Australian Government
Bureau of Meteorology

Tropical Cyclone *Helen*

1 – 7 January 2008

Darwin Tropical Cyclone Warning Centre
Bureau of Meteorology

A. Summary

A low that formed over the Top End and moved over the Joseph Bonaparte Gulf and intensified to cyclone intensity on 4 January and recurved towards the Northern Territory coast. Helen reached category two intensity before making landfall south of Darwin late on 4 January. Although not an intense system, *Helen* is notable for being the first cyclone to produce gales in Darwin since Tropical Cyclone *Gretel* in April 1985.

The maximum recorded wind gust was 120 km/h at Charles Point Lighthouse, while Darwin experienced a maximum wind gust of 102 km/h at about 2am CST 5 January. Winds in Darwin were enough to uproot or snap many trees. There were a few houses that suffered damage from trees falling on them. Powerlines also came down when trees fell across them. Approximately 15,000 homes lost power on Friday night, and there was widespread communications disruption.

Widespread 100-200mm rainfall totals over the weekend of 4-6 January caused some rivers across the western Top End to rise. The Adelaide River at Adelaide River Township reached major flood level during the afternoon of Saturday 5 January. Similarly, the Waterhouse River at the community of Beswick to the east of Katherine was at and near major flood level for most of Sunday and into Monday. The Katherine River at Nitmiluk Centre reached minor flood level on the afternoon of Sunday 6 January.

Tides along the west coast of the Top End were neap on the evening that TC *Helen* made landfall, with tide levels remaining several metres below Highest Astronomical Tide level. This largely contributed to the lack of storm surge damage to coastal areas

B. Meteorological Description

Leading into the 2007/08 Tropical Cyclone Season, the eastern Pacific Region had been showing consistently strong signs of a developing La Nina since autumn 2007. The typical signals for a La Nina in the Australian Region – namely higher than normal SST's and strongly positive SOI values – were not clear when the Seasonal Tropical Cyclone Outlook was issued in October. However, by the beginning of December SST's had warmed considerably, while the SOI had remained steady around +10 for a few weeks, and hence a state of La Nina was declared for the

Australian Region around this time. Combined with the newly developed La Nina, a very strong active phase of the MJO began to develop in the Indian Ocean around 10 December. By the 24th, the MJO was entering the Northern region, with westerly winds increasing to the north of the Territory. Tropical Cyclone Melanie formed off the northwest coast of Australia on 28 December, and it was around this time that a weak low began to form over the northwest Top End, between Darwin and Katherine.

For the next couple of days the low moved slowly eastwards across the Top End, with little or no development. In the upper levels, a convoluted upper trough over eastern Australia was retrogressing, and on 30 December, a low had cut off from the trough and was moving west across the Top End. Around this time, the monsoon northwesterly winds further increased and steered the low towards the southeast, near the southwestern Gulf of Carpentaria. The retrogressing upper low encouraged development in the divergent flow on its eastern flank, and the low deepened to 993hPa on the evening of 31 December.

Upon development, the system came under a middle-level steering influence, which was more easterly due to the strengthened ridge over southern Australia. The system then began to track towards the west, back across the base of the Top End. During its traverse back across the Top End, the system was under the influence of significant northeasterly wind shear, with deep convection becoming well removed from the low level centre. Correspondingly, the low weakened and central pressures rose to around 998hPa during this time. At around midnight of 2 January the weak low-pressure system moved over water into the Joseph Bonaparte Gulf. Convection remained limited near the low level centre, and the system only developed slowly for the first 12 hours. On the evening of the 3rd, when the low was near the north Kimberley coast, the system began to show signs of significant organisation. As the system developed, renewed mid-level ridging over Western
Australia steered the low towards the north, away from the north Kimberley coast. Development continued at the Dvorak standard rate of intensification, and at 9:30am CST 4 January, the system was named Tropical Cyclone *Helen*. As the system continued to move north, it came under the influence of the strong westerly monsoon flow to the north, and began to accelerate towards the east.

At 6:30pm the same day, TC *Helen* reached Category 2 intensity, before making landfall at Channel Point at around 10pm at close to its peak intensity. Tropical Cyclone *Helen* continued to accelerate towards the east, and had weakened to below cyclone intensity approximately 12 hours after landfall, when it was east of Adelaide River. The low tracked quickly across the Top End and into the Gulf of Carpentaria, and did not redevelop into a Tropical Cyclone prior to moving over Cape York Peninsula on the 6th.

Landfall

Since radar coverage was so good, it is worth revisiting landfall in a little more detail. In the hour or 2 prior to coastal crossing, the eye underwent what appeared to be an expansion, with the northern eye wall almost becoming a “feeder band” into the cyclone, and the southwestern eye wall becoming detached. This increased Darwin’s chances of receiving gales (due to closer proximity to feeder bands), while also decreasing its chances of receiving storm force winds (weakening of overall system strength due to eye expansion). At the time of this image, the Dundee Beach area

was experiencing its greatest damage in the northwesterly winds underneath the northern eye wall, while gale force winds were just beginning in Darwin.

After landfall, the southern eye wall began to reintensify, and a wedge of intense storms was evident on radar. Channel Point observers described the worst part of the cyclone being the second wind that came from the southwest, consistent with the re-intensifying southern eye wall. Although there were clear asymmetries in the radar imagery prior to landfall, Channel Point observed a “calm” that lasted around 1 hour.

C. Impact

As is often the case with Southern Hemisphere systems that are accelerating towards the east, the northern quadrant was the area of maximum wind speed, maximum wave height, maximum storm surge, and therefore maximum impact. Below is a summary of the main impacts:

Channel Point (landfall location):

- Approximately 10-15% of trees in cleared, open areas were downed or snapped. The
- majority of damage was due to failure of the tree root system.
- An iron roof was blown off a gazebo near the foreshore.
- A satellite dish was blown off the top of a roof.
- Several houses suffered minor structural damage due to fallen trees.
- Estimated storm surge of 2-3m, which only just surpassed the Highest Astronomical Tide mark in a few places.
- Waves overtopped dunes in some places, but there was no damage to infrastructure.

Darwin:

- Approximately 1500 trees were downed around Darwin.
- Several houses received minor structural damage to roofing by fallen trees.
- Many powerlines came down with fallen trees, cutting power to approximately 60% of Darwin homes.

Adelaide River Township:

The river peaked at 11.84m, at 1330 CST 5th January, which exceeded the Minor Flood level.

Victoria River:

A man drowned in the Victoria River, when his car was swept off the road by floodwaters (this occurred in the pre-cyclone period).

Katherine:

Katherine Rural Areas went into Flood Watch, with Nitmiluk Centre reaching a Moderate Flood level peak of 5.77m at 0130 CST on 8 January. However, the river never reached minor flood level at the bridge in town, peaking at 15.03m at 1409 CST on the 8th.

Figure 1. Track of Tropical Cyclone *Helen* December 2007 – 6 January 2008.
All times in CST.