How does the Australian Bureau of Meteorology assess and forecast hazard impact?

James Taylor
Manager Extreme Weather Desk
Australian Bureau of Meteorology (BoM)

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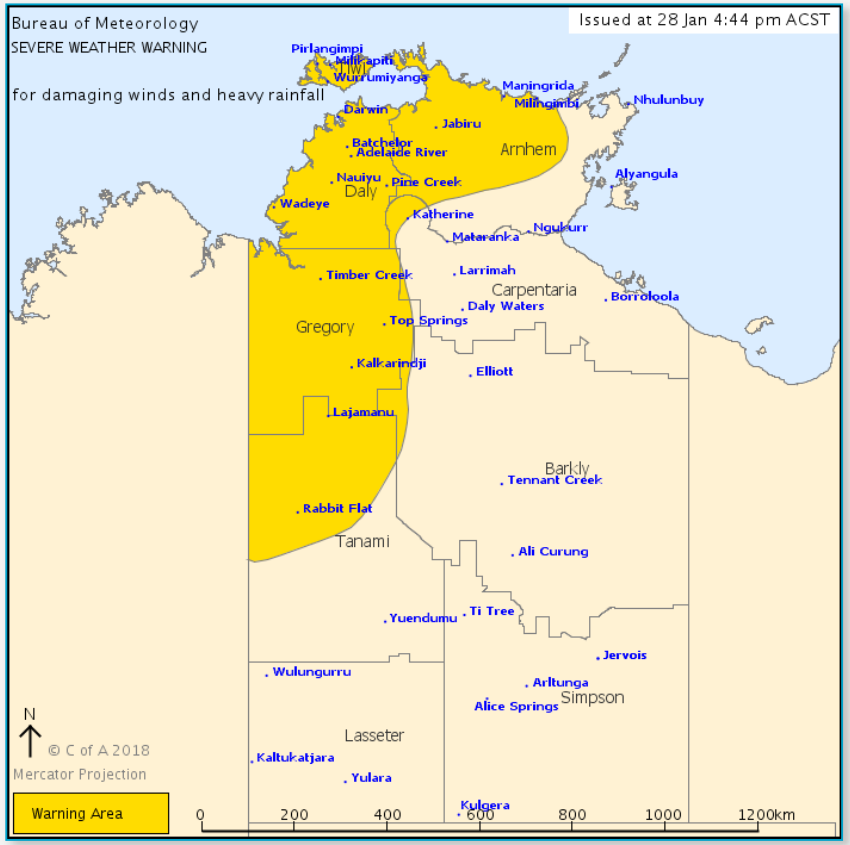
Motivation

BOM Warning Service

Meteorological and phenomena based thresholds

- Current warning service is based on meteorological thresholds, defined for each phenomena.
- **Example:** *Severe Weather Warning for Damaging Winds* - sustained winds of Gale Force (63 km/h) or more with wind gusts of 90 km/h or more.
  - Lacks impact: what does it mean for me?
- Meteorologist often talks about impacts and probabilities.
  - Based on experience only.
- Need a more structured and a considered way of assessing hazard impact and risk.



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Quick refresh on Risk of Impact

HAZARD

EXPOSURE

VULNERABILITY

RISK

- **Hazard:** Hydrometeorological-based threat that poses a level of threat to life, property or the environment.
- **Exposure:** Who and what may be affected (time and space dependent).
- **Vulnerability:** Susceptibility of human beings and their livelihoods and property.
- **Risk:** The probability and magnitude of harm attendant on human beings, their livelihoods and assets due to exposure and vulnerability to a hazard.

$$|\,Risk\ of\ impact\ (x,\ t)\,| \equiv |\,hazard\ (x,\ t)\,| \cup |\,vulnerability\ (x,\ t)\,| \cup |\,exposure\ (x,\ t)\,|$$

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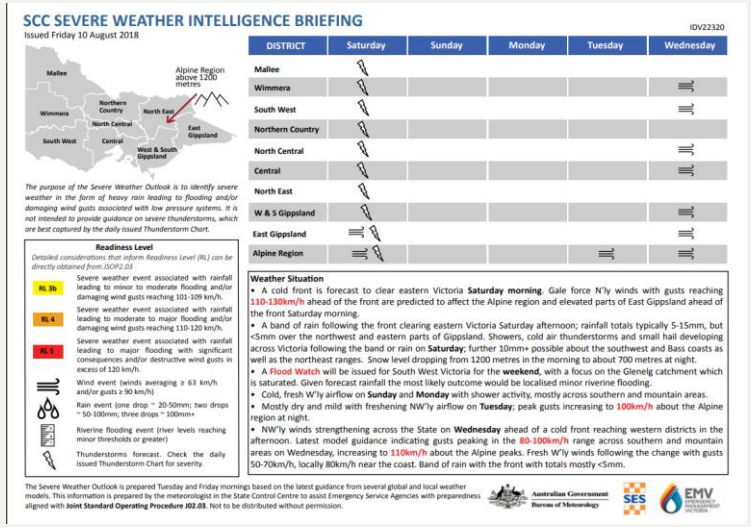
National Hazard Impact and Risk Assessment

WHAT CAN WE DO NOW?

- Take methodology/design inspiration from:
  - Existing state/territory severe weather outlooks
  - UK Met Office warning impact tables
  - WMO best practice on hazard impact forecasting



SCC SEVERE WEATHER INTELLIGENCE BRIEFING

Issued Friday 10 August 2018

IDV22320

DISTRICT	Saturday	Sunday	Monday	Tuesday	Wednesday
Mallee					
Wimmera					
South West					
Northern Country					
North Central					
Central					
North East					
W & S Gippsland					
East Gippsland					
Alpine Region					

Alpine Region above 1200 metres

Mallee · Wimmera · Northern Country · North East · North Central · East Gippsland · South West · Central · West & South Gippsland

The purpose of the Severe Weather Outlook is to identify severe weather in the form of heavy rain leading to flooding and/or damaging wind gusts associated with low pressure systems. It is not intended to provide guidance on severe thunderstorms, which are best captured by the daily issued Thunderstorm Chart.

Readiness Level

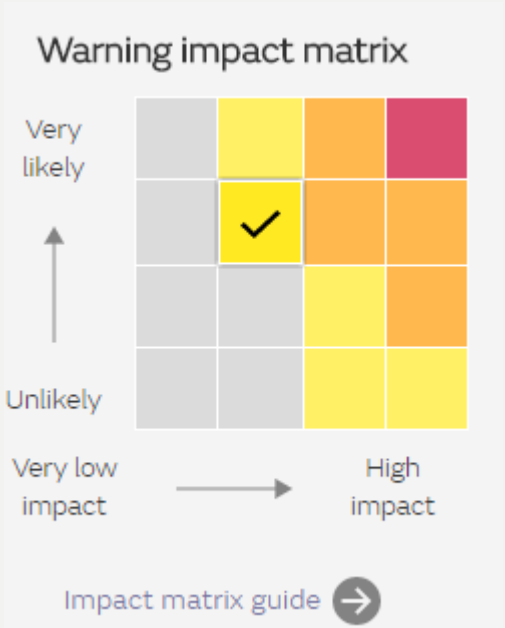
Detailed considerations that inform Readiness Level (RL) can be directly obtained from ISOP2.03

- RL 3b: Severe weather event associated with rainfall leading to minor to moderate flooding and/or damaging wind gusts reaching 101-109 km/h.
- RL 4: Severe weather event associated with rainfall leading to moderate to major flooding and/or damaging wind gusts reaching 110-120 km/h.
- RL 5: Severe weather event associated with rainfall leading to major flooding with significant consequences and/or destructive wind gusts in excess of 120 km/h.
- Wind event (winds averaging ≥ 63 km/h and/or gusts ≥ 90 km/h)
- Rain event (one drop ~ 20-50mm; two drops ~ 50-100mm; three drops ~ 100mm+
- Riverine flooding event (river levels reaching minor thresholds or greater)
- Thunderstorms forecast. Check the daily issued Thunderstorm Chart for severity.

Weather Situation

- A cold front is forecast to clear eastern Victoria **Saturday morning**. Gale force N'ly winds with gusts reaching 110-130km/h ahead of the front are predicted to affect the Alpine region and elevated parts of East Gippsland ahead of the front Saturday morning.
- A band of rain following the front clearing eastern Victoria Saturday afternoon; rainfall totals typically 5-15mm, but <5mm over the northwest and eastern parts of Gippsland. Showers, cold air thunderstorms and small hail developing across Victoria following the band or rain on **Saturday**; further 10mm+ possible about the southwest and Bass coasts as well as the northeast ranges. Snow level dropping from 1200 metres in the morning to about 700 metres at night.
- A Flood Watch will be issued for South West Victoria for the **weekend**, with a focus on the Glenelg catchment which is saturated. Given forecast rainfall the most likely outcome would be localised minor riverine flooding.
- Cold, fresh W'ly airflow on **Sunday** and **Monday** with shower activity, mostly across southern and mountain areas.
- Mostly dry and mild with freshening NW'ly airflow on **Tuesday**; peak gusts increasing to 100km/h about the Alpine region at night.
- NW'ly winds strengthening across the State on **Wednesday** ahead of a cold front reaching western districts in the afternoon. Latest model guidance indicating gusts peaking in the 80-100km/h range across southern and mountain areas on Wednesday, increasing to 110km/h about the Alpine peaks. Fresh W'ly winds following the change with gusts 50-70km/h, locally 80km/h near the coast. Band of rain with the front with totals mostly <5mm.

The Severe Weather Outlook is prepared Tuesday and Friday mornings based on the latest guidance from several global and local weather models. This information is prepared by the meteorologist in the State Control Centre to assist Emergency Service Agencies with preparedness aligned with ***Joint Standard Operating Procedure J02.03****. Not to be distributed without permission.*



- **Place National Hazard Impact and Risk Assessment at the core of our real-time operations, before, during and after weather events**

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National Hazard Impact and Risk Assessment

BEFORE

Impact probability-based communication strategy.

Contingency planning

- National Hazard Outlook – Community
- National Hazard Outlook – Operations

DURING

Flexible resourcing strategy.

Monitoring, assessing and communicating

- Operational impact ratings and tiered structure for resource allocation.
- Planned response to impacts whilst maintaining agility.

AFTER

Post Event Review Management (PERM)

- Hazard impact assessment embedded within PERM procedures.
- Lessons learnt incorporated into culture.

Tropical Cyclone Marcus – March 2018

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National Hazard Impact and Risk Assessment

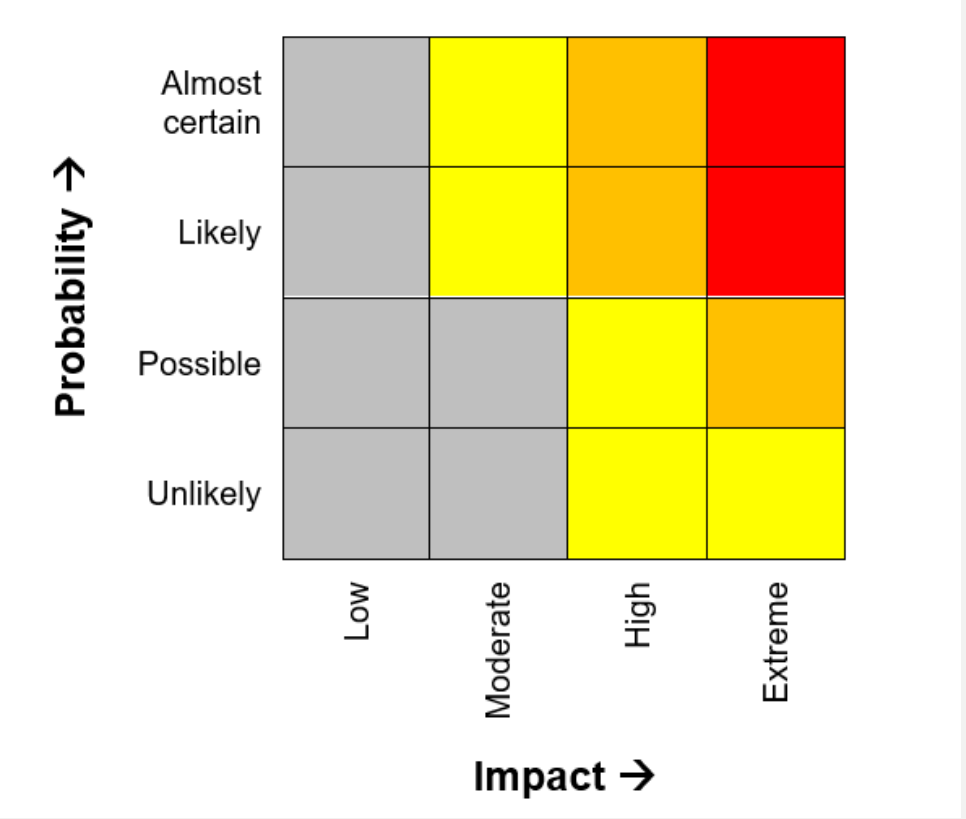
Impact probability-based communication strategy.

Contingency planning

BEFORE

- Graphical product, Days 1-4 plus outlook 5-7, issued every day, in partnership with states.
- Designed for internal and national emergency services use; suitable for development into a public product.
- A structured and considered record of how potential hazards were assessed.

Impact-probability-based matrix:



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National Hazard Community Impact
Tropical Cyclone Marcus

Impact probability-based communication strategy.

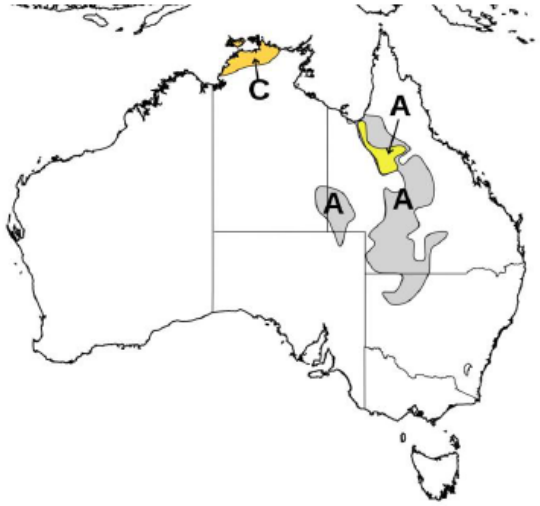
Contingency planning

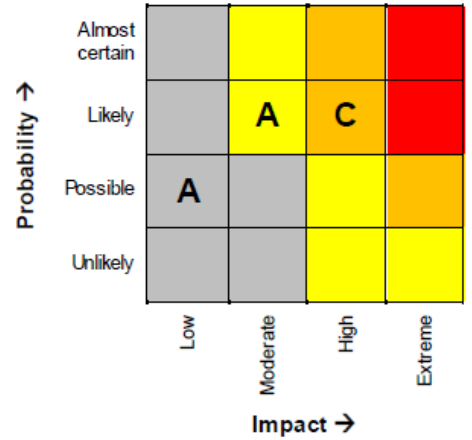
BEFORE

- A: Riverine flooding
- B: Severe fire weather
- C: Tropical Low/ Possible Cyclone
- D: Heavy rainfall

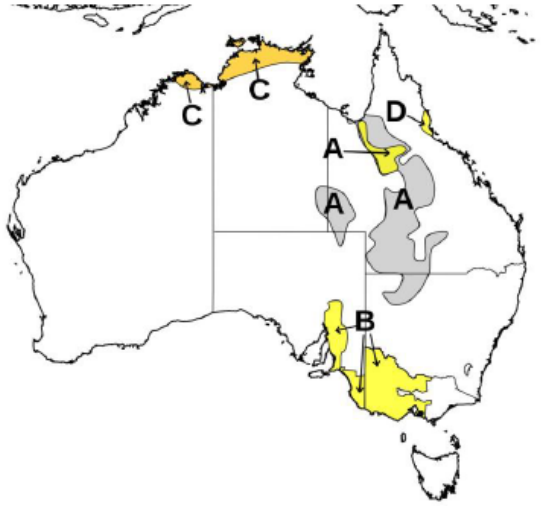
- **C: Tropical Low/ Possible Tropical Cyclone**
- Heavy rainfall, possible flash flooding
- Possible damaging wind gusts near the low or TC
- Risk to Darwin (NT capital city ~106,000 people).
- Risk of damage to property and agriculture.
- Increased demand of emergency services.

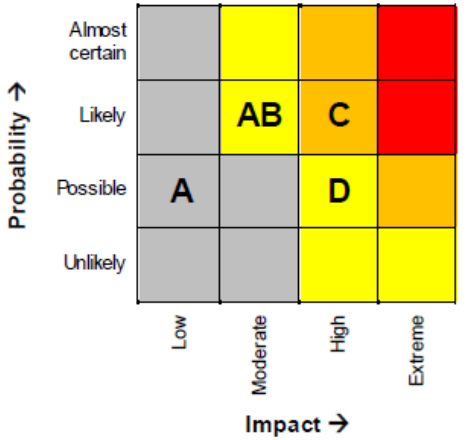
Day 1: Friday 16 March 2018





Day 2: Saturday 17 March 2018





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National Hazard Operational Impact
Tropical Cyclone Marcus

Impact probability-based communication strategy.

Contingency planning

BEFORE

A: Riverine flooding

B: Severe fire weather

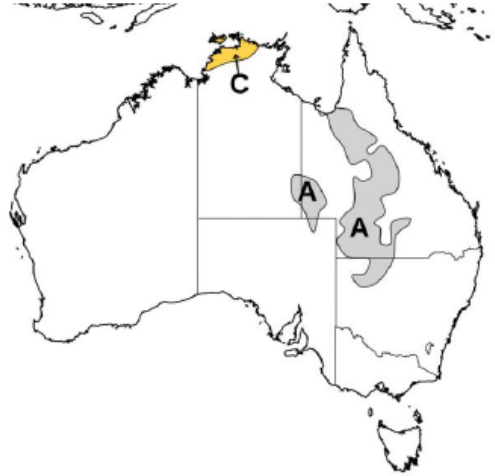
C: Possible Tropical Cyclone

D: Heavy rainfall

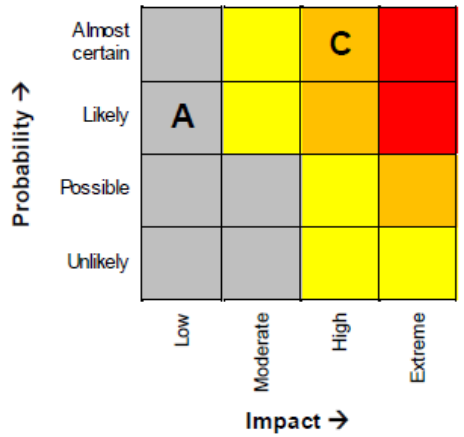
C: TCWC Activation – NT

- High risk of TC in the Arafura Sea from Friday
- Populated Areas, TC - Coastal Impact.
- Additional staff required.

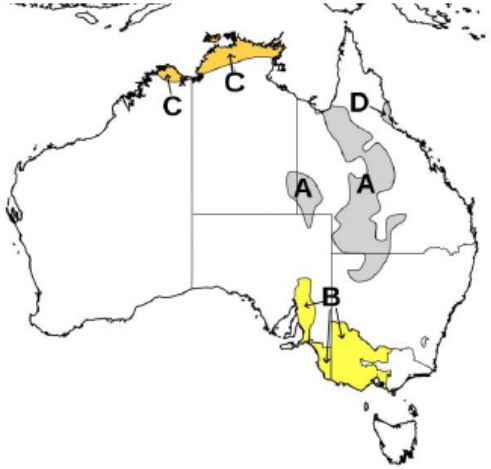
Day 1: Friday 16 March 2018



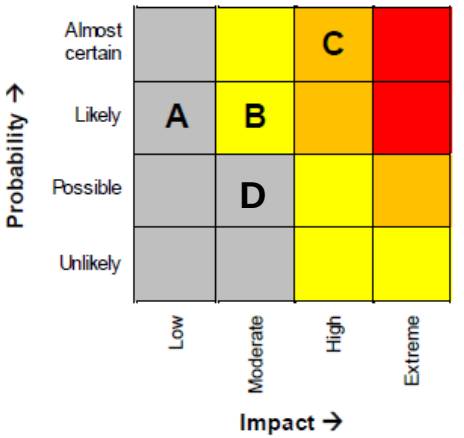
Other: ☐ ☐ ☐



Day 2: Saturday 17 March 2018



Other: ☐ ☐ ☐



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National Hazard Impact and Risk Assessment - Before

HAZARD COMMUNITY IMPACT

Tier	0	1
Impact level	LOW	MODERATE
Hazard		
Life	Minimal danger to life Minimal injuries/illnesses	Minimal danger to life C Few injuries/illnesses
Property	Minimal/no property damage	Localised or minor damage to buildings, structures and property
Delivery of services/utilities	Minimal/no disruption	Localised or brief disruption
Emergency services	Normal demand for emergency service response	Increased demand for emergency service response
Transport	Minimal/no disruption	Local transport routes affected Brief travel delays Local road/rail closures Brief airport delays
Day-to-day activities	Minimal/no impact on usual activities and routines	Brief disruption to usual activities and routines, including work and school
Agriculture	Minimal/no impact C	Localised damage to major agriculture Danger to major agriculture at key time of season
Land/vegetation	Minimal/no impact	Some tree damage/trees down Localised coastal erosion Localised land slips

HAZARD OPERATIONAL IMPACT

Tier	0	1	
Impact level	LOW	MODERATE	
BOM warning services	Marginal/no severe weather Minor to moderate flood, rural/remote	Low-end severe weather, populated areas Minor to moderate flood, populated areas Tropical cyclone, offshore	High-e multi-h areas Major areas Tropica impact Extrem severe existing
BOM staffing	Routine operational staffing	Additional staffing requirements covered locally Routine contingency planning arrangements C	Externa require Daily o conting meetin
Internal and government liaison	Routine internal briefing activities Routine liaison with local and state government agencies Routine outposted meteorologist operations	Increased internal briefing activities Increased liaison with local and state government agencies Increased demand on outposted meteorologist operations	Extensi activiti level Increas state a govern Infrequ briefing Extend outpos operati
Media	Routine media activity Local enquiries handled locally	Local enquiries handled locally National enquiries covered by BNOC C	Widesp Externa require remote National enquiries covered by BNOC

Total score: (sum all elements) 6

Hazard operational impact assessment:

0-2	TIER 0	LOW	
3-5	TIER 1	MODERATE	
6-9	TIER 2	HIGH	C
10-12	TIER 3	EXTREME	

HAZARD PROBABILITY

Tier	0	1	2	3
Probability level	UNLIKELY	POSSIBLE	LIKELY	ALMOST CERTAIN
Forecast likelihood	Not current official forecast policy Long term forecast period Computer model guidance very inconsistent Outlier forecast scenario Other forecast scenarios remain very likely	Not current official forecast policy Medium-long term forecast period Computer model guidance very inconsistent Other forecast scenarios considered to remain possible or Current official forecast policy Short- long term forecast period Computer model guidance remains uncertain Other forecast scenarios considered to remain possible	Current official forecast policy Short-medium term forecast period Majority of computer model guidance in agreement, although some uncertainty remains Other forecast scenarios now considered unlikely C	Current official forecast policy Short term forecast period/event imminent All computer model guidance in very close agreement Other forecast scenarios considered extremely unlikely/impossible

Total score: (sum all elements) 2

Hazard probability assessment:

0	TIER 0	UNLIKELY	
1	TIER 1	POSSIBLE	
2	TIER 2	LIKELY	C
3	TIER 3	ALMOST CERTAIN	

$$|\textit{Risk of impact } (x, t)| = |\textit{hazard } (x, t)| \cup |\textit{vulnerability } (x, t)| \cup |\textit{exposure } (x, t)|$$

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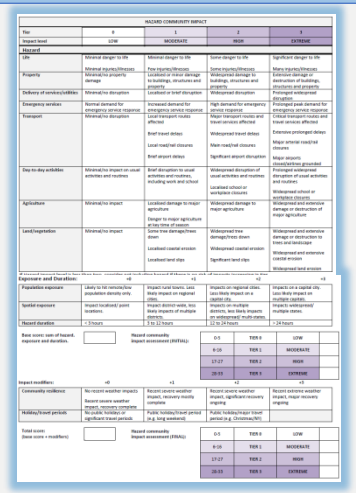
National Hazard Impact and Risk Assessment

Impact probability-based communication strategy.

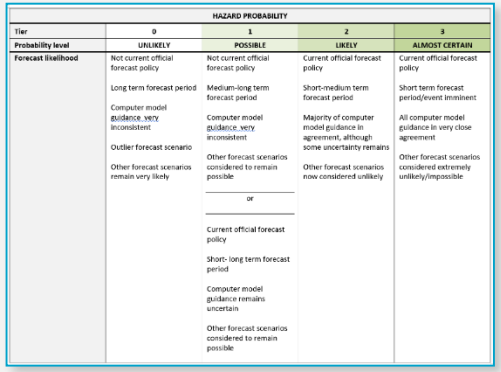
Contingency planning

BEFORE

Community Impact



Hazard Probability

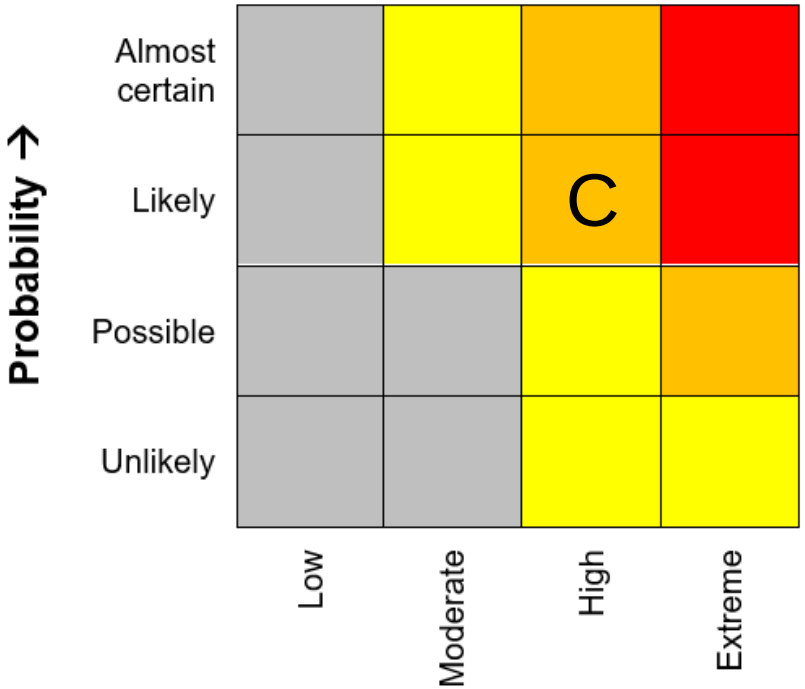


HAZARD PROBABILITY				
Tier	0	1	2	3
Probability level	UNLIKELY	POSSIBLE	LIKELY	ALMOST CERTAIN
Forecast likelihood	Not current official forecast policy Long term forecast period Computer model guidance very inconsistent Outlier forecast scenario Other forecast scenarios remain very likely	Not current official forecast policy Medium-long term forecast period Computer model guidance very inconsistent Other forecast scenarios considered to remain possible or Current official forecast policy Short- long term forecast period Computer model guidance remains uncertain Other forecast scenarios considered to remain possible	Current official forecast policy Short-medium term forecast period Majority of computer model guidance in agreement, although some uncertainty remains Other forecast scenarios now considered unlikely	Current official forecast policy Short term forecast period/event imminent All computer model guidance in very close agreement Other forecast scenarios considered extremely unlikely/impossible

0-5	TIER 0	LOW	
6-16	TIER 1	MODERATE	
17-27	TIER 2	HIGH	C
28-33	TIER 3	EXTREME	

0	TIER 0	UNLIKELY	
1	TIER 1	POSSIBLE	
2	TIER 2	LIKELY	C
3	TIER 3	ALMOST CERTAIN	

Impact-probability-based matrix:



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National Hazard Impact and Risk Assessment

Impact probability-based communication strategy.

Contingency planning

BEFORE

Ensure consistency with regional forecast policy:

- Chat room - jabber

Thursday, 16 August 2018

Rod Dickson 01:17
All good for Vic.

Mark Anolak 02:41
All good for SA

Christopher Kent 04:39
I've included the Darwin and Adelaide River area to the Fire Weather C area on Sunday. This time of year this area is very sensitive to wind with the high fuel loads so while the surge pushes through the Top End on Monday, a growing boundary layer on Sunday will see temps and winds increase as they mix down.

Rebecca Kamitakahara 05:22
For NSW I just removed the damaging wind gust area for Thursday (today) given we've now canned our warning. Otherwise all good.

Matthew Marshall 08:59
thanks all, input very much appreciated.

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National Hazard Impact and Risk Assessment

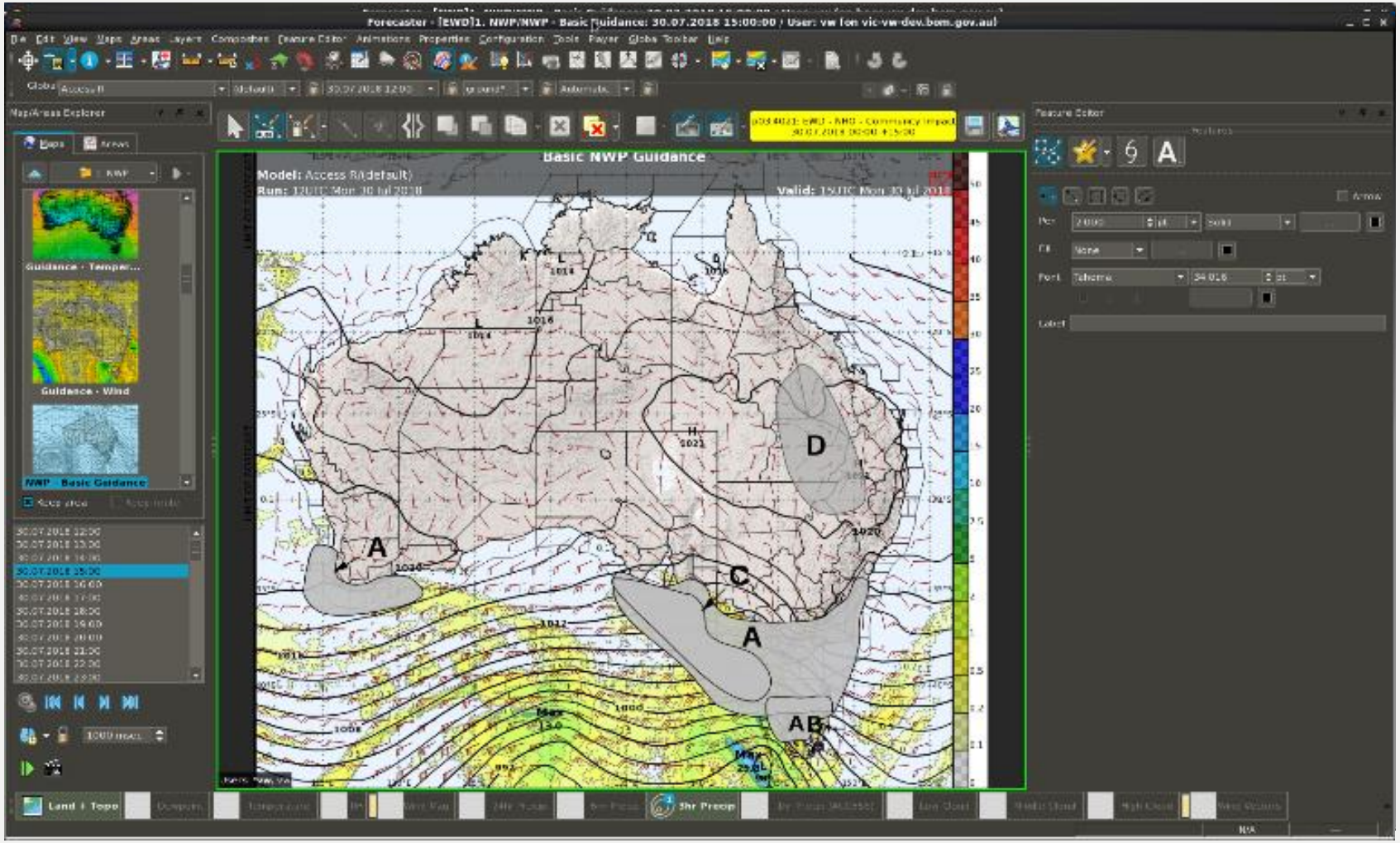
Impact probability-based communication strategy.

Contingency planning

BEFORE

Ensure consistency with regional forecast policy:

- Chat room - jabber
- Collaboration tool - allows regional forecasters to modify product overnight



- Users in other offices can see edits in real time

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Flexible resourcing strategy

Flexible resourcing strategy. Monitoring, assessing and communicating

DURING

- Use operational impact ratings and Tiered Structure for resource allocation
- Plan response to impacts and maintain team agility

	Level of Operations	Operational Activities
	Level 1	▪ Aware. ▪ Routine Operations, low-end warnings still possible.
	Level 2	▪ Busy shift, but largely routine and local operations. Extra staff may be required. ▪ National contingency and media messaging possible. ▪ Local media and support as required, press conference possible. ▪ Severe Wx video possible.
	Level 3	▪ Surge Operations, local and/or national staff required including both remote and/or fly in surge. ▪ Routine National Contingency planning and messaging ongoing. ▪ Executive and Government briefings. ▪ Continuous Media, Multi Agency Press conference likely. ▪ Daily Severe Wx videos.
	Level 4	▪ Prolonged Surge Operations, “All Bureau Response”. ▪ Daily National Contingency planning and messaging. ▪ Executive and Government briefings. ▪ Continuous Media, Multi Agency press conference (with Premier) ▪ Multiple Severe Wx videos each day.

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National Surge Response Meetings

Flexible resourcing strategy. Monitoring, assessing and communicating

DURING

- Use operational impact ratings and Tiered Structure for resource allocation
- Plan response to impacts and maintain team agility

A daily standup this week to discuss the upcoming weather (TC/low off SE QLD, active monsoon/potential TC's across the north and strong front over the SE during the weekend).

Could State Managers / SupMets and MACMs from affected States please attend to have input. (If WA come into line for impact or providing surge support the meeting time will be moved to accommodate time zones).

CMR 558947 Pin 2662.

Suggested run sheet.

Key messages from affected state's (2mins each)

Climate context (2 mins)

Media plans (2 mins each)

National media team

Video

Social media

Other input (2 mins)

Key decisions (yes/no)

Press conferences

- State

- National

Media release

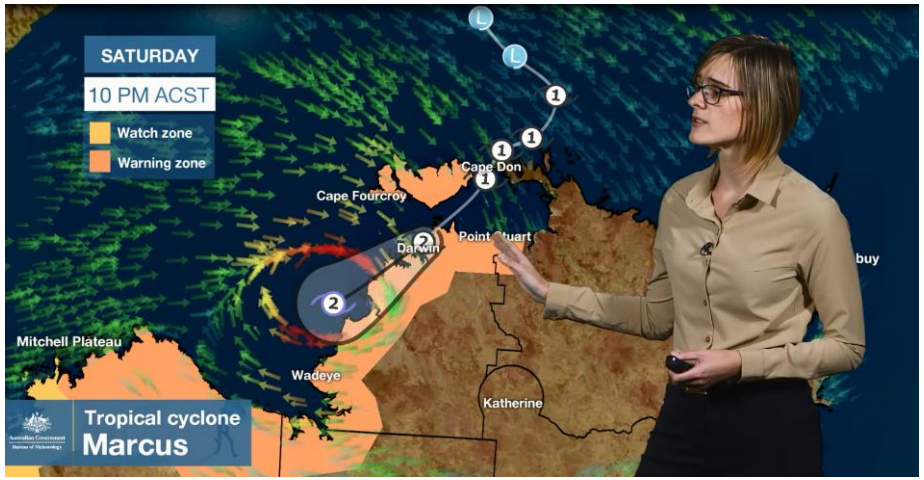
Video's

Other (audio news release, video news release, live crosses, etc)

Regards,

Mick

Centre Director National Operations Centre



New Process - Incident Management Structure:

Communications: media liaison, internal and stakeholder communications

Planning: staffing and resourcing, expected behaviour and response

Intelligence: current and forecast weather/warning situation & impact

Operations: all activities and resources assigned to resolve incident

Logistics: obtaining and maintaining human and physical resources, facilities, services and materials

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Post Event Review Management (PERM)

AFTER

- Embed hazard impact assessment into our Post Event Review Management (PERM) procedures.

- **What type of events?**
  - High Impact on the community (not just intensity)
  - High Impact on our real-time operations (Bureau's ability to deliver services/surge)
    - Service performance
    - Staff fatigue and skills
    - Ability to surge
  - Other non-hazard related service/performance factors

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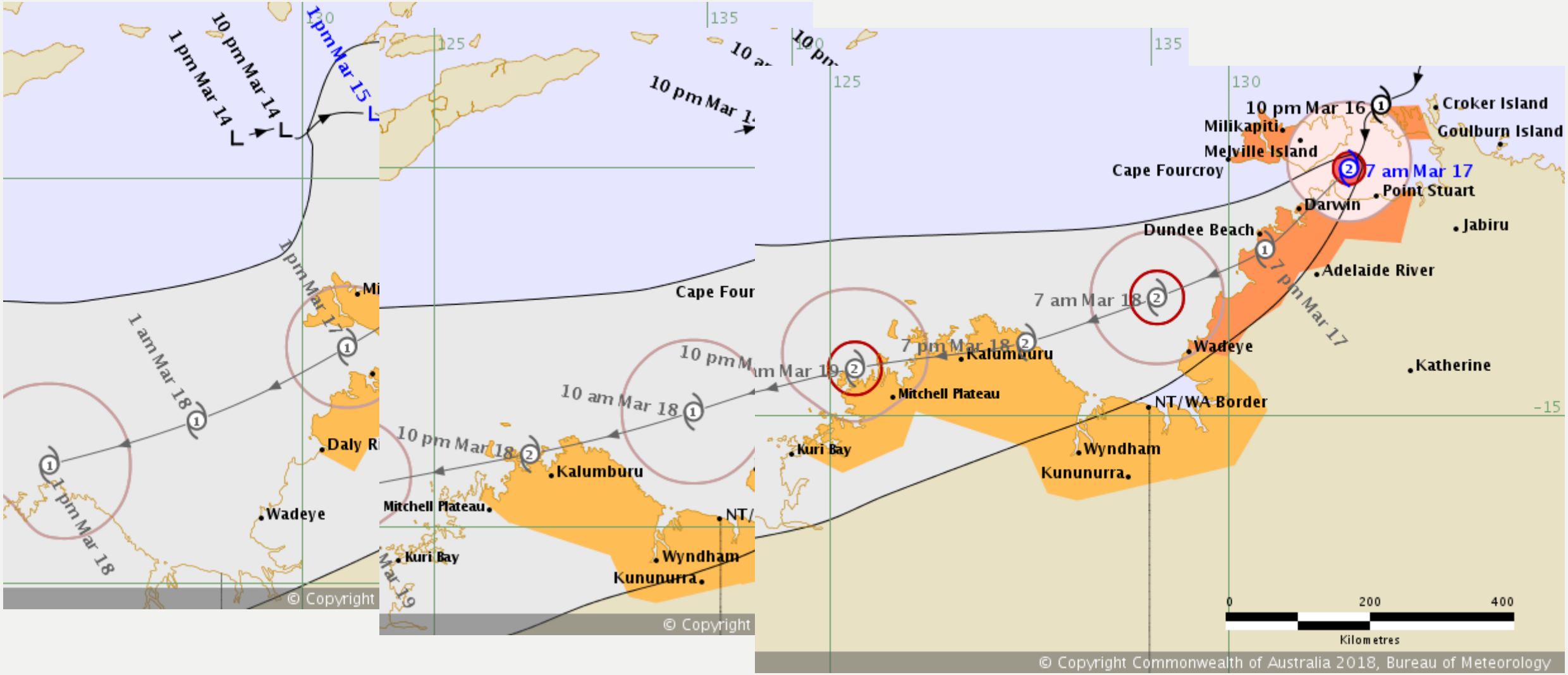
Warnings
Tropical Cyclone Marcus



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PERM – Impact assessments
Tropical Cyclone Marcus

Community Impacts

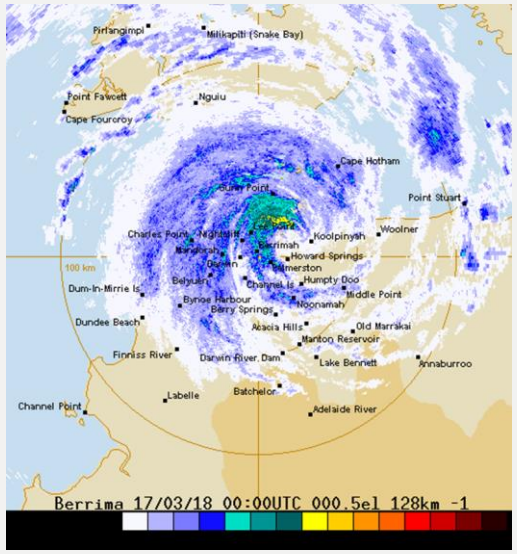
- 30,000 homes without power in Darwin
- 500 fallen power lines
- Widespread fallen and uprooted trees
- Property damage
- Potential contamination of drinking water

0 Low	1 Moderate	2 High ✓	3 Extreme

Operations Impacts

- Darwin Tropical Cyclone Warning Centre activated
- NT Cyclone staffing plan enacted;
  - ✓ seamless hand over of services to another office
- Widespread media interest
- Severe Weather Videos produced
- Joint press conferences

0 Low	1 Moderate	2 High ✓	3 Extreme



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PERM – Impact assessments
Tropical Cyclone Marcus

Community Impacts

COMMUNITY IMPACT RUBRIC

Tier	0	1	2	3
Impact level	LOW	MODERATE	HIGH	EXTREME
Life	Minimal danger to life Minimal injuries/illnesses	Minimal danger to life Few injuries/illnesses ✓	Some danger to life Some injuries/illnesses	Significant danger to life Many injuries/illnesses
Property	Minimal/no property damage	Localised or minor damage to buildings, structures and property	Widespread damage to buildings, structures and property ✓	Extensive damage or destruction of buildings, structures and property
Delivery of services/utilities	Minimal/no disruption	Localised or brief disruption	Widespread disruption	Prolonged widespread disruption ✓
Emergency services	Normal demand for emergency service response	Increased demand for emergency service response	High demand for emergency service response	Prolonged peak demand for emergency service response ✓
Transport	Minimal/no disruption	Local transport routes affected Brief travel delays Local road/rail closures Brief airport delays	Major transport routes and travel services affected Widespread travel delays Main road/rail closures Significant airport disruption	Critical transport routes and travel services affected Extensive prolonged delays Major arterial road/rail closures Major airports closed/airlines grounded ✓
Day-to-day activities	Minimal/no impact on usual activities and routines	Brief disruption to usual activities and routines, including work and school	Widespread disruption of usual activities and routines Localised school or workplace closures ✓	Prolonged widespread disruption of usual activities and routines Widespread school or workplace closures
Agriculture	Minimal/no impact	Localised damage to major agriculture ✓ Danger to major agriculture at key time of season	Widespread damage to major agriculture	Widespread and extensive damage or destruction of major agriculture
Land/vegetation	Minimal/no impact	Some tree damage/trees down Localised coastal erosion Localised land slips	Widespread tree damage/trees down Widespread coastal erosion Significant land slips	Widespread and extensive damage or destruction to trees and landscape Widespread and extensive coastal erosion ✓ Widespread land erosion
Population exposure	Minimal/remote Very low population density	Rural towns Low population density	Regional cities Moderate population density	Capital cities High population density ✓
Spatial exposure	Localised/point locations	Regional/district-wide Local river catchments	Multiple forecast districts Multiple flood catchments ✓	Widespread/multi-state
Hazard duration	< 3 hours	3 to 12 hours	12 to 24 hours	> 24 hours

Base score: (sum all elements)	23

Community impact assessment (INITIAL):

0-5	TIER 0	LOW	
6-16	TIER 1	MODERATE	
17-27	TIER 2	HIGH	23
28-33	TIER 3	EXTREME	

Impact modifiers:	+0	+1	+2	+3
Community resilience	No recent weather impacts Recent severe weather impact, recovery complete ✓	Recent severe weather impact, recovery mostly complete	Recent severe weather impact, significant recovery ongoing	Recent extreme weather impact, major recovery ongoing
Holiday/travel periods	No public holidays or significant travel periods ✓	Public holiday/travel period (e.g. long weekend)	Public holiday/major travel period (e.g. Christmas/NY)	

Total score: (base score + modifiers)	23

Community impact assessment (FINAL):

0-5	TIER 0	LOW	
6-16	TIER 1	MODERATE	
17-27	TIER 2	HIGH	23
28-33	TIER 3	EXTREME	

Operations Impacts

HAZARD OPERATIONAL IMPACT

Tier	0	1	2	3
Impact level	LOW	MODERATE	HIGH	EXTREME
BOM warning services	Marginal/no severe weather Minor to moderate flood, rural/remote	Low-end severe weather, populated areas Minor to moderate flood, populated areas Tropical cyclone, offshore	High-end severe weather, populated areas Multi-hazards, populated areas Major flood, populated areas Tropical cyclone, coastal impact ✓ Extreme fire weather Severe fire weather with existing fires	Extreme severe weather, populated areas Prolonged widespread major flood, key locations Severe tropical cyclone, major population coastal impact Catastrophic fire weather, significant threat to life
BOM staffing	Routine operational staffing	Additional staffing requirements covered locally Routine contingency planning arrangements	External surge support required, remote or fly-in ✓ 111Daily operational contingency planning meetings	Prolonged external surge support, remote or fly-in Daily operational contingency planning meetings Campaign event 'All hands on deck'
Internal and government liaison	Routine internal briefing activities Routine liaison with local and state government agencies Routine outposted meteorologist operations	Increased internal briefing activities Increased liaison with local and state government agencies Increased demand on outposted meteorologist operations	Extensive internal briefing activities, up to Executive level Increased liaison with local, state and federal government agencies Infrequent ministerial briefings Extended coverage for outposted meteorologist operations AGCCC briefings required	Extensive internal briefing activities, up to Executive level Extensive frequent liaison with local, state and federal government agencies ✓ Regular ministerial briefings Significantly extended coverage for outposted meteorologist operations Frequent AGCCC briefings required
Media	Routine media activity Local enquiries handled locally	Local enquiries handled locally National enquiries covered by BNOC	Widespread media interest External surge support required for local demand, remote or fly-in National enquiries covered by BNOC ✓	'Wall-to-wall' media coverage Prolonged external surge support for local demand, remote or fly-in National enquiries covered by BNOC

Total score: (sum all elements)	9

Hazard operational impact assessment:

0-2	TIER 0	LOW	
3-5	TIER 1	MODERATE	
6-9	TIER 2	HIGH	9
10-12	TIER 3	EXTREME	

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PERM

Post Event Review Management (PERM)

AFTER

Event Impact Assessment Summary

Tropical Cyclone Marcus – 16-24 March 2018

Weather Event	Noteworthy Observations and Records	Community Impacts	Bureau Operational Activities
Tropical Cyclone Marcus formed in the Arafura Sea on 16 March and moved south-west, impacting Darwin on 17 March as a Category 2 system. Marcus continued its south-west track, making landfall again over the northern Kimberley before moving into the Indian Ocean and reaching Category 5 by 21 March. The cyclone turned south a few days after and weakened, with no further coastal impacts.	Northern Territory: Strongest cyclone to impact Darwin in 40 years (since Tracy in 1974): • Darwin sustained gales for around 6 continuous hours, with the strongest gust at Darwin Airport being 128km/h. Other gusts recorded include 130km/h at Darwin Harbour, 98km/h at Charles Pt and 94km/h at Pt Stuart. • Rainfall was generally less than 100mm, with a few isolated higher totals: highest 136mm Gunn Pt, 60mm at Darwin Airport. Western Australia: • Strongest winds were offshore: highest recorded was 128km/h Adele Island. Rainfall totals across northern Kimberley generally 50-120mm.	Greatest impacts were around Darwin: • No reports of deaths or serious injuries. • Up to 30,000 homes without power in Darwin, with further outages in the region. • Widespread fallen and uprooted trees, 500 fallen power lines. Some building and property damage. • Potential contamination of drinking water, concerns for disease spread. • Flights cancelled to and from Darwin Airport for more than 24 hours. • Schools, unis closed and other services suspended. Darwin Airport closed. • 300 soldiers and 45 US Marines called in to help with cleanup. • Cyclone affected a capital city of moderate population density, significant recovery required. 0 Low | 1 Moderate | 2 High ✓ | 3 Extreme	• Tropical cyclone, with a coastal crossing over a capital city. • Early engagement with key government stakeholders leading up to the event. Joint press conferences. • Daily briefings held with NT Emergency Services each day from 12 March. • Darwin Tropical Cyclone Warning Centre activated. NT Cyclone Staffing Plan enacted. • Cyclone Watches (first on March 14) and Warnings issued. • Widespread media interest handled by local and BNOC staff. • Severe weather videos produced. • Structured debrief held for all staff post event. 0 Low | 1 Moderate | 2 High ✓ | 3 Extreme

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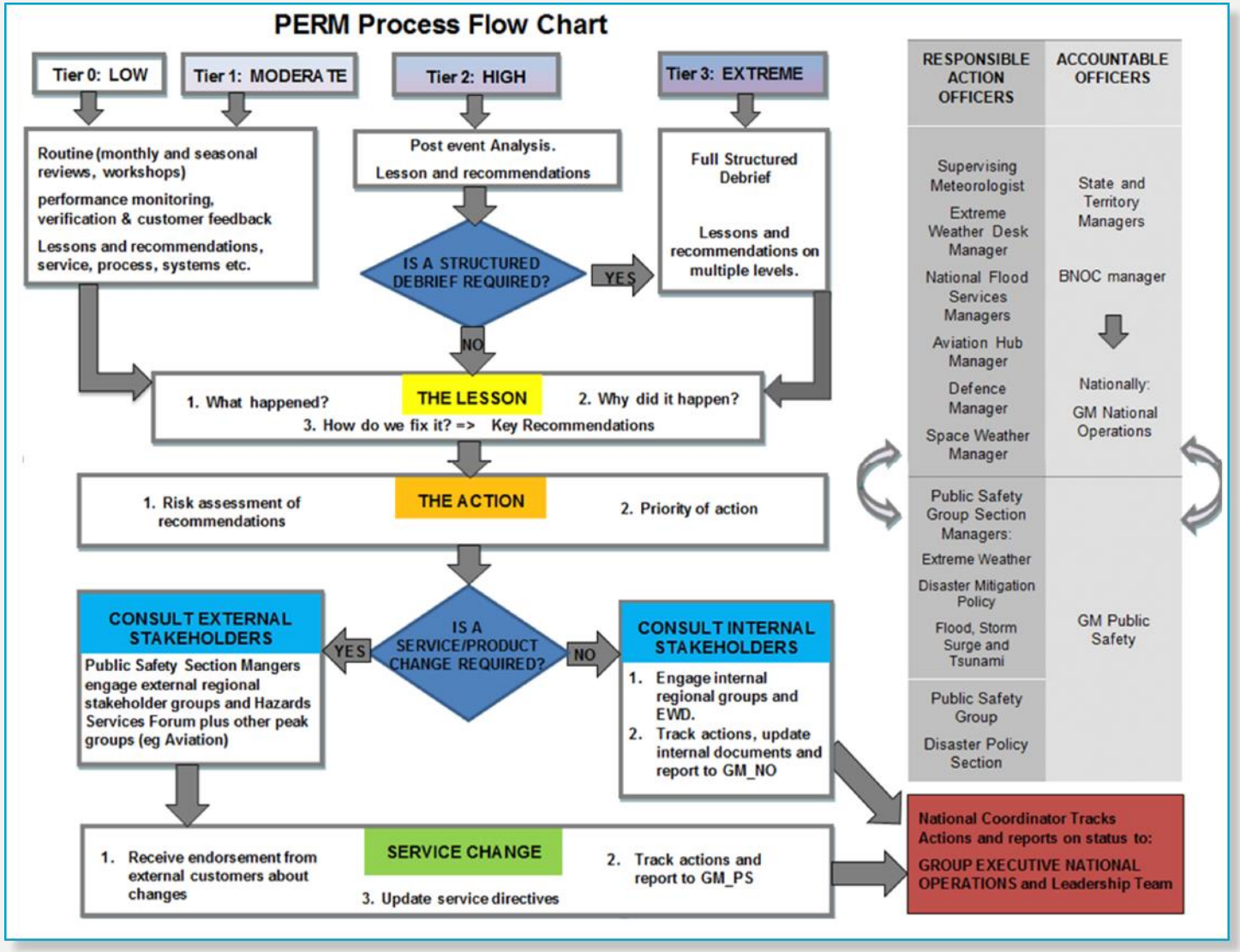
Post Event Review Management (PERM)

AFTER



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Lessons Register

Post Event Review Management (PERM)

AFTER

LESSONS REGISTER					
THE LESSON - DESCRIPTION		LESSON - SOURCE	POST EVENT REVIEW/REPORT - LINK	KEY RECOMMENDATIONS	THEME
What happened?	*Why did it happen?*	*Use drop down menu to select whether the lesson came from a Post Event Review or an annual/routine report*	*Weblink or pathway to shared drive where Post Event Review or Routine Report can be found*	*Required to turn issues/lessons identified into lessons learnt*	*Use drop down menu to select which theme the recommendation belongs to*

Actions						
ACTION	PRIORITY	ACCOUNTABLITY - WHO	NOTES	DEADLINE	EXTERNAL CONSULTATION REQUIRED?	STATUS
If the action differs from the recommendation fill in action below. Otherwise column may be left blank	*Assessed using Risk Analysis template (auto filled from RISK ASSESSMENT)*	*The person or section that is accountable for the completion of the action and for the lesson learnt*			*If client consultation is required due to a service change, please select 'yes' from the drop down menu below*	*Use drop down menu to select the status of the action*

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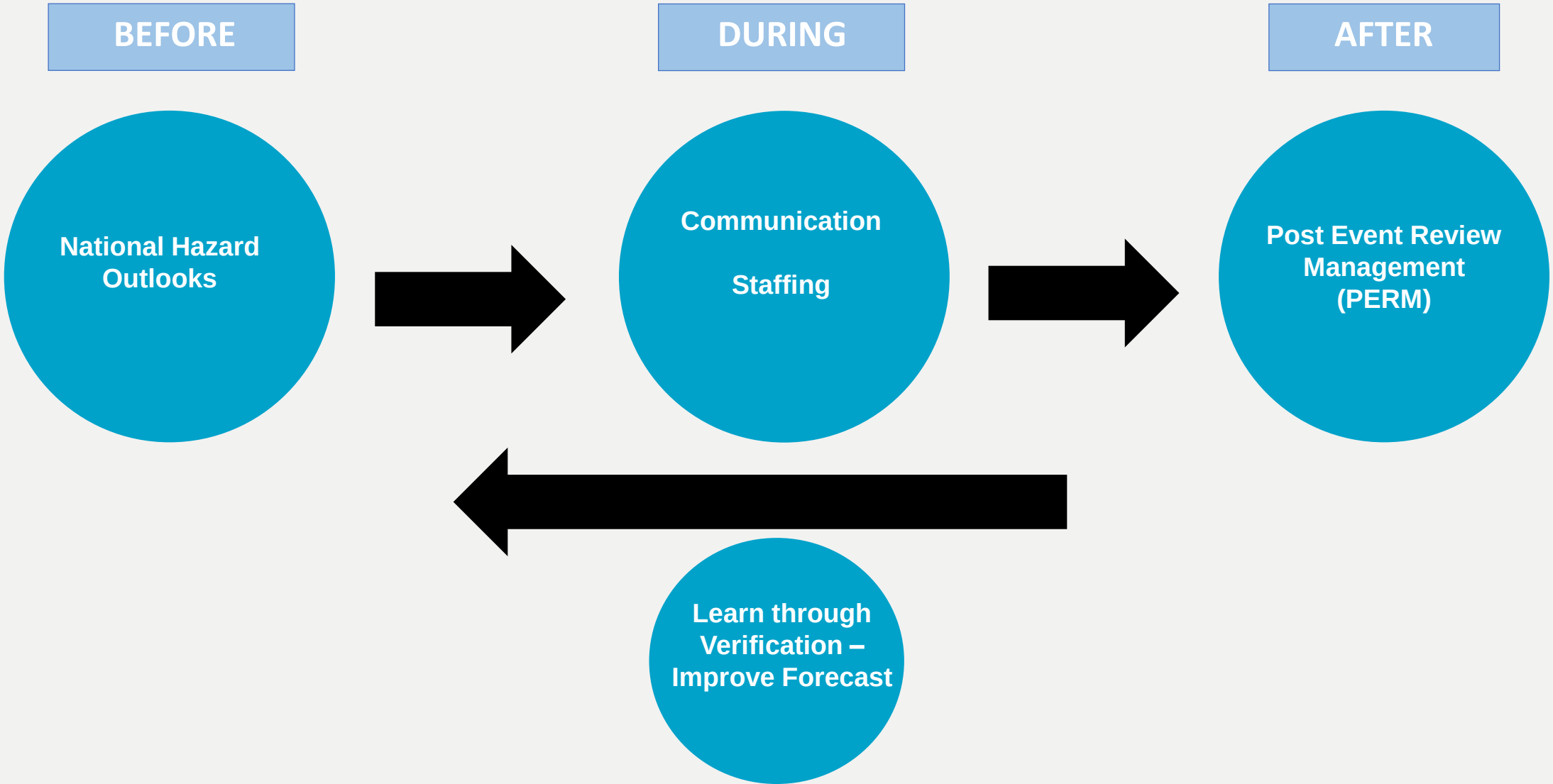
National Hazard Impact and Risk Assessment



Thank you

Questions?

James Taylor, Bureau of Meteorology

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@chriskentphotography