

## Townsville 2019 flood – insights from the field

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Flooding impacted large areas of Townsville from Wednesday 30<sup>th</sup> January 2019, as a consequence of heavy rainfall across the north of Queensland. The Bureau of Meteorology (BoM) noted that 370mm of rain fell within 24 hours at Paluma near Townsville. Almost 3300 properties were damaged, thousands were asked to evacuate and there were widespread blackouts. The flooding came in waves, with the initial rainfall causing around 30 cm of flooding in the worst affected areas. This subsided somewhat before more rain fell in the catchment, necessitating the release of water from the Ross River Dam, which led to flood depths of up to 1.6 m over floor height.

These were the highest rainfall volumes on record for this area, with most rain gauges suggesting the rainfall volume was on the order of at least a 1:200 year event. In some areas, like Mt Margaret, it was much greater than this. This rain event was produced by the southern arm of a low pressure trough that was centred over the Gulf of Carpentaria, drawing rain in from the Coral Sea. The low pressure system was part of the monsoonal trough which occurs around this time of year. This same causal event was also responsible for the generation of Cyclone Oma, which has concerned people tuning in to the regular Bureau of Meteorology updates.

While it is not possible to say whether climate change played a role in the intensity of this event, the event occurred after the final breakdown of the blocking high pressure system in the Tasman Sea which was the cause of the sustained heatwave conditions over much of Southeast Australia in January and delayed the onset of the monsoon. There is some theoretical base to suggest the stationarity of synoptic weather systems may increase with a weakening of the summertime circulation associated with anthropogenic warming, although there is little coherent evidence for this at present.

Risk Frontiers and Insurance Council of Australia staff visited Townsville on 11<sup>th</sup> and 12<sup>th</sup> February, supported by a grant from the Bushfire and Natural Hazards CRC. The aim was to undertake unstructured interviews with residents and business operators to gain preliminary insights into impacts and responses to warnings and to examine initial recovery. In total, more than 20 residents and six business operators were spoken to. This briefing note highlights key preliminary themes that arose from this research.

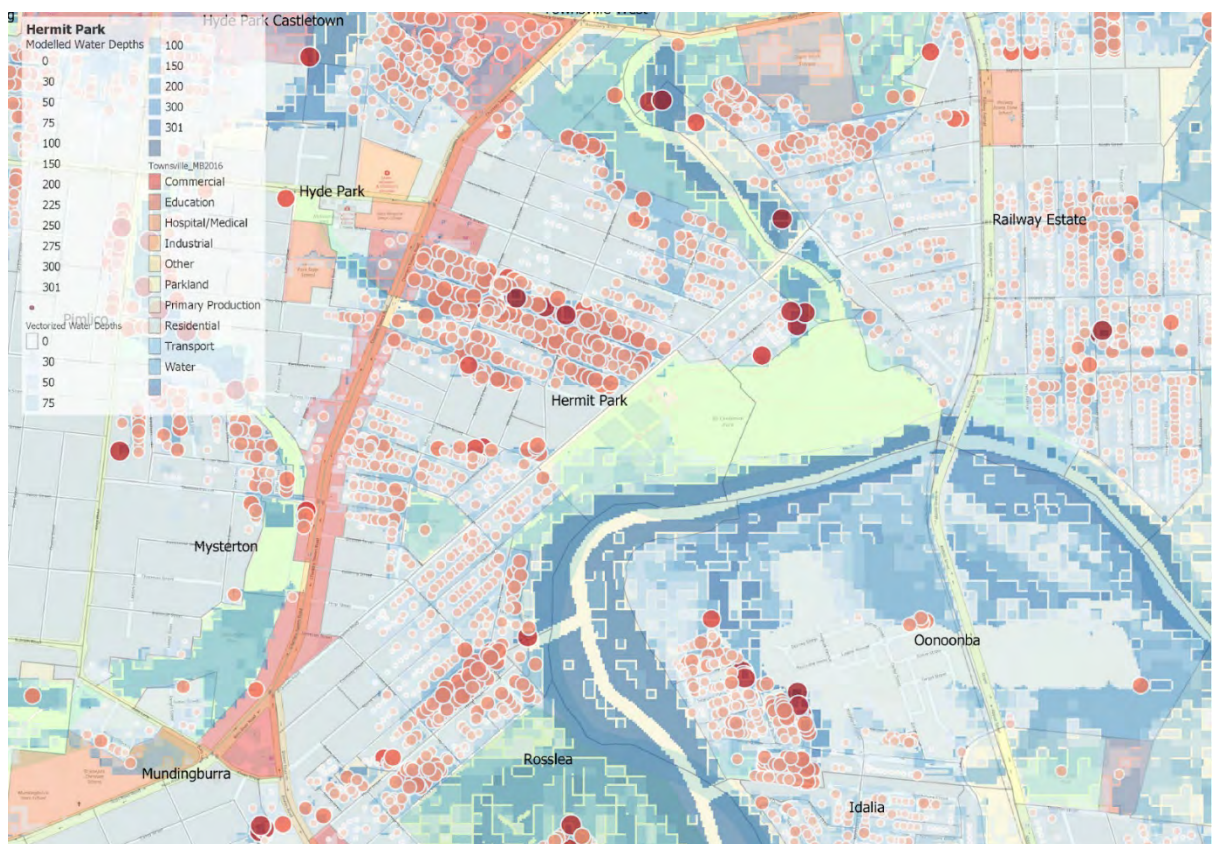
### Research Preparation

Before arriving in Townsville, Risk Frontiers acquired the Townsville city maps which indicated the likely flooding from a 2000 m<sup>3</sup>/s release from the Ross River dam and georeferenced that image onto the city. This was done by using the coordinates published on the frame of the map (the graticule) and linking that to points of reference on the ground. [See figure 1?]

Image classification was then used to extract the colours from the map which corresponded to the different depths of potential inundation and a GIS layer corresponding to those depths was created. Depths were then determined for every G-NAF (Geocoded National Address File) point which fell within the inundation layer and were mapped accordingly. OpenStreetMap data was also incorporated for a reference to the streets and other points of interest in the city, and the

landuse data from ABS meshblocks (the smallest statistical area containing around 20 households) was used to quickly separate residential from commercial and industrial building types.

The purpose of this map was to identify the most affected areas to prioritise the investigation and to assist in validating the modelled depths (which seemed to be very accurate, with minor exceptions usually being lower elevations in parkland or likely due to very minor shifts (e.g. <1m) in registration of the image prior to the analysis being performed).



**Figure 1: Sample Townsville map showing modelled flood extents and depths from Townsville City Council and inferred property depths**

## Impacts

Residential flood damages in the main appear to have been restricted to the ground story areas of raised dwellings, with peak flood heights reaching roughly halfway through these first floor or understorey living areas. In many cases it would appear that these spaces were occupied at the time of the flood and, in some instances, rented to others. The majority were certainly used for extensive storage. There was a smaller number, approximately one quarter of lower-set, slab on ground dwellings in which flooding impacted main living areas.

Almost every home and business on the floodplain had a large muddy pile of possessions stacked by the roadside awaiting council pick-up [figure 2]. Common residential items damaged were carpets; household appliances such as fridges, washing machines, dryers; cupboards and drawers; fabric lounge chairs, chairs and tables; hardware; bedding; doors and outdoor furniture. Some

residents mentioned stacking goods on tables or on shelves within the ground storey to attempt to put goods above the floodwaters or to relocate smaller, valuable items to the upper storey (where possible). At least one resident employed the creative solution of placing valuable items on inflatable platforms.

As many living spaces were spared damage on upper floors, the majority of people appeared to have remained living in their homes. Those whose dwelling was not habitable reported staying with friends.

Commercial damages largely varied with the type of business. We observed a number of businesses that had suffered significant losses. For example, the Townsville RSL suffered a total loss downstairs due to the floodwaters and was also in the process of stripping the upstairs due to mould that developed following the flooding. The RSL noted that they were receiving support from other clubs (e.g., supplying the RSL with their surplus equipment) and expected to have the upstairs of their business operating again within four weeks. However, they faced longer lead times for suppliers to fully refit the downstairs and were estimating business interruption of some six months.

Some businesses reported that they could not move large pieces of equipment to protect them in time. Most reported that they were insured and some said that they had sufficient warning time to relocate equipment, including stock and computers, with only minor damage suffered. An electrical / solar installation business had lost around \$10k worth of stock after up to 1.5m of water affected their business. The manager said he had redeployed half of his workforce to make safe existing solar installations where the equipment (inverters or isolators) may have been damaged by brackish water while the other half of his workforce completed new installations. He estimated that, with 400 installations to inspect and make safe, it would be many weeks before his workforce would be back to business as usual.

Most flood-affected businesses had closed for a week to enable clean-up and restoration to occur, with some reporting slightly longer shutdowns as they had made preparations in the Thursday and Friday before flooding. They operated without electricity in general for four or more days (Monday 4 February to Thursday 8 February) but continued to clean up. The majority had restarted trading if they had power reconnected and had not suffered significant losses (e.g., the local Ford dealer, automotive workshops and electrical wholesalers were operational) but a number of restaurants and cafes were shut along Charters Towers Road in south Townsville, presumably due to a lack of electricity and spoiled food due to a lack of refrigeration and perhaps mould in their kitchens. Outside of the flood-affected areas a café operator reported that they had lost their food supplies and were still working to get back to being fully stocked.



*Figure 2: Roller doors in Eastern Idalia potentially damaged by an electrical short. High flow flood waters were ruled out as a cause based on lack of debris and vegetation.*

While significant flood velocities were not reported in Adalia, some structural damage was observed to a few roller doors which were electrically operated. It was surmised that there may have been an electrical short causing the motor to attempt to open the door while it was locked in place, twisting and bending the door upwards within its frame. Figure 2 shows an example of this. There was also one occurrence of a tree having fallen on a building, seen in figure 3.



*Figure 3: Debris and furniture in the foreground. In the background, a tree has fallen on the roof of what appears to be a childcare centre.*



*Figure 4 – Showing damage to a commercial property’s roller doors in Hyde Park.*

Across the wider Townsville community, many schools had been closed as flooding was occurring and have now reopened, but a number of early-childhood centres remain closed. Several parks with play equipment have also been closed.

Recent commercial developments were also subject to flooding. These buildings have floor levels set above the one in one hundred year flood level, but that wasn’t sufficient to prevent significant water depths flowing through them. This included a large number of shops in Fairfield where BP, Bunnings, the Fairfield Central Shopping Centre (Woolworths, Kmart and a number of smaller businesses) and Fairfield Homemaker Centre (Petbarn, Pillowtalk, Godfreys etc.), were all still closed a week after floodwaters had subsided.

## Community response to warnings

The Bureau of Meteorology, Townsville Council and the QLD Fire and Emergency Services (QFES) provided warnings and information to the community throughout the event via websites, traditional media, door-knocking and social media. The local Council also utilised text messages and other social and traditional media to convey information during the flooding and the dam release.

Many in the community appeared to be caught off-guard by the scale and speed at which the flood occurred. Others believed that residents simply did not believe that the magnitude of the flood would eventuate. They discussed how their decision-making was influenced by a number of past flood events and many spoke of their memories of previous events and then the realisation that this was going to be a larger event when their local landmarks of previous flood extents were submerged.

Overall, people described flood warnings as 'okay'. Some implied they had found the warnings and particularly the maps difficult to understand and, as a result, misinterpreted the potential level of floodwaters at their house. Others, however, noted that, while text message warnings were vague, it had prompted them to seek further information from the range of sources available and to "take responsibility" for what might happen to them. Suggestions for improvement included providing warnings more regularly and, in regard to the dam release warning, earlier. The suggestion that "if council knew there was a hard limit and the gates would open automatically that should have been conveyed" was repeated a number of times. There was limited criticism of the dam operators, with the majority feeling that "they had done a good job" under difficult circumstances and had the water not been released "it would have been a lot worse". A dissenting opinion was that, if the dam is to be used for flood control, it should be largely empty before the wet season to maximise the ability of the dam to retain flood waters.

There was significant local flood experience among the worst affected areas in Hermit Park and Rosslea, with many locals stating they had lived in the area for a long time (some with family experience back to the 1940s) and they were well aware of the nature of flooding in the area. They hypothesised that some development had made the flooding worse (infilling of an old rubbish dump with a retaining wall that acted as a dam or levee at Bicentennial Park, for example); recollections of watching floodwaters overtop what is now Idalia while remaining dry in Rosslea were also common. The refrain "how could they have allowed that development" was heard from a number of long term-residents.

## Initial Recovery

Both formal and informal mechanisms were observed to have assisted recovery efforts. Emergency services, defence personnel and council staff were assisting with the clean-up. Others brought assistance for those affected on an informal level, and family and friends assisted in the clean-up. In general, the mood among those we spoke to was upbeat, with the majority having insurance and stating "it could have been worse" or "I'm lucky, others have it worse than me" – often while standing beside a pile of ruined belongings on their lawn. The generosity of the flood victims was also apparent, with most people offering us water, food, a spare hat etc. despite having had a difficult time already and with likely more hard work ahead of them.

The resilience of the community was reassuring and inspiring.

## Discussion and conclusions

Though Townsville had just experienced a significant and very damaging event, we were left with a sense that the community was functioning, and that there was resilience amongst community members, who seemed to be getting on with the job of cleaning up despite significant uncertainty over the coming weeks through the recovery.

Despite commentary about the size of this flood being unprecedented, bigger floods are definitely possible in Townsville (even denoting this event as a 1 in 500 year event it is far below the potential extent and depths likely to be experienced by a Probable Maximum Flood (1 in 10,000 year event)) and there is much to be learnt from this event. The physical and social impacts would have been far greater had the floods been only a little higher as they would have inundated living spaces of two-storey homes, making them entirely uninhabitable and doubling (or worse) losses for families and debris to be collected and dramatically increasing the displaced population.

There are significant opportunities to better understand community risk perceptions, responses to warnings, sheltering behaviours and flood damages, as well as gaining evidence of the effectiveness of flood mitigation and flood warning systems.

Several policy and communication issues are already apparent, including:

- what should be done to reduce flood damages in enclosed ground floor areas of raised dwellings? At the least these areas should not be rented as habitable space to others
- while the Townsville community is fortunate to have the resources of the Australian Defence Force nearby, a larger flood would have necessitated many more rescues which might have overwhelmed their capability. In any case, without local defence resources, a much wider emergency response would have been required
- as raised in our previous briefing note on land-use planning in flood prone areas, it is essential to adopt a risk-based approach to floodplain management and to ensure that the disclosure of risk considers all event magnitudes.