MANAGING AN EAST COAST LOW – WHAT TO EXPECT WHEN YOU'RE EXPECTING

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Introduction

During the first week of June a complex East Coast Low developed over the Tasman Sea, interacting with an extensive upper level trough over eastern Australia and a high pressure system over New Zealand. High winds, large waves, coastal erosion, and very heavy rainfall resulted between 4 and 7 June, causing flooding in areas of southeast Queensland, eastern New South Wales, eastern Victoria, and large areas of northern Tasmania. Over 10,000 jobs were registered with the New South Wales State Emergency Service (SES) from the event and natural disasters were declared in 41 Local Government Areas of that State (BOM, 2016). At the time of the storm, the Northern Beaches Council in Sydney was only approximately 3 weeks old, having been formed by proclamation on 12 May 2016, combining the former Pittwater, Warringah and Manly Local Government Areas (LGAs).

Collaroy-Narrabeen Beach has long been known as a coastal erosion hotspot and nearby Narrabeen Lagoon a vulnerable floodplain. The rapid escalation of the storm tested the responsiveness of Council's emergency planning systems and its integration with combat agencies. This paper sets out how this storm unfolded from an operational perspective and how a proper incident management framework is an essential tool for a local government response.

Council's Incident Management Framework

The former Warringah Council had adopted the Australasian Inter-service Incident Management System (AIIMS) (AFAC, 2013) as its incident management framework. AIIMS is used by most of the combat agencies in NSW, and this allowed a seamless interaction between Council and the agencies in previous incidents (e.g. the April 2015 East Coast Low). AIIMS effectively establishes an incident management structure that is scalable but with clear roles, enabling functional clarity and interaction with other agencies. The principal roles within AIIMS include:

- Incident Controller – overall responsibility for directing the incident (typically supersedes normal internal management structures and is permitted to make all necessary decisions regarding the incident
- Planning – gathers required information and intelligence and prepares the incident management plan to achieve the stated goals (in consultation with other agencies as required)
- Intelligence – strong focus on gathering data, forecasts and providing technical information needed for decision making and resource deployment
- Public Information/Communications – ensures single point of contact for people/agencies seeking information to avoid other roles being distracted. Co-ordinates with other agencies to maximise consistency/timing of messaging.

- Operations – manages the deployment of resources and actions to meet incident goals
- Logistics – arranges all the necessary support for the IMT (e.g. finances, IT equipment, procurement, staffing rosters, catering etc).

As incidents are declared an incident management team (IMT) is established with a clear allocation of the above roles and responsibilities.

Incident Response June 3-9

As the weather forecasts began to confirm significant rainfall and the potential for significant waves, Council formed an (IMT). Initially the IMT was formed at a team level to co-ordinate resources within the department that manages coastal erosion and flooding at Council. At this level, departmental decisions were made to increase the opening area of Narrabeen Lagoon (berm width and channel depth), Manly Dam was assessed as having the standard level of flood storage and other coastal lagoons had their entrances prepared for emergency openings.

The section below provides a snap shot of the key issues and actions for Northern Beaches Council in preparing for and responding to the June East Coast Low.

Day 1 – Friday 3 June – Planning & Preparation Mode

The incident was escalated to an interdepartmental incident on Friday 3 June due to the likely impact on multiple business units and the need to ensure business continuity for the newly amalgamated Council. Council's primary concern was the impact of flooding at Narrabeen Lagoon and managing the conditions at the Lagoon entrance to ensure the lagoon remained open during the storm. Significant works were undertaken to prepare the berm for opening once water levels had increased to provide enough head for scour. The IMT continued to monitor the forecast swell and coastal conditions. Conditions at the time were relatively calm.

Day 2 – Saturday 4 June – Planning & Preparation Mode

Following overnight rainfall and water levels in Narrabeen Lagoon continuing to rise, the Incident Controller decided on a lagoon opening at 1m AHD (below the normal opening of 1.3m AHD). The entrance opened progressively over a period of hours, however despite the berm preparation (far wider and deeper than normal) the swell conditions offshore (coupled with high tides) reduced the available head and retarded the lagoon outflow.

To assist in monitoring both lagoon and coastal conditions an expert coastal engineer was engaged to assist council with its ongoing monitoring and inspections. Minor erosion was beginning to occur at Collaroy-Narrabeen by Saturday afternoon however no properties were under threat.

Significant planning was undertaken by the IMT for what could be a flood emergency at some point on Sunday (although considered unlikely overnight given the typical time of

concentration for the lagoon) and monitoring of conditions continued overnight by the Intelligence role (using Manly Hydraulics Laboratory and Bureau of Meteorology products).

Day 3 – Sunday 5 June – Response Mode

With heavy rain continuing in the early hours of Sunday morning and water levels in the lagoon continuing to rise Intelligence advised the Incident Controller at 0430hrs that properties could be inundated by around 12pm on Sunday triggering a significant evacuation exercise.

The IMT reconvened at 0530hrs and took time to plan the main actions for the day in terms of flood response, coastal response, public information/communication response as well as making sure that contact details were available for everyone that may have been required during the day. At approximately 0630 additional IMT support was called in and the Local Emergency Operations Controller (LEOCON) and SES updated which triggered the opening of the Emergency Operations Centre (EOC).

In response to very rapidly rising water levels, Intelligence advised that evacuations were likely required by 0830hrs around Narrabeen Lagoon and LEOCON advised at 0730hrs. IMT moved into a support role around Intelligence, Planning and Public Information/Communications.

The primary goal until this point had been to prevent flooding of properties. In deciding to evacuate, there is an inherent mind shift that has to be overcome as you switch goals from protecting property (which is what you've been working so hard to achieve) to then making sure people remain safe regardless of the level of property impact that may now be unavoidable.

As rain continued and water levels continued to rise the number of properties to be evacuated increased from 100 to 800, meaning a rapid re-calibration of evacuation data. Given the expansion of the incident, a full-time Logistics role was added to the IMT, along with full-time Communications role. The constant modelling and interpolation, monitoring of levels and forecasts, updated property impact estimates, and data gathering from field reports went on throughout the day by Planning and Intelligence.

By mid-late afternoon, the water level in Narrabeen Lagoon was holding and starting to show signs that it was receding. Rainfall was forecast to continue easing, and there was a sense that the flood component of the emergency had peaked.

As it became evident that the erosion escarpment at Collaroy-Narrabeen was approaching the houses between Stuart and Ramsay Streets, a rapid assessment of coastal engineering, geotechnical and structural factors indicated that the residents may need to be evacuated and the Emergency Sub Plan enacted.

This reflected a real shift in the nature of the incident management; it went from a single issue large scale multi-agency response, to a small area critical incident which would also require a multi-agency response.

On site the erosion rates were extraordinary with approximately 1m being lost every 5-10 minutes in large sections that would take fences, gardens, sheds and decks with them. As the erosion moved closer to houses, Council, engineers advised the police (who had

assumed control of the site) to order the evacuation of an apartment building where a sink hole had opened up in front of the building and the properties between Stuart and Ramsay Streets. The residents were clearly shocked, very upset and in some cases simply refused to acknowledge the risk.

Following the evacuation, staff returned to the Incident Room to provide a detailed update and the Incident Controller set out an expanded focus for the IMT. The next high tide was due at approximately 8pm that night, and there were serious concerns about whether the houses at Collaroy would survive. The Operations role was relocated to the site in order to monitor the arrival of the high tide and co-ordinate with emergency services. The ocean conditions had deteriorated significantly as the low passed near the coast, and it was clear that erosion was being caused not only by wave action but also the very high standing water levels.

The high tide saw the erosion scarp retreat very close to the edge of the buildings, well within the private property boundaries. Once the high tide had passed, the IMT stood down for the evening, and prepared for the next day. Unfortunately, given the time of day, there was no time to organise replacement teams and therefore those that finished on Sunday night having been working long hours since Friday, would again be on duty at first light Monday. One key decision that was made during the site inspections was to engage a structural engineer to conduct inspections on Monday given the likely property damage.

Day 4 – Monday 6 June – Response Mode

By dawn on Day 4 the flood situation had improved and many people were likely to return to their homes that day. At this stage, it was not clear how many properties had experienced above-floor flooding and additional staff were called in to take field measurements of flood damage and debris marks for future reference.

In terms of the erosion event, daybreak revealed the extent of the damage that occurred overnight and it was getting extensive coverage on the breakfast news. The morning high tide and the potential for further impact on the properties, particularly given the extent of erosion was an ongoing concern. Morning inspections were conducted of the properties and included a second coastal engineer and a structural engineer. It was clear some properties were at significant risk from further wave action during the coming high tides. Residents were outside their properties, intent on inspecting damage and retrieving possessions, and some were being interviewed by the media.

In addition, other structures including essential utilities, the Collaroy Beach Club, a car park and road ends at the southern end of the beach had experienced serious damage. Actions to fence off unsafe areas and reduce public access were implemented.

Members of the IMT were called to give briefings to Council's Executive and Administrator to determine how the policy and media implications were to be handled. The focus of the IMT increased again to deal with three emerging issues:

- intense media interest,
- an urgent need to establish strong links with affected residents
- the need to maximise the use of, and guide the emergency services

The expansion of activity on the ground at Collaroy began to stretch the Intelligence and

Planning functions of the IMT. In addition, it had become clear that the storms had a major impact across the new Northern Beaches LGA which began to stretch the capability of this newly formed organisation. Major walkways had been destroyed, public toilets washed into the ocean, roads were undermined in a number of locations and number of beachfront reserves and infrastructure were damaged.

In response, additional support was established at Collaroy to guide Operations and feedback to the overarching IMT dealing with the impact across the entire peninsula. The adaptability of the incident management framework was critical to being able to cope with the expanded response and recovery that was required (including sandbagging by RFS and Surf Club volunteers and devising strategies for the coming high tides).

As the high tide arrived the persistently high water levels caused further undermining of the properties between Stuart and Ramsay Streets and triggered the collapse of balconies which also damaged the associated buildings. In addition, the water levels and wave attack began to cause outflanking of road end structures, threatening future residential and beach access. In addition, outflanking north of 1150 Pittwater Road began to pose a risk to a number of properties in this area as existing rock protection works started to fail.

From an incident management point of view, there was little that could be done other than observe the collapses and ensure public safety. This became more urgent as sections of the Ramsay Street road end began to be outflanked and collapse.

Day 5 – Tuesday 7 June – Response Mode

By dawn on Tuesday 7 June, it was clear that some buildings had suffered significant damage and undermining as a result of the wave action overnight. This included the loss of balconies, external structures and in one case an external wall.

Understandably, the residents were very concerned about the condition of their properties and while some were resigned to what had happened, others were desperate for action. In response, the Operations team worked hard to arrange access to properties for structural assessment and resident access, and were supported by structural engineers and NSW Fire & Rescue.

Additional roles within the IMT were established to ensure that activities relating to resident support and communication could be delivered without impacting the resources required for IMT to deliver an effective emergency response.

The Planning function began preparing for recovery. This included inspections with structural engineers and building surveyors and the identification of actions required to make damaged structure safe. These inspections formed the basis for an Emergency Order to be issued under the Local Government Act (1993) to enable residents to undertake demolition and repairs quickly to make the area safe (without which access under the buildings could not be undertaken to determine their structural integrity).

Additional sandbagging lead by the SES and local Surf Lifesaving Clubs was undertaken at 1150 Pittwater Road was undertaken to prevent further sinkholes and overtopping of the existing seawall, with over 10,000 sandbags installed in hours.

Day 6 & 7 – Wednesday 8 June & Thursday 9 June – Recovery Mode

By Wednesday, the swell had abated significantly and the high tides had reduced which allowed much greater access to properties and the beach. From an incident management perspective, Council moved from “Response” mode into “Recovery” mode. A natural disaster had been declared and the State had appointed a Recovery Coordinator to oversee operations once the emergency services (e.g. LEOCON, EOC, SES) had been stood down (scheduled for midday Friday 10 June).

Council commenced the stabilisation of its road ends and also the construction of a temporary access road onto the beach from Ramsay Street. The decision to protect the road ends and construct the road was made very quickly on Tuesday and reflects the kind of rapid decision making expected by emergency services. One of Council's engaged engineers conducted a site visit further along the Collaroy-Narrabeen strip towards Mactier Street and observed that the existing informal works had been undermined, experienced rear sinkholes or totally failed along almost the entire 1km of affected beachfront.

The failure of works along such a long stretch of the coast has had significant implications. Council's existing CZMP was predicated on the protection provided by these works and their undermining over such a large area has required a major shift in Council’s policy position and therefore a lot of further investigation and planning in addition to the main recovery actions between Stuart and Ramsey Streets.

The IMT began to scale down its activity as individual project managers were identified to handle the discrete pieces of work that were required in the recovery process including:

- the preparation of a long-term plan for the protection of property at Collaroy-Narrabeen including preparation of designs, impact assessments, CZMP amendments, an erosion policy and benefit distribution analysis
- the ongoing stabilisation of road ends that had been damaged along the beachfront to ensure ongoing access to the beach and protection of the road asset
- assisting residents with the stabilisation of their properties (using geocontainers)
- assisting residents return to their properties (liaising where necessary with utility companies)
- debris clean up, beach scraping and beach replenishment from the Narrabeen Lagoon entrance.

Lessons Learnt

Experiencing an incident like this provides a unique perspective on how future similar events can be managed. The use of an incident management framework was a critical factor in being able to respond quickly and escalate as required, however the lessons learnt from a range of other parts of the incident will be incorporated into future response planning.

Incident Management Systems

The use of the AIIMS approach was invaluable during the event. It provided a critical

framework within which to make decisions and ensure the right level of support and co-ordination was being provided by the right people at the right time. Utilising a consistent framework makes it easy to pair “partners” with combat agencies. For example, Communications/Public Information teams are able to liaise for consistency, Operations teams are able to allocate resources in an efficient and agile fashion and Incident Controllers can compare plans and the responsiveness of their organisations to ensure an effective response.

Once an incident management system has been adopted by an organisation, it is essential that incident decision makers are trained and understand how it works and how it escalates. The amalgamation demonstrated that a lack of consistency in frameworks can be overcome if one of the frameworks is sufficiently strong/robust, however common training makes it easier to communicate and respond during the incident.

Multi-site Incident Management Response

Council had set up its IMT at the Civic Centre in a dedicated meeting room. This worked effectively during the initial stage of the incident, however over time, as the focus switched to the Collaroy-Narrabeen area, a number of critical IMT members found themselves on the ground providing minute by minute advice to combat agencies and homeowners. As a consequence, a gap opened up with the IMT. The pressure on individual members at Collaroy was significant because of the overlap as they stepped into operational roles. It was not uncommon to have media, multiple emergency services (NSW Police, SES, Fire & Rescue), residents and management following around the individual IMT member seeking urgent answers to a multitude of questions. After 24 hrs an expanded IMT was established to include a sub-team on the ground at Collaroy which proved to be very effective. New roles were established to handle:

- all communication and co-ordination with affected residents
- all media enquiries, press conferences, site access, talent etc
- co-ordination of building assessments for safety of access
- planning and intelligence for response activities

The overall Incident Controller was still based in the main Incident Control Room, and the on-site expanded roles would report back to their functional lead in the ICR, ensuring the overall visibility and control was in place. In future incidents, once a particular area has been heavily impacted which requires significant resourcing, a sub-group will be immediately established at that site to provide better connection to the IMT.

Media management

Given its proximity to Sydney’s newsrooms, the impact of the storm on the Sydney coast drew significant media interest. This created another additional pressure in the incident response phase. Media require access to areas that enable the greatest visual story to be told, and in the case of Collaroy that meant that the areas being accessed were often the least safe. The NSW Police managed this process very well by allowing one film crew and photographer to be accompanied into areas with good vantage points and then that crew would share the footage with other outlets. This meant that media could tell the story without having a significant impact on resources of the emergency services (to

either move them on or escort them for safety).

In terms of managing the media enquiries on-site, a single point of contact was essential (and preferably someone with media experience). By directing all media through a central point, it was much easier for the critical IMT members to get on with the job. A single phone number was given out so that as staff rotated in and out of this role, communication was maintained with the media which reduced potential conflicts.

At some point press conferences and the like become unavoidable. It is important to understand ahead of time, who will be the voice of the organisation (the policy voice), who will be the voice of the emergency services and/or operational teams, and who will be the political voice for that area. This allows well thought out co-ordination of press conferences that fit with the timeframes required of the modern media (typically the breakfast timeslot, the mid-morning/noon bulletins, and the evening news bulletins). It is important to understand who is visiting the site and when so that media interaction can be managed to avoid conflicts or operational disruption.

Combat agency interaction

The coastal and flooding incident was declared an emergency on Sunday 5 June with the opening of the Emergency Operations Centre (EOC) by the Northern Beaches Police Commander in his role as LEOCON. This declaration can provide large amounts of resources and expertise in an emergency. Emergency services are geared to fixing problems quickly often without the bureaucratic/legislative barriers that Council officers have to consider. When they are in control of a site and a situation, they expect rapid decisions in order to best deploy resources. This can cause a significant amount of pressure for decision-makers (e.g. Coastal managers) when this inertia hits a complex policy problem like coastal erosion.

Emergency services delivered amazing outcomes that would not have been possible if Council had to rely on its own resources (e.g. RFS and hundreds of volunteer lifesavers sandbagging behind protective works over hundreds of metres to prevent failure of those works and inevitable debris on the beach, managing property evacuations and property access, Fire & Rescue NSW providing additional structural advice to complement that of Council's consulting engineers and assist property owners, traffic management, media management etc). There is little doubt that the emergency services were instrumental in the outcomes that were achieved at Collaroy-Narrabeen, however it is important the these services and Council regularly consult over complex issues that will require a joint response.

A decision was made early on Sunday 5 June to send a technical officer to the EOC to support their IMT and be the go-between for the EOC “Planning/Intelligence” and the Council “Planning/Intelligence” members. This made a huge difference compared to previous incidents (e.g. April 2015) and ensured a very easy transfer of information and in many cases, decisions were able to be made in advance of the next stage of the crisis.

Intelligence

When the EOC was making decisions about evacuations, they needed street numbers and street names for deploying front line emergency services. Council flood information

is often held as maps. During the April 2015 event, staff were put under extraordinary pressure to produce these street addresses (given 10 minutes to accurately forecast peak flood levels and identify approximately 100 individual street addresses in the middle of the event, followed by a subsequent request for 200 properties in another catchment, requested with a 5 minute delivery time). The advantage of this experience, was that in the post-storm analysis effort was put into more accurately gathering this information. This proved invaluable during the June 2016 event given the extraordinary change in water levels and the speed at which the flood response needed to be recalibrated.

In terms of the coastal erosion event, an existing dossier of beachfront property structural information was incredibly valuable. As staff, emergency services and engineers went door-to-door at the height of the erosion event, the property dossier was used to determine whether the footings of the buildings were sufficiently sound given the scale of the erosion occurring.

Expertise

The most important resource during the entire event, was access to coastal engineering expertise to inform decision making. This was essential during the monitoring part of the event, as the erosion began to unfold, and especially during the response (advising on impact and evacuations) and recovery stages (advising on long-term solutions). In the initial 24-48 hrs these engineers were joined by structural engineers who were able to direct safe resident access, advise Council's building surveyors and assist in the drafting of orders for occupation and recovery. In addition, Council has an in-house legal team, which was important for managing Council's liability, ensuring Council's actions and those of landowners were lawful, and in the drafting of orders and the like.

During the event and for a number of days during recovery, access to the beach was limited which made it difficult to survey beach debris, inspect property damage and determine appropriate ways to access the beach for clean-up and stabilisation work. The use of drones was very useful, and at one stage there were at least three organisations operating drones (UNSW WRL, NSW Fire & Rescue, and Westpac/Surf Life Saving NSW). Council has its own drone, however the quality of the information being gathered by these other agencies was superior and was shared to assist with the recovery effort.

The other group that was essential was the electrical, gas, water and sewer utility providers. Sydney Water lost a significant portion of its local sewer assets which resulted in raw sewage entering the ocean until they were able to close off the nearest junctions. Gas and water lines were compromised within properties as the erosion worsened and needed to be shut down, along with the electricity lines from the street. The utility providers assisted in providing safe access to the properties and ensured emergency services could continue to operate without these risks.

Resident support

While the evacuation of over 800 flood-affected residents was handled very effectively by the emergency services (using well established protocols and processes), the coastal erosion emergency was different in many ways and the process evolved more organically with a lot more Council involvement. As the impact of the event sank in,

residents found themselves not only homeless, but with strangers restricting access to their homes, Council staff and emergency services accessing their properties, media requesting interviews, uncertainty of insurance cover and an uncertain period without their usual routines (school, neighbours, operation of home businesses etc). They were under extraordinary stress and Council made an early decision to provide a significant amount of support.

Emergency services would not allow property access without engineer/Council approval. Council couldn't afford to station several engineers on-site to allow for residents to access their properties at any time, so rostered times for access were established. This made life easier for those managing the site, but harder for residents who were trying to conduct their own lives and occupations. To overcome this, Council established hot-lines in the incident control room, and appointed a single person to be on-site and contactable at all times to co-ordinate access and individual needs. Together with coordinated mass SMS text updates this targeted and frequent contact significantly improved communication with residents and ensured that issues could be resolved quickly and didn't escalate. It also assisted in separating communications from the experts that were still trying to manage the issues. In the initial stages, this impacted on the experts as they had tried to assist residents whenever requested.

As the initial emergency passed, fixed meeting times were established to ensure residents could come together as a group and discuss issues and be updated at once. This made it easier to convey the whole message at the same time and make sure everyone heard the answers to every question. Council offices were made available, and technical staff, Council management and the Administrator would attend these meetings for part of the time to assist in providing updates on what Council was doing. All of these communication tools were essential in maintaining open relationships with residents and ensuring they were supported.

Communication flow

As the event unfolded, the level of interest and involvement from other parties increased. Communication was a critical element of both the planning and response. This is important because often it's only during response that communication is a focus, whereas early communication protocols in the planning stage can help manage expectations during the busiest and most intense parts of an incident. Status updates were provided from the moment the IMT was formed, with updates provided between twice a day in the planning phase, to every 3-4 hours during response mode.

Status updates were prepared by the Public Information/Communications functions of the IMT and covered activity across all the roles in the IMT, gave a situation report on the ground conditions, set out the current intelligence, advised of changes in roles within IMT, outlined the timing of the next status report, current operational activity, and critical decisions. These reports were sent to the executive and to the IMTs of the agencies working with Council to ensure that there was a consistency in the operations of the various groups (also critical as the event expanded).

It is also important that activity within the IMT (particularly for a significant incident) is captured and logged including any external advice, critical decisions, and the context that the decisions were being made within. This is essential for a post-event review and also to ensure that if the decisions are later challenged or result in an adverse outcome, the full context of the decision can be outlined.

As discussed previously, communication remained a central role within IMT, however multiple “subordinate” roles were created during the event to manage media involvement on the ground, and also the interactions with the residents. It is important that the composition of an IMT is flexible, agile and responds to the needs of the incident rather than remains fixed in a pre-determined structure.

Resource and fatigue management

One of the final lessons that was learnt perhaps a little late in the incident was the need for vigilance in resource and fatigue management. There was so much for the IMT (and especially the Incident Controller) to do, and while we had accounted for rotating over a relatively short period (24-48hrs), we had not considered the implications of a 24/7 response over the course of many days of response mode. This meant that handover was done in response to exhaustion, rather than in an orderly process.

In addition, the importance of role delineation cannot be overstated. As a role expanded, it was important to clearly define roles and bring new people into the team in subordinate roles to ensure that a lead IMT role (e.g. Communications as in the above section) is not swamped. In retrospect, it would have been helpful for the Logistics role to have been supported by a subordinate who was focusing on how to support and resource the incident over multiple days. One of the issues which unexpectedly compromised this effort was the relatively small number of competent, trained incident controllers. This small group very quickly grew tired and needed replacement.

The final issue worth noting in the allocation of resources and management of fatigue is ensuring that subject matter experts are not too heavily involved in incident control, because they need to be able to think clearly and respond quickly on the ground. This is obviously difficult if they are also controlling all the moving parts of the IMT and the response/recovery effort.

Conclusion

East Coast Lows are unpredictable and can be more significant or less significant than forecasts. The importance of a strong incident management framework and appropriately skilled staff cannot be overstated. The fact that the AIIMS system could be rolled out, scaled up and used to effectively manage a major local emergency despite only a handful of people in the new organisation being well trained is a testament to its flexibility and adaptability. Future incidents should always learn the lessons of the past, and given the ability of east-coast lows to affect councils along the NSW coast, it is important that these experiences are discussed openly between colleagues for the future benefit of all.

References

AFAC (2013). The Australasian Inter-Service Incident Management System, Australasian Fire and Emergency Service Authorities Council Limited, East Melbourne, Victoria.

BOM (2016) Monthly Weather Review Australia – June 2016, Bureau of Meteorology, Commonwealth of Australia, Victoria.