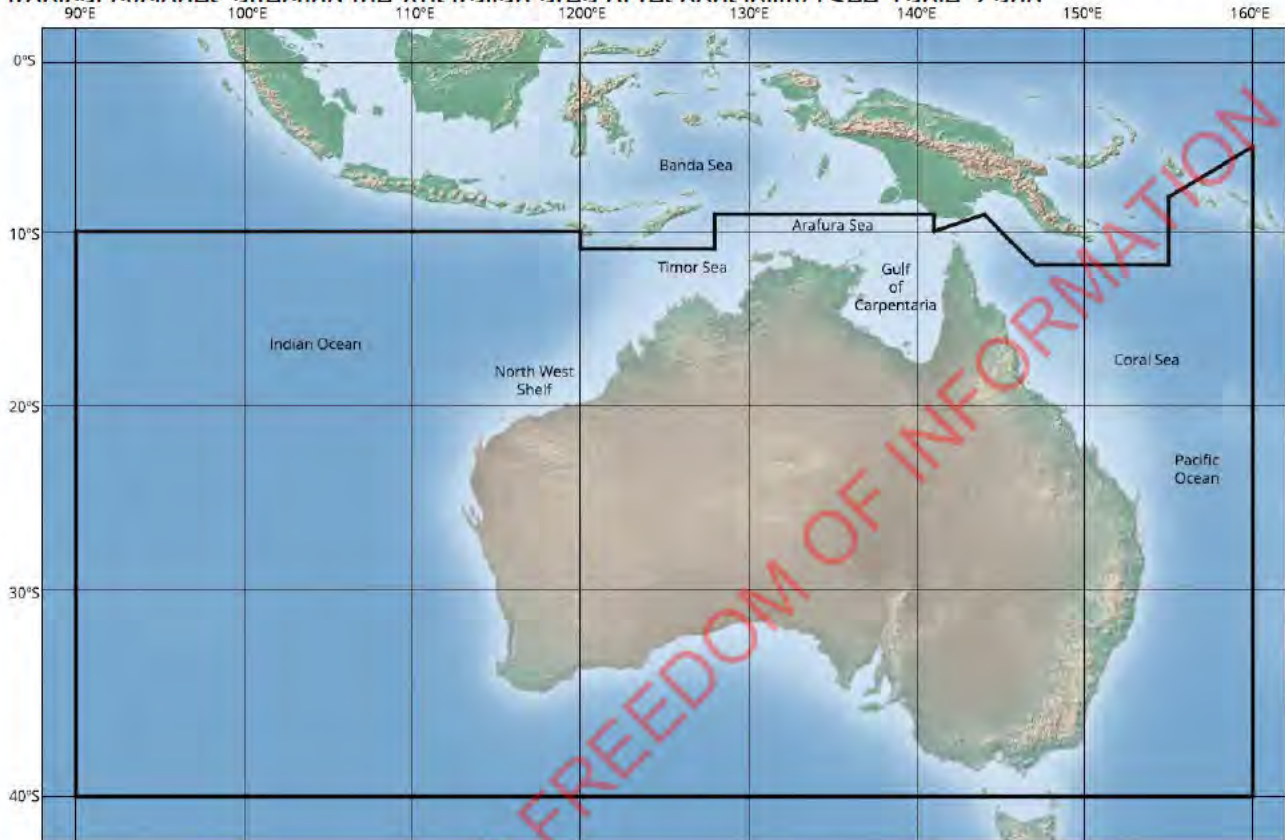


Figure 3 Australian area of responsibility for providing tropical cyclone services

). This includes the offshore territories of Cocos (Keeling) Islands, Christmas Island and Lord Howe Island. Tropical Cyclone Advices will also be issued by the Bureau for Norfolk Island. Storm Tide Advices are only issued for the Australian mainland.

For Tropical Cyclone Advisories issued to aviation the AoR extends north to the equator between 90°E and 160°E, covering the Jakarta AoR and Port Moresby AoR (see **Error! Reference source not found.**).

Table 2 Australian area of responsibility

Area of responsibility	Area bounded by
Australian	10°S 90°E, 10°S 120°E, 11°S 120°E, 11°S 128°E, 9°S 128°E, 9°S 141°E, 10°S 141°E, 9°S 144°E, 12°S 147°E, 12°S 155°E, 8°S 155°E, 5°S 160°E, 40°S 160°E, 40°S 90°E and 10°S 90°E

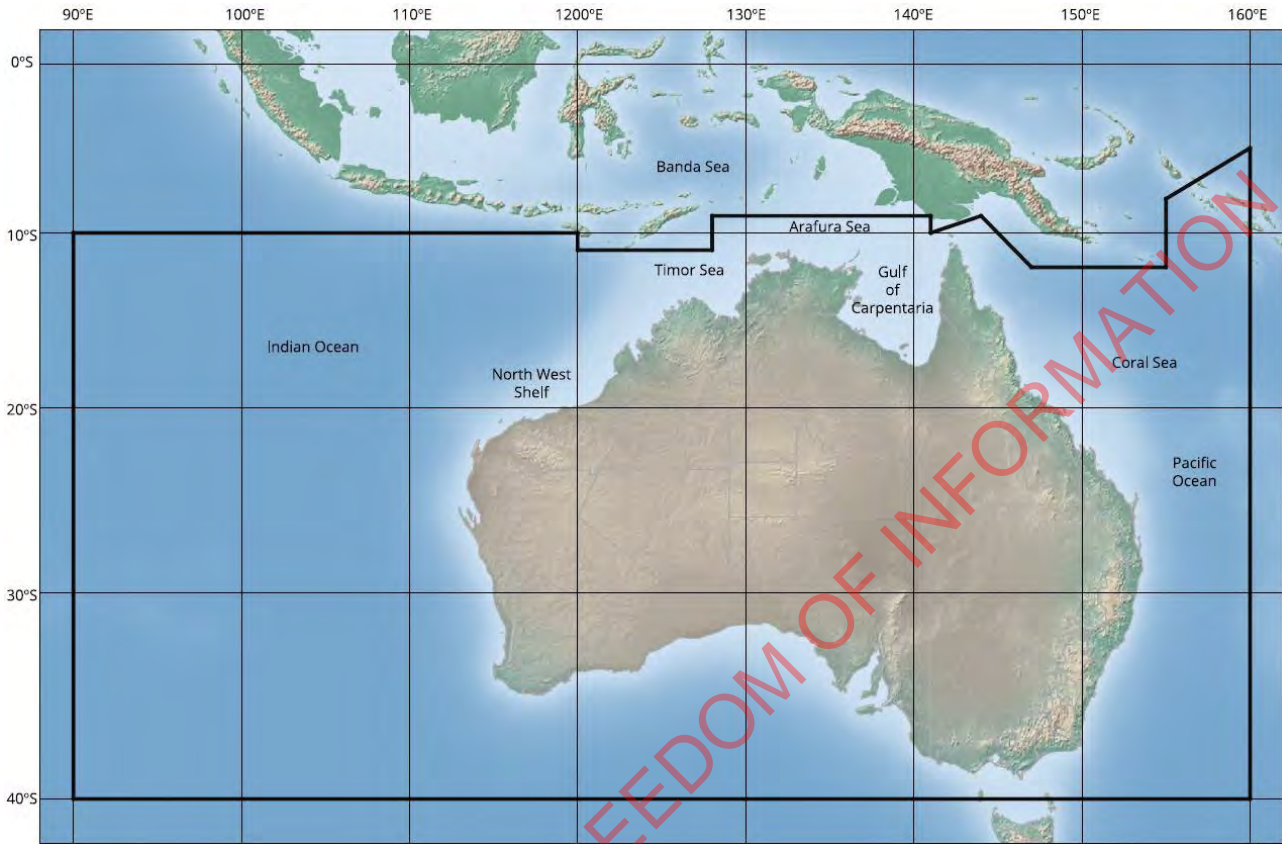


Figure 3 Australian area of responsibility for providing tropical cyclone services

### 3.3. Tropical Cyclone Definition

A tropical cyclone is defined as a warm-cored, non-frontal low-pressure system of synoptic scale developing over warm waters having organised convection and a maximum mean wind speed of 34 knots or 63 km/h (10-minute mean) or greater extending more than halfway around near the centre and persisting for at least six hours.

### 3.4. Extra-tropical and sub-tropical cyclones

Tropical cyclones can transition into an extra-tropical or sub-tropical cyclone as they move southwards out of the tropics. As a system undergoes this transition it can maintain an intensity equivalent to that of a tropical cyclone, or even further intensify.

### 3.5. Tropical Cyclone Naming Policy

The Bureau allocates tropical cyclone names, taken in order, from the list found at <http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/understanding/tc-names/>, until the list is exhausted, whereupon the sequence will be repeated.

The following policy is adhered to:

1. Australian tropical cyclone names in each list alternate male and female. The exception occurs at the end of the list, with the last name being used for either gender.
2. If a cyclone named by an adjacent WMO Region moves into the Australian area of responsibility, the existing name shall be retained.
3. If a cyclone has a significant impact on coastal or island communities, the name assigned to it will be permanently retired and another name substituted in the list. Names are not officially added to the list until ratified by the RAV-TCC.
4. RAI-TCC also ratify proposed additions to the list of names, as they retain the names of tropical cyclones that move from the Australian AoR into the southwest Indian Ocean (west of 90°E).

### 3.6. Tropical Cyclone Categories

Tropical cyclone intensity is an estimate of the maximum wind speed, at 10 m above the surface, averaged over a period of 10 minutes, occurring within the storm and not associated with phenomena on a scale significantly smaller than the cyclone's core circulation.

Tropical cyclones are categorised based on intensity, with Category 1 being the weakest and Category 5 the most intense. Category 3, 4 and 5 cyclones are given the appellation "Severe Tropical Cyclone". Severe Tropical Cyclones are equivalent in intensity to typhoons (North West Pacific) and hurricanes (Atlantic).

Although cyclone intensity is defined by the 10-minute wind, public messaging focuses on an indicative 3-second gust value as infrastructure damage is more closely related to the gust value<sup>6</sup>. Expected wind gusts over land are assumed to be about 40% greater than the 10-minute mean wind. Table 3 shows how the maximum 10-minute surface wind relates to the cyclone category, status and the strongest gust that can be expected.

---

<sup>6</sup> All references to gust values in tropical cyclone products are for indicative values only.

Table 3 Tropical Cyclone Category, Status and Wind Strength

Category	Status	10-Minute Mean Wind (km/h) (Knots)	Indicative Maximum 3-Second Gust (km/h)
1	Tropical Cyclone	63-88 34-47	90- 124
2	Tropical Cyclone	89-117 48-63	125-164
3	Severe Tropical Cyclone	118-159 64-85	165-224
4	Severe Tropical Cyclone	160-199 86-107	225-279
5	Severe Tropical Cyclone	≥200 ≥108	≥280

### 3.7. Standard Emergency Warning Signal (SEWS)

The standard criteria for authorisation of the use of Standard Emergency Warning Signal (SEWS) is when any of the following conditions are expected within 12 hours:

- Wind gusts > 125km/h, i.e., 'destructive' winds (Category 2 or higher)
- Storm tide > 0.5 m above HAT (discretion can be applied if there is a significant threat to areas below 0.5m above HAT)
- Intense rainfall potentially leading to flash flooding and/or landslides (1-6 hour rainfall total exceeding the 2% Annual Exceedance Probability)

The SEWS may also be authorised outside the range of these criteria, at the request of the primary hazard management agency for tropical cyclone in the affected jurisdiction.

The following statement is included at the beginning of the Tropical Cyclone Advice when a SEWS is issued:

*"Media: Transmitters serving the area ..... to ..... are requested to sound the Standard Emergency Warning Signal before broadcasting the following warning."*

When the SEWS is not required the following statement will be included at the beginning of the Tropical Cyclone Advice:

*"Media: The Standard Emergency Warning Signal should NOT be used with this warning."*

### 3.8. Dissemination of products

Bureau tropical cyclone products - including all outlooks, advices, warnings, technical bulletins and machine-readable products - are transmitted via the Bureau's website and app and by email and FTP to registered users. Tropical cyclone warnings and advisories relevant to marine users are also provided through HF voice radio and satellite communications.

### 3.9. Briefing Services

The Bureau will provide briefings to Emergency Management partners in areas under threat from an approaching or developing Tropical Cyclone. The format, timing and frequency of briefings will be agreed through state and territory-based arrangements.

### 3.10. Communication and adoption activities

In addition to the issuing of products through standard communication channels (e.g., website, app, email), the Bureau undertakes a range of complementary communication and adoption activities in partnership with emergency management agencies. These activities are aimed to increase the uptake and effectiveness of the forecasts and warnings and ensure consistent weather safety messages are provided to the community.

This includes pre-season community and industry preparedness briefings, social media campaigns and the Bureau's "[Tropical Cyclone Knowledge Centre](#)" web pages. During the season this extends to joint press conferences and media interviews, as well as continuing social media public safety campaigns and community and industry briefings.

### 3.11. Service Continuity

The Bureau maintains service continuity through its Business Continuity Plan. Most pertinent to tropical cyclone services is the built in redundancy of being able to deliver all the services mentioned in this document from several offices, primarily its Perth and Brisbane offices. This includes the ability to transfer operations between offices as required.

To maintain service continuity, the Bureau uses a large and diverse range of observational and forecast data in the delivery of its tropical cyclone services. This provides redundancy if any data source is unavailable during operations and ensures all products and services are based on the best available information at the time.

## 4. Quality Assurance and Performance

### 4.1. Australian Tropical Cyclone Advisory Group

The Australian Tropical Cyclone Advisory Group (ATCAG) supports tropical cyclone Hazard Management Agencies (HMAs) across northern Australia (primarily the Western Australia Department of Fire and Emergency Services (DFES), Northern Territory Emergency Services (NTES) and Queensland Fire and Emergency Services (QFES) and the Bureau of Meteorology (BoM), in mitigating the hazards caused by tropical cyclones.

ATCAG provides a forum to coordinate public education, services and warning processes across the primary HMAs, the Bureau and emergency broadcasters such as ABC Emergency.

### 4.2. Best Tracking

Quality assurance for tropical cyclone services is underpinned by a verification process that involves re-analysing the track, structure and intensity of each tropical cyclone after the event. The re-analysis process leverages all available data (some of which may not have been available during operations) to create a "Best Track" that is treated as an observational record against which forecast accuracy can be assessed.

In addition to generating a Best Track, a report is written for each tropical cyclone detailing the life cycle, warning performance and impacts.

Best Tracks are uploaded to the national Tropical Cyclone database, which is available as a .csv file for downloading.

The tropical cyclone database (Best Tracks) and individual cyclone reports are available on the Bureau website here: <http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/>.

### 4.3. Performance Statistics and Reporting

All official forecast tropical cyclone locations and intensities are verified against the Best Track.

### 4.4. Post Event Review

The Bureau conducts an internal review after every tropical cyclone event that has had a significant community or operational impact, and documents and tracks the insights and recommendations that arise.

Depending on the impact from a cyclone, the review process may include a debrief with external partners. Upon request, the Bureau also contributes to post incident reviews conducted by emergency services.

### 4.5. Forecaster Training and Competency

The Bureau runs a tropical cyclone training and competency-based assessment program for meteorologists. This program ensures that staff involved in analysing and forecasting tropical





**OFFICIAL**

cyclones have the qualifications, training and demonstrated ability to provide a high standard of tropical cyclone warning service to the Australian community.

RELEASED UNDER FREEDOM OF INFORMATION

**OFFICIAL**

## 5. National Tropical Cyclone Product Schedule

Standard issue times of products (e.g., Warnings, Advices, Bulletins) are provided in Coordinated Universal Time (UTC). Table 4 shows how to convert UTC to local time in different Australian time zones.

Table 4 Time Zone Conversions

Table heading row	Conversion from UTC
Cocos Islands Time (CCT)	+6:30
Christmas Island Time (CXT)	+7:00
Australian Western Standard Time (AWST)	+8:00
Australian Central Standard Time (ACST)	+9:30
Australian Eastern Standard Time (AEST)	+10:00
Australian Eastern Daylight Time (AEDT)	+11:00
Norfolk Standard Time (NFST)	+11:00
Norfolk Daylight Time (NFDT)	+12:00

### 5.1. Routine Services

#### 5.1.1. Australian Tropical Cyclone Seasonal Outlook

The Bureau releases a tropical cyclone seasonal outlook once a year, in October, for the season ahead. The outlook gives the likelihood of the Australia region experiencing more than normal numbers of tropical cyclones (chance of exceeding average). The outlook is based on a relationship that exists between tropical cyclone numbers in the Australian Region (5°S to 40°S and 90°E to 160°E) and the state of the El Niño–Southern Oscillation. A typical tropical cyclone outlook map is shown in **Error! Reference source not found.** The latest full product, including map and text, is available at <http://www.bom.gov.au/climate/cyclones/australia/>

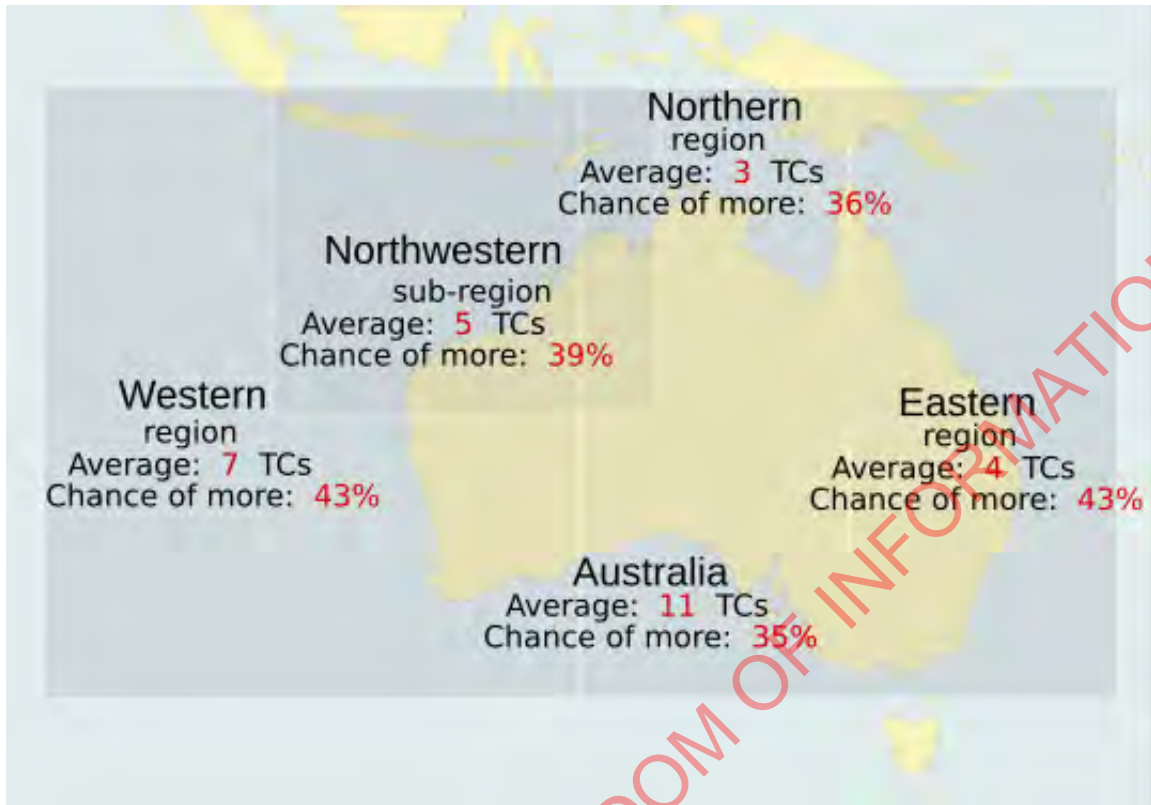


Figure 4 National Tropical Cyclone Seasonal Outlook example graphic

### 5.1.2. Weekly Tropical Climate Note

The Weekly Tropical Climate Note, issued on Tuesdays, describes current conditions in the tropical Indian and Pacific oceans and summarises model forecasts for the coming weeks. When models indicate the risk of tropical cyclone development is higher, or lower than normal in the Australian region it is highlighted in the note. The weekly tropical climate note is available on the web at <http://www.bom.gov.au/climate/tropical-note/>.

RELEASED UNDER FREEDOM OF INFORMATION

### 5.1.3. Tropical Cyclone Forecast

#### Purpose

The Tropical Cyclone Forecast provides status and development potential of any tropical lows expected to develop or move into the Australian area of responsibility over the next 7 days. It is a graphical and interactive web-based display with quantitative probabilistic assessments of tropical cyclone development potential for individual tropical systems at 12-hourly intervals. A map shows the likely location of the centre of each individual tropical at each of these 12-hourly intervals.

#### Issue Times

The Tropical Cyclone Forecast is available all year round via the Bureau external web page at <http://www.bom.gov.au/cyclone/>. It is updated whenever the Real-Time Event Data product is issued or at minimum twice a day.

#### Content

For each tropical system,

- Tropical system identifier, including tropical cyclone name if applicable.
- Forecast Confidence Area (FCA) of tropical system at 12-hourly timesteps out to 7 days. The FCA shows the likely location of the centre of the tropical system at each timestep.
- Categorical and percentage likelihood of the system being a tropical cyclone for each 12-hour timestep, with the following probability categories:
  - Very Low: 5% or less
  - Low: 5-20%
  - Moderate: 20-50%
  - High: 50% or more
- Tabular summary of each system and its likelihood of being a tropical cyclone.
- Brief worded details of each tropical system.

For further information on the Tropical Cyclone Forecast see [http://www.bom.gov.au/cyclone/tc7\\_product\\_guide.pdf](http://www.bom.gov.au/cyclone/tc7_product_guide.pdf).

### 5.2. Tropical Cyclone Wind Hazard Forecast

#### Purpose

The Tropical Cyclone Wind Hazard Forecast is offered by the Bureau of Meteorology to the primary emergency management agencies in tropical parts of Australia. It presents an interactive display that provides guidance on the risk of exceeding three specified wind thresholds (matching category 1, category 2, and category 3 tropical cyclone intensity) for up to the next 10 days.



## OFFICIAL

The Tropical Cyclone Wind Hazard Forecast is available to emergency management via a registered user web page. Due to the technical knowledge needed to interpret the forecast it is currently not available to the media or public. The forecast is automatically generated from the world's leading ensemble numerical weather prediction (NWP) models and is updated twice daily.

The web interface presents:

- An interactive map, which gives a visual summary of the wind risk.
- An interactive graph, to assist with assessing how the wind risk changes.
- A forecast table, demonstrating the degree of consistency in the guidance.

### Issue Times

Forecasts will be issued twice daily throughout the tropical cyclone season (1 November to 7 May inclusive).

The TC Wind Hazard Forecast is updated twice a day, usually by 2100 UTC and 0900 UTC. On rare occasions the update may be as late as 0000 UTC and 1200 UTC. If the data cannot be updated by this later time a message will be placed on the web page advising of difficulties with the processing for that update.

Further information is available for emergency managers in tropical regions, through their local Bureau of Meteorology representative. Users of the product can find more information at [https://reg.bom.gov.au/reguser/by\\_prod/tcwindhazard/static/Tropical\\_Cyclone\\_Wind\\_Hazard\\_Forecast\\_Product\\_Guide.pdf](https://reg.bom.gov.au/reguser/by_prod/tcwindhazard/static/Tropical_Cyclone_Wind_Hazard_Forecast_Product_Guide.pdf).

## 5.3. Non-Routine Services

### 5.3.1. Tropical Cyclone Information Bulletin

#### Purpose

The Tropical Cyclone Information Bulletin provides information on a tropical cyclone within or expected to move into the Australian TCWC area of responsibility but is not expected to produce gales at coastal locations within the next 48 hours.

#### Issue criteria and schedule

The Tropical Cyclone Information Bulletin is issued whenever a tropical cyclone is within the AoR or is likely to move into or develop within the AoR within the next 24 hours but is not likely to impact Australian communities within 48 hours. Tropical Cyclone Information Bulletins are issued every six-hours at the standard times of 0100, 0700, 1300 and 1900 UTC. The Product IDs and standard issue times are as shown in Table 5.

**OFFICIAL**

Table 5 Tropical Cyclone Information Bulletin - Product IDs and Issue times

Product ID number(s) <sup>7</sup>	Issue times UTC
IDW24000 - TC Information Bulletin 1	0100
IDW24010 - TC Information Bulletin 2	0700
IDW24020 - TC Information Bulletin 3	1300
IDD20300 – TC Information Bulletin 1	1900
IDD20301 – TC Information Bulletin 2	
IDQ20065 - TC Information Bulletin 1	
IDQ20066 - TC Information Bulletin 2	
IDQ20067 - TC Information Bulletin 3	

**Content**

- Tropical Cyclone name & category
- Location (latitude/longitude as well as distance and bearing relative to nearest key town/landmark)
- Current intensity and recent trend
- Current and future movement
- Statement that system is no threat to coastal areas and Island Communities within 48 hours.
- Next issue time

**5.3.2. Tropical Cyclone Advice**

**Purpose**

The Tropical Cyclone Advice provides information to communities that are under threat within 48 hours. It includes a description of the threat and advice from the lead emergency management agency regarding appropriate response actions. The area affected is divided to indicate those areas under threat of gales:

- Within 24 hours (Tropical Cyclone *Warning*)
- Beyond 24 hours but within 48 hours (Tropical Cyclone *Watch*)

---

<sup>7</sup> The third character of the product ID denotes the region (**W**estern Australia, **D**arwin, **Q**ueensland).

**Issue criteria and schedule**

The first Tropical Cyclone Advice is issued as soon as the need arises. Subsequent TC Advices are issued at 6-hourly intervals if there are no communities under *Warning*, and at 3-hourly (or hourly – See Hourly warnings

) intervals if there are any communities under *Warning*.

The Product IDs and standard issue times are as shown in Table 6

Table 6 Tropical Cyclone Advice - product IDs and issue times

Product ID number(s)	Watch only issue times UTC	Warning (with or without Watch) issue times UTC
IDW24100 - TC Advice 1	0100	0100
IDW24200 - TC Advice 2	0700	0400
IDW24300 - TC Advice 3	1300	0700
IDW24400 – TC Advice (Cocos/Christmas Islands)	1900	1000
IDD20150 - TC Advice 1		1300
IDD20250 - TC Advice 2		1600
IDQ20023 - TC Advice 1		1900
IDQ20026 - TC Advice 2		2200
IDQ20029 - TC Advice 3		
IDQ20064 – Norfolk Island Tropical Cyclone Advice		

For landfalling systems that do not warrant the issuance of hourly warnings (category 1 system and/or unpopulated areas) an additional update will be issued as the system crosses the coast.

**Flash Tropical Cyclone Advice**

A Tropical Cyclone Advice is issued with the prefix 'FLASH' when:

- (1) It is the first TC Advice for a cyclone, and it places communities under *Warning*. In other words, communities are being given only 24 hours advance warning of the threat of cyclone impact.
- (2) A major change is needed to Action Statements made in a current TC Advice, i.e., at the request of Emergency Services



## OFFICIAL

- (3) The analysed tropical cyclone position differs from its expected (previously forecast) position by more than the indicated uncertainty.
- (4) The tropical cyclone unexpectedly changes direction towards the coast and/or intensifies rapidly.

FLASH advices will contain text explaining why it was issued out of the normal sequence (i.e., as a FLASH Advice). The word FLASH will be deleted from subsequent advices.

### Hourly warnings

In situations when a Category 2 or stronger tropical cyclone is threatening a major population centre and the tropical cyclone core region is under radar surveillance, then the frequency of tropical cyclone warning messages and forecast track maps may be increased to hourly.

The commencement and duration of hourly warnings will be dependent on the circumstances of each cyclone, based amongst other things on time of day, clarity of radar signature, community requirements (vulnerabilities – as provided by emergency management partners) and will be authorised by the Team Leader – Tropical Cyclone or the Bureau's Hazard Preparedness and Response Manager for the affected region.

When issuing hourly warnings, the location of the tropical cyclone will be given for the hour of issue rather than one hour previous (as is done in 3- and 6-hourly TC Advices).

### Content

- B SEWS advice to Media
- Priority Statement (**PRIORITY** during a *Watch* phase, **TOP PRIORITY FOR IMMEDIATE BROADCAST** during *Warning* phase)
- Header (with sequence number)
- Headline
- Watch & Warning zones
- Description of system:
  - Name
  - Category
  - Location (with relative bearing and distance to two key locations)
  - Movement (velocity & relation to coastline)
- Description of associated phenomena and expected impact.
- Community Alerts (referenced to Emergency Service Organisation)
- Details:
  - Location (latitude/longitude)
  - Location Accuracy
  - Recent Movement
  - Max Gusts
  - Severity Category
  - Central Pressure
- Time of next Advice



**Notes**

- For each cyclone, the Advice will be numbered sequentially.

**5.3.3. Tropical Cyclone Forecast Track Map**

**Purpose**

The Tropical Cyclone Forecast Track Map is a graphical product that provides a track of the cyclone showing recent movement, forecast movement and the Forecast Confidence Cone (also known as the 'grey zone'). It also shows the current extent of damaging winds and a graphical representation of the areas under Cyclone Watch and Cyclone Warning.

**Issue criteria and schedule**

The Tropical Cyclone Forecast Track Map is issued in tandem with each Tropical Cyclone Advice or Information Bulletin. The Product IDs and standard issue times are shown in Table 7. A full list of product IDs, including machine-readable products associated with the Tropical Cyclone Advice and Tropical Cyclone Forecast Track Map, is included in Appendix 3.

Table 7 Tropical Cyclone Forecast Track Map - product IDs and issue times.

Product ID number(s)	Issue times UTC
IDW60281 - TC Forecast Track Map – System 1	Issued immediately after the Tropical Cyclone Advice or Information Bulletin is issued ((i.e., hourly, three-hourly or six-hourly)
IDW60285 - TC Forecast Track Map – System 2	
IDW60288 - TC Forecast Track Map – System 3	
IDW60295 - TC Forecast Track Map – Send to NT	
IDD65011 - Forecast Track Map – System 1	
IDD65012 - Forecast Track Map – System 2	
IDD65013 - Forecast Track Map for WA	
IDD65014 - Forecast Track Map for Qld	
IDQ65002 – Forecast Track Map 1	
IDQ65004 – Forecast Track Map 2	
IDQ65224 – Forecast Track Map 3	
IDQ65019 – Forecast Track Map for NT	

**Content**

The Tropical Cyclone Forecast Track Map contains the following information (in sequence):

- Identifying Header Australian Bureau of Meteorology Tropical Cyclone Warning Centre
- Tropical Cyclone Name



## OFFICIAL

- Indication of the corresponding Tropical Cyclone Advice number – if applicable
- Map indicating:
  - Past track. Generally, at least 24 hours of the past track is shown, with positions, intensity and time annotations (in black) are shown every 12 hours. When 12-hourly positions are very close together, some of them might not be shown, to improve readability.
  - Official forecast track to +72 hours with forecast positions (in grey) shown every 12 hours (providing that does not create too much clutter).
  - Forecast positions, denoted by either a tropical low or cyclone symbol.
  - Forecast intensity category of the cyclone, indicated by a number (1-5) within the cyclone symbol.
  - Graphical depiction of the extent of *damaging* (gusts > 90 km/h, gale-force), *destructive* (gusts > 125 km/h, storm-force) and *very destructive* (gusts > 165 km/h, hurricane-force) winds every 12 hours (dependent on readability).
  - Forecast Confidence Cone of future track (+72 hours), shown as grey shaded area.
  - Warning and/or Watch zones.

### Notes

- Further explanation of the Forecast Track Map, including a link to an explanatory video, are available here: <http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/warnings/>
- The forecast track is the most likely path of the cyclone. This means it is more likely than any other single scenario. It does *not* mean that it is more than 50% likely that the cyclone will follow the forecast track scenario.
- The grey zone (also known as the Forecast Confidence Cone) is the area that the cyclone centre has an approximately 80% likelihood of remaining within, during the following 72 hours. It is therefore *expected* that the cyclone centre will move *outside this area on approximately 1 in 5 occasions*. Importantly, even if the cyclone does not move outside the Forecast Confidence Cone, the impact of the cyclone is still likely to extend beyond the grey zone.

### 5.3.4. Tropical Cyclone Technical Bulletin

#### Purpose

The Tropical Cyclone Technical Bulletin is issued to customers requiring technical data in a format that can be read by humans and parsed by a computer.

#### Issue criteria and schedule

Tropical Cyclone Technical Bulletins are issued at six-hourly intervals at 0130, 0730, 1330 and 1930 UTC for all tropical cyclones, and all tropical lows that have an intensity equivalent to a Dvorak Current Intensity (CI) number of 2.0 or greater. A tropical low with CI=2.0 can be generally described as a weather system that could become a tropical cyclone within 24 hours.

In situations where the Australian Tropical Cyclone Warning Centre is issuing products for Australian communities while a system is outside its Area of Responsibility (e.g., TC Advice for Norfolk Island for a system approaching from Fiji or New Zealand's AoR) the Technical Bulletin will be issued to facilitate communication of forecast rationale between meteorological agencies in the region. The Product IDs and standard issue times are shown in Table 8.

OFFICIAL

Table 8 Tropical Cyclone Technical Bulletin - product IDs and issue times

Product ID number(s)	Issue times UTC
IDW27600 – TC Technical Bulletin 1	0130
IDW27700 – TC Technical Bulletin 2	0730
IDW27800 – TC Technical Bulletin 3	1330
IDD20020 – TC Technical Bulletin 1	1930
IDD20021 – TC Technical Bulletin 2	
IDQ20018 – TC Technical Bulletin 1	
IDQ20068 – TC Technical Bulletin 2	
IDQ20069 – TC Technical Bulletin 3	

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

### 5.3.5. Storm Tide Advice

#### Purpose

Storm Tide Advices are issued to emergency management authorities for agreed locations (as detailed in Appendix 1) to enable them to manage risks associated with elevated sea levels at the coast. Storm Tide Advices provide key forecast values for coastal sea level effects associated with the tropical cyclone. Storm Tide refers to the total water level at the coast but does not address inundation or landward extent of flooding.

#### Issue criteria and schedule

A Storm Tide Advice will always be issued with the first issue of a Tropical Cyclone Advice regardless of whether there is a risk of the Total Water Level exceeding the Highest Astronomical Tide. Subsequently, Storm Tide Advices will continue to be issued when the Total Water Level is expected to exceed the Highest Astronomical Tide (HAT) in the area under threat from a tropical cyclone. The Product IDs and standard issue times are shown in Table 9.

Table 9 Storm Tide Advice - product IDs and Issue times

Product ID number(s)	Issue times UTC
IDW26000 – Storm Tide Advice	0200
IDD20180 – Storm Tide Advice	0800
IDQ20017 – Storm Tide Advice 1	1400
IDQ20054 – Storm Tide Advice 2	2000
IDQ20055 – Storm Tide Advice 3	

#### Content

- Situation - coastal crossing location and approximate time of crossing.
- Storm tide forecast
  - Worst case scenario (for up to 10 locations)
  - Forecast track scenario (for up to 10 locations)
- Onset of damaging winds
- Next advice time

#### Notes

- Storm Tide Advices are not issued to the media or the general community due to the technical knowledge needed to interpret them.

**OFFICIAL**

- Storm Tide Advises may be provided for up to 10 locations that are situated within the Watch or Warning zones on the Tropical Cyclone Forecast Track Map.
- Storm tide heights in the warnings are referenced to Australian Height Datum (AHD), Lowest Astronomical Tide (LAT), and Highest Astronomical Tide (HAT).
- The "Worst Case Scenario" is defined as the Total Water Level value for which there remains 1 in 50 chance of storm tide going even higher.
- For Queensland, a graphical version of the Storm Tide Advice is also provided (see example Graphical Storm Tide Advice in Appendix 2). This product pictorially compares seawater level heights at a location with the elevation of known landmarks in the vicinity.

**5.3.6. Real-Time Event Data**

**Purpose**

The Real-Time Event Data is a machine-readable file that contains all the information relating to an individual tropical system including (when applicable):

- Current and past analysis
- Forecast Track
- Forecast Confidence Areas
- Likelihood of being a tropical cyclone

It is designed for high-end users to be ingested into operational systems and is available to emergency management authorities and subscription holders.

**Issue criteria and schedule**

The Real-Time Event Data is first issued for a tropical system that is expected to form within or move into the area in the next seven days. It will then be updated a minimum of twice daily, and more often when other products are required, until such time as the tropical low dissipates or leaves the region. The Product IDs and standard issue times are shown in Table 10.

Table 10 Real-Time Event Data - product IDs and Issue times

Product ID number(s)	Issue Time (UTC)
IDW65350 – Tropical Cyclone Real-Time Event Data (WA System 1)	With the issue of a Forecast Track Map or a minimum of twice daily at; 0100 0900
IDW65351 – Tropical Cyclone Real-Time Event Data (WA System 2)	
IDW65352 – Tropical Cyclone Real-Time Event Data (WA System 3)	
IDQ65355 – Tropical Cyclone Real-Time Event Data (QLD System 1)	
IDQ65356 – Tropical Cyclone Real-Time Event Data (QLD System 2)	
IDQ65357 – Tropical Cyclone Real-Time Event Data (QLD System 3)	
IDD65443 – Tropical Cyclone Real-Time Event Data (NT System 1)	
IDD65444 – Tropical Cyclone Real-Time Event Data (NT System 2)	

**Content**

The Real-Time Event Data congregates all information from Tropical Cyclone Advices and Forecast Track Maps. It also includes likelihood of a tropical cyclone and Forecast Confidence Area. This is all converted into a format that is machine readable and able to be displayed on geospatial systems. For more information see [http://reg.bom.gov.au/catalogue/Tropical\\_Cyclone\\_Real-Time\\_Event\\_Data\\_Product\\_Guide.pdf](http://reg.bom.gov.au/catalogue/Tropical_Cyclone_Real-Time_Event_Data_Product_Guide.pdf).

**5.3.7. CAP Tropical Cyclone Advice**

**Purpose**

The Common Alerting Protocol (CAP) Tropical Cyclone Advice is a product that standardises the content of alerts and warnings and provides warning messages that are machine readable by a range of technologies.

The Common Alerting Protocol (CAP) allows a warning message to be consistently disseminated simultaneously over many warning systems, across all hazards and to many applications.

**Issue criteria and schedule**

The CAP Tropical Cyclone Advice is issued each time a Tropical Cyclone Advice is issued. The Product IDs and standard issue times are shown in Table 11

Table 11 CAP Tropical Cyclone Advice - product IDs and issue times

Product ID number(s)	Issue times UTC
IDW24500 - CAP Tropical Cyclone Advice – System 1	Issued with every TC Advice (e.g., hourly, three-hourly or six-hourly)
IDW24510 - CAP Tropical Cyclone Advice – System 2	
IDW24520 - CAP Tropical Cyclone Advice – System 3	
IDD24500 - CAP Tropical Cyclone Advice – System 1	
IDD24510 - CAP Tropical Cyclone Advice – System 2	
IDQ24500 - CAP Tropical Cyclone Advice – System 1	
IDQ24510 - CAP Tropical Cyclone Advice – System 2	
IDQ24520 - CAP Tropical Cyclone Advice – System 3	

**Content**

The CAP Tropical Cyclone Advice obtains information automatically from the coastal threat area (Watch or Warning zone) of the Tropical Cyclone Forecast Track Map.

**OFFICIAL**

For further information on machine-readable tropical cyclone products see [http://reg.bom.gov.au/catalogue/Bureau\\_of\\_Meteorology\\_warning\\_products\\_user\\_guide.pdf](http://reg.bom.gov.au/catalogue/Bureau_of_Meteorology_warning_products_user_guide.pdf).

**5.3.8. GML Track**

**Purpose**

The GML file contains data to display the forecast track as a layer on a display system (i.e., GIS compatible format). For example, this allows for the forecast track to be viewable through MetEye on the Bureau’s website at <http://www.bom.gov.au/australia/meteye/>.

**Issue criteria and schedule**

The GML Track is issued each time the Tropical Cyclone Forecast Track Map is issued. The Product IDs and standard issue times are shown in Table 12. A full list of all product IDs, including all machine-readable products and product components is included in Appendix 3.

Table 12 GML Tropical Cyclone Forecast Track Map - product IDs and issue times

Product ID number(s)	Issue times UTC
IDW60266 - GML Tropical Cyclone Forecast Track Map 1	Issued with every TC Forecast Track Map (i.e., hourly, three-hourly or six-hourly)
IDW60267 - GML Tropical Cyclone Forecast Track Map 2	
IDW60268 - GML Tropical Cyclone Forecast Track Map 3	
IDW60283 - GML Tropical Cyclone Forecast Track Map for NT	
IDD65401 - GML Tropical Cyclone Forecast Track Map 1	
IDD65402 - GML Tropical Cyclone Forecast Track Map 2	
IDD65408 - GML Tropical Cyclone Forecast Track Map for WA	
IDD65409 - GML Tropical Cyclone Forecast Track Map for QLD	
IDQ65248 - GML Tropical Cyclone Forecast Track Map 1	
IDQ65249 - GML Tropical Cyclone Forecast Track Map 2	
IDQ65250 - GML Tropical Cyclone Forecast Track Map 3	
IDQ65251 - GML Tropical Cyclone Forecast Track Map for NT	
IDQ65252 - GML Tropical Cyclone Forecast Track Map for NSW	

**Content**

The track includes past positions to 72 hours prior, as well as forecast positions to 120 hours ahead.



**OFFICIAL**

For further information on machine readable tropical cyclone products see  
[http://reg.bom.gov.au/catalogue/Bureau\\_of\\_Meteorology\\_warning\\_products\\_user\\_guide.pdf](http://reg.bom.gov.au/catalogue/Bureau_of_Meteorology_warning_products_user_guide.pdf)

RELEASED UNDER FREEDOM OF INFORMATION

**OFFICIAL**



## 6. International Tropical Cyclone Product Schedule

### 6.1. Ocean Wind Warning

#### Purpose

Ocean Wind Warnings are issued to warn mariners on ocean-going vessels in the Australian AoR of impending threats of gale-force or stronger winds.

#### Issue criteria and schedule

Ocean Wind Warnings are issued whenever a tropical cyclone or developing tropical low is likely to cause gales in the Australian AoR within the next 24 hours. Note that the issue criteria relate only to the occurrence of gales and do not stipulate formation of a tropical cyclone, which requires gales to wrap more than halfway around the system. The product is issued at six hourly intervals. The Product IDs and standard issue times are shown in Table 13.

Table 13 Ocean Wind Warnings - product IDs and issue times

Product ID number(s)	Issue times UTC
IDW23100 – Ocean Wind Warning 1	0100
IDW23200 - Ocean Wind Warning 2	0700
IDW23300 - Ocean Wind Warning 3	1300
IDD20130 – Ocean Wind Warning 1	1900
IDD20230 - Ocean Wind Warning 2	
IDQ20008 - Ocean Wind Warning 1	
IDQ20009 - Ocean Wind Warning 2	
IDQ20074 - Ocean Wind Warning 3	

#### Content

- Product ID
- GMDSS code
- Message priority (SECURITE)
- Warning status (Corrected or Updated)
- METAREA number (8/10/11) and issuing TCWC office location.
- Type of warning (Gale, Storm or Hurricane)
- Standard statement "Please be aware, wind gusts can be a further 40 percent stronger than the averages given here, and maximum waves may be up to twice the height."

**OFFICIAL**

- Situation - Tropical Cyclone Name, location (Lat/Lon), location uncertainty, movement, maximum winds and central pressure
- Forecast - affected area and forecast winds, seas and swell over the next 24 hours.
- Forecast positions - +12 and +24 hours.
- Remarks
- Next issue time [UTC]

**Notes**

- The Global Marine Distress and Safety System (GMDSS) code (e.g., 40:2:1:24:08S133E999:11:00) above the message priority code ensures that the satellite broadcast of the Ocean Wind Warning via Inmarsat (Satcom C) reaches ships within 999 nautical miles of the specified location (e.g., 08S 133E).

## 6.2. CREX Bulletin

### Purpose

The Character form for Representation and EXchange of data (CREX) bulletins are designed to provide tropical cyclone data to international numerical weather prediction (NWP) centres for including in numerical weather prediction models. The data is provided in a compact binary (BUFR) or pseudo-binary ASCII (CREX) code.

### Issue criteria and schedule

CREX Bulletins are issued for tropical cyclones, and for tropical lows that have reached a defined intensity threshold<sup>8</sup>, within the Area of Responsibility. The CREX products are issued at six-hourly intervals.

The Product IDs and standard issue times are shown in Table 14.

Table 14 Tropical Cyclone CREX Bulletin - product IDs and issue times

Product ID number(s)	Issue times UTC
IDW20015 – CREX TC Bulletin 1	0100
IDW20016 – CREX TC Bulletin 2	0700
IDW20017 – CREX TC Bulletin 3	1300
IDD20015 – CREX TC Bulletin 1	1900
IDD20016 – CREX TC Bulletin 2	
IDQ20056 – CREX TC Bulletin 1	

<sup>8</sup> Dvorak Current Intensity number of 2.0 or higher.

IDQ20057 – CREX TC Bulletin 2	
IDQ20058 – CREX TC Bulletin 3	

**Content**

The Bulletin is coded from the analysis of the tropical cyclone data one hour before the issue time (i.e., 00, 06, 12 and 18 UTC):

- Time
- Latitude/Longitude
- Central Pressure
- Pressure Outermost Closed Circular Isobar
- Radius Outermost Closed Circular Isobar
- Radius Max Wind
- Mean Wind
- Gale Radius/Storm Radius

**6.3. Tropical Cyclone Advisory (Aviation)**

**Purpose**

Tropical Cyclone Advisories (TCA) provide international civil aviation with information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre.

**Area of responsibility**

The Australian TCWC issues Tropical Cyclone Advisories to aviation under the banner of the Darwin Tropical Cyclone Advisory Centre (TCAC). The Darwin Tropical Cyclone Advisory Centre (TCAC) is one of seven ICAO designated TCACs. The Darwin TCAC area of responsibility is illustrated in **Error! Reference source not found.**

**Issue criteria and schedule**

The first TCA shall be issued as soon as a tropical cyclone is expected to develop within twelve hours.

Subsequent TCAs are issued every 6 hours (0100|0700|1300|1900 UTC). Cyclone details are given for the standard synoptic times (0000|0600|1200|1800 UTC) and the message content includes analysis data and 6-hourly forecast data out to 24 hours. This issue cycle parallels the issue of Ocean Wind Warnings.

Advisories may be updated at any time there is a significant change in information.

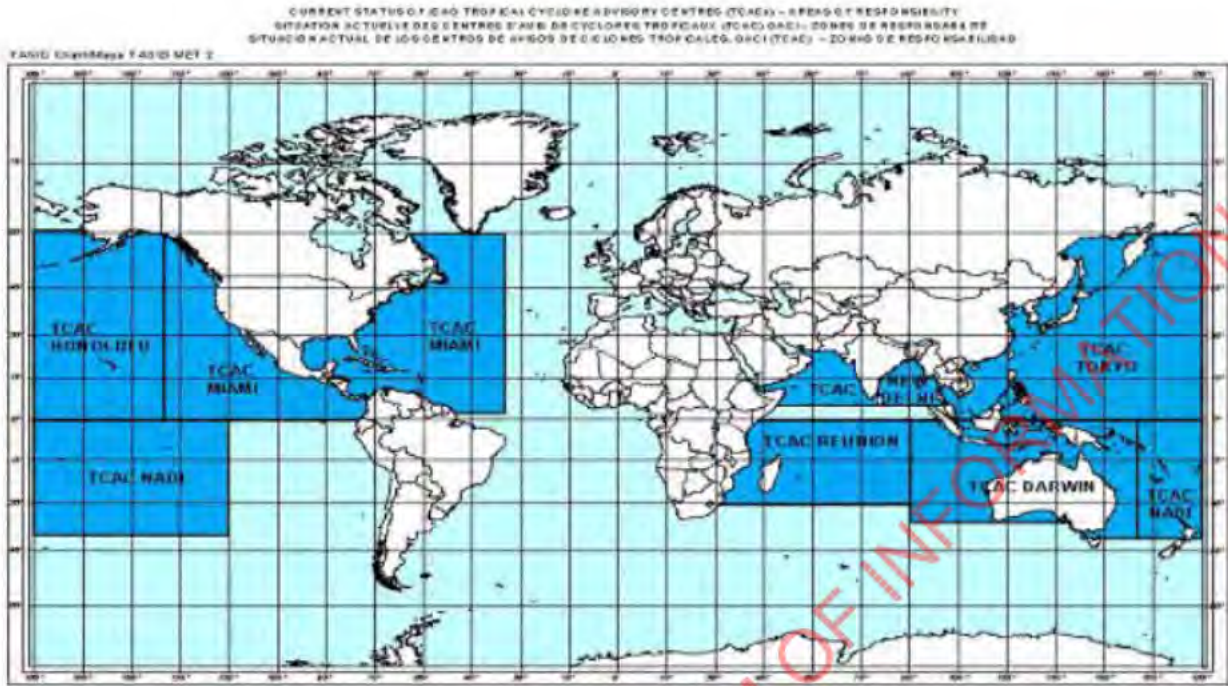


Figure 5 ICAO TCAC areas of responsibility

The Product IDs are shown in Table 15.

Table 15 Tropical cyclone Advisory - product IDs

Product ID number(s)
IDW41170 – Tropical Cyclone Advisory 1
IDW41180 - Tropical Cyclone Advisory 2
IDW41190 - Tropical Cyclone Advisory 3
IDD41170 – Tropical Cyclone Advisory 1
IDD41180 - Tropical Cyclone Advisory 2
IDQ41170 - Tropical Cyclone Advisory 1
IDQ41180 - Tropical Cyclone Advisory 2
IDQ41190 - Tropical Cyclone Advisory 3

**Content**

- Header
- Identification of the type of message

OFFICIAL

- Status indicator
- Time of fix
- Name of TCAC
- Name of cyclone
- Advisory number
- Observed position of centre
- Observed thunderstorm cloud (optional)
- Direction and speed of movement
- Changes in Intensity
- Central pressure
- Maximum surface wind
- Forecast of centre position and surface wind (+6, +12, +18 and +24 hrs)
- Remarks
- Expected time of issuance of next advisory or "NO MSG EXP"
- 

## 6.4. Satellite Analysis Bulletin

### Purpose

This product is issued as guidance to the Nadi Regional Specialised Meteorological Centre (Nadi RSMC) operated by Fiji Meteorological Service. It contains location and intensity information on tropical cyclones and developing tropical disturbances in the Southwest Pacific Ocean region.

The Nadi RSMC area of responsibility for which Satellite Analysis Bulletins are issued is shown in **Error! Reference source not found.** and Table 16.

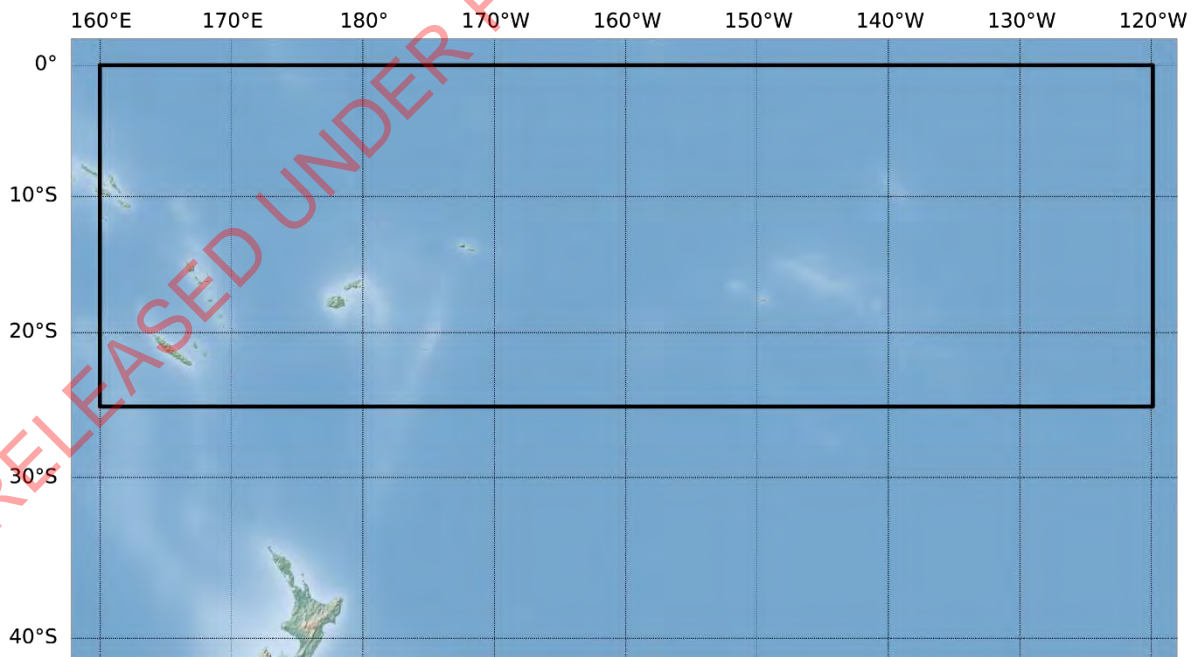


Figure 6 Nadi RSMC area of responsibility

OFFICIAL

Table 16 Nadi RSMC area of responsibility

Area of responsibility	Area bounded by
Nadi RSMC	25°S 160°E, 25°S 120°W, EQ 120°W, EQ 160°E and 25°S 160°E

**Issue criteria and schedule**

The Satellite Analysis Bulletin is issued daily at 0630UTC when a tropical disturbance has reached a Dvorak CI-number of 2.0 or greater and when further development is expected. The bulletin may be issued more frequently (usually at 0030, 1230 or 1830 UTC) See Note 2. The Product IDs and standard issue times are shown in Table 17.

Table 17 Tropical Cyclone Satellite Analysis Bulletin - product ID and issue time

Product ID number(s)	Issue times UTC
IDQ20015 - Satellite Analysis Bulletin	0630

**Content**

- Location (latitude/longitude in decimal degrees)
- Data used for determining intensity.
- Latitude and longitude detection sums - E.g. For an analysis position of 17.5S 162.0 E, the latitude detection sum would be 13 (1+7+5) and longitude detection sum would be 9 (1+6+2+0)
- Dvorak analysis code E.g., T2.5/3.0/D0.5/24HRS, where 2.5 is the FT, 3.0 is the CI and D- indicates slight development over the last 24 hours.
- Remarks relating to the Dvorak analysis.
- Next issue time

**Notes**

- Satellite Analysis Bulletins (SABs) provide satellite analysis details for existing tropical cyclones and developing tropical disturbances. SABs do not include forecast information.
- The frequency of the bulletins may be increased upon activation of the Australian TCWC for a system with the potential to (a) move into the Australian AoR and/or (b) initiate Special Advisories for the Solomon Islands (See section 6.5)

## 6.5. Special Advisory for the Solomon Islands

### Purpose

The Australian Bureau of Meteorology provides a Special Advisory for the Solomon Islands for tropical cyclones and developing tropical lows that have the potential to affect communities of the Solomon Islands.

The area that relates to Special Advisories for the Solomon Islands is shown in **Error! Reference source not found.** and Table 18. The Bureau will issue the Special Advisory for the Solomon Islands when the tropical low or cyclone expected to impact the area is located west of 160E with Nadi RSMC (Fiji) having responsibility when the tropical low or cyclone is east of 160E.

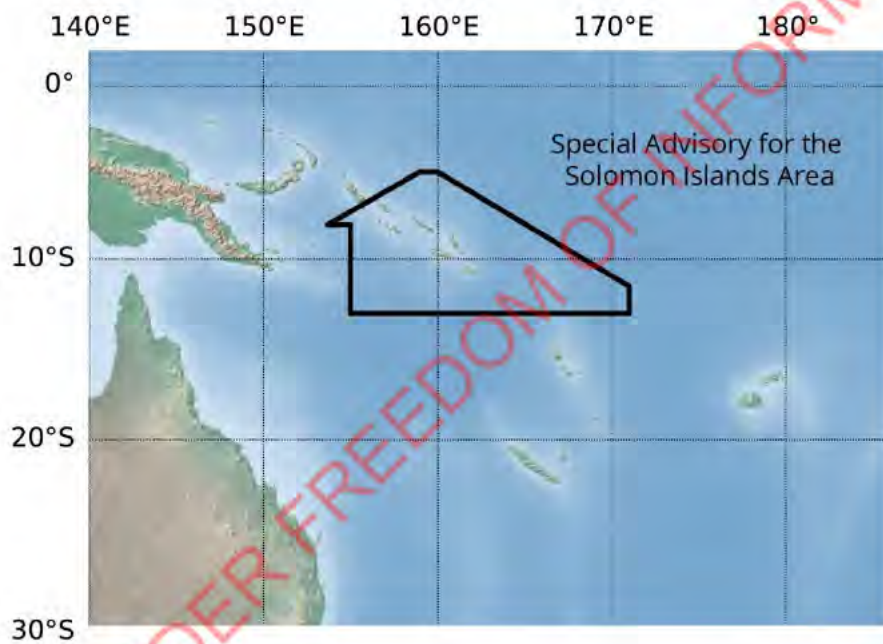


Figure 7 Special Advisory for the Solomon Islands AOR

Table 18 Special Advisory for the Solomon Islands Area

Area of responsibility	Area bounded by
Special Advisory for the Solomon Islands	5°S 160°E, 11.5°S 171°E, 13°S 171°E, 13°S 160°E, 13°S 155°E, 8°S 155°E, 8°S 153.7°E, 5°S 159°E and 5°S 160°E

### Issue criteria and schedule

The Special Advisory for the Solomon Islands will be issued as soon as a tropical cyclone or developing tropical disturbance is considered likely to cause gales over any islands within the defined area within 48 hours.

The Advisories are issued as soon as the need becomes apparent, then at 6-hourly intervals. The Product IDs and standard issue times are shown in Table 19.

**OFFICIAL**

Table 19 Special Advisory for the Solomon Islands – product ID and issue times

Product ID number(s)	Issue times UTC
IDQ20016 – Special Advisory for the Solomon Islands	0200 0800 1400 2000

**Content**

- Tropical Cyclone Name and Category
- Date/Time
- Latitude
- Longitude
- Movement Direction and Speed
- Maximum 10-Minute Wind and forecast Wind
- Radius of gales
- Radius of storm force winds
- Radius of hurricane force winds
- Forecast Position
- The next advisory issued time

**Notes**

- The frequency of the advisories may be increased to 3-hourly upon request from the Solomon Islands Meteorological Service. The frequency may only be increased as soon as a tropical cyclone or developing tropical disturbance is considered likely to cause gales about any of the provinces of the Solomon Islands within 24 hours.

RELEASED UNDER FREEDOM OF INFORMATION



## 7. Appendix 1: Storm Tide Advice Locations

### 7.1. Storm Tide Advice location list

All the Storm Tide Advice products are point-based. The points included are selected by forecasters from a pre-defined list of coastal locations. Table 20 lists each storm tide advice location along with nominal coordinates. The two tidal plane elevations that define tidal range are also listed. Tidal plane values are important but may differ from local sources as discussed in Section 7.3.

Table 20 Storm tide advice locations

Location	Longitude	Latitude	LAT mAHD	HAT mAHD	Note
Abbot Point	148.09	-19.87	-1.67	1.93	
Agnes Water	151.91	-24.19	-1.48	1.78	
Airlie Beach	148.71	-20.26	-1.84	2.32	
Albert River	139.76	-17.55	-1.92	2.47	
Alligator Point	140.79	-17.45	-2.09	2.78	
Alva	147.49	-19.45	-1.48	1.78	
Alyangula	136.42	-13.85	-1.16	1.22	
Angurugu	136.42	-13.90	-1.16	1.21	
Aurukun (Archer River)	141.61	-13.35	-1.27	0.95	See 7.3.5
Balgai	146.41	-19.01	-1.72	2.07	See 7.3.6
Baniyala	136.23	-13.20	-1.04	0.87	
Bidyadanga	121.78	-18.68	-4.22	4.19	
Bing Bong Port	136.39	-15.63	-1.43	1.14	
Bloomfield	145.37	-15.91	-1.43	1.55	
Boigu Island	142.22	-9.23	-2.01	2.24	See 7.3.5
Bowen	148.24	-20.02	-1.67	2.06	
Brisbane River	153.16	-27.38	-1.27	1.46	
Brisk Bay	148.29	-20.09	-1.67	2.06	
Broad Sound	149.95	-22.51	-3.32	3.68	See 7.3.5
Broome	122.24	-17.96	-5.32	5.20	
Bunbury	115.64	-33.33	-0.60	0.67	
Burnett Heads	152.46	-24.79	-1.73	1.97	
Busseton	115.35	-33.65	-0.61	0.59	
Bynoe Harbour	130.54	-12.63	-4.01	3.55	
Cairns Harbour	145.79	-16.90	-1.69	1.84	
Cape Cuvier	113.39	-24.22	-0.95	0.95	
Cape Preston	116.21	-20.83	-2.19	2.21	
Cardwell	146.04	-18.25	-1.94	2.18	
Carnarvon	113.66	-24.88	-1.03	1.02	

**OFFICIAL**

Clump Point	146.13	-17.85	-1.79	1.89	
Coconut Grove	130.85	-12.39	-4.12	3.86	
Conway_Beach	148.77	-20.49	-2.36	2.82	See 7.3.5
Cooktown	145.25	-15.44	-1.49	1.70	
Coolangatta_Beach	153.53	-28.16	-0.93	1.08	
Cooloola_Beach	153.15	-26.07	-1.03	1.20	
Coral Bay	113.77	-23.14	-0.89	0.91	
Cox Peninsula	130.74	-12.43	-4.06	3.67	
Cungulla	147.11	-19.40	-1.83	2.06	
Dampier	116.71	-20.66	-2.65	2.47	
Darwin	130.85	-12.47	-4.15	4.00	
Darwin Harbour	130.79	-12.43	-4.12	3.86	
Dauan_Island	142.55	-9.42	-1.67	2.08	
Denham	113.53	-25.93	-0.77	0.92	
Derby	123.64	-17.31	-6.20	5.99	
Dingo_Beach	148.51	-20.09	1.75	2.18	
Dubbar_Point	139.14	-16.67	-1.92	1.95	
Dundee Beach	130.35	-12.72	-3.66	3.09	
Evans Landing	141.85	-12.66	-1.83	1.54	
Exmouth	114.13	-21.93	-1.44	1.48	
Flying Fish Point	146.08	-17.49	-1.69	1.74	
Fremantle	115.74	-32.06	-0.74	0.66	
Galiwinku	135.57	-12.02	-2.70	2.51	
Geraldton	114.61	-28.78	-0.57	0.69	
Gladstone	151.27	-23.84	-2.30	2.45	
Golden Beach	153.12	-26.82	-0.95	1.11	
Great Keppel Island	150.92	-23.19	-2.40	2.61	
Green Island	145.98	-16.75	-1.54	1.56	
Hamilton Marina	148.95	-20.34	-2.07	2.53	
Hay Point	149.31	-21.28	-3.37	3.77	
Hayman Island	148.88	-20.06	-1.92	2.36	
Iama (Yam) Island	142.77	-9.90	-2.00	2.16	
Kalbarri	114.16	-27.71	-0.47	0.63	
Kalumburu	126.64	-14.30	-1.49	2.09	
Karratha	116.84	-20.74	-2.65	2.46	See 7.3.5
King Ash Bay	136.68	-15.81	-1.68	1.29	
Kubin	142.22	-10.25	-1.95	1.82	
Kuri Bay	124.52	-15.48	-5.28	5.36	
Laguna Quays	148.68	-20.59	-2.37	2.83	See 7.3.5
Lizard Island	145.44	-14.65	-1.41	1.58	
Lockhart River	143.37	-12.81	-1.57	1.61	

**OFFICIAL**

Lucinda	146.35	-18.52	-1.87	2.09	
Mackay	149.22	-21.15	-3.04	3.57	
Main Beach	153.44	-27.97	-0.87	1.09	
Maningrida	134.20	-12.05	-2.57	2.04	
Mapoon	141.91	-11.97	-1.75	1.05	See 7.3.5
Milikapiti	130.68	-11.43	-1.73	1.37	
Milingimbi	134.90	-12.10	-2.85	2.53	
Milyakburra	136.20	-13.78	-1.14	1.22	
Minjilang	132.58	-11.15	-1.37	1.05	
Molongle Creek	147.69	-19.82	-1.50	1.81	
Mooloolaba	153.13	-26.68	-0.97	1.20	
Nelly Bay	146.86	-19.17	-1.93	1.89	
Nhulunbuy	136.80	-12.20	-1.60	1.69	
Noosa Heads	153.09	-26.36	-1.06	1.22	
Numbulwar	135.70	-14.30	-1.44	1.36	
Onslow	115.11	-21.64	1.55	1.52	
Palm Cove	145.69	-16.73	-1.71	1.73	
Palm Island	146.55	-18.74	-1.68	2.01	
Palmerston	130.94	-12.50	-4.13	3.93	
Perth	115.86	-31.95	-0.57	0.58	
Pirlangimpi	130.42	-11.40	-2.49	1.51	
Pormpuraaw	141.59	-14.92	-1.33	1.16	See 7.3.5
Port Alma	150.86	-23.58	-2.85	3.07	
Port Douglas	145.48	-16.48	-1.58	1.78	
Port Hedland	118.60	-20.31	-3.83	3.73	
Port Roper	135.40	-14.70	-1.37	1.35	
Rainbow Beach	153.11	-25.90	-1.02	1.19	
Redland Bay	153.31	-27.61	-1.24	1.50	
Saint Pauls	142.33	-10.20	-1.76	2.16	
Scarborough Boat Harbour	153.11	-27.19	-1.11	1.31	
Shoalwater Bay	150.56	-22.55	-3.51	3.85	See 7.3.5
Southport	153.42	-27.95	-0.86	1.09	
St Lawrence	149.60	-22.29	-4.08	4.71	
Toolakea	146.58	-19.15	-1.73	2.07	See 7.3.6
Townsville	146.82	-19.24	-1.93	2.18	
Ugar (Stephen) Island	143.53	-9.52	-1.99	2.08	
Umbakumba	136.81	-13.86	-0.85	0.95	
Urangan	152.90	-25.28	-2.07	2.22	
Wadeye	129.50	-14.20	-4.44	3.75	
Waiben (Thursday Is)	142.22	-10.59	-1.87	1.67	
Wallal Downs	120.64	-19.78	-3.81	3.78	

OFFICIAL

Waruwi	133.39	-11.65	-1.73	1.33	
Weddell	130.85	-12.47	-4.15	4.00	
Wickham	117.14	-20.67	-3.19	2.94	
Wurrumiyanga	130.63	-11.77	-3.81	3.30	
Wyndham	128.12	-15.48	-4.60	4.11	
Yarrabah	145.89	-16.87	-1.69	1.60	
Yeppoon	150.79	-23.13	-2.36	2.77	
Yirrkala	136.89	-12.25	-1.18	1.14	

### 7.2. Storm Tide Advice location maps

All of The Storm Tide Advice locations listed in Table 20 are shown below as a series of map views. In each map, named storm tide advice locations are coloured to reflect relative tidal range. Red symbols indicate locations where the tidal range is especially large. The relevance of tidal range is discussed above in Section 7.3.3.

The nominal location of the numerical model grid cell corresponding to each advice location is indicated by a black 'X' symbol, noting that where this coincides with the advice location, it is less visible.

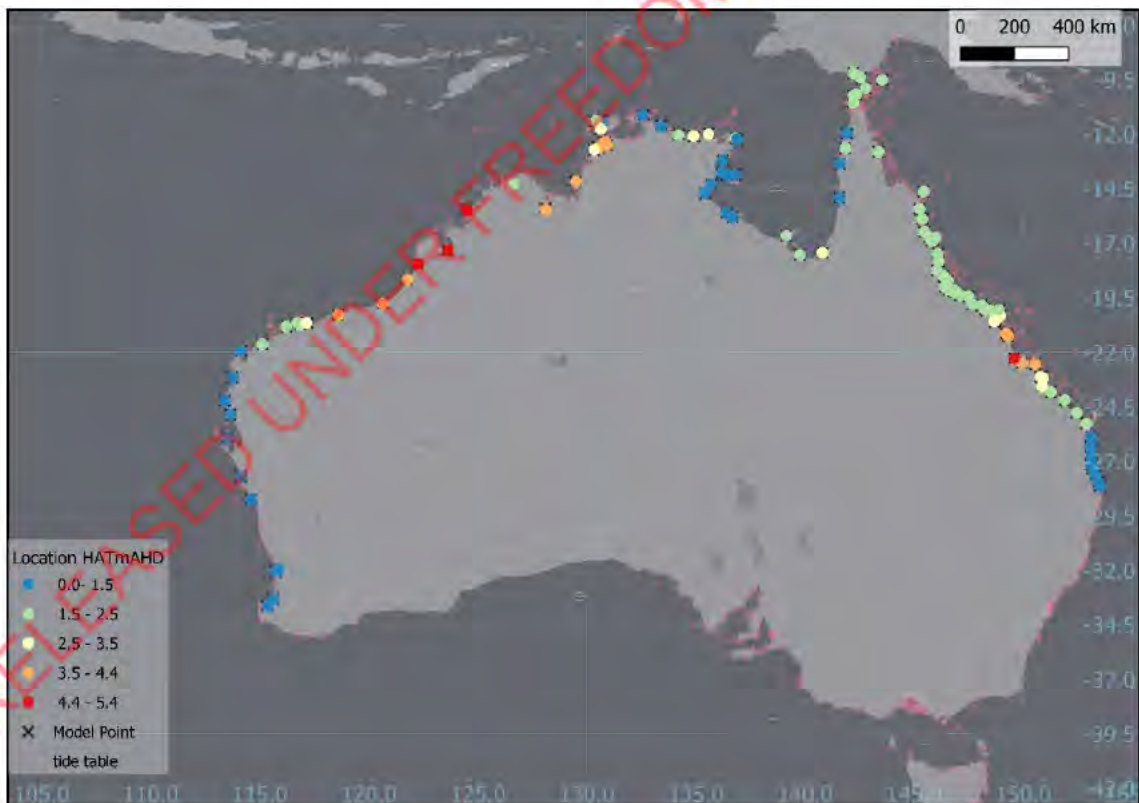


Figure 8 Storm tide advice locations overview



OFFICIAL

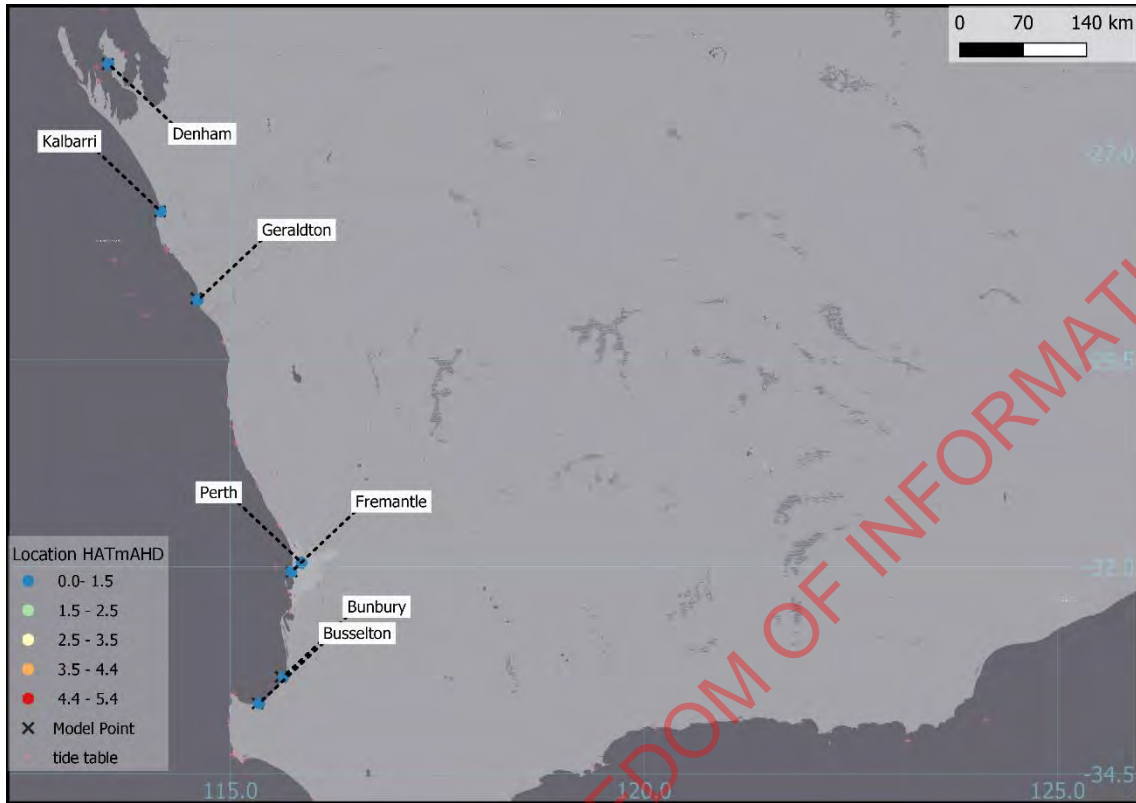


Figure 9 Storm tide advice locations - WA view 1

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

OFFICIAL

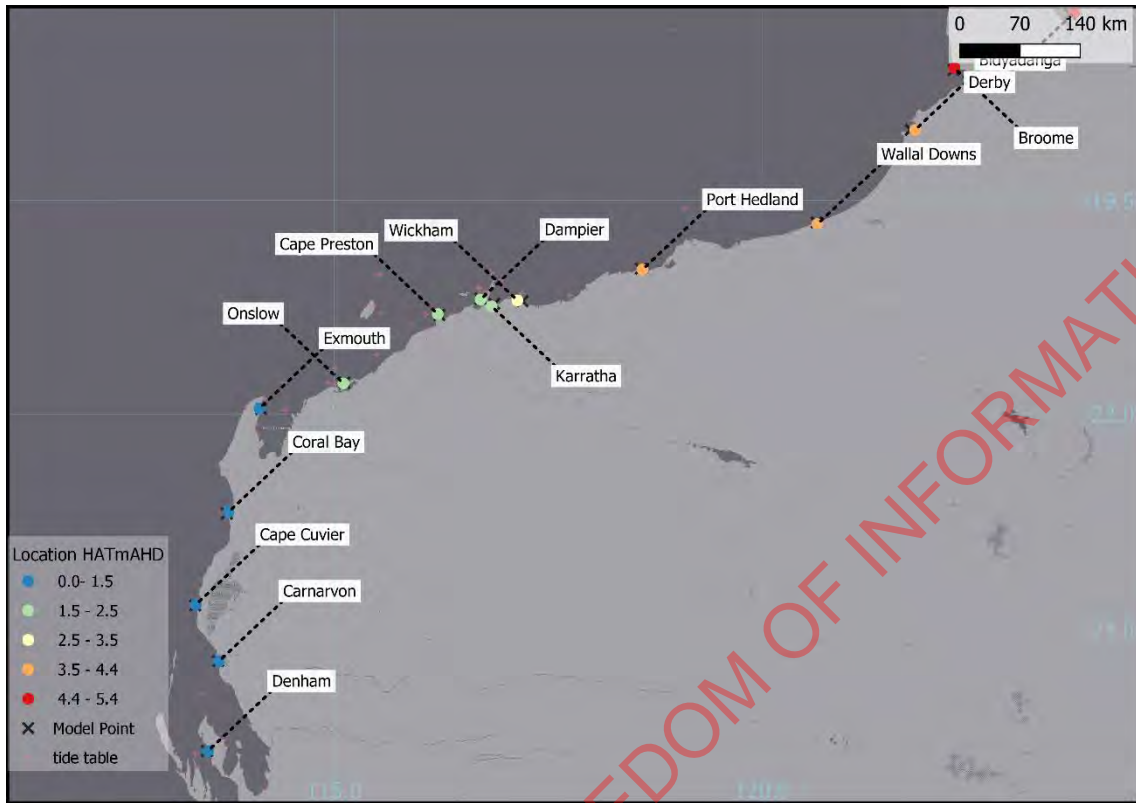


Figure 10 Storm tide advice locations - WA view 2

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL



OFFICIAL

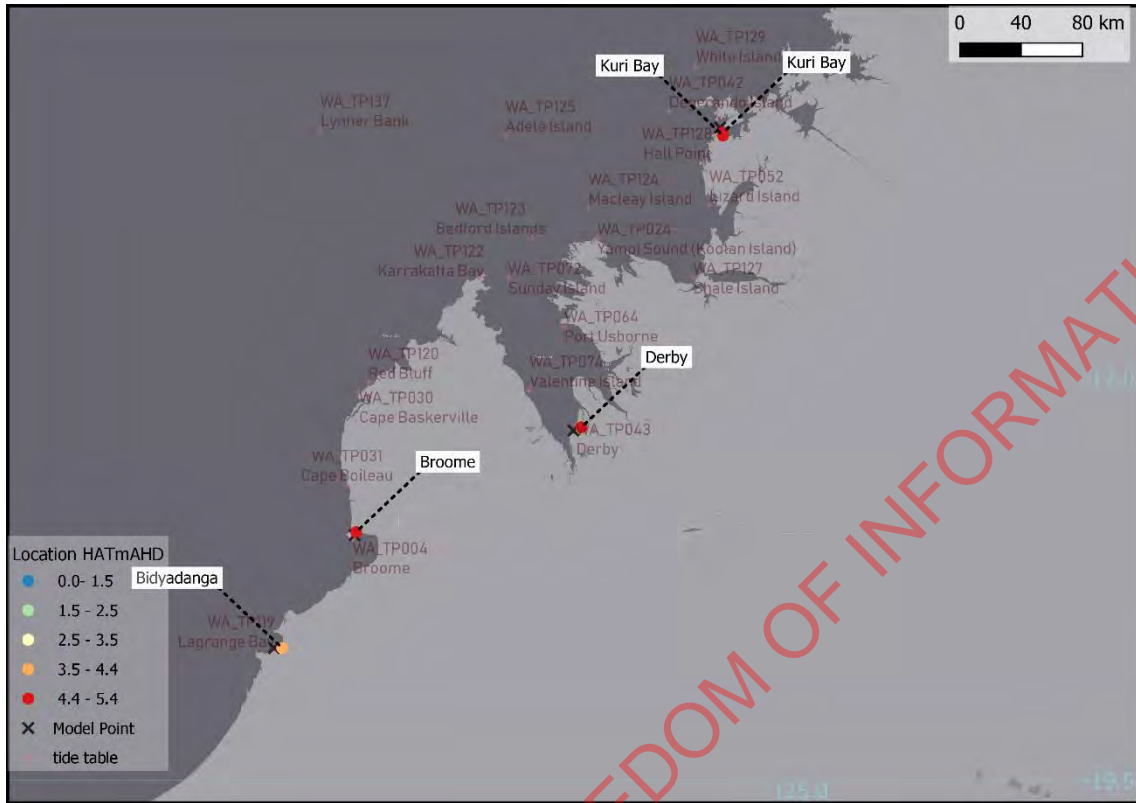


Figure 11 Storm tide advice locations - WA view 3

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

OFFICIAL

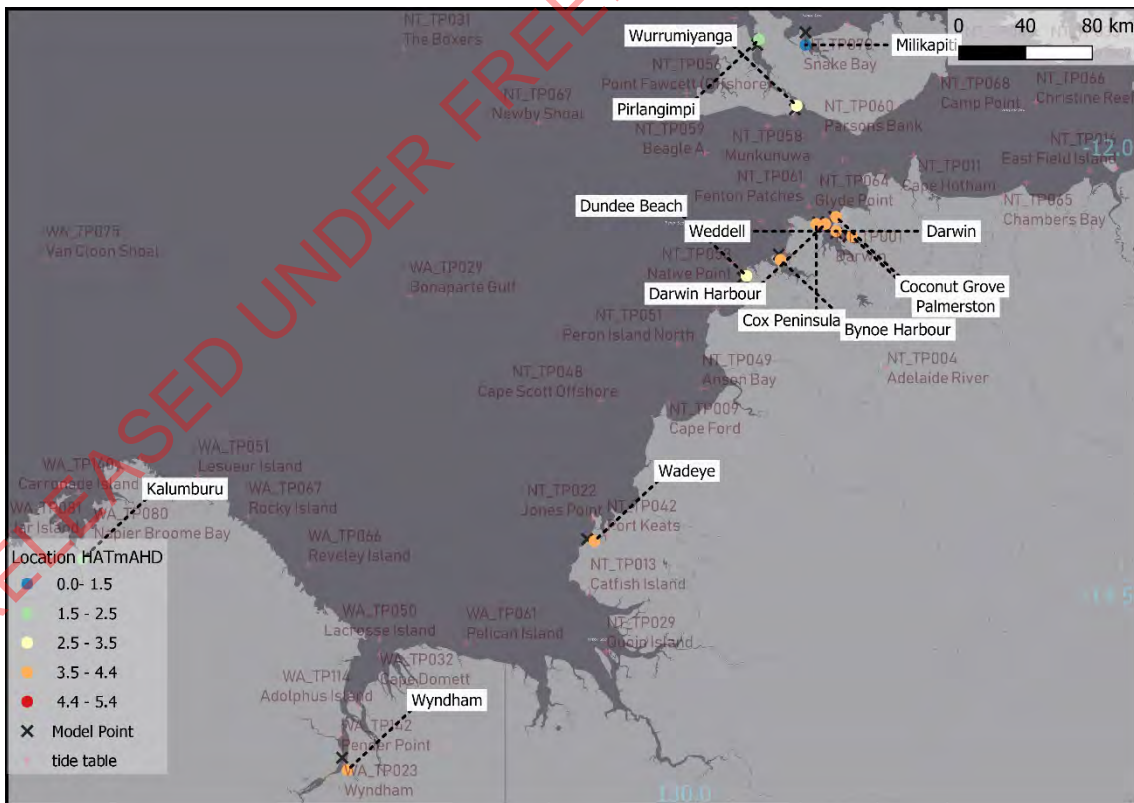


Figure 12 Storm tide advice locations – NT view 1

OFFICIAL



OFFICIAL

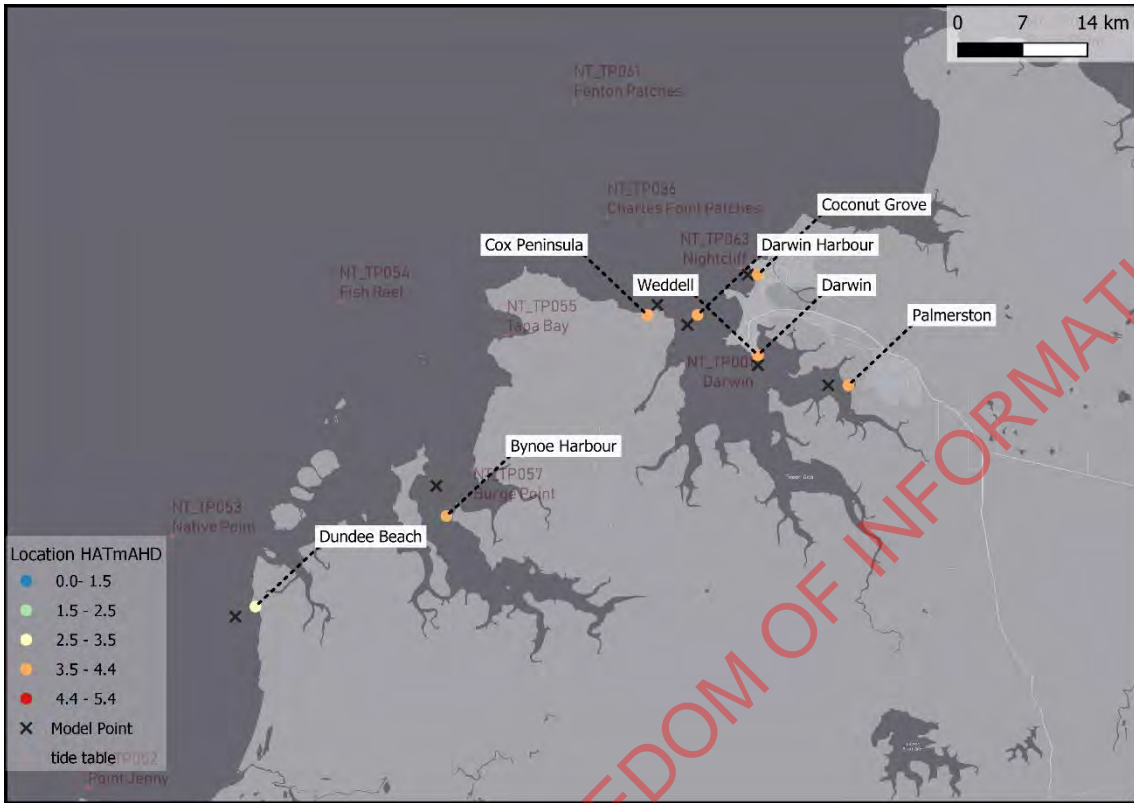


Figure 13 Storm tide advice locations – NT view 2

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

OFFICIAL

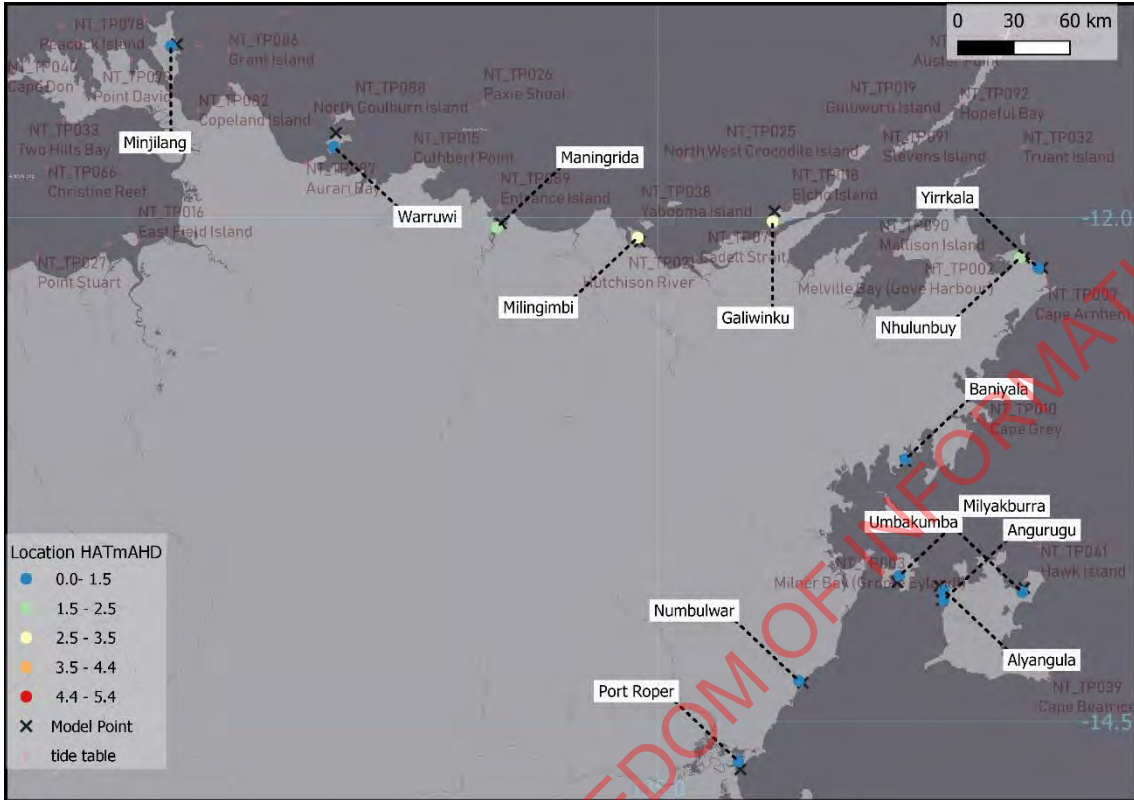


Figure 14 Storm tide advice locations – NT view 3

OFFICIAL

OFFICIAL

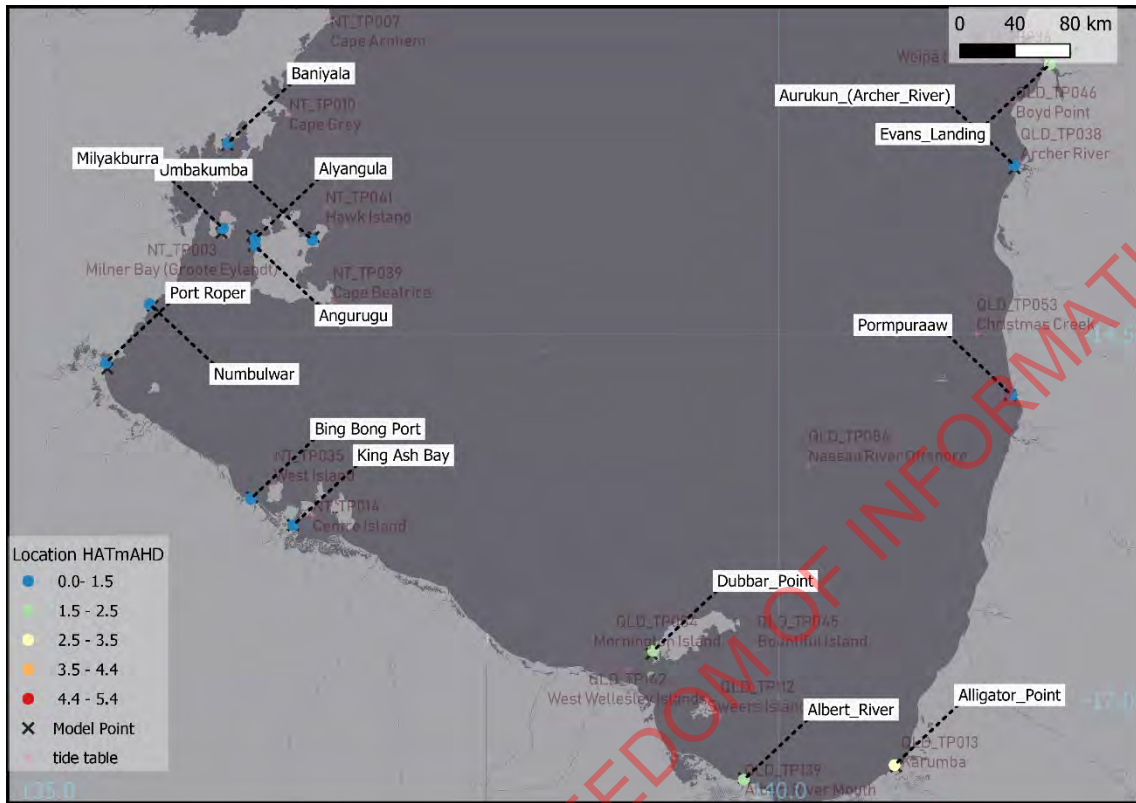


Figure 15 Storm tide advice locations – NT/QLD view

OFFICIAL

OFFICIAL



Figure 16 Storm tide advice locations – QLD view 1

OFFICIAL

OFFICIAL



Figure 17 Storm tide advice locations – QLD view 2

OFFICIAL

OFFICIAL

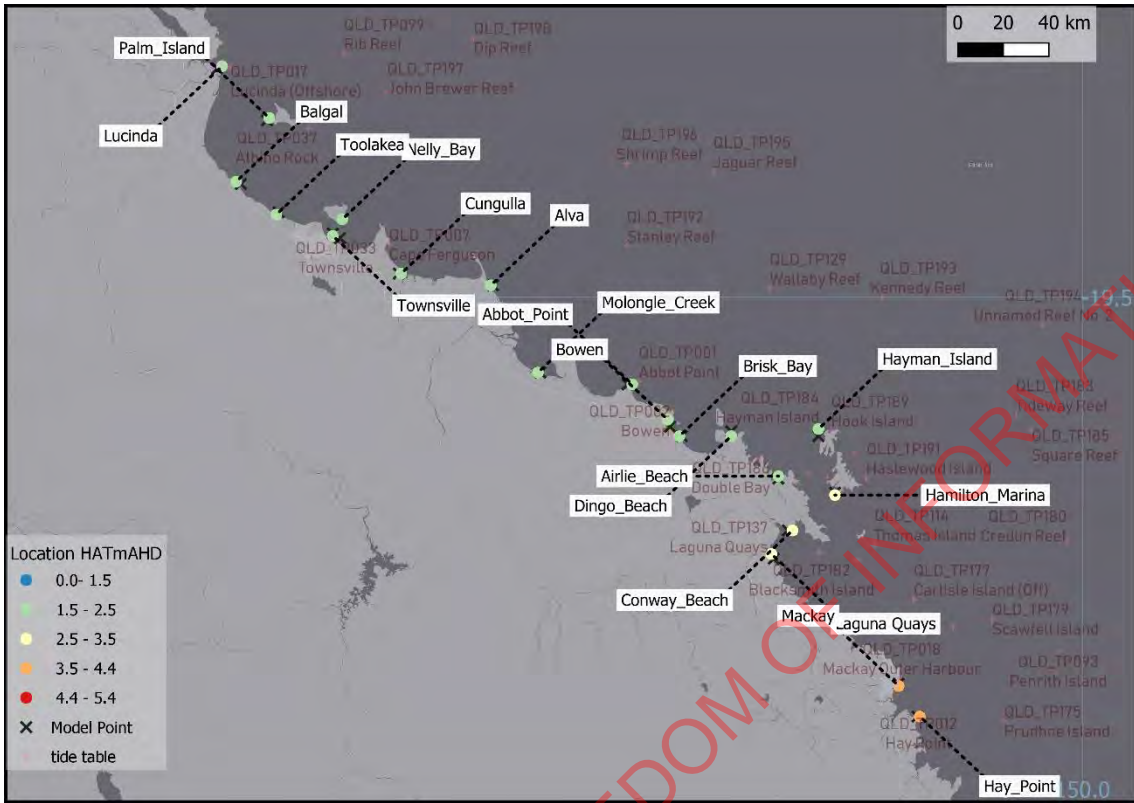


Figure 18 Storm tide advice locations – QLD view 3

OFFICIAL

OFFICIAL

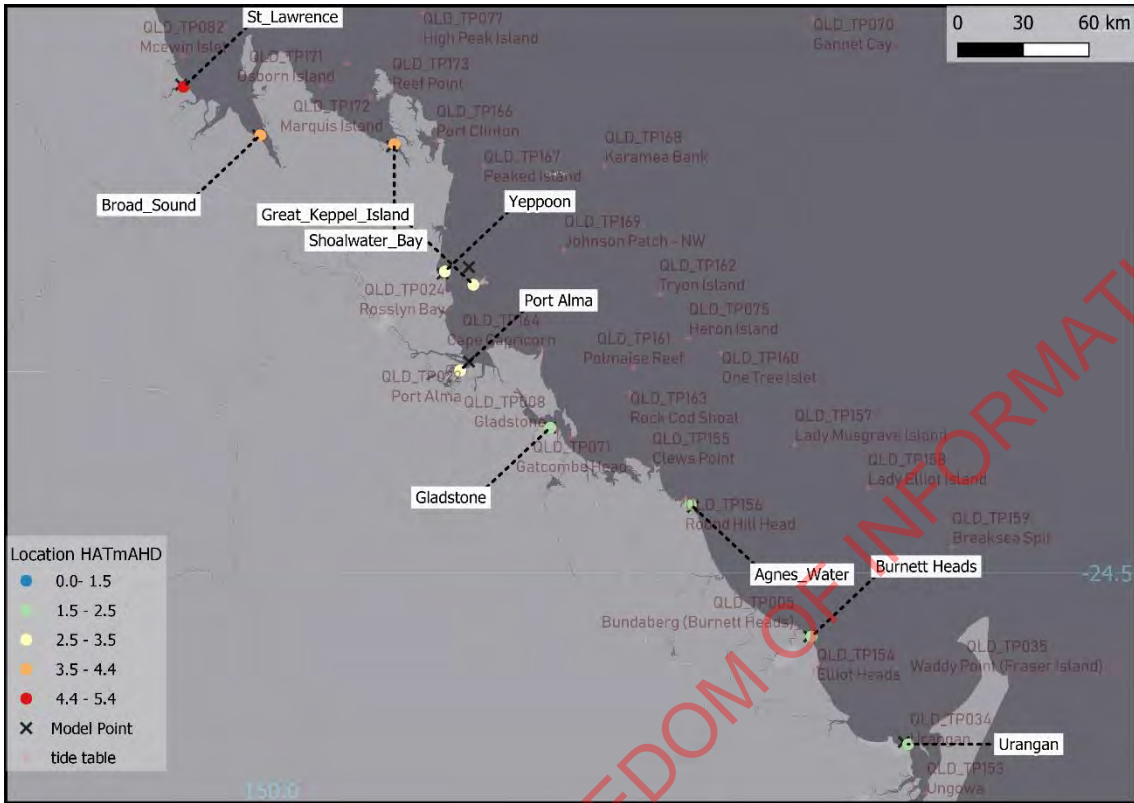


Figure 19 Storm tide advice locations – QLD view 4

OFFICIAL



Figure 20 Storm tide advice locations – QLD view 5

### 7.3. Interpretation of advice content

#### 7.3.1. Communication risks association with vertical datums

Coastal elevations are core to the value of Storm Tide Advice. The potential impact of a storm tide is a function of the relative elevations of coastal water and coastal land. Unfortunately, coastal elevations are often problematic and lead to technical and communication issues. Multiple vertical references are in use by coastal decision makers and offsets between datums are not well defined for the whole coast; so special caution is required to avoid miscommunication.

This situation reflects a history of different authorities working around the Australian coast as well as the rapidly expanding role of Global Navigation Satellite System (GNSS) technology. Marine and land-based elevations have been managed separately by a mixture of state and federal agencies and storm tide responses have necessarily worked with a hybrid of such sources. Coordination is improving under the aegis of the Inter-governmental Committee on Survey and Mapping (ICSM). ICSM activities directly relevant to storm tide applications include:

- <https://www.icsm.gov.au/what-we-do/aushydroid>
- <https://www.icsm.gov.au/what-we-do/elevation-and-depth-data>



Regardless of the changing technology, tidal analysis continues to play a role in connecting marine and land elevations. Tidal analysis is the basis for defining "tidal planes" which at the coast are conventionally used as fixed reference elevations. Select tidal planes are included in the Storm Tide Advice products. Tidal planes of special relevance to storm tide include the following:

- LAT = Lowest Astronomical Tide.
- MSL = Mean Sea Level
- HAT = Highest Astronomical Tide

It is notable the land elevation reference Australian Height Datum (AHD) is founded on the analysis of point tide gauge observations. It is not identical to MSL but can approximate it within a few decimetres.

Tide tables are typically, but not always, reported relative to a prediction datum chosen to match LAT.

The Bureau of Meteorology storm tide systems are based on elevation offsets and grids supplied by the Australian Hydrographic Service (AHS). This information is an active area of development as discussed above and is not guaranteed to match information used by all agencies.

### 7.3.2. Forecaster mediation of numerical model data

Storm tide advice products are based on numerical model data.

To a large degree the values included in the products are automatically generated, however forecasters have discretion to modify when additional information is available.

Modifications can include:

- choice of locations included in the Advice;
- modification of the numerical forecast water levels;
- modification of reference metadata such as tidal plane elevations.

### 7.3.3. Importance of tidal range

Tide patterns at the coast are a fundamental contextual factor in forecasting storm tide impacts. The Australian coast encompasses an especially wide range of tidal patterns that can be summarised by tidal range, the height difference between the highest and lowest normal tides. Where the tidal range is very large, the timing of a storm surge event relative to tidal patterns can become the most impact factor that renders an event impactful.

### 7.3.4. Tidal plane comparison graph

The tidal range at each site sets the background on which inconsistencies of elevation information can be interpreted. The tidal range background is relevant to the communication risks discussed in section 7.3.3.

OFFICIAL

**Error! Reference source not found.** summarises the tidal range at each of the storm tide advice locations in order of smallest to largest tidal range. Tidal range is shown as the height of the grey bar between each LAT and HAT value.

Reference values sourced from the Queensland Department of Environment and Science document *Storm Tide Reference Landmarks 2018* are shown for comparison.

Locations with known mismatch between the Queensland state reference landmark tidal planes and the Bureau system are highlighted and labelled in red. In all cases of mismatch, the HAT tidal plane used by the Bureau is lower than the state reference. Similar landmark data is not yet available for NT or WA.

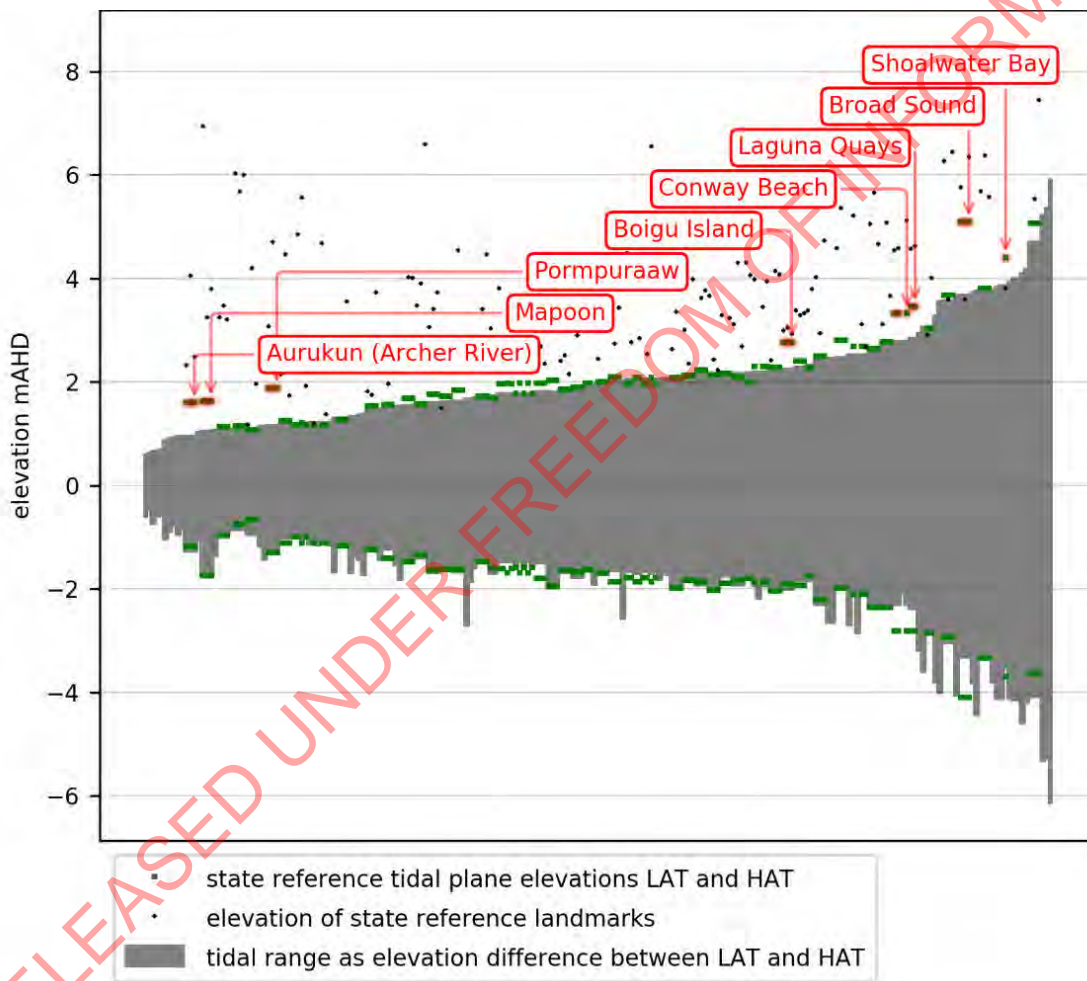


Figure 21 Visualisation of tidal planes as a function of tidal range.

Queensland landmark data overlaid and large mismatches highlighted.

### 7.3.5. Highlighted locations with mismatched tidal plane data

#### QLD: Eastern Gulf of Carpentaria

Notable mismatch between tidal plane data for Aurukun, Mapoon and Pormpuraaw in the Eastern Gulf of Carpentaria. These sites have very low astronomical tidal range.

The storm tide model HAT value is *lower* than the Queensland landmark report.

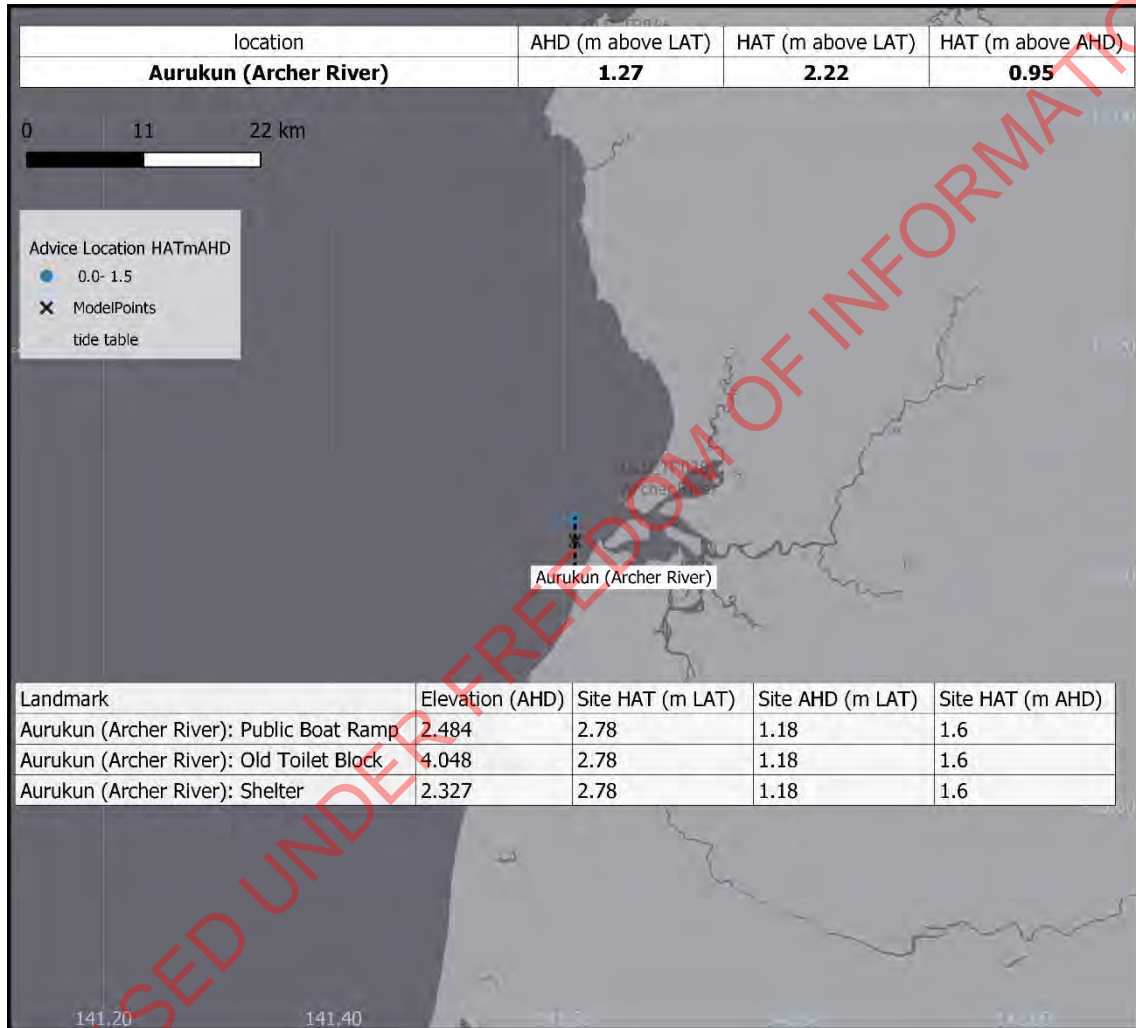


Figure 22 Highlight map - Aurukun

QLD: Northern Torres Strait

Notable mismatch between tidal plane data for Boigu Island in the Northern Torres Strait. The storm tide model HAT value is *lower* than the Queensland landmark report.

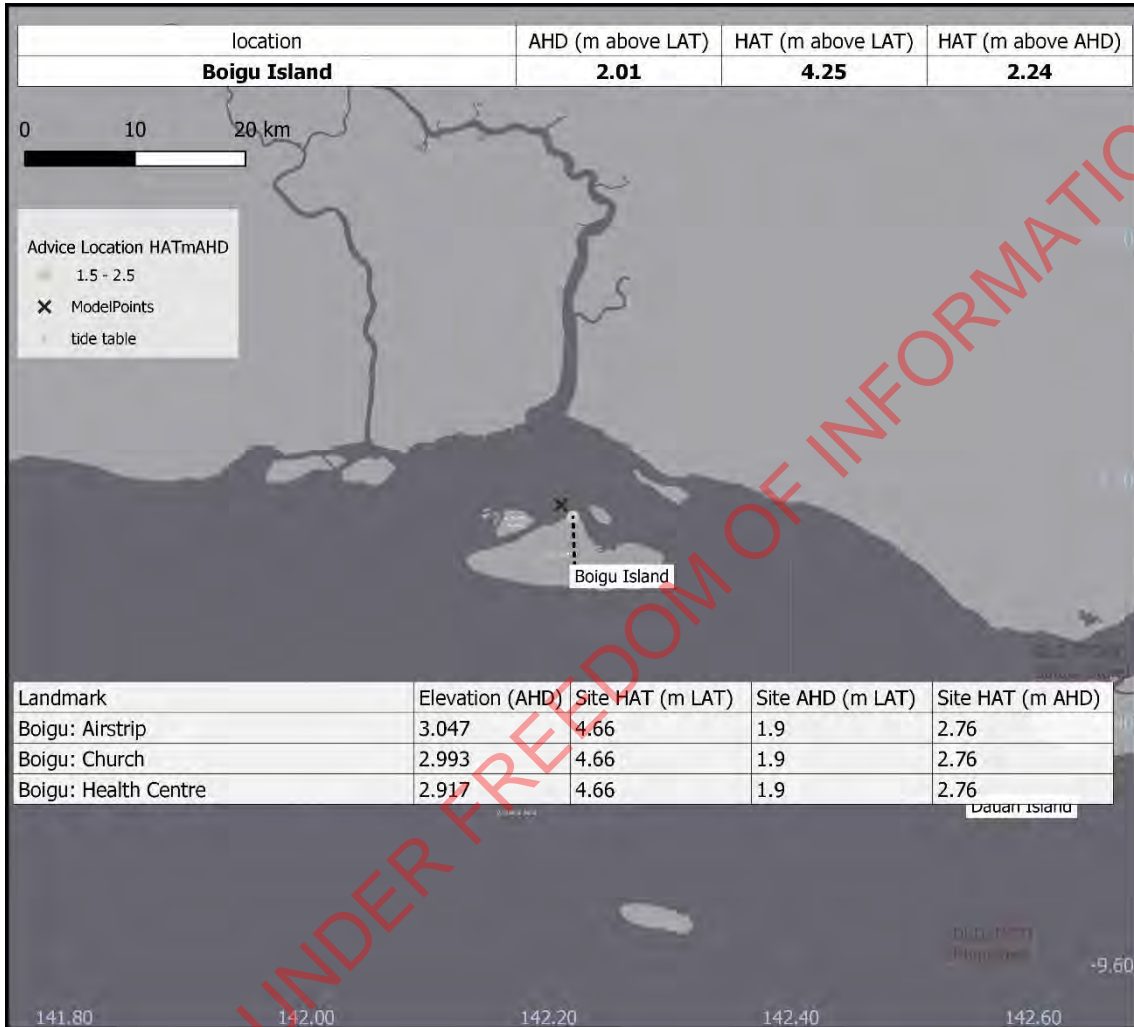


Figure 23 Highlight map - Boigu Island

**QLD: Broad Sound**

Notable mismatch between tidal plane data for Broad Sound and Shoalwater Bay. These sites have very large astronomical tidal range. The storm tide model HAT values are *lower* than the Queensland landmark report.

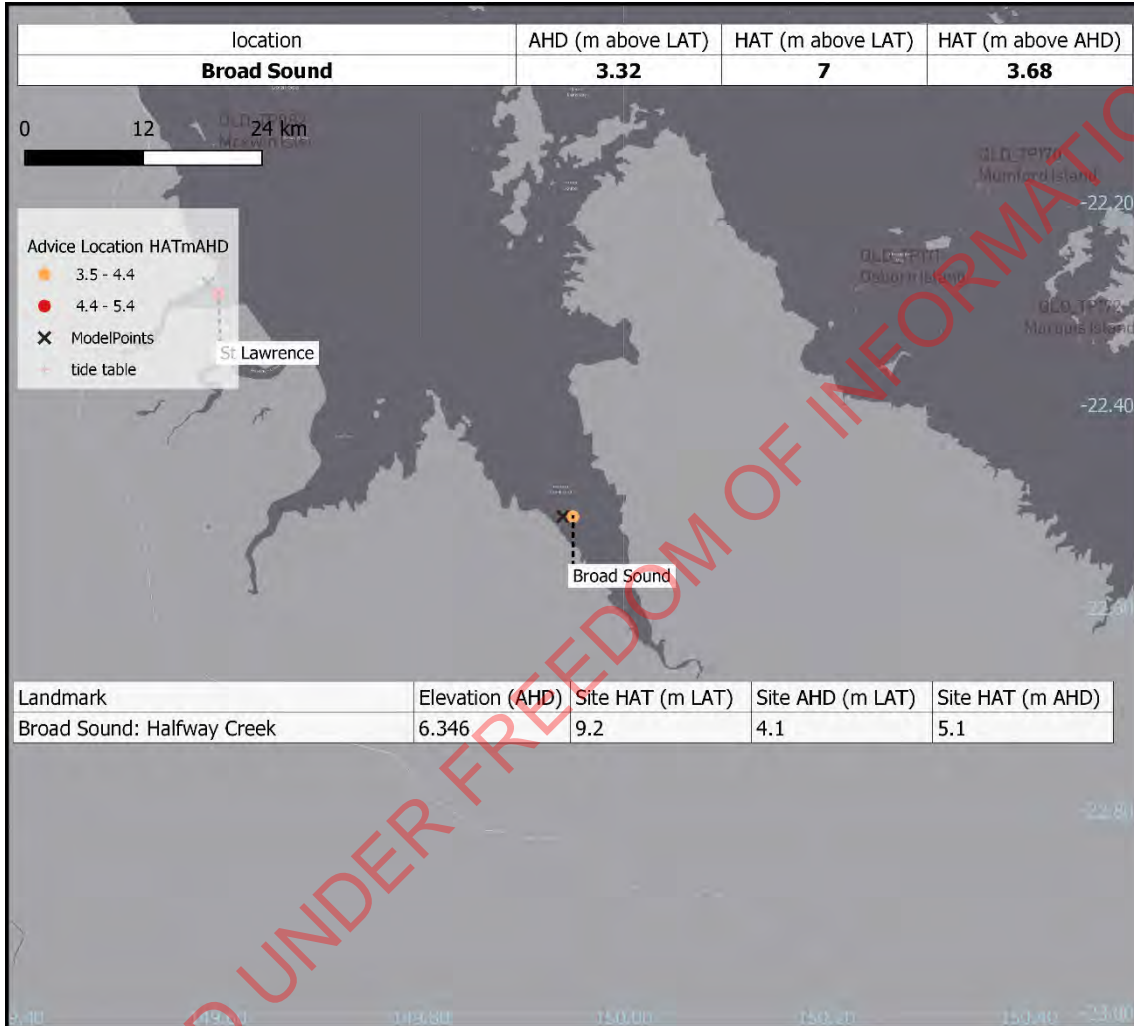


Figure 24 Highlight map - Broad Sound

RELEASED UNDER FREEDOM OF INFORMATION

**QLD: Laguna Quay and Conway Beach**

Notable mismatch between tidal plane data for Laguna Quays and Conway Beach These sites have a large astronomical tidal range. The storm tide model HAT values are *lower* than the Queensland landmark report.

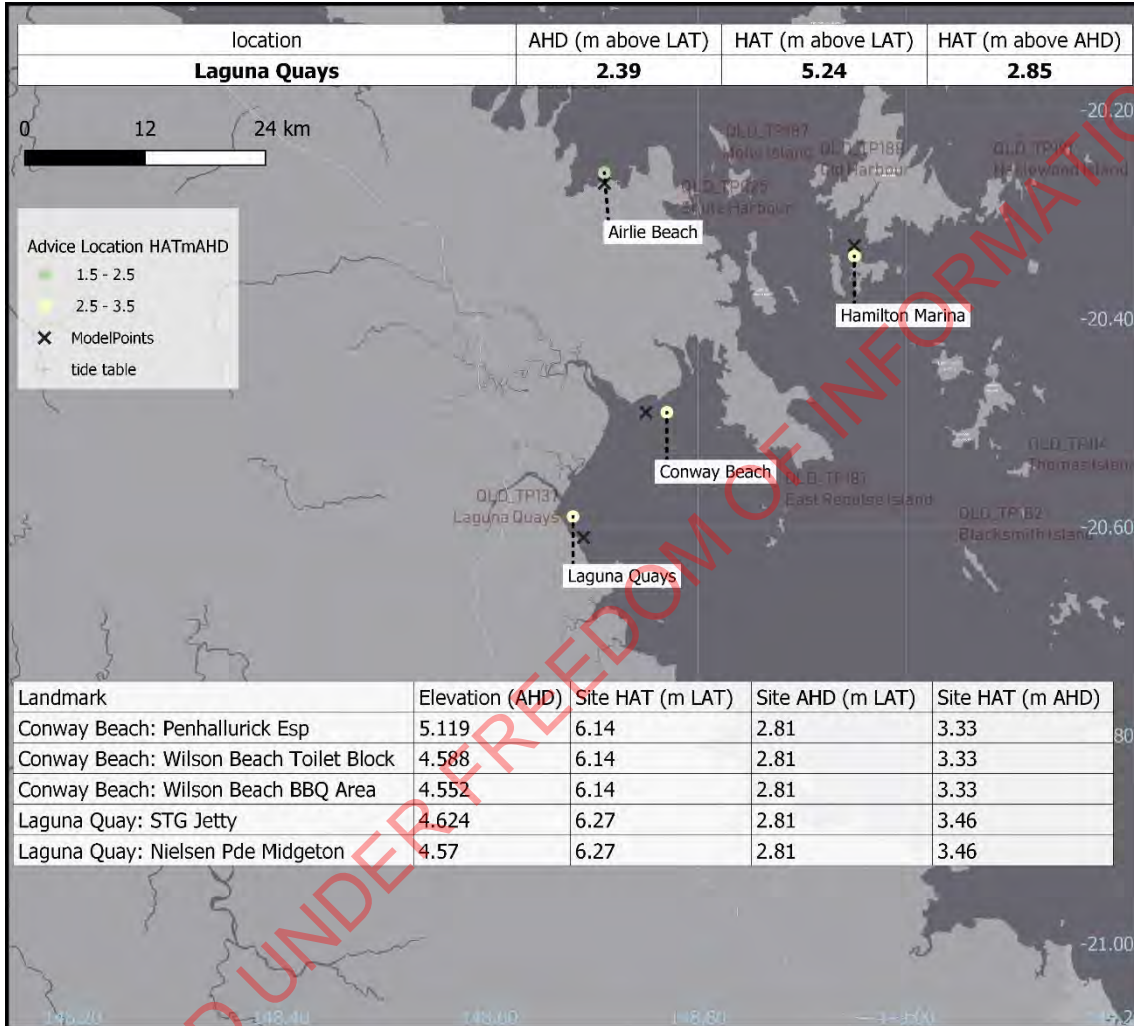


Figure 25 Highlight map - Laguna Quays

### 7.3.6. Highlighted locations with no standard tide table

#### QLD: Balgal and Toolakea

Additional sites to the north of Townsville that are not included in the Queensland landmark report and not associated with a standard tide table.

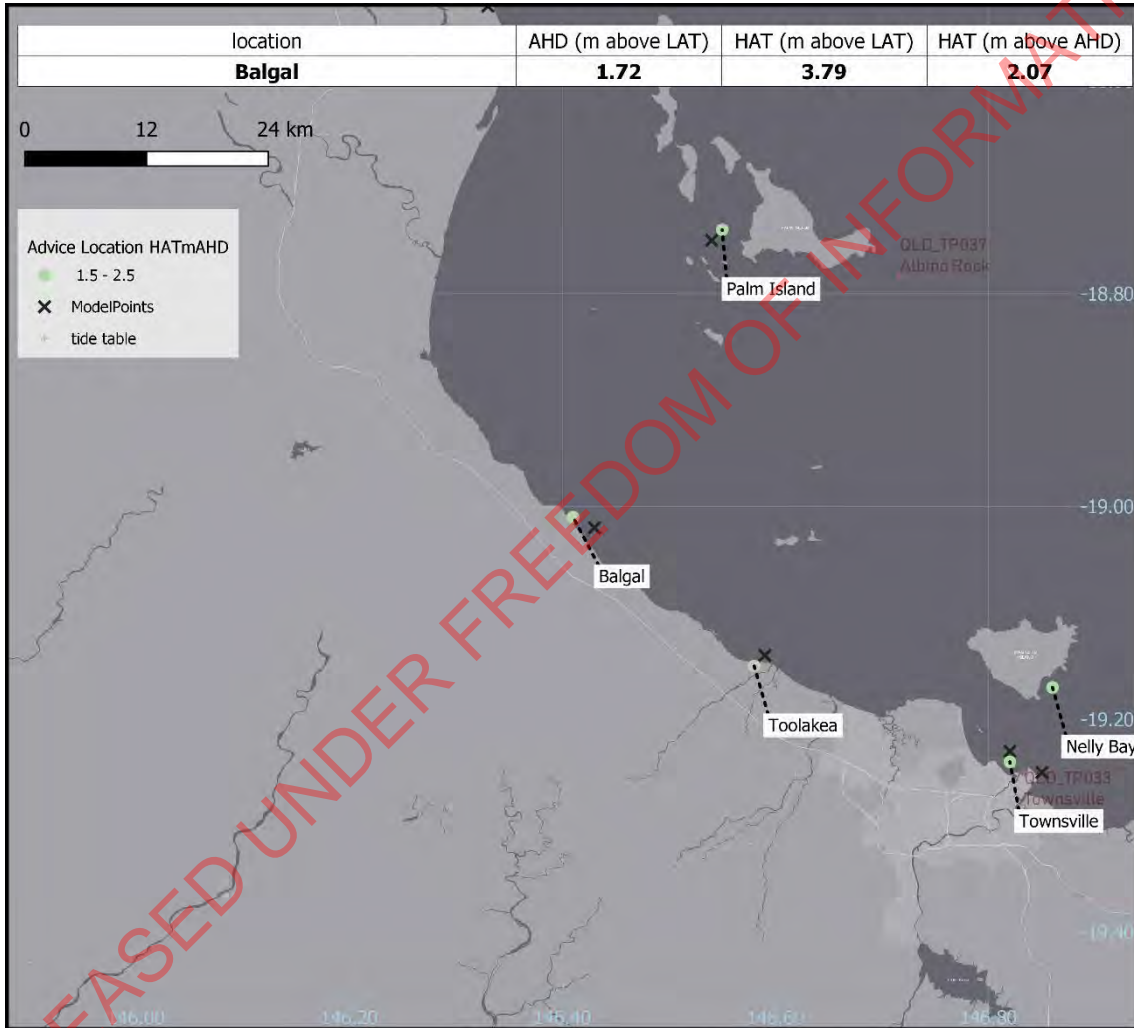


Figure 26 Highlight map - Balgal.

**WA: Karratha**

Karratha township is not associated with a standard tide table.

Storm Tide Advices for Karratha have historically referenced tidal heights from Port Walcott (WA\_TP021). All new Advices for Karratha will be based on tidal heights from the numerical model point closest to the township. Subsequently, the new HAT value of 5.1m above LAT has been reduced from the 6.1m used in previous years with the agreement of the WA Department of Fire and Emergency Services.

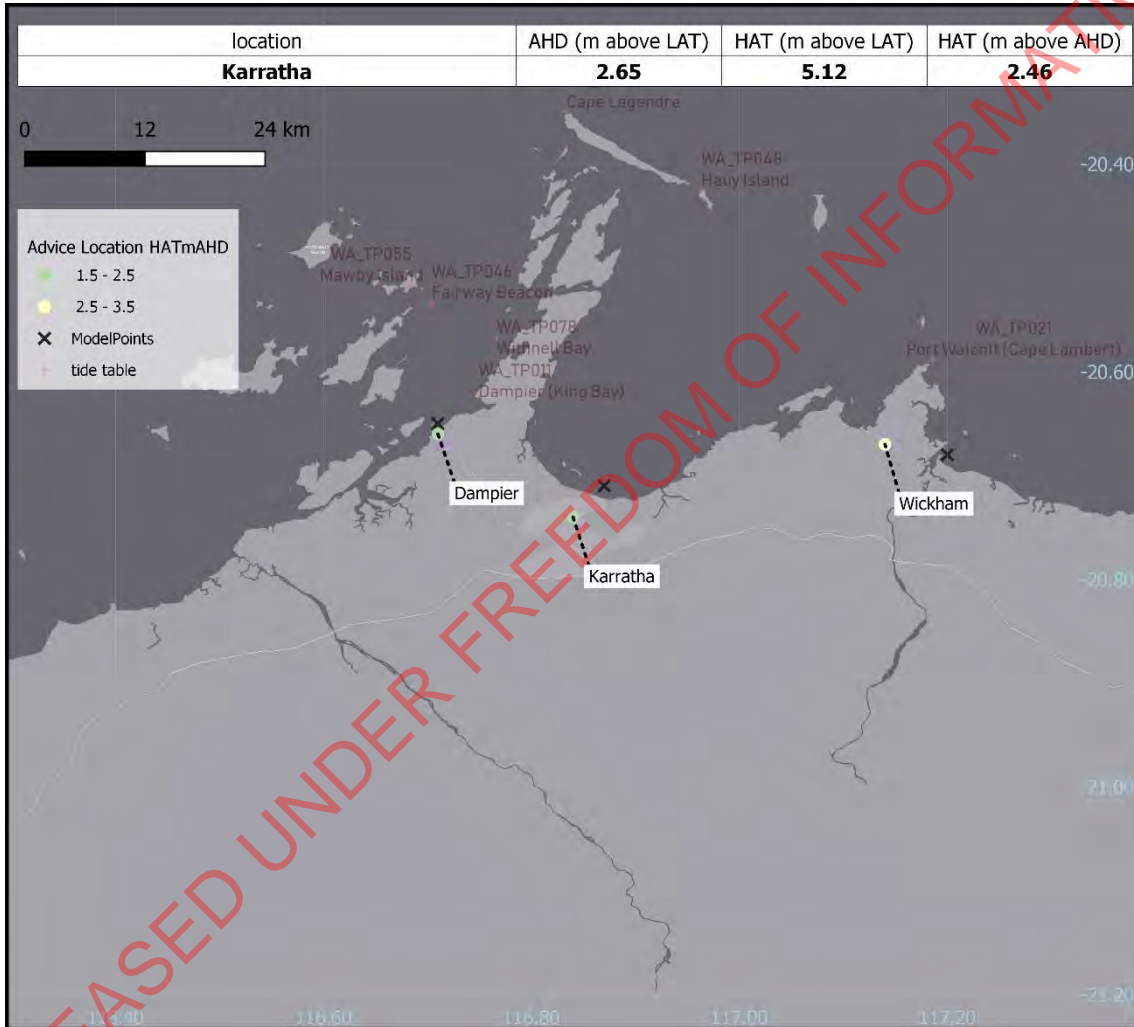


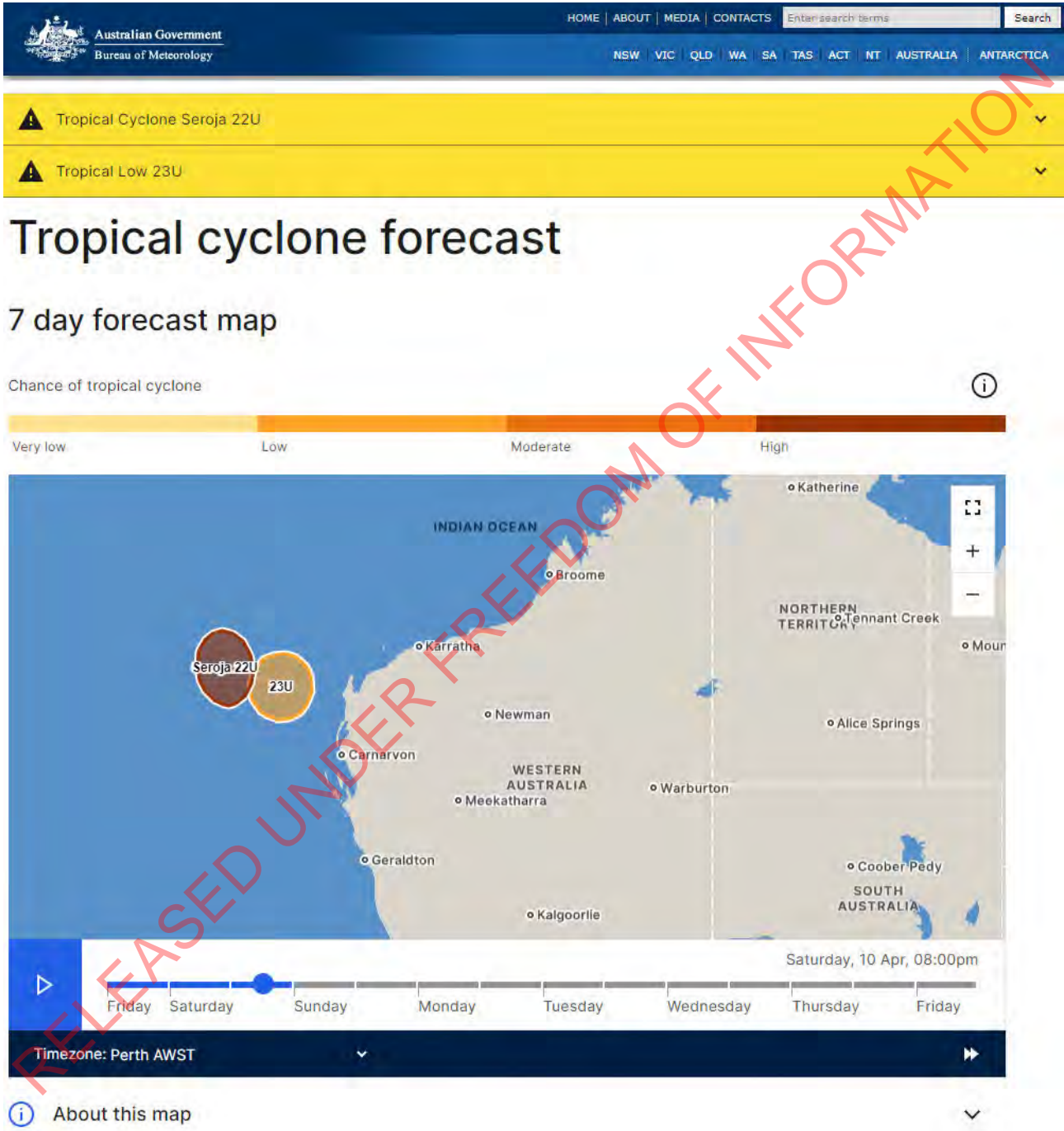
Figure 27 Highlight map - Karratha



OFFICIAL

## 8. Appendix 2: Product Samples

### 8.1. Tropical Cyclone Forecast



OFFICIAL

## 7 day forecast table

[Table legend](#)

Tropical lows	Fri 9 Apr 08:00 pm	Sat 10 Apr 08:00 am	Sat 10 Apr 08:00 pm	Sun 11 Apr 08:00 am	Sun 11 Apr 08:00 pm	Mon 12 Apr 08:00 am
Tropical Cyclone Seroja 22U	100% High	100% High	100% High	100% High	95% High	55% High
Tropical Low 23U	75% High	35% Moderate	10% Low	Less than 5% Very Low	None	None

[Download 7 day forecast table \(CSV 1.76 KB\)](#)

## Forecast description

### Tropical Cyclone Seroja 22U

Tropical Cyclone Seroja expected to cross the west coast of WA late Sunday night or early Monday.

- Please refer to the Advice and Forecast Track Map for more detail.
- Seroja lies offshore from Exmouth and is forecast to continue moving southwest today then turn to the south then southeast during Saturday 10 April.
- Seroja is interacting with nearby Tropical Low 23U, which increases the forecast uncertainty in both movement and intensity.
- Seroja is expected to cross the west coast of Western Australia between Geraldton and Carnarvon later Sunday or early Monday, possibly as a category 3 severe tropical cyclone.
- Once over land, Seroja will weaken quickly and will be below tropical cyclone intensity by Tuesday 13 April, and then weaken into a trough in the Bight.

Last updated

5 hours ago, 08:30 am AWST

### Tropical Low 23U

Tropical Low 23U likely to develop today and pass close to the west Pilbara on Saturday.

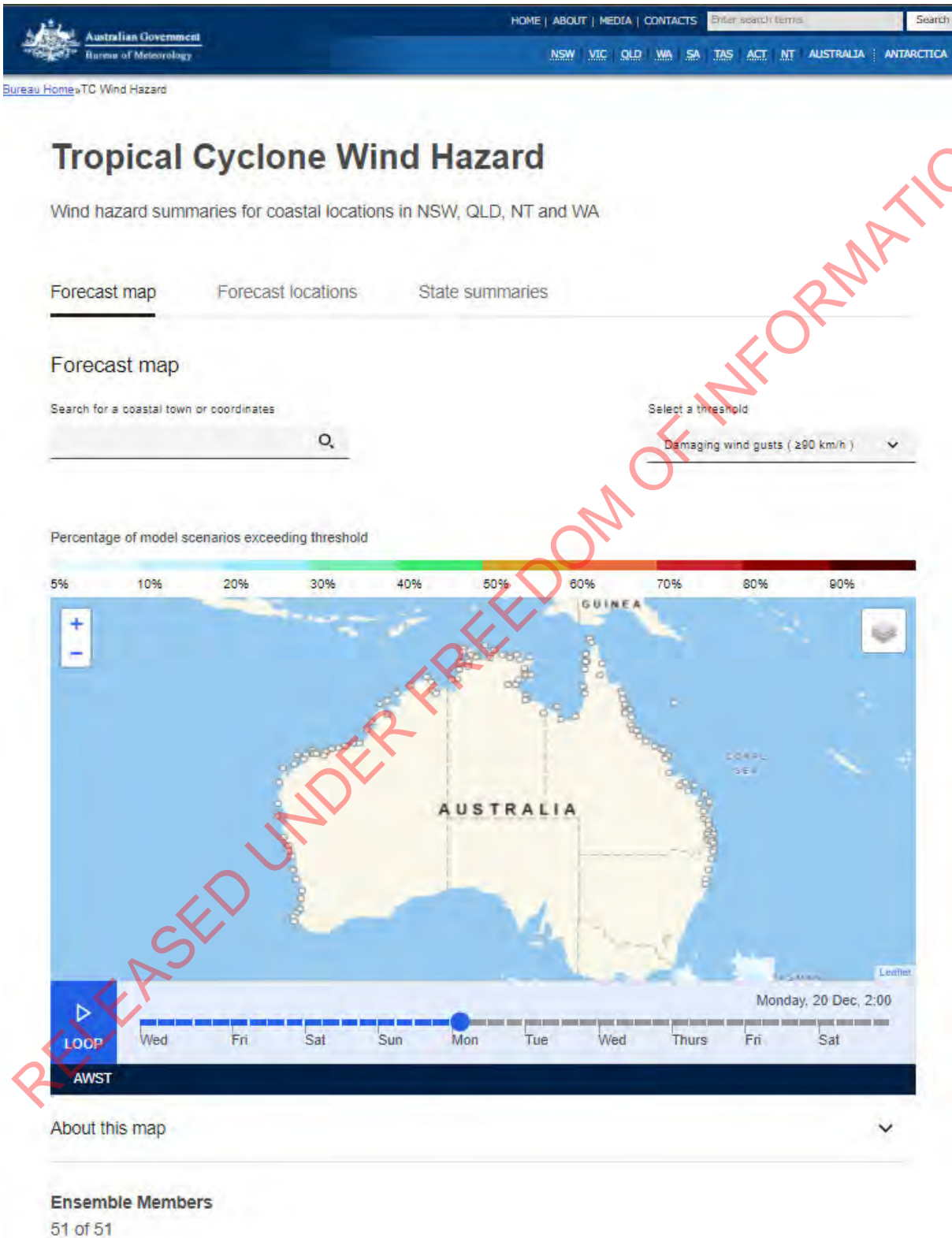
- Please refer to the Advice and Forecast Track Map for more detail.
- Tropical Low 23U lies south of Christmas Island and north of Tropical Cyclone Seroja.
- 23U is a small system that is moving around and interacting with the larger Seroja. This increases the forecast uncertainty in both movement and intensity.
- 23U is likely to develop into a tropical cyclone during today, then weaken overnight or during Saturday 10 April.
- During Sunday it should move to be south of Seroja, then be absorbed by the larger cyclone.

Last updated

5 hours ago, 08:30 am AWST

OFFICIAL

## 8.2. Tropical Cyclone Wind Hazard Forecast



OFFICIAL



**OFFICIAL**

### **8.3. Tropical Cyclone Information Bulletin**

#### **TROPICAL CYCLONE INFORMATION BULLETIN**

**Issued at 5:00pm EST on Saturday the 23rd of January 2011**

At 4 pm EST Friday, Tropical Cyclone Zelia (Category 1) with central pressure 992 hPa was located over the Coral Sea near latitude 12.8 south longitude 151.5 east, which is about 770 km northeast of Cairns and 425 km north northeast of Willis Is.

The cyclone is moving east southeast at about 15 kilometres per hour and should intensify over the next 24 hours.

Tropical Cyclone Zelia, Category 1, is expected to continue moving in a south-easterly direction away from the Queensland coast.

The next Information Bulletin will be issued by 11 pm AEST today.

RELEASED UNDER FREEDOM OF INFORMATION

**OFFICIAL**



**OFFICIAL**

## **8.4. Tropical Cyclone Advice**

IDD20150  
Australian Bureau of Meteorology  
Tropical Cyclone Warning Centre

Media: The Standard Emergency Warning Signal should NOT be used with this warning.

TOP PRIORITY FOR IMMEDIATE BROADCAST  
TROPICAL CYCLONE WARNING

TROPICAL CYCLONE ADVICE NUMBER 7  
Issued at 11:04 am ACST on Friday 16 March 2018

Headline:  
Tropical Cyclone Marcus has formed off the NT north coast.

Areas Affected:  
Warning zone: Maningrida to Daly River Mouth, including Darwin and the Tiwi Islands.

Watch zone: Daly River Mouth to Mitchell Plateau.  
Cancelled zone: Maningrida to Milingimbi.

Details of Tropical Cyclone Marcus at 9:30 am ACST:  
Intensity: Category 1, sustained winds near the centre of 65 kilometres per hour with wind gusts to 95 kilometres per hour.  
Location: within 55 kilometres of 10.3 degrees South 132.6 degrees East, estimated to be 95 kilometres north of Croker Island and 310 kilometres northeast of Darwin.  
Movement: southeast at 13 kilometres per hour.

Tropical Cyclone Marcus has formed north of Cobourg Peninsula. Tropical Cyclone Marcus is expected to approach the northwest Top End coast today, most likely crossing the Cobourg Peninsula tonight. The tropical cyclone is expected to turn south towards the southwest, passing close to Darwin during Saturday, before moving into the Timor Sea late on Saturday or early Sunday. During Sunday, Tropical Cyclone Marcus is expected to approach the north Kimberley coast.

Hazards:  
GALES with DAMAGING WIND GUSTS to 110 km/h are expected to develop over the Cobourg Peninsula during this afternoon, then extend to Goulburn Island later this evening. Damaging wind gusts may extend to Maningrida tonight if the tropical cyclone takes a more easterly track.

Damaging wind gusts are expected to extend to Darwin and the Tiwi Islands from early Saturday morning as the tropical cyclone passes through the Van Diemen Gulf. However, if the tropical cyclone crosses the coast east of the Cobourg Peninsula tonight, the tropical cyclone will likely weaken before approaching Darwin, reducing the chance of gales being experienced.

**OFFICIAL**



**OFFICIAL**

Damaging wind gusts may extend to Daly River Mouth by Saturday afternoon and further south to the WA/NT border later on Saturday or Sunday as the cyclone moves into the Timor Sea later. Gales are expected to extend to the north Kimberley during Sunday.

A STORM TIDE between Milikapiti and Maningrida, including the Van Diemen Gulf, is expected as the cyclone centre crosses the coast tonight. Tides are likely to rise significantly above the normal high tide, with DAMAGING WAVES and DANGEROUS FLOODING tonight and into Saturday morning.

HEAVY RAIN is expected along the north coast today, extending into the northwest Top End on Saturday.

Recommended Action:

NTES advises residents from Milikapiti to Goulburn Island, including Croker Island:

- Prepare for gales and heavy rain during today into this evening;
- Move indoors and shelter as the conditions deteriorate;
- Stay indoors and avoid travel during the storm;
- Stay away from beaches and immediate coastal areas as dangerous coastal flooding may occur.

Milikapiti to Cape Fourcroy, Point Stuart to Daly River Mouth including Darwin and Goulburn Island to Maningrida.

- Be ready for wet and windy conditions to arrive in your area;
- Finalise your home preparations;
- Check your family, friends and neighbours understand and are prepared;
- Move indoors and take shelter as the weather deteriorates.

NTES advises communities under Watch:

- Prepare your home, yard and family for a cyclone, finalise your emergency kit;
- Decide NOW where you will shelter - at home, with friends or family, or a public shelter, where available;
- If you plan to leave the area, leave while it is safe to do so.

DFES advises of the following community alerts:

BLUE ALERT: People from the NT border to Mitchell Plateau, including Kununurra and Wyndham need to prepare for cyclonic weather and organise an emergency kit including first aid kit, torch, portable radio, spare batteries, food and water.

Further advice on cyclone emergencies is available at [www.securent.nt.gov.au](http://www.securent.nt.gov.au)

Please ensure that friends, family and neighbours have heard and understood this message, particularly new arrivals to the area.

Next Advice:

The next advice will be issued by 2:00 pm ACST Friday 16 March.

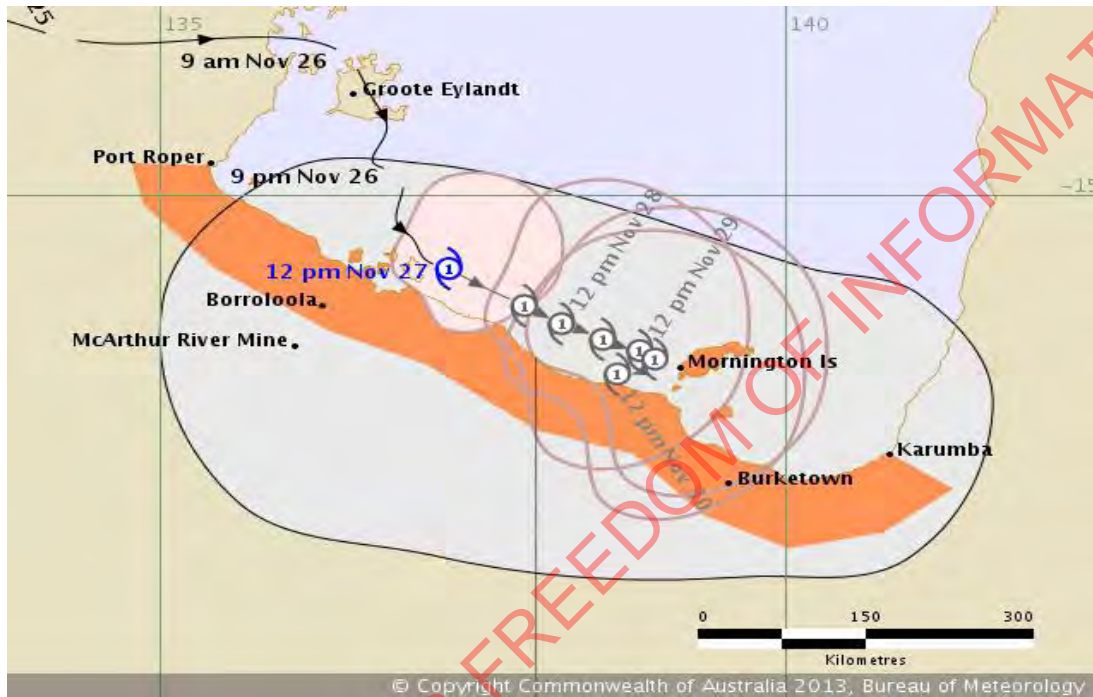
**OFFICIAL**

OFFICIAL

## 8.5. Tropical Cyclone Forecast Track Map

### Tropical Cyclone Alessia

Issued at 1:00 pm AEST Wednesday 27 November 2013. Refer to Tropical Cyclone Advice Number 1.



Community Threat		
<b>Warning Zone</b> Gales within 24 hours	<b>Watch Zone</b> Gales from 24-48 hours	
Past Cyclone Details	Current Cyclone Details	Forecast Cyclone Details (at 24 and 48 hours from issue)
Past Location and Intensity Number	Current Location and Intensity Number	Forecast Location and Intensity Number
Past Track and Movement	Very Destructive Winds	Very Destructive Wind Boundary
	Destructive Winds	Destructive Wind Boundary
	Gale Force Winds	Gale Force Wind Boundary
		Most Likely Future Track
		Range of Likely Tracks of Cyclone Centre

The forecast path shown above is the Bureau's best estimate of the cyclone's future movement and intensity. There is always some uncertainty associated with tropical cyclone forecasting and the grey zone indicates the range of likely tracks of the cyclone centre.

Due to the uncertainty in the future movement, the indicated winds will almost certainly extend to regions outside the rings on this map. The extent of the warning and watch zones reflects this.

This product is designed for land-based communities; mariners should read the coastal waters and high seas warnings.

### Headline

Tropical Cyclone Alessia develops in the Gulf of Carpentaria

OFFICIAL

### Areas affected

Warning zone: Port Roper to Karumba

Watch zone: Nil

### Details of Tropical Cyclone Alessia at 1:00pm AEST:

Intensity: category 1, sustained winds near centre 65 kilometres per hour with gusts 90 kilometres per hour.

Location: within 30 kilometres of 15.7 degrees South, 137.3 degrees East.

Movement: southeast at 10 kilometres per hour.

### Hazards

Damaging winds with gusts to 120km/hr are expected to develop about coastal areas between Borroloola and the Northern Territory/Queensland border today and possibly extending to coastal areas between the Northern Territory/Queensland border and Karumba during Thursday.

### Community Alerts

People between Port Roper and Karumba should take precautions and listen to the next advice at 5pm.

- Information is available from your local government
- For cyclone preparedness and safety advice, visit Queensland's Disaster Management Services website ([www.disaster.qld.gov.au](http://www.disaster.qld.gov.au))
- For emergency assistance call the Queensland State Emergency Service (SES) on 132 500 (for assistance with storm damage, rising flood water, fallen trees on buildings or roof damage).

#### Details:

	Time (CST)	Intensity Category	Latitude (decimal deg.)	Longitude (decimal deg.)	Estimated Position Accuracy (km)
0hr	1 pm November 27	1	15.75	137.3E	30
+6hr	7 pm November 27	1	15.95	137.6E	60
+12hr	1 am November 28	1	16.15	137.9E	80
+18hr	7 am November 28	1	16.15	138.1E	105
+24hr	1 pm November 28	1	16.25	138.2E	130
+36hr	1 am November 29	1	16.45	138.5E	165
+48hr	1 pm November 29	1	16.55	138.8E	200
+60hr	1 am November 30	1	16.65	138.9E	235
+72hr	1 pm November 30	1	16.75	138.6E	270

Tropical Cyclone information is also available in MetEye.

### Next Issue

The next Forecast Track Map will be issued by 5:00 pm AEST Wednesday



## 8.6. Tropical Cyclone Technical Bulletin

### TROPICAL CYCLONE TECHNICAL BULLETIN:

Issued by Australian Bureau of Meteorology

Tropical Cyclone Warning Centre

at: 0648 UTC 16/01/2011

Name: Severe Tropical Cyclone Zelia

Identifier: 10U

Data At: 0600 UTC

Latitude: 19.0S

Longitude: 158.7E

Location Accuracy: within 20 nm (35 km)

Movement Towards: southeast (130 deg)

Speed of Movement: 24 knots (44 km/h)

Maximum 10-Minute Wind: 85 knots (155 km/h)

Maximum 3-Second Wind Gust: 120 knots (220 km/h)

Central Pressure: 957 hPa

Radius of 34-knot winds NE quadrant: 120 nm (220 km)

Radius of 34-knot winds SE quadrant: 100 nm (185 km)

Radius of 34-knot winds SW quadrant: 60 nm (110 km)

Radius of 34-knot winds NW quadrant: 120 nm (220 km)

Radius of 48-knot winds NE quadrant: 40 nm (75 km)

Radius of 48-knot winds SE quadrant: 40 nm (75 km)

Radius of 48-knot winds SW quadrant: 40 nm (75 km)

Radius of 48-knot winds NW quadrant: 40 nm (75 km)

Radius of 64-knot winds: 25 nm (45 km)

Radius of Maximum Winds:

Dvorak Intensity Code: T5.0/5.0/D1 5/24HRS

Pressure of outermost isobar: 1000 hPa

Radius of outermost closed isobar: 150 nm (280 km)

### FORECAST DATA

Date/Time (UTC)	Location degrees	Loc. Accuracy nm (km)	Max Wind knots(km/h) hPa	Central Pressure
+12: 16/1800	22.8S 162.1E	070 (130)	080 (150) 960	
+24: 17/0600	27.3S 165.5E	100 (185)	065 (120) 971	
+36: 17/1800	32.3S 168.6E	125 (230)	035 (065) 990	
+48: 18/0600	38.3S 171.4E	155 (285)	035 (065) 988	
+60: 18/1800	44.9S 176.9E	190 (350)	030 (055) 989	
+72: 19/0600	51.1S 175.2W	245 (455)	030 (055) 986	

### REMARKS:

Dvorak based on eye pattern with B surround and LG centre, giving DT of 5.0. MT and PT both suggest 5.0 FT based on DT. Severe Tropical Cyclone Zelia has rapidly intensified over the past 24 hours while moving into a more favourable environment for development with weak vertical wind shear and very warm sea surface temperatures. Zelia has also increased in speed during today with the development of an upper trough across the western Coral Sea, allowing north-westerly mid-level steering to develop. Zelia will begin to move over cooler sea surface temperatures south of New Caledonia on Monday and as a result should begin to weaken during the day.

The next bulletin for this system will be issued by Nadi RSMC.

## 8.7. Storm Tide Advice

IDQ20017  
 Australian Bureau of Meteorology  
 Tropical Cyclone Warning Centre

Storm Tide Warning  
 Issued at 2:42 pm AEST on Monday 27 March 2017.

Technical Information - not suitable for public dissemination

### SITUATION

Below is the forecast based on the 2pm forecast track map.

Tropical cyclone Debbie, category 3, is intensifying as it moves in a south-westerly direction towards the coast. The system is expected to intensify further to category 4 prior to making landfall on Tuesday morning.

The forecast track is based on a category 4 system crossing near the high tide on Tuesday morning. The forecast storm tide values are highly dependent on the crossing timing in relation to the local tide times, as well as the specific crossing location. The worst-case scenarios are generally based on a slightly stronger system crossing the coast close to each location. Impacts are likely to be most significant around the high tide Tuesday, depending on the time and location of crossing.

### STORM TIDE: WORST CASE SCENARIO

Location	Tide (m above LAT)	Storm Surge (m)	Wave setup (m)	Storm Tide (m above LAT)	Storm Tide (m above AHD)	Storm Tide (m above HAT)
Laguna Quays	5.4m 11:18 AM 28 Mar	4.5	0.0	9.9	7.1	3.6
Molongle Creek	2.6m 7:18 AM 28 Mar	4.2	0.0	6.7	5.1	3.0
Abbot Point	3.1m 9:08 AM 28 Mar	2.7	0.8	6.6	4.9	3.0
Bowen	3.2m 9:58 AM 28 Mar	3.1	0.0	6.3	4.6	2.6
Mackay	6.0m 10:38 AM 28 Mar	2.8	0.4	9.2	6.1	2.5
Airlie Beach	3.3m 9:58 AM 28 Mar	2.3	0.5	6.1	4.3	2.1
Alva	3.1m 9:48 AM 28 Mar	2.2	0.4	5.7	4.1	2.0
Townsville	3.4m 8:58 PM					

**OFFICIAL**

	28 Mar	1.2	0.3	5.0	3.1	0.9
Hamilton Marina	4.1m					
	10:48 AM					
	28 Mar	1.4	0.0	5.5	3.4	0.6

**STORM TIDE: FORECAST TRACK SCENARIO**

Location	Tide (m above LAT)	Storm Surge (m)	Wave setup (m)	Storm Tide (m above LAT)	Storm Tide (m above AHD)	Storm Tide (m above HAT)
Laguna Quays	5.2m 10:48 AM 28 Mar	2.4	0.1	7.7	4.8	1.4
Molongle Creek	3.2m 9:28 AM 28 Mar	0.2	0.1	3.4	1.7	-0.3
Abbot Point	3.1m 9:58 AM 28 Mar	0.8	0.6	4.4	2.8	0.8
Bowen	3.2m 9:38 AM 28 Mar	1.4	0.1	4.7	3.0	1.0
Mackay	6.0m 10:38 AM 28 Mar	1.3	0.3	7.5	4.5	0.8
Airlie Beach	3.4m 10:18 AM 28 Mar	1.7	0.5	5.6	3.8	1.6
Alva	3.2m 9:08 AM 28 Mar	0.0	0.2	3.4	1.8	-0.3
Townsville	3.7m 8:48 AM 28 Mar	0.0	0.1	3.8	2.0	-0.3
Hamilton Marina	4.1m 10:28 AM 28 Mar	1.0	0.0	5.1	2.9	0.2

**Notes:**

1. Advice values do not represent all factors that can contribute to inundation or damage.
2. Rivers, erosion and highly localised effects are not represented.
3. Wave set-up is included in storm tide, but wave run-up is excluded.
4. Water level values are objective estimates based on many variations of the most recent TC forecast track map.
5. Track variations are processed into summary scenarios for each location separately.
6. Water levels higher than the "Worst Case Scenario" are possible.
7. "Worst Case" can be thought of the height for which there remains 1 in 50 chance of storm tide going even higher.
8. "Forecast Track" heights are linked to the latest track map but do not have an associated likelihood.
9. "Forecast Track" heights can vary more abruptly than likelihood values across the full TC event.
10. Tide values are at the specified time for each location and are not the highest tide for the day.
11. AHD is the Australian Height Datum
12. HAT is the Highest Astronomical Tide reference (caution: HAT values are known to differ between sources).



**OFFICIAL**

13. LAT is the Lowest Astronomical Tide reference (caution: LAT values are known to differ between sources).

**ONSET OF DAMAGING WINDS**

Wind gusts expected to exceed 100 kilometres per hour are expected at:

Location	Earliest Onset Time (EST)	Forecast Track Onset Time (EST)
Laguna Quays	27 Mar 2:00 PM	27 Mar 5:00 PM
Molongle Creek	28 Mar 2:00 AM	28 Mar 7:00 AM
Abbot Point	27 Mar 5:00 PM	28 Mar 4:00 AM
Bowen	27 Mar 3:00 PM	28 Mar 3:00 AM
Mackay	27 Mar 3:00 PM	
Airlie Beach	27 Mar 1:00 PM	27 Mar 3:00 PM
Alva	28 Mar 3:00 AM	28 Mar 10:00 AM
Townsville	28 Mar 8:00 AM	
Hamilton Marina	27 Mar 1:00 PM	27 Mar 1:00 PM

The next Storm Tide Warning will be issued by 3pm AEST Monday 27 March 2017.

Contact for Tropical Cyclone forecasts and warning details:  
Bureau of Meteorology Operations Lead - Telephone (08) 9263 xxxx

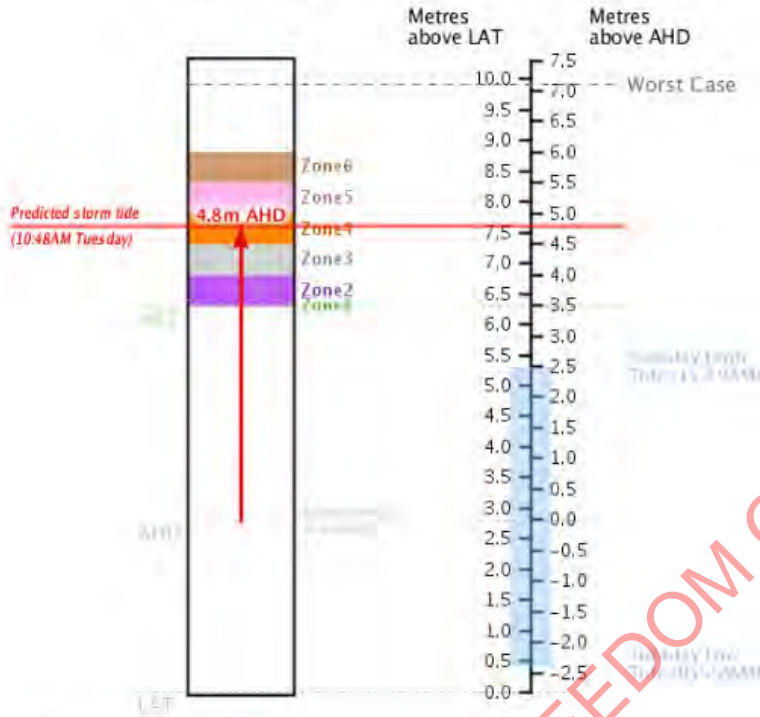
RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

## 8.8. Graphical Storm Tide Advice

### Storm Tide Warning for Laguna Quays

Issued Monday 02:42PM AEST 27/03/2017



Storm Tide	4.8m AHD at 10:48AM Tuesday (7.6m LAT)
Storm Surge	2.4m
Wave Setup	0.1m
Tuesday High Tide	2.5m AHD at 11:29AM (5.3m LAT)
Tuesday Low Tide	-2.4m AHD at 05:22AM (0.4m LAT)
HAT	3.5m AHD (6.3m LAT)
Worst Case	7.1m AHD (9.9m LAT)
AHD	2.8m LAT

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL



**OFFICIAL**

## **8.9. Ocean Wind Warning**

WTAU03 ADRM 211953  
IDD20130  
Australian Bureau of Meteorology  
Tropical Cyclone Warning Centre

40:2:2:24:14S140E400:11:00  
**SECURITE**

### **OCEAN WIND WARNING**

**OCEAN WIND WARNING FOR METAREA 10/11**  
**Issued by the AUSTRALIAN BUREAU OF METEOROLOGY**  
**Issued at 1953UTC 21 MARCH 2019**

#### **PLEASE BE AWARE**

Wind gusts can be a further 40 percent stronger than the averages given here, and maximum waves may be up to twice the height.

#### **HURRICANE FORCE WIND WARNING FOR NORTHERN AREA**

##### **SITUATION**

At 1800 UTC Tropical Cyclone Trevor was centred within 15 nautical miles of latitude fourteen decimal one south (14.1S)  
longitude one hundred and forty decimal three east (140.3E)  
Recent movement : southwest at 7 knots  
Maximum winds : 60 knots  
Central pressure: 981 hPa

##### **AREA AFFECTED**

Within 80 nautical miles in NE quadrant  
and within 90 nautical miles in SE quadrant  
and within 100 nautical miles in SW quadrant  
and within 80 nautical miles in NW quadrant.

##### **FORECAST**

Maximum winds to 60 knots near the centre increasing to 90 knots by 0600 UTC 22 March.

Winds above 64 knots developing within 20 nautical miles of centre with very high to phenomenal seas.

Winds above 48 knots within 20 nautical miles of centre with very rough to high seas and heavy swell.

Winds above 34 knots within 50 nautical miles in NE quadrant  
and within 50 nautical miles in SE quadrant  
and within 90 nautical miles in SW quadrant  
and within 50 nautical miles in NW quadrant with rough to very rough seas and

**OFFICIAL**



**OFFICIAL**

moderate to heavy swell.

**Forecast positions**

At 0600 UTC 22 March: Within 35 nautical miles of 14.7 south 139.3 east

Central pressure 950 hPa.

Winds to 90 knots near centre.

At 1800 UTC 22 March: Within 60 nautical miles of 15.5 south 138.1 east

Central pressure 940 hPa.

Winds to 105 knots near centre.

**REMARKS**

All ships in the area please send weather reports every three hours. Regular weather observing ships use normal channels. Other ships please use email to [met@met.gov.au](mailto:met@met.gov.au).

Next warning will be issued by 0130 UTC 22 March 2019.

RELEASED UNDER FREEDOM OF INFORMATION

**OFFICIAL**



OFFICIAL

## 8.10. CREX Bulletin

CREX++  
T000101 A007 B01033 B01025 B01027 D01011 D01012  
D01023 B02041 B19001 B19007 B19005 B19006 B19008  
B08005 B10004 B08005 B10004 B19007 B08005 B08021 B04075 B11040 B19007  
R05004 B05021 B05021 R02002 B19003 B19009++  
065 10U ZELIA 2011 01 16 06 00  
-1900 15870 00 04 0278 130 01209  
3 01 09570 02 10000 0278 03 02 10 0437 0041  
36000 09000 025 0074 015 0222  
09000 18000 025 0074 015 0185  
18000 27000 025 0074 015 0111  
27000 36000 025 0074 015 0222++  
7777

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL





OFFICIAL

## 8.11. Satellite Analysis Bulletin

Australian Bureau of Meteorology  
Tropical Cyclone Warning Centre

**SATELLITE ANALYSIS BULLETIN**  
**0732 UTC 25 January 2011**

Tropical Cyclone Wilma  
251100 UTC

21.4S 177.4W

Analysis based on: GOES enhanced IR image at 0652UTC.

Latitude Detection Sum: 7

Longitude Detection Sum: 19

T5.0/5.0/D1.5/24HRS

Eye pattern with LG surround and OW centre, giving DT of 5.0.MT 4.0 and PT 4.5.  
FT based on DT as it is clear.

Next Satellite Analysis Bulletin will be issued at 262300 UTC

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL



OFFICIAL

## 8.12. Special Advisory for the Solomon Islands

Australian Bureau of Meteorology  
Tropical Cyclone Warning Centre

**SOLOMON ISLANDS ADVISORY**  
**Issued at 1316 UTC on 30/01/11**  
**Special Advisory Number 3**

Tropical Cyclone Yasi at 301200 UTC  
Located at  
Latitude: 13.9S  
Longitude: 167.7E

Moving: W/SW at 10 knots

Central Pressure: 987 hPa

Mean maximum winds to 45 knots with maximum gusts to 65 knots, increasing to 55 knots with gusts to 75 knots by 310000UTC.

The system is intensifying.

Expect gales out to 150 nautical miles in the eastern semicircle and out to 60 nautical miles in the southwest quadrant.

Expect storm force winds to develop out to 40 nautical miles within the next 12 to 18 hours.

Expect hurricane force winds to develop out to 20 nautical miles within 24 to 36 hours.

Gales are likely to continue about southern Santa Cruz Islands near Tikopia and extend west towards Vanikolo within the next 12 hours. Gales could also develop about Rennell Island and Bellona Island within 24 to 36 hours.

Forecast position at 0000 UTC 31 January 2011

Latitude: 14.5S

Longitude: 165.0E

The next Special Advisory will be issued at 1630 UTC 30 January 2011

Please acknowledge receipt of this bulletin to the Australian Tropical Cyclone Warning Centre via email at [tcwc@bom.gov.au](mailto:tcwc@bom.gov.au)

OFFICIAL

## 9. Appendix 3: Product Identifiers

Product ID	Description
IDQ20065	Tropical Cyclone Information Bulletin 1 (QLD)
IDQ20066	Tropical Cyclone Information Bulletin 2 (QLD)
IDQ20067	Tropical Cyclone Information Bulletin 3 (QLD)
IDD65002	Tropical Cyclone Forecast Track Map 2 - Graphic (NT)
IDD65003	Tropical Cyclone Forecast Track Map for WA - Graphic (NT)
IDQ65002	Tropical Cyclone Forecast Track Map 1 (QLD)
IDQ65003	Tropical Cyclone Forecast Track Map 2 - Graphic (QLD)
IDQ65004	Tropical Cyclone Forecast Track Map 2 (QLD)
IDQ66043	TTS Tropical Cyclone Advice 1 (QLD)
IDQ66044	TTS Tropical Cyclone Advice 2 (QLD)
IDQ66045	TTS Tropical Cyclone Advice 3 (QLD)
IDQ66055	TTS Tropical Cyclone Information Bulletin 1 (QLD)
IDQ66056	TTS Tropical Cyclone Information Bulletin 2 (QLD)
IDQ66061	TTS Ocean Wind Warning 1 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQ66063	TTS Ocean Wind Warning 2 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQP0004	NT Tropical Cyclone Advice for System Affecting QLD
IDD66031	TTS Tropical Cyclone Advice 1 (NT)
IDD66032	TTS Tropical Cyclone Advice 2 (NT)
IDD66035	TTS Tropical Cyclone Advice 1 - WA Border Area (NT)
IDD66036	TTS Tropical Cyclone Advice 1 - QLD Border Area (NT)
IDD66038	TTS Tropical Cyclone Advice 2 - QLD Border Area (NT)

**OFFICIAL**

IDD66063	TTS Ocean Wind Warning 2 - Metarea 10 Northern - Tropical Cyclone - Radio (NT)
IDDP0007	QLD Tropical Cyclone Advice for System Affecting NT
IDN40487	SIGMET - Tropical Cyclone (NSW)
IDD20150	Tropical Cyclone Advice 1 (NT)
IDD20250	Tropical Cyclone Advice 2 (NT)
IDQ20008	Ocean Wind Warning 1 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQ20015	Tropical Cyclone Satellite Analysis Bulletin (QLD)
IDQ20016	Tropical Cyclone Special Advisory - Solomon Islands (QLD)
IDQ20018	Tropical Cyclone Technical Bulletin 1 (QLD)
IDW66207	TTS Tropical Cyclone Advice 1 (WA)
IDW66208	TTS Tropical Cyclone Advice 2 (WA)
IDW66209	TTS Tropical Cyclone Advice 3 (WA)
IDW66210	TTS Tropical Cyclone Information Bulletin 2 (WA)
IDW66220	TTS Tropical Cyclone Advice - Cocos Island and Christmas Island (WA)
IDW66415	TTS Ocean Wind Warning 2 - Metarea 10 Western - Tropical Cyclone (WA)
IDW66417	TTS Ocean Wind Warning 3 - Metarea 10 Western - Tropical Cyclone (WA)
IDWP0004	NT Tropical Cyclone Advice for System Affecting WA
IDW23100	Ocean Wind Warning 1 - Metarea 10 Western - Tropical Cyclone (WA)
IDW23300	Ocean Wind Warning 3 - Metarea 10 Western - Tropical Cyclone (WA)
IDW24010	Tropical Cyclone Information Bulletin 2 (WA)
IDW24100	Tropical Cyclone Advice 1 (WA)
IDW24200	Tropical Cyclone Advice 2 (WA)
IDW24300	Tropical Cyclone Advice 3 (WA)
IDW24400	Tropical Cyclone Advice - Cocos Island and Christmas Island (WA)
IDW27600	Tropical Cyclone Technical Bulletin 1 (WA)

  
**OFFICIAL**

IDW27800	Tropical Cyclone Technical Bulletin 3 (WA)
IDD65016	Tropical Cyclone Forecast Track Map 1 - FAX (NT)
IDD65017	Tropical Cyclone Forecast Track Map 2 - FAX (NT)
IDD65018	Tropical Cyclone Forecast Track Map for WA - FAX (NT)
IDD65019	Tropical Cyclone Forecast Track Map for QLD - FAX (NT)
IDD63023	TTS 1196 Tropical Cyclone Warning List - Darwin (NT)
IDQ65018	Tropical Cyclone Forecast Track Map for NT - Graphic (QLD)
IDQ65019	Tropical Cyclone Forecast Track Map for NT (QLD)
IDDP0008	QLD Tropical Cyclone Forecast Track Map for System Affecting NT - Graphic
IDDP0009	QLD Tropical Cyclone Forecast Track Map for System Affecting NT
IDWP0006	NT Tropical Cyclone Forecast Track Map for System Affecting WA
IDQP0011	NT Tropical Cyclone Forecast Track Map for System Affecting QLD - Graphic
IDQP0012	NT Tropical Cyclone Forecast Track Map for System Affecting QLD
IDDP0010	WA Tropical Cyclone Forecast Track Map for System Affecting NT - Graphic
IDDP0011	WA Tropical Cyclone Forecast Track Map for System Affecting NT
IDCKAUTCSO	Australian Tropical Cyclone Season Outlook
IDCKSPTCSO	South Pacific Tropical Cyclone Season Outlook
IDD65012	Tropical Cyclone Forecast Track Map 2 (NT)
IDD65013	Tropical Cyclone Forecast Track Map for WA (NT)
IDD65004	Tropical Cyclone Forecast Track Map for QLD - Graphic (NT)
IDD65014	Tropical Cyclone Forecast Track Map for QLD (NT)
IDD65011	Tropical Cyclone Forecast Track Map 1 (NT)
IDW60280	Tropical Cyclone Forecast Track Map 1 - Graphic (WA)
IDW60284	Tropical Cyclone Forecast Track Map 2 - Graphic (WA)
IDW60287	Tropical Cyclone Forecast Track Map 3 - Graphic (WA)

**OFFICIAL**

  
**OFFICIAL**

IDW60281	Tropical Cyclone Forecast Track Map 1 (WA)
IDW60285	Tropical Cyclone Forecast Track Map 2 (WA)
IDW60288	Tropical Cyclone Forecast Track Map 3 (WA)
IDW60294	Tropical Cyclone Forecast Track Map for NT - Graphic (WA)
IDW60295	Tropical Cyclone Forecast Track Map for NT (WA)
IDW23200	Ocean Wind Warning 2 - Metarea 10 Western - Tropical Cyclone (WA)
IDW65015	TTS 1196 Tropical Cyclone Warning List - Perth (WA)
IDD60017	Cyclone Warnings - Darwin (NT)
IDD60019	Cyclone Warnings - Brisbane (NT)
IDQ20023	Tropical Cyclone Advice 1 (QLD)
IDQ20026	Tropical Cyclone Advice 2 (QLD)
IDQ65026	TTS 1196 Tropical Cyclone Warning List - Brisbane/Ipswich (QLD)
IDQ65027	TTS 1196 Tropical Cyclone Warning List - Gold Coast (QLD)
IDQ65028	TTS 1196 Tropical Cyclone Warning List - Sunshine Coast (QLD)
IDQ65029	TTS 1196 Tropical Cyclone Warning List - Rockhampton (QLD)
IDQ65030	TTS 1196 Tropical Cyclone Warning List - Townsville (QLD)
IDQ65031	TTS 1196 Tropical Cyclone Warning List - Cairns (QLD)
IDD20015	Tropical Cyclone Bulletin 1 - Northern Region - CREX (NT)
IDD20016	Tropical Cyclone Bulletin 2 - Northern Region - CREX (NT)
IDD41240	SIGMET - Tropical Cyclone 1 (NT)
IDD41250	SIGMET - Tropical Cyclone 2 (NT)
IDQ48500	SIGMET - Brisbane FIR - Tropical Cyclone 1 (QLD)
IDW44710	SIGMET - Perth-YBBB Tropical Cyclone (WA)
IDW44810	SIGMET - Perth-YMMM Tropical Cyclone 1 (WA)
IDW44820	SIGMET - Perth-YMMM Tropical Cyclone 2 (WA)
IDW44830	SIGMET - Perth-YMMM Tropical Cyclone 3 (WA)
IDW20015	Tropical Cyclone Bulletin 1 - Western Region - CREX (WA)

**OFFICIAL**

  
**OFFICIAL**

IDW20016	Tropical Cyclone Bulletin 2 - Western Region - CREX (WA)
IDW20017	Tropical Cyclone Bulletin 3 - Western Region - CREX (WA)
IDQ20056	Tropical Cyclone Bulletin 1 - CREX (QLD)
IDQ20057	Tropical Cyclone Bulletin 2 - CREX (QLD)
IDQ20058	Tropical Cyclone Bulletin 3 - CREX (QLD)
IDQ65230	Tropical Cyclone Forecast Track Map for NSW - Graphic (QLD)
IDQ65231	Tropical Cyclone Forecast Track Map for NSW (QLD)
IDNP0004	QLD Tropical Cyclone Advice for System Affecting NSW
IDQ41190	Tropical Cyclone Aviation Advisory 3 (QLD)
IDQ20068	Tropical Cyclone Technical Bulletin 2 (QLD)
IDQ20069	Tropical Cyclone Technical Bulletin 3 (QLD)
IDD20021	Tropical Cyclone Technical Bulletin 2 (NT)
IDN29980	Tropical Cyclone Warnings from Queensland (NSW)
IDQ20074	Ocean Wind Warning 3 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQ66140	TTS Ocean Wind Warning 3 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQ41170	Tropical Cyclone Aviation Advisory 1 (QLD)
IDQ65223	Tropical Cyclone Forecast Track Map 3 - Graphic (QLD)
IDQ65224	Tropical Cyclone Forecast Track Map 3 (QLD)
IDD41170	Tropical Cyclone Aviation Advisory 1 (NT)
IDD41180	Tropical Cyclone Aviation Advisory 2 (NT)
IDQ41180	Tropical Cyclone Aviation Advisory 2 (QLD)
IDW41170	Tropical Cyclone Aviation Advisory 1 (WA)
IDW41180	Tropical Cyclone Aviation Advisory 2 (WA)
IDD65408	Tropical Cyclone Forecast Track Map for WA - GML (NT)
IDD65409	Tropical Cyclone Forecast Track Map for QLD - GML (NT)
IDW6026601	Tropical Cyclone Forecast Map 1 - Fix

**OFFICIAL**

IDW6026602	Tropical Cyclone Forecast Map 1 - Track
IDW6026603	Tropical Cyclone Forecast Map 1 - Wind Areas
IDW6026604	Tropical Cyclone Forecast Map 1 - Areas
IDW6026701	Tropical Cyclone Forecast Map 2 - Fix
IDW6026702	Tropical Cyclone Forecast Map 2 - Track
IDW6026703	Tropical Cyclone Forecast Map 2 - Wind Areas
IDW6026704	Tropical Cyclone Forecast Map 2 - Areas
IDW6026801	Tropical Cyclone Forecast Map 3 - Fix
IDW6026803	Tropical Cyclone Forecast Map 3 - Wind Areas
IDW6026804	Tropical Cyclone Forecast Map 3 - Areas
IDC10023	Tropical Cyclone segments GIS dataset
IDC10021	Tropical Cyclone Lines GIS Dataset
IDC10022	Tropical Cyclone Points GIS Dataset
IDQ41172	Tropical Cyclone Aviation Advisory 1 - IWXXM (QLD)
IDQ41182	Tropical Cyclone Aviation Advisory 2 - IWXXM (QLD)
IDQ20064	Tropical Cyclone Advice - Norfolk Island (QLD)
IDQ65253	Tropical Cyclone Forecast Track Map - Norfolk Island (QLD)
IDQ65254	Tropical Cyclone Forecast Track Map - Norfolk Island - Graphic (QLD)
IDZ00025	Tropical Cyclone ID code description list
IDW24020	Tropical Cyclone Information Bulletin 3 (WA)
IDW41190	Tropical Cyclone Aviation Advisory 3 (WA)
IDD65401	Tropical Cyclone Forecast Track Map 1 - GML (NT)
IDD65402	Tropical Cyclone Forecast Track Map 2 - GML (NT)
IDW60266	Tropical Cyclone Forecast Track Map 1 - GML (WA)
IDW60267	Tropical Cyclone Forecast Track Map 2 - GML (WA)
IDW60268	Tropical Cyclone Forecast Track Map 3 - GML (WA)
IDQ65248	Tropical Cyclone Forecast Track Map 1 - GML (QLD)



  
**OFFICIAL**

IDQ65249	Tropical Cyclone Forecast Track Map 2 - GML (QLD)
IDQ65250	Tropical Cyclone Forecast Track Map 3 - GML (QLD)
IDW66224	TTS Tropical Cyclone Information Bulletin 3 (WA)
IDM00005	Tropical Cyclone Service Area boundaries
IDQ65251	Tropical Cyclone Forecast Track Map for NT - GML (QLD)
IDQ65252	Tropical Cyclone Forecast Track Map for NSW - GML (QLD)
IDW60283	Tropical Cyclone Forecast Track Map for NT - GML (WA)
IDW60350	Tropical Cyclone Technical Bulletin 1 - CXML (WA)
IDW60351	Tropical Cyclone Technical Bulletin 2 - CXML (WA)
IDW60352	Tropical Cyclone Technical Bulletin 3 - CXML (WA)
IDD41225	SIGMET - Non Tropical Cyclone 2 - YBBB (NT)
IDD41235	SIGMET - Non Tropical Cyclone 2 - YMMM (NT)
IDQ65255	Tropical Cyclone Technical Bulletin 1 - CXML (QLD)
IDQ65256	Tropical Cyclone Technical Bulletin 2 - CXML (QLD)
IDQ65257	Tropical Cyclone Technical Bulletin 3 - CXML (QLD)
IDD65441	Tropical Cyclone Technical Bulletin 1 - CXML (NT)
IDD65442	Tropical Cyclone Technical Bulletin 2 - CXML (NT)
IDQ60327	Tropical Cyclone Warnings - Perth (QLD)
IDQ60328	Tropical Cyclone Warnings - Darwin (QLD)
IDQ60329	Tropical Cyclone Warnings - Brisbane (QLD)
IDQ20029	Tropical Cyclone Advice 3 (QLD)
IDQ41191	Tropical Cyclone Aviation Advisory 3 - Graphic (QLD)
IDD60001	Cyclone Warnings - Perth (NT)
IDD60123	Tropical Cyclone Warnings Bulletin - High Seas Forecasts (NT)
IDD60124	Tropical Cyclone Warnings Bulletin - Tropical Weather Advisories (NT)
IDD41181	Tropical Cyclone Aviation Advisory 2 - Graphic (NT)
IDQ41171	Tropical Cyclone Aviation Advisory 1 - Graphic (QLD)

**OFFICIAL**

IDQ41181	Tropical Cyclone Aviation Advisory 2 - Graphic (QLD)
IDW41171	Tropical Cyclone Aviation Advisory 1 - Graphic (WA)
IDW41181	Tropical Cyclone Aviation Advisory 2 - Graphic (WA)
IDW41191	Tropical Cyclone Aviation Advisory 3 - Graphic (WA)
IDD66037	TTS Tropical Cyclone Advice 2 - WA Border Area (NT)
IDD66061	TTS Ocean Wind Warning 1 - Metarea 10 Northern - Tropical Cyclone - Radio (NT)
IDW66211	TTS Tropical Cyclone Information Bulletin 1 (WA)
IDW66413	TTS Ocean Wind Warning 1 - Metarea 10 Western - Tropical Cyclone (WA)
IDWP0005	NT Tropical Cyclone Forecast Track Map for System Affecting WA - Graphic
IDW24000	Tropical Cyclone Information Bulletin 1 (WA)
IDW27700	Tropical Cyclone Technical Bulletin 2 (WA)
IDD41171	Tropical Cyclone Aviation Advisory 1 - Graphic (NT)
IDD20300	Tropical Cyclone Information Bulletin 1 (NT)
IDBDM007	National GIS Tropical Cyclone Track Maps Bundle (without wind_areas)
IDD66044	TTS Tropical Cyclone Information Bulletin 1 (NT)
IDD66045	TTS Tropical Cyclone Information Bulletin 2 (NT)
IDQ48600	SIGMET - Brisbane FIR - Tropical Cyclone 2 (QLD)
IDW6026802	Tropical Cyclone Forecast Map 3 - Track
IDD24510	Tropical Cyclone Advice 2 - CAP (NT)
IDQ24500	Tropical Cyclone Advice 1 - CAP (QLD)
IDQ24510	Tropical Cyclone Advice 2 - CAP (QLD)
IDQ24520	Tropical Cyclone Advice 3 - CAP (QLD)
IDW24500	Tropical Cyclone Advice 1 - CAP (WA)
IDW24510	Tropical Cyclone Advice 2 - CAP (WA)
IDW24520	Tropical Cyclone Advice 3 - CAP (WA)

  
**OFFICIAL**

IDD20301	Tropical Cyclone Information Bulletin 2 (NT)
IDD65001	Tropical Cyclone Forecast Track Map 1 - Graphic (NT)
IDD20020	Tropical Cyclone Technical Bulletin 1 (NT)
IDD20130	Ocean Wind Warning 1 - Metarea 10 Northern - Tropical Cyclone (NT)
IDQ65001	Tropical Cyclone Forecast Track Map 1 - Graphic (QLD)
IDD20230	Ocean Wind Warning 2 - Metarea 10 Northern - Tropical Cyclone (NT)
IDD24500	Tropical Cyclone Advice 1 - CAP (NT)
IDQ66057	TTS Tropical Cyclone Information Bulletin 3 (QLD)
IDQ20009	Ocean Wind Warning 2 - Metarea 10 Northeast - Tropical Cyclone (QLD)
IDQ41192	Tropical Cyclone Aviation Advisory 3 - IWXXM (QLD)
IDD24610	Tropical Cyclone Tweet 2 (NT)
IDW24600	Tropical Cyclone Tweet 1 (WA)
IDW24610	Tropical Cyclone Tweet 2 (WA)
IDW24620	Tropical Cyclone Tweet 3 (WA)
IDD24600	Tropical Cyclone Tweet 1 (NT)
IDQ24600	Tropical Cyclone Tweet 1 (QLD)
IDQ24610	Tropical Cyclone Tweet 2 (QLD)
IDQ24620	Tropical Cyclone Tweet 3 (QLD)
IDA25000	Tropical Cyclone Probability of Wind Package
IDZ20009	National Tropical Cyclone for WMS
IDD41172	Tropical Cyclone Aviation Advisory 1 - IWXXM (NT)
IDD41182	Tropical Cyclone Aviation Advisory 2 - IWXXM (NT)
IDW41172	Tropical Cyclone Aviation Advisory 1 - IWXXM (WA)
IDW41182	Tropical Cyclone Aviation Advisory 2 - IWXXM (WA)
IDW41192	Tropical Cyclone Aviation Advisory 3 - IWXXM (WA)
IDQ48700	SIGMET - Brisbane FIR - Tropical Cyclone 3 (QLD)
IDQ48800	SIGMET - Brisbane FIR - Tropical Cyclone 4 (QLD)



**OFFICIAL**

IDW65350	Tropical Cyclone Real-Time Event Data (WA System 1)
IDW65351	Tropical Cyclone Real-Time Event Data (WA System 2)
IDW65352	Tropical Cyclone Real-Time Event Data (WA System 3)
IDQ65355	Tropical Cyclone Real-Time Event Data (QLD System 1)
IDQ65356	Tropical Cyclone Real-Time Event Data (QLD System 2)
IDQ65357	Tropical Cyclone Real-Time Event Data (QLD System 3)
IDD65443	Tropical Cyclone Real-Time Event Data (NT System 1)
IDD65444	Tropical Cyclone Real-Time Event Data (NT System 2)

RELEASED UNDER FREEDOM OF INFORMATION

## 10. Navigation aids

### 10.1. List of figures

Figure 1 Total Warning System.....	9
Figure 2 Tropical Cyclone Warning Centre areas of responsibility (AoR) in the South Pacific and South East Indian Ocean .....	13
Figure 3 Australian area of responsibility for providing tropical cyclone services .....	15
Figure 4 National Tropical Cyclone Seasonal Outlook example graphic.....	22
Figure 5 ICAO TCAC areas of responsibility .....	39
Figure 6 Nadi RSMC area of responsibility.....	40
Figure 7 Special Advisory for the Solomon Islands AOR.....	42
Figure 8 Storm tide advice locations overview .....	47
Figure 9 Storm tide advice locations - WA view 1.....	48
Figure 10 Storm tide advice locations - WA view 2.....	49
Figure 11 Storm tide advice locations - WA view 3.....	50
Figure 12 Storm tide advice locations – NT view 1.....	51
Figure 13 Storm tide advice locations – NT view 2.....	52
Figure 14 Storm tide advice locations – NT view 3.....	53
Figure 15 Storm tide advice locations – NT/QLD view .....	54
Figure 16 Storm tide advice locations – QLD view 1.....	55
Figure 17 Storm tide advice locations – QLD view 2.....	56
Figure 18 Storm tide advice locations – QLD view 3.....	57
Figure 19 Storm tide advice locations – QLD view 4.....	58
Figure 20 Storm tide advice locations – QLD view 5.....	59
Figure 21 Visualisation of tidal planes as a function of tidal range.....	61
Figure 22 Highlight map - Aurukun .....	62
Figure 23 Highlight map - Boigu Island .....	63
Figure 24 Highlight map - Broad Sound .....	64
Figure 25 Highlight map - Laguna Quays.....	65
Figure 26 Highlight map - Balgal.....	66
Figure 27 Highlight map - Karratha .....	67

### 10.2. List of tables

Table 1 National Tropical Cyclone SLS Distribution List.....	10
Table 2 Australian area of responsibility.....	14
Table 3 Tropical Cyclone Category, Status and Wind Strength .....	17
Table 4 Time Zone Conversions .....	21
Table 5 Tropical Cyclone Information Bulletin - Product IDs and Issue times .....	25
Table 6 Tropical Cyclone Advice - product IDs and issue times .....	26
Table 7 Tropical Cyclone Forecast Track Map - product IDs and issue times. ....	28
Table 8 Tropical Cyclone Technical Bulletin - product IDs and issue times .....	30
Table 9 Storm Tide Advice - product IDs and Issue times .....	31



**OFFICIAL**

Table 10 Real-Time Event Data - product IDs and Issue times ..... 32  
Table 11 CAP Tropical Cyclone Advice - product IDs and issue times ..... 33  
Table 12 GML Tropical Cyclone Forecast Track Map - product IDs and issue times ..... 34  
Table 13 Ocean Wind Warnings - product IDs and issue times ..... 36  
Table 14 Tropical Cyclone CREX Bulletin - product IDs and issue times ..... 37  
Table 15 Tropical cyclone Advisory - product IDs ..... 39  
Table 16 Nadi RSMC area of responsibility ..... 41  
Table 17 Tropical Cyclone Satellite Analysis Bulletin - product ID and issue time ..... 41  
Table 18 Special Advisory for the Solomon Islands Area ..... 42  
Table 19 Special Advisory for the Solomon Islands – product ID and issue times ..... 43  
Table 20 Storm tide advice locations ..... 44

RELEASED UNDER FREEDOM OF INFORMATION

# Document 8

welcome: [please sign in](#)

location: [TropicalCyclones](#) / [TropicalCycloneWarningSOP](#)

## Tropical Cyclone Forecast Process

[WA Intranet](#)  
[WA Climate](#)

[WA Aifs](#)  
[Emergencies \(WA\)](#)

[WA Warnings](#)  
[WA Sections](#)

[WA Forecasts](#)

[WA Observations](#)

The following timeline is intended as a guide of when tasks should be completed. Times are relative to analysis time. Refer to the [SLS](#) for policy guidelines.

Situational Awareness	
<input type="checkbox"/> -01:45	<a href="#">Perform Team Handover/Takeover</a>
<input type="checkbox"/> -01:35	<a href="#">Review Current Information</a>
<input type="checkbox"/> -01:20	<a href="#">Assess Broadscale Pattern</a>
<input type="checkbox"/> -01:20	<a href="#">Analyse TC</a>
<input type="checkbox"/> -01:00	<a href="#">Review Position and Intensity Analysis</a>
<input type="checkbox"/> -00:45	<a href="#">Load Guidance Tracks into TC Module</a>
<input type="checkbox"/> -00:30	<a href="#">Review NWP</a>
Guidance Assessment, Intervention (Update Analysis Track/Create Forecast Track)	
<input type="checkbox"/> -00:30	<a href="#">Analysis</a>
<input type="checkbox"/> -00:20	<a href="#">Create Official Forecast Track</a>
<input type="checkbox"/> -00:20	<a href="#">Create Confidence Areas and Confidence Cones</a>
<input type="checkbox"/> -00:10	<a href="#">Determine Intensity and Structure Parameters</a>
<input type="checkbox"/> -00:05	<a href="#">Enter details into Probability of TC table</a>
Assess Risks & Impacts	
<input type="checkbox"/> 00:00	<a href="#">Determine Watch/Warning Areas</a>
<input type="checkbox"/> 00:00	<a href="#">Communicate Scientific Process</a>
Produce Products	
<input type="checkbox"/> 00:15	<a href="#">Produce Datasets</a>
<input type="checkbox"/> 00:30	<a href="#">GFE/Storm Surge</a>
<input type="checkbox"/> 00:55	<a href="#">TC Advice/Info Bulletin; Track Map; GML; CAP</a>
<input type="checkbox"/> 01:00	<a href="#">Ocean Wind Warning; TC Advisory; CREX</a>
<input type="checkbox"/> 01:30	<a href="#">E&amp;R products</a>
<input type="checkbox"/> 01:30	<a href="#">Tech Bulletin</a>
<input type="checkbox"/> 02:00	<a href="#">Storm Tide</a>
<input type="checkbox"/> 24:00	<a href="#">ARPC system commencement or cessation notice</a>

### Contents

#### 1. 1 Situational Awareness

1. [Perform Team Handover/Takeover](#)
2. [Review Current Information](#)
3. [Conduct Scientific Forecast Process](#)
  1. [Assess Broadscale Pattern](#)
  2. [Analyse TC](#)
  3. [Review Position and Intensity Analysis](#)
  4. [Load Guidance Tracks into TC Module](#)

1. Creating Ensemble Mean Tracks
5. Review NWP
2. 2 Guidance Assessment, Intervention (Update Analysis Track/Create Forecast Track)
  1. Assess Guidance for Intervention + Perform Intervention
    1. Analysis
    2. Create Official Forecast Track
      1. Truncate Official Forecast Track
    3. Review Motion
    4. Create Probability of TC values table
    5. Determine Confidence Areas and Confidence Cones
      1. Confidence Areas tool
      2. Choosing Guidance
    6. Determine Intensity and Structure Parameters
    7. Enter details into Probability of TC table
3. 3 Assess Risks & Impacts
  1. Assess Risks & Impacts
    1. Determine Watch/Warning Areas
    2. Standard Emergency Warning Signal (SEWS)
4. 4 Situational Awareness (2)
  1. Communicate Scientific Process
5. 5 Produce Products
  1. Produce Datasets
6. 6 Deliver Enhanced Communications to Customers
  1. Via Briefings
7. 7 Produce Products (2)
  1. Produce Tailored Forecasts & Products + Produce Warnings
    1. ARPC Notification
    2. E&R Process
    3. Storm Tide
8. 8 Finish

[old detailed forecast process wiki](#)

## 1 Situational Awareness

---

### ■ Perform Team Handover/Takeover

- [Handover Checklist](#)
- **Update** Teams channel for shift update; Open onenote [operational collaboration](#)
- **Open** [TCWC sharepoint](#) to access files such as Dvorak spreadsheet in event archive season/disturbance
- **Phone Setup** - Check [Tropical Cyclone Phones](#)

### ■ Review Current Information

- [External Web](#)
- **NT:** [NTES Reg User Page](#) (bomw0207 | jN96atjP) [Product Store](#)
- **WA:** [DFES Reg User Page](#) (bomw0336 | hat99tEr) [Product Store](#)
- **QLD:** [SDCC Reg User Page](#) (bomw0296 | ATt73end) [Product Store](#)
- Identify key decisions under consideration: potential watch/warning changes and other policy changes; user input e.g. evacuation decisions

### Workstation Setup

- **Open** [tcwc@bom.gov.au](mailto:tcwc@bom.gov.au) email. [Outlook](#) online is preferred. Click your avatar in the top right and choose Open another mailbox from drop down menu - type in [tcwc@bom.gov.au](mailto:tcwc@bom.gov.au)



To add in desktop app (separate account: Outlook: File->Account settings. You should see a window with your mail account highlighted. Click "Change" then "More Settings". On the Advanced tab click "Add...". In the Add Mailbox dialog

type [✉ tcwc@bom.gov.au](mailto:tcwc@bom.gov.au) and then click OK. This image may help  )

- **Update** [workstation allocation list](#) [Live CSG workstations](#)
- **Configure TC Module:** simply set Configuration (top setting) to the affected region. The table below should then look like:

TC Module Configuration	
Policy and product set:	<i>affected region</i>
Database server:	REST-OP
Despatch server:	<i>affected region</i>
TC Application server:	HO

- **Reset 3D-Rapic configuration to new region?**
  1. Exit 3D Rapic (if already open)
  2. In a terminal  

```
rm /data/3D-Rapic/3DRapic_office.txt
```
  3. Restart 3D-Rapic, and it will ask you for a new office configuration
- [National Contact List](#)

## ■ Conduct Scientific Forecast Process

### | Assess Broadscale Pattern

- **Water Vapour** [Panther](#) or [CIRA page](#) or Visual Weather
- **Total Precipitable Water** [CIMSS Loop](#)
- **IR/Vis** [Panther](#), [JMA Full Disc IR Loop](#) or Visual Weather
- **Synoptic Charts** [MSLP Gradient Wind](#) [00Z](#), [12Z 200hPa Streamlines](#) [00Z](#), [12Z](#), [Darwin Plotting Charts](#) NWP in Visual Weather
- **SST and Ocean Heat Potential** [OceanMAPS](#) (including TCHP); [SeeDragon SST viewer](#).
- **Upper Level Winds/Shear/Divergence** [CIMSS winds](#) | [CIMSS deep layer winds](#)

### | Analyse TC

Look for changes in intensity/structure/motion, changes in local environment

- **IR/Vis** [Panther](#), [not-Panther](#) , [JMA Full Disc IR Loop](#) or Visual Weather
- **Microwave** [Image Viewer](#) [NRL](#) [FNMOC](#)
- **Scatterometer** Use VisWx for ASCAT; or [Image Viewer](#) [NOAA Scatwinds](#) [WA Scatwinds Viewer](#) [NT Merged](#) [KNMI](#) [FNMOC](#) [SAR \(NOAA\)](#)
- **CIRA Analysis** [CIRA CIMSS Analysis](#) [CIMSS home](#)
- **Surface Observations** Use Panther or VisWx or the following for extra obs [WA Obs Map](#) (useful for extra E&R obs) [AIMS sites](#) | [Prelude \(Shell\)](#) login: [✉ energy-resources-ops@bom.gov.au](mailto:energy-resources-ops@bom.gov.au)/NWShelf\$\$\$ | [PPA sites](#)(BOM Perth/123bom4567) | [24h Rainfall](#) [QLD Wind Gusts One minute data](#): [WA](#) | [NT](#) | [Qld](#); [QLD Tides](#) [QLD Swell](#) [Sondes](#) [NT](#) | [Indonesian obs](#)
- **Radar** 3D-Rapic; [Radar](#) | [Indonesian Radars](#)

## Review Position and Intensity Analysis

If there is any doubt about the current analysis it may be necessary to check previous positions and intensity estimates to ensure current analysis is appropriate. This may involve going back ~12-24h to check Microwave/Scatterometer images

- **Review Dvorak Estimates** Excel Spreadsheets. [XLS](#) available from each disturbance dir on sharepoint. [CI-wind table](#); [Dvorak IR](#) and [Vis diagrams](#)
- **Review Objective Guidance** [CIMSS ADT](#), [CIMSS AiDT](#), [CIMSS DMN](#), [CIMSS Open-AIIR](#), [NESDIS ADT](#), ([ADTNotes](#)), [CIMSS AMSU](#), [CIMSS Satcon](#), [CIRA AMSU](#) [SMAP](#)
- **Compare International Agencies** [JTWC Analysis/Forecast Policy](#)

## Load Guidance Tracks into TC Module

For Forecast Consensus see 2.2 [Create Official Forecast Track](#). Models of interest (including for intensity and structure): ACCESS (G/TC); COAMPS; EC and EC ensemble mean; GFS-AVNO; HFSA (replaces HWRF); JMA; UK and UK ensemble mean; ICNW; RVCN. Optional to GEFS ensemble means (AEMN).

- **ACCESS G, TC** - Restore Track, or save the cxml file [here](#)
- **COAMPS CTCX** from JTWC
- **ECMWF** JTWC ECMF or Visual Weather
- **EC ensemble mean** JTWC (EEMN) or manually within TCModule
- **GFS-AVNO** US GFS deterministic, from JTWC, can use GFS-JAVN from JTWC if AVNO not available
- **GEFS ensemble mean** AEMN from JTWC or generated within TCM (GEFS-avgshift-00 or similar)
- **HFSA** JTWC
- **ICNW** (intensity consensus) JTWC
- **JMA** JTWC (JGSM or JJGS)
- **RVCN** (radius of gales consensus) JTWC
- **UKMO** open URL or UKM from JTWC (UKM version contains wind radii so is better)
- **UK ensemble mean UEMN** UK ensemble mean from JTWC or via TCModule create from ensemble wizard

NOTE: Ignore GFS as this can be the US GEFS ensemble mean.


Methods to get tracks.

**Restore Track** In TCModule *File - Restore Track - Guidance Forecast Tracks* ([Model Arrival Times](#))

**Visual Weather** [Vortex Tracking Instructions](#) Some tracks need to be tracked from Visual Weather. This is the case for ACCESS-G and for the other globals such as EC/GFS/UK/JMA prior to agencies automatically generating tracks. This also searches for max winds and wind radii BUT works for the level of the map being used so if using above sfc the values won't be helpful for intensity and size in TCModule. Note: use search radius of 500km not 5000km as described in these notes below.

**JTWC Collaboration Site:** [Instructions](#) Other tracks can be accessed via [JTWC web page](#) login: bom\_tcwc password: Category4Tracy! Tracks are available about 7 hours after the base time. HINT: use a browser on your workstation not MDT so you can easily import track to TCModule. Some of them are automatically ingested into the database, can use File / Restore Track to load, but with about a 10 hour delay relative.

### Ensemble tracks

- Optional step if ensemble guidance [quality control](#) (QC) is required: Use the 'Guidance Track Viewer' to review ensemble guidance from EC, UK MOGREPS, ACCESS-GE and GFS (when available). Quality control tracks if required.
- Guidance can be loaded in via the 'Load Guidance Tracks' button 
- Any tracks not available by this method can be brought in via '[Track \(ensemble\) viewer](#)' using right click 'save file'. This exports the tracks into the downloads directory and can then be brought into TCModule via the 'import track' option.

## Creating Ensemble Mean Tracks

Ensemble mean tracks can be created by:

- Right click on an ensemble track in layer manager, go to properties.
- Choose an Ensemble Mean method down the bottom. Preferred method is "Shift to average position at +00, use movement average" (track name has "avgshift" in it). If tracks start in the future (always the case for ACCESS-GE APS3), use "Don't shift tracks, use position average".
- Click "Create Ensemble Mean Track".

The created ensemble mean track has a name which has a part which is based on the model source. Some end up having the same name, so some renaming is required.

Name	Auto Mean Name	Rename Mean Name
ACCESS-GE	GEEM	AGE
ACCESS-GE 4 Preformation	GEEM	GE4
ECMWF	ECEM	
EC-Ens Preformation	ECEM	
GFS	GFEM	GEFS
GEFS Preformation	GEEM	GEFS
MOGREPS-G	MOEM	
MOGREPS Preformation	MOEM	

## Review NWP

- **Deterministic** [TC Model Viewer](#) [Windy.com](#) [EC Charts](#) -> Products -> Lightning + IR + Wind (for EC synthetic sat imagery) ( [maxnmau](#) | [#1IB-om\\_bers](#) ) (If the EC password changes, look [here](#) ) [ACCESS-TC](#) [ACCESS-G/C](#) [HFSA web page](#); [COAMPS web page](#);
- **Ensemble** [Ensemble Track Viewer](#) [dev version](#) [UK Ensemble Forecast \(metcon2| A0tEmR\)](#) EC Ensemble Bias Corrected Maps (Visual Weather: Maps->WA RO->\_task->ECNBC->perc\_wndspd\_34kts/48kts/64kts\_24hrs [Risk Matrix \(BC EC ensemble\)](#))
- Wind hazard: [TC Wind Hazard \(bomw0336 | hat99tEr\)](#)
- **Objective Forecast Aids ICNW, RVCN**
  - **ETT** [Phase Space FSU](#)
  - **CIMSS** [CIMSS Phase guidance](#)
- **Okubo Weiss diagnostics:** [Okubo-Weiss GFS](#)

Determine;

- Consistency with current analyses
- Consistency between models
- Variations in forecast time steps eg change of shear, steering flow, synoptic features etc.

Having reviewed the available information it should be easier to prioritise the most important material during forecast issue process.

## 2 Guidance Assessment, Intervention (Update Analysis Track/Create Forecast Track)

Monitor for the arrival of new information and review previous steps as necessary

## Assess Guidance for Intervention + Perform Intervention

### Analysis

Ensure that analysis track has all 6-hourly (00Z, 06Z, 12Z, 18Z) fixes from first fix to last fix including uncertainty, max wind, wind gust, mslp, category. It can have more fixes but not less and is required for the Real Time Event Data Product (Machine Readable Product). If there are issues with the early part of the track such as large uncertainty, transient or

multiple centres, rather than removing or editing any fixes, start a new analysis track from the time a reasonable analysis can be performed. This way the information in the previous analysis track won't be lost.

## Position

- Consider radar/Vis/IR/scat/microwave/obs and noting previous positions for a motion check
- [Himawari Parallax Error Corrections](#)
- [Archer Technique](#) can help for ASCAT but otherwise isn't that helpful
- Enter centre positions to the Analysis track in TC Module (add fix) checking consistency with recent movement.
- Enter uncertainty according to [suggested guidelines](#). Also use the Visual Weather distance tool in circle mode on a satellite image.

## Intensity

- Complete subjective Dvorak [CI-wind table](#); [Dvorak IR](#) and [Vis](#) diagrams
- Combine inputs: Dvorak (complete xls), ASCAT/SCATSAT/SMAP/SAR, obs, microwave patterns with objective guidance below with some consideration of previous analysis arrive at final mean wind estimate.
- SATCON is only as good as its members - AMSU can over-estimate weak systems; ADT: Check if scene type is valid; underestimates in the period prior to eye developing
- Note: ASCAT useful for winds less than 55kn, slight under bias for winds 35-50kn; SCATSAT can overestimate winds in deep convection;
- Enter Mean Wind, FT, CI
- Enter P5 based upon estimate of 95th percentile intensity - the 'upper bound' (default is 10kn higher than mean wind)

## Structure

- **Wind Radii** Gale/Storm/Hurricane (consider existing policy and Quadrants) If asymmetric enter quadrants otherwise use single value wind radii.  
[ASCAT](#) or use VisWx or [scatwinds viewer](#) including SMAP/SMOS; SCATSAT/HY-2B/CFOSAT from [KNMI web page](#),
- **Size** RMW - use radar, microwave, scat, [RMW climatology guidance](#); RadiusOCI and Press OCI - use charts or model fields M163 VW map, can overlay winds to show extent of circulation and matching isobar is POCl; (note Radius 1000hPa and Vertical Extent do not need to be included).

## Remaining Analysis

- **Autofill** for Central Pressure, Wind Gust, Symbol and Category once the above values have been entered.

## | Create Official Forecast Track

Review the environmental steering (1.3 [Assess Broadscale Pattern](#)) to have a conceptual picture of the forecast track. Check availability of new tracks as per 1.7 [Load Guidance Tracks into TC Module](#). If no new models are available or time is short, you may choose to SHIFT track instead.

Notes on creating a forecast track when there is [no analysis fix](#).

Standard models for the consensus (in alphabetical order). **Now that we are QCing ensemble tracks, it is suggested we use the ensemble means generated from these track in TC Module:**

- **ACCESS-G**
- **ACCESS-G ensemble mean** AG-4 better than AG-3. Required to manually create the mean in TCM after importing ensembles via track viewer.
- **EC** latest run only; restore from database or generate from VW for lows
- **EC ensemble mean** (EEMN from JTWC or manually generated in TCM using ensemble(right click on EC track in layer manager to get to properties)) or from track viewer (right click)
- **GFS-AVNO or KGFY** (**GFS-JAVN** if unavailable, don't use GFS as it can be GEFS ensemble mean).
- **GFS ensemble mean** best used once TC intensity is attained.
- **JMA** (JGSM or JJGS)
- **UK**

- **UK ensemble mean** manually generated in TCM using ensemble(right click on EC track in layer manager to get to properties)

\* Notes: **HFSA** and **CTCX** COAMPS are not used for consensus track position but should be viewed for intensity purposes.

Use the SCATTER PLOT  tool to compare models steering and speeds of movement;

- Examine model behaviour by using unshifted track option with the base time as the MODEL run time (not the current anal time)
- Use the 2nd option (shift to average guidance position) for lows with a poorly defined location or yet to form
- A clear rationale is needed for excluding a model from consensus, such as;
  - Poor TC analysis
  - Poor synoptic analysis
  - Erratic motion
  - Known model weaknesses/bias
  - Note: excluding a track doesn't change the consensus track that much but it does affect the final spread of models which is a consideration into the uncertainty
- Once the models to be put into the consensus are decided then change the analysis time to the current anal time and choose shifted option
  - Compare with previous OFT (change to 'all tracks', remember to return to 'guidance tracks' to make a consensus/offt)

Create Official Forecast Track Either

- when consensus members are decided within Scatter Plot, create Consensus and Official Forecast Track (OFT).

or for intermediate issues

- Use SHIFT track (Tools menu) to create a new official forecast track, check;
  - Check wind/cat/radii for internal consistency
  - Confidence Areas: Recreate using the Confidence Areas tool. This must be done to create confidence areas for 7 Day Forecast product.
  - Round mean winds to nearest 5kn and re-autofill all the gust values

### Truncate Official Forecast Track

- If appropriate, shorten the OFT by removing fixes when no longer significant system or for policy reasons the track of weakening low should not be shown.
- If not truncated to shorter for above reasons:
  - Length of OFT should be to at least 120 hours, even if outside AoR
  - Length of OFT should be to at least 168 hours if it remains inside AoR

### | Review Motion

Review:

- **Forecast motion speed and direction** in the short term against recent movement, if necessary adjust (up to but not exceeding) the first 24 hours of motion accordingly
- For **implied erratic motion** or any motion with policy implications for warnings

### | Create Probability of TC values table

Hit the 'Create a new set of Probability of TC values' button  and set the base time the same as your OFT.


### | Determine Confidence Areas and Confidence Cones

Ensure that you have truncated your OFT prior to running the confidence area tool (when appropriate)

This is for **+24, +48, +72 hour and +120h Forecast Confidence Cones on OFT**, and for the **twice-daily Forecast Confidence Areas in the 7 Day Forecast**. Particularly for E&R purposes, maintain consistency of uncertainty areas.

Clients can be very sensitive to changes so ensure any changes are due to forecast policy.

## Confidence Areas tool


- Use  to generate areas from super-ensemble. See [instructional video](#) or [slide summary](#).
- Steps: Open confidence area tool; Choose recent ensembles (EC, UK, US and AG4) for past two model runs within past 18 hours; view confidence areas and step forward; build confidence cones; create 'consensus and OFT', compare with previous and final manual edits if required especially for undesired 'kinks' and consistency with previous runs; noting reasons for change in chat window.

## Choosing Guidance

- The default guidance is 2 of EC, UK, US and AG4.
  - 2 runs of each gives good performance and enough members to be confident in the output.
    - If the guidance becomes spread out more than normal, consider using 3 runs of each.
    - If the longer term forecast is important AND the most recent base time of the guidance is 00Z or 12Z, then you can use most recent 00Z and 12Z from EC and 2 runs which are 6 hours apart of the rest.
  - US isn't always available, the tool will work fine without this data.
  - ACCESS-GE 4 is preferred over 3 (the one with no number), but 3 is still a good option.
- Excluding guidance:
  - The GFDL tracker which produces the US tracks can track shallow low pressure centres which can be not representative of the system being forecast. Consider if the US guidance is tracking a significant lower and consider removing from the super ensemble if it isn't. The GFDL tracker is used for "GFS" and "ACCESS-GE" ensembles, along with any with "(GFDL)" at the end of the name.

## Tips:

- Drag slider bars to time of interest rather than stepping through as the tool is slow
- If OFT is near edge or outside of Confidence Areas consider changing guidance to be a closer match to OFT or by adding climatological weight (recommended default 30%).
- OFT uncertainty values will be updated to be the average of the Forecast Area for that time.
- For a base time, the tool will not allow multiple sources of ensemble guidance from the same agency. For example ECMWF and 'Bias Corrected ECMWF' or 'EC-Ens Preformation'.
- If the OFT track is going over land, weakening and needing truncation, it is best to do this prior to using the confidence area tool.
- New Forecast Areas are NOT used for the gale onset tool and gale onset times in Storm Tide Advice. These will need to be considered manually. Likewise, measuring tool, gale radii and Forecast Areas (24 and 48) will be needed to determine Watch and Warning areas.
- The 'Auto Forecast Areas' button should not need to be used as much as in the past (it generates confidence cones based upon values in the track table).
- If 12-hourly confidence areas have been modified, use the **Derive Confidence Cones from Existing Confidence**


**Areas** button . Note manual adjustments in TC Collab.

- Note any adjustments to the sliders, Fade In, Start Fade Out, End Fade Out and Climatology Weight in the TC Collab.

## | Determine Intensity and Structure Parameters

### Intensity

- **Environmental influences** (1.3 [Assess Broadscale Pattern](#))
- **NWP inc. ICNW (model consensus and RI aids (refer tcwc emails))** (1.7 [Review NWP](#))

Using the intensity tool  If wanting to use the previous policy for intensity and/or P5 wind, click on copy previous OFT to OFT to insert existing policy and review, otherwise follow these from scratch:

- **Edit subjective Dvorak track** using forecast T number changes to help set intensity as a starting point
- **Review guidance** including previous policy and inland decay model if appropriate
- **Manually edit OFT track**, can type in table or click on the graphic to set intensity
- **Check spread of uncertainty** with respect to intensity

- Consider possibility for rapid intensification: SHIPS RI guidance via email to tcwc - threshold of 40% highlights RI potential
- **Enter mean wind** at critical points such as landfall, +24, +48, +72, +96 +120h etc.
- **Use Autofill** to interpolate between these points (in Autofill highlight the mean wind column only)
- **Review the times of changes** at 35, 50, 65 knots.
- Hint! To make the inland decay model guidance appear within intensity tool you must first set an intensity in your current OFT for the pre- and post-landfall positions.
- **Upper Bound Wind column (P5 Wind)**
  - Use intensity tool, copy from previous OFT to preserve previous values (will need to be done before changing mean wind otherwise changes will be overwritten)
  - Deriving from climatology (not recommended - particularly for weakening system/system moving inland)
    - Use Auto Fill to populate by adding a climatological error to the forecast speeds [First guess P5 exceedence wind values](#)
  - Fill in the blank spots MANUALLY (need more time than is automatically populated)



**Structure** Can use Structure Forecasting tool to copy previous policy as starting point then consider following:

- NWP
- RVCN
- Climatological values (WA specific) - gale: 90nm, storm: 40nm, hurricane:20nm; large:gale 120+, storm 50-60 hurricane 25-30nm; small:gale 70, storm 30, hurricane 15nm

Enter gale/storm/hurricane values as appropriate for the mean wind.

#### Other values

- The Symbol, Category, Wind Gust and central pressure (using W-P algorithm) are all taken from Autofill
- Check interpolated values, some may be near the change over to storm and hurricane force values and you will need to ensure they are correct and that the appropriate radii have been included
- All data is to be filled out for every six-hour fix position. Include details to at least 120 hours and preferably to 168 hours

**RMW** is required for all forecast positions when system is at TC intensity. Refer to [RMW Climatology](#) for some guidance and guidelines on RMW based on Vmax (system mean wind). Recommended to perform this step after auto-filling symbol/category to aid in identification of when RMW is required. As of the 22.1 release of TC Module, RMW is now in the autofill tool.

## Enter details into Probability of TC table

Fill out the 'Probability of TC' values for the base time associated with this issue by right clicking the layer and selecting properties. In almost all instances, 'Copy from previous' will be used to initially populate the current issue, with minor tweaks as necessary.

A new time is added for the base times: 21Z (or 00Z if previous issue was 18Z) and 06Z.

Allowed values:

- Empty = System is very likely to not exist or is outside AoR and there is no value in showing it on 7DF map.
- Very Low = 1
- Low = 5, 10, 15
- Moderate = 25, 30, 35, 40, 45
- High = 55 and every subsequent increase of 5 thereafter up to 100 (amazingly, a 105% probability of TC is not valid)
- Note: Boundary values between Low to Moderate and Moderate to High aren't allowed (20% and 50%)

Typical edits of probabilities:

- Change of timing a system is forecast to intensify to tropical cyclone
- Change of timing of inland decay or transition to subtropical/extratropical status
- Change of track length (truncation of track is associated with the timing of blank values in TC probability table)

## Consistency with Confidence Areas:

- The Area of 7 Day Coverage (Ao7DFC) is the area that is shown on the 7 Day Forecast web page, including the area outside the AoR.
- The Area of Responsibility (AoR) incorporates some risk to Norfolk Island.
- If the Confidence Area is completely outside the Area of 7 Day Coverage (see Map) then PoTC should be empty.
- If the Confidence Area has any part in the AoR and the system could exist or there is an OFT, then the PoTC must not be empty.
- If the Confidence Area has any part in the Ao7DFC but not in the AoR, then the PoTC can be empty if there is no value in showing the CA on the map.
  - For example, for a system moving out of and then staying out of the AoR, have CA's showing on the 7DF map until it is clear it is well outside the AoR and continuing to move that way then set PoTC to empty.
  - If PoTC is empty and there is an OFT fix for the time, then the consistency message "There is a forecast fix but PoTC is empty" will show. This can be ignored if the CA is outside the AoR and there is no value showing the CA on the map.

## Consistency with OFT:

- Any timestep that is forecast to be a TC must have a probability greater than 50%
- Any timestep that is forecast to be a tropical low must have a probability less than 50%
- Timesteps after the OFT is truncated have corresponding blank values in the TC probability table
  - Exceptions may exist to this rule if significant impacts are expected from the decaying weather system and a larger discussion with TC EPS has occurred with reasons to continue the 7 day product (think ex-TC Ellie that lingered and impacted NT/Kimberley for many days after forecast track maps ceased)

For more information on the 7 Day Forecast process, click [here](#)

## 3 Assess Risks & Impacts

---

### ■ Assess Risks & Impacts

#### | Determine Watch/Warning Areas

- Use 24/48h confidence areas and forecast gale radii to measure likely extent
- Gale Onset tool
- NWP sfc winds, EC prob of gales, wind probabilities; [risk matrix](#)
- Previous policy
- TCModule Coastal Threat Area (Tools menu)

Ensure Watch/Warning zones are correct (Changing zones from Watch to Warning, extending Watch/Warning zones etc) and if required, create threat polygons for inland areas using the TC Module polygon tool. It is good practice to remove unused threat polygons in the annotations layer at this time.

- Determine Gale/Storm onset times at key locations
- Is a FLASH WARNING required

#### | Standard Emergency Warning Signal (SEWS)

Consider risk of Category 2 winds/storm tide 0.5m > HAT within 12 hours and advise Decision Support for confirmation to include SEWS on advice (refer SLS). Decision Support to check detailed criteria in SLS, seek appropriate authorisations in relevant jurisdiction and advise accordingly.

## 4 Situational Awareness (2)

---

### ■ Communicate Scientific Process

Liaison with DSS Guidelines



- The TCWC lead will ensure a draft OFT and Watch/Warning zones are ready for review about one hour prior to the time of issue (WA require policy for DFES conference at one hour before issue) followed by liaison (via MSTeams, phone call or teleconference as required) between the TCWC lead and Decision Support
- By 45 minutes prior to issue, the TCWC team will have the key text components (Headline, Discussion and Hazards) ready for review in the operational collaboration [OneNote](#)
- By 30 minutes prior to issue liaison will occur to confirm the text in the operational collaboration [OneNote](#). Note for storm tide refer to Storm Tide section below

## Operational Communications

# 5 Produce Products

---

## ■ Produce Datasets

### Onenote [Operational Collaboration](#)

- Headline
  - Refer to [Tropical Cyclone Advice Headline SOP](#).
- Discussion
- Hazards
  - List the most significant hazards first. This may be rainfall especially for developing lows and cat 1 systems.

Sample warning text [WA](#) | [NT](#) | [Qld](#)

### Policy Wizard

- Ensure that the correct speed of movement (6hr/12hr/other) is selected
- Enter the Dvorak Code including short term trend. Format is *TFT/CI/trend/24HRS* STT: *trend/6HRS* (note 'trend' is interpreted as the change in the FT)
- When a system is affecting the mainland, use 2 locations for "distance from" in the TC Advice
- Mentioning **Storm Tide in TC Advice** use [standard phrasing from these notes](#).
  - Note currently varies from state to state and different from TCModule notes).

# 6 Deliver Enhanced Communications to Customers

---

## ■ Via Briefings

Briefings are the responsibility of DSS teams but there will be occasions when TCWC staff will be required to deliver them to emergency services or assist in other ways.

### WA DFES

- DFES Briefing [Instructions](#).

### NTES

- at least 45 min prior to issue time, the locations for the specific action statements are emailed to NTES as per these [instructions](#). Statements are based on the expectation of gales with 0-6h, 6-12h, 12-24h and 24-48h as per these [descriptions](#). NTES should be phoned as well to also provide a briefing. The science team should be in contact with local decision support to ensure consistent messaging before email is sent to NTES.

### QFES

- QFES met will handle teleconferences typically. Teleconference are normally held once a day, just after the 11am AEST issue. [notes](#)

### NSW

- NSW procedures [NSW](#) including Norfolk and Lord Howe Islands.

## 7 Produce Products (2)

---

### ■ Produce Tailored Forecasts & Products + Produce Warnings

#### Policy Wizard

- Issue **Send to GFE/Storm Surge** product FIRST. This can be done prior to completing all of Policy Wizard Step 2 fields but requires locations. If triggering storm tide advice must be issued by 30mins after analysis time.
  - standard cut off times are 00:30, 06:30, 12:30, 18:30
  - *automatic* model start times are 00:40, 06:40, 12:40, 18:40 only
  - only the latest policy for each TC will be run at release time - intermediate updates are not run
  - model runs can be "released" at other times by contacting ITCC [x4010]
    - ITCC call the system "StormSurge\_tc". Identify the run required by storm id and basetime eg 16U at 03UTC.
    - ITCC contact required to request runs at 03:00, 09:00, 15:00, 21:00 or any other non-standard time
    - ITCC contact recommended if the file is submitted after the standard cutoff time or to cancel a run in progress after a policy update
  - If you are unsure if the model was run can check confirmation either by [✉ tcwc@bom.gov.au](mailto:tcwc@bom.gov.au) email or via the [🔗 ROMS status web page](#)
    - ([🔗 alternative monitoring plots](#))
- Once Step 2 of policy wizard is complete, synchronise to allow other users to open policy wizard and issue support to issue track map and E&R to issue their products.
- Issue **Advice** then **Track Map** refer to [🔗 maps of sites](#). Ensure major towns in advice area and boundary points are included.
- Issue **CAP** product (rejig required) immediately after Forecast Track Map, if a TC Advice has been issued. (Recall that CAP is essentially a machine readable format of the TC Advice. There should always be a 1:1 correspondence between TC Advice and CAP.)
- Issue **Real Time Event Data** product after Forecast Track Map. Required anytime a Forecast Track Map is required, or twice daily at other times (to populate the 7 Day Forecast). Preview is in JSON format, no editing is expected
- Issue **GML** product after and for each Forecast Track Map, another rejig is required to ensure the analysis and forecast track are sent.
  - For each FTM means if cross region FTM issued, also issue corresponding cross region GML.
  - If possible, send all the required GML's close together to minimise the time Meteye has two different tracks.
- **Ocean Wind Warning**
  - Use "All Messages" for the warning zone as well as any others that apply.
  - Sea heights follow [🔗 sea state scale](#). General scale 25-33kn rough seas; 34-47kn very rough to high seas; 48-63kn high to very high seas; 64kn+ very high to phenomenal seas. Note: TC cases have fetch limitations for limited wind radii.
- When issuing for **Cocos Islands** please check that you are using the right time. The form defaults to Christmas Island which is UTC + 7 and is noted as CXT. Cocos is UTC + 6.5 and is noted CCT. This should be in the Details section and the next issue statement and you will need to edit this as black text.
- Aviation
- CREX
- Tech Bulletin
- Information Bulletin (only if TC Advice not required)
- If this is a final issue for a system then check the [🔗 Product Termination](#) page

#### ■ ARPC Notification

- **New to season 2022/2023** - Determine if ARPC commencement or cessation notification is required
  - [ARPC Instructions](#)

#### ■ E&R Process

- **Important** Follow this link to guide you through the E&R process in TC Module - [🔗 E&R process in TCModule](#)

- Refer to the [TC Procedures E&R](#) page for operational guidelines and other information.
- Other useful quick links can be found here:
  - Track upload [Upload TC Module track file to SSUWEB](#) (step 6 in E&R Process)
  - [Active client list](#) (check column E for TC Forecasts check box)

## | Storm Tide

- [Storm Tide Instructions](#)

## 8 Finish

---

- Update Teams channel for shift update; Review [HOTO](#); and notes for Tech hazard briefing when appropriate
- Update TCWC logbook [National logbook on sharepoint](#) [guidelines](#) and [Significant Obs form](#)
- Handover ([Checklist](#)) or return to 1.2
- Remove old tracks in TCModule
- Consider extra sondes([schedule](#)); obs; [RapidScan](#) request(contact NP)
- Remove TC forecast from web (TC Advice). Send an email to [operator@bom.gov.au](mailto:operator@bom.gov.au)
- Post event: Follow procedures here: [TCWC Product Termination and Post Event Actions](#) and update [onenote page](#) . .

TropicalCyclones/TropicalCycloneWarningSOP (last edited 2024-02-08 12:11:28 by rabir)

RELEASED UNDER FREEDOM OF INFORMATION

# Document 9

**From:** [Matthew Collopy](#)  
**To:** s 22: removed with consent [HPR Leads](#); [NPS\\_LT](#); [NP\\_Ops\\_LeadMets](#); [EPS\\_SevereWeather\\_LT](#); [BSG-LT](#)  
**Cc:** [CSG\\_Extended\\_LT](#); [EPS\\_LT](#); [EPS\\_Severe\\_Weather](#)  
**Subject:** RE: Draft Thunderstorm and Severe Weather Service Level Specification (SLS) for internal feedback [SEC=OFFICIAL]  
**Date:** Monday, 23 October 2023 12:45:49 PM  
**Attachments:** [Thunderstorm and Severe Weather Service Level Specification 2023\\_2024\\_consultation\\_GMEPS\\_comments.pdf](#)  
[image002.png](#)  
[image004.png](#)  
[image005.png](#)  
[image006.png](#)  
[image007.png](#)  
[image008.png](#)  
[image009.png](#)  
[image010.png](#)  
[image011.png](#)  
[image012.png](#)  
[image013.png](#)

Hi all,

I have reviewed and added comments to the attached pdf (which I find a tad clunky to work with as opposed to a word doc).

Regards,

Matt Collopy (He/Him)

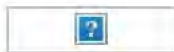
General Manager

Environmental Prediction Services, Community Services Group

s 22: removed with consent

[Redacted]

[Redacted] [@bom.gov.au](#) | [www.bom.gov.au](#)



The Bureau of Meteorology acknowledges the Traditional Custodians of Australia and their continuing connection to land, sea and community.

Important: This message may contain confidential or legally privileged information. If you think it was sent to you by mistake, please delete all copies and advise the sender.



**From:** s 22: removed with consent [@bom.gov.au](#)

**Sent:** Friday, October 20, 2023 3:10 PM

**To:** [HPR Leads](#) <[HPR\\_Leads@bom.gov.au](#)>; [NPS\\_LT](#) <[NPS\\_LT@bom.gov.au](#)>; [NP\\_Ops\\_LeadMets](#) <[NP\\_Ops\\_LeadMets@bom.gov.au](#)>; [EPS\\_SevereWeather\\_LT](#) <[EPS\\_SevereWeather\\_LT@bom.gov.au](#)>; [BSG-LT](#) <[BSG-LT@bom.gov.au](#)>

**Cc:** [CSG\\_Extended\\_LT](#) <[CSG-Extended-LT@bom.gov.au](#)>; [EPS\\_LT](#) <[EPS\\_LT@bom.gov.au](#)>; [EPS\\_Severe\\_Weather](#) <[EPS\\_Severe\\_Weather@bom.gov.au](#)>

**Subject:** Draft Thunderstorm and Severe Weather Service Level Specification (SLS) for internal feedback [SEC=OFFICIAL]

Hello everyone,

**Request: Provide feedback on draft Thunderstorm and Severe Weather Service Level Specification (SLS) by COB 27<sup>th</sup> October 2023**

Please find through this link (and attached) the draft Thunderstorm and Severe Weather Service Level Specification (SLS) for 2023-2024: [Thunderstorm and Severe Weather Service Level Specification 2023\\_2024\\_consultation.pdf](#)

Feedback can be provided through this feedback log: [Thunderstorm and Severe Weather Service Level Specification Feedback Log 2023.xlsx](#)

Following this period of internal feedback, the SLS will be updated and then shared with customers for a period of external consultation.

Note this version builds on previously shared SLS's and has incorporated that internal feedback.

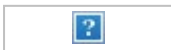
Thanks

s 22: remov

Manager Severe Weather  
Environmental Prediction Services, Community Services Group

s 22: removed with consent

[@bom.gov.au](#) | [www.bom.gov.au](#)



The Bureau of Meteorology acknowledges the Traditional Custodians of Australia and their continuing connection to land, sea and community.

Important: This message may contain confidential or legally privileged information. If you think it was sent to you by mistake, please delete all copies and advise the sender.



ELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL

Document 9A

# Thunderstorm and Severe Weather Service Level Specification

Community Services Group

Season 2023-2024



OFFICIAL

### Revision history

Date	Version	Author	Description
10/08/2023	0.1	s 22 removed with consent	Initial draft template
14/10/2023	0.2		Final internal draft
	0.3		Draft sent for internal consultation

### Review status

Date	Version	Reviewer	Description
DD/MM/2023	1.0	s 22 removed with consent	

### Release history

Date	Version	Status	Approval
DD/MM/2023	1.0		Matt Collopy



Unless otherwise noted, all images in this document are licensed under the Creative Commons Attribution Australia Licence.

© Commonwealth of Australia 2023

Published by The Bureau of Meteorology

Cover image: Adelaide River, Northern Territory, Christopher Kent, 12 December 2019.



OFFICIAL

# Contents

1. Introduction ..... 8

1.1. Purpose ..... 8

1.2. Scope ..... 9

1.3. Authority ..... 9

1.4. Distribution ..... 9

2. National Thunderstorm and Severe Weather Services ..... 11

2.1. Partnerships ..... 11

2.2. Definitions ..... 11

2.2.1. Thunderstorm ..... 11

2.2.2. Severe Thunderstorm ..... 11

2.2.3. Severe Weather ..... 13

2.3. Severe Weather Seasonality ..... 15

2.4. Area of Responsibility ..... 15

2.5. Dissemination of Products ..... 15

2.6. Briefing Services ..... 16

2.7. Embedded Meteorologists ..... 16

2.8. Communication and Adoption Activities ..... 16

2.9. Service Continuity ..... 16

RELEASED UNDER FREEDOM OF INFORMATION

OFFICIAL



3. Quality Assurance and Performance ..... 17

3.1. Hazards Services Forum ..... 17

3.2. Commonwealth, State and Territory Liaison and Consultation..... 17

3.3. Performance Statistics and Reporting..... 17

3.3.1. Verification..... 17

3.3.2. Damage Assessments..... 17

3.4. Lessons Management ..... 18

3.5. Meteorologist Training and Competency ..... 18

4. National Thunderstorm and Severe Weather Routine Product Suite ..... 19

4.1. Real-time Data Services & Australian Digital Forecast Database ..... 19

4.2. Thunderstorm Forecasts..... 19

4.2.1. Issue Criteria, Times, and Validity ..... 19

4.2.2. Content..... 20

4.2.3. Amendment Criteria..... 21

5. National Thunderstorm and Severe Weather Non-Routine Product Suite..... 21

5.1. Severe Thunderstorm Warnings ..... 21

5.1.1. Warning Content..... 21

5.1.2. Regional Severe Thunderstorm Warnings ..... 22

5.1.3. Detailed Severe Thunderstorm Warnings ..... 23

5.2. Severe Weather Warnings..... 24

5.2.1. Issue Criteria and Validity ..... 24

5.2.2. Warning Content..... 25

5.3. Warning Escalations..... 26

RELEASED UNDER FREEDOM OF INFORMATION

5.3.1. Very Dangerous Storm (VDS)..... 26

5.3.2. Standard Emergency Warning Signal..... 26

5.3.3. Emergency Weather Alerts..... 27

6. Appendices ..... 28

6.1. Weather Forecast District Maps..... 28

6.2. Detailed Severe Thunderstorm Warning Domains ..... 34

6.3. Product Samples ..... 42

6.3.1. Thunderstorm Forecast Map..... 42

6.3.2. Regional Severe Thunderstorm Warning ..... 44

6.3.3. Detailed Severe Thunderstorm Warning ..... 45

6.3.4. Severe Weather Warning ..... 47

6.3.5. Severe Weather Warning ..... 49

6.3.6. Severe Weather Warning for offshore Islands ..... 50

6.4. Product Identifiers..... 51

7. Navigation aids..... 53

7.1. List of figures ..... 53

7.2. List of tables ..... 53

RELEASED UNDER FREEDOM OF INFORMATION

## List of acronyms used in this Service Level Specification

ACT	Australian Capital Territory
ADFD	Australian Digital Forecast Database
AEP	Annual Exceedance Probability
BMTC	Bureau of Meteorology Training Centre
NEMA	National Emergency Management Agency
EWA	Emergency Weather Alert
HAT	Highest Astronomical Tide
HMA	Hazard Management Agency
HSF	Hazard Services Forum
ID	Identification (numbers or codes)
IGA	The Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories
LAT	Lowest Astronomical Tide
NSW	New South Wales
NT	Northern Territory
NWP	Numerical Weather Prediction
PERM	Post Event Review Management
PSG	Predictive Services Group
QLD	Queensland
QPF	Quantitative Precipitation Forecast
SA	South Australia
SES	State Emergency Service
SEWS	Standard Emergency Warning Signal
SLS	Service Level Specification
SOP	Standard Operating Procedures
SWH	Significant Wave Height
TAS	Tasmania

VIC Victoria  
VDS Very Dangerous Storm  
WA Western Australia

RELEASED UNDER FREEDOM OF INFORMATION

# 1. Introduction

## 1.1. Purpose

The purpose of the Service Level Specification (SLS) is to document the thunderstorm and severe weather services provided by the Bureau of Meteorology (the Bureau).

The Total Warning System<sup>1</sup> recognises that a fully effective warning service is multi-faceted in nature and its development and operation involves input from several 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 Warning System for thunderstorms and severe weather.

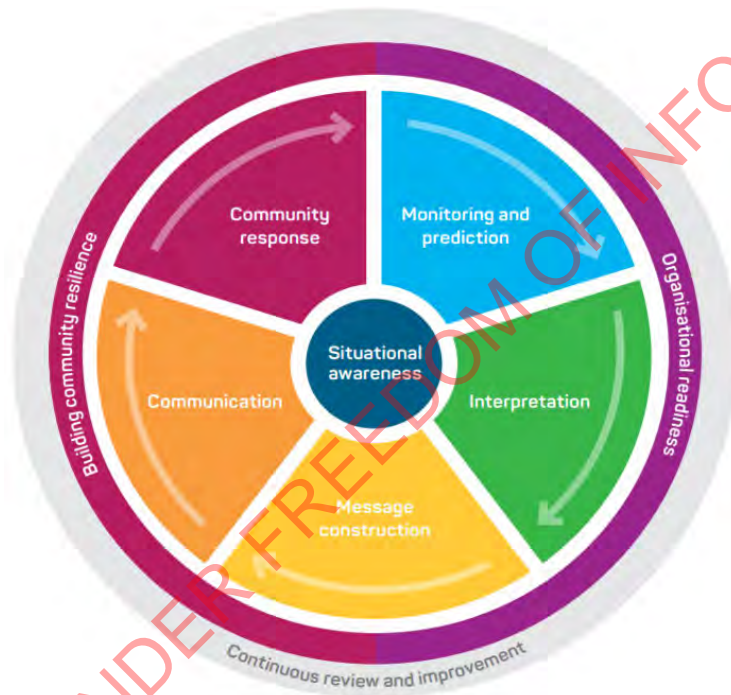


Figure 1: Total Warning System

---

<sup>1</sup> <https://knowledge.aidr.org.au/media/5972/warnings-handbook.pdf> pg. 10

The Bureau's role in the thunderstorm and severe weather warning system is focussed on monitoring and prediction, message construction and communicating threats and impacts associated with these hazards to Government, industry, and the community.

The Bureau also contributes to activities designed to strengthen organisational readiness and build community resilience and participates in the planning and coordination of activities with disaster mitigation agencies.

## 1.2. Scope

The scope of the SLS is the Bureau's publicly available thunderstorm and severe weather services and additional services provided to support emergency management.

The SLS details **what** the Bureau does and **when** it does it, to provide thunderstorm and severe weather services. **How** the Bureau produces these services is addressed in internal Bureau documentation.

## 1.3. Authority

The Meteorology Act, 1955 provides the Bureau a number of functions including but not limited to the taking and recording of observations, forecasting the weather, and issuing of warnings for weather conditions likely to endanger life or property. The [Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories](#) (IGA) confirms the roles and responsibilities of the Bureau and State and Territory governments and local governments.

The Bureau has historical and statutory responsibility for the issue of warnings of gales, storms, and other weather conditions likely to endanger life or property (Meteorology Act 1955 - Sect 6). This includes the provision of forecast and warning services for severe thunderstorms and severe weather. The responsibility for preparation for and response to thunderstorm and severe weather impacts lies with state and territory governments and local governments.

The Bureau of Meteorology Thunderstorm and Severe Weather SLS is issued by the General Manager Environmental Prediction Services under the authority of the Director of Meteorology.

## 1.4. Distribution

This document will be distributed to the agencies listed in Table 1.

Jurisdiction	Agency Name
National	National Emergency Management Agency (NEMA)
National	Australasian Fire and Emergency Services Authorities Council (AFAC)

QLD	Queensland Fire and Emergency Services (QFES)
QLD	Queensland Police Services (QPS)
QLD	Queensland Inspector General Emergency Management
NSW	New South Wales State Emergency Service (NSW SES)
ACT	Australian Capital Territory Emergency Services Authority (ACT ESA)
ACT	Australian Capital Territory Parks and Conservation (ACT PCS)
VIC	Emergency Management Victoria (EMV)
VIC	Victoria State Emergency Service (Vic SES)
VIC	Victoria Department of Environment, Land, Water and Planning (DELWP)
VIC	Victoria Police (VicPOL)
TAS	Tasmania State Emergency Service (Tas SES)
TAS	Tasmanian Parks and Wildlife Service
SA	South Australian State Emergency Service (SA SES)
SA	South Australian Country Fire Service (SA CFS)
SA	South Australia Department for Environment and Water (DEW)
SA	South Australia Police (SAPOL)
WA	Western Australia Department of Fire and Emergency Services (DFES)
NT	Northern Territory Police, Fire and Emergency Services (PFES)

Table 1: Bureau of Meteorology Thunderstorm and Severe Weather SLS distribution list by jurisdiction

## 2. National Thunderstorm and Severe Weather Services

The Bureau's thunderstorm and severe weather services provide the Australian community and emergency management with essential thunderstorm and severe weather forecasts and warnings that are timely and accurate.

Thunderstorm and severe weather services are designed to inform the community and emergency management organisations of the occurrence of, or potential for, severe thunderstorms or other severe weather conditions.

An important secondary role is to assist media and state or territory emergency services with community engagement programs, and to advise on meteorological aspects of severe thunderstorm and severe weather-related disaster preparedness and planning.

### 2.1. Partnerships

The Bureau has formed partnerships with emergency management organisations, other government authorities and media across the country to ensure that forecasts and warnings are fit-for-purpose and are broadly distributed in a timely manner.

Partnerships underpin the delivery of effective thunderstorm and severe weather services to the Australian community. The partnerships with Commonwealth, State and Territory Governments and local government are formalised through the IGA, which clarifies and confirms responsibilities across the Total Warning System. Specifically, the Bureau and States and Territories agree to work together to mutually develop and maintain national standards for warnings of severe thunderstorms and severe weather.

### 2.2. Definitions

#### 2.2.1. Thunderstorm

A thunderstorm is a localised atmospheric disturbance that produces lightning and thunder. There are various types of thunderstorms, and each type has a distinct structure and set of characteristics, affecting thunderstorm motion, intensity, and longevity as well as the type of weather phenomena that they produce. Thunderstorms may evolve through various thunderstorm types during their life cycle.

#### 2.2.2. Severe Thunderstorm

The Bureau of Meteorology defines a severe thunderstorm as a thunderstorm which produces one or more of the following phenomena:

- Damaging wind gusts
- Large hailstones
- Heavy rainfall which may lead to flash flooding
- Tornadoes



A severe thunderstorm is categorised as a very dangerous storm (VDS) if it produces one or more of the following high-end severe phenomena:

- Destructive wind gusts
- Giant hailstones
- Intense rainfall which may lead to dangerous and life-threatening flash flooding
- Tornadoes

These weather phenomena are defined as in Table 2:

Phenomenon	Definition
<b>Damaging Wind Gusts</b>	Wind gusts $\geq$ 90 km/h (49 knots)
<b>Destructive Wind Gusts</b>	Wind gusts $\geq$ 125 km/h (68 knots)
<b>Large Hailstones</b>	Hailstones $\geq$ 2 cm in diameter * Large accumulations of small hail may be included in the text of an existing warning for Large Hail in NSW when conditions are favourable.
<b>Giant Hailstones</b>	Hailstones $\geq$ 5 cm in diameter
<b>Heavy Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 10% AEP <sup>2</sup> depth
<b>Intense Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 2% AEP depth  <b>Exception - NSW</b> As above or if lower than 2% AEP depth, $\geq$ 70 mm in 1 hour or less $\geq$ 150 mm in 3 hours or less
<b>Tornado</b>	Any tornado occurrence

Table 2: Phenomena definitions associated with severe thunderstorms

<sup>2</sup> The Annual Exceedance Probability (AEP) is the probability that a rainfall amount over a given period will be exceeded in any one year. The [Design Rainfall Data System](#) (2016) provides the national datasets for 10% and 2% AEP used in Bureau services.

### 2.2.3. Severe Weather

The Bureau of Meteorology defines severe weather as hazardous or dangerous weather that is not the direct consequence of thunderstorms, tropical cyclones or bushfires that consists of one or more of the following phenomena:

- Damaging and/or destructive winds
- Heavy rainfall which may lead to flash flooding and/or intense rainfall which may lead to dangerous and life-threatening flash flooding
- Damaging surf
- Abnormally high tides
- Blizzards

These weather phenomena are defined in Table 3 and Table 4.

Land Phenomenon	Definition
<b>Damaging Winds</b>	<p>Wind gusts <math>\geq</math> 90 km/h (49 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p><b>Exception - Tasmania</b> Wind gusts <math>\geq</math> 100 km/h (54 knots) for westerly winds or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p>Wind gusts <math>\geq</math> 80 km/h (43 knots) for easterly winds or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 63 km/h (34 knots)</p> <p><b>Exception - NSW</b> For elevations <math>\geq</math> 1900 metres: Wind gusts <math>\geq</math> 125 km/h (68 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 80 km/h (43 knots).</p>
<b>Destructive Winds</b>	<p>Wind gusts <math>\geq</math> 125 km/h (68 knots) or mean wind speeds (averaged over 10 minutes) <math>\geq</math> 89 km/h (48 knots)</p> <p><b>Exception - Tasmania</b> Wind gusts <math>\geq</math> 110 km/h (59 knots) for easterly winds</p>
<b>Heavy Rainfall</b>	Rainfall over a period between 30 minutes and 6 hours which exceeds the 10% AEP depth
<b>Intense Rainfall</b>	<p>Rainfall over a period between 30 minutes and 6 hours which exceeds the 2% AEP depth</p> <p><b>Exception - NSW</b> As above or if lower than 2% AEP depth, <math>\geq</math> 70 mm in 1 hour or less <math>\geq</math> 150 mm in 3 hours or less</p>
<b>Blizzards</b>	NSW and Victoria for elevations $\geq$ 1200 metres

	* Included in text of existing warning when conditions are identified as favourable.
--	--

Table 3: Land phenomena definitions associated with severe weather.

Coastal Phenomenon	Definition	
<b>Damaging Surf</b>	Qld	SWH $\geq$ 4 metres, when from directions 0 to 150 degrees
	NSW	SWH $\geq$ 5 metres in surf zone and from onshore directions.
	Vic	SWH $\geq$ 7.5 metres at Portland
	Tas	Cape Grim clockwise to South East Cape ONLY SWH $\geq$ 6 metres and from onshore directions or Southeast coasts when primary swell is from S to SE and SWH $\geq$ 7 metres at Cape Bruny
	WA	SWH $\geq$ 5 metres or SWH $\geq$ 7 metres for locations south of North West Cape when primary direction from W to S
	NT	SWH $\geq$ 2 metres
	SA	No service
	<b>Abnormally High Tides</b>	Qld
NSW		Sea levels > 0.5 metres above HAT
Vic		No service
Tas		Sea levels $\geq$ 1.9 metres above LAT at Battery Point (Hobart) or and $\geq$ 4.0 metres above LAT at Burnie
WA		Sea levels > 0.5 metres above HAT
NT		Sea levels > HAT
SA		For Gulf St Vincent and Spencer Gulf coastlines, sea levels $\geq$ 3.75 metres above LAT at Outer Harbor (Adelaide)

Table 4: Coastal severe weather phenomena definitions

\* SWH, HAT and LAT correspond to Significant Wave Height, Highest Astronomical Tide, and Lowest Astronomical Tide respectively. Damaging surf is referred to as 'dangerous surf' in Queensland.

## 2.3. Severe Weather Seasonality

There is no distinct severe weather season in Australia. Severe weather can occur across Australia throughout the year, with some types of severe weather more seasonal than others.

Severe thunderstorms can occur at any time of the year. However, for most parts of the country, they are more common during the warmer months between October and March.

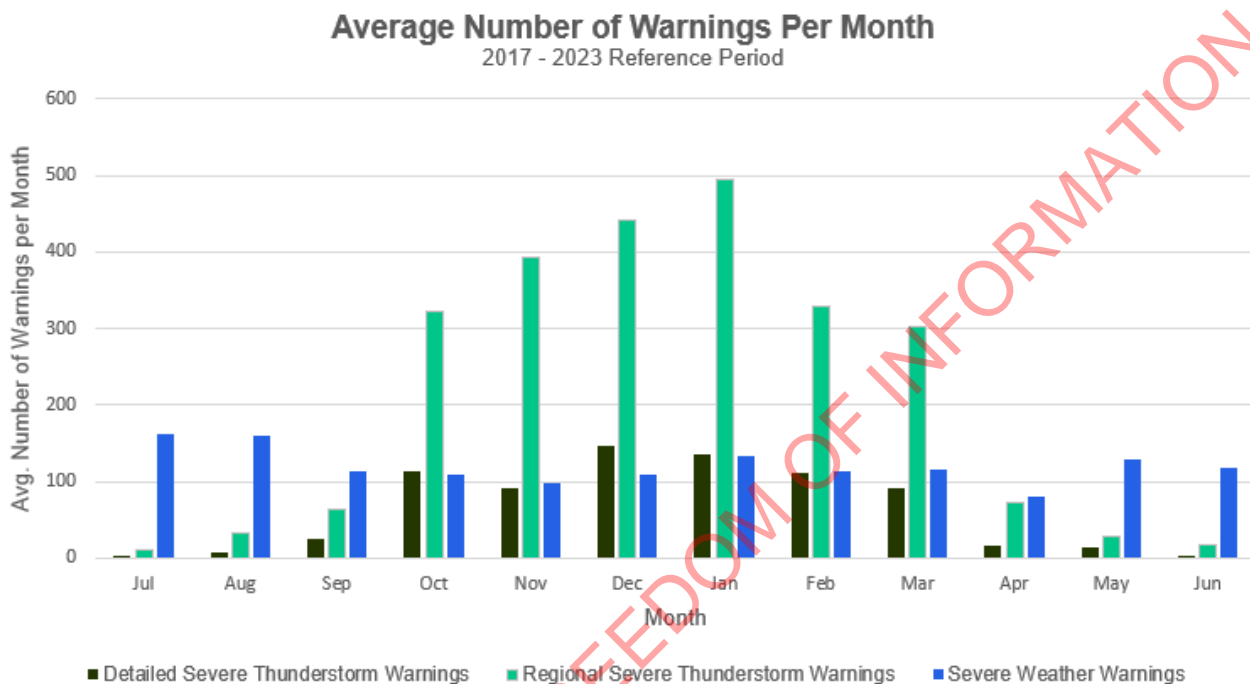


Figure 2: Average number of warnings per month across all mainland states and territories of Australia for the 2017-2023 reference period

## 2.4. Area of Responsibility

The Bureau's thunderstorm and severe weather services cover all Australian states and mainland territories. Severe weather services are also provided for Lord Howe Island and Norfolk Island.

## 2.5. Dissemination of Products

The Bureau's thunderstorm and severe weather products are disseminated primarily through the Bureau's website and app. Products are also disseminated via email and are available as a recorded voice via the Bureau's telephone weather service.

Severe Thunderstorm and Severe Weather Warnings are 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 internet protocols such as File Transfer Protocol (FTP).

## 2.6. Briefing Services

The Bureau provides briefings to emergency management partners to assist planning, response, and coordination. The format, timing and frequency of briefings is agreed through national, state and territory-based arrangements.

## 2.7. Embedded Meteorologists

The Bureau has arrangements with several emergency service organisations to provide services through an embedded meteorologist to support operational awareness and communication. In each instance, the services provided are agreed between the Bureau and the organisation and provided on a cost recovery basis.

## 2.8. Communication and Adoption Activities

In addition to issuing products through standard communication channels such as the website, app and via email, the Bureau undertakes a range of complementary communication and adoption activities in partnership with emergency management agencies. The purpose of these activities is to increase the uptake and effectiveness of the forecasts and warnings, and to ensure consistent weather safety messages are provided to the community.

Activities include community and industry preparedness briefings, social media campaigns and the Bureau's "[Severe Weather Knowledge Centre](#)" web pages. Ahead of, during and following significant severe thunderstorm and severe weather occurrences, this extends to joint press conferences and media interviews, as well as continuing social media public safety campaigns and additional community and industry briefings.

## 2.9. Service Continuity

The Bureau maintains service continuity through its Business Continuity Plans. Most pertinent to thunderstorm and severe weather services is the built-in redundancy of being able to transfer operations between offices, as required.

To maintain service continuity the Bureau uses a large and diverse range of observational and forecast data in the delivery of all its thunderstorm and severe weather services. This provides redundancy if any data source is unavailable during operations and ensures all products and services are based on the best available information at the time.

As per 2.6(2) of the IGA, the Bureau will aim to provide a continuity of services across the nation subject to the Bureau's available resources, operational limitations and any applicable policy considerations.

## **3. Quality Assurance and Performance**

### **3.1. Hazards Services Forum**

The IGA established the Hazards Services Forum (HSF) in 2018. The HSF facilitates consultation with state and territory operational emergency service agencies to guide current and future strategic development of the Bureau of Meteorology's hazard services.

The forum provides a pathway for states and territories to request and prioritise changes to the standard services and to refer services that could be considered supplementary services to the Bureau for consideration. The HSF also assists with the process of consulting on modifications to services schedules.

### **3.2. Commonwealth, State and Territory Liaison and Consultation**

The Bureau maintains ongoing liaison and engagement at a Commonwealth, state and territory level with emergency management organisations to ensure all parties maintain awareness of thunderstorm and severe weather operations and procedures. This occurs through regular meetings between team leaders and operations managers in the Bureau and the emergency service. The format, timing and frequency of these meetings is agreed through state and territory-based arrangements.

### **3.3. Performance Statistics and Reporting**

#### **3.3.1. Verification**

All official forecast and warning products are verified against available observations and compiled into routine reports. Key performance measures are reported in the Bureau's Annual Report.

#### **3.3.2. Damage Assessments**

The Bureau may choose to undertake damage assessments after severe thunderstorm and/or severe weather events, to advance knowledge and understanding of these high impact occurrences, and for verification and reporting purposes. At times, the Bureau may ask emergency service organisations and local governments (councils) to provide additional information, reports, and intelligence about a specific event, which may ultimately improve the final damage assessment. The Bureau of Meteorology will liaise with the relevant emergency service organisation if access is desired to any restricted areas impacted by severe weather and will always respect the directions of emergency services.

### **3.4. Lessons Management**

The Bureau conducts an internal debrief and lessons management process after the occurrence of severe thunderstorms and severe weather which have had a significant community or operational impact.

The insights and recommendations gained from these post event reviews are used to improve processes, systems and services delivered by the Bureau.

Depending on the impact from the severe thunderstorm or severe weather event, the process may include a debrief with external partners. Upon request, the Bureau also contributes to post incident reviews conducted by emergency services and government.

### **3.5. Meteorologist Training and Competency**

The Bureau undertakes competency-based training and assessment programs for qualified meteorologists involved in forecast, warning, and decision support operations.

This includes a public weather warning training and assessment program, and a specific severe thunderstorm training and competency-based assessment program. These programs ensure that staff involved in analysing, forecasting, and warning for severe thunderstorms and severe weather have the qualifications, training and demonstrated ability to provide a high standard service to the Australian community.

RELEASED UNDER FREEDOM OF INFORMATION

## 4. National Thunderstorm and Severe Weather Routine Product Suite

Unless otherwise noted, all issue times are quoted as local time for the relevant jurisdiction and time of year.

### 4.1. Real-time Data Services & Australian Digital Forecast Database

The Bureau's real-time data services provide tailored delivery of real-time Bureau of Meteorology products including datasets such as numerical output grids, satellite and radar data and web map service layers.

Part of these services is the Australian Digital Forecast Database (ADFD), which provides detailed forecast information across all states and mainland territories, including grids that are relevant to thunderstorms. These grids are available all year round.

The ADFD files are updated routinely twice per day at approximately 6:00 am and 6:00 pm local time and updated at other times, as required. If the forecasts are updated, the ADFD grids are not necessarily updated at the same time as the changes to the forecasts. Priority is given to updating the forecasts and warnings issued directly to the public through the media or internet.

Further details on real-time data services and the ADFD, including information on data bundles, can be found at <http://reg.bom.gov.au/reguser/> or <http://reg.bom.gov.au/catalogue/adfdUserGuide.pdf>.

### 4.2. Thunderstorm Forecasts

The Bureau routinely provides geospatial thunderstorm forecasts to emergency services as a planning and operational decision support resource. These thunderstorm forecasts provide a graphical depiction of the geospatial areas which may be affected by thunderstorms and severe thunderstorms for the remainder of the current day (Day 1) and the following day (Day 2).

Thunderstorm forecasts are published to various Bureau registered user websites, from where they can be accessed by emergency services and are also provided to specific registered users by email.

Thunderstorm forecasts are published via social media from respective state or territory Bureau accounts, typically when severe thunderstorms are considered possible or likely and/or there is potential for significant community impact.

#### 4.2.1. Issue Criteria, Times, and Validity

Thunderstorm forecasts are issued routinely, once a day, during selected periods of the year, as listed in Table 5. In some jurisdictions, forecasts may be issued outside this period when severe thunderstorms are considered possible and/or likely and/or there is potential for significant community impact.



Separate forecasts are issued for each state and mainland territory (ACT are included in NSW thunderstorm forecasts).

The issue times for thunderstorm forecasts are set to meet the needs of emergency services, and account for Bureau workflow processes and priorities.

State/Territory	Seasonal Coverage	Day 1 Issue Time	Day 2 Issue Time
Queensland	All year round	09:45 am (23:45 UTC)	11:30 am (01:30 UTC)
NSW/ACT	All year round	By 11:00 am (00:00 UTC)	By 11:00 am (00:00 UTC)
Victoria	All year round	By 7:00 am, updated by 11:30 am (00:30 UTC), if required	1:45 pm (02:45 UTC)
Tasmania	Not provided		
South Australia	1/10 to 30/04, ad hoc at other times	12:00 pm (01:30 UTC)	12:00 pm (01:30 UTC)
Western Australia	1/10 to 30/04	10:30 am (02:30 UTC)	10:30 am (02:30 UTC)
Northern Territory	1/10 to 30/04, ad hoc at other times	12:00 pm (02:30 UTC)	2:00 pm (04:30 UTC)

Table 5: The seasonal coverage and local issue times for the thunderstorm forecasts for each state and mainland territory

#### 4.2.2. Content

The thunderstorm forecast comprises of a national map and accompanying text description. The map uses shaded polygons that depicts geospatial areas where thunderstorms are possible as well as areas where severe thunderstorms are considered possible or likely, as defined in Table 6.

Forecast polygon category	Definition
Thunderstorms Possible	10% to 30% probability of lightning within 10 km of a point
Severe Thunderstorms Possible	If a thunderstorm occurs, the probability of it being severe is 10% to 30%
Severe Thunderstorms Likely	If a thunderstorm occurs, the probability of it being severe is $\geq 30\%$

Table 6: Definition and shading of polygon categories on the thunderstorm forecast

### 4.2.3. Amendment Criteria

There is no requirement to update thunderstorm forecasts after issue. However, at times, it may be beneficial to do so, to ensure significant changes to the thunderstorm forecast policy can be effectively communicated to emergency services, and possibly to the community via social media.

## 5. National Thunderstorm and Severe Weather Non-Routine Product Suite

### 5.1. Severe Thunderstorm Warnings

A Severe Thunderstorm Warning is issued whenever there is sufficient meteorological evidence to suggest that severe thunderstorm development is likely, or when a severe thunderstorm has been directly reported or observed, or inferred through various observational datasets, and a Severe Thunderstorm Warning is not already current.

The Bureau issues two types of Severe Thunderstorm Warnings that alert the community, emergency services and other organisations about the threat of severe thunderstorms.

- Regional Severe Thunderstorm Warnings
- Detailed Severe Thunderstorm Warnings

If severe thunderstorms develop within an area that is already described by a Severe Weather Warning (refer Section 5.2), a separate Severe Thunderstorm Warning will only be issued if a hazard (as defined by section 2.2.2) other than those already included in the Severe Weather Warning is occurring or expected to occur. This may include escalations of hazards mentioned in the Severe Weather Warning, e.g., Severe Thunderstorm Warning for intense rainfall associated with thunderstorms within a broader Severe Weather Warning for heavy rainfall.

#### 5.1.1. Warning Content

A Severe Thunderstorm Warning consists of information that highlight threat areas and potential phenomena in a graphical and textual format.

##### **Title**

The title states the warning type and lists potential phenomena and the affected weather forecast districts.

##### **Issuance Time**

The issuance time and date of the severe thunderstorm warning.

##### **Headline Statement**

A succinct one-line statement that describes the '*where, what, and when*' of key severe thunderstorm threats.

### **Graphical Warning Content**

Displays a geospatial map of weather forecast district boundaries overlain with one or more yellow shaded polygons depicting the spatial extent of the warning.

### **Weather Situation**

A brief description on the current and/or developing severe thunderstorm situation. It lists the synoptic drivers producing the severe thunderstorms and may provide an overview on the spatial and temporal extent of the severe thunderstorm activity.

### **Warning Details**

The main body of the warning lists potential phenomena and affected locations.

### **Observations**

Any significant observations recorded relevant to the hazards listed in the warning.

### **Action Statements**

Automatically generated action statements that have been agreed upon by state and territory-based emergency services.

### **Warning Updates**

The update time of the next severe thunderstorm warning.

### **Warning Accessibility**

Automatically generated text that provides a brief statement on the additional channels where the severe thunderstorm warning is broadcast.

## **5.1.2. Regional Severe Thunderstorm Warnings**

The Bureau provides Regional Severe Thunderstorm Warnings for all states and mainland territories. Warning areas are based on one or more weather forecast districts and/or parts of weather forecast districts.

### ***Issue Criteria and Validity***

Regional Severe Thunderstorm Warnings are issued whenever there is sufficient meteorological evidence to suggest that severe thunderstorm development is possible within the next 3 hours. They are also issued when a severe thunderstorm has been observed, or when a severe thunderstorm outside the warning domain is expected to move into the area.

Regional Severe Thunderstorm Warnings are valid for a three-hour period from the issuance time and will be updated routinely every one to two hours but may be updated more frequently during rapidly evolving situations. Depending on forecast confidence and the level of threat, Regional Severe Thunderstorm Warnings may be issued with shorter lead times.

If a current Regional Severe Thunderstorm Warning does not adequately describe the situation, it will be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

Once the threat of severe thunderstorms has passed, the Regional Severe Thunderstorm Warning will be cancelled.

### **5.1.3. Detailed Severe Thunderstorm Warnings**

The Bureau provides Detailed Severe Thunderstorm Warnings for all capital cities and surrounding areas, as shown in Appendix [6.2](#). They provide time and location-specific information about the severe thunderstorm threat.

#### ***Issue Criteria and Validity***

Detailed Severe Thunderstorm Warnings are issued when one or more severe thunderstorms are detected within the warning domain, or an existing thunderstorm is forecast to become severe within the next 60 minutes. They are also issued when a severe thunderstorm outside of the detailed severe thunderstorm warning domain is expected to move into the area.

Detailed Severe Thunderstorm Warnings are valid for 30 or 60 minutes from the issuance time and will be updated routinely every 30 to 60 minutes. If a current Detailed Severe Thunderstorm Warning does not adequately describe the situation, it will be updated immediately. Examples for when this is necessary are an escalation or de-escalation of the hazard threat or a change in the communities expected to be impacted.

When the threat of severe thunderstorms has eased within a metropolitan area but further development is possible within the next 60 minutes, and the Regional Severe Thunderstorm Warning which includes the metropolitan area remains current, the Detailed Severe Thunderstorm Warning will be suspended. The text of the suspended warning will advise that severe thunderstorms have eased but the situation will be closely monitored. Only once no further severe thunderstorms are anticipated, the Detailed Severe Thunderstorm Warning will be cancelled, following an update of the Regional Severe Thunderstorm Warning to remove the metropolitan area.

#### **Additional Graphical Warning Content**

If a Regional Severe Thunderstorm Warning is in effect over parts of the relevant Detailed Severe Thunderstorm Warning domain, the Detailed Severe Thunderstorm Warning graphic will include the area of the Regional Severe Thunderstorm Warning as well as a depiction of the areas under immediate threat from individual severe thunderstorm cells.

The graphic transmitted to the emergency services contains additional information and shows all thunderstorms (severe or otherwise) and automated tracks depicting the past movement of these thunderstorms.

#### **Additional Warning Text Details**

In addition to the information described in Section [5.1.1](#), the warning will also specify current and future impacted suburbs that correspond to an existing severe thunderstorm (red shaded ellipses) and an immediate threat area (orange-hashed shaded polygons).

## 5.2. Severe Weather Warnings

The Bureau issues Severe Weather Warnings that alert the community, emergency services and other organisations about the threat of severe weather. They are issued whenever there is sufficient meteorological evidence to suggest that severe weather, that is not the direct consequence of thunderstorms, is occurring or expected to develop.

Severe Weather Warnings are issued for all states and mainland territories where all warning areas are based on one or more weather forecast districts and/or parts of weather forecast districts.

At times, Severe Weather Warnings may be issued at the discretion of severe weather meteorologists to drive an appropriate response in the community to the weather event.

Severe Weather Warnings for Lord Howe Island and Norfolk Island are issued for the whole island and are text-based warnings.

### 5.2.1. Issue Criteria and Validity

Severe Weather Warnings are issued when severe weather is occurring or is expected to develop. The lead-time provided for a Severe Weather Warning will depend on the nature of the event, the ability to forecast it with reasonable certainty and the time of day. In general, severe weather events will fall into two categories:

- Synoptic-scale phenomena such as east coast lows, recently decayed tropical cyclones, widespread land gales or vigorous cold fronts
- Local-scale phenomena such as localised heavy rain or damaging wind gusts caused by topography

For synoptic-scale phenomena, Severe Weather Warnings will aim to be issued 24 to 36 hours ahead of the expected onset of severe weather conditions. Depending on forecast confidence and the level of threat, Severe Weather Warnings may be issued with shorter lead times.

Local-scale phenomena are more difficult to forecast with significant lead-time and in some instances, Severe Weather Warnings will be issued with shorter lead times.

Severe Weather Warnings do not have a prescribed validity period, this is described in general terms within the warning details section.

Once a Severe Weather Warning is issued, routine updates will be issued at least every six hours until the threat has passed. They are typically updated at the standard times of 4:30 - 5:00 am, 10:30 - 11:00 am, 4:30 - 5:00 pm and 10:30 - 11:00 pm in local time, but may be updated more frequently, during rapidly evolving situations or periods of high-impact severe weather.

Severe Weather Warnings are provided for abnormally high tides and damaging/dangerous surf (for most states and territories - refer to Table ) in a dedicated Severe Weather Warning for coastal hazards. As a result, there may be two Severe Weather Warnings in place for overlapping areas for concurrent severe weather phenomena. In this instance, one warning would be covering land-based

phenomena while the second warning would be covering coastal-based phenomena. When concurrent Severe Weather Warnings for coastal-based phenomena and land-based phenomena occur, the warning products will reference each other.

Once the threat of severe weather has passed the Severe Weather Warning will be cancelled.

### **5.2.2. Warning Content**

A Severe Weather Warning consists of various sections that highlight threat areas and potential phenomena in a graphical and textual format.

#### **Title**

The title states the warning type and lists potential phenomena and the affected weather forecast districts.

#### **Issuance Time**

The issuance time (local time) and date of the severe weather warning.

#### **Headline Statement**

A succinct one-line statement that describes the 'where, what, and when' of key severe weather threats.

#### **Graphical Warning Content**

Displays a geospatial map of weather forecast district boundaries overlain with one or more yellow shaded polygons depicting the spatial extent of the warning.

#### **Weather Situation**

A description of the current and/or developing severe weather situation. It generally covers the current and future synoptic pattern along with the major weather systems that will produce the severe weather.

#### **Warning Details**

The main body of the warning lists potential phenomena and describes their upper limits or ranges, probability, and temporal characteristics. It may describe the current situation and the spatial distribution of the weather indicated by radar and satellite.

#### **Locations**

A summary of locations which may be affected by the severe weather event.

#### **Observations**

Any significant observations recorded relevant to the hazards listed in the warning.

#### **Action Statements**

Automatically generated action statements that have been agreed upon by state and territory-based emergency services.

#### **Warning Updates**

The update time of the next severe weather warning in local time.

### **Warning Accessibility**

Automatically generated text that provides brief statement on the additional channels where the severe weather warning is broadcasted.

## **5.3. Warning Escalations**

### **5.3.1. Very Dangerous Storm (VDS)**

If there is an expectation or a report of one or more high-end severe phenomena listed in the VDS criteria from Section 2.2.2, a label that states **'This thunderstorm is very dangerous'** will be added to the Detailed Severe Thunderstorm Warning graphic. An example has been provided in Section [6.3.3](#).

The warning details will also declare that a very dangerous storm has been detected on the weather radar with an updated list of destructive phenomena.

Once the threat of high-end severe phenomena listed in the VDS criteria from Section 2.2.2 has passed, the label will be excluded from the warning graphic.

### **5.3.2. Standard Emergency Warning Signal**

The Standard Emergency Warning Signal (SEWS) is a siren sound used as an alerting signal in Queensland, Victoria, and Tasmania. The SEWS is designed to alert the community to the broadcast of an urgent safety message relating to a VDS with one or more confirmed high-end severe phenomena from Section 2.2.2 on the Australian Broadcasting Corporation (ABC) radio stations.

The signal is sounded immediately prior to an emergency warning message being played on ABC broadcasts, in the potential or likely impacted areas. As part of a coordinated national emergency plan, the SEWS is used to attract attention to emergency warnings.

The Bureau can request the use of the SEWS by including a standardise SEWS statement in a Severe Thunderstorm Warning. In the event where a request is warranted, SEWS text will be added above the title section on either or both Regional and Detailed Severe Thunderstorm Warnings. It will explicitly state the major towns, suburbs, cities or local government areas where the SEWS should be directed, transmitted, and broadcast on the ABC. An example has been provided in Section [6.3.3](#).

The official activation of the SEWS is at the discretion of the ABC.

Once the threat of high-end severe phenomena listed from Section 2.2.2 has passed, the SEWS request will be cancelled by excluding the associated text from the warning.

The following criteria is to be satisfied before requesting the use of the SEWS:

- A confirmed report of **one or more high-end severe phenomena** listed in the VDS criteria from Section 2.2.2 by a reliable source such as a Bureau observer, automatic weather station, storm spotter and/or trustworthy social media outlet.
- It is of sufficient scale where a significant number of people will be warned. This includes all towns and cities that have a designated Bureau forecast (see Figure 4, 6 and 7 in Appendix 6.1), and all areas within the respective Detailed Severe Thunderstorm Warning domain.
- Is expected to continue for 30 minutes or more.

### 5.3.3. Emergency Weather Alerts

An Emergency Weather Alert (EWA) is a verbal notification provided to Queensland Fire and Emergency Services (QFES) and Queensland Police Service (QPS). It is done at the meteorologist's discretion when they believe there are special circumstances requiring notification but there is insufficient evidence such as a confirmed high-end severe report to trigger a request of the SEWS, as described in Section [5.3.2](#).

An EWA can be invoked for any area across Queensland, irrespective of known population.

Once the threat of high-end severe phenomena listed from Section 2.2.2 has passed, the meteorologist will provide a verbal notification of cancellation to QFES and the QPS.

RELEASED UNDER FREEDOM OF INFORMATION



## 6. Appendices

### 6.1. Weather Forecast District Maps



Figure 3: Weather Forecast Districts for Queensland

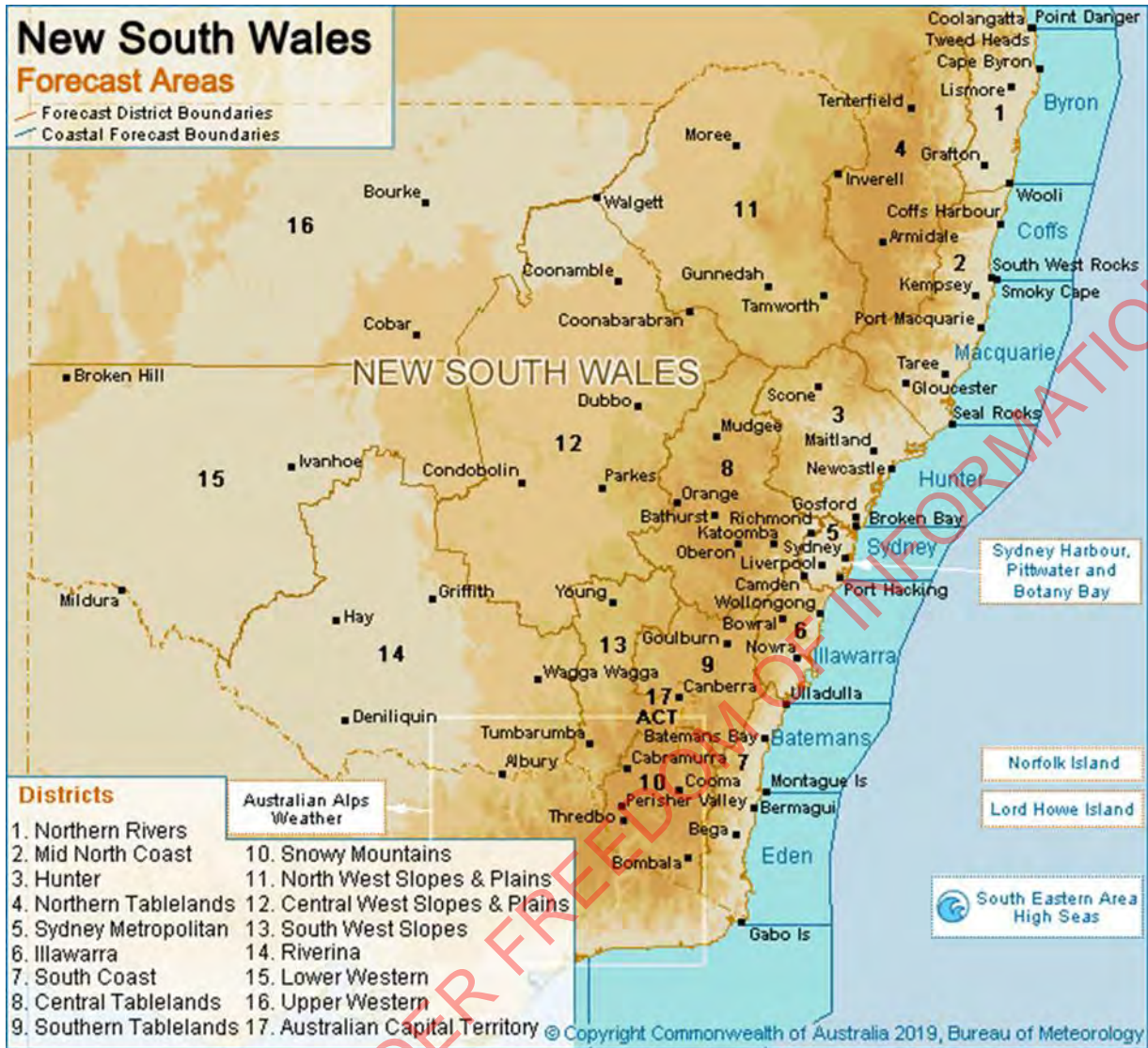


Figure 4: Weather Forecast Districts for New South Wales



Figure 5: Weather Forecast Districts for Victoria

RELEASED UNDER FREEDOM OF INFORMATION

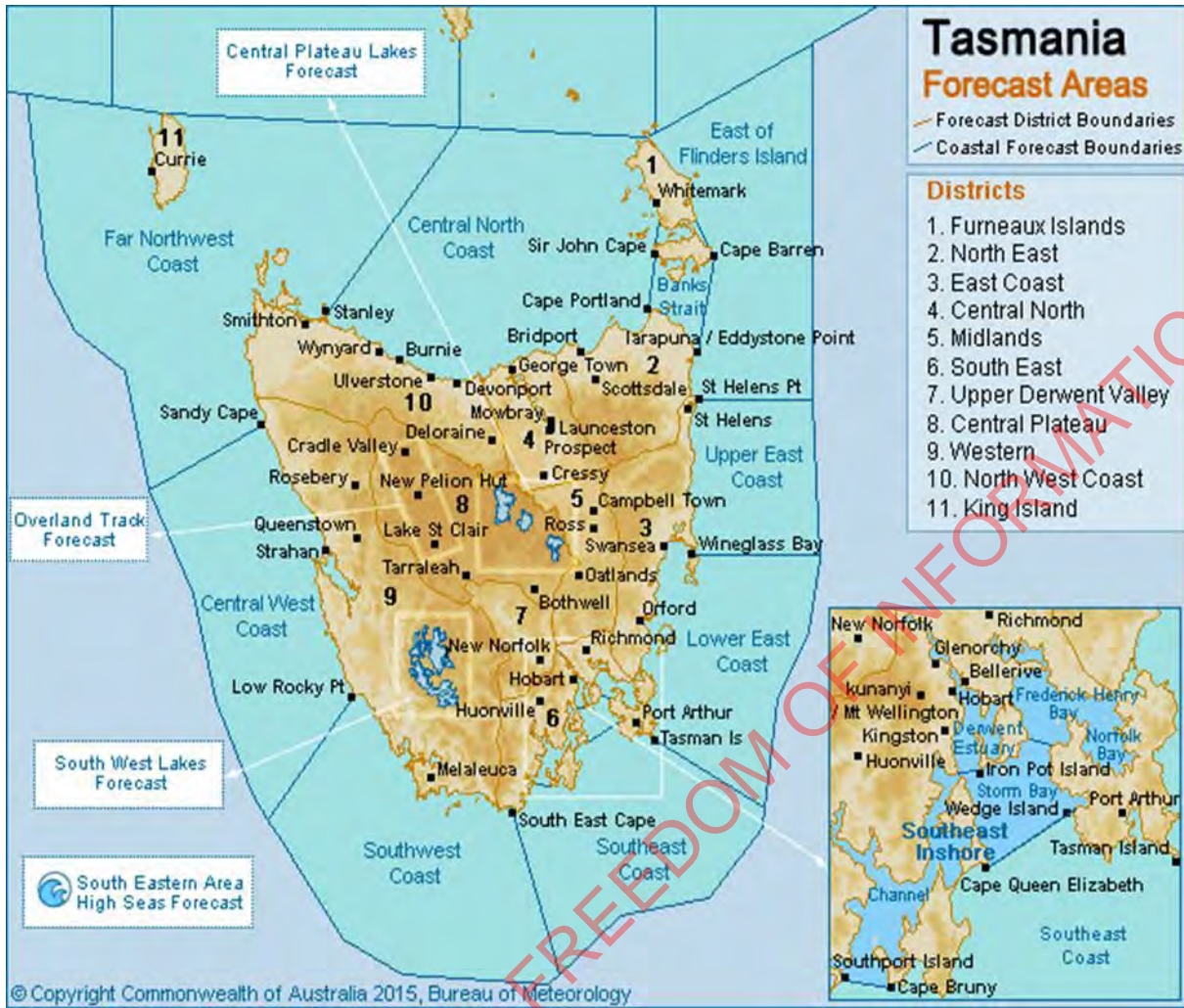


Figure 6: Weather Forecast Districts for Tasmania

RELEASED UNDER FREEDOM OF INFORMATION



Figure 7: Weather Forecast Districts for South Australia



Figure 8: Weather Forecast Districts for Western Australia



Figure 9: Weather Forecast Districts for Northern Territory

## 6.2. Detailed Severe Thunderstorm Warning Domains

Detailed Severe Thunderstorm Warnings are provided for all Australian capital cities and surrounding areas. The domains covered by this service are shown here.



Figure 10: Detailed Severe Thunderstorm Warning domain – Brisbane and Southeast Queensland





Figure 11: Detailed Severe Thunderstorm Warning domain – Sydney, Newcastle, Wollongong

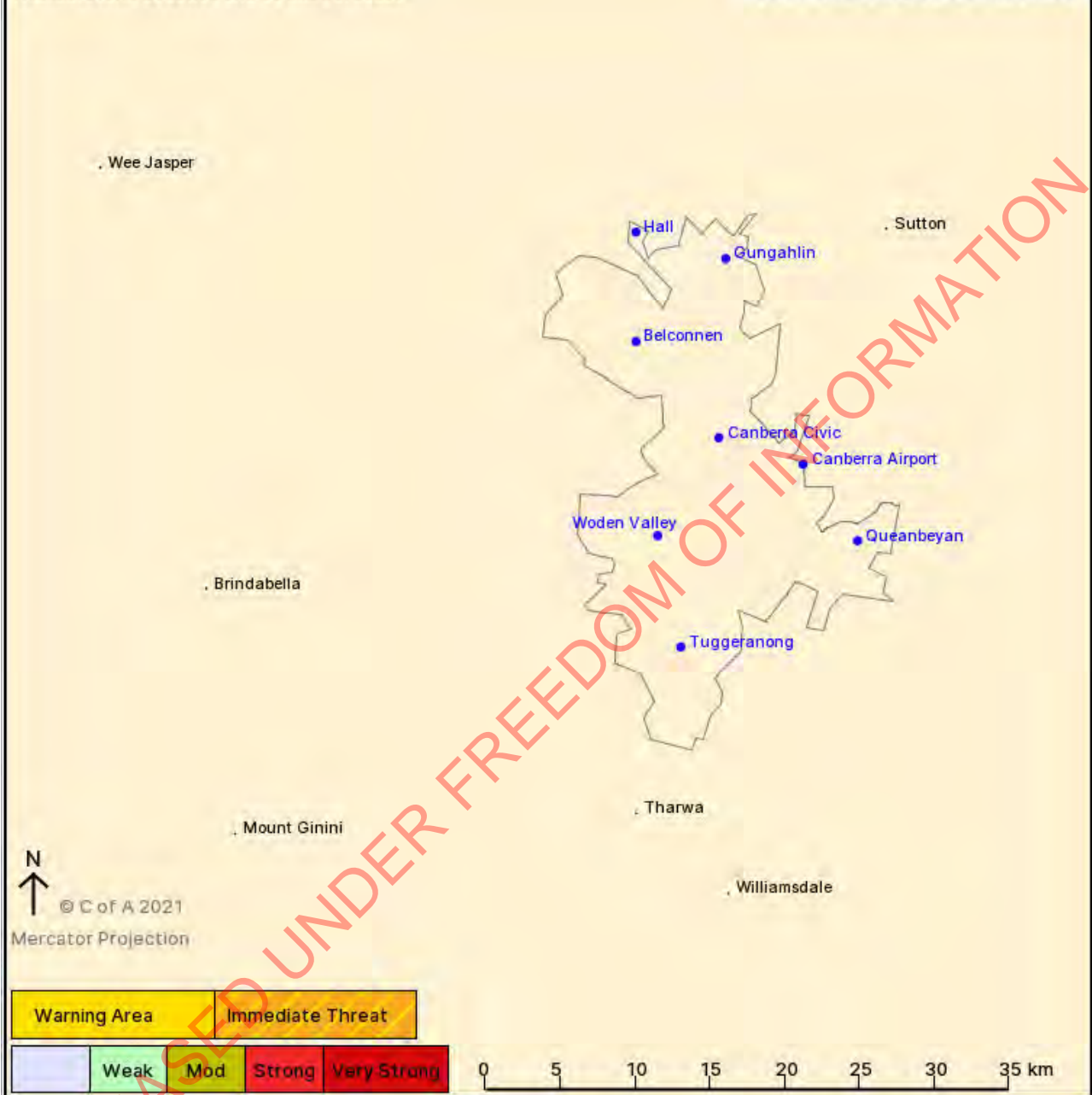


Figure 12: Detailed Severe Thunderstorm Warning domain – Canberra

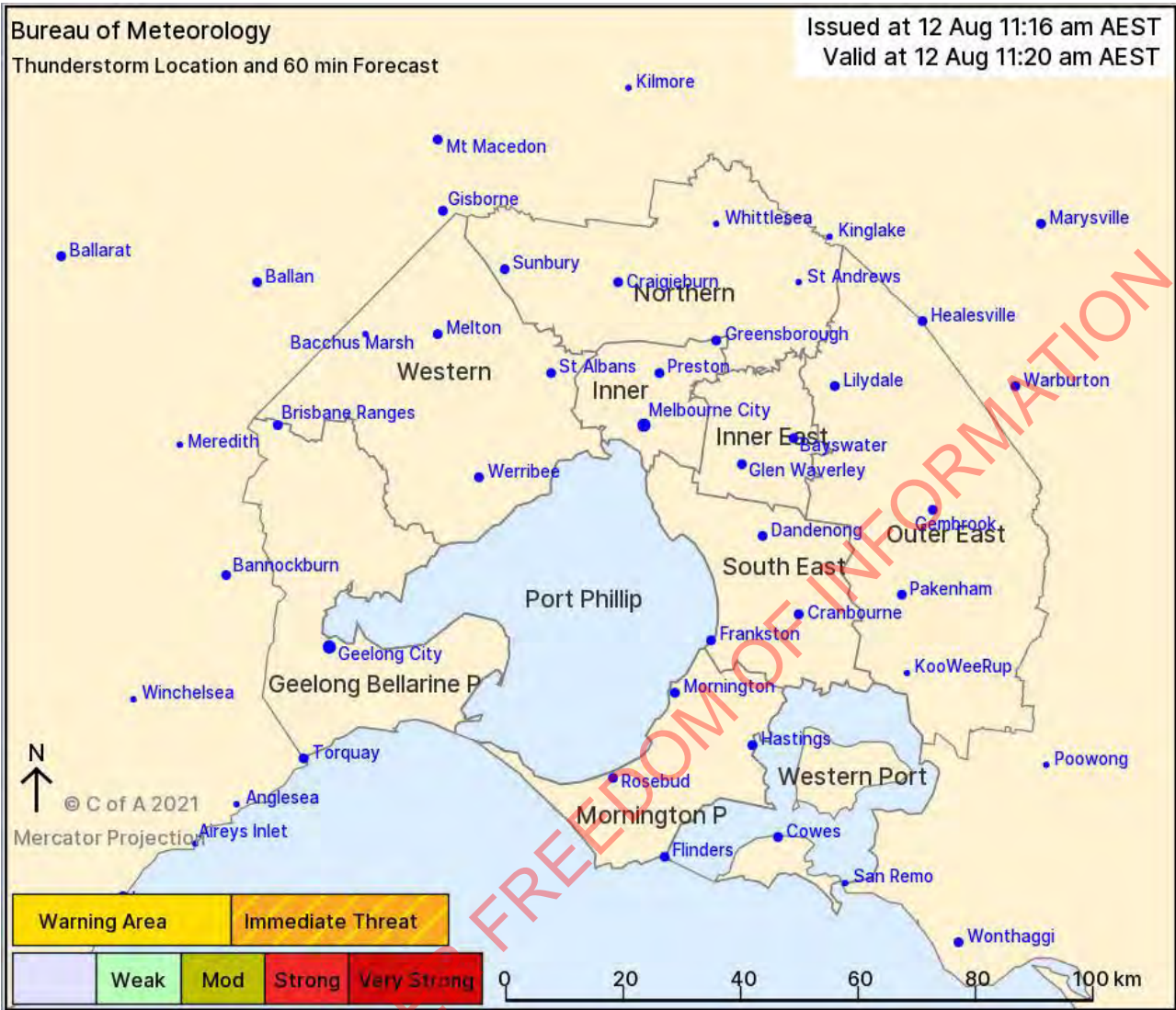


Figure 13: Detailed Severe Thunderstorm Warning domain – Melbourne

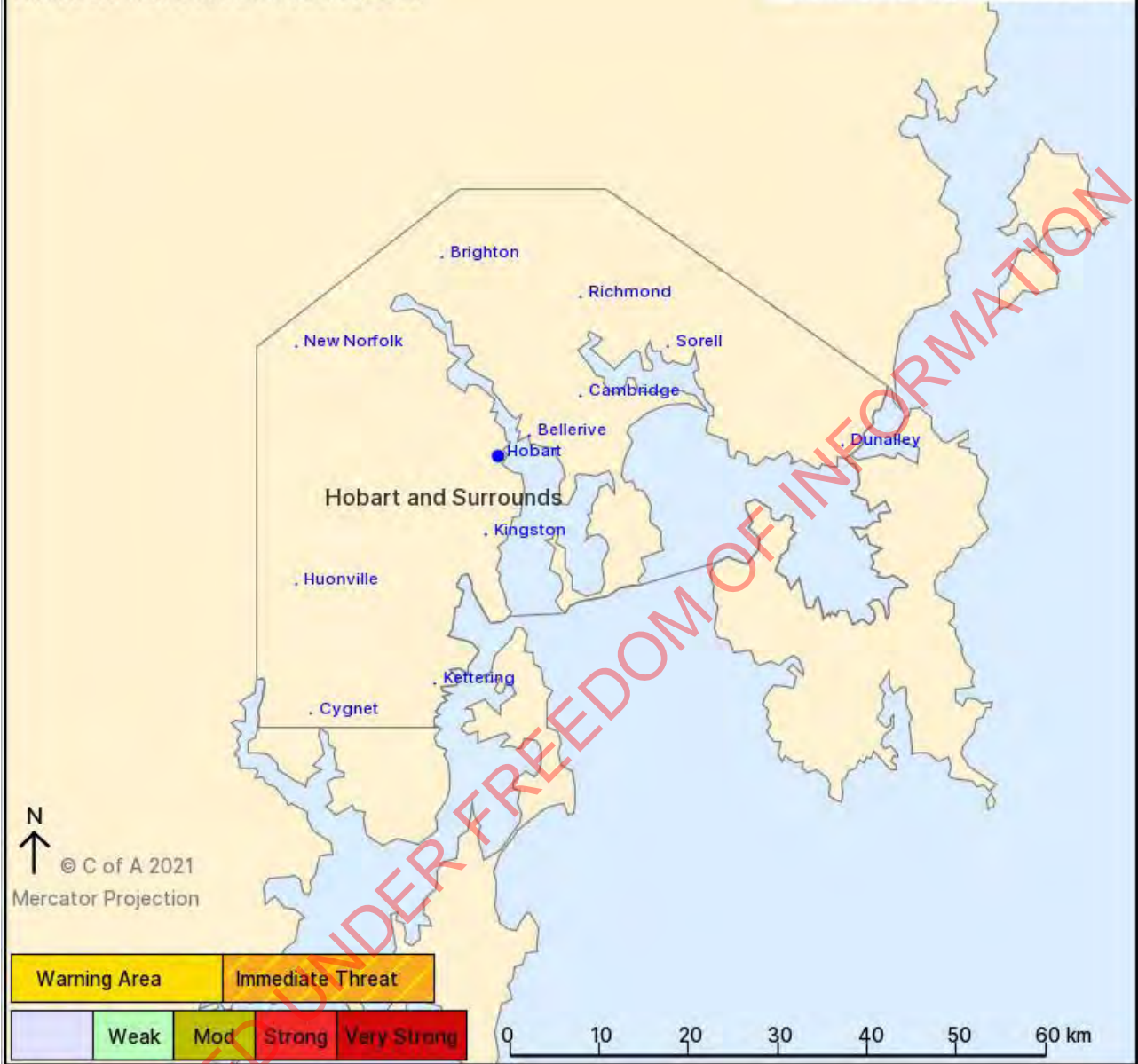


Figure 14: Detailed Severe Thunderstorm Warning domain – Hobart

RELEASE UNDER FREEDOM OF INFORMATION



Figure 15: Detailed Severe Thunderstorm Warning domain – Adelaide

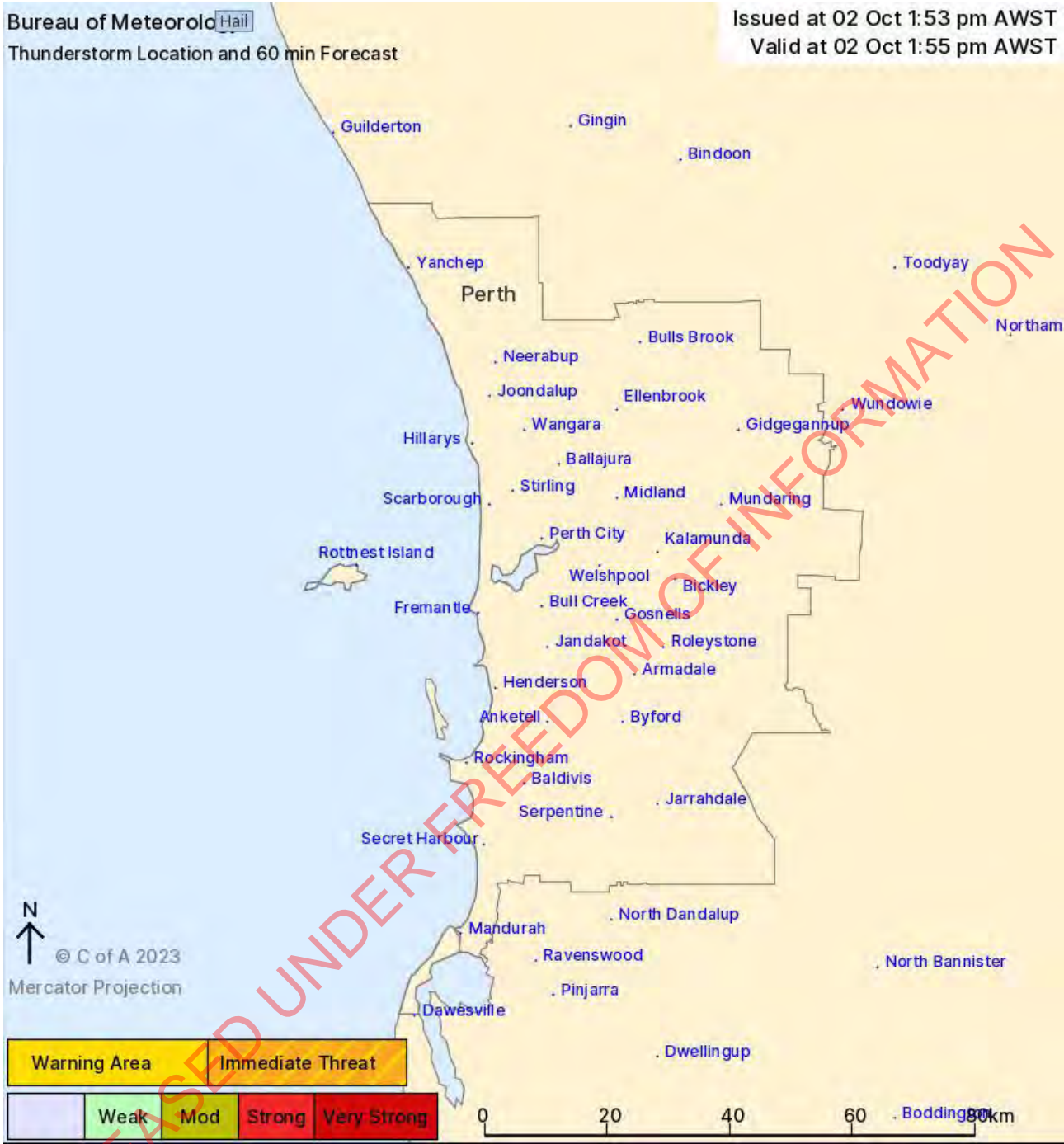


Figure 16: Detailed Severe Thunderstorm Warning domain – Perth

**OFFICIAL**

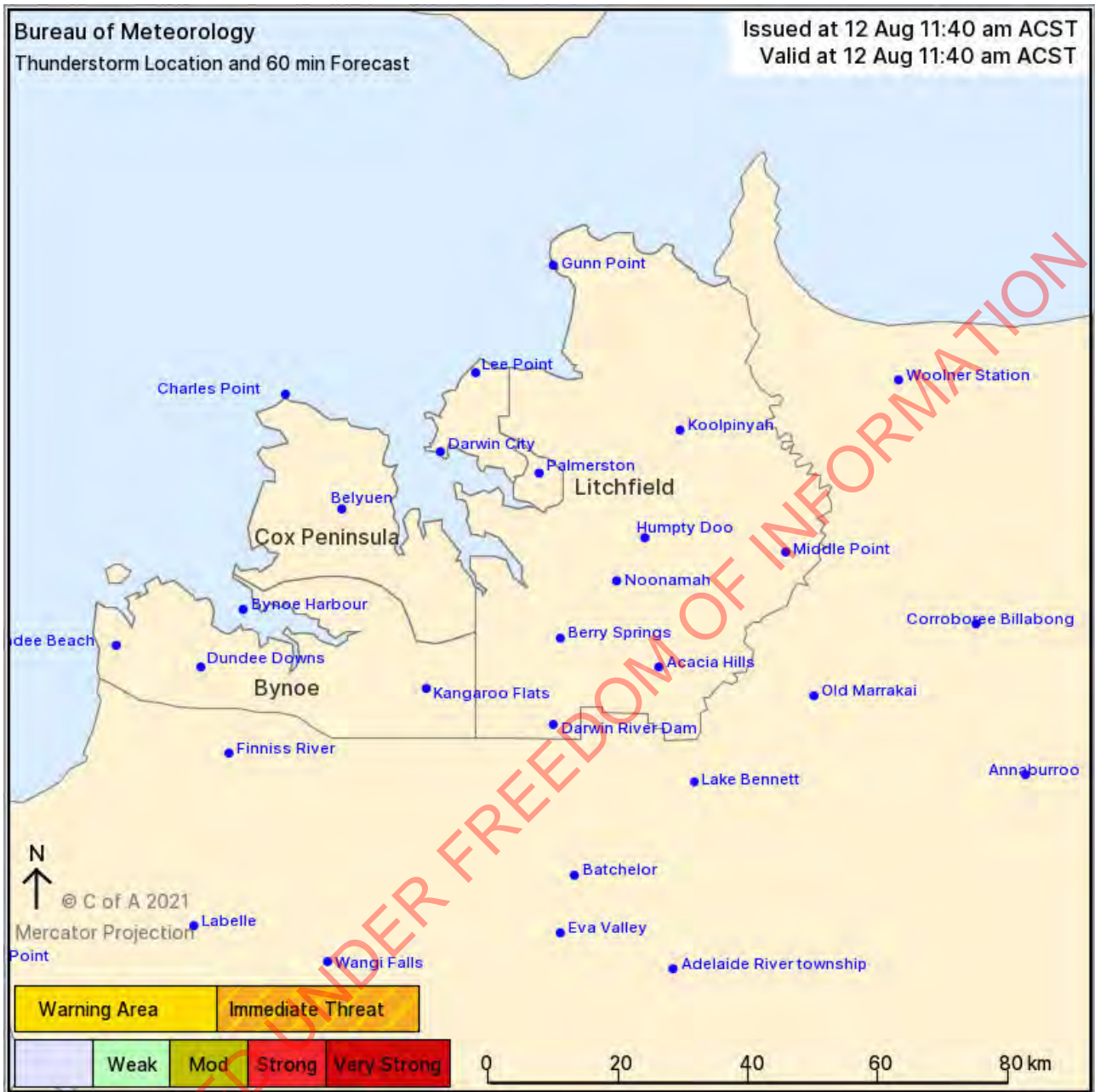


Figure 17: Detailed Severe Thunderstorm Warning domain – Darwin

## 6.3. Product Samples

### 6.3.1. Thunderstorm Forecast Map

IDS21032

Australian Government Bureau of Meteorology  
South Australia

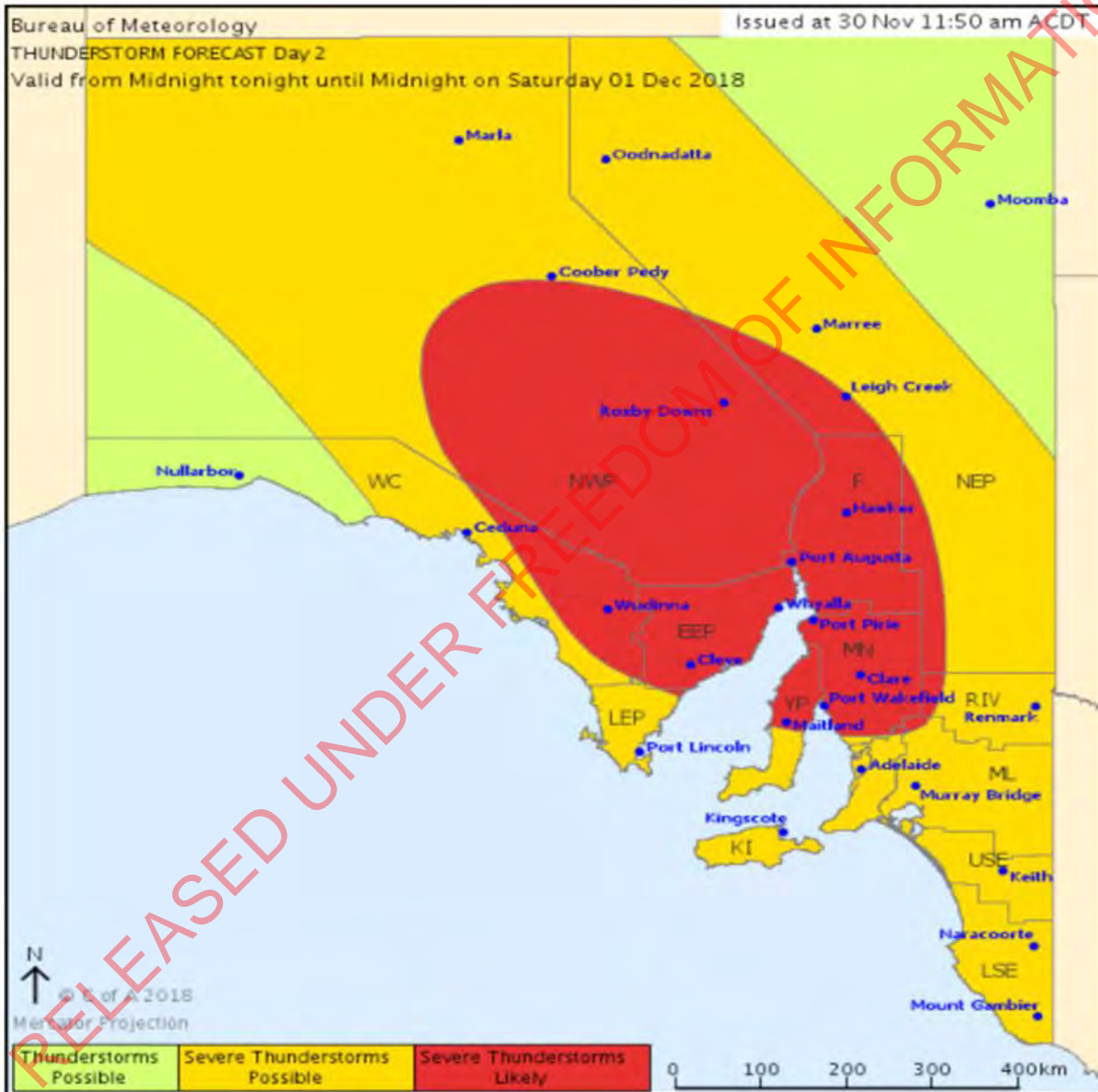
OFFICIAL

### Day 2 Thunderstorm Forecast

Issued at 11:00am Friday, 30 November 2018,

Valid from midnight tonight until midnight on Saturday, 1 December 2018.

Thunderstorms are possible across SA on Saturday with severe thunderstorms possible across a broad swathe. There is a slight risk of damaging winds from the morning in the west and south. In the afternoon, severe thunderstorms are forecast to develop near the front over the Eyre Peninsula and the North West Peninsula district, moving eastward across central parts late afternoon and evening. Damaging to destructive wind gusts are possible. Large hailstones are also possible, particularly in the severe likely area.



OFFICIAL



### 6.3.2. Regional Severe Thunderstorm Warning

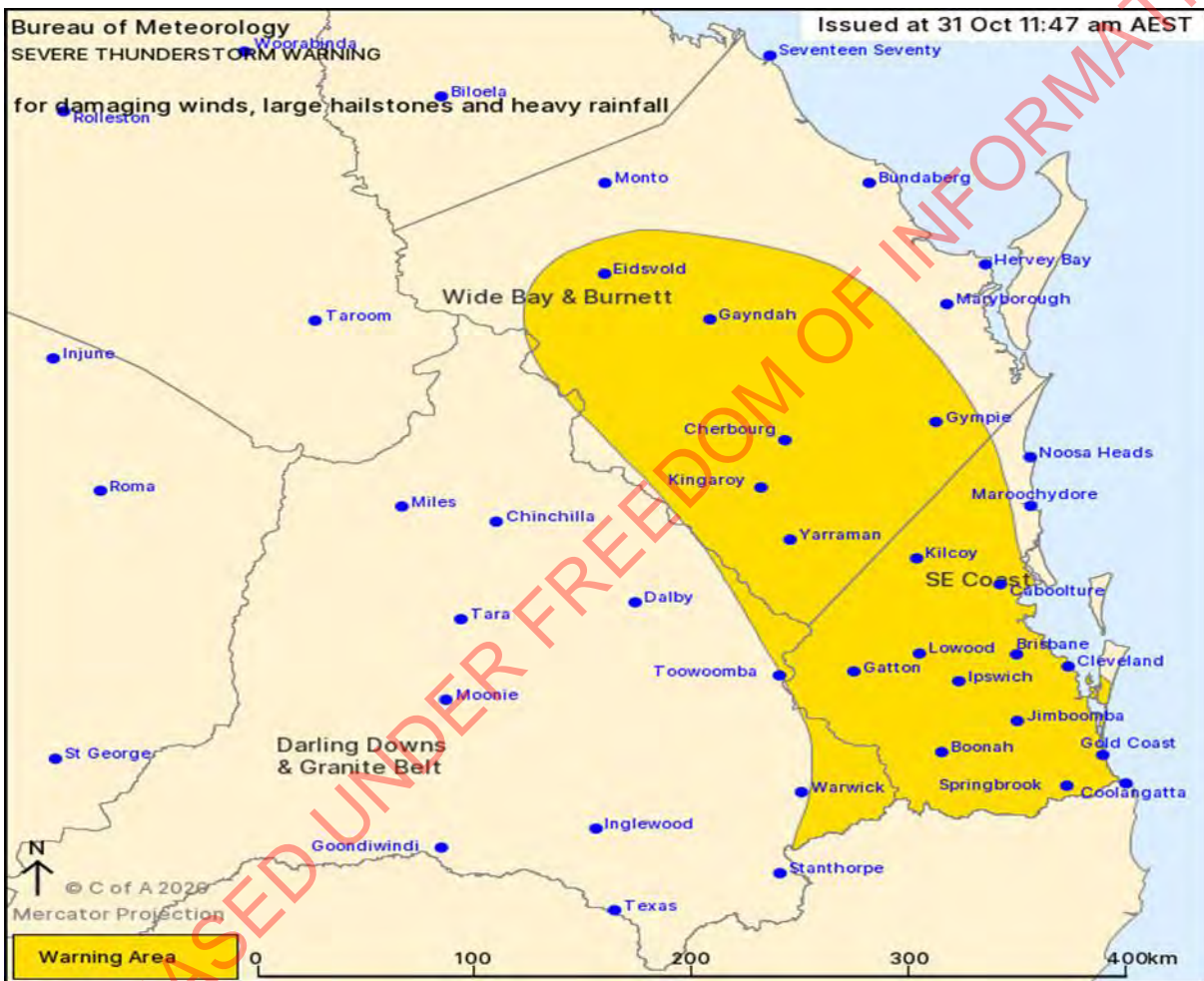
IDQ21033

Australian Government Bureau of Meteorology  
**TOP PRIORITY FOR IMMEDIATE BROADCAST**

**Severe Thunderstorm Warning  
for DAMAGING WINDS, LARGE HAILSTONES and HEAVY RAINFALL  
For people in Southeast Coast and parts of Wide Bay and Burnett and Darling Downs and Granite Belt  
Forecast Districts.**

Issued at 11:47 am Saturday, 31 October 2020.

**Severe thunderstorms forecast to rapidly develop across Southeast Queensland.**



Weather Situation: Severe thunderstorms will rapidly develop over the coming hours with very dangerous thunderstorms with giant hail and destructive winds likely to initiate along the dryline and extend eastward during the afternoon period.

Severe thunderstorms are likely to produce damaging winds, large hailstones and heavy rainfall that may lead to flash flooding in the warning area over the next several hours. Locations which may be affected include Gold Coast, Brisbane, Gympie, Kingaroy, Caboolture, Coolangatta and Ipswich.

**OFFICIAL**

Queensland Fire and Emergency Services advises that people should:

- \* Move your car under cover or away from trees.
- \* Secure loose outdoor items.
- \* Never drive, walk or ride through flood waters. If it's flooded, forget it.
- \* Seek shelter, preferably indoors and never under trees.
- \* Avoid using the telephone during a thunderstorm.
- \* Beware of fallen trees and powerlines.
- \* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 2:50 pm.

If severe thunderstorms develop in the Southeast Queensland area (east of Dalby from Rainbow Beach to Stanthorpe), a more detailed Severe Thunderstorm Warning will be issued to people in this area. Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

### **6.3.3. Detailed Severe Thunderstorm Warning**

DQ21035

Australian Government Bureau of Meteorology

**Transmitters serving the area Ipswich, Greenbank, Logan area are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.**

#### **TOP PRIORITY FOR IMMEDIATE BROADCAST**

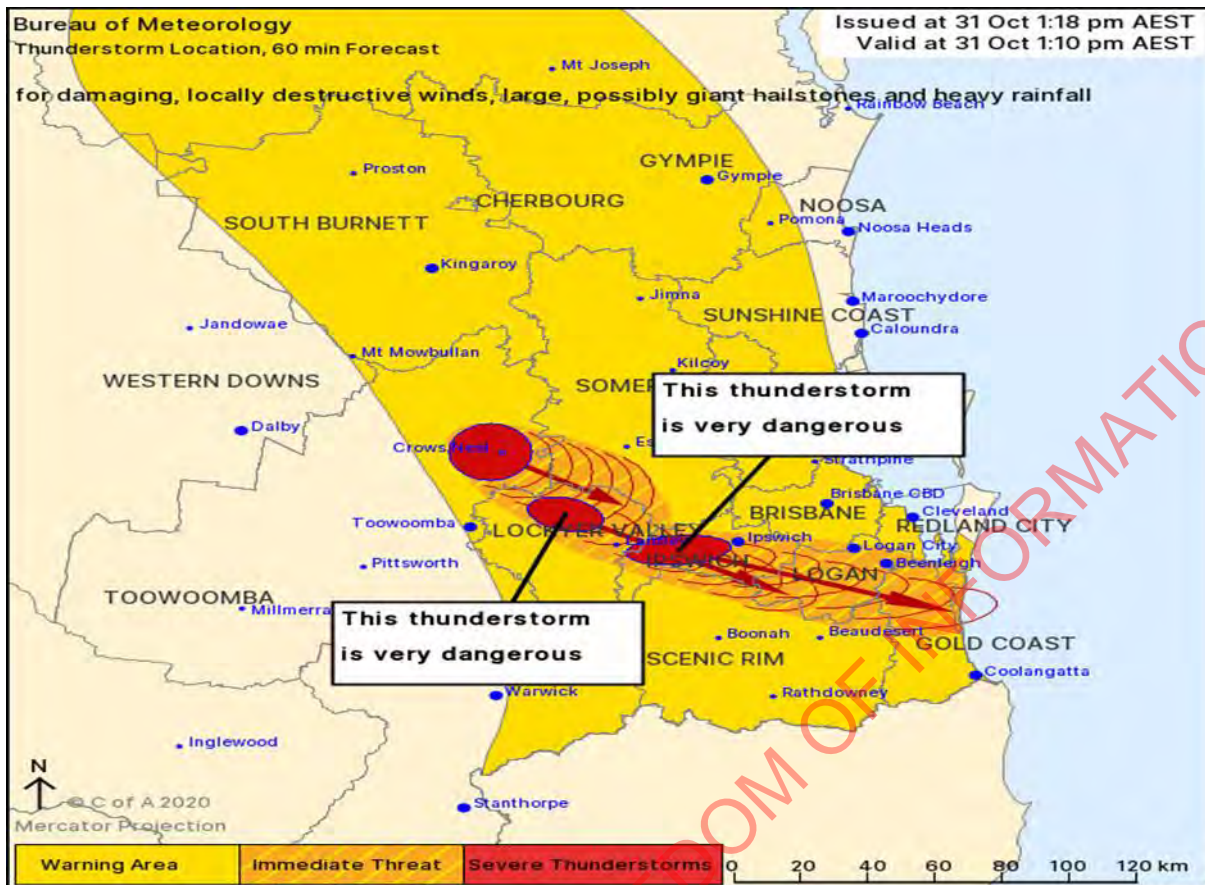
#### **Severe Thunderstorm Warning - Southeast Queensland for DESTRUCTIVE WINDS, GIANT HAILSTONES and HEAVY RAINFALL**

For people in Ipswich, Logan and parts of Scenic Rim, Lockyer Valley, Gold Coast, Redland City and Brisbane City Council Areas.

Issued at 1:18 pm Saturday, 31 October 2020.

**VERY DANGEROUS STORMS WITH GIANT HAIL LOCATED OVER AND NEAR GATTON AND IPSWICH.**

RELEASED UNDER FREEDOM OF INFORMATION



The Bureau of Meteorology warns that, at 1:10 pm, very dangerous thunderstorms were detected on the weather radar near Gatton, Rosewood and Grandchester. These thunderstorms are moving towards the east to southeast. Very dangerous thunderstorms are forecast to affect Laidley, Redbank Plains and Hatton Vale by 1:40 pm and Hope Island, Jimboomba and South Stradbroke Island by 2:10 pm.

Other severe thunderstorms were detected on the weather radar near Crows Nest and Hampton. They are forecast to affect the area southwest of Esk by 1:40 pm and the area south of Esk and the area west of Esk by 2:10 pm.

Damaging, locally destructive winds, large, possibly giant hailstones, and heavy rainfall that may lead to flash flooding are likely.

4-7cm has been observed around Gatton and Adare around 12:30pm

Queensland Fire and Emergency Services advises that people should:

- \* Move your car under cover or away from trees.
- \* Secure loose outdoor items.
- \* Never drive, walk or ride through flood waters. If it's flooded, forget it.
- \* Seek shelter, preferably indoors and never under trees.
- \* Beware of fallen trees and powerlines.
- \* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 2:20 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

#### **6.3.4. Severe Weather Warning**

IDQ21037

**Australian Government Bureau of Meteorology**

**Queensland**

**TOP PRIORITY FOR IMMEDIATE BROADCAST**

**Severe Weather Warning**

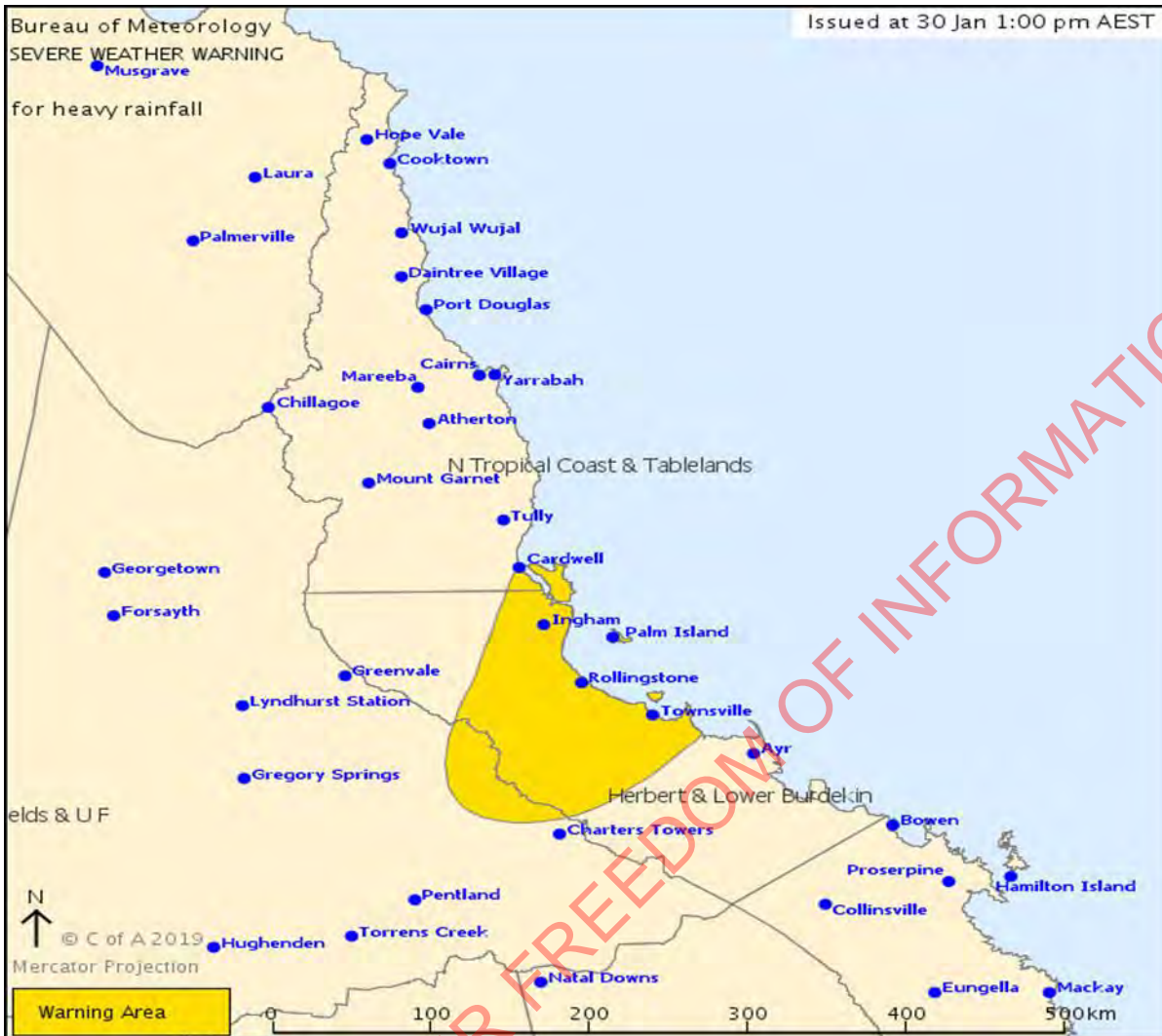
**for HEAVY RAINFALL**

**For people in parts of North Tropical Coast and Tablelands, and Herbert and Lower Burdekin Forecast Districts.**

Issued at 1:00 pm Wednesday, 30 January 2019.

**HEAVY, LOCALLY INTENSE, RAINFALL CONTINUING ACROSS THE HERBET AND LOWER BURDEKIN.**

RELEASED UNDER FREEDOM OF INFORMATION



Weather Situation: A convergent zone embedded along the monsoon trough has developed to the west of Townsville, producing a swath of very heavy, locally intense, rainfall across the Herbert and Lower Burdekin district. The convergence zone is expected to remain near-stationary for the remainder of the day.

Heavy rainfall, which is likely to lead to flash flooding, will continue for the remainder of today and into Friday across the warning area. Six-hourly rainfall totals between 150mm to 200mm are likely, with locally intense rainfall totals up to 300mm possible.

Locations which may be affected include Townsville, Palm Island, Ingham, Cardwell, Woodstock and Lucinda.

Rainfall totals between 9am to 1pm on Wednesday:

274mm at Upper Black River

202mm at Blue Water

Queensland Fire and Emergency Services advises that people should:

\* Never drive, walk or ride through flood waters. If it's flooded, forget it.

- \* Keep clear of creeks and storm drains.
- \* For emergency assistance contact the SES on 132 500.

The next Severe Weather Warning will be issued by 5:00 pm AEST Wednesday.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 219. The Bureau and Queensland Fire and Emergency Services would appreciate warnings being broadcast regularly.

### 6.3.5. Severe Weather Warning

IDT21137  
 Australian Government Bureau of Meteorology  
 TOP PRIORITY FOR IMMEDIATE BROADCAST

**Severe Weather Warning  
 for ABNOMRALLY HIGH TIDES  
 For people in parts of Western, South East and East Coast Forecast Districts.**

Issued at 1:00 pm Wednesday, 30 January 2019.



**Abnormally high tides are expected along western, southern, and lower eastern Tasmania coasts**  
 Weather Situation: High astronomical tides over the coming days are expected to coincide with a low pressure system, resulting in abnormally high tides that may lead to localised inundation.

ABNOMALLY HIGH TIDES, which may cause sea water flooding of low-lying areas, are expected along western, southern and lower eastern Tasmania coasts and tidal rivers during Friday, Saturday and Sunday. The high tides along the southeast and lower east coasts are expected during the evening on all three days. The high tides along the west coast are expected during the afternoon on all three days.

The highest tides will occur during Saturday and will bring the highest risk of inundation. Tides are expected to be about 40 to 50 cm higher than the standard astronomical tides during this time and may be the highest experienced across southeastern Tasmania since 1994.

Locations which may be affected include Orford, Strahan, Hobart, and Dover.

The State Emergency Service advises that people should:

- \* Supervise children closely.
- \* Manage pets and livestock.
- \* Be prepared in case of power outages and report any outages to TasNetworks on 132 004.
- \* Do not walk, ride, or drive through flooded waters.
- \* For emergency assistance contact the SES on 132 500.

The next Severe Weather Warning will be issued by 11:00 pm AESR Friday.

Warnings are also available through TC and Radio broadcasts, and Bureau's website at [www.bom.gov.au](http://www.bom.gov.au) or call 1300 659 210. The Bureau and State Emergency would appreciate warnings being broadcast regularly.

### **6.3.6. Severe Weather Warning for offshore Islands**

IDN28504

**Australian Government Bureau of Meteorology  
New South Wales**

**Severe Weather Warning  
for DAMAGING SURF  
for Lord Howe Island**

Issued at 10:54 pm LHST on Thursday 5 August 2021

#### **LARGE AND POWERFUL SURF ON THURSDAY**

##### **Weather Situation**

Large and powerful southwesterly swell has been generated by a deep complex low pressure system over the southern Tasman Sea and will slowly decrease as the low moves further east.

Damaging surf conditions, with waves exceeding 5 metres in the surf zone, may produce significant beach erosion for southwest facing beaches during Thursday evening and early Friday morning. Surf conditions are expected to ease during Friday morning.

The State Emergency Services advises that people should:

- \* Check your property regularly for erosion or inundation by sea water, and if necessary, raise goods and electrical items.
- \* Stay out of the water and stay well away from surf-exposed areas.

For emergency help in floods and storms, ring the Lord Howe Island Police on [02] 6563 2199

The next warning will be issued by 5:00am LHST on Friday 6<sup>th</sup> August 2021.

## 6.4. Product Identifiers

Product ID	Description
<b>New South Wales</b>	
IDN21031	Thunderstorm Forecast Day 1
IDN21032	Thunderstorm Forecast Day 2
IDN21033	Regional Severe Thunderstorm Warning
IDN21035	Detailed Severe Thunderstorm Warning - Sydney, Wollongong, Newcastle
IDN21036	Detailed Severe Thunderstorm Warning - Canberra
IDN21037	Severe Weather Warning - 1
IDN21038	Severe Weather Warning - 2
IDN21137	Severe Weather Warning - 3
IDN28503	Severe Weather Warning – Norfolk Island
IDN28504	Severe Weather Warning – Lord Howe Island
<b>Northern Territory</b>	
IDD21031	Thunderstorm Forecast Day 1
IDD21032	Thunderstorm Forecast Day 2
IDD21033	Regional Severe Thunderstorm Warning - 1
IDD21034	Regional Severe Thunderstorm Warning - 2
IDD21035	Detailed Severe Thunderstorm Warning – Darwin City and Outer Darwin
IDD21037	Severe Weather Warning - 1
IDD21038	Severe Weather Warning - 2
IDD21137	Severe Weather Warning - 3
<b>Queensland</b>	
IDQ21031	Thunderstorm Forecast Day 1
IDQ21032	Thunderstorm Forecast Day 2
IDQ21033	Regional Severe Thunderstorm Warning -1
IDQ21035	Detailed Severe Thunderstorm Warning – Southeast Queensland
IDQ21037	Severe Weather Warning - 1
IDQ21038	Severe Weather Warning - 2
IDQ21137	Severe Weather Warning - 3
	Thunderstorm Tracker – Southeast Queensland
<b>South Australia</b>	
IDS21031	Thunderstorm Forecast Day 1
IDS21032	Thunderstorm Forecast Day 2
IDS21033	Regional Severe Thunderstorm Warning -1



IDS21035	Detailed Severe Thunderstorm Warning – Adelaide Region
IDS21037	Severe Weather Warning - 1
IDS21038	Severe Weather Warning - 2
IDS21137	Severe Weather Warning - 3
<b>Tasmania</b>	
IDV21031	Thunderstorm Forecast Day 1
IDV21032	Thunderstorm Forecast Day 2
IDV21033	Regional Severe Thunderstorm Warning -1
IDV21035	Detailed Severe Thunderstorm Warning – Melbourne Area
IDV21037	Severe Weather Warning - 1
IDV21038	Severe Weather Warning - 2
IDV21137	Severe Weather Warning - 3
<b>Victoria</b>	
IDV21031	Thunderstorm Forecast Day 1
IDV21032	Thunderstorm Forecast Day 2
IDV21033	Regional Severe Thunderstorm Warning -1
IDV21035	Detailed Severe Thunderstorm Warning – Melbourne Area
IDV21037	Severe Weather Warning - 1
IDV21038	Severe Weather Warning - 2
IDV21137	Severe Weather Warning - 3
<b>Western Australia</b>	
IDW21031	Thunderstorm Forecast Day 1
IDW21032	Thunderstorm Forecast Day 2
IDW21033	Regional Severe Thunderstorm Warning - 1
IDW21034	Regional Severe Thunderstorm Warning - 2
IDW21035	Detailed Severe Thunderstorm Warning – Greater Perth
IDW21037	Severe Weather Warning - 1
IDW21038	Severe Weather Warning - 2
IDW21137	Severe Weather Warning - 3

Table 7: Product Identifiers

## 7. Navigation aids

### 7.1. List of figures

Figure 1: Total Warning System.....	8
Figure 2: Average number of warnings per month across all mainland states and territories of Australia for the 2017-2023 reference period .....	15
Figure 3: Weather Forecast Districts for Queensland.....	28
Figure 4: Weather Forecast Districts for New South Wales.....	29
Figure 5: Weather Forecast Districts for Victoria .....	30
Figure 6: Weather Forecast Districts for Tasmania .....	31
Figure 7: Weather Forecast Districts for South Australia .....	32
Figure 8: Weather Forecast Districts for Western Australia .....	33
Figure 9: Weather Forecast Districts for Northern Territory .....	34
Figure 10: Detailed Severe Thunderstorm Warning domain – Brisbane and Southeast Queensland .....	35
Figure 11: Detailed Severe Thunderstorm Warning domain – Sydney, Newcastle, Wollongong ...	36
Figure 12: Detailed Severe Thunderstorm Warning domain – Canberra .....	37
Figure 13: Detailed Severe Thunderstorm Warning domain – Melbourne .....	38
Figure 14: Detailed Severe Thunderstorm Warning domain – Hobart .....	39
Figure 15: Detailed Severe Thunderstorm Warning domain – Adelaide .....	40
Figure 16: Detailed Severe Thunderstorm Warning domain – Perth.....	41
Figure 17: Detailed Severe Thunderstorm Warning domain – Darwin .....	42

### 7.2. List of tables


Table 1: Bureau of Meteorology Thunderstorm and Severe Weather SLS distribution list by jurisdiction.....	10
Table 2: Phenomena definitions associated with severe thunderstorms.....	12
Table 3: Land phenomena definitions associated with severe weather. ....	14
Table 4: Coastal severe weather phenomena definitions .....	14
Table 5: The seasonal coverage and local issue times for the thunderstorm forecasts for each state and mainland territory ..	20
Table 6: Definition and shading of polygon categories on the thunderstorm forecast .....	20
Table 7: Product Identifiers .....	52

## Comments recorded in Document 9A:


10 comments

Add a comment...


PAGE 1 1

 confirming this is an SLS and not an SLA which we would get agreed to by our customers (the EM organisations listed?)

PAGE 9 1

 we need to be cognisant that the impact part is not directly our accountability, we may add impact statements to hazard warnings, but these come from EM

PAGE 13 1

 should this be "sea level" rather than tide?

RELEASED UNDER FREEDOM OF INFORMATION

PAGE 16

1 ▾



do we need to consider a reduced service level for unavailability of data, e.g. lack of radar would negate cell-based STS warnings, there is precedent for flood SLA

PAGE 19

1 ▾



may need review with FIDS

PAGE 23

1 ▾



is this the right term, do we want to tie ourselves to this detail...a suburb can be a very small area

RELEASED UNDER FREEDOM OF INFORMATION

PAGE 24

2 ▾



I'm not sure this belongs here, is this not the role of EM...perhaps we have role in liaising and then issuing in accordance with their response?



▶ does anyone...outside teh Bureau understand what synoptic-sclae means...should we say large-scale or continent-scale or maybe broad-scale??

PAGE 26

1 ▾



standardised?

PAGE 27

1 ▾



have we considered whether we can "sdjust" this very Qld centric service...is it effectively the remit of Embedded met...but clearer not when not on duty...we should be aiming this minimise this type of bespoke service with what seem to be less than 100% clarity on application i.e. it's an "almost SEWS"?

RELEASED UNDER FREEDOM OF INFORMATION