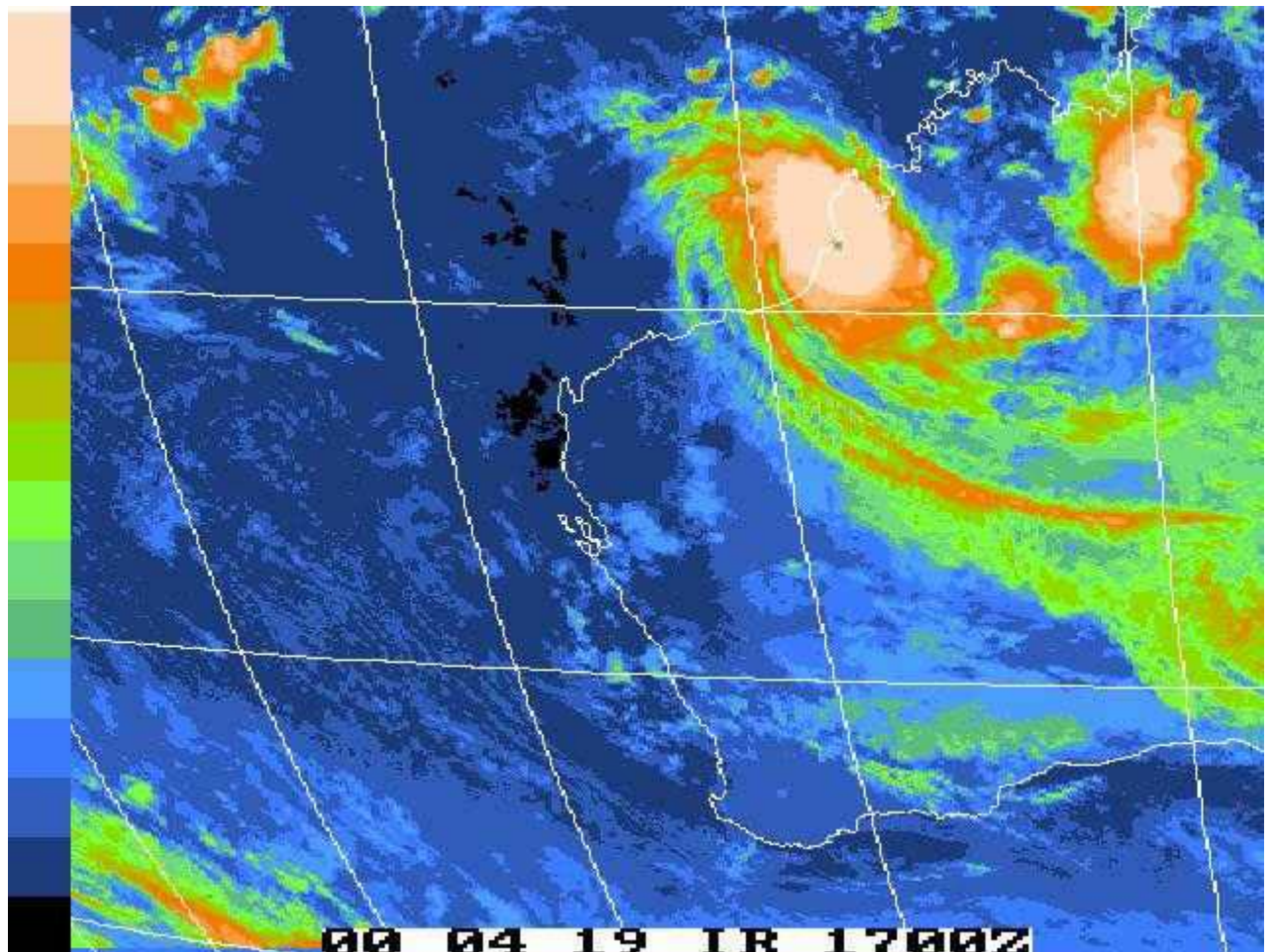


# Cyclone Rosita April 20, 2000 Broome. W.A.



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Cyclone Rosita  
Broome – April 20, 2000  
Post Disaster Report

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For  
Emergency Management Australia  
Commonwealth Bureau of Meteorology  
Department of Fire and Emergency Services W.A.  
State Emergency Services W.A.

The Bureau of Meteorology supplied the satellite image of Cyclone Rosita that appears on the cover of this report, the cyclone track map and meteorological details of Cyclone Rosita.

Special thanks for their contribution to the production of this report to

Gary Gifford  
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Barry Hanstrum  
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Broome residents that participated so willingly.

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Tropical Cyclone Rosita, a severe Category 5 cyclone, crossed the west Kimberley coast 40 kilometres south of Broome at 0100WST (Western Standard Time) April 20, 2000. It was one of the most severe tropical cyclones to cross this section of the coastline in the last 100 years. The tropical cyclone was named on April 17 while it was located 670km north of Port Hedland and tracking in a south-south-westerly direction. During April 19 Rosita intensified into a severe tropical cyclone and changed track to a more easterly and later east-south-easterly direction. Residents of coastal communities around Broome were warned to prepare for the impact of Cyclone Rosita and take precautionary action. Rosita was a small but very powerful cyclone. The lowest central pressure was estimated at 930 hPa and maximum wind gusts were 290 km/h. The radius to maximum winds was 10 km and radius to gales just 70 km, this is about half the average for cyclones in northwest Australia. The core of very destructive winds extended only about 25 kilometres from the centre. In the township of Broome maximum wind gusts of 153 km/h were experienced around midnight April 19. Relatively little precipitation was associated with this cyclone with just 167 mm of rainfall recorded at Broome in the 24 hours to 0900 WST April 20.

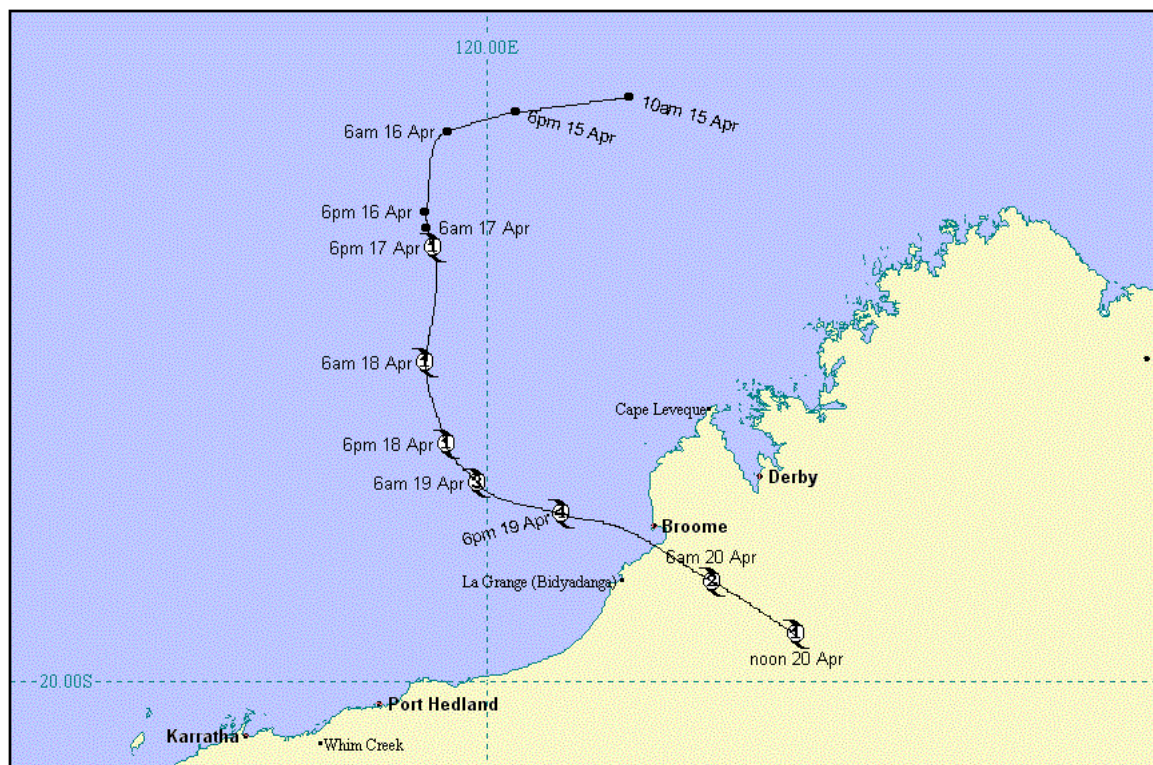


Figure 1. Cyclone Rosita Track

Broome, with an estimated usual resident population of approximately 11,000 is located at 18°0'S: 122°15'E in Western Australia. It is 2,250 kilometres north of Perth and is considered to be the southern gateway to the Kimberley region. It is of very



high tourist value as a 'tropical oasis' nestled between the blue waters and white sandy beaches of the Indian Ocean and the spectacular red and green landscape of the Kimberley wilderness. With its stunning natural beauty and wealth of historic sights it is a popular holiday destination and the local economy depends heavily on the tourist industry. Broome was originally established as a pearling port in the 1880's. Over the years it has been settled by people of diverse nationalities including Europeans, Malays, Chinese and Japanese, as well as Australia's Indigenous People many of whom, in Broome's early days, flocked to the shores of Roebuck Bay in the hope of making their fortune from the pearling industry. Pearling, particularly the farming of cultured pearls, continues to be one of the town's major industries. Broome is also a hub for the northwestern Australian fishing industry. It is 1,859 kilometres by road from Darwin and is situated on a peninsula surrounded by the Indian Ocean and Roebuck Bay at the edge of the Great Sandy Desert. The nearest towns are Derby (221kms), Port Hedland (604kms), Fitzroy Crossing (391kms) and Kununurra (1032kms).

During the period that Cyclone Rosita threatened the West Australian coast residents of Broome's 5,000 or so households were in many ways fortunate as the region of very destructive winds passed approximately 15 kilometres to the south of the township. The most destructive winds impacted at Cape Villaret where the Eco Beach tourist resort is located and at nearby Yardoogarra and Thangu Stations where the eye crossed the coast. After making landfall Rosita moved southeast across the north of the Great Sandy desert passing across the community of Balgo Hills around 2200 WST April 20, approximately 700 kilometres inland. It was estimated to be still a category 1 cyclone and caused some damage to trees and property.

As Cyclone Rosita crossed the coast Broome experienced winds approximately equivalent to a Category 3 cyclone and properties in Broome suffered extensive damage to trees and vegetation. Several properties sustained varying degrees of structural damage that was primarily caused by falling trees or flying vegetation debris. A few properties suffered wind damage to roofs.



Figure 2: Damage to vegetation in Broome



Figure 3: House damaged by falling tree - Broome



Figure 4: Roof damaged by high winds - Broome

The Broome racecourse buildings and stables on Gantheaume Point were particularly exposed and suffered major damage with many of the structures totally destroyed. Early estimates of repair and replacement costs were in excess of \$1,000,000. This venue is essential for the hosting of The Broome Cup weekend in July, - one of the regions major annual tourist events. In the immediate post cyclone period there were high levels of community concern that the repair work necessary to get this facility operational again could not be carried out in time for this years Broome Cup. Cancellation of this event would have a major economic impact on the town.



Figure 5: Broome Racecourse Stables

The towns power supply sustained major damage. More than 200 power poles were down or leaning over. Some were damaged by the high winds while others were hit with falling trees and flying debris. The power poles along one of the main lines to service Broome were described as ‘leaning over like a row of dominos’. Aboveground transformers also sustained damage. Some areas were able to have power restored relatively quickly and an effort was made to ensure the central business district was able to function normally over the Easter and Anzac Day holidays. Broome is particularly vulnerable to power outages during cyclones as the main transmission lines are all above ground (although some of the newer areas have underground supplies). Power was restored to many business and residential properties within 5 days with the majority back to normal by Sunday April 30 - 11 days after Rosita. Many residences suffered water damage to circuits during the short period of cyclone driven rain, these homes had to be checked before power could be turned back on and this caused some additional delays.



Figure 6: Fallen power lines – Gantheaume Point





Figure 7: Damaged electricity transformer and housing -Broome

High seas and cyclone driven waves caused extensive beach erosion particularly at Cable Beach. Dunes and cliffs were washed out along the full length of the coastline.



Figure 8: Storm tide erodes sand dunes and exposes rocks – Cable Beach



Figure 9: Sand dunes eroded by storm tide – Cable Beach

Much of the northern end of Cable Beach had been stripped of sand - some locals were jokingly referring to the area as 'Cable Rocks'. Coastal vegetation that had stabilized the base of the beach cliffs was also taken out by torrents of water.



Figure 10: Exposed rocks and washed out cliff bases – Northern end of Cable Beach



Figure 11: Cable Rocks! – Northern end of Cable Beach

Three of the main beach access points - two sets of concrete stairs and a concrete ramp - were dangerously undermined. The stairs, for the most part, remained intact however the ramp collapsed when the supporting sand dune was washed away.



Figure 12: Collapsed ramp access to Cable Beach





Figure 13: Stair access to Cable Beach – previously over sand dune

Many of the town's roads and streets were covered with a layer of sand that had been blown from the beaches. The boat ramp at Reddell Beach suffered structural damage and the pounding seas broke away large sections of the rocky cliffs and exposed outcrops along the coastline.



Figure 14: Remains of boat ramp at Reddell Beach



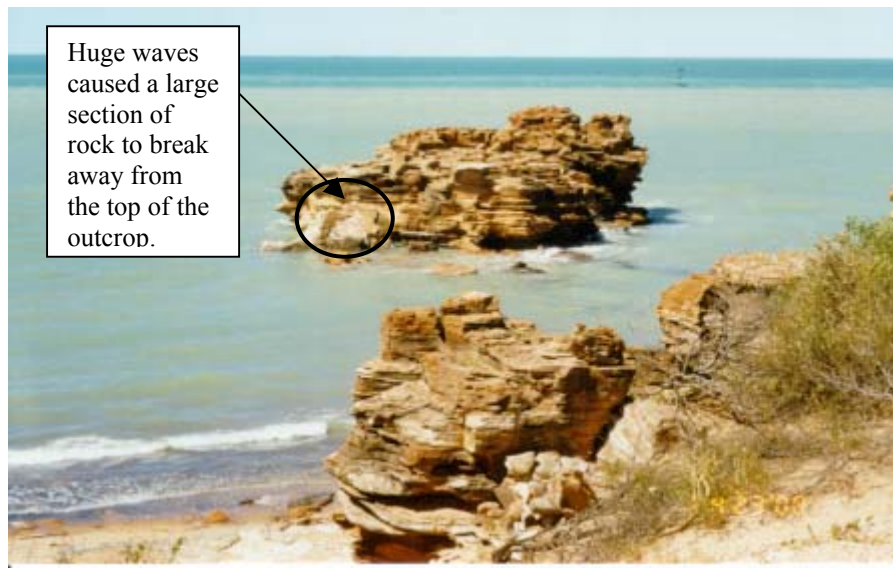


Figure 15: Coastal cliffs and rocks

The Port of Broome at the southern end of Roebuck Bay offers fully operational port facilities. The modern steel and concrete jetty has been recently upgraded and is open to the public for commercial and recreational fishing and boat launch. Boats in the port when Cyclone Rosita warnings were issued were generally able to get to safe anchorage before the full fury of the storm was felt. Despite this nine boats went missing during the storm, four of which were actually lost. These included a newly restored pearl lugger, a 10 metre trimaran, and a couple of smaller boats that service the pearl industry – one of these was broken up with much of the debris washed up on Cable Beach within a couple of days.



Figure 16: Broken boat debris washed up on Cable Beach

Two of the steel breakwater pontoons broke loose from their moorings and were later retrieved from around the peninsula where they ended up on Cable Beach.



Figure 17: Pontoon adrift – Cable Beach

Jetty and port facilities also sustained significant damage with several navigational aids being destroyed. The Port of Broome Chief Executive Officer has estimated the cost of this damage to be \$1.3 million.

## Impact of Cyclone Rosita on community residents

Broome lies within one of Australia's most active cyclone prone regions however it has not experienced the direct impact of a cyclone since Cyclone Lindsay in March 1985. Since then the population has more than doubled and a thriving tourist industry has developed. Today Broome's population is estimated to be in excess of 11,000 and this can more than trebled during peak times during the tourist season. Within the region it can be expected that four cyclones will develop annually with two coastal crossings. The 1999/2000 cyclone season appears to have been particularly active with Cyclone Rosita being the tenth to form off the north West Australian coast and the third to make landfall.

Immediately following Cyclone Rosita's coastal crossing a post disaster study was conducted in the Broome area to determine the impact of the cyclone on the local community residents. Survey questionnaires were administered, by telephone, to 30 households and interviews were conducted with representatives from emergency services, the fishing industry, tourist operators and accommodation providers, local businesses, local authorities and the Bureau of Meteorology.

When a tropical cyclone that is likely to threaten coastal communities' forms staged warnings are issued. In Western Australia these are colour coded and defensive action statements accompany each level of warning (Appendix III). The first level of warning is a Blue Alert - this indicates that a cyclone has formed and may affect the area within 48 hours. Residents are advised to check that all pre-season preparation activities have been undertaken. It is equivalent to a Cyclone Watch in Queensland. The second level of warning is a Yellow Alert - this indicates that the cyclone is moving closer to the area and appears inevitable in 12 hours, it is equivalent to Queensland's cyclone warning phase. The final level of warning is the Red Alert that advises that the cyclone is imminent. A warning siren accompanies all alert messages. All Broome residents that were interviewed demonstrated that they are familiar with this warning system and are generally well informed about actions that they are required to take.

Cyclone Rosita Blue Alert warnings commenced on the morning of Wednesday April 19, this was upgraded to a Yellow Alert at 1pm then to a Red Alert at 8pm. As it was possible that Cyclone Rosita making landfall would coincide with the high tide<sup>1</sup> at 11.30pm a dangerous storm tide was also forecast. Emergency Services and local residents began to prepare. Residents generally have experience of a Blue Alert as many cyclones have formed in the region but as most have continued to track down the coast and pose no further threat to the Broome community Yellow and Red Alerts have been infrequent. Despite this, household residents treated the Cyclone Rosita threat seriously and began appropriate preparatory activities, particularly ensuring food and water supplies, checking radios, torches and candles and clearing loose objects from yards and verandahs. Recommended season preparation appears to have been previously carried out (albeit in varying degrees) particularly the November clean up and rubbish pick up that is supported by the local council.

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<sup>1</sup> Broome has a tidal range in excess of 9 metres

Almost without exception residents received their first cyclone advice message via the radio. Some sought additional information from other sources such as the Internet and television but generally they depended on radio messages for regular updated messages. Overwhelmingly residents particularly appreciated the role the local ABC radio announcer, George Manning, played throughout the warning period. The Bureau of Meteorology's 1300 number for recorded advice messages appears to have been widely used and was considered to have been current and updated regularly. Residents indicate that they felt adequately informed prior to and during the cyclone period, some however expressed disappointment at the lack of current local information in the hours and days following the cyclone when power failures interrupted local radio transmissions.

Residents continued to fully prepare for Cyclone Rosita although many were not convinced that Broome would actually be impacted. People were generally surprised that a cyclone had formed so late in the season particularly as the dragon-flies, that are locally considered to signal the end of the wet season and cyclones and the beginning of the dry season, had already begun swarming. Recent history has shown that cyclones have usually impacted further south. Most agree however that this has been due more to good luck than any natural protection afforded by the local geography. This perception contrasts with many far north Queensland coastal communities where local folklore incorrectly concludes that the local topography will protect some areas from cyclone impact. Almost half of the residents surveyed have had direct personal experience of cyclones, others have friends and relatives that have previous experience. Most residents are relatively long term either in Broome – where the average length of residence of those surveyed was 14.9 years - or in the greater Western Australian / Northern Territory cyclone prone regions. As experience together with education are powerful influences in how an individual perceives the risk of a hazard event these factors may explain the communities willingness to respond appropriately to the Cyclone Rosita warnings.

Household units generally sheltered together during the passage of the cyclone. No households reported members that were unaccounted for during the storm. Many residents admit to feeling afraid while sheltering in their homes with the wind roaring out side and the sound of breaking trees in the pitch dark “.....the noise was unbelievable, just the roar, the consistency of it”; “.....I was fearful for my kids – it would be awful if I couldn't protect the kids anymore”.

Very few Broome properties escaped with no damage at all. Most suffered at least vegetation damage with larger trees loosing limbs and smaller trees blowing over. Exotics, especially the popular African Mahogany, were particularly susceptible to the high winds with many large well-established trees toppling. Many homes suffered water damage as the cyclonic winds drove the rain in horizontally. On interview residents were generally confident that they could cope with the level of damage their properties had sustained and often felt fortunate that things had not been worse. Many compared their situation to that of the residents of Exmouth and Cyclone Vance in 1999. Numerous residents expressed a strong sense of community with such comments as “...everyone comes together to help each other”; “...has brought people closer together”; “....has strengthened an already strong community”.



Arguably the main problem that faced residents was the lengthy delay in restoring power. Some households were without electricity for more than a week. Television and radio were limited to transmissions from Perth so many were unable to access information about what supplies were available around the town. Supermarkets reopened within a few days and were relatively well stocked however there were a few ugly scenes with disgruntled customers. Banks closed on Wednesday April 19 at lunchtime and remained closed for almost a week with the Easter and Anzac Day holidays. Pension day was Thursday therefore many social security recipients had little money for provisions to prepare for the cyclone and those who were passbook holders had no access to their money until banks reopened.

### Evacuations

In the hours prior to Cyclone Rosita impacting the coastal communities many residents from the low-lying downtown areas, particularly around Chinatown, evacuated to the homes of friends and relatives in more elevated locations<sup>2</sup>. Two of three available evacuation shelters were opened and coordinated by Department of Family and Children's Services officers. These centres were primarily utilised by caravan park residents and tourists although some other local residents also made use of the facilities. One hundred and eighty people gathered at Broome Senior High School Gym. Some minor problems were experienced with a leaking roof however the structural integrity of the building was not compromised. Minor problems with amenities were also experienced. A further 100 people made their way to Cable Beach Primary School. More evacuees could have been accommodated at this centre but some communication problems resulted in an incorrect announcement on radio that the capacity was reached. The third possible centre - The Police and Citizens Youth Club - was not used because of its location on Robuck Bay and the fear of storm tide.

Seventy-eight residents from Bidyadanga, an Aboriginal community of some 500 to 700 residents south of Broome, were evacuated - 56 went to Port Hedland and 22 ended up back in Broome. Initially it was intended that 190 residents that were either very old, very young or had special needs should evacuate. Early confusion and late decision making however delayed the departure of the two available busses. All evacuees were to go to Port Hedland however one bus developed mechanical problems and attempted to return to Broome. As it traveled back through a band of destructive winds the bus windows 'popped' and passengers were badly shaken. Evacuees that went on to Port Hedland were expected and welcomed. They all stayed in the Police and Citizens Recreation Centre where they were fed and well cared for. The Bidyadanga community suffered minimal damage. Those that stayed in the settlement sheltered in the church and family homes. They had the Bracks radio to keep up to date with news, warnings and reports, and the school had access to the Internet. The community did not lose power at any time.

Staff and guests at the Eco Beach tourist resort received Cyclone Rosita warnings early on April 19 and made a timely return to Broome during the day (discussed below).

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<sup>2</sup> Tidal surge of 2.6m occurred 2 hours after high tide of 8.6m. Actual surge level reached 5.26m AHD and caused minor flooding only in Chinatown

## State Emergency Service

The Western Australia State Emergency Service was responsible for the coordination of the response to the Cyclone Rosita threat. The Emergency Operations Centre was activated early on Wednesday April 19 and remained operational for almost a week. In the hours prior to Rosita's coastal crossing SES officers, in cooperation with police and local authorities ensured that the community was adequately warned and prepared and assisted with evacuations where necessary. Following Rosita's impact SES volunteers worked tirelessly to help the community recover, tarping damaged roofs and clearing debris from roads and from around homes where it was limiting the residents access. Much of their work involved clearing vegetation from power lines to enable linesmen for Western Power to begin repair work. They secured the houses that had been damaged and removed a few trees from on cars. By Monday morning (April 24) approximately 300 requests for help had been attended to and volunteers from as far as Perth, Bunbury, Karratha, Derby and Tom Price had arrived to assist. Senior SES officers evaluated what level of support was needed in the Broome community and the most heavily impacted areas, they sourced equipment and supplies as necessary and ensured communications were restored to outlying areas. During the response and recovery period the SES earned huge public respect and this was demonstrated with a spontaneous round of applause at Anzac Day Dawn Service.



Figure 18: Gary Gifford (WA SES) re-establishing satellite phone communications – Eco Beach

## Bureau of Meteorology

In order for a community to be well informed in times of hazard impact and for residents to be in the best possible position to minimize loss to life and livelihood it is essential that warning messages are delivered in a timely fashion and are both received and understood. Community response to the Cyclone Rosita warning advice messages issued by the Bureau of Meteorology (BoM) appears to indicate that *effective* warning messages were delivered. The community was generally very satisfied with the services provided by the BoM and rated their performance very highly. Many residents accessed the Internet to confirm warnings or find additional information while they still had power. Most went to the BoM web site and were generally satisfied a few searched other weather sites. Many said that they had called the 1300 information line, often a number of times throughout the warning period. Overwhelmingly they considered it to be a useful service. Throughout the interview period several residents expressed a belief that Cyclone Rosita had traveled south of Broome before changing direction and hooking back up the coast towards Broome. Clearly this was not the case. Survey respondents were not asked directly whether they had tracked Rosita on a cyclone-tracking map however this misperception would indicate that they did not. Post cyclone studies in Queensland have shown that north Queensland residents rarely use cyclone-tracking maps. They depend heavily on televised warnings with maps and graphics to understand where the cyclone is in relation to them. When power is lost and they must rely on radio broadcast messages residents tend to be less sure of where the cyclone is and where it is heading. This is a public awareness and education issue that needs to be addressed.

Residents expressed confidence in the BoM's regular forecast service although many commented that the forecast region is large and forecasts are generalized for the whole area rather than being Broome specific.

How the community rated the performance of the Bureau of Meteorology during Cyclone Rosita

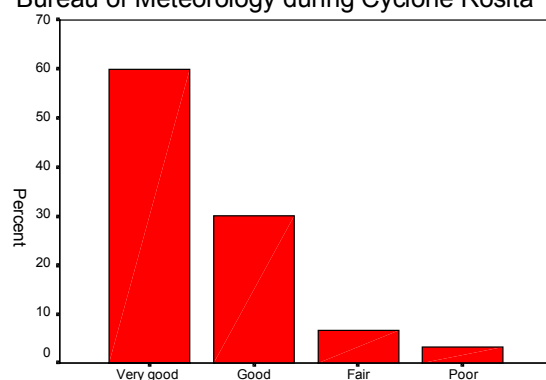


Figure 19a

How the community rate the Bureau of Meteorology's regular forecast service

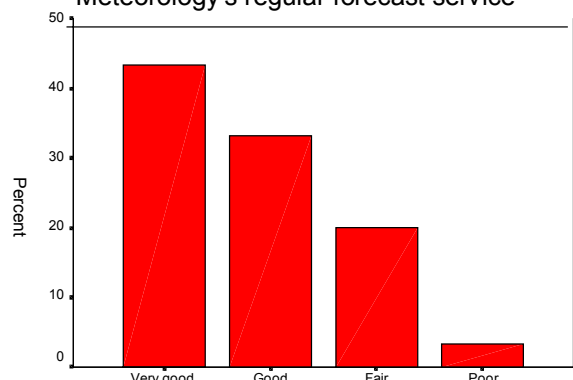


Figure 19b

## Impact on the tourist industry

Cyclone Rosita's timing could not have been worse for Broome's regional tourist industry, arriving the day before the Easter and Anzac Day Holiday period. Easter is considered to mark the beginning of the tourist season and it is usually expected that there will be an influx of visitors into Broome. According to regional tourist industry association statistics Easter visitors travel to the area predominantly by road and are most likely to come from Pilbara and other Western Australian towns even as far south as Perth. This trade was certainly affected by the arrival of Cyclone Rosita. Many of the self-drive holiday makers delayed or cancelled their trips. A smaller number of visitors at this time usually arrive in Broome by air and generally these visitors continued to arrive however, many of them cut their holiday short and left earlier than they otherwise would have. Many hotels were initially without power and some suffered water damage to rooms or facilities. Most however were fully operational by the weekend and although some reported cancellations they were generally busy. Traders around town considered that the town was exceptionally 'quiet' believing that this was a direct consequence of the cyclone. Car hire companies that had been booked out for the entire holiday period had cars available because people had returned vehicles early.



Figure 20: Tourist activity on Cable Beach – April 23





Figure 21: Sail boards available for hire – Cable Beach

Cyclone related damage to tourist industry facilities was relatively minor. Notable exceptions included a charter boat that was not moved to safe anchorage in time and suffered structural damage as it broke away from its harbour mooring; the Cable Beach Intercontinental Resort which closed because underground power and utilities had been damaged as trees uprooted (it was expected that the resort would remain closed for a few weeks); and the Eco Beach –Wilderness Retreat (discussed below).

The Executive Director of the Kimberly Tourism Association was confident that the effect of Cyclone Rosita on Broome's tourist industry would be very short term. Initially there was some concern that the negative media coverage about the loss of sand at Cable Beach and the extent of damage at Eco Beach that was being aired in Perth and Nationally may discourage potential future visitors. To offset any negative media impact the Minister of Tourism visited the area four days after Rosita's impact and the Kimberly Tourism Association, through the West Australian tourist commission, planned to launch a promotion of the area within a few weeks.

Visitors that were in Broome during the warning period were generally pleased with the way the tourist industry responded to their needs. Most, particularly those in hotel and resort accommodation, considered that they had been adequately informed<sup>3</sup>. Information about cyclone warnings is included in the information wallets in all hotel rooms (Appendix IV) and staff members were also helpful. Guests either sheltered in their rooms or went to a designated area within the hotel/resort complex. Post cyclone power outage left many guests uncomfortable resulting in early departure for some. Visitors in caravan parks and camping grounds were evacuated to the designated evacuation centres. A few problems arose when visitors, who had very limited supplies of fresh food, had difficulty in purchasing items from local stores – either because they were closed or had no power themselves. These problems were resolved within a few days however there were a couple of ugly scenes.

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<sup>3</sup> Visitors from nearby regions, the majority of visitors at this time of year, were already cyclone aware.

## Impact on the fishing industry

During the conduct of this study only one direct interview with representatives of the fishing industry was possible. This was the skipper and some of the crew of the fishing boat *'The Rachel'*. Boats that had sheltered in Broome during the cyclone returned to sea as soon as conditions on the water were favorable and this was within a couple of days. Cyclone Rosita warnings were received by *'The Rachel'* via radio from the regular Bureau of Meteorology's marine forecasting service. The skipper advised that this is the usual way weather information is received and it is considered to be a reliable service. SES officers in Broome however pointed out that there are times when some fishing vessels are out of radio range and during these periods weather information via the usual channel is not accessible. During the height of Cyclone Rosita safe anchorage was found in an inlet however the boat had to be moved several times during the night. At one stage it passed the pearl lugger that later broke anchor and foundered. While in Broome regularly updated warnings via the local ABC radio station were accessible and a mobile phone was used to access the BoM's 1300 number. Once again this service was considered to have been extremely useful. One concern that was very strongly expressed is that all public cyclone-warning messages locate the position of 'eye' of the storm in degrees and points of a degree rather than degrees and minutes. The skipper interviewed considered this to be confusing for him and many other marine users. The BoM web site explains this forecasting decision however it appears that at least one marine user, who makes decisions based on marine weather and storm forecasts that effect lives and livelihoods, is concerned and in need of more information. This is a public awareness and education issue that should be addressed.

## Yardoogarra and Thangu Stations

The places that sustained the most significant structural and environmental damage were Yardoogarra and Thangu Stations and Eco Beach Wilderness retreat, a tourist resort at Cape Villaret 40 kilometres south of Broome, where the eye of Cyclone Rosita crossed the coast.

Yardoogarra Station lies 40 kilometres SSW of Broome and is approximately 2 kilometres inland. The homestead suffered significant structural damage. Water tanks, some farm equipment and vegetation planted around the homestead were also destroyed. Approximately 60 kilometres of fencing was wrecked and needs to be replaced and stock losses, although still being assessed at the time of preparing this report, are believed to be significant.

Thangu Station homestead is less than a kilometre from the coast and was devastated as Cyclone Rosita made landfall. The two residents of the homestead and their 8-year-old grandson sheltered in what they considered to be the strongest room in the house. Frighteningly, at the height of the storm, the house began to break up around them. One resident described being picked up by the wind and blown back against an interior wall while trying to get to the safety of a nearby shed. Both residents describe the sound of the wind as being the loudest noise they have ever encountered. The property was not inundated as it is elevated on a sandy ridge however the storm tide was significant and despite the fact that landfall was almost two hours after high tide sea water was estimated to have traveled up to two kilometres inland in some places. Stock losses are expected to be significant. The carcasses of many drowned cattle on the dunes adjacent to the coast were clearly visible from the air. (Station owners anticipated that some of the missing stock had escaped through broken fences and would be found in the coming days). Vegetation around the homestead was destroyed. Palm trees were snapped and the once green vegetation near the coast was stripped of all leaves by the destructive winds carrying air borne salt and sand giving it the appearance of having been burned.



Figure 22: Rear view of Thangu homestead



Figure 23: Thangu homestead and shed



Figure 24: Coconut Palms at Thangu Homestead





Figure 25: Trees stripped – Thangu homestead



Figure 26: Semi-trailer with a stock crate attached was pushed on to its side – Thangu

## Eco-Beach 'Wilderness Retreat'

Eco Beach 'Wilderness Retreat' at Cape Villaret is a remote tourist destination. While just 40 kilometres south of Broome 'as the crow flies' it is 130 kilometres by road (mostly unmade). Access to the facility is by road, sea or helicopter. The resort has been developed as a nature based eco-tourism experience offering up to eighty resident guests a wilderness retreat where almost no electronic devices are used and organised activities included walking, bird watching, swimming and observing the rich local flora and fauna. Forty timber chalets, an amenities block, a conference centre, an entertainment centre (restaurant and bar) and a machinery shed were built amongst the sand dunes to accommodate and service guests and staff. All were positioned to take full advantage of prevailing breezes while offering unobstructed viewing of the natural bush surroundings. Raised timber walkways linking resort facilities were installed to protect the fragile dune environment.

On the morning of April 19 staff at Eco Beach were advised by their Broome office that a cyclone warning was in force and a responsible and timely decision was made to move all guests and staff to Broome. By the end of the day the resort was fully evacuated and buildings were as secure as possible. By the following morning only three buildings were left relatively unscathed – the machinery shed and a couple of the chalets. Cyclone Rosita's destructive winds destroyed both timber and brick structures, tore roofs from buildings and chalets from their stumps. Walkways were broken, chalets were strewn through the sand dunes and a sea container that was being used for storage was moved many several hundred metres by the hurricane force winds. Coastal vegetation was stripped and, as with Thangu, appeared as if it had been burned.



Figure 27: Eco Beach Resort – remains of a guest chalet



Figure 28: Eco Beach resort - devastated



Figure 29: Conference Centre – Echo Beach – Rear view





Figure 30: Conference Centre, Echo Beach – Front view



Figure 31: Restaurant and Bar, Echo Beach – front view



Figure 32: Restaurant and Bar, Echo Beach – rear view



Figure 33: Restaurant and Bar, Echo Beach – view to beach





Figure 34: Several chalets are totally missing



Figure 35: Damaged chalet – Echo Beach



Figure 36: Two chalets remained relatively intact, Echo Beach



Figure 37: Where has the chalet gone? – Echo Beach



Figure 38: "There it is !" – Echo Beach

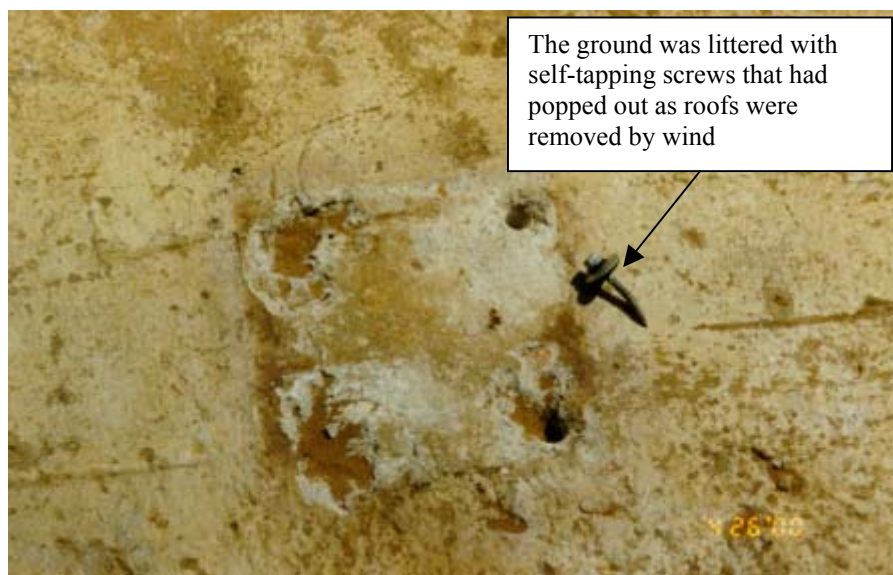


Figure 39: Concrete footing, Echo Beach – timber stumps pulled out in high winds





Figure 40: Upturned trailer and debris amongst stripped and sand and salt blasted coastal vegetation, Echo Beach



Figure 41: Damaged coastal vegetation, Echo Beach



Figure 42: Remains of chalet on the beach, Echo Beach

Destruction at the Echo Beach Wilderness Retreat was almost total. All buildings except the shed and one or two of the chalets were totally destroyed. All similar structures appeared to have been constructed in an equivalent way therefore it must be accepted that the fact that a couple of buildings remained intact was due to the random nature of the cyclonic wind gusts rather than the integrity of any particular structure. Therefore it must be concluded that there was no 'safe' place to shelter at the Eco Beach resort and had visitors or staff remained there during the cyclone their survival would have been a matter of luck. Eco Beach was well insured and at the time this report was being prepared it was the owners' intention to rebuild and be operational again for next year's tourist season.



## Conclusion

Cyclone Rosita crossed the West Australian coast at a relatively isolated location near Broome at 1am April 20, 2000. The severe Category 5 cyclone caused major damage to the coastal area immediately to the south of Broome and moderately high levels of damage in Broome itself. This cyclone was unexpected as it developed very late in the season, in fact many residents had believed the season to be over. Despite this, community response to warnings was generally appropriate. Many residents expressed the view that they considered Cyclone Rosita had been a good 'wake up' for the community as it has been so long since Broome has been impacted by a cyclone the community had become apathetic and very relaxed about the cyclone risk. Warning response at both the official and community level however did not generally indicate an unaware or unprepared community. This appears to be attributable to some extent to the past cyclone experience of many community residents together with the vicarious experience of the coastal crossing of several severe tropical cyclones in other north western Australian locations in recent years. It would be useful to build on Broome's Cyclone Rosita experience in the development and production of future regional cyclone awareness and preparedness education campaigns.

Cyclone warnings were generally considered to be both timely and effective with the majority of the community accessing regular warning information via the local radio station. Confirmation of warnings and additional information was sought from the Internet and from the Bureau of Meteorology's 1300 recorded information service. This service was widely used and was considered to be very informative and regularly updated. Community satisfaction with the Bureau of Meteorology is generally high particularly with regard to cyclone warnings.

An area where there appears to be some level of confusion with cyclone warnings is among the marine users of Bureau of Meteorology forecast services. The position of the eye of a cyclone is given in degrees and points of a degree in cyclone warnings rather than degrees and minutes, which is more commonly used by the maritime community to geographically locate positions at sea. A focussed information and education effort by the Bureau of Meteorology for the sea faring community appears to be indicated.

Broome residents, like many other northern Australian coastal residents, do not always demonstrate a good geographical understanding of the coastline and cannot easily visualise the position of a cyclone when given only the coordinates and direction of movements. Future cyclone awareness and preparedness education campaigns should emphasize the importance of residents tracking cyclones themselves on a cyclone-tracking map throughout the warning period.

Throughout the Cyclone Rosita warning period the voice of local radio announcer, George Manning was greatly appreciated, not only for the delivery of warning messages and additional information but also as a source of comfort and support. This was cut off from the community when power to the local ABC radio station was lost as cyclonic winds damaged the towns power supply. Communities often develop a relationship with local radio personalities and have confidence in information that is delivered from a local source. This is particularly true in times of 'disaster' when live

to air interviews with authorities and service providers keep the community confident that it is being kept well informed. With 'talk back' radio the communication is interactive and the community can share experiences, both giving and receiving information of local interest and importance. A dedicated alternative power source to ensure the continuity of local radio transmissions throughout periods of generalized power loss is essential in Broome, as indeed it is in all remote townships and communities.

The extended period of power outage was a major problem for the Broome community. Business and industry was variably disrupted and for households it added additional stress during the warning and clean up periods. Damage to power lines was largely caused by falling trees and flying vegetation. Public effort to keep power lines clear of foliage would certainly help to mitigate against this problem. It would be useful to include information on vegetation clearing and appropriate planting practices (including recommended tree species) in future public awareness and preparedness education literature. Western Power and local government should support an effort to keep power lines clear of vegetation during the cyclone season. Underground power supplies would be an effective long-term strategy. Western Power officers were generally praised for their efforts in restoring power as quickly as possible, the community generally appreciated the enormity of the task.

Smaller communities in the Kimberley region that are also vulnerable to cyclones and associated hazards need to have well developed and practiced emergency response and evacuation plans. In times of hazard impact such communities may become physically isolated and effective communications with major centres cannot always be guaranteed. Self-reliance is therefore essential if loss of life and property is to be minimised. Emergency Services together with Local and State Government should support the development of community based emergency management and evacuation plans. A 'safe' shelter within all communities is necessary in the event that evacuation from a threatened area is not possible.

Tourist industry operators, particularly accommodation providers, responded adequately to the cyclone threat. Cyclone emergency plans for individual operations should now be reviewed and with the support of Emergency Services and Local Government updated and enhanced where required.

Official response to the Cyclone Rosita threat was generally effective, warnings were timely and the residents of Broome appear to have coped well. The Broome Shire post-activation review of the Local Emergency Management Plan will identify strengths and any deficiencies in the process. It was fortunate that the coastal crossing was 40 kilometres to the south of the township and that the system, though severe, was very small. Had Rosita's landfall been at Broome and the full fury of the storm felt where population, business and industry are concentrated the story would have been very different – particularly if landfall coincided with a high tide.

## Appendix 1.

### Cyclone Rosita Community Questionnaire Administered by telephone

Ph: 08

1	Where did you get most of your warnings and information about Cyclone Rosita?	TV, Radio, friends, family work, internet, other
2	During Cyclone Rosita warning and impact period were all the usual members of your household home or accounted for?	
3	Did you expect a tropical cyclone to hit Broome this year? Why	
4	What cyclone preparation did you do for this season – When?	
5	When did you start to prepare for Cyclone Rosita – what did you do?	
6	Have you been in a cyclone before Which ones – where	
7	How long have you lived in Broome?	
8	How many in your household?	
9	What did you expect to happen when the Cyclone Rosita warnings started?	
10	Did you expect a storm surge with Cyclone Rosita? Why?	
11	How did Cyclone Rosita effect your household? Damage? (NB Power when off – when expected back)	
12	Did the cyclone effect your work in any way?	
13	Do you believe that there is anything that protects Broome from cyclones or storm surge (if yes what)?	
14	If the authorities had requested you to evacuate would you have been willing to go? Why	
15	Where would you have evacuated to?	Friends      Family      hotel Evacuation centre
16	Do you have any pets? What would you have done with them if you had evacuated?	
17	During the Cyclone Rosita warning and impact period did you receive enough information in the warning messages?	
18	Was there any information that would have been useful that you did not	

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	receive?	
19	Were warnings easy to understand? If not please explain	
20	How would you rate the performance of the Bureau of Meteorology during Cyclone Rosita	Very good Good Fair Poor Very poor
21	How would you rate the Bureau of Meteorology's regular forecast service	Very good Good Fair Poor Very poor
22	Did you call for assistance during Cyclone Rosita –if yes who (which authority)	
23	What was the response? Were you satisfied with this response?	
24	How would you rate the performance of emergency services during Cyclone Rosita?	Very good Good Fair Poor Very poor
25	Can you recall how you felt when the Cyclone Rosita warnings started?	Frightened Scared Excited Unconcerned Other
26	Do you think that this cyclone has had any effect on your community (please explain)	
27	<u>Comments Bureau of Meteorology</u>	Comments - SES



## Appendix II.

1	Where did you get most of your warnings and information about Cyclone Rosita?
1	Radio
2	Radio –ABC
3	TV – after 4pm - no warnings on TV before then
4	Radio –ABC
5	Radio – ABC
6	Radio – Internet
7	Radio
8	Radio
9	Radio – at ¼ past the hour – internet had 6 hour delay because of congestion
10	Radio
11	Radio – ABC
12	Radio – internet BoM
13	Radio –ABC
14	Husband works on fishing boat – phoned in marine warnings
15	Radio
16	Internet
17	Radio ABC then WAFM
18	Radio
19	Radio
20	TV then Radio
21	Radio – internet at work
22	Radio – ABC
23	Neighbors then radio
24	Radio – police with sirens
25	Radio – but very poor
26	Radio – not much warning
27	Radio – ABC George Manning a darling
28	Radio
29	Radio
30	Radio ABC

2	During Cyclone Rosita warning and impact period were all the usual members of your household home or accounted for?
1	Yes
2	Yes
3	Yes
4	Yes
5	Oldest son with friends but contactable
6	Yes
7	Yes
8	Husband at Fitzroy Crossing – no radio contact but not a problem
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	All accounted for but not at home
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Lives alone – needs oxygen – had supply
25	Yes
26	Yes
27	Yes – had to evacuate caravan park
28	Yes
29	Yes
30	Yes

3	Did you expect a tropical cyclone to hit Broome this year? Why
1	A chance – about time
2	Yes, cyclone prone area – but usually pass by us
3	No, don't usually come in and hit Broome
4	Probably, thought cyclone season was over – they usually go south – late in season
5	Never expect them to hit here – thought wet season had finished
6	Not really – most go by
7	Yes, always a chance
8	No, don't know – none over last few years
9	Broome usually not hit but always a chance
10	No, very complacent – most seem to swing around the coast
11	No, usually seem to go past
12	No
13	No, never usually do
14	Probably, but not this one because it was so far away
15	No, because thought season was over
16	Do every year
17	No, only just moved here but locals said they usually don't hit Broome
18	No, just doesn't happen this time of year – late cyclones normally go past
19	No, lucky for last 30 years – this one a bit of a shock
20	Maybe
21	No – history most go past
22	Always expect
23	Yes, something different (about this season) and late in season
24	Not a bad one
25	Must be one sooner or later
26	No, not normal for cyclones to come close to Broome
27	Always aware – normally they pass by – wish this bugger had
28	Hard to say but no
29	Always talk about it – may be – but past history = probably not
30	Not really 'cos they tend not to

4	What cyclone preparation did you do for this season – When?
1	New house (structurally sound) had food etc.
2	November – shire advise clean up – not much outdoor furniture
3	Nothing really – keep yard tidyISH – have food
4	Trees cut back
5	Outdoors tidied – shed trampoline – tied down
6	General clean up but not much
7	Normal clean up of yard
8	Clear yard – stocked up on canned food
9	Plenty of tinned food etc. Gas lamps radio etc.
10	Shire clean up – house / yard clean up
11	House tidy – lose items away
12	None
13	Nothing
14	None
15	Usual outside clean up
16	Usual yard preparation
17	None
18	Standard clean up
19	Industrial and home clean up
20	Usual – tidy yard
21	Packed up prior to Christmas – but all was out again by now – had to redo
22	Clean up in November – maintained (because 8= cyclones have passed Broome in the past)
23	Cyclone kit complete – yard cleaned up – boat tied down
24	Handicapped so not much
25	Yard clearance, generator, food on hand, torches, batteries etc.
26	General cleaning
27	Clean up ready for the wet
28	Garden pruned well
29	Clean up, pruning, loose objects away etc.
30	Usual pre-cyclone clean up



5	Did you receive any information on how to prepare for this cyclone season? – What was the information and who was it from?
1	Just normal info
2	Good info throughout the years (nothing special this season)
3	No
4	No, been here long enough to know usual preparations
5	Just usual – work at the airport and get info from BoM – satellite images
6	Usual in local paper
7	Same every year
8	No
9	Not really, know ‘cos lived here for 15 years
10	No different than usual
11	Not specifically
12	Info out – but didn’t read it
13	Nothing special
14	No
15	Get tourist bureau info from BoM
16	No, just usual from radio
17	Yes, local knowledge, some info on radio – leaflets from SES
18	Normal radio ads
19	Not particularly
20	No, just usual
21	Nothing new
22	Info always there, SES radio, shire directories
23	Not more than usual, this year quiet on that front
24	Always info available (hospital checks on him – needs oxygen continuously)
25	Shire always puts info in paper – radio
26	Every year info from local authorities
27	Always do at the beginning of wet season
28	Do every year, SES meetings ads on TV from shire
29	Yes always
30	Same as usual

6	Was this information useful?
1	-
2	-
3	-
4	-
5	-
6	Of some use
7	Very – a good reminder
8	-
9	-
10	-
11	-
12	Didn't use it at all
13	-
14	-
15	Very
16	Of some use
17	Very
18	Of some use
19	Didn't use it at all
20	Of some use
21	-
22	Very
23	Of some use
24	Of some use
25	Didn't use it at all – 'cos lived here all her life
26	Didn't use it at all – but impt info is there for new people to the area
27	Didn't use it at all – lived here for 20 years
28	Very – especially for new comers
29	Very
30	Of some use

7	When did you start to prepare for Cyclone Rosita – what did you do?
1	4pm Wednesday – shopping – put down shutters – cleared loose objects in yard
2	2pm Wednesday – cleaned outdoors
3	5pm Wednesday put garden equipment away – got water
4	4:30 pm yellow alert – red alert pending, cleaned yard, tied things down, went shopping – had some supplies already – filled water containers, got tape
5	Midday Wednesday – put pot plants away
6	2pm Wednesday – renovating so weighed and tied things down
7	Wednesday lunchtime – all ready any way
8	Wednesday afternoon and evening filled bath etc. and cleaned yard
9	Already mostly prepared – out door clean up – pot plants etc.
10	11am Wednesday – when aware of yellow alert – cleaning up – put down shutters
11	Made sure loose items away
12	Wednesday afternoon – it was all very quick – cleaned up yard tied things down
13	3pm Wednesday – bought food
14	Food, candles, batteries, cleaned yard, water in bath
15	Cleaned yard, moved heavy objects into shed
16	About 3pm Wednesday after checking internet ABC site then weather on BoM site
17	3pm Wednesday – yellow alert
18	1pm stowed everything away, filled bath, got food
19	1pm Wednesday
20	Cyclone came quickly – prepared a day before
21	Wednesday – outdoor furniture away, batteries, fuel in car, generator, water, picked up kids
22	Wednesday lunchtime, got kids, cleaned up yard, had enough food already
23	Wednesday evening, cleared yard, secured car, tied gas bottles – no shopping – had enough
24	Didn't – can't
25	Wednesday morning – found out on yellow alert – shuttered down – mad panic
26	Already prepared – final preparations Wednesday afternoon
27	Thought she was going past – so Wednesday evening
28	After lunch Wednesday – short notice this time
29	This cyclone very quick – Wednesday afternoon
30	Late Wednesday afternoon – code yellow

8	Have you been in a cyclone before? Which ones – where
1	Yes, Cairns cyclone Steve
2	Yes, in Port Headland '76 – '80
3	Yes, in Darwin for 10 years
4	No
5	Yes, Lindsay ?'85
6	Yes, Lindsay early '80's
7	No
8	No – on yellow alert only
9	Yes, Lindsay – but it was only a large puff of wind really
10	No
11	No
12	No
13	Yes, when young in Darwin
14	Yes, lots (6-7) – I lived in Darwin for years
15	Yes, many – always lived in the north
16	1, in 1992
17	No
18	No, not in 30 years
19	No
20	No, other cyclones usually stay far away
21	No
22	No, many go past this is the only one that has hit
23	Yes, 1982
24	Bad one in 1957, old houses – people killed
25	Yes, all in last 40 years
26	Yes, years ago
27	Yes, many years ago
28	Yes, in 7 cyclones at sea – worked on gas platform since 1983
29	No, first one – quite an experience
30	No

9	How long have you lived in Broome?
1	2 years
2	23 Years
3	3 years
4	10 years
5	20 years
6	45 years
7	11 years
8	15 years
9	15 years
10	7 years
11	15 years
12	5 years
13	6 years
14	1 year
15	3 months
16	12 years
17	5 months
18	30 years
19	30 years
20	20 years
21	4 years
22	15 years
23	3 years = 5 years in the '70's
24	52 years
25	40 years
26	17 years
27	20 years
28	7 years
29	4 years
30	8 years

10	How many in your household?
1	2 adults
2	2 adults 1 child
3	2 adults 1 child
4	2 adults
5	2 adults 2 children
6	4 adults 1 child
7	2 adults 3 children
8	2 adults 2 children
9	4 adults
10	3 adults
11	1 self
12	2 adults
13	2 adults 1 child
14	2 adults 1 child
15	5 adults 1 child
16	2 adults 3 children
17	3 adults
18	3 adults
19	2 adults 4 children
20	4 adults 1 child
21	2 adults 2 children
22	2 adults 2 children
23	2 adults
24	1 – self
25	3 adults 2 teenagers
26	4 adults
27	2 adults
28	2 adults
29	2 adults
30	2 adults



11	What did you expect to happen when the Cyclone Rosita warnings started?
1	About what did happen
2	Complacent at first then thought it might actually hit
3	Expected 12 hours notice
4	Prepared for the worst – but probably would not hit because of lateness in the season
5	Thought it would do as it normally does and track down the coast
6	That it would hit us
7	No idea – hoped it would not hit - ?expect and prepare for the worst
8	Wind ++, rain ++
9	That the roof would go – windows would blow in (so we went into the shed)
10	Wind would increase and there would be rain – some have come close in the past – so expected it to go by until it turned – speed – it took us by surprise
11	Would be close – had to prepare – possibly would hit
12	Didn't expect cyclone to come so close – a few have gone past
13	Expected it to die down or turn off in another direction
14	Cyclone – direct hit
15	Didn't think it would hit Broome as hard as it did
16	Expected it would be close to Broome
17	That it would not become full cyclone – Blue alert
18	Tracking on the net but knew it was going to hit – tracking from Guam
19	It would get quite rough – tracking on the net
20	That it would not hit Broome – normally move down the coast
21	Yellow warning then it would hit
22	Would probably hit – cyclones late in the season more intense
23	Would be close or direct hit wind+++
24	When police alerted – red alert “good God” thought it was going to head south
25	Probably would go past – then plotting on sea charts – knew it would be close
26	Hoped it would head south
27	Go past – but then it did a U turn and came back to Broome
28	Heavy rain and strong winds
29	When red – close to getting hit – used internet for info
30	? may hit

12	Did you expect a storm surge with Cyclone Rosita? Why?
1	Yes, but it wouldn't have bothered us – 'cos of the time – big tide was earlier
2	Yes, - from previous experience
3	Yes, they always come on a high tide
4	Yes, media –cyclone to coincide with big tide. Used tracking map
5	Till about a couple of hours before – after it slowed down no
6	Yes, had one with Lindsay
7	Yes, thought it would hit at high tide
8	Yes, because of what I heard on the radio – girlfriends experience at Onslow
9	Yes, at high tide but we would not have been effected
10	Yes, media and expected at high tide
11	Yes, heard on the radio
12	Yes, they come with cyclones
13	No
14	Yes, 'cos of Broome's tides – cyclone at high tide
15	Yes, got used to surge with cyclones
16	Yes
17	Didn't really think about it
18	Atone stage but when it didn't coincide with high tide – no
19	Not initially but when I received a call for sand from emergency services I began to worry
20	Normally would be one with high tide and wind blows water up
21	Yes, if with high tide
22	Said there would be one
23	Yes, 'cos predicted
24	It was always in the back of my mind
25	My main concern – horses in tidal area
26	Always a storm surge with any cyclone- depends on the tide
27	Yes, fortunately it didn't – we overlook Robuck Bay
28	No, until I looked at the tide chart and realised it was high tide
29	No but bid tide
30	Highly likely

13	How did Cyclone Rosita effect your household? Damage? NB Power off – when expected back
1	Will need new ceiling – water in. Garden destroyed. No power 109 hours – damage
2	Destroyed garden, tree fell on fence. Power back Monday
3	Roof damage – can't open back door properly. No water damage. Power lines down – tree down
4	Fence broken trees down. A little bit of flooding in the bedroom. Power back Monday
5	Trees from other people's yards. Garden damage – shade cloth – gate off. Water in roof. Power back Monday
6	Wind howled, no damage just trees down. Power back Monday
7	We were fine really, garden and trees damaged – fence down. Power still off.
8	Work ++ Clean up – all garden lost and fence – mess everywhere. Power back Sunday
9	Trees – 70+ mango trees lost, vegetation damage ++ Fences down – power still off
10	House is secure – some water inside. Lost garage fell on car – not much damage to the car tho'. Lot of damage to trees and vegetation
11	In the garden trees ate down and the fence is leaning over. Power still off
12	Lost a few trees, pushed over a fence a bit. Power just on
13	Trees down still no power
14	Power off for 5 days – minimal vegetation damage
15	No power for 4 days. Damage to garden
16	Garden damage ++ tree on house, few dints in tin. Water damage inside but that is all – sand inside house – power still out – now no water
17	We were prepared, vegetation damage – took 2 hours to clean up. No power for 4 days
18	Everyone was apprehensive. Power lines and trees down – there will be no mangoes this year – vegetation damage
19	Not much, a few trees down, wife and kids OK – power still off
20	Not much – just the fence and garden – all plants broken
21	Lost power – water through front door. Vegetation damage fence damage, gate and trellis
22	We were all calm, no damage to house – small amount of vegetation damage. Power off for 5 days
23	We were so lucky – fence damage and trees down. Awning ripped – will not be making any insurance claims. Road blocked by tree down.
24	Lost vegetation – trees down – “lucky really” Lost power – has urgent medical needs
25	House and vehicles fine. Yard destroyed +++ Power still off
26	No major damage just ridge capping on the roof. Fence damage from trees – power still off
27	We live overlooking Robuck Bay – I was a bit snappy with new husband – live

	in caravan – no damage to van – vegetation around vans damaged – all the beautiful gardens are lost
28	Lost trees – popped a few screws in Colourbond sheeting – still no power
29	Trees down – no structural damage – all large trees gone
30	Water damage to inside house – garden damage – still no power

	Did the cyclone effect your work in any way?
1	Yes, could not go on Thursday 'cos no power
2	No, self employed
3	No
4	Yes, no power in medical centre till Friday
5	No, airport is on emergency power – some problem with lights so no night flights
6	No
7	No
8	Power off – wholesale chocolate business – had to get refrigeration truck in
9	Tourist bureau relocated to airport
10	Minister of Church – had to clean up for services – no power
11	Not yet 'cos still on Easter break – depends on power
12	Yes, doubled work, - an electrician
13	No
14	No
15	Yes, loss of power effected work at resort – loss of hours
16	Could not work on Thursday
17	Missed 2 days work but off over Easter anyway
18	On call only
19	Yes, concrete and earth moving – all out working at the moment
20	Yes, no power, still no power
21	TAFE had to leave early – don't know about next Wednesday – probably work as usual
22	No, work in a resort had to get guests out
23	Could not open post office on Thursday
24	Pensioner 75 year old
25	Yes, charter boat operators – can't take people in rough weather – water dirty – some tourists left – boat damaged
26	Yes, off work all day Thursday – no pay loss
27	Yes, curtain maker – needs power
28	Yes – work in tattoo studio – water damage – no power
29	Not really – 'cos long weekend – worked Saturday – electrician
30	Possibly will – no power will be a problem

15	Do you believe that there is anything that protects Broome from cyclones or storm surge (if yes what)
1	Position on bay – cyclone must come due east to hit Broome – most go down the coast and go past
2	Good fortune
3	Gantion point
4	No, history indicates that maybe peninsular protects us
5	Luck – huge coastline - ??? developments on coast
6	In a bay – sort of tucked in. Not open like Port Headland and Exmouth
7	No
8	No
9	No, but tucked in cyclones usually pass
10	No, the Almighty
11	Trees protect buildings
12	No
13	No, maybe location in Bay
14	No
15	No
16	No, any point along the coast can be hit = chance
17	Must be something ‘cos 40 years since one has been close
18	Its natural position
19	Physical location steers cyclones south of Broome
20	Don’t know
21	No
22	In a lee way – most go past. It starts further north and will likely track down the coast
23	? On a peninsular may help. Prayer within Christian community
24	No, its nature – but we have been lucky over the years
25	No
26	Tucked in underneath peninsular – protects from direct hit – particularly if they come in from the south
27	No
28	No
29	Surrounded by sand dunes
30	No

16	If the authorities had requested you to evacuate would you have been willing to go? Why
1	No, want to stay in own home
2	Yes, after seeing destruction at Exmouth
3	No, because they were inadequately prepared but I could still sit on a roof with a 5m surge
4	Yes, ready to go – they know best
5	Yes, trust their judgement if it is necessary
6	Yes, they know best
7	Yes, they must have a very good reason
8	Yes, if danger to family – but would rather stay
9	Don't know – self evacuated to shed – feel confident in shed
10	Yes, must trust those with expertise
11	Yes, crazy to argue, life more important than property
12	Yes, probably. Broome houses only rated to Cat 3
13	Probably not it would be a hassle and I didn't think it would get bad enough
14	Yes, they know best
15	Yes, personal safety paramount
16	You bet
17	Yes
18	No, house is older and safe
19	No, house is safe – has cellar
20	Yes
21	Yes, if serious enough – If authorities think it is necessary people should probably leave
22	Yes
23	No, 'cos of dog – I am a volunteer ambulance officer
24	Don't think so. I am on oxygen here. I believe in my karma and natures way – if my time is up it's up
25	Probably would have gone north
26	Yes, if severe enough – but where to from Broome?
27	Yes, live in a caravan – evacuated Wednesday evening – night of cyclone
28	They did ask people in this area to evacuate but I didn't go 'cos of the dog and the wind was already strong and it was too dangerous to go. New building – more cyclone safe
29	Yes, for sure
30	Yes, trust judgement



17	Where would you have evacuated to?
1	-
2	North to Derby
3	To Fitzroy Crossing
4	Evacuation centre
5	Friends – Derby
6	Friends / family
7	Evacuation centre
8	Friends
9	Friends
10	Evacuation centre
11	Friends – Fitzroy crossing
12	Friends
13	Family
14	Work (Paspaley hatchery) have an evacuation centre
15	Evacuation centre
16	Hotel –Derby
17	Evacuation centre
18	Evacuation centre
19	-
20	Evacuation centre or wherever sent
21	Friends – Derby
22	Family Derby
23	-
24	-
25	Just go up north
26	Don't know
27	Hotel
28	-
29	Friends – Derby
30	Don't know

18	Do you have any pets? What would you have done with them if you had evacuated?
1	No
2	Dog, take with us
3	1 cat, 3 kittens 2 dogs – take with me
4	Cat take with us if possible
5	Dog – take with us
6	7 dogs (puppies) take with us
7	No
8	2 dogs 2 horses – take the dogs
9	Boarding kennels – 4 dogs 9 cats – fish and horses – dogs to stay in kennels
10	Birds and chooks – leave behind
11	No
12	Cat dog – come with us
13	2 dogs – take with us
14	2 dogs and fish – leave at home
15	Dog and 2 birds – take with us
16	Dogs chickens – take dogs leave chickens
17	Dog – take with us
18	2 dogs – leave in house
19	Dog in garage
20	Dogs – take with us
21	Dog (indoor dog) take with us – so would not go to evacuation centre – horse – in paddock
22	Dog, bird – come with us
23	Dog
24	No
25	3 horses – in paddock – dogs and cat come with us
26	Dogs – take with me or closed up inside
27	No
28	Dog – want to take with me
29	Dog comes with us – ducks and chickens in shed
30	Parrot – don't know – take with us

19	During the Cyclone Rosita warning and impact period did you receive enough information in the warning messages?
1	Yes, local ABC BRILLIANT
2	Yes, ABC radio very informative
3	Not really, radio did an excellent job
4	Yes, coverage on ABC excellent – constant – well updated – comforting to listen to what was going on
5	Yes, best I have ever known – Police drove around town. George Manning on Radio rang met office every half hour not just regular warnings
6	Yes
7	Yes, could not have been better – radio fantastic – before, during and afterwards
8	Yes, didn't see much on TV but radio OK
9	No, radio station, not George Manning at ABC – giving wrong info – read wrong bulletin at one stage
10	As long as there was access to the radio yes
11	Yes
12	Came quickly – not much time to give much info
13	Yes
14	Regular but sometimes not enough info
15	Yes
16	Yes, was really good – told us what was happening
17	Yes
18	Yes, ABC local – good
19	Yes, on radio – current
20	Yes
21	Nothing on TV small item on news – ABC all night – really good radio
22	Yes, George Manning on ABC = fantastic
23	Yes, went to bed
24	Yes
25	No, not in early stages, blue alert, not regular enough, drove around town to get info
26	Yes
27	Yes, heaps, ABC wonderful – couldn't have done without George
28	Yes, everyone taken by surprise when turned into coast
29	Yes, for sure – rang weather bureau 1300 number – good
30	Yes

20	Was there any information that would have been useful that you did not receive?
1	No
2	No, even after the cyclone the ABC liased with SES and updated
3	Not really radio did an excellent job
4	What side of house to leave open, what stage should windows be open, hints about what to do
5	No
6	No
7	No, George Manning has covered everything
8	Having access to info about shops ie. Who is open for necessities etc.
9	Very quick – not a lot of time for warning info
10	After the cyclone was over there was not enough info. – very difficult
11	No
12	Not much warning time
13	No
14	No
15	No, radio very informative – every 15 minute updated
16	No
17	No, - no one expected power to be off for so long
18	Local ABC – no stand by generator – info from Perth – not as good – only interested in talking to people while wind was blowing the hell out of us
19	No
20	No
21	Confusion about evacuation shelter – how to find – difficult for tourists – info about tying caravans down etc.
22	No
23	No
24	No
25	Lack of timeliness – info OK otherwise
26	Yes, warning of when power was going to be turned off
27	No
28	A longer warning time
29	No
30	No

21	Where warnings easy to understand? If not please explain
1	Yes
2	Yes, I am very familiar with cyclones
3	Yes
4	Yes, we are now familiar with them
5	Yes, very basic info – clear
6	Yes
7	Totally
8	Yes
9	Not all radio stations giving regular messages
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Very – local guy very good George Manning
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes, a bit sensationalised
24	Yes, police up and down road warning
25	Yes, people understand alerts
26	Yes, 'cept depending on which TV station – variation in warnings – so got weather fax when power still on
27	Yes
28	Yes
29	Yes
30	Yes



22	How would you rate the performance of the Bureau of Meteorology during Cyclone Rosita?
1	Very good
2	Very good
3	Good
4	Good
5	Very good
6	Very good
7	Very good
8	Fair – not much on TV
9	Fair – radio station filter info – rang BoM later re second cyclone rumor – forecaster was wonderful – took time to talk and explain
10	Very good
11	Very good
12	Good
13	Very good
14	Good
15	Very good
16	Good – do their best
17	Good – yellow alert is usually longer
18	Poor – they lost it that is why I looked at Guam
19	Very good
20	Good
21	Very good
22	Very good natural phenomenon difficult to predict – direct hit predicted
23	Very good
24	Very good cyclones – can't predict – may turn suddenly
25	Good regular reports are necessary – hourly at regular time
26	Good
27	Very good
28	Very good
29	Very good
30	Very good

23	How would you rate the Bureau of Meteorology's regular forecast service
1	Good
2	Very good
3	Good
4	Very good
5	Very good
6	Fair – not always right – comes from Perth not local enough
7	Good
8	Fair
9	Fair – not individual forecast for Broome – often includes all Kimberley
10	Very good
11	Very good
12	Good, pretty hard in Broome – every day the same pretty much
13	Good
14	Good
15	Very good
16	Very good
17	Good
18	Good
19	Very good
20	Very good
21	Good
22	Very good
23	Don't know – forecast boring
24	Very good
25	Poor – usually get it wrong – we are charter boat operators
26	Good – mostly
27	Good
28	Very good
29	Good
30	Good

24	Did you call for assistance during Cyclone Rosita – if yes who (which authority)
1	No
2	No
3	No
4	No
5	No
6	No
7	No
8	No
9	No – but called the SES since
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	After
19	No
20	No
21	No
22	No
23	No
24	No
25	No
26	No
27	No
28	No – prayed a bit
29	No
30	No

25	What was the response? Were you satisfied with this response?
1	-
2	-
3	-
4	-
5	-
6	-
7	-
8	-
9	Not a priority but took phone number
10	-
11	-
12	-
13	-
14	-
15	-
16	-
17	-
18	Called SES about downed power line – repaired self – an electrician
19	-
20	-
21	-
22	-
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-

26	How would you rate the performance of emergency services during Cyclone Rosita?
1	Good – warned power would go off
2	Very good
3	Fair
4	Good – warned well in advance that power would go off. Plenty of warning at red alert – sirens going – police going around
5	Good – common sense to turn power off
6	Very good – fantastic – especially Western Power
7	Very good
8	Very good
9	Fair SES did not seem to have contingency plans in places. Eg. Opening evacuation centres for evacuees from caravan park
10	Very good
11	Very good
12	Don't know
13	Very good
14	Don't know – no power for 5 days
15	Very good
16	Very good
17	Very good – don't know but know they are doing a good job
18	Good
19	Very good
20	Poor – power out too long
21	Very good
22	Very good
23	Good
24	Very good – got power back on by Saturday
25	Very good
26	Good – after the cyclone OK – Power on is excessively slow ?? Why need more info - businesses need to know.
27	Very good excellent A1
28	Very good
29	Very good
30	Good



27	Can you recall how you felt when the Cyclone Rosita warnings started?
1	Excited
2	Frightened – relaxed till cyclone began to come close
3	Frightened
4	Frightened –Anxious – alert sirens going, police going around
5	Scared – when red alert
6	Unconcerned – not worried at all
7	Worried
8	Concerned – blasé at first
9	Scared – very uneasy – had a REALLY bad feeling
10	Concerned for those on their own – fairly ‘matter of fact’ – secure in house
11	Concerned – not frightened
12	Concerned
13	‘ho hum’ another cyclone
14	OK too used to them
15	Worried
16	Concerned for the rest of Broome – ‘Oh no here we go again!’
17	Excited – but nervous
18	A bit nervous – worried about 75yo mother
19	Apprehensive – feeling this was different this time
20	Unconcerned
21	Concerned
22	Concerned
23	Concerned but not overly
24	Excited – ‘good god this must be dinkum’
25	Concerned needed to organise
26	Concerned but OK
27	Unconcerned – a mad rush
28	Shocked – surprised at rapid development
29	A bit blasé at first – here we go again.
30	Concerned


28	Do you think that this cyclone has had any effect on your community (please explain)
1	Bonding eg with neighbours
2	Yes, brings community closer together
3	Pulls community together
4	It has woken many people up – frightened them – now they are alert – so much damage – brought people closer together
5	Services back ASAP
6	Interested in each other – most afraid or worried – feel lucky about lives and houses
7	Community has bonded together – realise they will/can hit here
8	Will affect tourism cable beach = cable rocks
9	Hope so – less complacency – take future warnings more seriously eg. Pre season clean up
10	Community has been complacent – heightened awareness
11	People pull together
12	Yes, people more prepared in future
13	Yes, everyone busy – bit shocked
14	Don't know
15	Greatly, business huge effect – everyone comes together to help each other
16	Profound – many talking about leaving Broome – some feel they don't know how to go on – especially tourists
17	Yes, people will take alerts more seriously in future- different trees will be planted in the future
18	Yes, made them all work together more – less complacency
19	Sure it will put a lot of people out – Broome community will get over it quickly
20	No
21	Yes, better prepared in future – pre pension day banks closed Wednesday – also branches – no access to money
22	Strengthened an already strong community
23	Yes
24	Always does – gets close knit
25	It better have – a timely reminder – most don't have a cyclone kit
26	Probably – tall trees gone – may keep trees trimmed in future
27	Everyone has pulled together – helped each other
28	I heard on the radio that we needed to have a cyclone to bring community together – 'bull shit'
29	Not really – a wake up call – due for one
30	Yes, definitely – everyone effected in different ways

29	Comments about the Bureau of Meteorology
1	Excellent
2	Very informative
3	Why were warnings so late?
4	Kept us informed – very good job ABC got info through the met bureau
5	Kept people well informed – stressed importance of messages
6	Doing a great job
7	-
8	-
9	-
10	They were taken by surprise – by sudden turn in cyclone and let community know immediately – I was well informed
11	-
12	-
13	Doing a great job
14	-
15	-
16	-
17	Very happy with service – gave as much warning as they could
18	Should make sure they get things running properly
19	Done an excellent job
20	-
21	Good forecast – nature difficult to predict
22	-
23	Do a good job – try their hardest – can only work with info they get
24	Doing a good job
25	If they forecast 20K winds – they probably occurred yesterday – need our own bureau here not Perth – standard has definitely declined
26	-
27	A fine job – they weren't to know the damn thing was going to make a 'U' turn – it was already south of us
28	-
29	-
30	-

30	Comments about SES
1	Very excellent – performed better than the Government that took 5 days to get here – a couple of Ministers arrived yesterday
2	Very good
3	Should have had free candles – more D batteries – why did army not come in and help distribute things
4	Very good job
5	-
6	Doing a great job
7	Have been fantastic – power people have done a good job – working as hard as they can
8	Have done a really good job -? A bit selective with jobs- some emergencies not attended to
9	Broome did not expect to be hit by a cyclone – no contingency plan
10	Community supportive of others
11	Congratulate them all
12	Seem to be doing a great job
13	Doing a great job
14	-
15	Great – put in so much time – very helpful
16	Absolutely fantastic
17	Great job
18	Did a good job
19	Done an excellent job
20	-
21	Fantastic job
22	Fantastic as always – problem with power frustrating
23	Western power have done a wonderful job – working long hours have kept good spirits
24	Very good – a lot of people have come in from Port Headland to help (volunteers)
25	Volunteers do a wonderful job for the community
26	Seem to be working alright
27	Magic A1 – and they are still going
28	Great
29	Been excellent
30	-

## Additional comments

3	Problems in the supermarkets – plastic money would not work Seems important to keep the local radio station open
4	Information in the phone directory was useful People seem to be using tracking maps Roaring wind often described Went to ANZAC service – biggest crowd ever - ? community spirited
5	Dragon flies – that mark the end of the wet season have been out 3x so far this year Tourists still coming in to Broome – by air – but leaving early because of no power
8	Still no power so not getting much news eg. The TV coverage of the damage
9	Employed at Broome tourist Bureau – reported that there was a 6 hour delay in getting info via the internet during the warning period – congestion
10	Broome residents missed out on info AFTER cyclone eg did not know for 2 days that ice was available – ABC Broome was down and public holiday meant that programming was from Perth Notre Dame Uni. campus has been badly damaged – and the phone system is out
16	There was bad media coverage – very bad press in Perth – hope this does not lead to a bad tourist season
20	Restaurant owner – restaurant closed since Wednesday – will remain closed until power is on – may take a day or two to get back to normal – restock. NB holiday time – usually busy but not height of season. Some other restaurants were already reopened – especially on China town – this one on the next street over
21	Pension day was Thursday – many had no money for provisions – Banks closed Wednesday lunchtime therefore passbook holders had no access to money for almost a week Area needs more pre-cyclone pruning – clean up
22	George Manning – local voice – everyone knew – very calming – terrific Some areas had underground power so were not without for very long
23	One local shop tried to open with a generator which over loaded and the shop had to shut down – tourists were angry – some thought they should have priority – situation a bit ugly Many people were angry because they had no power Most had water within a couple of hours
25	A charter boat operator – warnings were late – did not have time to move boat and missed the tide. In the old days warnings were 20 minutes past the hour – not any more – this one was a bit of a mad panic



## Cyclone Actions

### CYCLONE SEASON PREPARATION

The cyclone season extends from 1st November to 30th April. Prior to the start of each season, the following cyclone season preparation activities should be taken:—

- Clean your residence or work area of unwanted materials and rubbish.
- Trees of excess height and growth should be trimmed to withstand high winds.
- Clean drains of rubbish or obstructions.
- Have on hand a stock of emergency supplies, eg. first aid kit, torches, a portable radio, (include spare batteries for radio and torches) canned, dehydrated and non-perishable food, (frozen foods do not last if electricity is cut) drinking water containers (allow 10 litres per day, per person), etc.
- Decide where to best shelter your pets.
- Determine location and establish cyclone tie down areas for your caravans, boats and trailers, etc.
- Have on hand a supply of plastic bags and tape to seal items of personal value, such as; photographs, bank books, insurance policies, passports, etc. and determine a safe location to store them within your home during a cyclone.
- Develop an emergency communication plan; in case family members are separated at the time of the cyclone and have a plan to get back together. Ask a relative or friend in a non-cyclone prone area to serve as the "family contact" and make sure everyone in the family knows the contact details of that person.
- Become familiar with the following community alerts of the cyclone procedures.

**Listen to your radio or monitor your television for official SES cyclone information.**

### BLUE ALERT

A cyclone has formed and may affect the area within 48 hours. Check that all pre-season preparation activities have been undertaken:—

- Clear your area of all loose material and rubbish not required.
- Check that cyclone screens are available or securely fitted in place.
- Check that emergency supplies are well stocked and to hand.
- Caravan, boat, trailer etc. — cyclone tie down equipment is available.
- Observe economy in the use of water to enable the Water Corporation to fill local supply tanks.
- A Blue Alert may remain in force after the cyclone moves away from your area. This indicates the cyclone is still within range and could affect your community.

### YELLOW ALERT

The cyclone is moving closer to the area and appears inevitable in 12 hours. Carry out the following activities:—

- Ensure that all loose material and objects around residences, commercial and industrial buildings and work areas are securely fastened into position.
- Check that all cyclone screens are securely fastened into position (do not lock them into position for house fire safety purposes).
- Secure caravan, boats, trailers, etc., to their tie-down positions.
- Prepare safe shelters for pets or animals.
- Top up vehicle fuel tanks.
- Fill emergency containers with water and make sure all other emergency supplies are to hand.

### RED ALERT

The cyclone is imminent:—

- All personnel should make arrangements to be in their residences or shelter areas when the cyclone arrives.
- If going to a shelter ensure that you take with you enough food for 24 hours, a towel and toiletries, any medication, a portable radio, a torch (include spare batteries for each), spare clothing and sufficient bedding. Take reading material and games for children. Do not take pets or alcohol.
- Ensure your pets and animals are safely sheltered.
- When parking vehicles, select the best available sheltered area, apply handbrake and engage park gear (if automatic) or reverse gear (if manual).
- Listen to your radio or monitor your television for official cyclone information.
- During the height of the cyclone, keep clear of windows and stay in the most sheltered part of your residence.
- Should the eye of the cyclone pass immediately over the area, the wind will temporarily drop, then blow again from the opposite direction. Stay indoors there will be little or no warning when the wind will return.
- If you are unavoidably caught in the cyclone in an unprotected area, make your way stooping or crawling if necessary, to shelter; otherwise lie down and hang on to a secure object.

**EXCEPT IN EXTREME EMERGENCIES, STAY INDOORS UNTIL THE CYCLONE HAS PASSED AND ALL CLEAR HAS BEEN ANNOUNCED**

### ALL CLEAR

- The cyclone has passed the area but there may still be high wind and heavy rain.
- For safety purposes the "All Clear" will be officially broadcast via radio and television by the WA State Emergency Service.
- Check the following danger items: fallen trees, live power lines, broken water and drain pipes, loose sheeting or debris and structural damage.
- Commence clean-up activities as soon as practical.
- Report danger situations to the appropriate authority.

## Cyclone Severity Categories

	Average Wind (Km/h)	Strongest Gust (Km/h)	Central Pressure (hPa)
<div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">1</div> <div style="font-size: 0.8em;">Typical Effects</div>	63-90	Less than 125	Greater than 965
Negligible house damage. Damage to some crops, trees and caravans. Craft may drag moorings.			
<div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">2</div> <div style="font-size: 0.8em;">Typical Effects</div>	90-120	125-170	965-970
Minor house damage. Significant damage to signs, trees and caravans. Heavy damage to some crops. Risk of power failure. Small craft may break moorings.			
<div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">3</div> <div style="font-size: 0.8em;">Typical Effects</div>	120-160	170-225	970-945
Some roof and structural damage. Some caravans destroyed. Power failures likely.			
<div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">4</div> <div style="font-size: 0.8em;">Typical Effects</div>	160-200	225-280	945-920
Significant roofing loss and structural damage. Many caravans destroyed and blown away. Dangerous airborne debris. Widespread power failures			
<div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">5</div> <div style="font-size: 0.8em;">Typical Effects</div>	Greater than 200	Greater than 280	Below 920
Extremely dangerous with widespread destruction.			

**Note: Typical effects are only indicative and will vary from area to area based on factors such as building standards, flooding etc.**

**For Cyclone Tracking Charts & further Information contact your Local SES Unit:**



## Appendix IV

**CYCLONE PROCEDURE**

**PHONE: (08) 9192 1002****FAX: (08) 9192 1715**

**STAGE BLUE**

A cyclone has formed and may affect the area within 24 hours

- Check that all preparation activities has been undertaken.
- Clear your area of all loose material and rubbish not required.
- Check that cyclone screens are available and securely fitted in place.
- Emergency supplies to hand.
- Caravan, boat, trailer, etc, cyclone tie down equipment is available.
- Observe economy in the use of water.

**STAGE YELLOW**

The cyclone is moving closer to your area and appears inevitable in 12 hours.

- Ensure that all loose material and objects around residence, commercial and industrial buildings and work areas are safely stored or secured.
- Check that all cyclone screens are securely fastened into position. Secure caravans, boats, trailers, etc, to their tie-down position.
- Top up vehicle fuel tanks.
- Fill emergency containers with water and make sure all other emergency supplies are to hand.

**STAGE RED**

The cyclone is imminent.

- All personnel should make arrangements to be in their residences and/or shelter areas when the cyclone arrives.
- Ensure animals and pets are safely sheltered.
- When parking up vehicles, select the best available sheltered area, apply handbrake and engage park or reverse gear.
- During the height of the cyclone keep clear of windows and stay in the most sheltered part of your residence/public shelter.
- Should the "eye" of the cyclone pass immediately over the area, the wind will temporarily drop, then blow in the opposite direction.
- Except in extreme emergencies, stay indoors until the cyclone all-clear is announced.

- If you are unavoidably caught in the cyclone in an unprotected area, make your way stooping or crawling, if necessary, to shelter, otherwise lie down.
- Continue to listen to your radio for up-to-date instructions affecting your area.

**ON WARNING OF A LOCAL EVACUATION**

- Switch off electricity, gas, etc.
- Follow instructions.
- Listen to your radio.

**IN THE EVENT OF A STAGE "YELLOW" CYCLONE ALERT**

1. Please ensure motor vehicles are secure.
2. Candles will be issued to all rooms, please use these sparingly, and position them safely away from any flammable material.

**IN THE EVENT OF A STAGE "RED" CYCLONE ALERT**

1. Remain in your room unless informed personally by a senior staff member.
2. Only use phones for absolute emergencies.
3. Draw the curtains and keep clear of windows.
4. The hotel facilities are shut down during "Red" alert, but water and food will be made available to all in-house guests once the alert has been lifted.
5. During "Red" alert, all electricity and gas services will be cut as a precautionary measure.
6. Try to remain calm and always follow directions from senior staff.

**AFTER THE CYCLONE**

- Don't go outside until advised officially or you are positive the cyclone has passed.

Contact Reception for further information.