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STORM TIDE HAZARD STUDY
MORETON BAY REGIONAL COUNCIL (INCORPORATING CABOOLTURE, PINE RIVERS & REDCLIFFE COUNCILS)

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Report Prepared for

Moreton Bay Regional Council

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1. INTRODUCTION

Caboolture Shire Council, acting on behalf of Caboolture Shire Council, Redcliffe City Council and Pine Rivers Shire Council, together with Redland Shire Council (on behalf of Redland Shire Council and Logan City Council), invited tenders from suitable parties to provide consultancy services for a Storm Tide Hazard Study within the south-east Queensland region. The purpose of this study was to enable a standardised best practice, regional approach to be established with regard to storm tide modelling, mapping, risk assessments and mitigation strategies. Cardno Lawson Treloar have been commissioned to undertake that work. Figure 1.1 shows the study area and delineates each Council shoreline region.

Caboolture Shire, Redcliffe City and Pine Rivers Shire Councils amalgamated in March 2008 to form the Moreton Bay Region Council. This report presents study results for all three of the original Council areas.

A parallel report (LJ8824/R2504/02) provides similar information for Redland Shire and Logan City Councils.

The intention of the State Coastal Plan policy 2.2.4 is that coastal areas vulnerable to inundation by storm tide should be identified through a comprehensive and detailed natural hazard assessment study. The purpose of this study is to identify the 'natural hazard management areas (storm tide)' in the specified council areas so that a consistent unified approach is developed. The recommended approach for determination of the storm tide is set down in Appendix 2 of Environmental Protection Agency (EPA) document 061218.

The 'natural hazard management area (storm tide)' is the area of the coast inundated by the Defined Storm Tide Event and the purpose of this study is to provide this information to the participating Councils.

The EPA Guideline is not specific about the level of risk that should be associated with the management area - it is appropriate to adopt different levels of risk for different activities within an overall management area. Hence each Council is somewhat free to make these policy decisions. However, commonly, they may be:-

- 100-years average recurrence interval (ARI) storm tide for general residential areas
- 1,000-years ARI for evacuation routes and hospitals and similar high level public infra-structure

For the purposes of planning, storm tide in Queensland is defined to be the instantaneous sum of astronomical tide plus storm surge and wave set-up determined assuming a natural beach shoreline. However, there are occasions when it is useful to have data about astronomical tide plus storm surge, together with appropriate wave parameters, so that wave set-up or wave run-up can be calculated for different shoreline types. This is needed because wave set-up and run-up depend upon back-beach form. Both sets of results are presented.

Normal conventions are used in this report, namely:-

- waves and winds – coming from
- currents – flowing towards.

Unless specified otherwise, all levels in this report are to Australian Height Datum (AHD).

The progress of the study has been managed and monitored by the Study Advisory Group (SAG) comprising the Environmental Protection Agency, Bureau of Meteorology and the respective Councils under Project No. Q/GMO/02.

This report describes the data and data sources, study approach, model systems applied and outcomes of this investigation.

2. SCOPE OF WORK

2.1 General

Full details of the work to be undertaken for this study were set out in Part 2 of the Study Brief. The studies are required for Moreton Regional Council (Caboolture Shire, Redcliffe City and Pine Rivers Shire), and also by Redland Shire and Logan City Councils; the last two being reported separately.

The purpose of conducting the storm tide hazard studies was to identify, understand and quantify the risks associated with the possibility of extreme storm tides occurring in the respective Local Government Areas (LGA) for use in long-term town-planning and for emergency response needs. A risk assessment (e.g. DES 2005) of the potential impacts of such events that considers environmental, economic and social perspectives has been undertaken and reported separately. That investigation considered emergency response issues and made recommendations for optimizing the effectiveness of warnings. Recommendations were provided also for a Defined Storm Tide Event (DSTE, as per EPA 2006) applicable to each LGA that participated in this project consistent with the determined level of impact. In fact the functional DSTE has been based on the 100-years and the 1,000-years ARI so that appropriate risk levels can be adopted for a range of development types.

Due to the proximity of each of the LGA's and their common exposure to Moreton Bay and associated islands, a combined investigation was adopted in order to maximize the technical benefits to Councils.

"Storm tide" for this study is defined as the combined effects of astronomical tide, meteorological tide (storm surge) together with and without localized wave-induced effects (breaking wave set-up) on the total still-water ocean level at the shoreline. As part of the hazard study, associated near shore wave parameters were also provided and wave run-up heights determined in specifically nominated areas for selected shoreline edge types. Coastal morphological modifications, rainfall, surface runoff, up-river propagation and river flooding effects were not included in the scope of work. Appendix A provides a glossary of terms.

For quantitative predictions of storm tide levels within the South-East Queensland region, the analysis process was based on recommendations from SEQDMAG (2007); generally:-

- Establishment of the representative storm climatology for the region south of northern Fraser Island;
- Development of numerical models (wind and pressure, hydrodynamic and wave) capable of representing the physical impacts of the storms on coastal water levels;
- Calibration and/or verification of the numerical models, drawing on reliable time series of data relevant to the study, including long term wind, wave, cyclone track and tidal records or Council records;
- Modelling of the storm climatology and its associated storm tide impacts to provide a statistical database of sufficient resolution and range for reliable estimation of low probability events;
- Sensitivity testing of the model assumptions across the range of uncertainty, including the effects of potential enhanced-Greenhouse climate change;
- Comprehensive reporting, supply of electronic mapping datasets – see Cardno Lawson Treloar (2008);
- Reporting detail sufficient to enable a third party technical review.

2.2 Outline Study Approach

2.2.1 Regional Storm Climatology

The region is known to be affected by a wide range of large scale storm systems. Principal amongst these in terms of potential storm tide impact are tropical cyclones. In addition, a number of sub-tropical, extra-tropical and non-cyclonic storm systems can have more frequent, although typically lower impacts, on coastal water levels. Larger scale and remote synoptic systems may also generate persistent, but low amplitude long wave effects (for example, coastally trapped shelf waves). Appendix B provides a detailed description of the SE Queensland storm climatology prepared by SEA (2007). For this study, all non-cyclonic events have been generally classified as east coast low (ECL) events.

Discussions were held with the Bureau of Meteorology (BoM) during the study and they assisted by providing advice on wind field characteristics of historical events such as cyclone Dinah, which is known to have caused local flooding at Sandgate, (which is not within the study area), for example. Improved wind fields for cyclones Dinah and Pam were provided for the study by BoM – based on meteorological observations rather than the Holland (1980) wind field model used generally within this study.

The study has addressed the potential effects of enhanced Greenhouse climate change on mean sea level (MSL) and various storm types – essentially of cyclones and ECLs.

Generally, the numerical results were based on tropical cyclone and ECL storms considered as two separate meteorological populations.

2.2.2 Establishment of Numerical Models

Cardno Lawson Treloar established the numerical storm tide and wave models necessary to enable adequate representation of the various storm influences on the ocean water levels in the region. Tropical cyclone events were explicitly modelled by application of an atmospheric forcing model to an ocean model – Holland wind field model developed for tropical Australia by the Bureau of Meteorology and the Delft3D hydrodynamic and SWAN (wave) models. Following model calibration, sets of basic storm surge plus astronomical tide and wave simulations were undertaken to provide basic data for a Monte Carlo analysis.

Non-cyclonic events were investigated using suitable long term predicted tides and tidal residual data for the area – Brisbane Bar. That data was used to infer and extrapolate the statistical storm surge response of such systems using a range of wind simulations (different speeds and directions) to describe the spatial variability of ECL impacts (surge and waves) relative to Brisbane Bar. An auto-covariance approach (Pugh and Vassie, 1980) was used to develop combined tide and surge water levels up to 10,000-years ARI at the nominated study locations. Wave parameters and wave set-up/run-up were investigated using a set of historical east coast lows and recorded wave data.

(a) Atmospheric Forcing

The minimum requirement for modelling of atmospheric forcing of large scale severe tropical storm (cyclone) systems was to be:-

- A prescribed wind and pressure field at gradient height characterized by a pressure deficit relative to the environment, a scale radius and a forward motion vector;
- A boundary layer gradient wind speed reduction to +10 m;
- Radially variable frictional inflow at the surface;

- A first-order forward speed wind field asymmetry;
- Calibration and verification of the atmospheric model against a minimum of three near-coastal official Bureau of Meteorology weather recording stations (e.g. Brisbane Airport, Cape Moreton, Coolangatta Airport, Maroochydore (Sunshine Coast) Airport or Sandy Cape) for significant historical storm systems (to be agreed with the SAG) before commencement.

The Holland wind model applied to this investigation fulfilled these requirements and was calibrated using data available from those sites. Note that wind data was not available from all sites for each calibration event and that data from every site was not of equal quality for model calibration. Wind data was available also for some events from navigation beacons within Moreton Bay.

(b) Hydrodynamic Modelling of Storm Surge and Astronomical Tide

The hydrodynamic modelling of the ocean response to storm systems undertaken by Cardno Lawson Treloar included:-

- A generalized long-wave model (that is, ignoring vertical accelerations);
- Two dimensional depth-integrated formulation;
- Coriolis acceleration and advection of momentum formulations;
- Non-linear bed friction and surface stress formulations;
- Domains encompassing the expected scale of significant atmospheric forcing - confirmed by model calibration;
- Domains that resolved coastal features of significance to storm tide propagation – typical nearshore grid sizes of 50m:
- Along-shore resolution was no greater than 560m (0.3’ arc) - generally much smaller, about 100m, near the shorelines;
- Over-land resolution for tidally-coupled modelling was no greater than 56m (0.03’ arc);
- A variable grid-size curvilinear model domain was developed;
- Wetting and drying capability;
- Calibration and verification of a typical spring-neap cycle against the astronomical tide at the Brisbane Bar tide gauge and comparison at other available gauging stations near the LGA shorelines;
- Calibration and/or verification against significant historical cyclones (Dinah and Pam) at Brisbane Bar. Hence both tidal and storm tide calibrations were undertaken.

The adopted model system (Delft3D) plus the linked SWAN wave modeling system more than fulfilled these requirements, see Section 3. It is based on a continually variable spatial domain (curvilinear grid system).

In addition, Cardno Lawson Treloar undertook testing and analysis of combined tide and meteorological effects to determine a suitable relationship, assumption or justification in regard to such interactions. The purpose of this task was to investigate the non-linear relationship between wind set-up and water depth. Regional (non-shoreline) wave set-up was found to be important as well and to be dependent on water level and flood-ebb tidal stage.

All Tasman Sea to Moreton Bay entrances were included in the model set-up - Gold Coast Seaway, Jumpinpin and the channel between Moreton and North Stradbroke Islands.

(c) Hydrodynamic Modelling of Sea Surface Wave Effects

The minimum requirements for modelling the surface (short) wave response of the sea to storm systems were:-

- A shallow water 2nd generation spectral model for open sea conditions and a 3rd generation spectral wave model within Moreton Bay;
- Domains encompassed the expected scale of significant atmospheric input - generally the same extent as the Delft3D storm tide model;
- The model grid layout resolved coastal features of significance to storm tide related wave effects - based on available bathymetric charts;
- Spatial resolution was the same as the hydrodynamic model resolution, generally, but note that both sea and swell modelling were undertaken;
- A curvilinear grid system was adopted;
- Calibration and/or verification against a significant historical storm system (cyclone) at one of the EPA wave recording stations offshore South East Queensland (Brisbane, Mooloolaba or Tweed River) and also at the Moreton Bay site was undertaken.
- Analytical breaking wave set-up calculations at all shoreline locations and analytical run-up calculations at selected nominated locations – based on 2D wave and storm tide modelling was undertaken to ensure 2D wave set-up was described, rather than the more common 1D approach. Moreover, wave run-up depends on edge treatment and a range of run-up calculations were undertaken, based, for example, on a natural beach and a rock revetment.

In addition, waves which propagate into Moreton Bay break on the sandy shoals at its northern end. This wave breaking causes a wave set-up that may raise the level of Moreton Bay - a regional wave set-up. This process is similar to the wave set-up that occurs as a result of nearshore wave breaking. The flood and ebb tide currents and water levels affect this wave breaking and consequent wave set-up and a model based investigation was required to describe these variations.

Although this phenomenon had been estimated empirically as part of storm tide estimation for Brisbane Airport expansion, Blain, Bremner and Williams (1979), it has not been included in previous numerical storm tide studies - its importance is location specific.

The wave model applied to this study was SWAN and it is described in Section 3.

2.2.3 Establishment of Statistical Models

Cardno Lawson Treloar developed statistical models enabling probabilistic quantification of the storm tide hazard, expressed in terms of the Average Recurrence Interval (ARI), and based on the maximum likelihood method of fitting to a range of extremal distributions. The minimum requirement was to define storm tide impacts for the:-

- 50, 100, 200, 500, 1000 and 10,000-years ARI

The 10,000-years ARI was taken to be the *theoretical maximum storm tide level* as per NSTMM (2002).

(a) Statistical Modelling of the Storm Climatology

An outline of the statistical modelling adopted to describe the cyclone climatology follows:-

- A statistical model of the occurrence of the parameters of the identified cyclone climatology consistent with the numerical modelling capability, that is, the cyclone track parameters (track, forward speed, central pressure), was adopted - non-cyclonic storms were treated separately;
- A common radius to maximum winds of 40km was adopted. This leads to slightly conservative storm tide levels;

- Monte-Carlo based sampling of the range of identified storm parameters was adopted;
- Consideration of attenuation of tropical cyclones at landfall, that is, reduction of off-land wind speed and central pressure was included;
- Consideration of the Maximum Potential Intensity of storms - depends on latitude and sea surface temperature – discussed with Bureau of Meteorology and agreed to be 930hPa because cyclones originating from more northerly and warmer sea areas may maintain their higher central pressure as they propagate southward (pers. comm. Callaghan - Treloar/Taylor) was adopted
- Consideration of enhanced-Greenhouse climate change – MSL rise and increased cyclogenesis was included;
- Verification of the statistical model performance in terms of regional wind speeds was undertaken;
- A sensitivity study of the principal parameters and assumptions was included.

(b) Statistical Modelling of the Storm Tide Hazard

An outline description of the statistical modelling of the storm tide hazard follows:-

- Interpolation of results from systematic storm tide modelling (tide, surge, wave parameters) of a set of discrete storm systems that cover the expected range of parameters, for example, central pressure, was undertaken;
- Linear combination of tide, storm surge elevation and shoreline wave set-up elevation time series, together with a more steady state regional wave set-up was undertaken;
- Consideration of non-linear storm tide modifications, including surge-tide interactions and depth-sensitive wave and surge effects was included;
- Determination of the frequency of exceedance of selected ARI water levels (tide + surge + regional wave set-up and associated nearshore wave parameters, and tide + surge + regional and shoreline wave set-up) was included;
- Determination of duration of exceedance (persistence) statistics - duration of water level and potential inundation was investigated – see Cardno Lawson Treloar (2008);
- Verification of the statistical model performance in terms of any available long term water levels – considering cyclonic and non-cyclonic conditions was included;
- Joint probability assessment of tide + storm surge water levels and incident wave heights and periods is included in the outcomes;
- A sensitivity study of the principal parameters and assumptions leading to recommendations for freeboard allowances for planning purposes – depending upon the extent of wave run-up effect. This entailed assessing wave run-up at selected output locations for a natural sand beach and a 1V:2H rock revetment

2.2.4 Risk Assessment

Cardno Lawson Treloar (2008b) have also undertaken a risk assessment (e.g. DES 2005) of the storm tide hazard for each of the LGA areas with respect to the identified ARI storm tide levels to identify, analyze and evaluate the storm tide risk and examine treatment options. These analyses included:-

- Encroachment;
- Depth of inundation and depth × velocity – equates to hazard level;
- Duration of inundation;
- Wave penetration in nominated high resolution areas;
- Population at Risk (PAR) analysis based on LGA-supplied data;
- Assessment of infrastructure impacts;
- [Optional] Estimated economic damage, including Annual Average Damage.

The risk assessment is reported separately in Cardno Lawson Treloar (2008b).

3. MODEL SYSTEMS

3.1 General

Tide and storm surge investigations undertaken throughout the study area required application of high level model systems capable of simulating a range of processes – wind and pressure fields, tidal forcing, hydrodynamic and wave processes.

3.1.1 Hydrodynamic Numerical Scheme

Delft3D is comprised of several modules that provide the facility to undertake a range of hydrodynamic process studies. All studies generally begin with the Delft3D-FLOW module. From Delft3D-FLOW, details such as velocities and water levels can be provided as inputs to the other modules. The wave module works interactively with the FLOW module through a common communications file. In the case of wave modelling this ensures physically realistic wave set-up in a 2D plan layout. This is especially important in complex waterways where the shoreline is not 'straight' and also where regional wave set-up, for example, from Spitfire Banks into Moreton Bay, occurs.

The Delft3D FLOW module is based on the robust numerical finite-difference scheme developed by G. S. Stelling of the Delft Technical University in The Netherlands. Since its inception, the Stelling Scheme has undergone considerable development and review by Stelling and others.

The Delft3D Stelling Scheme arranges modelled variables on a horizontal staggered Arakawa C-grid. The water level points (pressure points) are designated in the centre of a continuity cell and the velocity components are perpendicular to the grid cell faces. Finite difference staggered grids have several advantages including: -

- Boundary conditions can be implemented in the scheme in a rather simple way
- It is possible to use a smaller number of discrete state variables in comparison with discretisations on non-staggered grids to obtain the same accuracy
- Staggered grids minimise spatial oscillations in the water levels.

Delft3D can be operated in 2D (vertically averaged) or 3D mode. In 3D mode, the model uses the σ-coordinate system first introduced by N Phillips in 1957 for atmospheric models. The σ-coordinate system is a variable layer-thickness modelling system, meaning that over the entire computational area, irrespective of the local water depth, the number of layers is constant. As a result, a smooth representation of the bathymetry is obtained. Also, as opposed to fixed vertical grid size 3D models, the full definition of the 3D layering system is maintained into the shallow waters and until the computational point is dried. 2D modelling was adopted for this investigation because it has been found in previous storm tide investigations that there is no significant difference in water levels computed by 2D and 3D models.

Horizontal solution is undertaken using the Alternating Direction Implicit (ADI) method of Leendertse for shallow water equations. In the vertical direction (in 3D mode) a fully implicit time integration method is also applied.

3.1.2 Wetting and Drying of Intertidal Flats

Many nearshore areas include shallow intertidal areas; consequently Delft3D includes a robust and efficient wetting and drying algorithm for handling this phenomenon.

3.1.3 Conservation of Mass

Problems with conservation of mass, such as a 'leaking mesh', do not occur within the Delft3D system.

However, whilst the Delft3D scheme is unconditionally stable, inexperienced use of Delft3D, as with most modelling packages, can result in potential mass imbalances.

Potential causes of mass imbalance and other inaccuracies include: -

- Inappropriately large setting of the wet/dry algorithm and unrefined inter-tidal grid definition
- Inappropriate bathymetric and boundary definition causing steep gradients
- Inappropriate time-step selection (that is, lack of observation of the scheme's allowable Courant Number condition) for simulation

4. DATA

A range of data items were required to set up the numerical storm tide and wave models and then calibrate/verify them, followed by a series of hindcast simulations of historical cyclones.

4.1 Bathymetry

A range of bathymetric and survey data was utilised in this project, including:-

- Land and water survey provided by the Councils,
- Maritime Safety Queensland (MSQ) charts
  - MB1 (Moreton Bay),
  - MB8 (Redland Bay to Cabbage Tree Creek)
  - MB7 (Couran to Redland Bay) and
  - MB6 (Nerang River to Couran),
- Australian Hydrographic Charts
  - AUS 365,
  - AUS 814, and
- Geoscience Australia Australian bathymetric and topographic grid (Petkovic and Buchanan, 2002) - beyond 3,000m depth.

A detailed Digital Terrain Model (DTM) of the model region was developed as indicated in Figure 1.1. The DTM incorporates all of the datasets listed above. The following precedence (highest precedence first) was adopted when developing the DTM:-

1. Data supplied by Councils
2. MSQ charts
3. AUS charts
4. Geoscience Australia data.

The datum of the DTM is Australian Height Datum (AHD). At Brisbane Bar, Australian Height Datum is 1.243m above chart datum.

4.2 Water Level

Tidal data has been obtained from three sources. Tidal constants have been obtained from Australian National Tide Tables – 2007 (Australian Hydrographic Service, 2006). Tidal predictions were undertaken using the so-called Canadian tidal prediction package (Foreman, 1977) and also internally within the Delft3D model system.

Long-term water level (predicted tide and recorded water levels) data obtained from MSQ for Brisbane Bar, Mooloolaba and Gold Coast have also been utilised. The data set at Brisbane Bar covers the period from 1967 to 2008. For selected events, water level data from a variety of gauges around Moreton Bay were also obtained from MSQ.

Offshore tidal data in the form of harmonic constants were required to prepare time series of tidal water levels along the open boundaries of the storm tide model. Tidal constant data for offshore sites has been obtained from the Danish National Space Centre which has a 0.5 degree resolution global tidal model based on Le Provost (1998) for five tidal constants – M_2, S_2, K_1, O_1 and N_2. These are the principal tidal components and generally provide predicted tidal levels in close agreement with water levels predicted at Brisbane Bar, for example, using the 15 constants presented in Australian National Tide Tables (2007), but with high water levels being about 0.1m lower. Note, in the design water level calculations the full range of constants for Brisbane Bar have been used to calculate the predicted tide.

4.3 Cyclone and Wind Data

Cyclone data was obtained from the Bureau of Meteorology cyclone track database (BoM, 2003). Cyclone tracks which passed through the region 151^{o}E to 160^{o}E and 25.5^{o}S to 28.5^{o}S since 1959 were identified. Although track data is available for cyclones occurring before 1959, that data is less reliable. The advent of satellite imagery and over-the-horizon radar has improved cyclone identification and significantly improved the quality of the track data recorded since then. A total of 29 events have been identified in the analysis region. Of these, 23 have been specified as coast-parallel events and 6 as coast-crossing (direction of motion east to west). The general properties of each cyclone event, for example, central pressure, forward velocity and distance from the coast, have been identified. Due to the small cyclone dataset, the analysis window has not been refined into small sections.

The probability distributions obtained from frequency analyses of these data were used in the Monte Carlo modelling phase, applying them in the form of a histogram rather than fitted curves. Neither the coast-parallel nor the coast-crossing populations is defined particularly well because of their small populations.

Offshore tracking cyclones (land to sea) have been omitted from the cyclone statistics due to the extremely small sample size.

Historical synoptic charts have been obtained from the Bureau of Meteorology for the following large-scale cyclones or tropical low pressure storms:-

- Tropical Cyclone Pam,
- Tropical Cyclone David,
- Tropical Cyclone Roger, and
- March 2004 tropical low.

These charts have been used to reconstruct wind fields for at least two of these events. The purpose here was to investigate the storm surge and wave effects of these events, which fall outside of the normal parametric characterisation range of tropical cyclones and the basic simulations adopted for Monte Carlo simulations. That is, in the case of cyclone David, its physical extent within the Coral Sea was very large and uncommon and not described by the Holland wind field model parameters adopted to prepare the basic simulation input for the Monte Carlo process. Windfield analyses have involved digitising the isobars and calculating the geostrophic and 10m above MSL wind speeds and directions using an algorithm provided in the MIKE-21 modelling system (Danish Hydraulics). The purpose was to determine the spatial variation of the outcomes of these events and to confirm that those results did not exceed those determined via the more general Monte Carlo approach – see Section 9.1.

Wind data records have been obtained from the following four BoM sites that are on or close to the coast. Brisbane Airport and Cape Moreton are within the study area. Sunshine Coast Airport (Maroochydore) is the closest long-term wind data site to the north and Coolangatta Airport is the closest long-term site immediately south of the study area. The data record periods at each site are presented below:-

- Brisbane Airport – 1950 to 2007
- Cape Moreton – 1957 to 2007
- Maroochydore Airport – 1994 to 2007
- Coolangatta Airport – 1987 to 2007

Wind data was also obtained from the BoM for three 'over-water' sites within Moreton Bay. The data record periods at each site are presented below:-

- Spitfire Channel Beacon – 2002 to 2008
- Inner Reciprocal Marker – 2002 to 2008
- Banana Bank Beacon – 2002 to 2008

Since the mid-1990's, high resolution satellite derived wind data is available for offshore Queensland. For this study, over-water wind data has been obtained from NOAA. The blended wind dataset is available of a 25km grid, at intervals of six hours. A full description of the dataset is presented in Zhang *et al* (2006). The data is available online at http://www.ncdc.noaa.gov/oa/rsad/seawinds.html.

4.4 Wave Data

Historical wave data was provided by Queensland EPA for the following sites:-

- Brisbane Offshore WRB - 1976 to 2008,
- Gold Coast Offshore WRB - 1987 to 2008, and
- Moreton Bay WRB - 2000 to 2008.

This data was used to calibrate the SWAN wave model. WRB indicates a Waverider buoy wave recording instrument. Analyses of that data by EPA provided wave height and period parameters, commonly H_s and T_z.

5. MODEL SET UP

5.1 Delft3D Storm Tide Model Set Up

Amongst its characteristics, the Delft3D model includes spatially variable bed friction. Bed roughness was set to be a constant Chezy 60$m^{1/2}$/s on the general seabed during the tidal calibration phase. At the Gold Coast Seaway and Jumpinpin Bar Entrances to the Broadwater, a roughness coefficient of 30$m^{1/2}$/s was adopted.

The key model parameters were:-

- Time step – 0.5min,
- Minimum dx, dy – 50m,
- Maximum dx, dy – 2000m, and
- Wind drag coefficients:
  - 0.00100 @ 5m/s
  - 0.00354 @ 15m/s
  - 0.00354 @ 30m/s

The wind drag coefficients were selected during the storm tide calibration process – see Section 5.4.2.

Wind set-up develops across the nearshore area as the result of interfacial shear between the wind and sea surface and the consequent onshore currents. The Coriolis acceleration acting on northward flowing coastal currents may also cause a storm surge component. Set-up is inversely proportional to water depth, directly proportional to fetch and proportional to the square of wind speed - in a steady state system. There is also the inverse barometer component which generally can cause 1cm of sea level rise for each hPa drop in atmospheric pressure below normal for the season. This water level rise may not be achieved in fast moving cyclones, or may be exceeded if resonance occurs between cyclone forward speed and wave celerity. More details are described in Appendix C.

A large area model was established to ensure that physically realistic development of the cyclone-caused currents and set-up occurred over the whole study area. Furthermore, detailed nearshore model output was required at many locations over an extensive length of shoreline. Fine grid models are required in the nearshore areas to properly describe the wave and wind set-up gradients. A series of nested models was developed to overcome these conflicting requirements of large model extent and nearshore resolution, without compromising accuracy whilst still maintaining practical computational times. Using the Delft3D nested grid approach, a total of four separate, interlinked, grids were developed. The domains covered:-

1. Overall model area extending 120km offshore to depths beyond 3,000m
2. Moreton Bay north including the northern entrance and south channel entrances to Moreton Bay. Grid resolution was a minimum of 200m x 200m.
3. Moreton Bay south including the entrance between North and South Stradbroke Islands
4. Pumicestone Passage, which provided a detailed description of the Pumicestone Passage itself from Caloundra to northern Moreton Bay.

Figure 5.1 presents a plan view of the extent of the model grids.

5.2 Wind Model System – Holland Cyclone Model

For calibration, wind fields were computed from the available historical cyclone track data. This includes position, time and central pressure. The wind and pressure fields were prepared using the Holland wind model developed for the Bureau of Meteorology. The model includes first-order asymmetry based on the forward speed of the cyclone. This model is considered to provide the most realistic description of cyclonic wind fields for the Australian region. The empirical formula proposed in Holland (1980) has been used to determine the 'B' parameter value. Neutral pressure has been taken to be 1010hPa. The Holland model was also used for the idealized basic cyclone simulations undertaken for Monte Carlo system input.

5.3 Wave Model System

The first step in this investigation was to set up a large area offshore wind/wave model based on the third generation wind/wave modelling system, SWAN, developed by the Delft Technical University.

The SWAN model is incorporated as part of the Delft3D system. It includes natural bathymetry, offshore wave input (parametric or spectral), wind input, refraction, shoaling, bed friction, full frequency-direction wave propagation, white-capping, wave/current interaction and solutions to third order. Fine grids can be nested within coarser outer grids. The model system is considered to be one of the most reliable available. For this study it was operated outside of the Delft3D system to allow for time varying wind conditions.

The wind/wave model was established on a 5km computational grid with an origin at 35^{o}S; 150^{o}E. The model grid extended northward and eastward over 2,000km from the origin. The large model extent was required to enable realistic simulation of waves generated from gradient winds across the Tasman Sea, as well as describing the rotating wind fields of cyclones.

A time-step of 60 minutes was adopted to ensure physically realistic wave propagation and growth. The frequencies selected for spectral description ranged from 0.05Hz to 1.0Hz - a total of twenty-four frequencies being used. Directional resolution was based on thirty-six divisions of the compass. The Holland wind model, developed by the Australian Bureau of Meteorology for tropical regions of Australia, was used to calculate cyclone wind fields from the cyclone track parameters. The model extent and spatial resolution are considered more than adequate for the description of peak storm wave conditions arising from tropical cyclones and east coast lows with large gradient wind forcing.

In addition to this regional model, a finer grid (500m) SWAN wave model was established for the region between the Gold Coast and Mooloolaba. This grid included Moreton Bay and the Broadwater. Hindcast simulations were undertaken for selected events and the SWAN model was operated in non-stationary mode.

The SWAN model was also operated interactively with the storm tide model so that the spatial and temporal variation in water levels and current speeds due to wave forcing (radiation stresses) could be investigated. A time-series of wave conditions was specified along the Moreton Bay and Broadwater boundaries of the Delft3D-FLOW model for the cyclone hindcast simulations using the regional SWAN model described above.

5.4 Model Calibration

Model calibration was undertaken in stages, the first being tide only in order to separately address bed friction and schematisation, and subsequently to address wind friction in

cyclone simulations. In a separate exercise, the Holland wind model was used to generate numerical wind fields for comparison with recorded wind data, mainly at Brisbane Airport and Cape Moreton, though the latter site is high above sea level and possibly affected by topographic features.

5.4.1 Tide Calibration

The Delft3D model has been calibrated using predicted tides to ensure that the model geometry and bed friction provide a suitable hydrodynamic representation of the study area. Deepwater tidal constants from a global tide model have been specified at selected locations along the offshore model boundary. Tide conditions along the northern and southern inshore boundaries were developed from tidal constants from Waddy Point and Point Danger - Australian Hydrographical Service, 2007. Along all boundaries the five principal tidal constants – M_2, S_2, K_1, O_1 and N_2 have been specified. The lack of reliable offshore constants beyond these five is the principal reason for specifying only five constants. In the determination of design water levels within the study area, up to 15 tidal constants were utilised to generate the predicted tide at specified sites within the study area. The tidal calibration simulation covered a 28-days period plus a 3-days warm-up period. The simulation period was selected to be from 1 to 31 January 2007. Figure 5.2 presents a plan view showing the tide calibration sites.

Figures 5.3 to 5.5 present time-series water level plots at the calibration locations over a 14-days spring-neap tidal period extracted from the simulation. In all plots, the Delft3D result is shown by solid black lines and the predicted tide (five constants) is presented as a dashed red line.

Figure 5.3 presents water level time series at Mooloolaba and Point Danger, open coast sites to the north and south of the study area, respectively. The model calibration is generally good, with modelled water levels within 0.1m of predicted water levels.

Figure 5.4 presents water level time-series at a point near the northern entrance to Moreton Bay (BnM2), near the entrance to Pumicestone Passage (Bribie Island) and at Brisbane Bar. The model calibration is generally good with modelled water levels generally within 0.1m of predicted water levels.

Figure 5.5 presents water level time-series at a point near the entrance to the Gold Coast Seaway and a point inside the Broadwater at Runaway Bay. The model calibration at the Gold Coast Seaway is generally good with modelled water levels generally within 0.1m of predicted water levels. At Runaway Bay, the Delft3D model slightly overestimates the predicted tide near high water.

Table 5.1 quantifies the tidal calibration in terms of the mean difference between the predicted and modelled tides at all sites. The maximum and minimum residual for each site is also presented in Table 5.1.

Table 5.1: Water Level Standard Deviations and Residuals – Delft3D Model (Five-Components Predicted Tide)

		Residual (m)	
Site	σ (m)	Min	Max
Mooloolaba	0.01	-0.07	0.06
Point Danger	0.01	-0.03	0.02
BnM2	0.02	-0.07	0.07
Bribie Island (Bongaree)	0.04	-0.15	0.10
Brisbane Bar	0.04	-0.15	0.10
Gold Coast Seaway	0.01	-0.06	0.03
Runaway Bay	0.03	-0.12	0.1

5.4.1.1 Pumicestone Passage

In order to accurately describe storm tide within Pumicestone Passage, it is important to accurately simulate the hydraulics of the system in the Delft3D model. In the model developed for this study, Pumicestone Passage has a dedicated curvilinear grid which provides high resolution through the sinuous channel.

No digital current data was available for this study, however, a report from the EPA which included spring tide currents sampled at two sites in southern Pumicestone Passage was available. During that study, the EPA deployed S4 current instruments for two days off Bellara (Site 1) and Banksia Beach (Site 2). Appendix D presents the reported currents from the EPA study. Figure 5.6 presents time series of spring currents (January 2007) from the Delft3D model at the two locations. The general character of the modelled currents agrees well with the measured currents, with Site 1 experiencing stronger currents during the flood tide, and Site 2 experiencing stronger currents during the ebb tide. This outcome provides confidence that the Delft3D model will accurately describe the propagation of storm tide through Pumicestone Passage.

5.4.2 Cyclone Events

The Delft3D model has been calibrated for modelled storm surge for two severe tropical cyclones that have affected the study area. Tropical Cyclone Daisy (February 1972) and Tropical Cyclone Dinah (January 1967) are two severe 'close tracking' cyclones that have affected Moreton Bay.

5.4.2.1 Tropical Cyclone Daisy

Tropical Cyclone Daisy passed close to the northern entrance to Moreton Bay in February 1972. A maximum total storm surge of 0.7m was recorded at Brisbane Bar. Because of the close proximity of the cyclone eye to the Bay, the observed residual water level at Brisbane Bar displays a pronounced peak water-level when the cyclone eye is to the north of Moreton Bay, followed by a negative surge when the cyclone eye passes to the east of Moreton and Stradbroke Islands.

Figure 5.7 presents the predicted, observed and measured water levels at Brisbane Bar for Cyclone Daisy. The modelling does not consider any gradient wind forcing or residual tide due to oceanic processes prior to the cyclone. A background residual water level of 0.15m was specified in the modelling, based on the observed residual tide prior to Cyclone Daisy passing near Moreton Bay. A radius to maximum winds of 50km was specified based on available satellite images and calibration of the recorded winds at Brisbane Airport.

Figure 5.8 presents time series of measured and modelled wind parameters (speed and direction) at Brisbane Airport and Cape Moreton. The modelled wind direction at both sites is good and the modelled wind speed at Brisbane Airport is also generally good. The model does not reproduce the lull in wind speed as the cyclone eye passes north-east of Brisbane Airport; however, the general modelled time series is good surrounding the peak wind conditions. It is difficult to calibrate winds at Cape Moreton because of the location of the anemometer on top of a cliff, 100m above the sea-level.

The focus of the calibration has been to describe the wind speeds at Brisbane Airport where the quality of the data and temporal resolution is better. The measured wind speeds provided by the Bureau of Meteorology are specified at 10m above ground elevation. The Cape Moreton anemometer is on top of a cliff 100m above sea-level. This site is known to over-estimate the 10m elevation wind speed, particularly for wind directions between north-east and south-east.

A range of wind friction parameters were investigated before the selection of the calibration values. Figure 5.9 presents a time series of modelled and measured storm surge at Brisbane Bar and Mooloolaba with only wind and predicted tidal forcing applied to the model. The peak modelled storm surge is reasonable at both sites. The time series at Mooloolaba indicates the modelled storm surge is approximately 3 to 4 hours earlier than the measured peak. It should be noted that the cyclone track adopted in this study is the specified track in the BoM database. Generally the accuracy of the cyclone eye data is at best +/- 10 to 20 km. Passing close to Moreton Bay means that track and windfield shape detail are particularly important to the modelled outcome.

The influence of regional wave set-up (as distinct from nearshore wave set-up) has long been recognised as an important component in the observed storm surge inside Moreton Bay. The momentum flux change caused by wave breaking along the whole northern entrance shoal has the potential to elevate water level inside Moreton Bay by a few decimetres when severe wave conditions persist for a sufficient length of time. The large-scale SWAN wave model has been used to estimate the time-series of wave heights near the northern entrance of Moreton Bay at a depth of 60mAHD. Figure 5.10 presents a time series of modelled wave conditions for Cyclone Daisy. These wave conditions were specified along the northern boundary of the Moreton Bay sub-model to investigate potential wave set-up.

Figure 5.11 presents time series of observed and modelled storm surge, the latter with and without wave set-up included, for Brisbane Bar. The inclusion of wave set-up improves the time series calibration of the model, although the modelled storm surge still has a drop near the peak. The good agreement between the measured and modelled storm surge leading up to the peak and the periodicity of the wave set-up component inside Moreton Bay indicates that the tide phase is important in determining the magnitude of wave set-up – albeit wave conditions varied over the same period. During the ebb tide, the height of wave set-up induced storm surge is highest as the wave momentum flux acts against the tidal forcing (ebb tide) to 'hold' water within Moreton Bay.

A correlation analysis has been undertaken for the Cyclone Daisy storm surge results. The correlation coefficient for the modelled and measured surge at Brisbane Bar is 0.87, which indicates very good agreement in the time series trends between the modelled and measured storm surge. The correlation coefficient between the predicted tide and wind set-up component is 0.11, which indicates there is a no identifiable relationship between wind set-up and tide.

The correlation coefficient between the predicted tide and the wave set-up component is -0.47, which indicates that there is a moderate inverse relationship between the two. That is, wave set-up will tend to increase on the ebb tide. The period of the wave set-up

component is 12.5 to 13-hours, which is consistent with the semi-diurnal tide period, again indicating the relationship between wind and regional wave set-up and the astronomical tide. The net storm surge, that is, the combined pressure, wind set-up and wave set-up time series, has a harmonic character with a 12 to 13-hours period that is generally in phase with the measured storm surge time-series (R^2=0.87).

Overall the model system developed in this study has been able to simulate storm surge during Cyclone Daisy well. Importantly, the modelling approach is able to separate the wind (plus inverse barometer), and wave set-up components and to demonstrate the importance of regional wave set-up (developed on the shallow sand banks in northern Moreton Bay – Spitfire area) on observed storm tide within Moreton Bay. The model used in the design simulations (see Sections 7 and 8) also includes nearshore wave set-up computation, but that set-up does not occur at the Brisbane Bar tide gauge site.

5.4.2.2 Tropical Cyclone Dinah

Tropical Cyclone Dinah was an intense tropical cyclone which tracked off the South-East Queensland coast in January 1967. It caused extensive damage between Hervey Bay and the Gold Coast through a combination of high waves and storm tide. At Brisbane Bar, the maximum peak surge recorded was approximately 0.4m above the predicted tide. At Mooloolaba, the peak surge was approximately 0.8m above the predicted tide. Figure 5.12 presents a time-series of predicted and measured water level at Brisbane Bar. Although, when compared with Cyclone Daisy, the recorded surge at Brisbane is not high, the peak surge occurred near high water and due to the direction of the wind forcing inside Moreton Bay the observed storm tide at some shoreline sites was considerably higher than recorded at Brisbane Bar. For example, considerable flooding was observed near Sandgate, approximately 9km north-west of the Brisbane Bar tide gauge.

Analysis of synoptic charts for Cyclone Dinah indicated that near the study area the cyclone eye diameter was approximately 80km (Harper *et al*, 2000). It is likely that the radius to maximum winds was approximately 40km. For the calibrated wind field case, a radius to maximum winds of 42km was adopted.

Figure 5.13 presents time series of measured and modelled wind conditions (speed and direction) at Brisbane Airport and Cape Moreton. At Brisbane Airport, the modelled wind speed provides a good description of the measured wind speed near the event peak. Prior to the event peak, it appears that strong gradient winds, which are not described in the Holland model, were significant - pers. comm. Callaghan (BoM) – Taylor/Treloar. Additional information for Cyclone Dinah was provided by the BoM and is presented as Appendix E.

Following the initial simulations of Cyclone Dinah with the Delft3D storm surge model using the Holland wind model, it became evident that the wind forcing from the Holland model did not provide a realistic description of the storm tide observed at Brisbane Bar. A simulation was undertaken applying a wind field based on the measured winds observed at Brisbane Airport (see Figure 5.13). The winds from Brisbane Airport were adjusted upward by 3m/s on 29 January 1967 to reflect the observed over-water wind speed of 12.5m/s – see Appendix E. Figure 5.14 presents a comparison between observed and modelled storm surge and total water level at Brisbane Bar. Measured values are presented in the solid black lines, and the Delft3D model results are presented in the dashed red line. Note, the Delft3D result includes the effect of regional wave set-up, although this is a minor contribution to the peak surge value. This outcome identifies the limitations of the Holland model when strong gradient winds persist prior to the cyclone eye passing close to the study area. The outcome also provides confidence that, provided appropriate wind conditions are applied to the Delft3D model, it is able to accurately simulate the observed storm tide at Brisbane Bar.

Figure 5.15 presents a time series of modelled wave conditions during Cyclone Dinah at a depth of 60m near the northern entrance to Moreton Bay. The wind field applied to the wave model was taken from the Holland model. The winds from the Holland model are likely to underestimate the wave conditions prior to the eye passing close to Moreton Bay, but should provide a reasonable forcing for the peak storm wave heights. The peak wave conditions are easterly, compared with the north-easterly waves developed for Cyclone Daisy. These Cyclone Dinah wave conditions were specified along the northern boundary of the Moreton Bay hydrodynamic model to investigate potential regional wave set-up.

The variation in storm tide between Brisbane Bar and the shoreline areas near Sandgate, where significant inundation during Cyclone Dinah was observed, is presented in Figure 5.16. The peak storm surge at Sandgate was 0.60m compared to 0.47m at Brisbane Bar. The peak modelled storm tide, excluding local shoreline wave set-up, was 1.76m AHD at Sandgate compared to 1.66m AHD at Brisbane Bar. Figure 5.17 presents a plan view of the modelled total water level (excluding local set-up) in northern Moreton Bay at 12:00pm (midday) on 29 January 1967.

Shoreline wave set-up at the time of peak storm tide at Sandgate would likely have added between 0.1 and 0.15m to the water level. This height of local wave set-up would produce a modelled total water level of approximately 1.9m AHD near the shoreline at Sandgate. Cyclone Dinah generated significant rainfall in the Brisbane region. At Brisbane Airport, a total of 360mm of rainfall was observed. Sandgate is a flood prone area during events of rainfall intensity such as that observed during Cyclone Dinah. The ground level of road and houses immediately west of the shoreline is lower than the shoreline crest. It is likely that the storm tide from Cyclone Dinah would have backed-up the stormwater drainage system around Sandgate and increased the flooding of low-lying areas from rainfall.

Overall the model system developed in this study was able to simulate storm surge during Cyclone Dinah to a reasonable level. For Cyclone Dinah, the cyclone track data has lower temporal resolution compared to Cyclone Daisy and the gradient wind forcing prior to the event is significant.

5.5 Large Eye Cyclones and Tropical Low Modelling

Large eye tropical cyclones, tropical lows and East Coast Low systems have the potential to generate strong persistent winds and large offshore waves in the Moreton Bay region. Generally the centres of these low pressure weather systems are located offshore several hundred kilometres from Moreton Bay. Strong isobaric gradients generated from the interaction of the low pressure and a nearby high pressure system causes strong winds across the study area. Synoptic charts for selected large scale cyclones and low pressure storm systems provided by the BoM have been used to hindcast wind conditions in the study area. The third storm surge event used for model calibration in this study is the intense storm which tracked near Moreton Bay in March 2004. This event has been described as a 'Hybrid' storm which was observed to have properties of both tropical cyclones and ECL events. This event generated large offshore waves from the east-north-east to east sector and the highest recorded storm surge at the Brisbane Bar site. Although Brisbane Bar is not within the study area, it does provide reliable long term water level data for regional model calibration; noting that the highest storm tides will not normally be recorded there. Appendix F presents a summary of the event prepared by the EPA.

March 2004 Tropical Low Event

In March 2004 a tropical low system developed off the central Queensland coast. Since this event is more recent than others considered for model calibration, there were more wind data locations available for calibration. In addition to Cape Moreton and Brisbane

Airport, calibration of the wind conditions has also been undertaken using data from Coolangatta and Maroochydore Airports.

Initially a wind field generating routine from the MIKE-21 (DHI) model system was used to prepare the wind fields for the regional SWAN wave model grid and the Delft3D hydrodynamic model from the synoptic charts. Figure 5.18 presents time series plots of modelled and measured wind parameters at Brisbane Airport and Cape Moreton. Figure 5.19 presents time series plots of modelled and measured wind conditions at Coolangatta and Maroochydore Airports.

The modelled wind conditions at Brisbane, Coolangatta and Maroochydore Airports are a good representation of the measured 3-hourly wind conditions. At Cape Moreton, as with the hindcast of previous historical events, the modelled wind speeds are lower than the measured values when the wind direction is from the south-east. As the wind tends towards the north the modelled wind speed becomes closer to the measured values.

At all sites the modelled wind direction is generally a good match to the measured wind directions, which gives confidence that the general wind structure during this event is well described in the Moreton Bay region. Although there is some disagreement between the model and measured phases for the storm tide, the peak magnitudes and general character are in good agreement, which provides confidence that the Monte Carlo simulation will be reliable.

During the early stages of the calibration process for the March 2004 event, it became evident that the hindcast winds based on the synoptic charts did not generate the observed offshore wave conditions at the offshore Brisbane WRB. An alternative windfield was obtained from the blended satellite wind dataset provided by NOAA. This data includes high-resolution QuikSCAT satellite data. The data is provided on a 0.25 degree resolution grid (approximately 25km) every six hours. The satellite wind data has been verified using measured winds from the Spitfire Banks AWS in Moreton Bay. Figure 5.20 presents a comparison between measured (blue solid line), satellite (red dashed line), and modelled synoptic chart winds (green dashed line) near Spitfire Banks. The NOAA satellite wind data generally describes the observed over-water winds better. As a result, the NOAA satellite wind data has been adopted as the forcing winds for this event. Atmospheric pressure over the Delft3D model is based on the synoptic charts provided by the Bureau of Meteorology.

Figure 5.21 presents a comparison of the modelled and measured wave conditions at the Brisbane WRB. The modelled wave height and period generally agree well with the observed conditions. Typically the modelled wave direction is more easterly when compared with the observed wave directions. This outcome provides confidence that the SWAN model can reliably simulate the peak offshore storm wave conditions.

Figure 5.22 presents a comparison between the modelled and measured wave conditions at the Moreton Bay WRB. For this simulation, the measured winds at Spitfire Bank beacon were applied to the SWAN model. The modelled wave height and period agree very well with the observed wave conditions. This outcome provides confidence that the SWAN model can reliably simulate the local sea wave conditions within Moreton Bay.

Figure 5.23 presents a comparison of modelled and measured storm surge and storm tide at Brisbane Bar during the March 2004 event. Generally the modelled surge agrees well with the observed surge. During the simulation, the offshore wave conditions have been based on the observed wave conditions at the Brisbane WRB. For the March 2004 event, regional wave set-up is a significant contributor to the total storm surge.

Figure 5.24 presents modelled and measured storm surge (and tide) at Mooloolaba and the North-West 12 Beacon gauge sites. The modelled storm surge agrees well with the observed conditions at both sites. Note that the modelled surge at the North-West 12 Beacon includes wind, pressure and regional wave set-up forcing. This outcome provides confidence that the Delft3D model is able to reliably simulate storm tide over the whole of South-East Queensland and importantly account for local processes, for example regional wave set-up over Moreton Bay.

6. REGIONAL WAVE SET-UP INVESTIGATIONS

6.1 General Process – Wave Set-up inside a Coastal Embayment

Wave set-up is a process commonly observed at open beaches where the mean water level increases between the zone of wave breaking and the shoreline. It is caused by the conservation of momentum flux during wave breaking. In simple terms, wave set-up can be viewed as the conversion of some of the kinetic energy released during wave breaking into potential energy in the form of a rise in the mean water level surface.

Whilst wave set-up is usually associated with open beaches, studies have also shown that wave set-up can also influence water level within estuarine entrance and coastal embayment systems. Wave breaking at the entrance to a coastal embayment can cause a rise in the mean water level, the rise depending upon embayment size and depth, other entrances and storm parameters. This process has been documented in numerous studies that have applied data analysis and numerical modelling techniques. Nguyen *et al* (2007) investigated the impact of wave set-up on measured water levels inside river and inlet entrances on the coast of Japan. These investigations indicated that wave set-up, or wave momentum flux processes in breaking wave conditions, could increase water levels inside entrances by 10% to 15% of the offshore wave height for shallow and narrow entrances, and 0.2% to 4% of the offshore wave height for deep and wide entrances. Tanaka and Debasish (1993) also investigated wave set-up inside a river mouth and compared measured set-up with Goda's irregular wave breaking model. There studies indicated that coupling Goda's model with the effects of currents provided a reasonable model of wave set-up inside the entrance at the study site.

Irish *et al* (2004) adopted an approach similar to that adopted in this study to investigate storm water levels inside coastal embayments along Long Island, USA. That paper is included as Appendix G. In that study the Delft3D FLOW model was coupled with a wave model (HISWA – predecessor to the SWAN model). The modelled water level was compared to measurements at seven sites inside the coastal embayment. A model simulation that was forced using tide, local wind and local wave conditions provided the best agreement with the measured water levels. Based on the calibrated Deflt3D model, wave set-up during the study event contributed 15% of the measured storm tide inside the coastal inlets during the event.

This process has been recognised in a previous storm tide study undertaken by Blain, Bremner and Williams (1979a) for the 'New Brisbane Airport'. Storm tide outcomes from that study were based on tide and surge simulations. Regional wave set-up (termed effective set-up), was included in an empirical manner. Evidence cited by Blain, Bremner and Williams for this phenomenon is the tidal anomalies observed during cyclones David and Pam for which storm surge modelling showed no tidal anomaly, yet differences above the predicted tides were in the order of 0.3m – those cyclones generally tracked no closer than 500km from Brisbane, yet caused very high waves near the Moreton Bay entrance shoals.

The calibration process has shown that during particular storm events, there is a residual water level inside Moreton Bay that cannot be attributed to either inverse barometer or conventional wind set-up processes – as identified by Blain, Bremner and Williams. The magnitude of this residual water level was largest during the Cyclone Daisy and March 2004 calibration events, which generated large offshore waves from the north-east to east sector. Spitfire Banks is a coastal bar system which extends some 30km across the northern entrance to Moreton Bay. The depths along the high points of Spitfire Banks are typically 5m to datum AHD. Offshore of Spitfire Banks the seabed is very steep and due to

its orientation, offshore waves originating from the north-east to east sector propagate to Spitfire Banks without significant energy loss due to refraction or bed friction. During large wave events, it is common to observe wave breaking along the entire extent of Spitfire Banks.

The calibration events addressed in Section 5 include significant wind and pressure forcing together with wave forcing. All three processes influence the residual water level. A fourth calibration event from July 2001 has been selected in which the degree of local wind and pressure forcing was relatively small whilst moderate long-period waves were observed offshore which generated significant wave breaking along Spitfire Banks. The calibration of the Delft3D model for this event is discussed in Section 6.2.

6.2 July 2001 Event

A moderate wave event was observed on the 6th and 7th July, 2001. The waves were generated by an intense low in the Tasman Sea, some 1,500km to 2,000km east of Brisbane. Offshore wave heights reached 4m (H_s) at the Brisbane Waverider buoy with peak periods (T_p) of up to 12 seconds. The offshore wave direction was generally east during the peak of the event. Figure 6.1 presents measured wave height, period and direction during the July 2001 event.

During the period of moderate offshore waves, the measured winds inside Moreton Bay were generally calm and the atmospheric pressure stable. Figure 6.2 presents time-series of measured wind speed, direction and mean sea-level air pressure during the wave event.

Observed water levels at Mooloolaba, Brisbane Bar and Southport (Gold Coast) have been analysed during this period. Figure 6.3 presents time-series of the predicted and measured tide at Brisbane Bar, together with the measured residual tide at Mooloolaba, Brisbane Bar and the Gold Coast. Generally the residual tide is small at Mooloolaba; less than 0.05m. At Brisbane Bar, the residual tide shows a clear oscillatory character with a period of oscillation of about 12 hours. The magnitude of the residual tide is up to 0.19m coinciding with the peak offshore wave heights. Southport also shows some residual tide with a similar character to Brisbane Bar near the peak of the event.

The Delft3D model described in Section 5 has been applied to hindcast the residual tide during this event. Satellite 'over-water' wind data from NOAA has been applied together with measured air pressure at Brisbane Airport. For the wave simulations, measured offshore wave conditions from the Brisbane Waverider buoy have been specified as the boundary conditions.

Figure 6.4 presents modelled and measured residual tide at Mooloolaba, Brisbane Bar and the Gold Coast for the July 2001 event with tide, wind and pressure forcing only. Generally the model agrees well with the observed residual tide at Mooloolaba, however, the modelled water level at Brisbane Bar is not in good agreement with the measured residual tide. The model also under-estimates the residual water level at Southport. Figure 6.5 presents the modelled residual tide with wave forcing together with the measured residual tide at Brisbane Bar and Southport. Compared to Figure 6.4, the modelled residual tide is in much better agreement with the measured residual at both sites. It should be noted that although the current Delft3D model includes the Broadwater, it does not have the resolution nor data in this area to cover the whole storage of this system; therefore it can be expected that the modelled result at Southport it not as realistic as it is at Brisbane Bar, which is located in the centre of the study area. The inclusion of wave processes significantly improves the temporal agreement of the modelled residual tide compared to the measured residual tide. The modelled peak residual tide is in good agreement with the measured peak residual tide.

The measured residual tide at Brisbane Bar during the July 2001 event and the storm events described in Section 5 show a strong correlation with the tide and offshore wave conditions. The hindcast simulation of the July 2001 event, together with the storm events described in Section 5, demonstrate that the Delft3D model system is capable of simulating this wave induced variation in observed water level.

6.3 Regional Wave Set-up Investigations

The calibration process has demonstrated that the Delft3D model can simulate a wave induced water level variation within Moreton Bay. A series of parametric simulations have been undertaken with the Delft3D model to investigate the relationship between regional wave set-up inside Moreton Bay and offshore wave height, period and direction. A series of 27 simulations were undertaken with the following combinations of wave height, period and direction:-

- Wave Height (H_s) – 5m, 7m, and 9m
- Wave Period (T_z) – 6s, 8s, and 10s
- Wave Direction (deg. TN) – 45, 90 and 135

Each simulation was run for a period of three days. During the first day, the wave height increased from 2m up to the simulation value. During the second day, the wave height remained constant at the specified value and on the third day the wave height again decreased to 2m (H_s). Wave period and direction remained constant at the selected values during the whole simulation. Tide forcing was included in all simulations.

Figure 6.6 presents a time series of predicted tide (modelled), modelled water level with wave forcing and modelled residual tide at Brisbane Bar for the three specified wave directions. The offshore wave height is 7m (H_s) and wave period 8s (T_z). The results indicate that the magnitude of regional wave set-up is strongly influenced by wave direction. The magnitude of wave set-up for north-east and easterly waves is significantly higher than for similar south-easterly waves. South-easterly waves lose significant wave energy due to refraction before reaching Spitfire Banks. Tidal flows also have a significant impact on the magnitude of the modelled regional wave set-up. Regional wave set-up increases on the ebb tide and peaks near low water. Near high-water, the magnitude of the regional wave set-up is significantly reduced. This outcome is, at first, counter-intuitive.

Within Moreton Bay, the magnitude of regional wave set-up is relatively uniform on a magnitude basis although there is some temporal variation. Figures 6.7 to 6.13 present plan views of regional wave setup over a 12-hour period within Moreton Bay. The tide condition at Brisbane Bar is indicated in the bottom panel of each plot. Note that regional wave set-up may not occur at every Queensland coastal site.

6.3.1 Regional Wave Set-up Models – Moreton Bay

The Delft3D model has been demonstrated to simulate regional wave set-up within Moreton Bay that is consistent with observed water level data. However, the influence of wave direction and tide on magnitude of the regional wave set-up limits the ability to directly include it in the design cyclone simulations used to determine the planning levels within the study area. In the design cyclone simulations, astronomical tide is addressed independently in the Monte Carlo simulation – see Section 8. As a result, a series of regression models have been developed based on the simulations described in Section 6.3. These models can be easily implemented within the Monte Carlo procedure whereby, for a modelled offshore wave height, period and direction during a cyclone event, the magnitude of regional wave set-up can be determined realistically.

The regional wave set-up (η) relationship for Moreton Bay has been developed into a simple linear regional model of the form presented in Equation 6.1 where the coefficients β_0 and β_1 are calculated by regression analysis of the simulations described in Section 6.3.

$$\eta = \beta_0 + \beta_1 \left(H_s^{\,2} \times T_z^{\,2} \right) \qquad (6.1)$$

Figure 6.14 presents the linear regression model presented in Equation 6.1 for north-east, east and south-east wave directions respectively. For all wave directions, the models show a strong linear trend and the correlation coefficient is greater than 0.96 for all wave directions. Table 6.1 presents the regression coefficients for the regional wave set-up models.

Table 6.1 Regression Parameters for Directional Regional Wave Set-up Models

Offshore Wave Direction	β_0	β_1
North-East	0.1856	3.568×10^{-05}
East	0.1343	2.892×10^{-05}
South-East	0.03963	1.028×10^{-05}

Equation 6.1 has been developed for the peak wave set-up occurring during the tide cycle. Near high water, which is typically where peak storm tide occurs, the magnitude of the regional wave set-up is generally 25% to 35% of the peak wave set-up which occurs near low water. This tidal phase reduction was included in the Monte Carlo analyses.

7. DESIGN WATER LEVEL INVESTIGATIONS – NON-CYCLONIC

Design water levels arising from non-cyclonic events have been determined using a combined numerical modelling and data analysis procedure. The long-term water level record from Brisbane Bar has been used to determine the probability distribution of the residual tide at that site. The Delft3D model described in Section 5 has then been used to determine the relationship between the residual tide at Brisbane Bar and locations within the study area during strong wind conditions that typically prevail during non-cyclonic events, of which East Coast Lows are a significant meteorological case.

7.1 Data Analysis

A common method of extremal analysis of recorded water level data is to adopt the Extreme Value Type 1 distribution and to fit independent event peak water-levels to this distribution. An alternative method, which was adopted for this study, is the joint probability approach described by Pugh and Vassie (1980). That approach separates the astronomical tide (a deterministic phenomenon) and storm surge (a stochastic phenomenon) components because they come from different populations. The probability density function for both populations is formed first, and then a joint probability matrix developed.

Time-series of measured water levels and predicted tides at 1 hour intervals were obtained from Maritime Safety, Queensland, for the Brisbane Bar tide gauge. The data covered the period from 1966 to 2008; however, there were some periods where no measured data was available. The data included periods when cyclones were in the vicinity of Moreton Bay. Therefore those periods were removed from the predicted and measured water level data so that the analysis could be undertaken on times of non-cyclonic storm surge and no surge only. Table 7.1 presents the probability of occurrence of the predicted tide, and Table 7.2 presents the probability of occurrence of the residual water level excluding cyclone events at the Brisbane Bar tide gauge.

The joint probability of the residual tide and predicted tide were considered in the determination of water levels at the tide gauge and then for selected nearshore locations for specified ARI periods. This method is based on research by Pugh and Vassie (1980). A Type 1 Extreme Value distribution is then used to determine the water level at selected ARI intervals. This is the approach that was adopted in the Pine Rivers Storm Surge Study (Lawson and Treloar, 2004).

Table 7.1 Brisbane Bar Predicted Tide - Probability of Occurrence

Water Level Bin (mAHD)	Occurrences	Percentage Occurrence
1.5 - 1.4	91	0.02%
1.4 - 1.3	827	0.22%
1.3 - 1.2	1922	0.52%
1.2 - 1.1	3750	1.02%
1.1 - 1.0	6539	1.77%
1.0 - 0.9	9019	2.44%
0.9 - 0.8	11748	3.18%
0.8 - 0.7	14411	3.90%
0.7 - 0.6	16683	4.52%
0.6 - 0.5	18637	5.04%
0.5 - 0.4	20010	5.42%
0.4 - 0.3	20301	5.49%
0.3 - 0.2	20063	5.43%
0.2 - 0.1	19456	5.27%
0.1 - 0.0	18692	5.06%
0.0 - -0.1	18379	4.97%
-0.1 - -0.2	18781	5.08%
-0.2 - -0.3	20204	5.47%
-0.3 - -0.4	21988	5.95%
-0.4 - -0.5	23235	6.29%
-0.5 - -0.6	23582	6.38%
-0.6 - -0.7	22111	5.98%
-0.7 - -0.8	17782	4.81%
-0.8 - -0.9	12315	3.33%
-0.9 - -1.0	6301	1.71%
-1.0 - -1.1	2282	0.62%
-1.1 - -1.2	347	0.09%
-1.2 - -1.3	0	0.00%

Table 7.2 Brisbane Bar Residual Tide - Probability of Occurrence

Water Level Bin (m)	Occurrences	Percentage Occurrence
0.8 - 0.7	1	0.00%
0.7 - 0.6	2	0.00%
0.6 - 0.5	30	0.01%
0.5 - 0.4	106	0.03%
0.4 - 0.3	842	0.27%
0.3 - 0.2	7378	2.39%
0.2 - 0.1	45342	14.71%
0.1 - 0.0	123995	40.23%
0.0 - -0.1	95203	30.89%
-0.1 - -0.2	30220	9.81%
-0.2 - -0.3	4541	1.47%
-0.3 - -0.4	498	0.16%
-0.4 - -0.5	32	0.01%
-0.5 - -0.6	0	0.00%
-0.6 - -0.7	0	0.00%
-0.7 - -0.8	0	0.00%

7.2 Model Simulations

The Delft3D model presented in Section 5 has been used to determine the relationship between the wind-induced surge at Brisbane Bar and shoreline sites within the study area. Correlation analysis between non-cyclonic storm surge recorded at Brisbane Bar and wind conditions indicated that there is a moderate relationship between wind speed (measured at Brisbane Airport) and the magnitude of the storm surge. The correlation coefficient was 0.525. There was little to no relationship between storm surge and the wind direction, and also between wind direction and wind speed. A series of simulations have been undertaken with the Delft3D model to determine the wind surge ratios between Brisbane Bar and the selected locations within the study area. Simulations were undertaken for all wind directions at 45 degree intervals with a wind speed of 18m/s. This wind speed corresponds to a 20-years ARI 3-hourly average 'over-water' wind speed. For each output location, the maximum wind set-up ratio (output location to Brisbane Bar), was selected from all wind direction results to be applied in the joint probability calculation – see Section 7.3.

Within Moreton Bay, the total non-cyclonic storm surge for an event is formed from the following components:-

1. Oceanographic processes (including coastal trapped waves),
2. Regional wave set-up generated by wave breaking along Spitfire Banks,
3. Inverse barometer (atmospheric pressure),
4. Local wind set-up within Moreton Bay, and
5. Local wave set-up generated near the shoreline.

Components 1 to 4 are all present in the historical record of residual tide at Brisbane Bar. For each event, the contribution of each component will vary. A particular event may be dominated by local wind set-up, whilst another event may be dominated by oceanographic processes and regional wave set-up. For this study, the wind set-up ratios developed from the Delft3D simulations (see above) have been applied to the total residual tide record from Brisbane Bar to estimate the total residual tide at each model output point. This approach is somewhat conservative because Components 1 to 3, which are likely to be relatively uniform across Moreton Bay for any given event, have also been scaled by the wind set-up ratio for each output location. Since there is no reliable method to separate the storm surge components for the whole Brisbane Bar tide record (1966 to 2008), and given that cyclonic storm surge (see Section 8) generally governs the 100-years ARI storm tide level within the study area, the approach adopted to determine the non-cyclonic storm tide levels within the study area, whilst conservative, does not result in unreasonable planning levels.

In the Moreton Bay Regional Council Area, the maximum storm surge was generated in east to south-east wind directions. For Pumicestone Passage, southerly wind generated the largest surge. At all output locations, the wind surges are higher than at Brisbane Bar. Within the study area, the smallest shoreline wind set-up is observed around the Redcliffe peninsula. The largest surges occur within Pumicestone Passage.

7.3 Joint Probability Calculations

Design water levels at selected ARI's have been determined at the output locations by factoring the residual tide histogram at Brisbane Bar, see Table 7.2 by the site specific adjustment factors calculated from the Delft3D investigations. Design levels have been calculated for 20, 50, 100, 200, 500, 1,000 and 10,000-years ARI conditions.

7.4 Wave Parameters

Wave parameters have been calculated at all output locations for sea and swell conditions. With the exception of eastern and southern Bribie Island, all output locations are generally governed by local sea conditions.

7.4.1 Local Sea

The SWAN model presented in Section 5 has been used to hindcast local sea wave conditions between 2001 and 2008. Wind data from the Inner Marker station have been applied as the input wind parameter. Figure 7.1 present a comparison between the wave height probability of exceedance from the measured Moreton Bay Waverider buoy data and the SWAN model. The SWAN model agrees well with the measured data. A Type 1 Extreme Value distribution has been used to determine local sea wave heights for 20, 50, 100, 200, 500, 1,000 and 10,000-years ARI conditions.

7.4.2 Swell Waves

The SWAN model described in Section 5 has been used to hindcast swell waves for the top 500 wave conditions based on the offshore Brisbane Waverider buoy. The measured water level at Brisbane Bar was included in the hindcast to describe the influence of water level on the amount of swell penetration into Moreton Bay. The wave data covered the period from 1996 to 2008, which is the record period of the Brisbane directional Waverider buoy. A Type 1 Extreme Value distribution analysis was applied to the top 30 independent wave heights at each location to determine swell wave heights for 20, 50, 100, 200, 500, 1,000 and 10,000-years ARI conditions.

7.4.3 Wave Set-up

Wave parameters were selected and wave set-up was calculated by adopting the wave conditions most likely to occur jointly with each ARI water level (astronomical tide plus surge) at each site. The Goda formulation for irregular wave set-up was adopted (Goda, 2000). An extrapolation procedure was applied to estimate set-up beyond zero initial depth. Wave set-up has been calculated for a 1V:15H beach slope for the following range of wave heights and periods:-

- Wave Heights (H_s) – 0.5m, 1.0m 1.5m, 2.0m and 2.5m
- Wave Periods (T_z) – 2s, 4s, 6s, 8s, 10s and 12s

7.5 Design Water Levels

Appendix H presents non-cyclonic design water levels for ARI's between 20 and 10,000-years and for all output locations in the study area. Output locations are presented in plan view in Figure 7.2. Figure 7.3 presents a plan view of the 100-years ARI non-cyclonic water levels around the study area – astronomical tide + storm surge + wave set-up, and excluding any climate change aspects. Note, Appendix H also does not include any sea-level rise or freeboard allowance, which should be considered by Council when determining planning levels.

Appendix H includes wave run-up levels for two different edge treatments:-

1. Sandy Beach – 1V:15H average slope
2. Rock Revetment - 1V:2H average slope

Wave run-up levels for the sandy beach have been calculated using the Holman formula (Holman, 1986). Wave run-up levels for the revetment have been calculated using formula for wave run-up on permeable, rough surfaces presented in the USACE (2002) which is based on research published in Delft Hydraulics (1989). Run-up levels are presented for 50%, 2% and 1% exceedence levels. It is common to adopt the 2% run-up exceedence level in design levels. The 2% exceedence level refers to the elevation that is exceeded by wave run-up by only 2% of all waves during the design event.

Table 7.3 presents non-cyclonic storm tide (tide + surge + regional wave set-up) levels for Brisbane Bar, excluding any local wave set-up.

Table 7.3 Brisbane Bar Non-Cyclonic Water Levels at Selected ARI's – No Potential Climate Change Aspects Included – No Shoreline Wave Set-up

ARI (years)	Water Level (mAHD)
20	1.69
50	1.74
100	1.78
200	1.82
500	1.88
1,000	1.92
10,000	2.05

Note that these water levels have been prepared as part of the non-cyclonic storms investigation process and are not suitable for design purposes.

8. DESIGN WATER LEVEL INVESTIGATIONS – TROPICAL CYCLONES

8.1 Cyclone Population Statistics

A total of 29 cyclones which have occurred since 1959 have been identified as having potential significant effects on the study area – see Section 4.3. These events have been analysed to identify values for the following parameters:-

- Track Direction
- Month of Origin
- Landfall Location or Minimum Distance from the Coast
- Minimum Central Pressure
- Average Forward Speed

Cyclones were classified as either 'Coast-Parallel' or 'Coast-Crossing' based on the direction of motion and visual inspection of the recorded tracks. Each track direction was treated as a separate population in the Monte Carlo analysis and as a result the statistics for the other variables have been assembled from only cyclone events with the same track direction. Minimum central pressure was the minimum pressure observed whilst the cyclones were within the designated 'cyclone study area'.

Figure 8.1 presents the cyclone statistics for 'Coast-Crossing' events and Figure 8.2 presents the cyclone statistics for 'Coast-Parallel' events. Appendix I presents track plots for all adopted cyclone events. Note that cyclones which have tracked from west to east, for example Cyclone Althea, have been omitted from the analysis because there were only two such events in the 49 years of record, which is too small a sample from which to generate reliable statistics.

Following discussions with the BoM (pers. com. Taylor/Treloar – Callaghan), the potential for coast-parallel events which track 'in-land' has been included in the cyclone probability functions of the Monte Carlo model. Cyclones with this track have not been observed since 1959, however, they have been observed in earlier historical cases and caused widespread damage in the Moreton Bay region. Since no reliable statistics for the occurrence of these events can be obtained from the post-1959 database, the Monte Carlo model has specified that 2% of coast-parallel cyclones may track 'in-land' through the study area. Since coast-parallel cyclones occur for 79% of all events, the total frequency of occurrence for these events is 1.5 events per 100-years, generally consistent with the long term data.

8.2 Base Simulations

The calibrated Delft3D and SWAN models described in Section 5 have been applied to simulate a series of base cases that provided the interpolation matrix for the Monte Carlo simulation. Based on the analysis of observed cyclone events since 1959, a series of design cyclone tracks were developed for the base simulations. 'Coast-parallel' tracks have been designed to follow the general alignment of the coastline in south-east Queensland. 'Coast-crossing' cyclones track in a south-westerly direction at regular intervals along the coastline. Figure 8.3 presents the 'coast-crossing' and 'coast-parallel' cyclone tracks which have been adopted. There are a total of 9 'coast-parallel' tracks and 7 'coast-crossing' tracks. For both cases, the distance between adjacent tracks is 40km, which corresponds to the radius of maximum winds adopted for these simulations. Based on the historical data, it is difficult to reliably estimate the radius to maximum winds for all the cyclones dating back to 1959. Therefore, a uniform value of 40km has been adopted

for this study. The selection of a 40km track grid for the base simulations is designed to minimise interpolation errors in the Monte Carlo procedure.

For each cyclone track specified in Figure 8.3, the following central pressure and forward speed ranges were simulated:-

- Central Pressure: 925hPa, 950hPa, 975hPa and 1000hPa
- Forward Speed: 3m/s and 7m/s

A total of 128 base cases were simulated. Additional simulations were undertaken at high and low water for a 'coast-crossing' and 'coast-parallel' cyclone case. These simulations were used to develop correction factors for wind set-up based on the tide level. In general, wind set-up is usually higher at low water compared to high water.

8.3 Monte Carlo Modelling

8.3.1 Program Structure

A FORTRAN based Monte Carlo storm tide model has been developed for this study. The program is based on the Monte Carlo models developed by Cardno Lawson Treloar for other studies along the Queensland Coast. The key features and general algorithms of the program are described in the following sections.

8.3.1.1 Astronomical Tide

Astronomical tide is included in the model through an input file of 19-years of 30-minute predicted tide levels for Brisbane Bar to datum AHD. This time period covers the whole astronomical tide cycle of nodal recession along the plane of the ecliptic. For each simulated event, a period of predicted tide is extracted randomly from the pre-calculated input file. The month of origin is included in the random number function which permits predicted tide records to only be extracted from months when cyclones are likely to be observed within the study area. Tidal predictions were based on the so-called Canadian method using 22 tidal constants.

8.3.1.2 Cyclone Parameters

Cyclone parameters, described in Section 8.1 and Appendix K, were selected through random number functions. Once parameters were selected, appropriate base simulations (Section 8.2) were identified for the interpolation procedure. The storm surge time-series and peak wave parameters for the event were then determined through a series of interpolation routines. Interpolation procedures for cyclone track location and central pressure apply a conventional linear interpolation routine.

Forward speeds that were less than 3m/s adopted the 3m/s base simulation case. Forward speed events greater than 7m/s adopted the 7m/s base simulation results. For events between 3m/s and 7m/s, the storm surge time-series is determined for forward speeds of 3m/s and 7m/s, and then a scaling function interpolation routine is applied to calculate the actual event storm surge time series. The scaling interpolation routine calculates the ratio between the peak storm surges for the two base forward speed conditions, and then applies this ratio to the storm surge time series of the base forward speed case which is closer to the event forward speed.

A similar scaling function interpolation routine is applied to the extrapolation routine used to determine the storm tide for events that have tracks outside the region covered by the base simulations.

Based on discussions with the Bureau of Meteorology (Section 4.3), a minimum potential central pressure within the study area of 930hPa has been adopted to present-day climate simulations.

8.3.1.3 Tide Correction

The influence of tide level on the magnitude of storm surge is accounted for through a tide correction module. In this module, the interpolated storm surge for the event is adjusted at each time point based on the predicted tide at the time. Linear interpolation is applied to determine the tide correction factor for each time in the record based on the ratios obtained from the base tide simulations – see Section 8.2.

8.3.1.4 Regional Wave Set-up

Regional wave set-up is determined for each event based on the peak offshore wave conditions determined within the Monte Carlo simulation for that event. Based on these wave conditions, which were obtained from interpolation of the base cyclone wave simulations, the maximum regional wave set-up level for the event was determined through the application of the linear regression models presented in Section 6.3.1. Linear interpolation is applied for wave directions between the specified directions adopted for the wave set-up models – see Section 6.3.1.

The influence of the predicted tide on the magnitude of regional wave set-up is accounted for through a simple tide correction factor. When the predicted tide is above 0.5m AHD, the magnitude of the peak regional wave set-up within Moreton Bay is reduced to one-third of the maximum value based on the results from the investigations reported in Section 6.3; noting that this regional wave set-up component is not the major water level component. For predicted water levels less than -0.5m AHD at Brisbane Bar, the full magnitude of the regional wave set-up is adopted for a particular point in time. Between +0.5m AHD and -0.5m AHD, linear interpolation is applied to simulate the regional wave set-up for the given predicted tide.

8.3.1.5 Greenhouse Related Climate Change

Based on discussions between Moreton Bay Regional Council and the Bureau of Meteorology (pers. com. Davidson – Gunn), this study has adopted a change in maximum wind speed condition for potential Greenhouse related climate change on tropical cyclones within the study area. Changes to other cyclone parameters such as frequencies and southern extents are more un-certain because of the large natural variations in these parameters due to processes such as ENSO and the Inter-decadal Pacific Oscillation. For the potential Greenhouse related change to wind speed in the planning period between 2050 and 2100, the maximum wind speed for each simulation event has been increased by 10%. This may be compared with CSIRO (2001) which provides an estimated average and standard deviation reductions in central pressure of 4.2 and 2hPa, respectively, summing to a mean reduction of 6.2hPa. This may be compared with the present climate mean intensity of 986hPa for the Brisbane region. Cyclonic winds are related to pressure difference between the cyclone and the peripheral pressure, taken to be 1,010hPa. Hence for the present climate condition, the mean cyclone pressure difference is 24hPa. For the maximum climate change, pressure difference may be about 26% larger (central pressure = 980hPa) and for the average climate change pressure difference being 17.5% larger (central pressure = 982hPa). On this basis the adopted procedure provides a reasonable basis for describing potential climate change effects on storm tide.

The Greenhouse module within the Monte Carlo program calculates a new central pressure for each event based on a 10% increase in the wind speed at the radius to maximum

winds. Hence, for less severe events, a smaller reduction in central pressure is required to achieve a 10% increase in maximum wind speed. For the Greenhouse simulation cases, the minimum central pressure within the study area has been reduced to 925hPa.

8.3.1.6 Comparison with Measured Cyclone Wind Speeds – Brisbane Airport

The probability distribution of the cyclonic wind speeds at Brisbane Airport developed from the Monte Carlo simulation has been compared to the distribution developed from the measured cyclonic wind speeds at Brisbane Airport from the 29 cyclones included in the population statistics (see Section 8.1).

The peak measured 3-hourly speeds for the selected cyclone events in Section 8.1 have been extracted from the long-term record at Brisbane Airport. The measured wind speeds have been corrected for elevation and 'overland/overwater' effects. The 3-hourly wind speeds have also been converted into 1-hour equivalent winds speeds. Based on the methodology in USACE (2002), the total correction factor applied to the measured wind speeds was 1.50. Type-I extremal analyses have been undertaken on the adjusted, measured winds and the whole Monte Carlo record. Table 8.1 presents a comparison between the measured and Monte Carlo modelled peak cyclone winds at Brisbane Airport up to 100-years ARI. Due the limited record of the measured data, the extremal analysis is only reliable up to 2 to 3 times the length of the record.

Table 8.1 Peak Cyclonic Wind Speeds (m/s) - Brisbane Airport (3-hour, 10-minute Average, 10m Elevation, 'Over-water')

ARI (years)	Measured Cyclone Winds (1959-2008)	Monte Carlo Modelled Wind (Holland Cyclone Wind)
20	18.9	17.1
50	21.0	21.6
100	22.5	25.0

8.4 Design Water Levels – Existing Climate Conditions

Appendix J presents cyclonic design water levels for ARI's between 20 and 10,000 years for all output locations within the study area. Output locations are presented in plan view in Figure 7.2. Figure 8.4 presents a plan view of the 100-years ARI cyclonic water levels around the study area. Appendix J includes wave run-up levels for sandy beach and rock revetment edge treatments (see Section 7.3 for calculation methodology).

Table 8.2 presents cyclonic storm tide (tide + surge + regional wave set-up) levels for Brisbane Bar for the current climate condition.

Table 8.2 Brisbane Bar Cyclonic Storm Tide Levels – No Greenhouse Related Climate Change – No Shoreline Wave Set-up

ARI (years)	Water Level (m AHD)
20	1.62
50	1.70
100	1.76
200	1.82
500	1.90
1,000	1.96
10,000	2.15

Note that, up to the 100-years ARI case, the non-cyclonic storm tide levels of Table 7.2 are marginally higher then the cyclonic storm tide levels – both excluding shoreline wave set-up. It is not possible to be specific about what causes this outcome because all of the computations are inter-linked, but it is most likely caused by the more frequent high wave conditions caused by ECL and higher regional wave set-up, which is included in both results.

8.5 Design Water Levels – Greenhouse Related Climate Change Conditions

Appendix K presents design water levels (tide + storm tide + regional wave set-up and with and without shoreline wave set-up) for all ARI's between 20 and 10,000 years for all output locations in the study area for the case when the adopted Greenhouse climate change in cyclogenesis is included, but excluding sea level rise (SLR). Output locations are presented in plan view in Figure 7.2. Figure 8.5 presents a plan view of the 100-years ARI cyclonic water levels (tide + storm tide + regional wave set-up + local wave set-up) under enhanced 'Greenhouse' climatic conditions around the study area. No sea-level rise is included in Figure 8.5. Appendix K includes wave run-up levels for sandy beach and rock revetment edge treatments (see Section 7.3 for calculation methodology).

Table 8.3 presents the cyclonic water levels (tide + storm tide + regional wave set-up) for Brisbane Bar for potential 'Greenhouse' climate change conditions, but excluding any mean sea-level rise (see Section 9.3). The results in Table 8.3 are not provided for design use.

Table 8.3 Brisbane Bar Cyclonic Water Levels (Tide + Storm Tide + Regional Wave Set-up)– Including Greenhouse Related Cyclogenesis Change but Excluding Sea-Level Rise

ARI (years)	Water Level (mAHD)
20	1.70
50	1.81
100	1.89
200	1.96
500	2.07
1000	2.14
10000	2.40

9. DISCUSSION

9.1 Comparison between Design Levels and Historical 'Large-Eye' Cyclones

Historically it has been observed that very high waves and high storm surges have been observed when large-eye intense cyclone systems move through the Coral Sea. These systems can be several 100km away at their closest point, yet are able to generate strong winds over a wide area. The Holland wind model is not able to accurately simulate the windfield for these events hundreds of kilometres from the study area. Three notable 'large-eye' events which have affected Moreton Bay are:-

- Cyclone Pam – February 1974
- Cyclone David – January 1976
- Cyclone Roger – March 1993

Water level data was recorded at Brisbane Bar during cyclones Pam and Roger; the instrument was not operating during cyclone David. Table 9.1 presents the peak total water levels (m AHD) at the site and the maximum residual values.

Table 9.1 Observed Brisbane Bar Water Levels – Historical Large-Eye Cyclone Events

Event	Peak Predicted Tide (m AHD)	Peak Measured Water Level (m AHD)	Peak Residual (m)
Pam	1.1	1.46	0.53
Roger	1.06	1.03	0.34

A comparison between the observed data in Table 9.1 and the Monte Carlo results for Brisbane Bar has been undertaken. Table 9.2 presents the cyclonic total water levels (astronomical tide + storm surge + regional wave set-up) and surges at Brisbane Bar – excluding potential enhanced Greenhouse changes. It can be seen that, although the water levels recorded during cyclones Pam and Roger were elevated compared to the predicted values, from a design perspective, those cyclones are of much less importance than the cyclone climate adopted for this study. This comparison supports the view that cyclonic storm tide levels, noting that water depths are too deep at Brisbane Bar for there to be shoreline wave set-up, will be determined by storms which track close to the study area where the Holland model provides a reasonable description of the windfield within 100km of the cyclone eye.

Table 9.2 Brisbane Bar Cyclonic Storm Tide Levels and Storm Surge – Cyclone Events (Current Climate Conditions) – No Shoreline Wave Set-up – Includes Regional Wave Set-up

ARI (years)	Storm Tide (m AHD)	Storm Surge (m)
20	1.62	0.81
50	1.70	1.02
100	1.76	1.18
200	1.82	1.33
500	1.90	1.54
1000	1.96	1.70
10000	2.15	2.22

9.2 Design Conditions under Climate Change Scenarios

The climate change cyclogenesis scenario investigated in this study generally increases design water levels by between 0.1m and 0.3m for the 100-years ARI condition; as a result of different effects (wind set-up, regional wave set-up and local wave set-up) throughout Moreton Bay. On the other hand any rise in MSL would affect all sites similarly. Exposed locations, for example, eastern Bribie Island and the eastern shoreline at Redcliffe, have smaller cyclogenesis caused increases in design water levels than Pumicestone Passage, Deception Bay and Pine Rivers/Hays Inlet. Wave set-up does not vary significantly between existing and enhanced 'Greenhouse' climate conditions because wave conditions within the study area are generally fetch and/or depth limited.

No changed wind conditions have been investigated for non-cyclonic conditions because there is presently no clear direction for those storms. Moreover, at 100-years ARI, cyclonic and non-cyclonic water levels are very similar. For less frequent cases (ARI > 100-years), the cyclonic results are higher.

9.3 Sea-Level Rise

Historically, storm tide studies have adopted a sea-level rise allowance of 0.2m for a 50-years planning period, increasing more recently to 0.3m. It is understood that the Queensland EPA is currently revising the sea-level rise estimates for Queensland based on the latest IPCC recommendations as part of the State Coastal Management Plan. Discussions with the EPA (pers. com. Prenzler - Sultmann) indicate that for the 100-years planning period the EPA may recommend 0.8m sea-level rise allowance. The 0.3m (that is, 2058) for the 50-years planning period is likely to remain.

For the 50-years planning period, it is recommended that 0.3m sea-level rise allowance be included. For the 100-years planning period, it is recommended that Council undertake further consultation with the EPA to ensure that any level adopted is consistent with future storm tide studies within the state.

These sea level rises are equally applicable to the non-cyclonic design water levels described in Section 7.

9.4 Inundation Mapping

It is recommended that any inundation mapping undertaken as part of this study adopt an envelope methodology for the selected ARI conditions. That is, both cyclonic and non-cyclonic design levels should be mapped and the larger condition at any location be adopted when determining planning levels. For the 100-years ARI condition, cyclone conditions are generally the higher, with the exception of western Bribie Island where non-cyclonic conditions are higher.

10. CONCLUSIONS

10.1 General Comments

This study was undertaken for the Moreton Bay Regional Council area as part of a larger study which included the Redland Shire and Logan City Council areas.

Detailed wind, storm tide and wave models have been developed for the study area which extended between Byron Bay in the south, Fraser Island in the north and up to 150km offshore. A regional wave (SWAN) model has also been developed which covers the Coral and Tasman Seas up to 1500km offshore of the study area. The model systems have been calibrated for a total of four events (two cyclones, two East Coast Lows) and the models generally are in good agreement with measured storm tide levels at Brisbane Bar, Gold Coast and Mooloolaba.

As part of the calibration process a detailed model investigation has been undertaken of the influence of wave breaking at Spitfire Banks on water levels inside Moreton Bay. Those investigations indicated that, for particular storm events, wave breaking near the entrance to Moreton Bay can contribute a significant amount of the total surge observed within Moreton Bay. This 'Regional Wave Set-up' process is most significant when waves originate from the north-east to east sector offshore, and when the astronomical tide is near low water on the ebb tide. Near high-water for the predicted tide, the influence of this regional wave set-up near high water falling is generally only 25% to 35% of the magnitude near low water for constant offshore wave conditions.

Storm tide levels and associated wave conditions have been specified for non-cyclonic and cyclonic storm events. The non-cyclonic design levels have been determined through combined model simulations and joint-probability analysis of long-term water level record from the Brisbane Bar tide gauge. The results are presented in Section 7.1. At most shoreline locations, particularly within embayed areas and along Pumicestone Passage the non-cyclonic water levels are slightly lower than cyclonic results up 100-years ARI. At the 100-years ARI condition, with the exception of eastern Bribie Island, design water levels are higher for cyclonic conditions. Since cyclonic events generate higher water levels for specific design events, potential climate change impacts on design water levels (excluding sea-level rise) have been investigated for cyclonic events only – see below.

Cyclonic design levels have been calculated using a Monte Carlo model that was based on a large number of simulations. The cyclone parameter distributions for the Monte Carlo model have been developed from analysis of cyclone events that passed within 500km of the study area. Cyclone events were separated into 'Coast-Crossing' and 'Coast-Parallel' populations based on cyclone track directions. Cyclone events that featured a large-eye and/or strong coincident gradient wind have been considered separately. The design cyclonic storm surge and total storm tide levels developed from the Monte Carlo model have been compared with two 'large-eye' cyclone events for which measured water level data from the Brisbane Bar tide gauge were available. These two events, cyclones Pam and Roger, caused storm tides below the 20-years ARI results developed from the Monte Carlo model. Hence this outcome indicates that, although these large-eye events generate reasonably large storm surges and offshore waves, over the long-term, those storm surge levels are significantly lower than those caused by more common smaller cyclones which track close to the study area. Hence the results of the analyses have not been compromised by their exclusion from the main study.

For cyclonic and non-cyclonic design levels, shoreline wave set-up and wave run-up levels have been specified at all output locations. Wave run-up levels have been calculated for

sandy beach and rock revetment shoreline edge treatments for 50%, 2% and 1% exceedence levels.

Within the overall study area, at the 100-years ARI design level, cyclonic storm tides are slightly higher than the equivalent non-cyclonic results with the exception of eastern Bribie Island where non-cyclonic conditions are higher.

Within the study area, embayed locations, for example, the Pine River/Hays Inlet and Deception Bay area, have higher storm tide levels (cyclonic and non-cyclonic) compared to other sites. Pumicestone Passage also has higher storm tide levels.

Cyclonic design levels have also been calculated for enhanced 'Greenhouse' climate change conditions. The Greenhouse scenario specified a 10% increase in the maximum cyclone wind speeds and this condition was implemented in the Monte Carlo model. Under enhanced Greenhouse cyclogenesis conditions, design water levels are generally increased by 0.1m to 0.3m depending on the shoreline location. This increase in water level under enhanced 'Greenhouse' conditions does not include any allowance for sea-level rise. For a 50-years planning period, it is recommended that a 0.3m sea-level rise allowance be included. For a 100-years planning period, it is recommended that Council undertake further consultation with the EPA to ensure that any rise adopted is consistent with future guidelines and storm tide studies within the state.

10.2 Planning Recommendations

The following recommendations are made for application of the outcomes of this investigation. Appendix L presents recommended storm tide planning levels for Moreton Bay Regional Council LGA. The planning levels are based on the 100-years ARI storm tide level. Figure 10.1 presents a plan view of the recommended planning levels.

A planning period of 100 years is commonly adopted in Australia for new general infrastructure and housing. Redevelopment or extensions of existing infrastructure will often adopt shorter planning periods, for example 50-years. Critical infrastructure such as hospitals, police stations and evacuation routes may be required to be designed to withstand 500-years ARI design conditions.

As 100-years is the nominal planning period, the recommended storm tide planning levels have been based on the cyclonic storm tide with future enhanced Greenhouse cyclogenesis estimates included. Note, at all locations within the study area future Greenhouse enhanced cyclonic storm tide levels are greater than the non-cyclonic storm tide levels at the specified 100-years ARI.

Sea-level rise estimates for 50-years (2059) and 100-years (2109) planning periods are specified in Appendix L. A SLR allowance of 0.3m has been adopted for the 2059 planning period, and a SLR allowance of 0.8 has been adopted for the 2109 planning period. The 100-years SLR allowance is believed to be consistent with proposed EPA guidelines. As mentioned previously, 50-years planning periods are generally adopted for works associated with existing infrastructure, while 100-years planning periods are adopted for new (general) infrastructure.

A freeboard allowance of 0.3m has been included in the recommended planning levels. When considering freeboard allowances, a number of factors need to be considered including:-

1. Quality and quantity of historical data used in the calculation of storm tide levels.
2. Confidence associated with investigations techniques.

3. Precautionary allowances already adopted within the investigation techniques, for example, including Greenhouse related climate change impacts separately within the study as has been done in this investigation.
4. Whether SLR allowances are included separately in the planning level calculations, as has been done in this study.

Regarding Point 1, the quality of the input data in this study is generally high as there are over 40-years of reliable water level measurements and nearly 50-years of reliable cyclone track data. A key limitation in the input data is caused by the highly variable cyclone climatology of south-east Queensland. Over the last 20 to 30-years, no major cyclone has tracked close to the Moreton Bay Regional Council LGA. Through discussions with the Bureau of Meteorology, this study has attempted to generate a reliable long-term cyclone climatology which is consistent with the present climate condition.

In relation to Point 2, this study has adopted well validated techniques to investigate cyclonic and non-cyclonic storm tide. The study methodology is consistent with guidelines presented by the Queensland EPA (2002). The study has also included more recent storm tide investigation techniques, most notably in the area of variation in storm tide generated by wave processes.

In relation to Point 3, the recommended planning levels are based on storm tide investigations which included an estimate of potential changes to the regional cyclone climatology due to Greenhouse related climate change.

In relation to Point 4, the study has separately addressed the issue of SLR in the recommended planning levels.

Based on the discussion above, adopting a 0.3m freeboard is an appropriate precaution because it is not uncommon for other studies which have adopted higher freeboard allowances to have done so to address uncertainty associated with processes which, unlike this study, have not been included in the planning level investigations.

It is important to understand that design water levels have been presented in two ways. They are:-

- The sum of astronomical tide, storm surge, regional wave set-up and nearshore wave set-up – the common basis in Queensland
- The sum of astronomical tide, storm surge and regional wave set-up in combination with nearshore wave parameters – H_s and T_z in a 2m water depth

The first of these design criteria is suited to sites where wave run-up is not an issue. The second set is more widely useful because wave run-up will be an issue at coastal sites. Note that the underlying nearshore wave set-up is implicitly included in wave run-up calculations. It is common to base wave run-up height on the R_2 parameter. Example run-up levels for rock revetment and sandy shoreline edge treatments are included in the result tables presented in Appendices H, J and K. However, it is recommended that each individual development be considered, by the property owner and his consultant, on the basis of site specific parameters – this basis is being adopted elsewhere, for example, Pittwater and Gosford City Council's in NSW. This approach is recommended because edge treatments may vary from block to block. Where properties are constructed on a natural dune, then the water level and wave run-up parameters presented in Appendices H, J and K may be used as the design basis – then adding freeboard and any adopted allowance for SLR.

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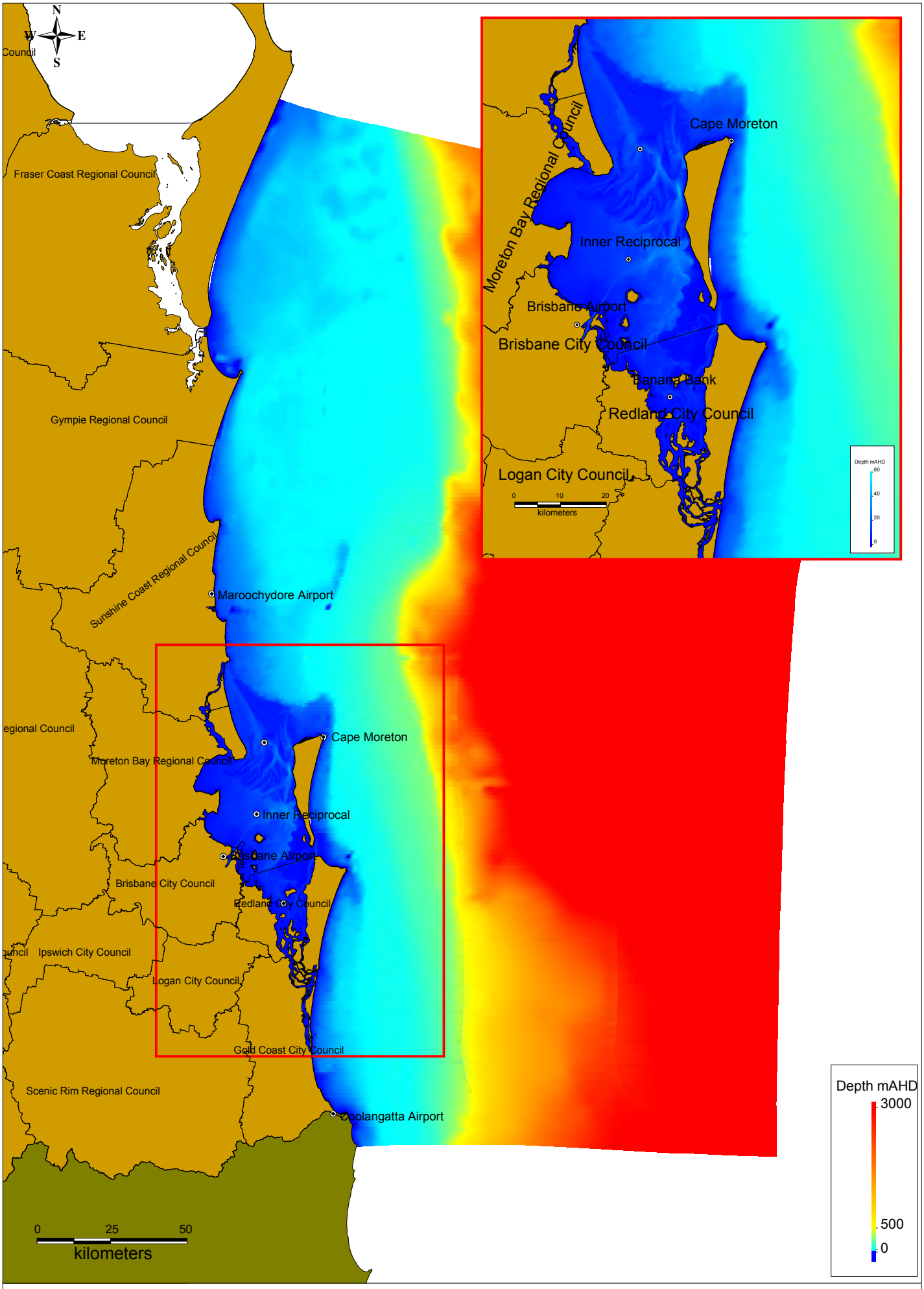
FIGURES

FIGURES



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Storm Tide Hazard Study - Moreton Bay Regional Council

LOCALITY PLAN AND DTM

Figure 1.1

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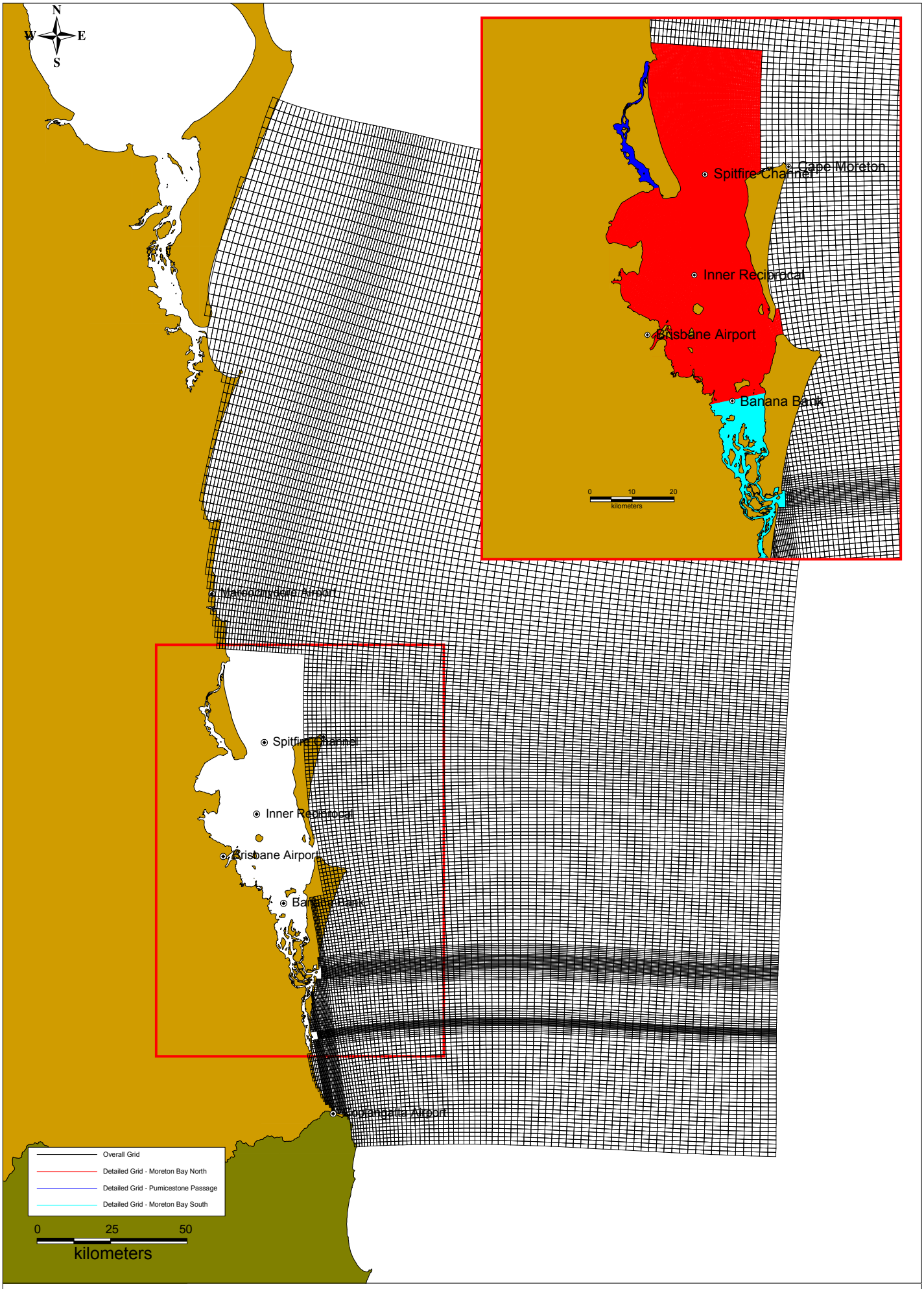

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DELFT3D DOMAIN DECOMPOSITION GRIDS

Figure 5.1

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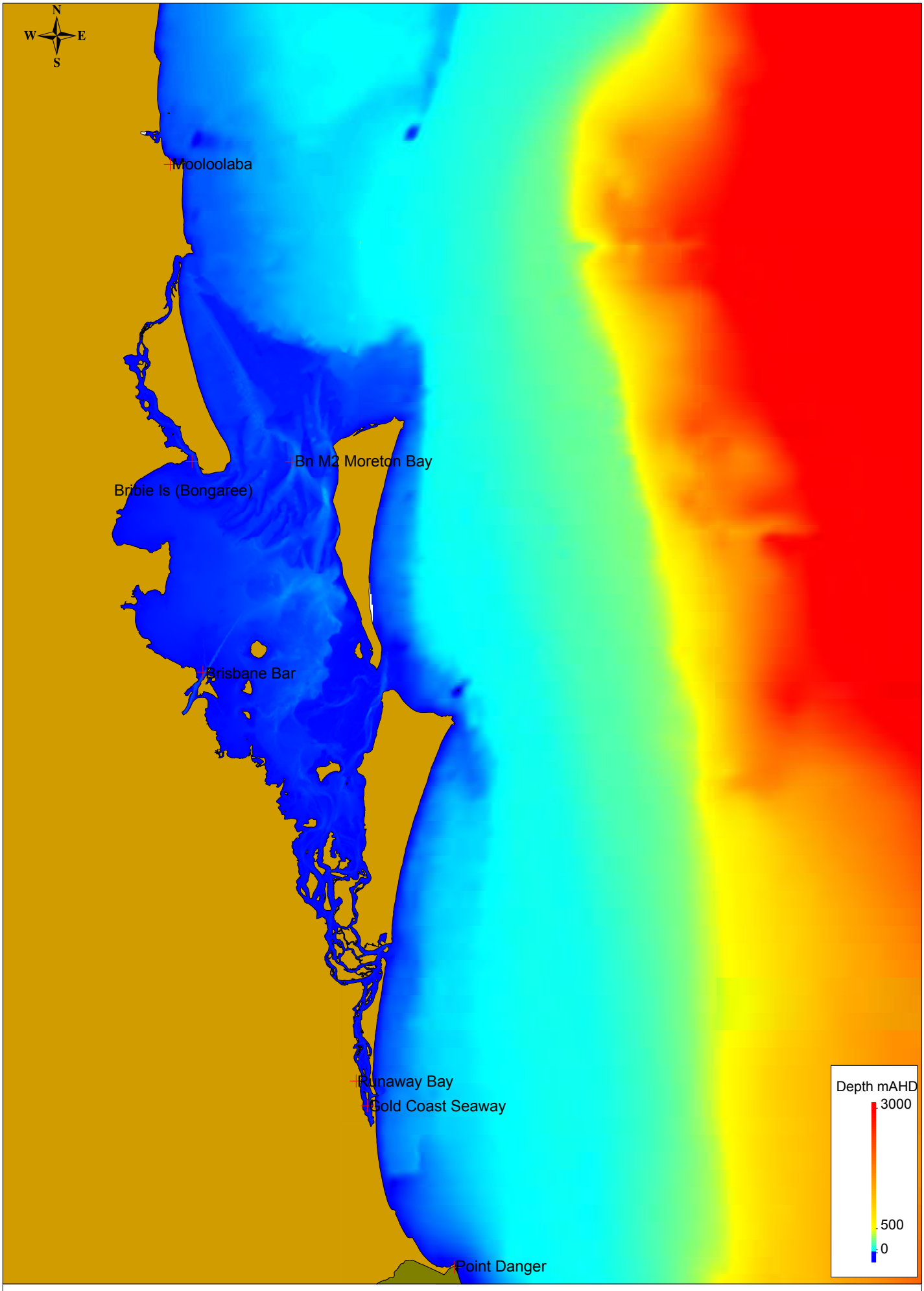

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TIDAL CALIBRATION LOCATIONS

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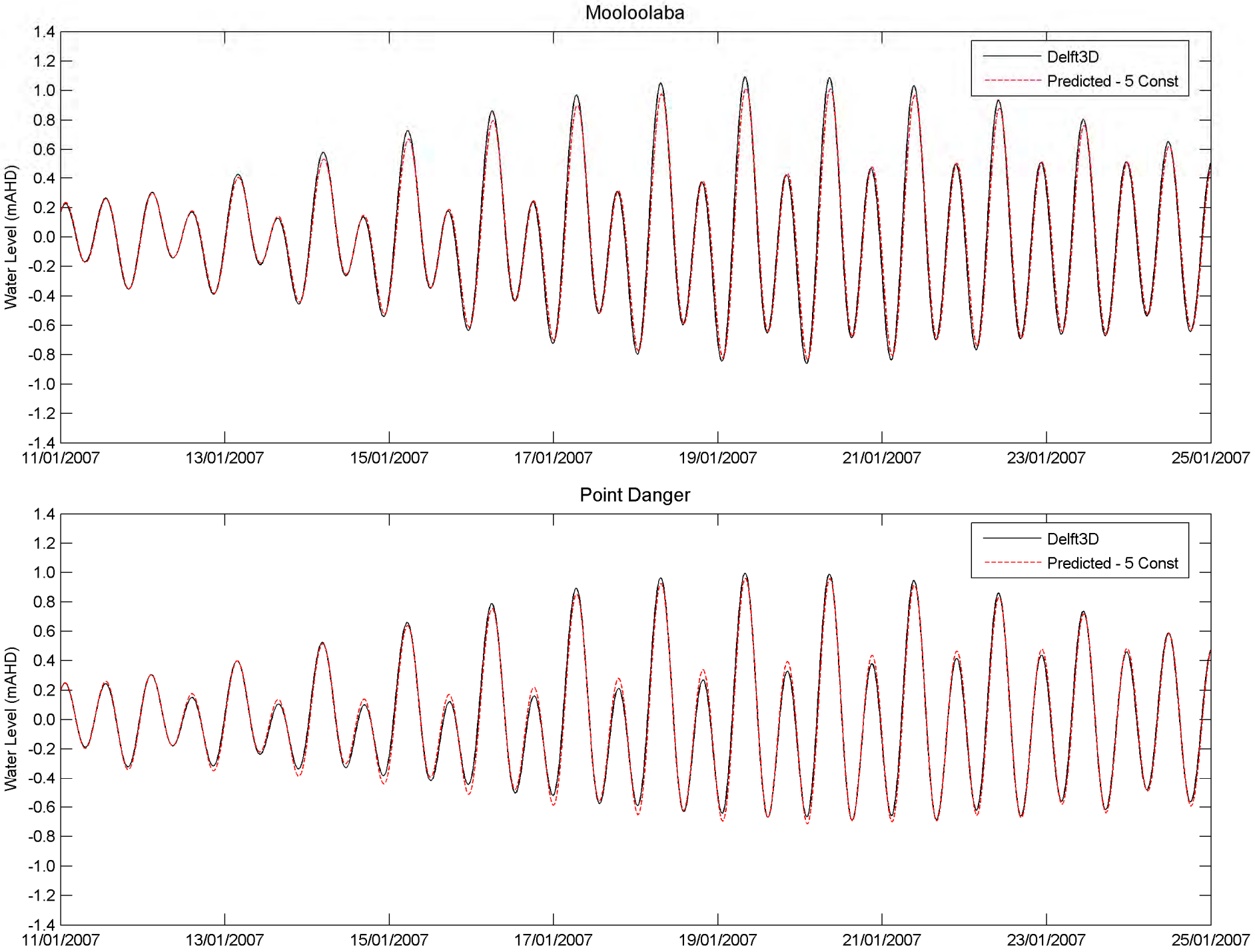

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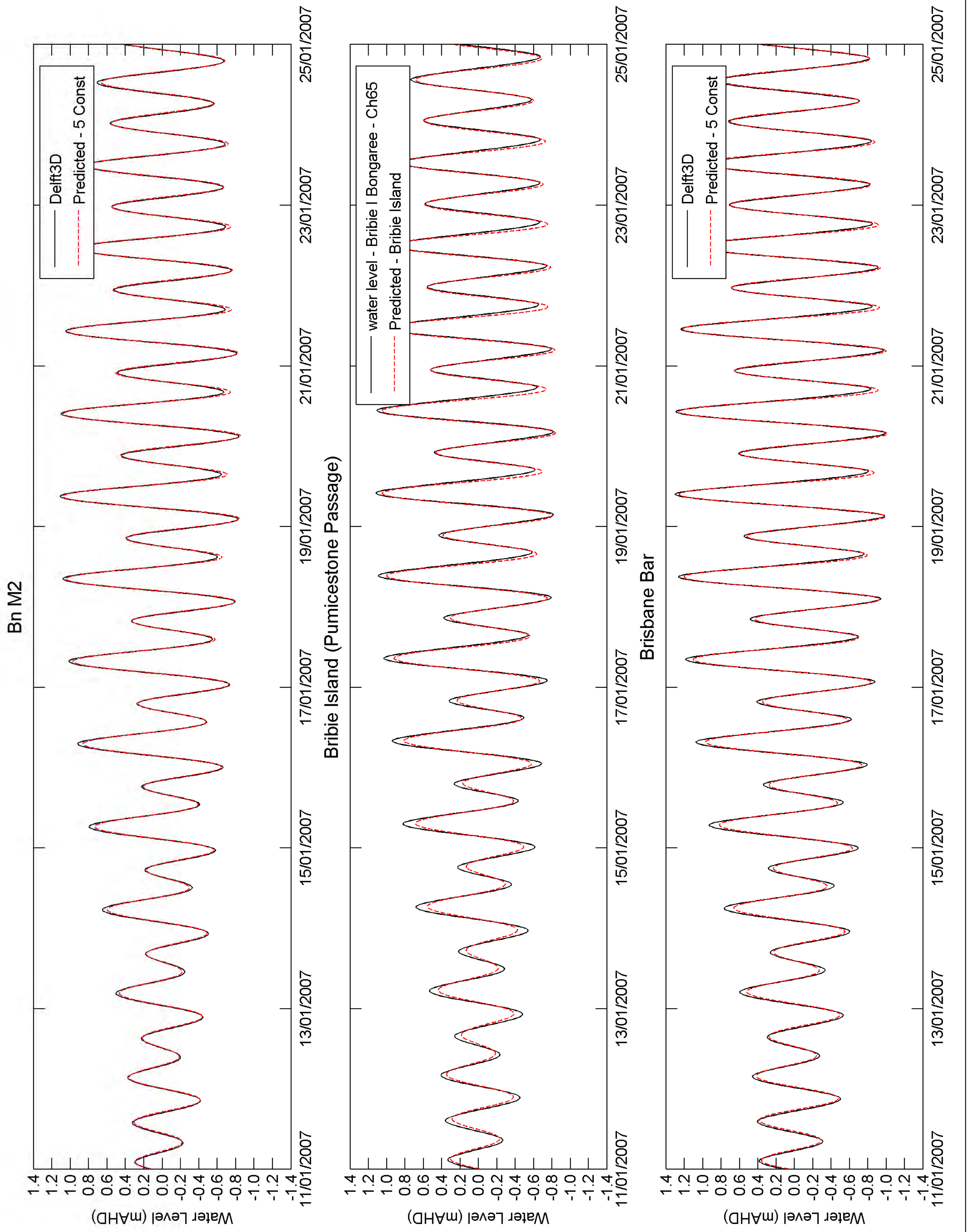
TIDE CALIBRATION

Open Coast Sites

Figure 5.3



Cardno Lawson Treloar

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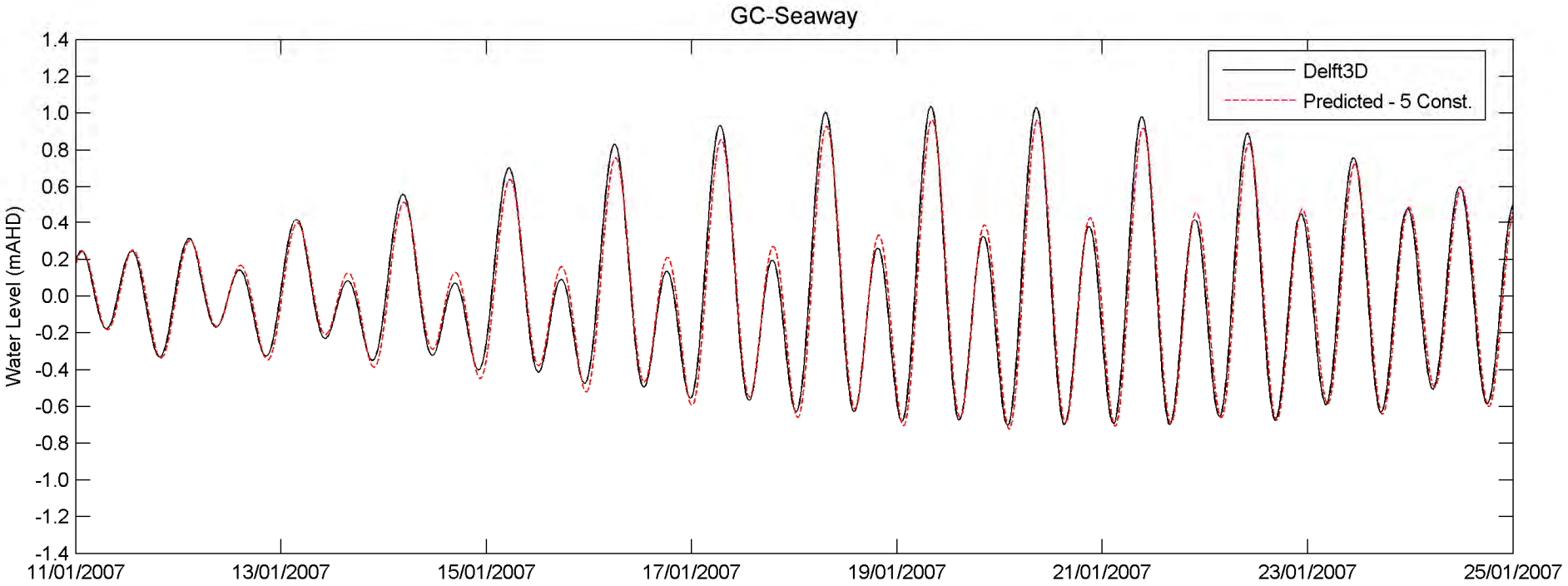
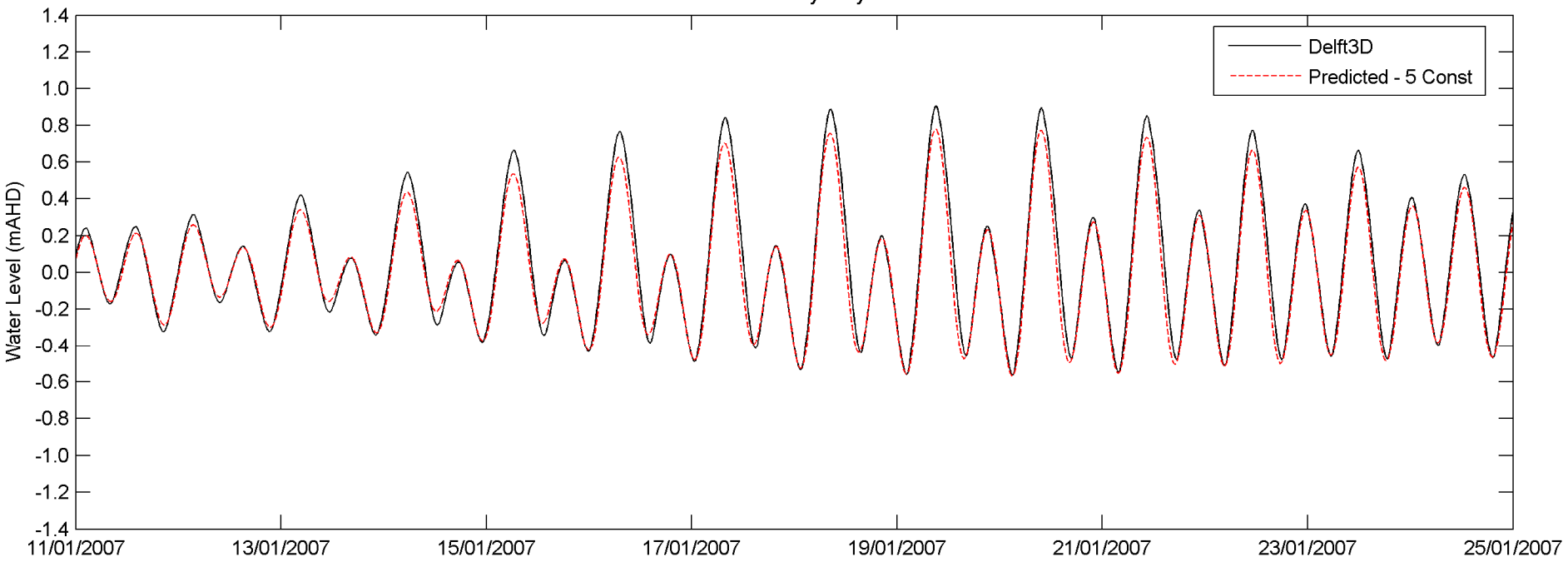
TIDE CALIBRATION

Moreton Bay Sites

Figure 5.4





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TIDE CALIBRATION

Broadwater Sites

Figure 5.5

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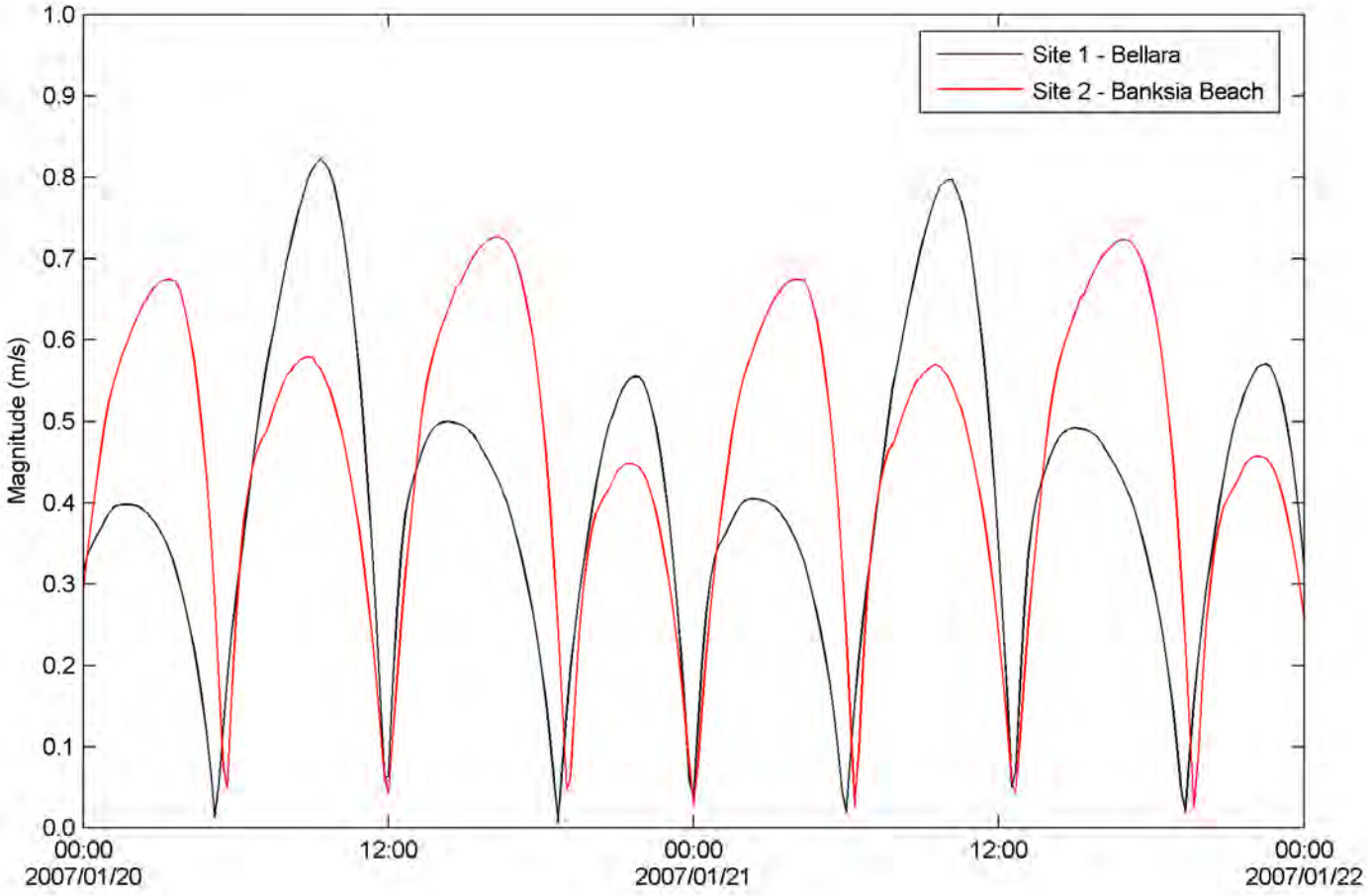

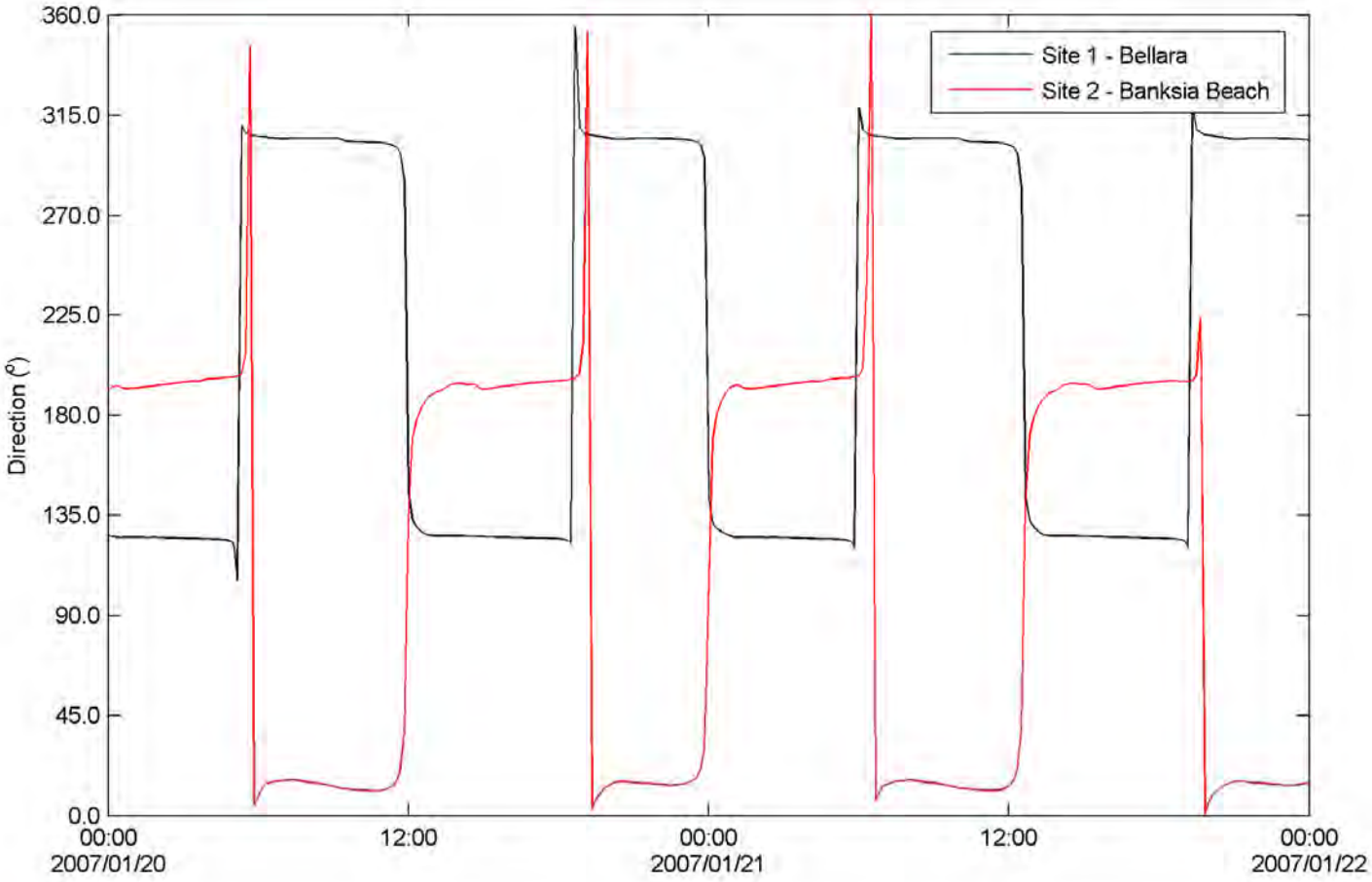

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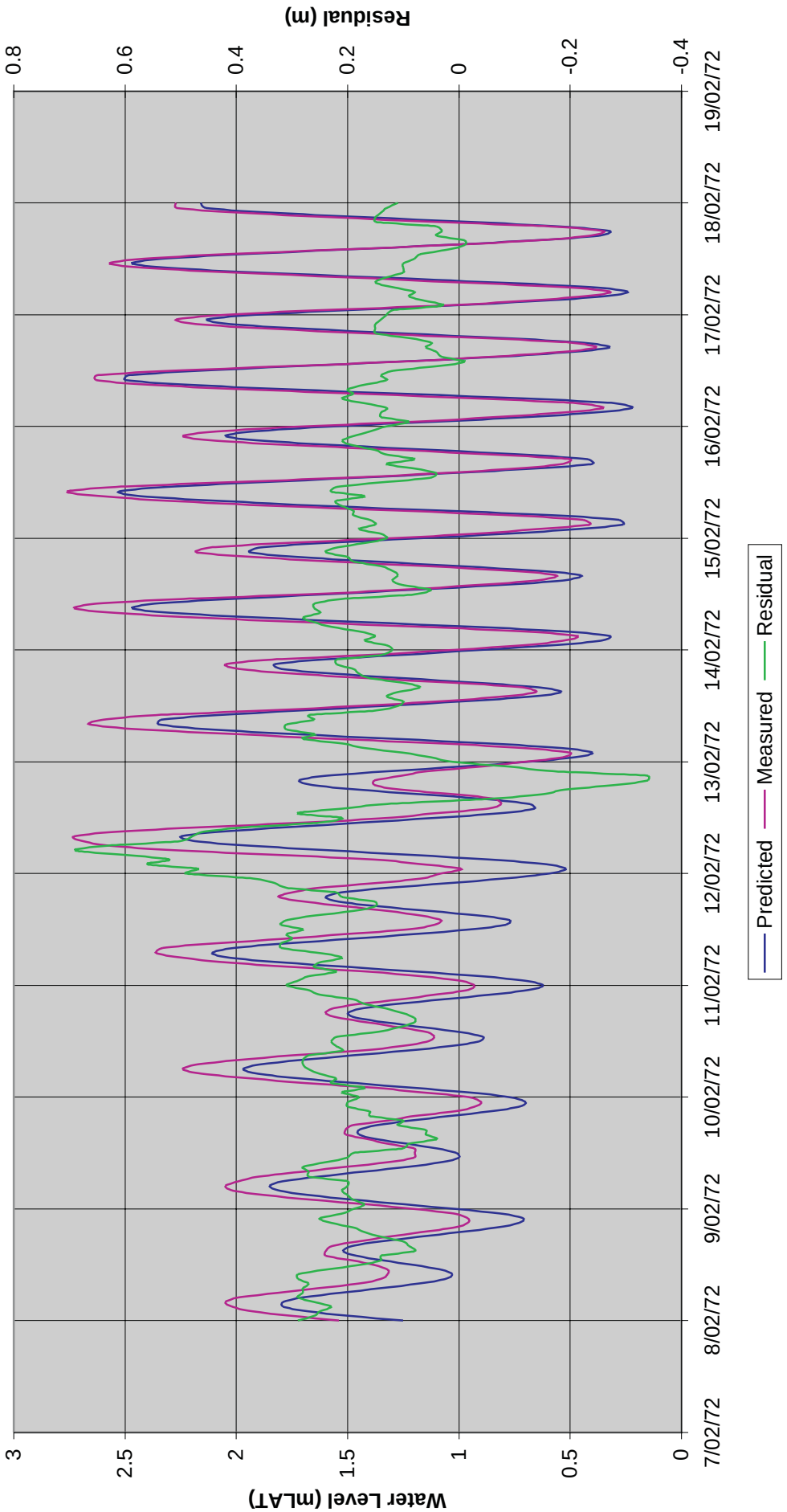
Storm Tide Hazard Study - Moreton Bay Regional Council
TIDE CALIBRATION
Pumicestone Passage Currents
Figure 5.6



Storm Tide Hazard Study - Moreton Bay Regional Council

CYCLONE DAISY WATER LEVEL - BRISBANE BAR

Figure 5.7

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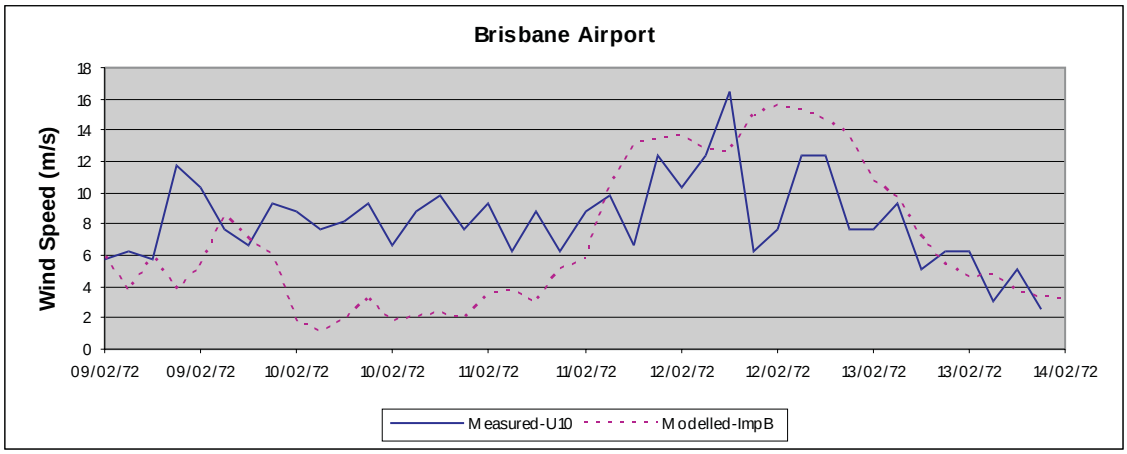

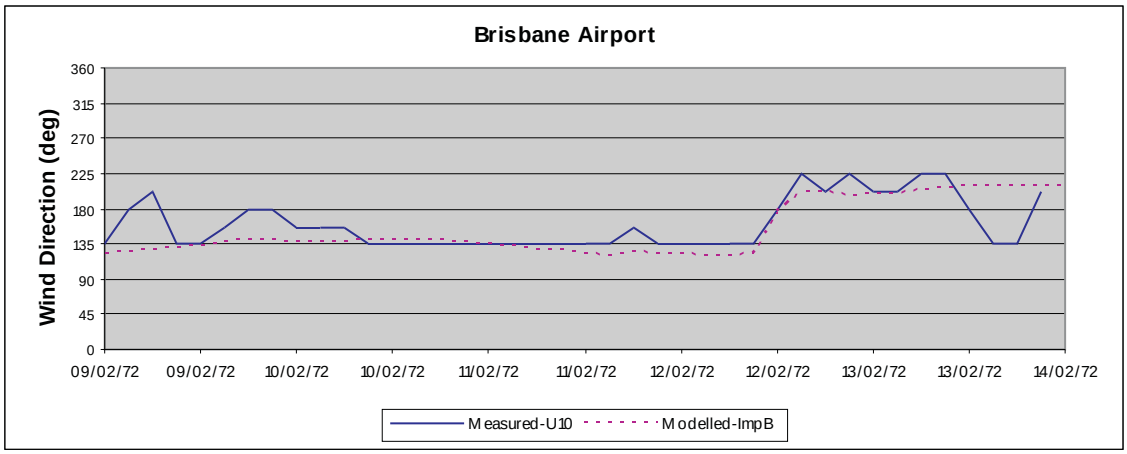

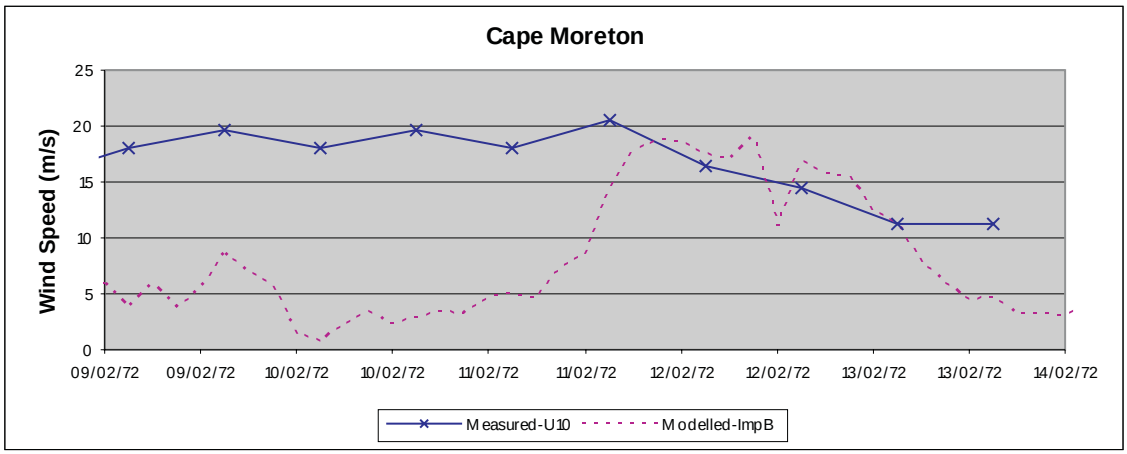

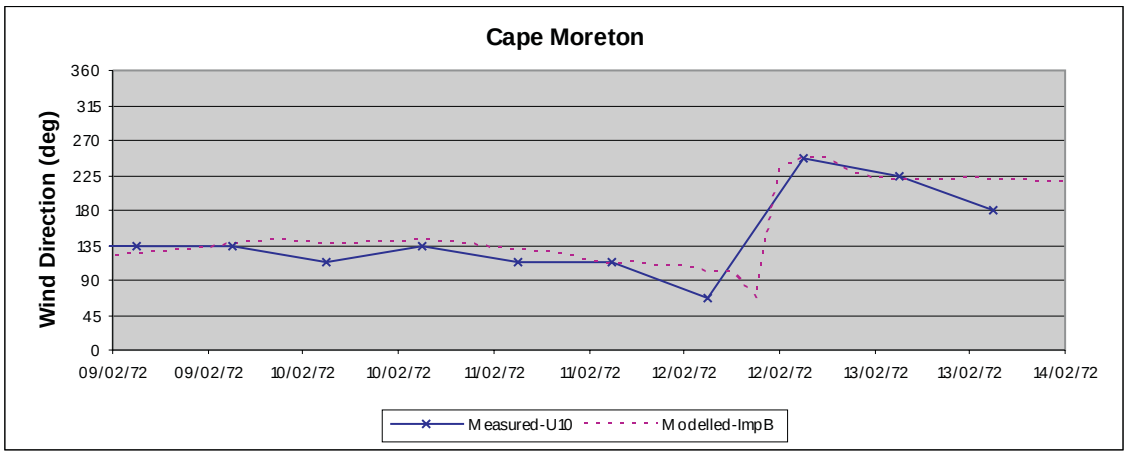

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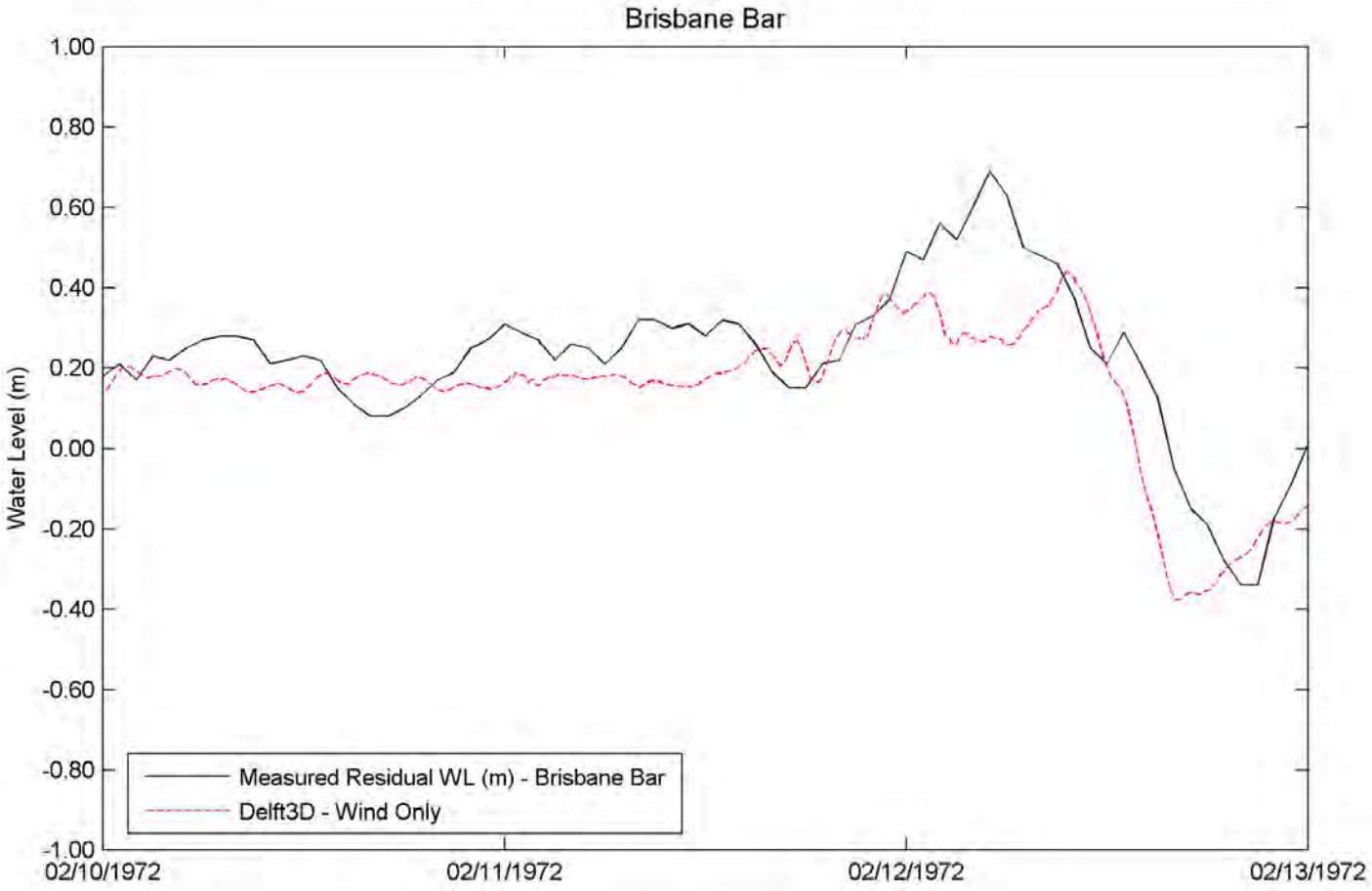
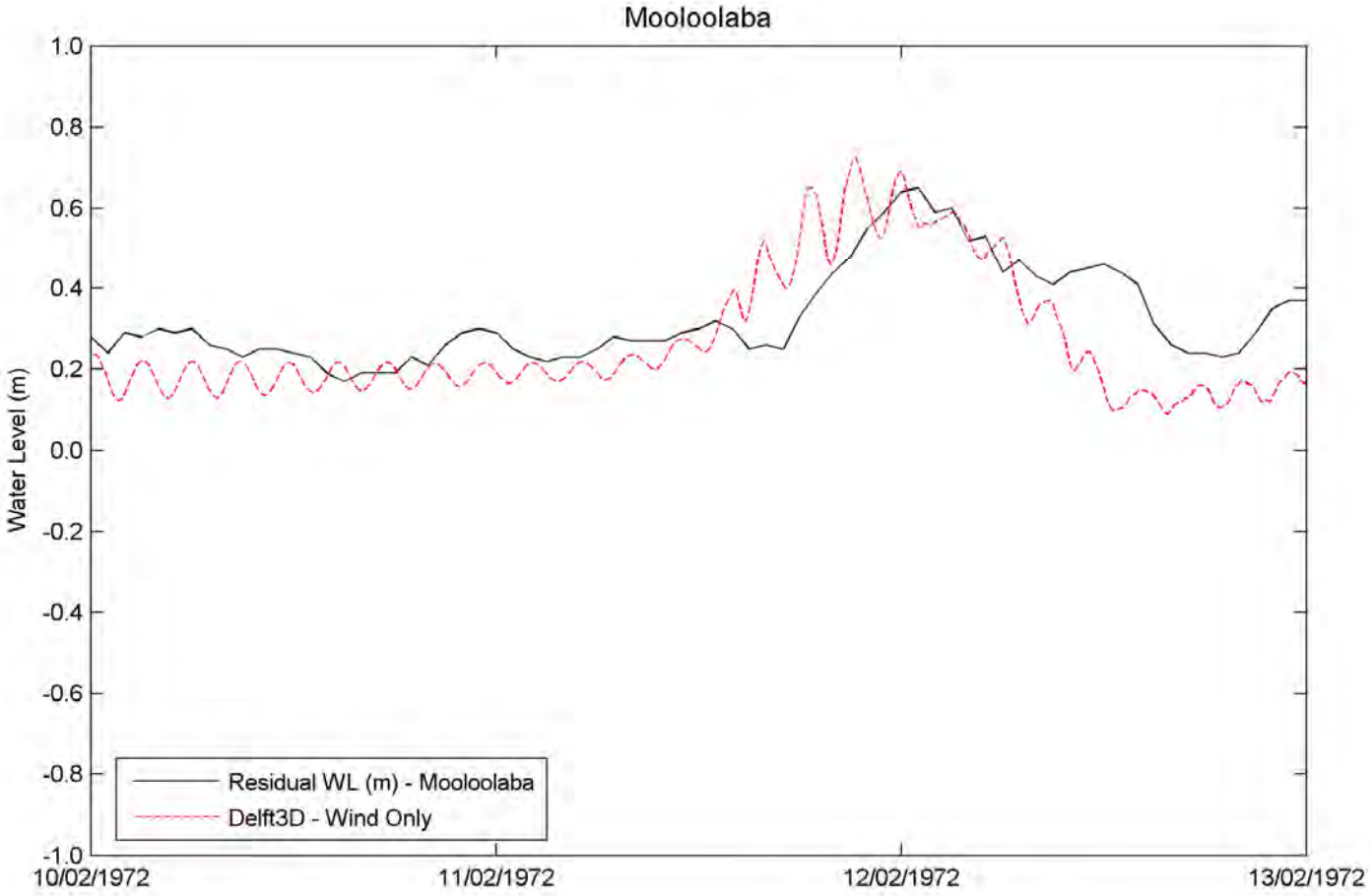
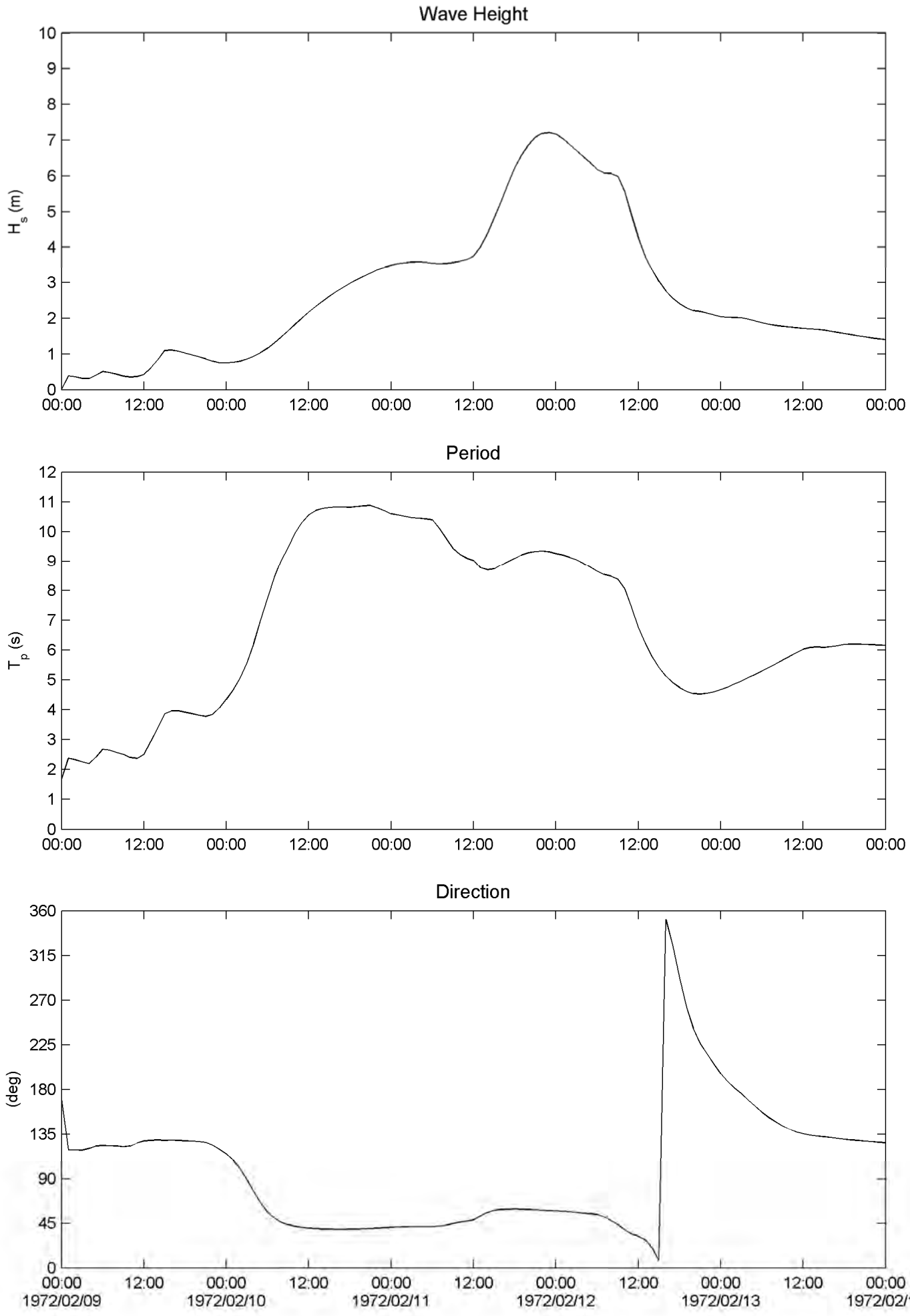
Storm Tide Hazard Study - Moreton Bay Regional Council
MEASURED AND MODELLED WIND CONDITIONS
CYCLONE DAISY
Figure 5.8


Brisbane Bar
Water Level (m)
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
02/10/1972
02/11/1972
02/12/1972
02/13/1972
Measured Residual WL (m) - Brisbane Bar
Delft3D - Wind Only


Mooloolaba
Water Level (m)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
10/02/1972
11/02/1972
12/02/1972
13/02/1972
Residual WL (m) - Mooloolaba
Delft3D - Wind Only



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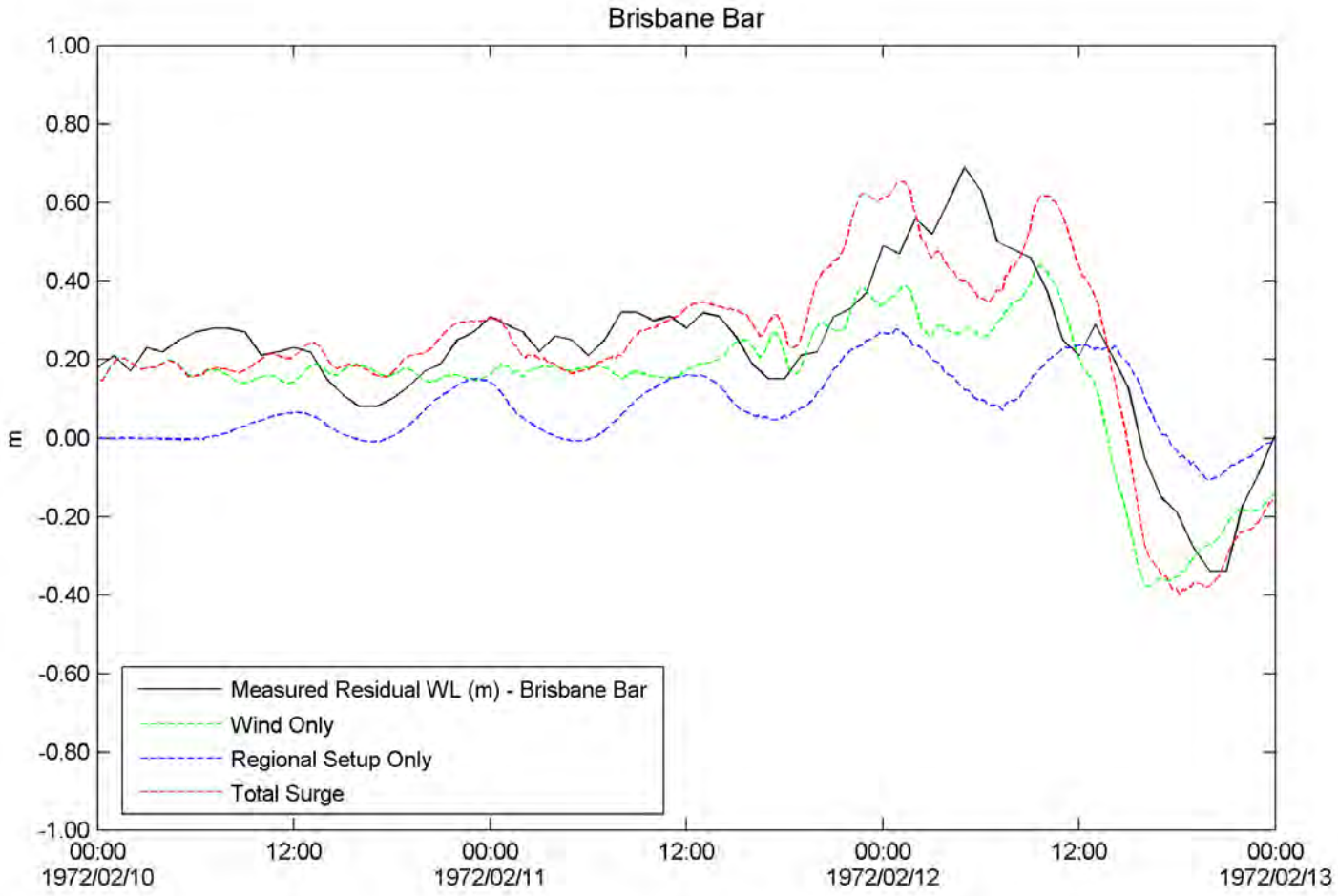
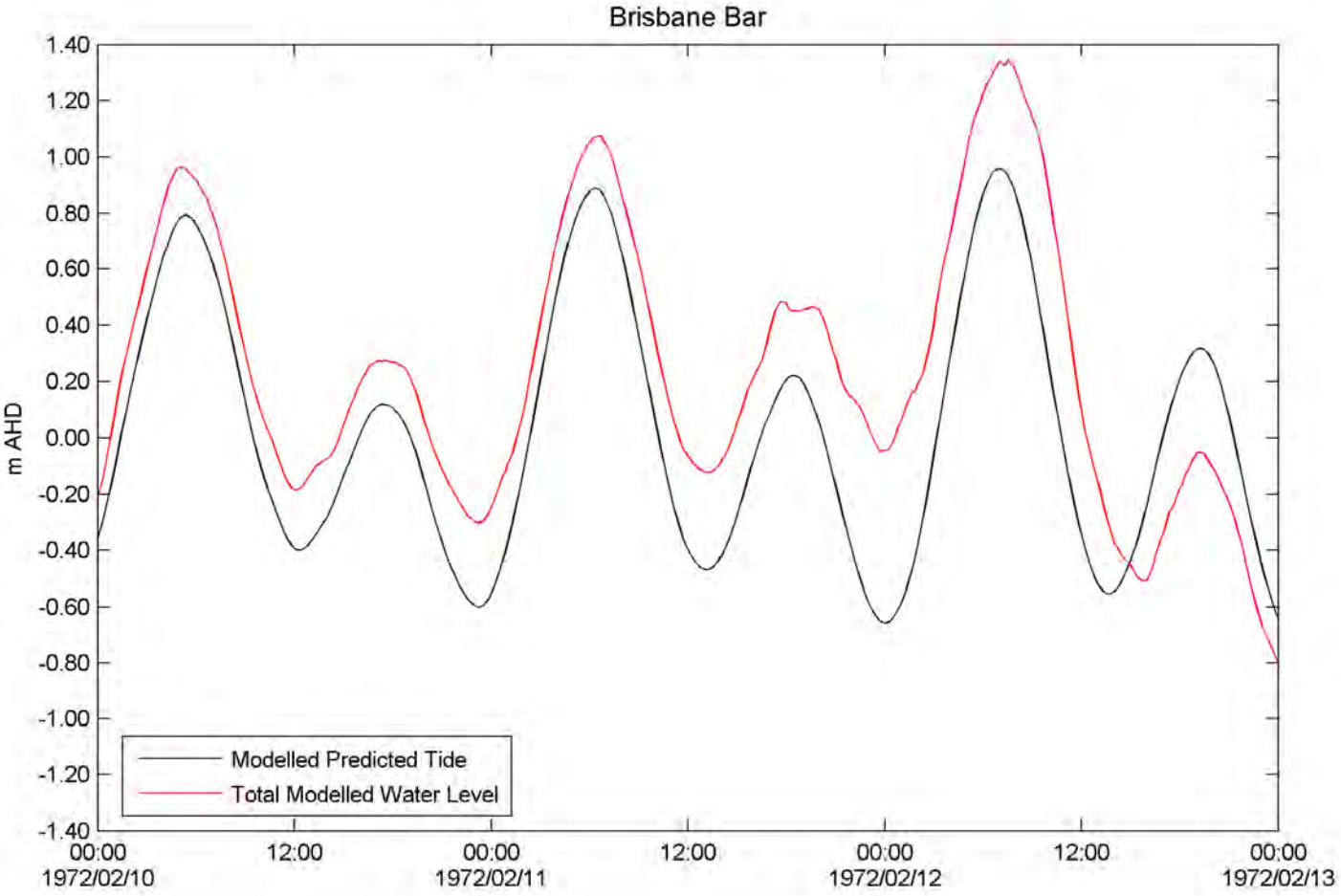
Storm Tide Hazard Study - Moreton Bay Regional Council

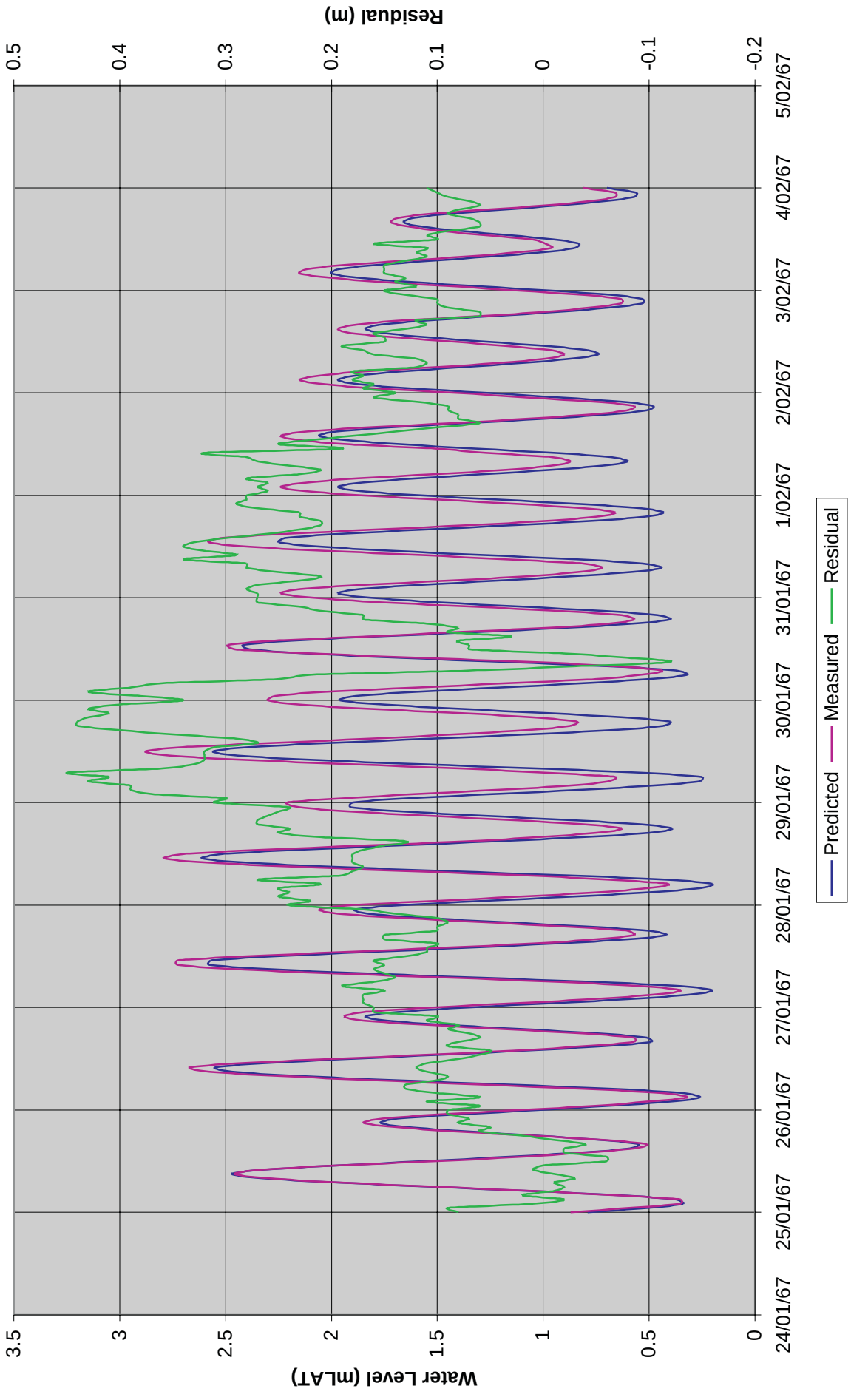
TC DAISY MODELLED WAVE CONDITIONS

Northern Entrance to Morton Bay (Depth 60m AHD)

Figure 5.10


Brisbane Bar
m
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
00:00 1972/02/10
12:00
00:00 1972/02/11
12:00
00:00 1972/02/12
12:00
00:00 1972/02/13
Measured Residual WL (m) - Brisbane Bar
Wind Only
Regional Setup Only
Total Surge


Brisbane Bar
m AHD
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-1.20
-1.40
00:00 1972/02/10
12:00
00:00 1972/02/11
12:00
00:00 1972/02/12
12:00
00:00 1972/02/13
Modelled Predicted Tide
Total Modelled Water Level



Storm Tide Hazard Study - Moreton Bay Regional Council

CYCLONE DINAH WATER LEVEL - BRISBANE BAR

Figure 5.12

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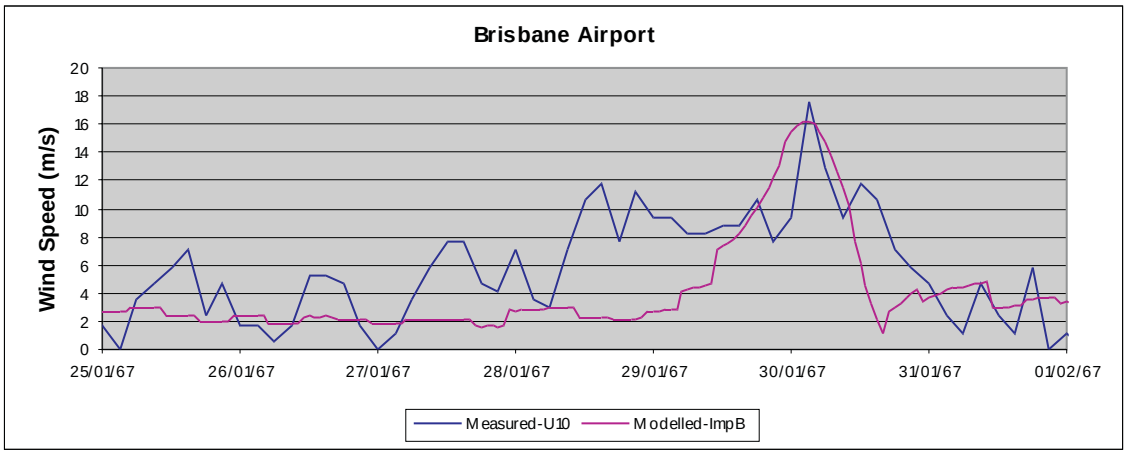
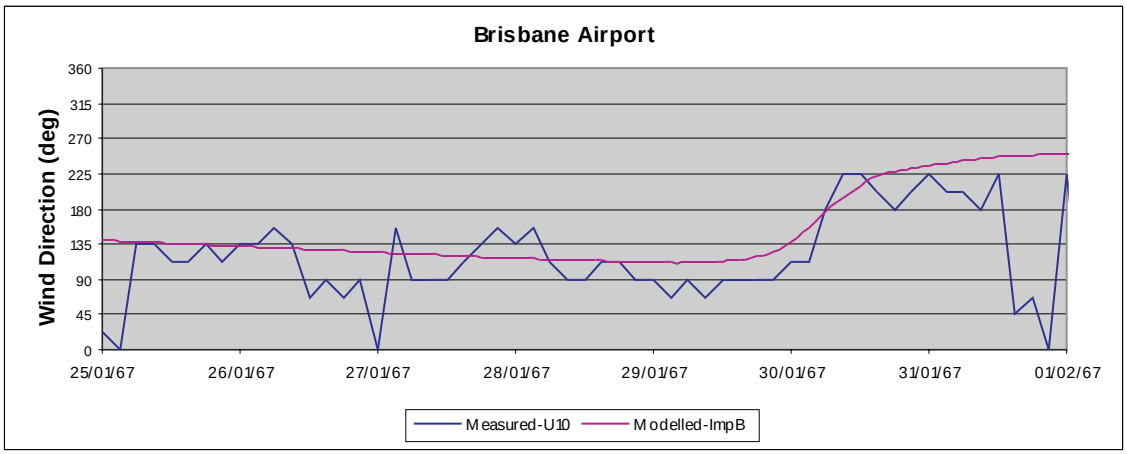
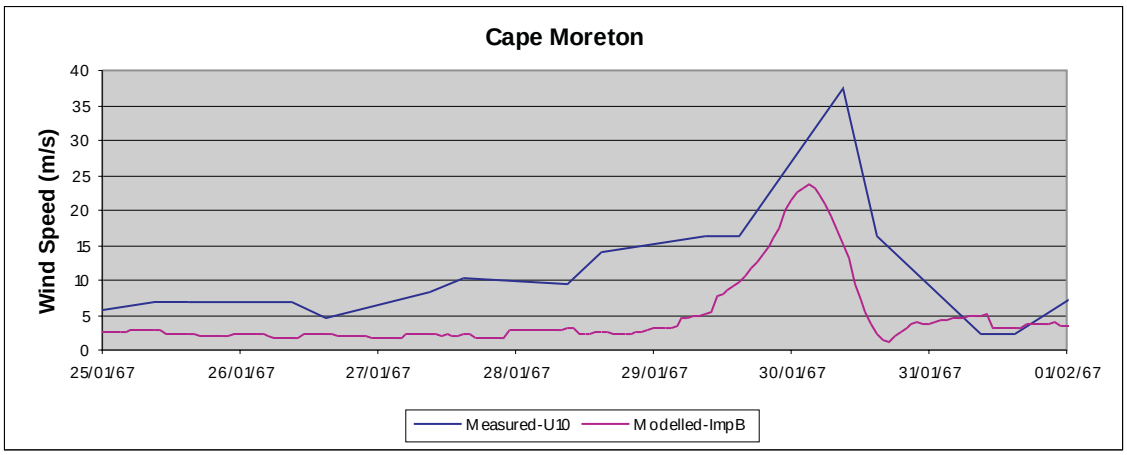
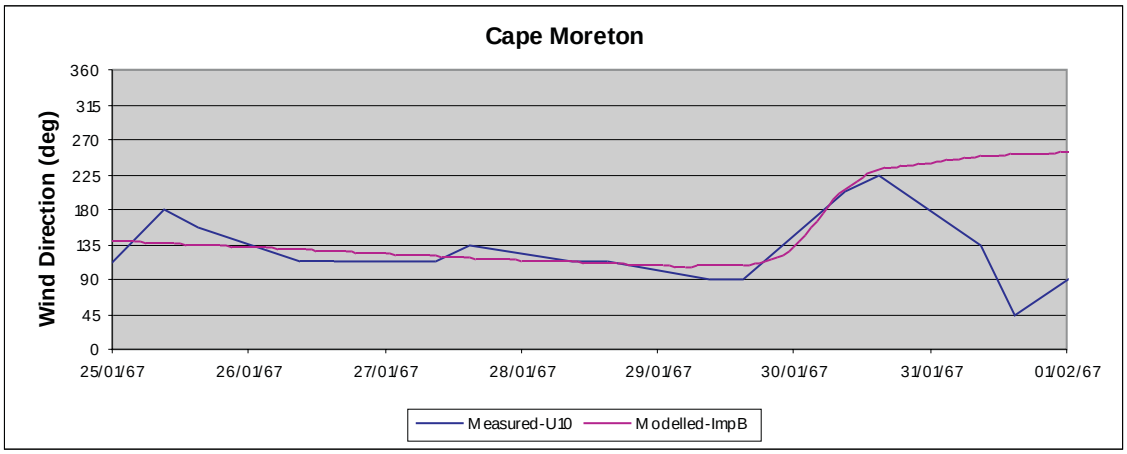
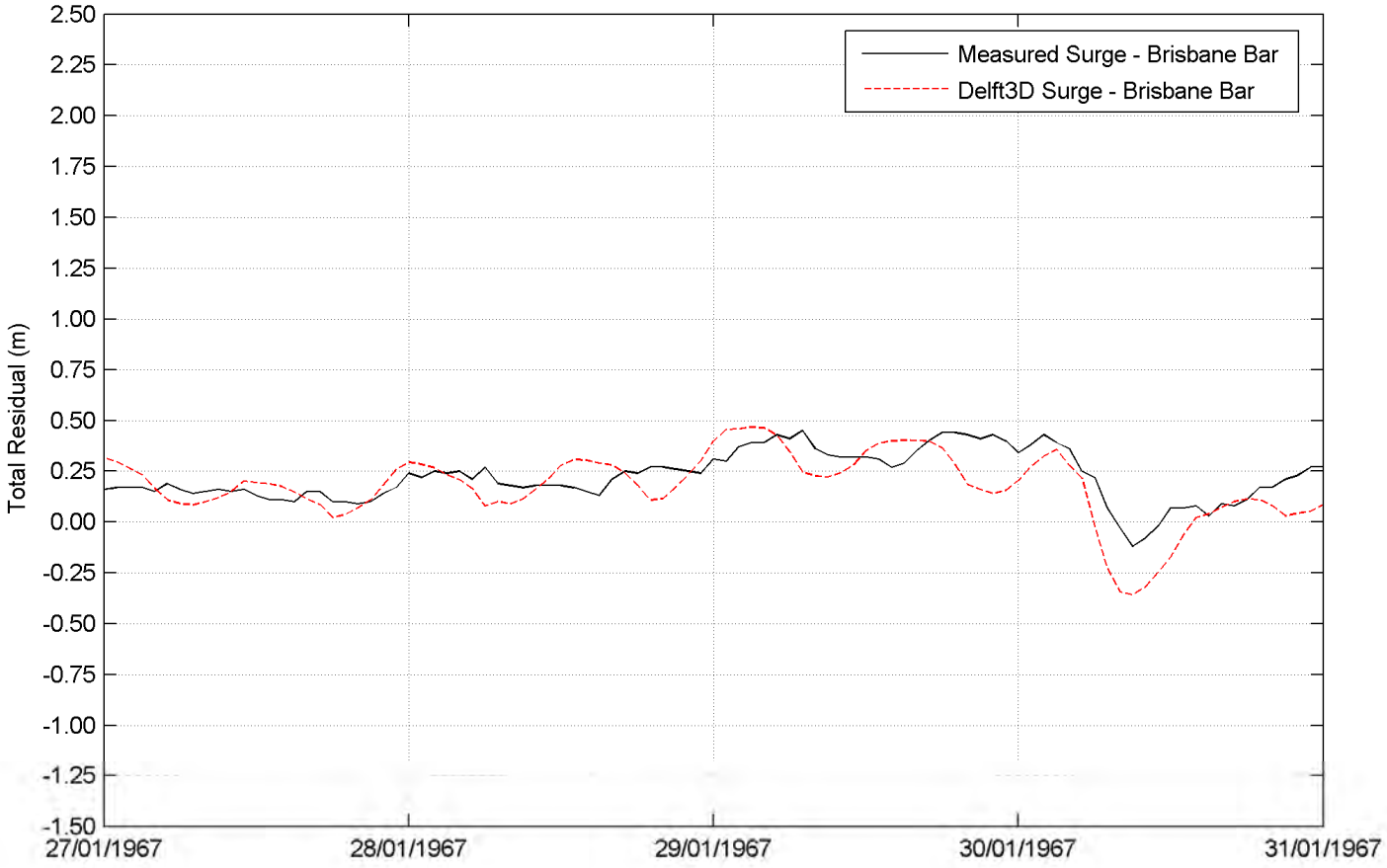
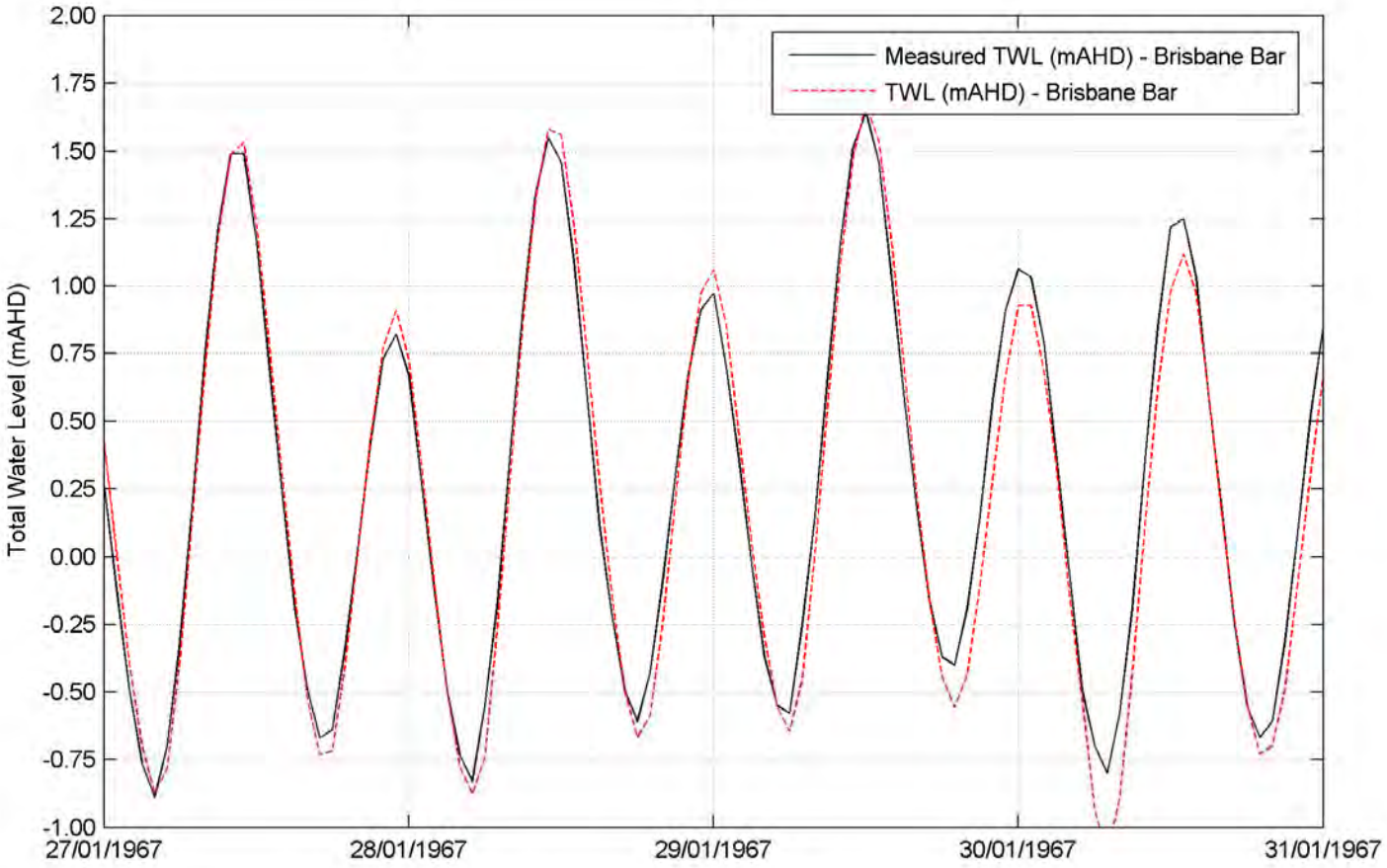

Brisbane Airport
Wind Speed (m/s)
0
2
4
6
8
10
12
14
16
18
20
25/01/67
26/01/67
27/01/67
28/01/67
29/01/67
30/01/67
31/01/67
01/02/67
Measured-U10
Modelled-ImpB


Brisbane Airport
Wind Direction (deg)
0
45
90
135
180
225
270
315
360
25/01/67
26/01/67
27/01/67
28/01/67
29/01/67
30/01/67
31/01/67
01/02/67
Measured-U10
Modelled-ImpB


Cape Moreton
Wind Speed (m/s)
0
5
10
15
20
25
30
35
40
25/01/67
26/01/67
27/01/67
28/01/67
29/01/67
30/01/67
31/01/67
01/02/67
Measured-U10
Modelled-ImpB


Cape Moreton
Wind Direction (deg)
0
45
90
135
180
225
270
315
360
25/01/67
26/01/67
27/01/67
28/01/67
29/01/67
30/01/67
31/01/67
01/02/67
Measured-U10
Modelled-ImpB





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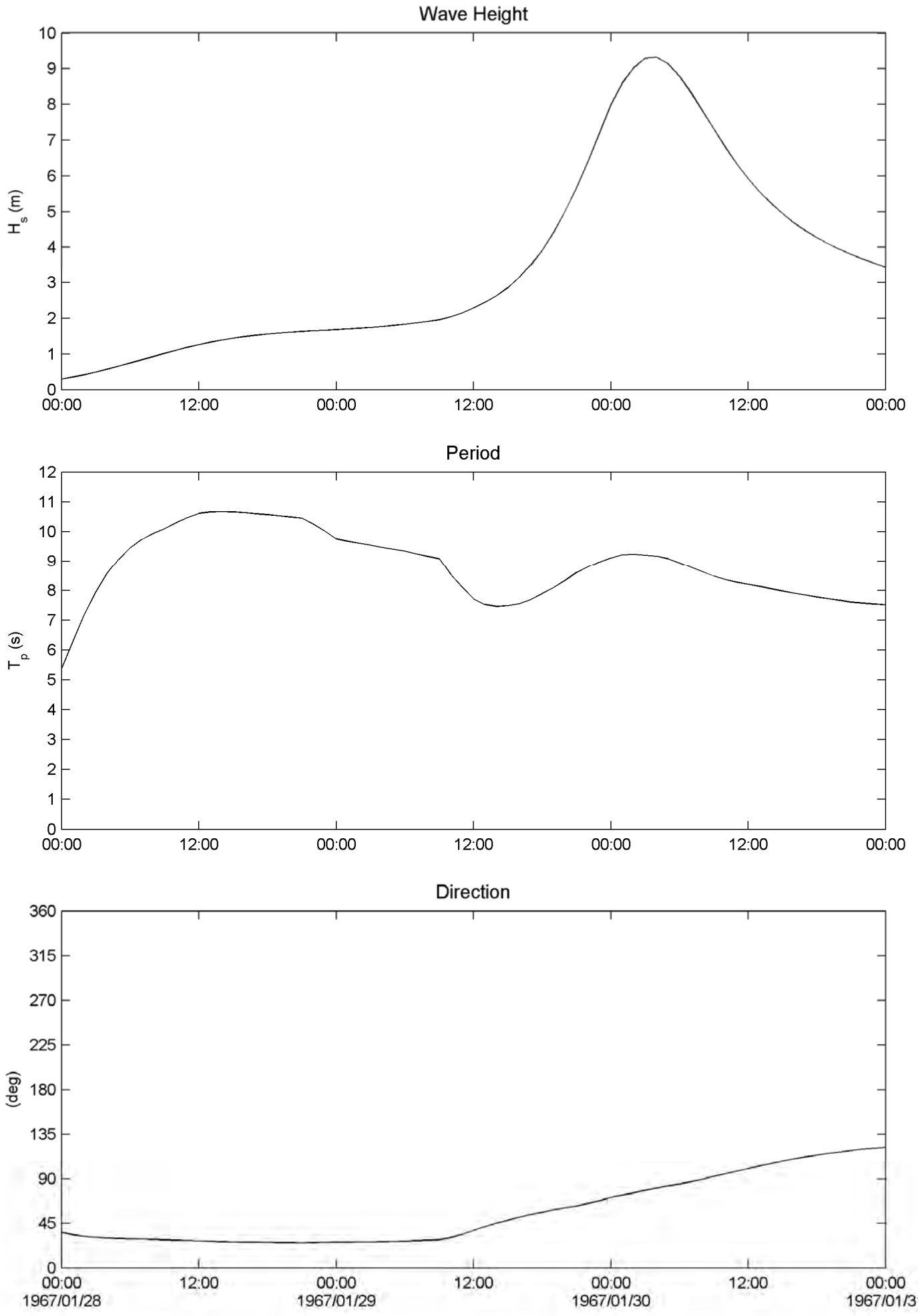
File: J:\CM\LJ8824\Figures\R2461\Figure5.14.png

Storm Tide Hazard Study - Moreton Bay Regional Council
TROPICAL CYCLONE DINAH
Modelled and Measured Storm Tide - Brisbane Bar
Figure 5.14



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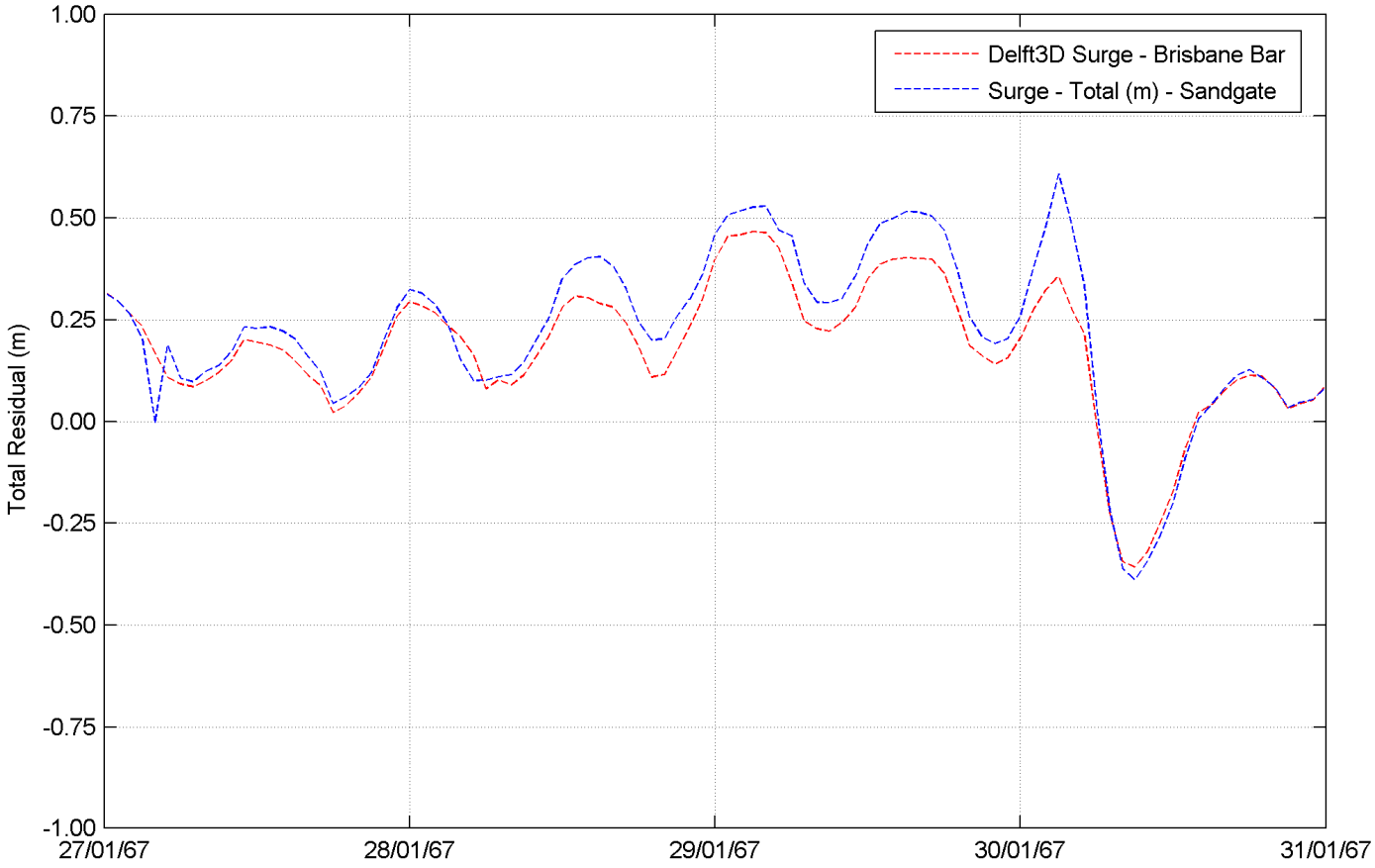
File: J:\CM\LJ8824\Figures\R2461\Figure5.15.png

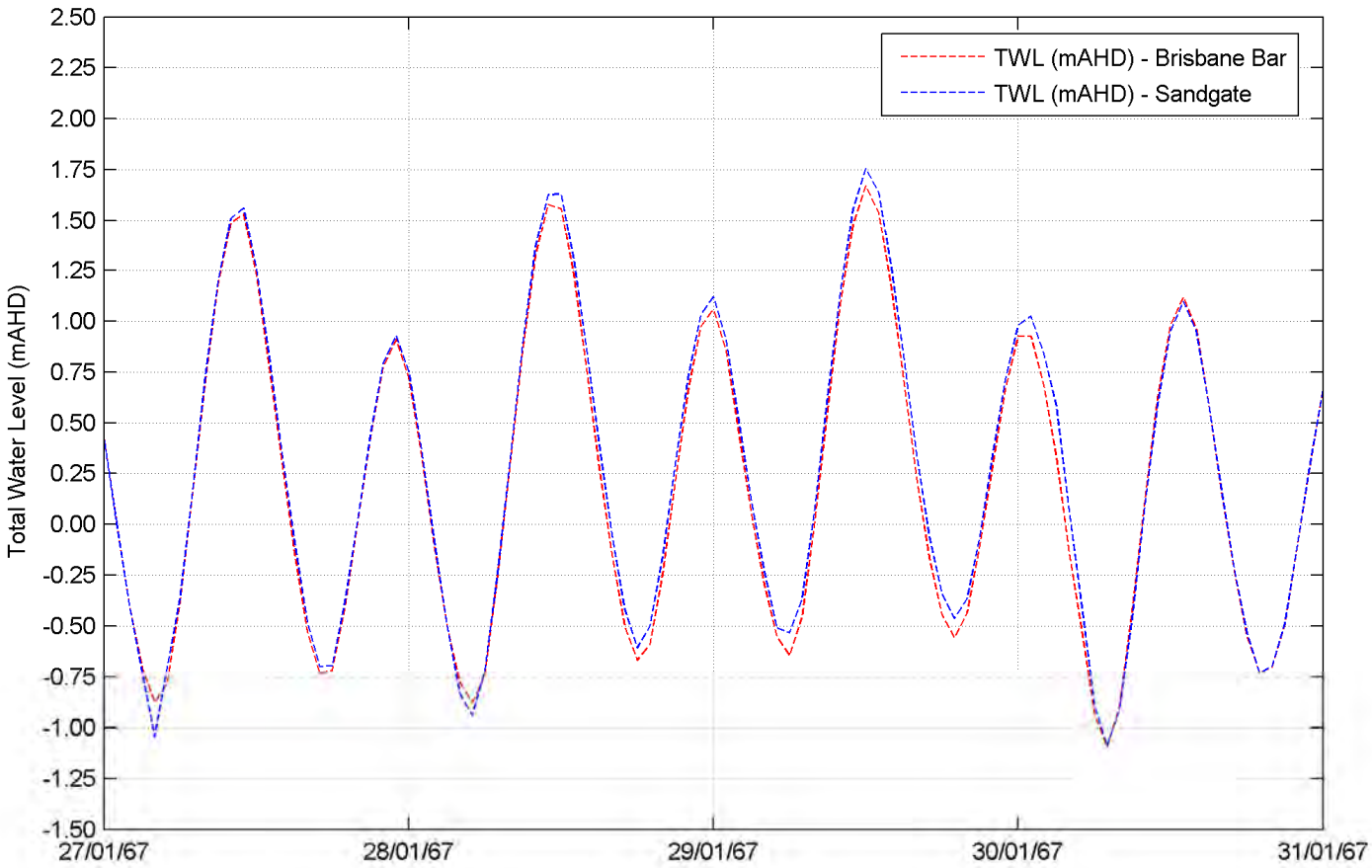
Storm Tide Hazard Study - Moreton Bay Regional Council

TC DINAH MODELLED WAVE CONDITIONS

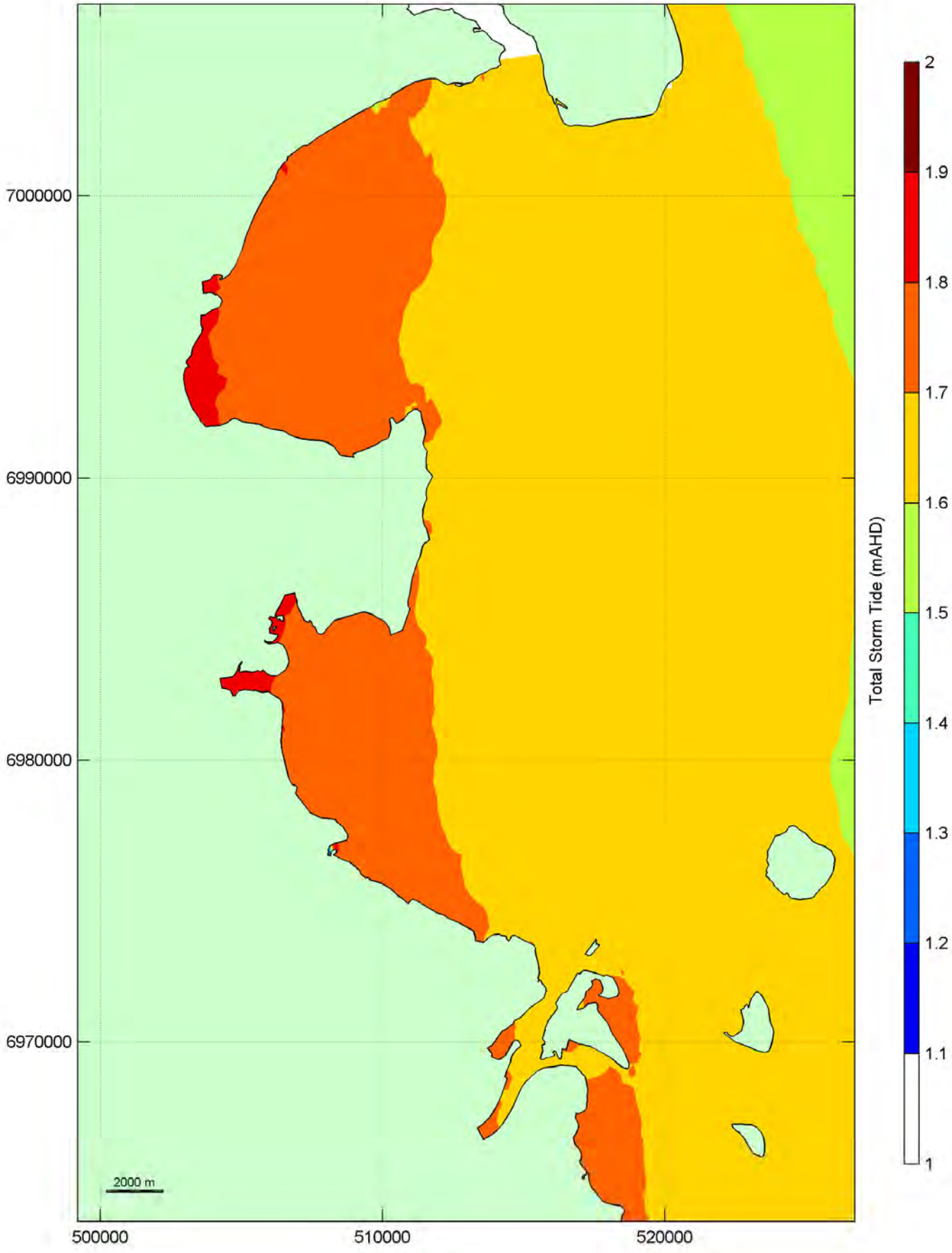
Northern Entrance to Morton Bay (Depth 60m AHD)

Figure 5.15





Storm Tide Hazard Study - Moreton Bay Regional Council
TROPICAL CYCLONE DINAH
Comparision Between Storm Tide at Brisbane Bar and Sandgate
Figure 5.16



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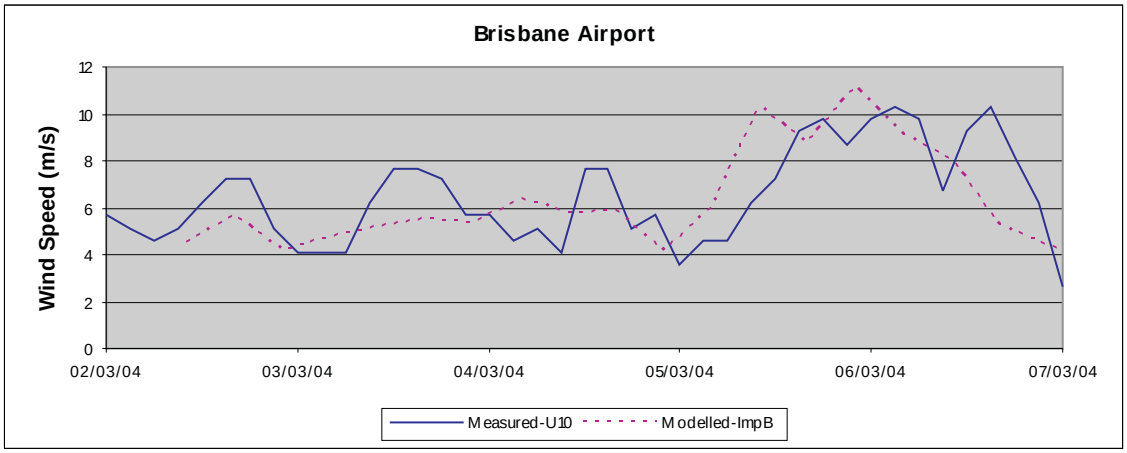
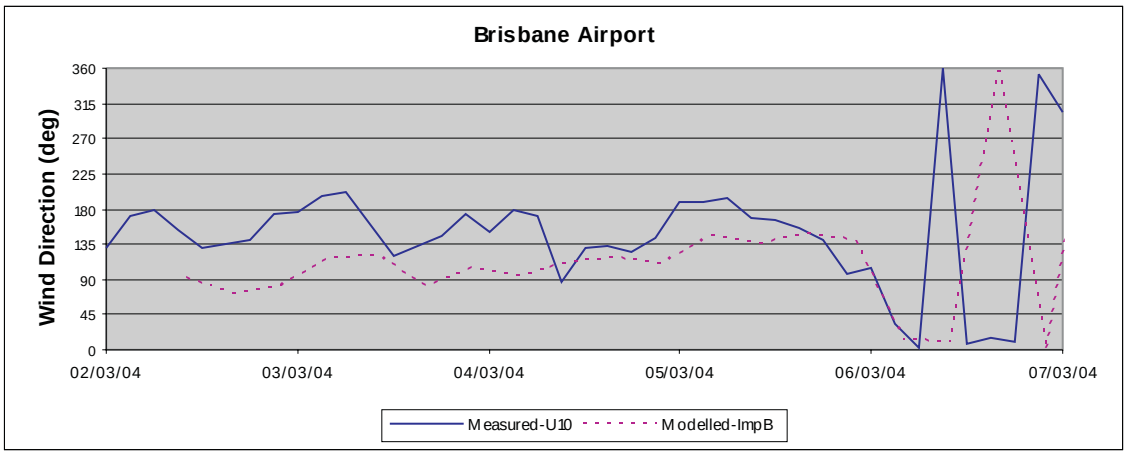
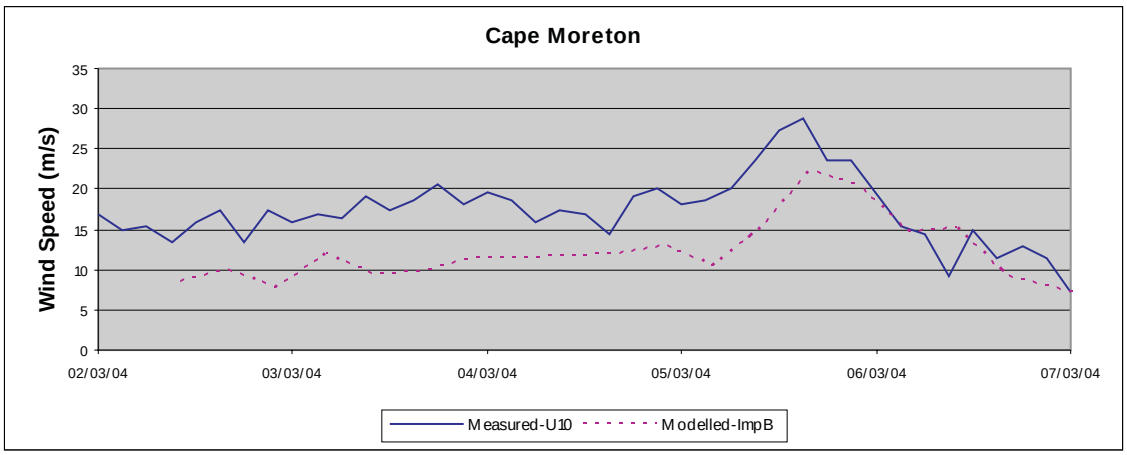
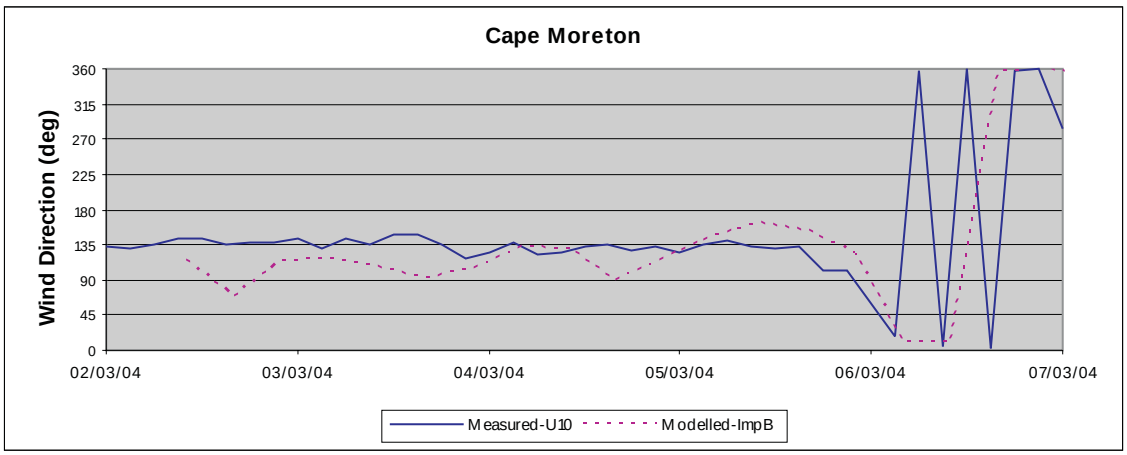
File: J:\CM\LJ8824\Figures\R2461\Figure5.17.png

Storm Tide Hazard Study - Moreton Bay Regional Council
TROPICAL CYCLONE DINAH
Total Peak Water Level: 12:00 29/01/1967 (Excluding Local Wave Setup)
Figure 5.17









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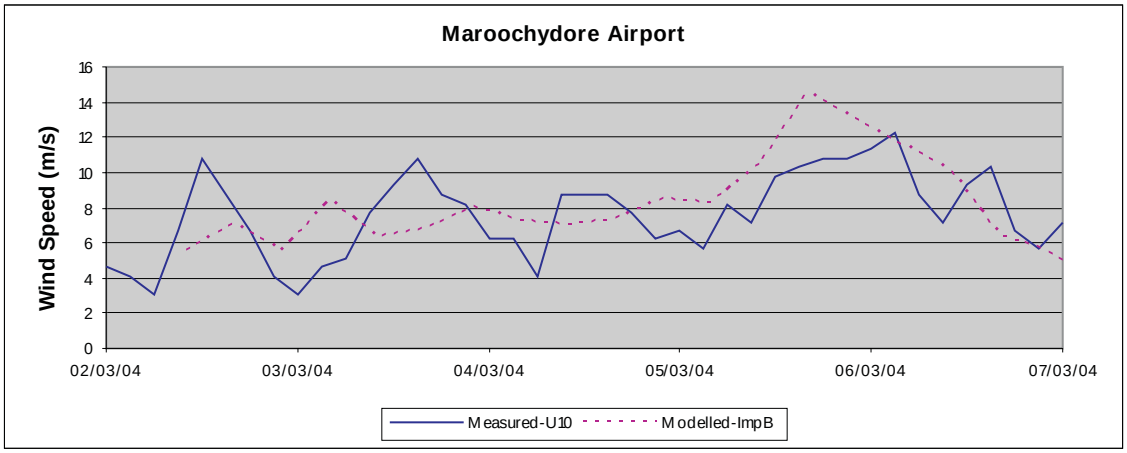
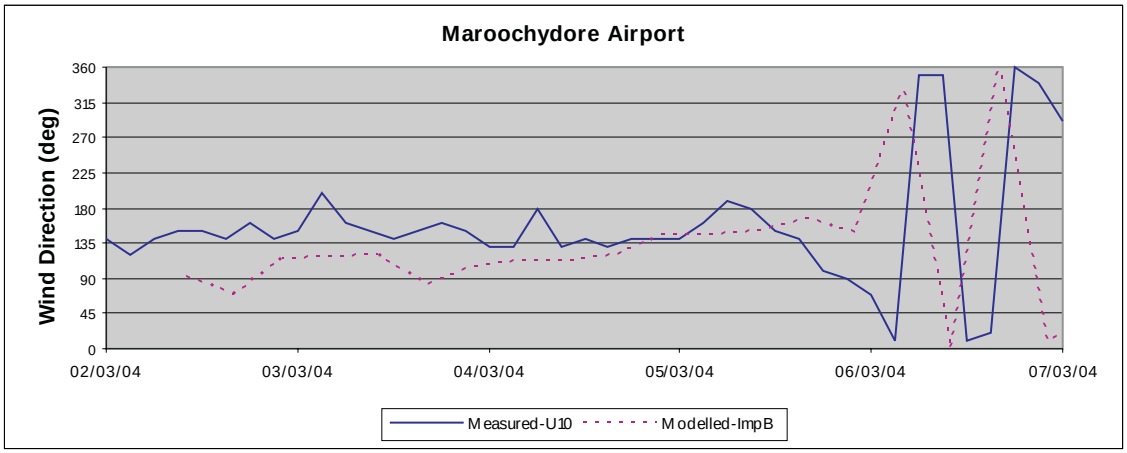
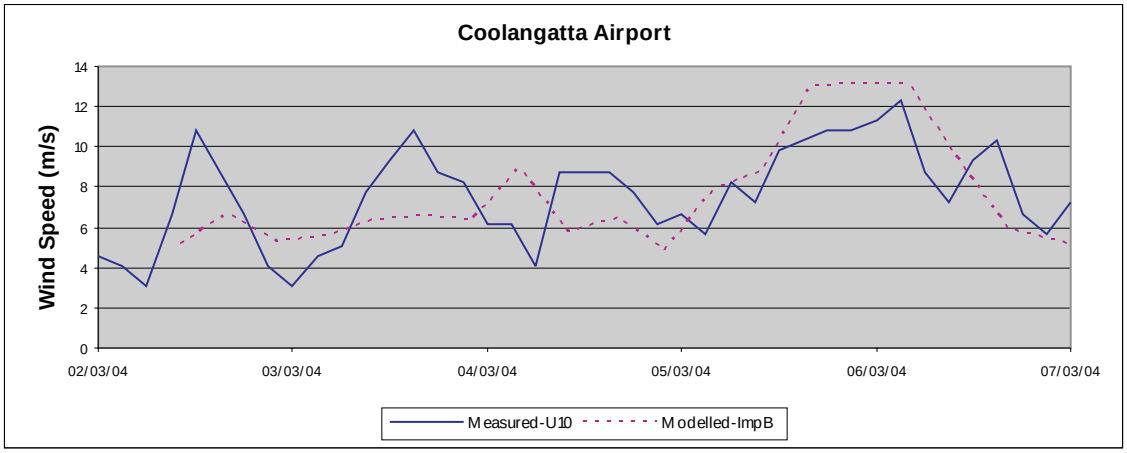
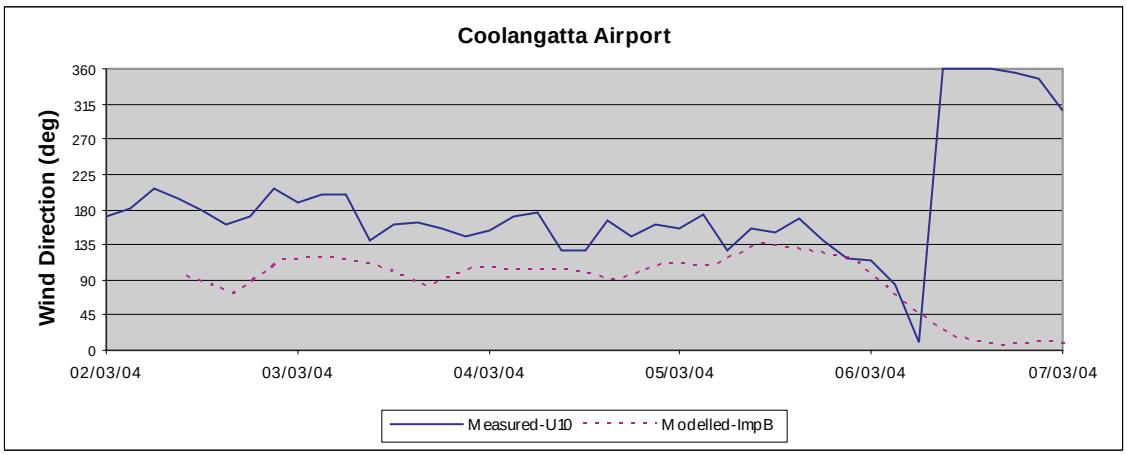
File: J:\CM\LJ8824\Figures\R2461\Figure5.18.cdr

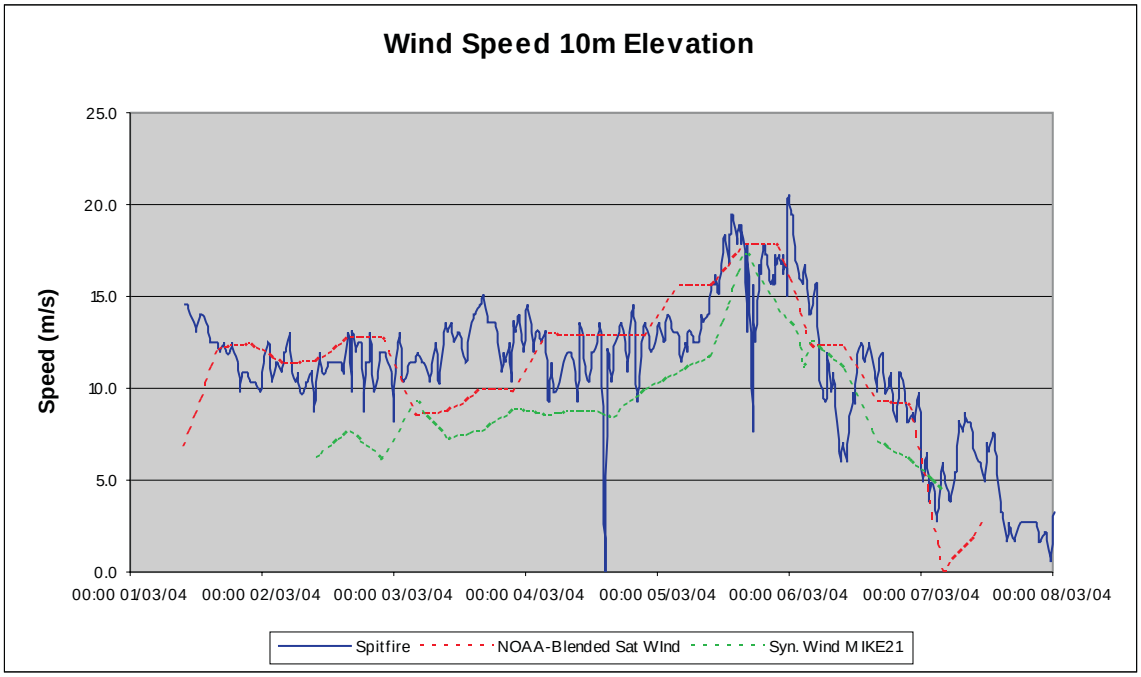
Storm Tide Hazard Study - Moreton Bay Regional Council
MEASURED AND MODELLED WIND CONDITIONS
MARCH 2004 EVENT
Figure 5.18

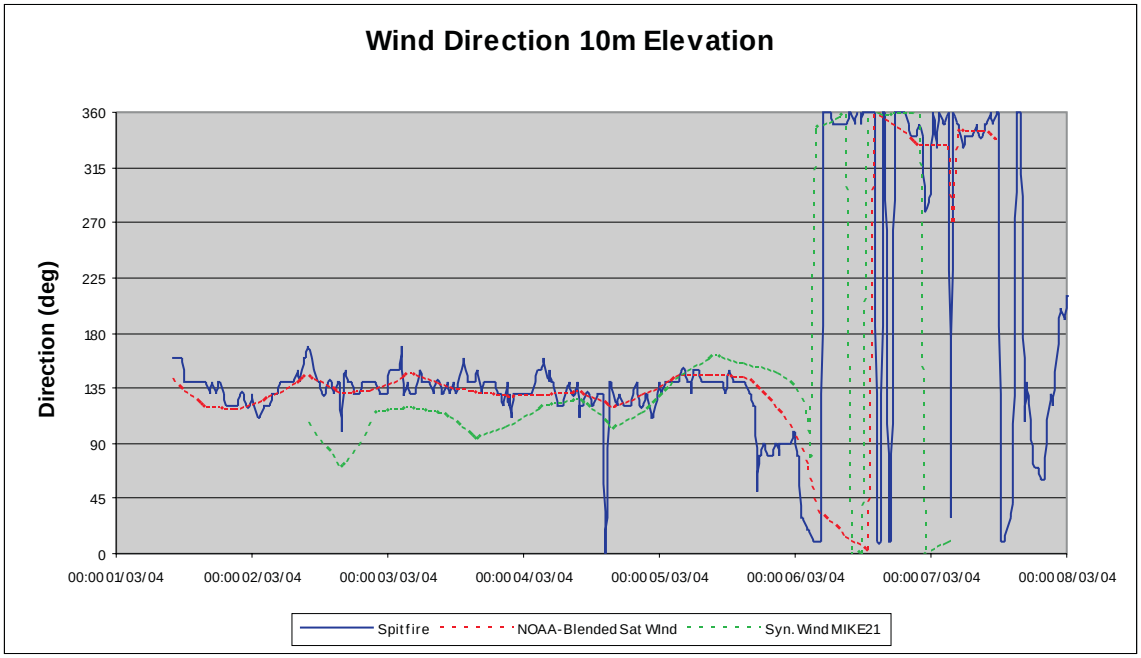

Maroochydore Airport
Wind Speed (m/s)
0
2
4
6
8
10
12
14
16
02/03/04
03/03/04
04/03/04
05/03/04
06/03/04
07/03/04
Measured-U10
Modelled-ImpB

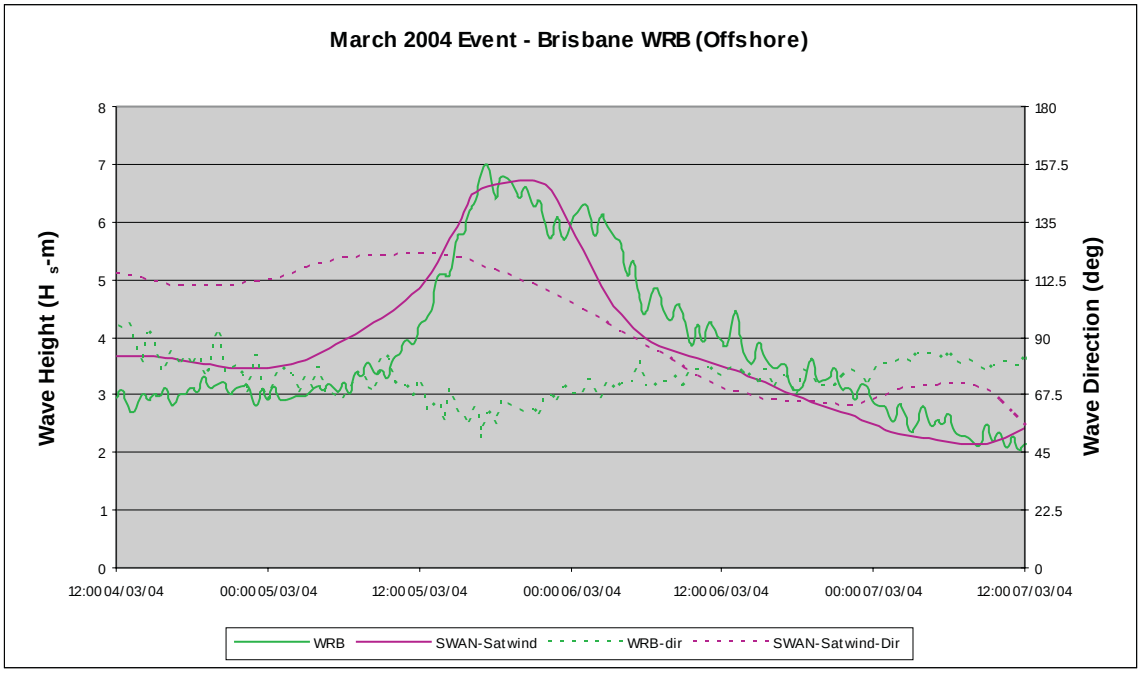

Maroochydore Airport
Wind Direction (deg)
0
45
90
135
180
225
270
315
360
02/03/04
03/03/04
04/03/04
05/03/04
06/03/04
07/03/04
Measured-U10
Modelled-ImpB

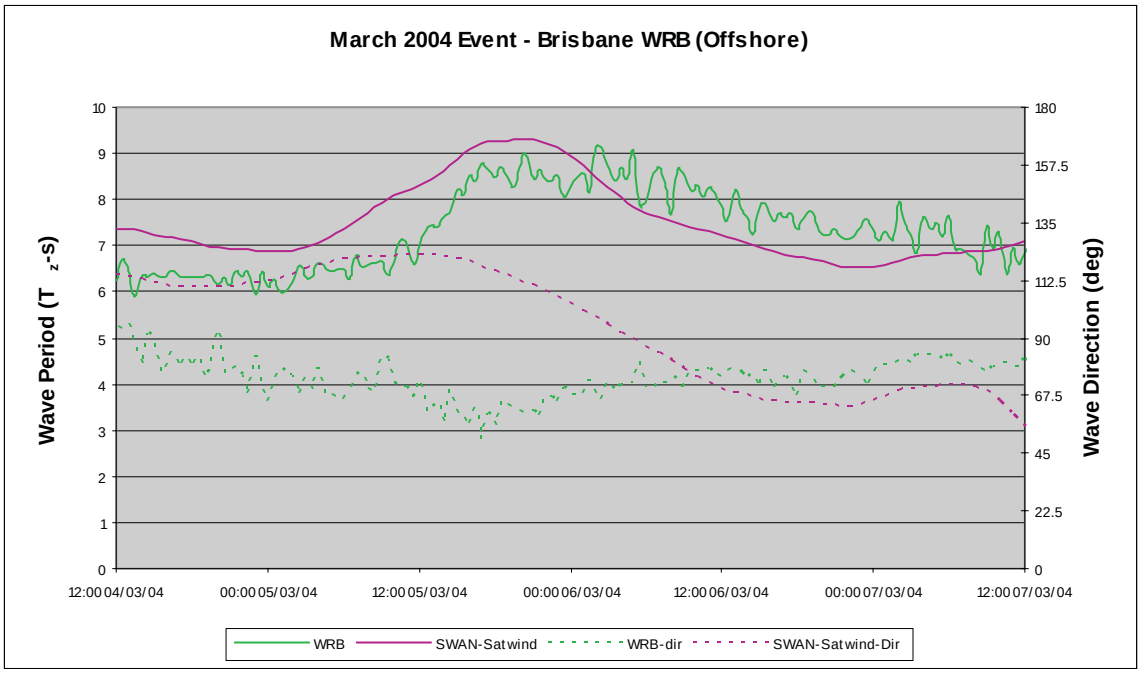

Coolangatta Airport
Wind Speed (m/s)
0
2
4
6
8
10
12
14
02/03/04
03/03/04
04/03/04
05/03/04
06/03/04
07/03/04
Measured-U10
Modelled-ImpB

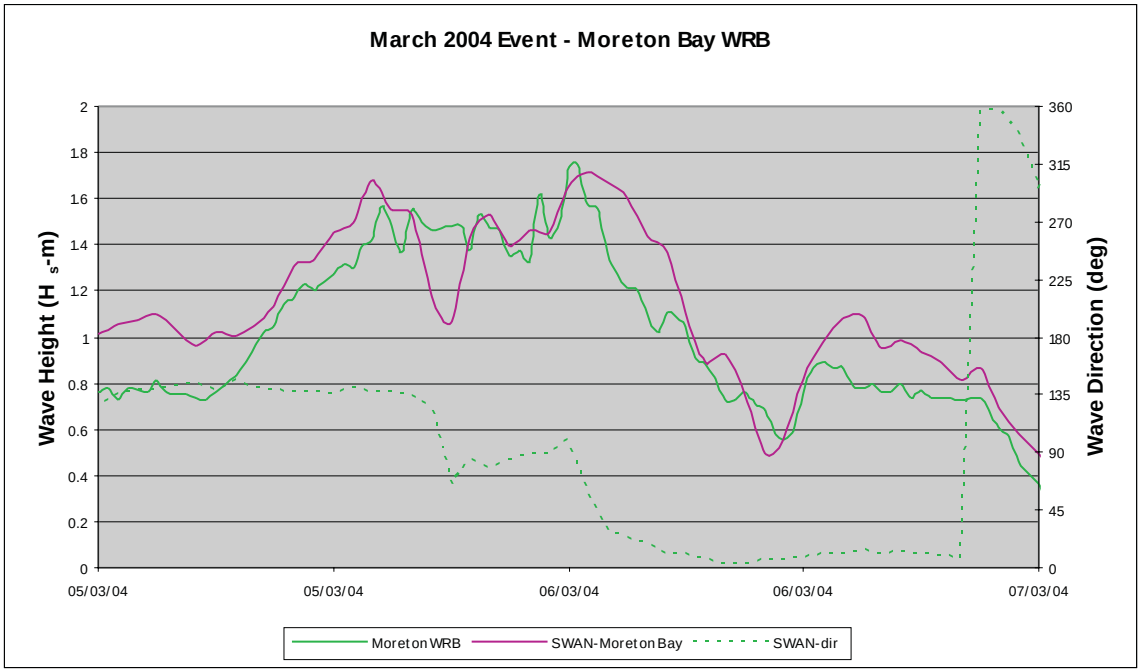

Coolangatta Airport
Wind Direction (deg)
0
45
90
135
180
225
270
315
360
02/03/04
03/03/04
04/03/04
05/03/04
06/03/04
07/03/04
Measured-U10
Modelled-ImpB

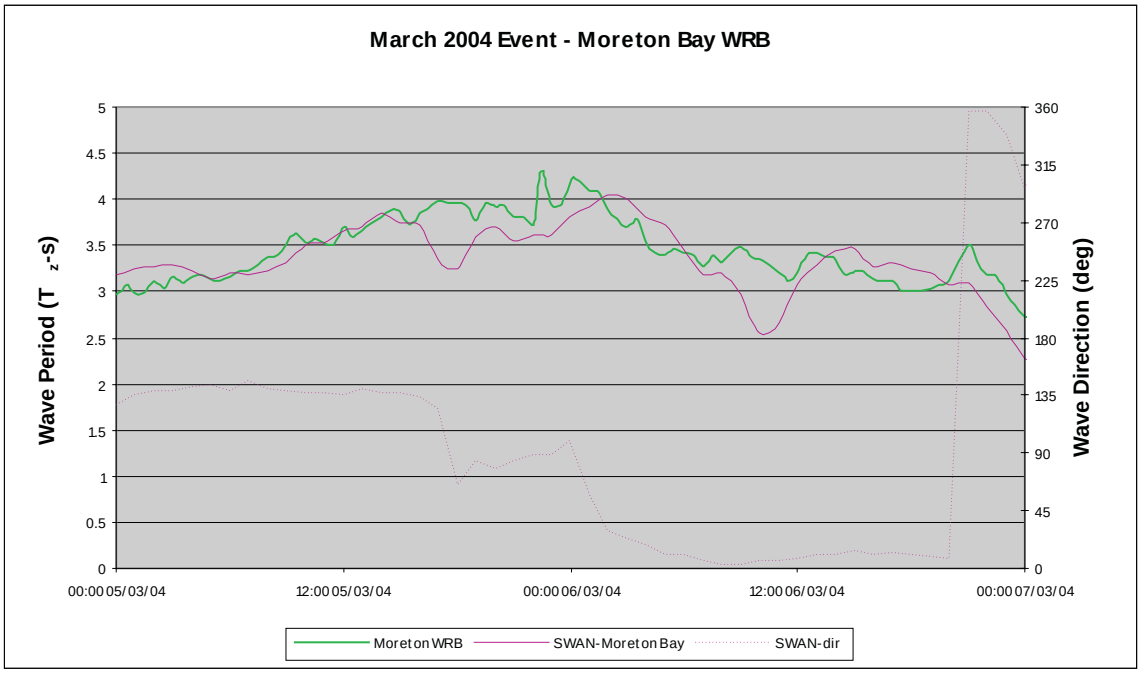

Wind Speed 10m Elevation
Speed (m/s)
25.0
20.0
15.0
10.0
5.0
0.0
00:00 01/03/04
00:00 02/03/04
00:00 03/03/04
00:00 04/03/04
00:00 05/03/04
00:00 06/03/04
00:00 07/03/04
00:00 08/03/04
Spitfire
NOAA-Blended Sat Wind
Syn. Wind MIKE21

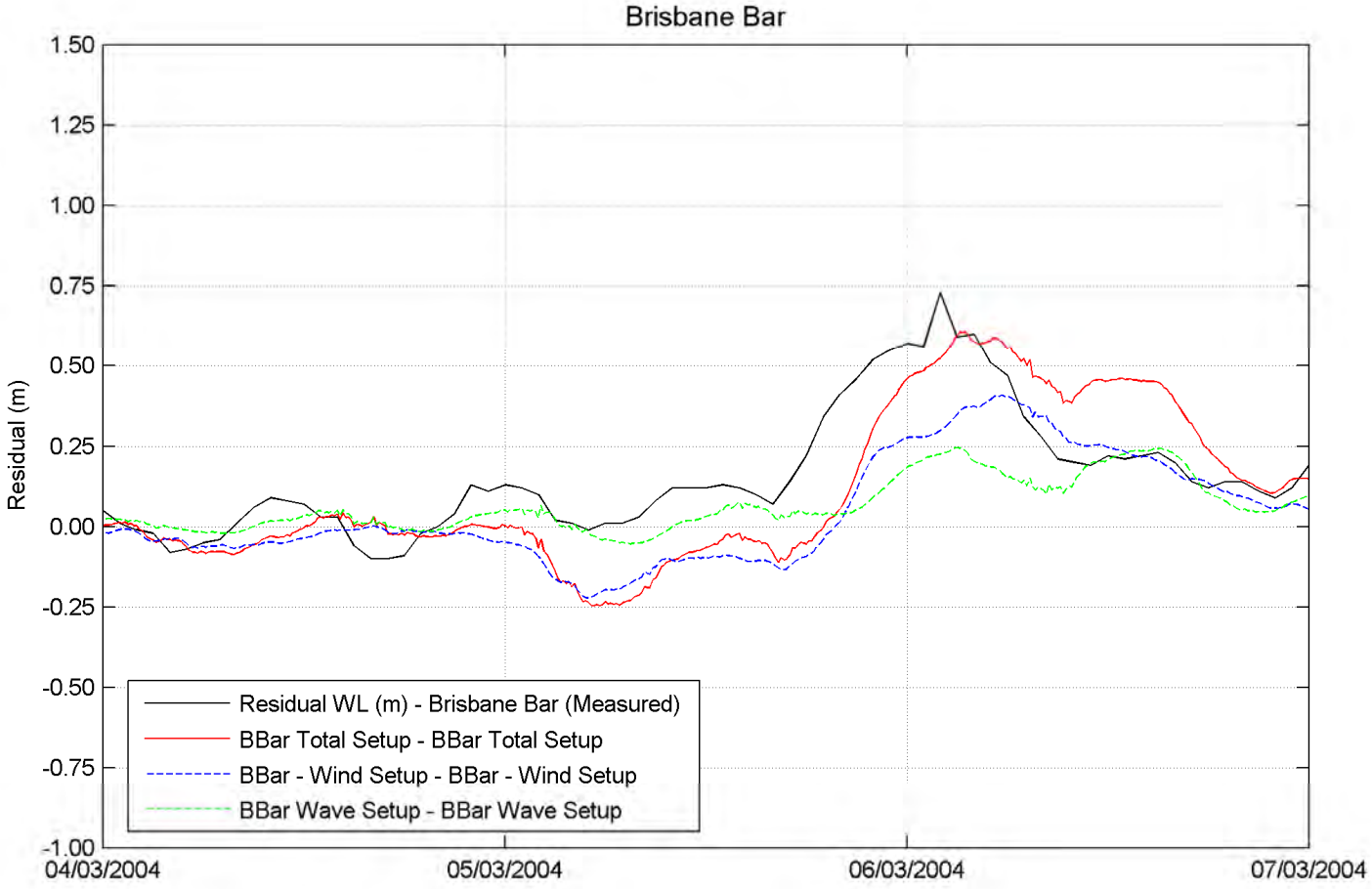

Wind Direction 10m Elevation
Direction (deg)
360
315
270
225
180
135
90
45
0
00:00 01/03/04
00:00 02/03/04
00:00 03/03/04
00:00 04/03/04
00:00 05/03/04
00:00 06/03/04
00:00 07/03/04
00:00 08/03/04
Spitfire
NOAA-Blended Sat Wind
Syn. Wind MIKE21

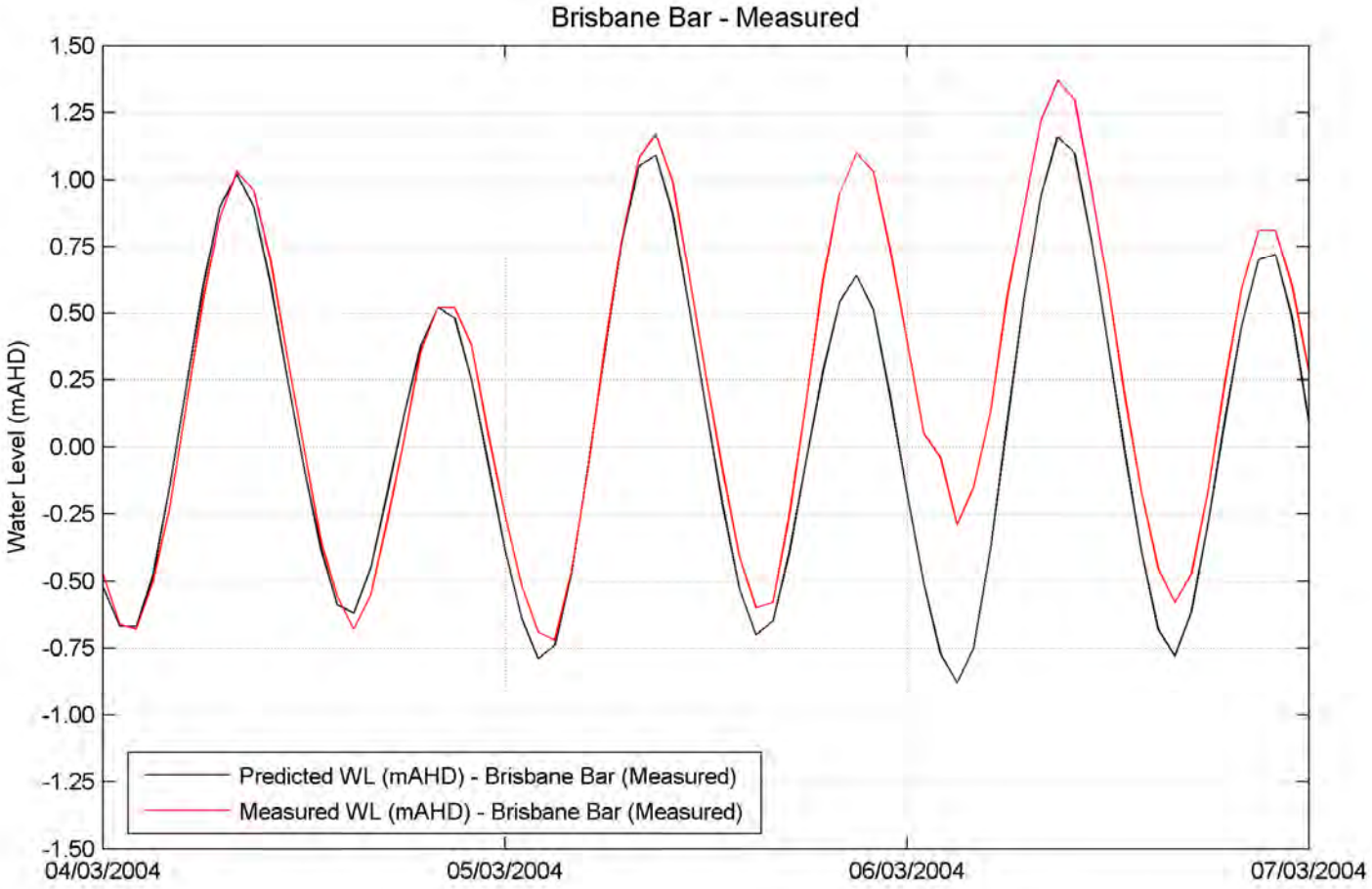

March 2004 Event - Brisbane WRB (Offshore)
Wave Height (H s-m)
Wave Direction (deg)
0
1
2
3
4
5
6
7
8
0
22.5
45
67.5
90
112.5
135
157.5
180
12:00 04/03/04
00:00 05/03/04
12:00 05/03/04
00:00 06/03/04
12:00 06/03/04
00:00 07/03/04
12:00 07/03/04
WRB
SWAN-Satwind
WRB-dir
SWAN-Satwind-Dir


March 2004 Event - Brisbane WRB (Offshore)
Wave Period (T z-s)
Wave Direction (deg)
0
1
2
3
4
5
6
7
8
9
10
0
22.5
45
67.5
90
112.5
135
157.5
180
12:00 04/03/04
00:00 05/03/04
12:00 05/03/04
00:00 06/03/04
12:00 06/03/04
00:00 07/03/04
12:00 07/03/04
WRB
SWAN-Satwind
WRB-dir
SWAN-Satwind-Dir


March 2004 Event - Moreton Bay WRB
Wave Height (H s-m)
Wave Direction (deg)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
45
90
135
180
225
270
315
360
05/03/04
05/03/04
06/03/04
06/03/04
07/03/04
Moreton WRB
SWAN-Moreton Bay
SWAN-dir


March 2004 Event - Moreton Bay WRB
Wave Period (T z-s)
Wave Direction (deg)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
45
90
135
180
225
270
315
360
00:00 05/03/04
12:00 05/03/04
00:00 06/03/04
12:00 06/03/04
00:00 07/03/04
Moreton WRB
SWAN-Moreton Bay
SWAN-dir





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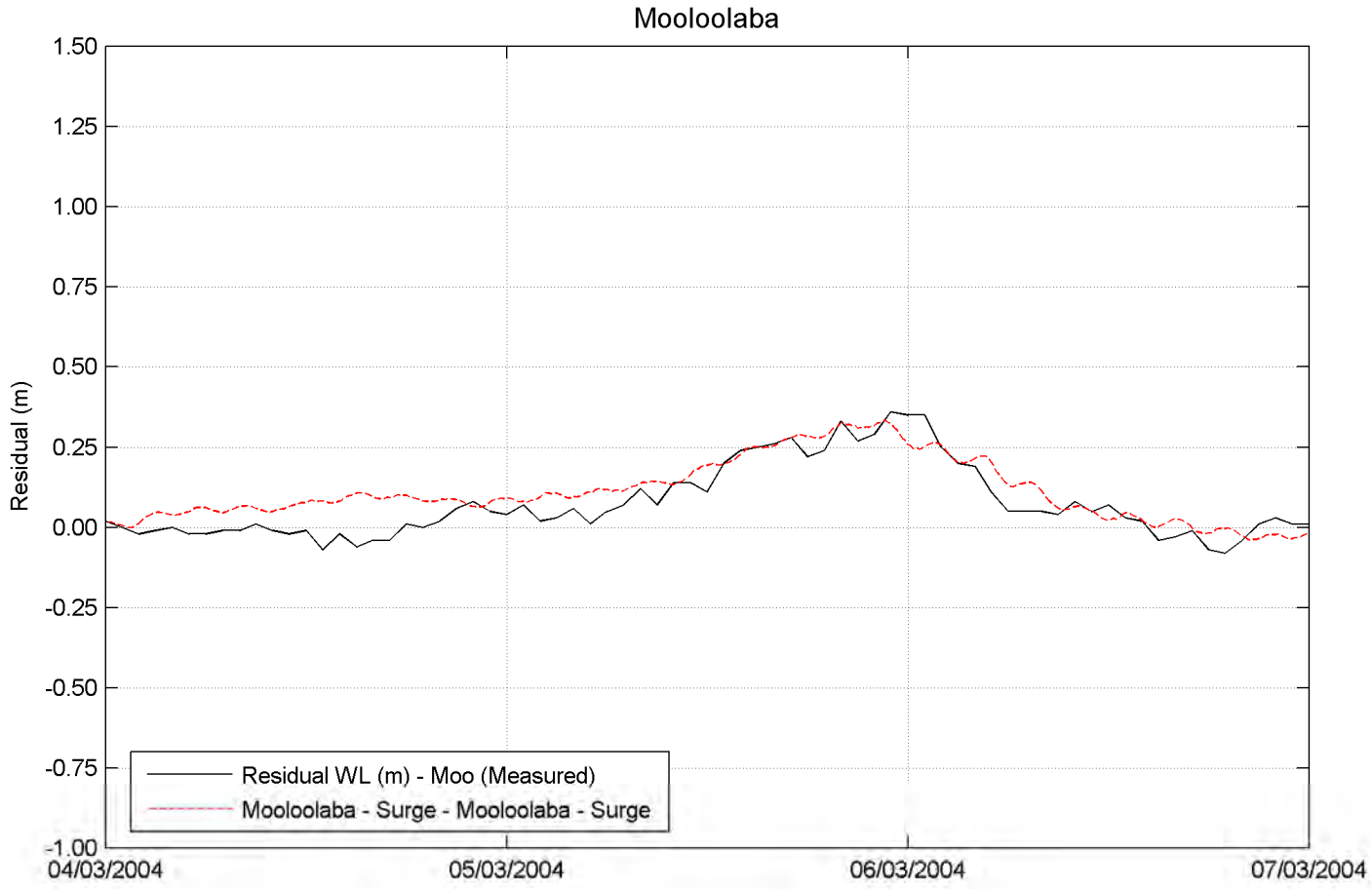
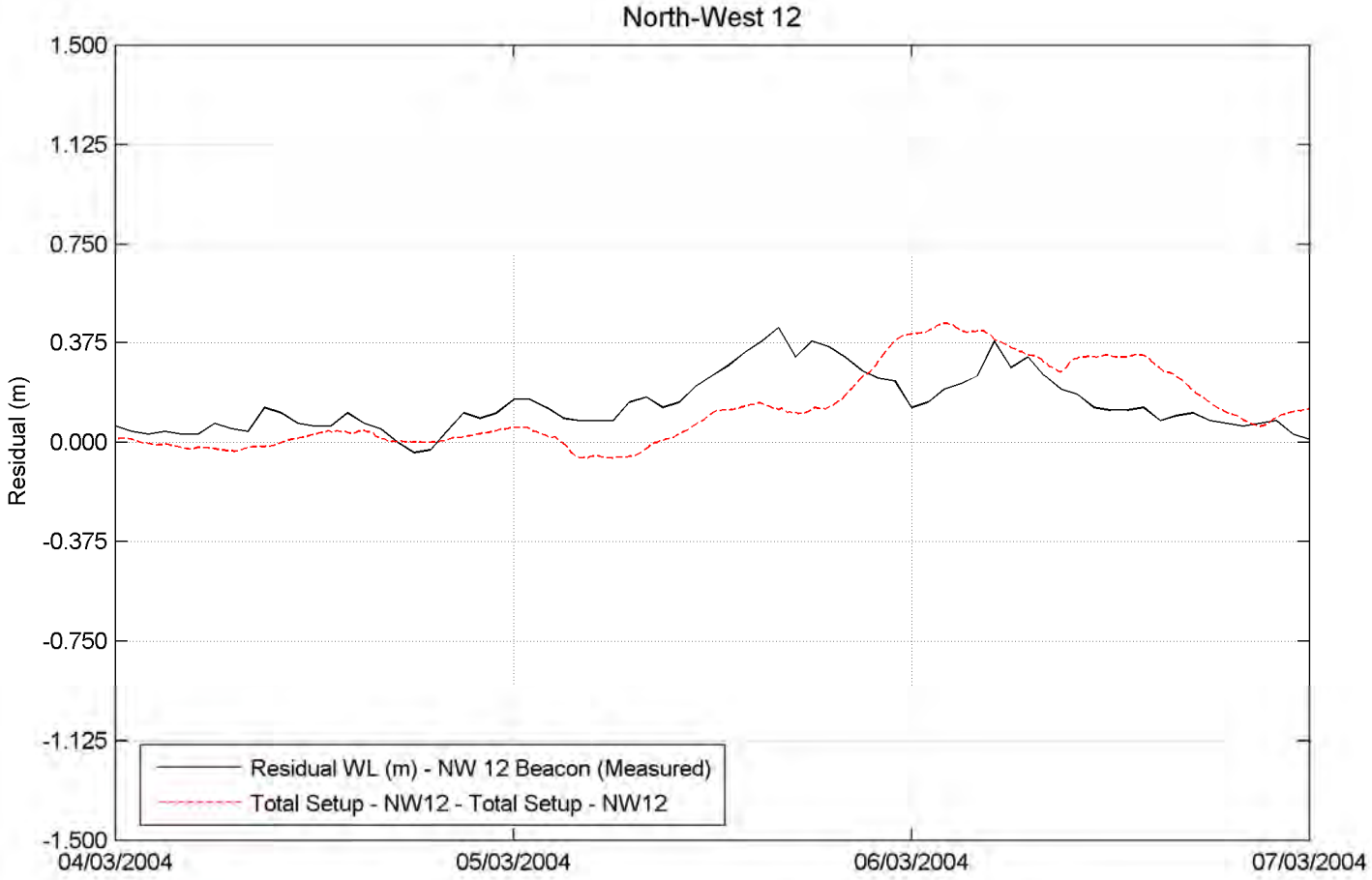
File: J:\CM\LJ8824\Figures\R2461\Figure5.23.png

Storm Tide Hazard Study - Moreton Bay Regional Council
MARCH 2004 Event
Modelled and Measured Storm Surge - Brisbane Bar
Figure 5.23





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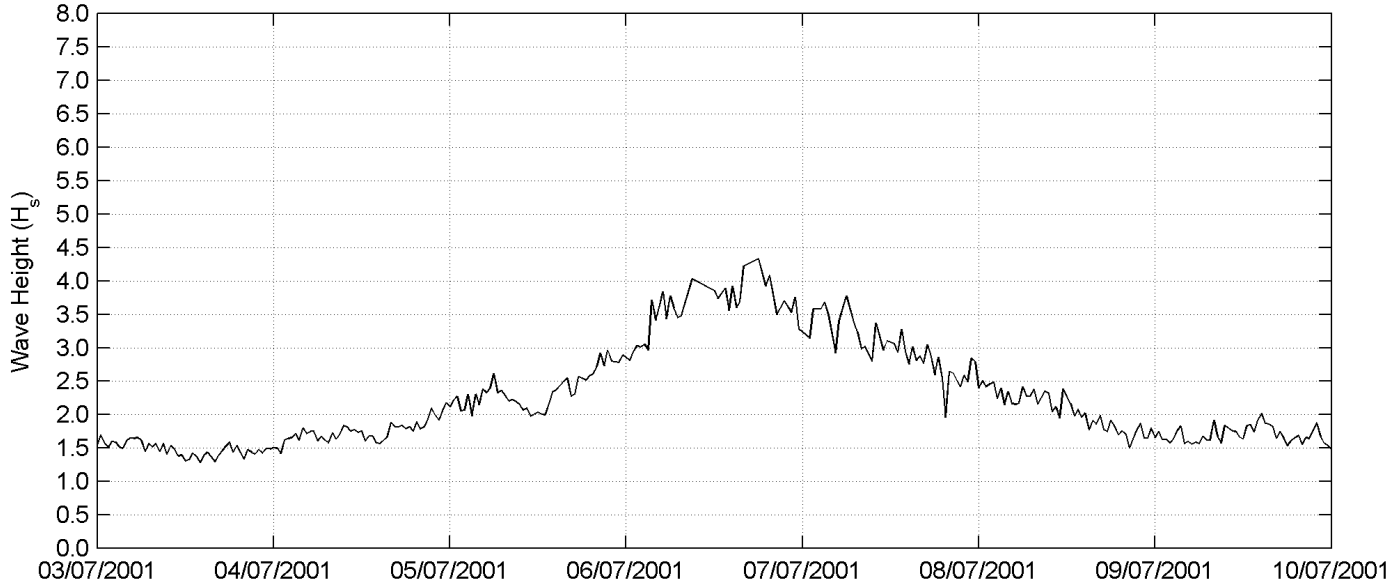
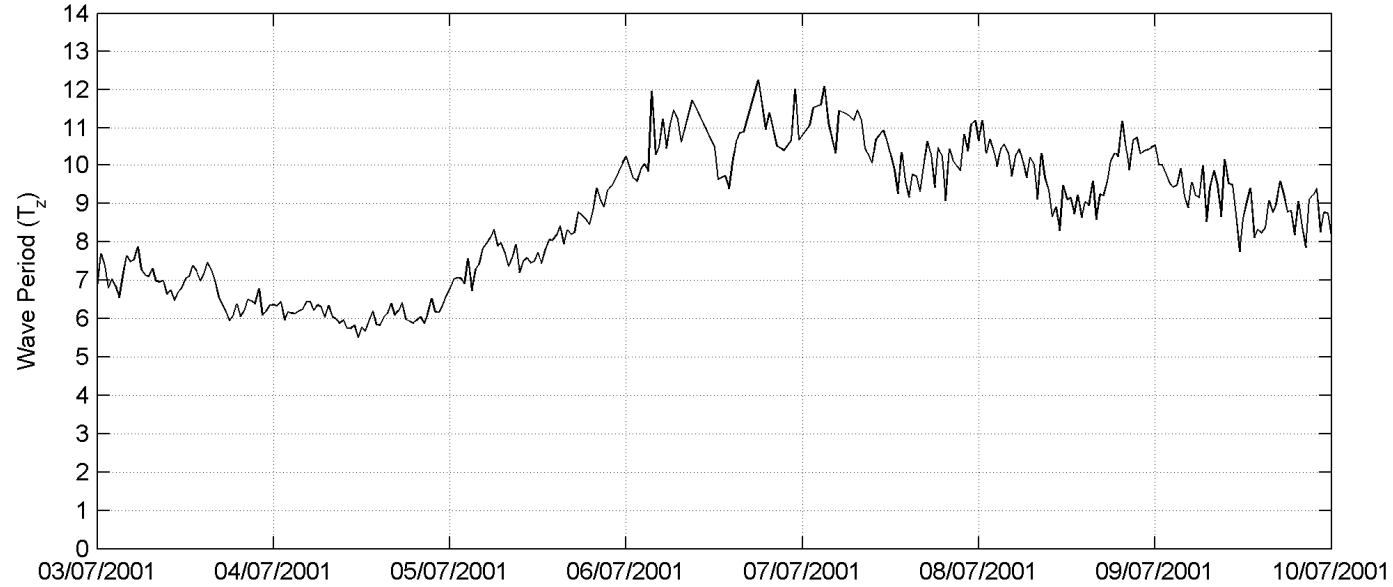
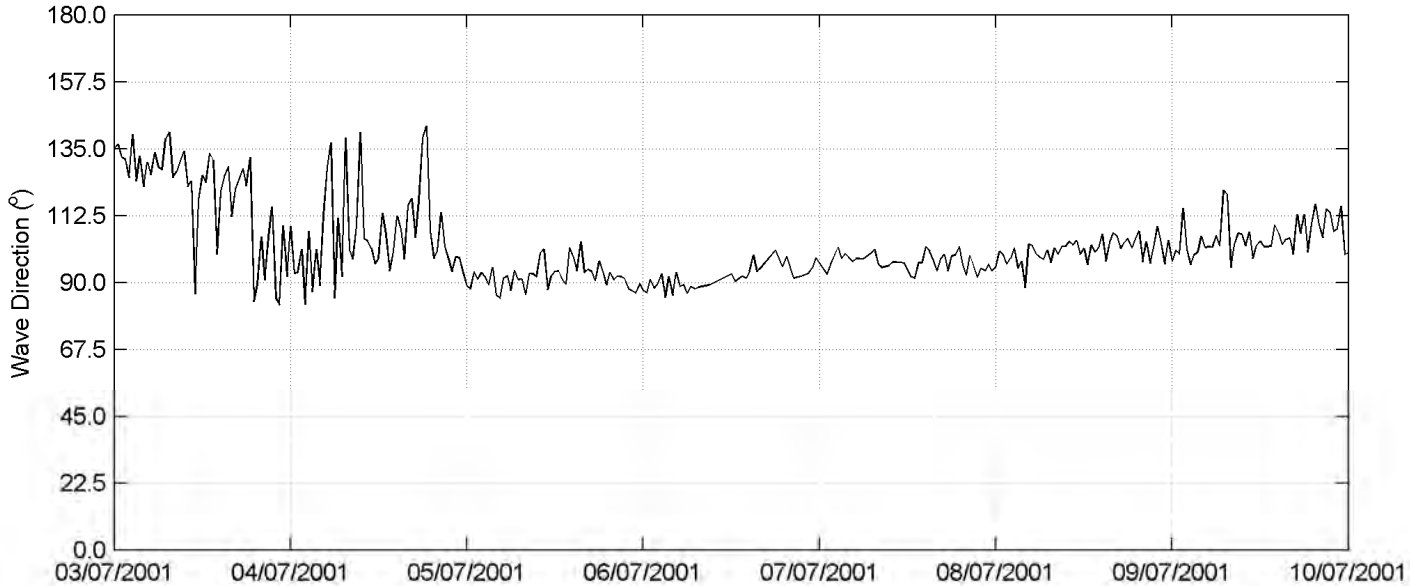
File: J:\CM\LJ8824\Figures\R2461\Figure5.23.png

Storm Tide Hazard Study - Moreton Bay Regional Council
MARCH 2004 Event
Modelled and Measured Storm Surge - Mooloolaba and NW12 Beacon
Figure 5.24







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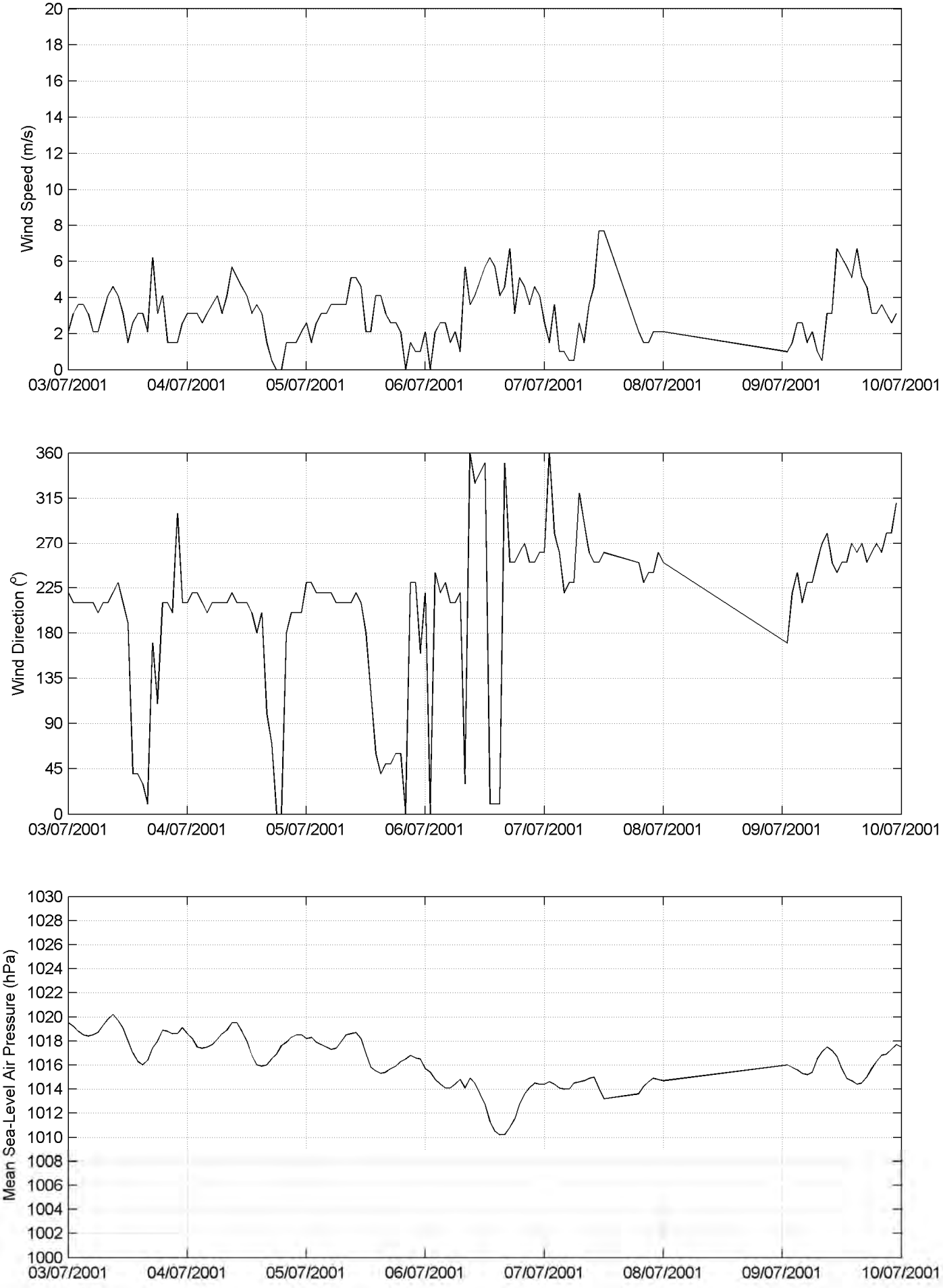
File: J:\CM\LJ8824\Figures\R2461\Figure6.1.png

Storm Tide Hazard Study - Moreton Bay Regional Council
MEASURED OFFSHORE WAVE CONDITIONS
Brisbane WRB
Figure 6.1



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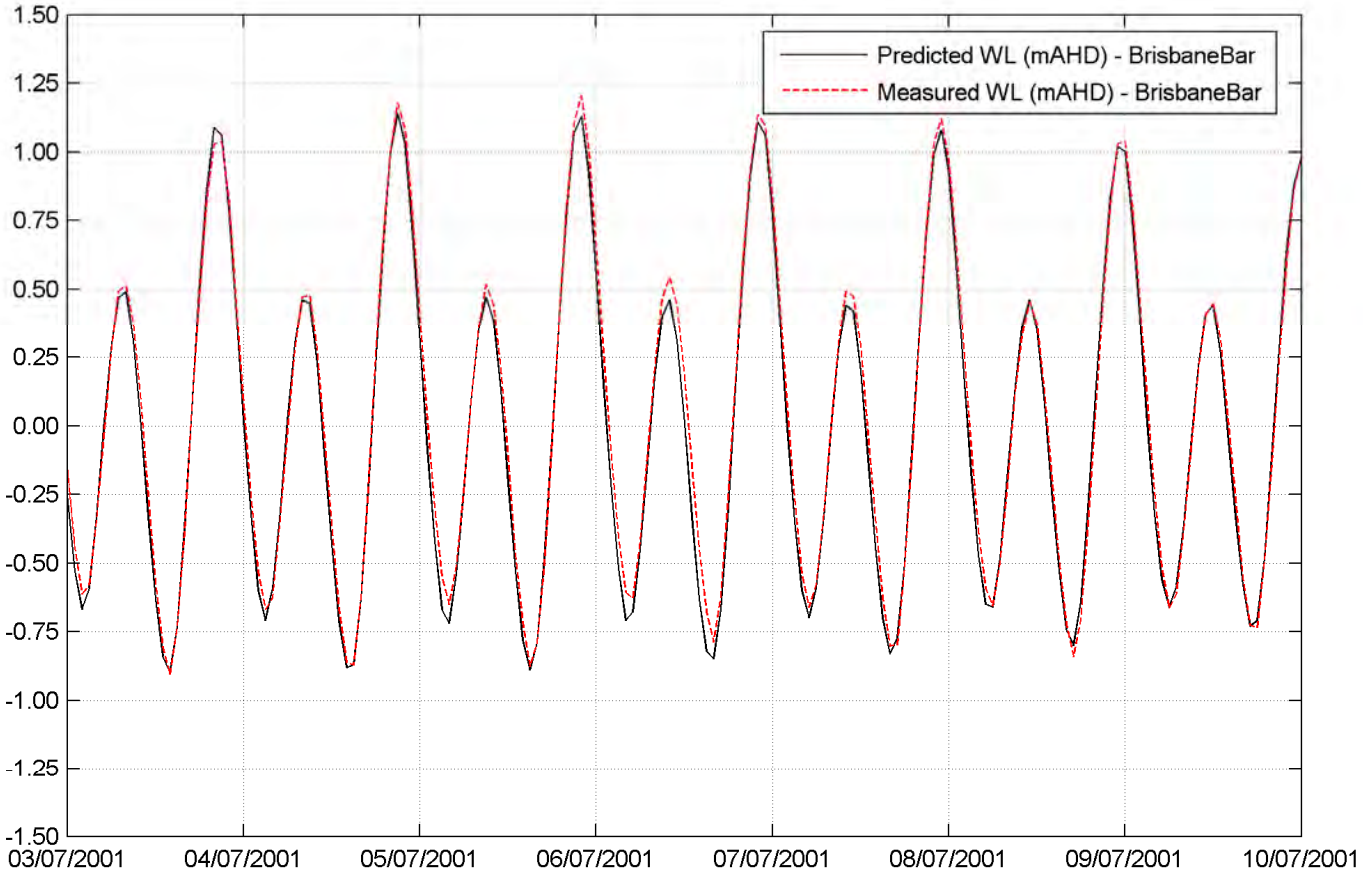
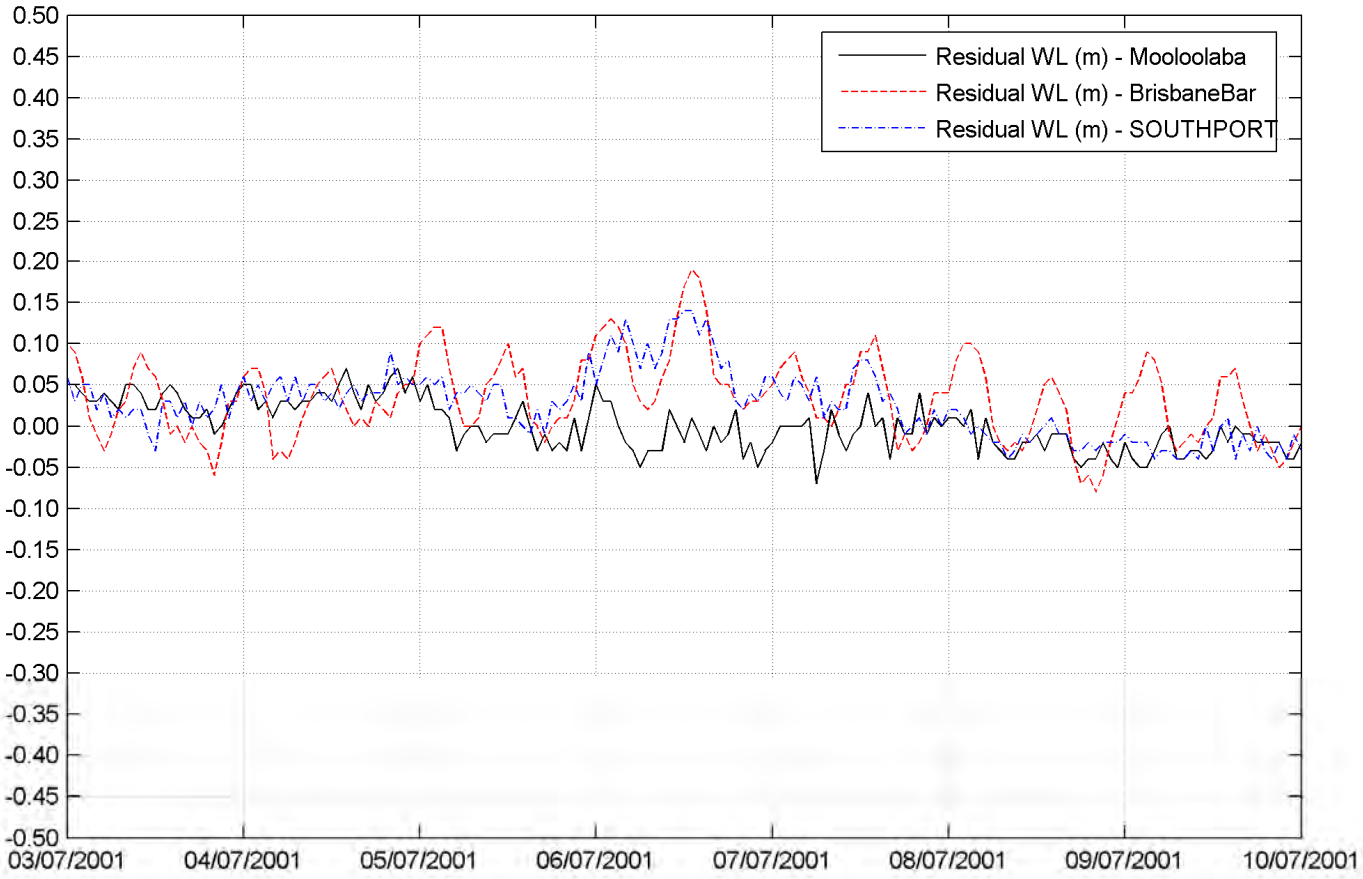
File: J:\CM\LJ8824\Figures\R2461\Figure6.2.png

Storm Tide Hazard Study - Moreton Bay Regional Council

MEASURED WIND AND ATMOSPHERIC PRESSURE
Brisbane Airport - July 2001
Figure 6.2





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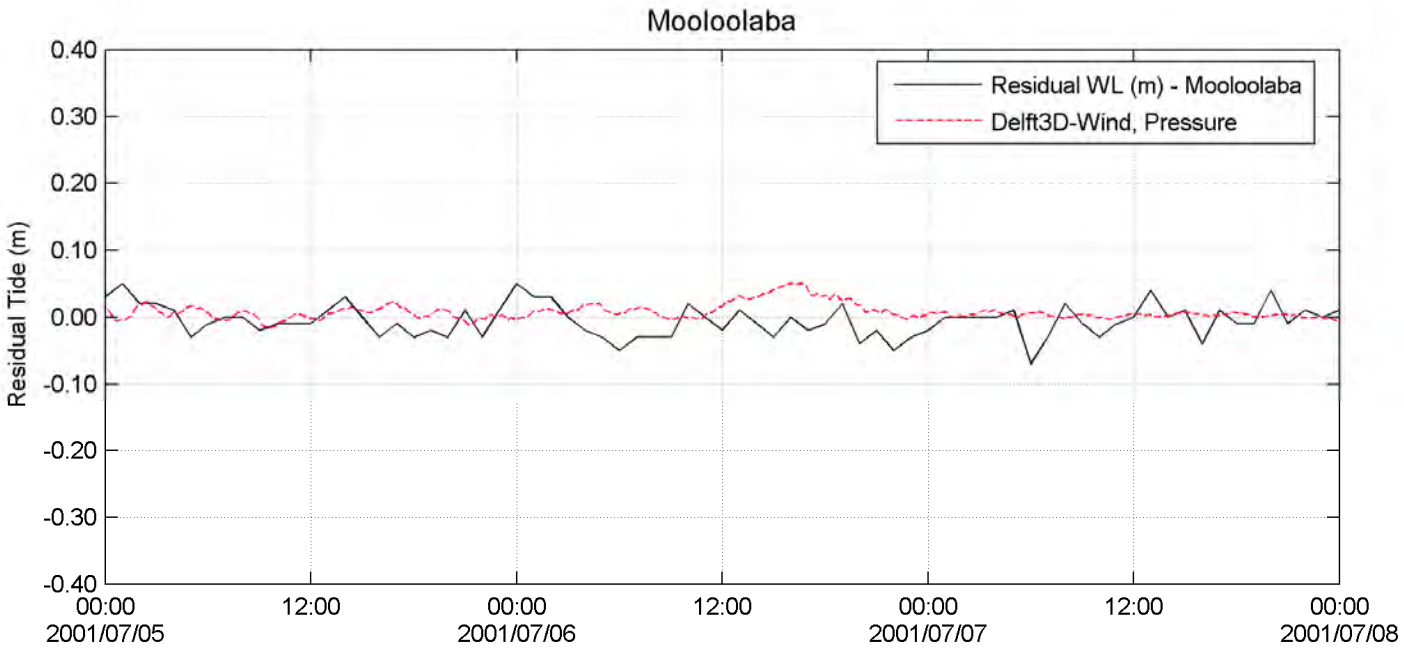
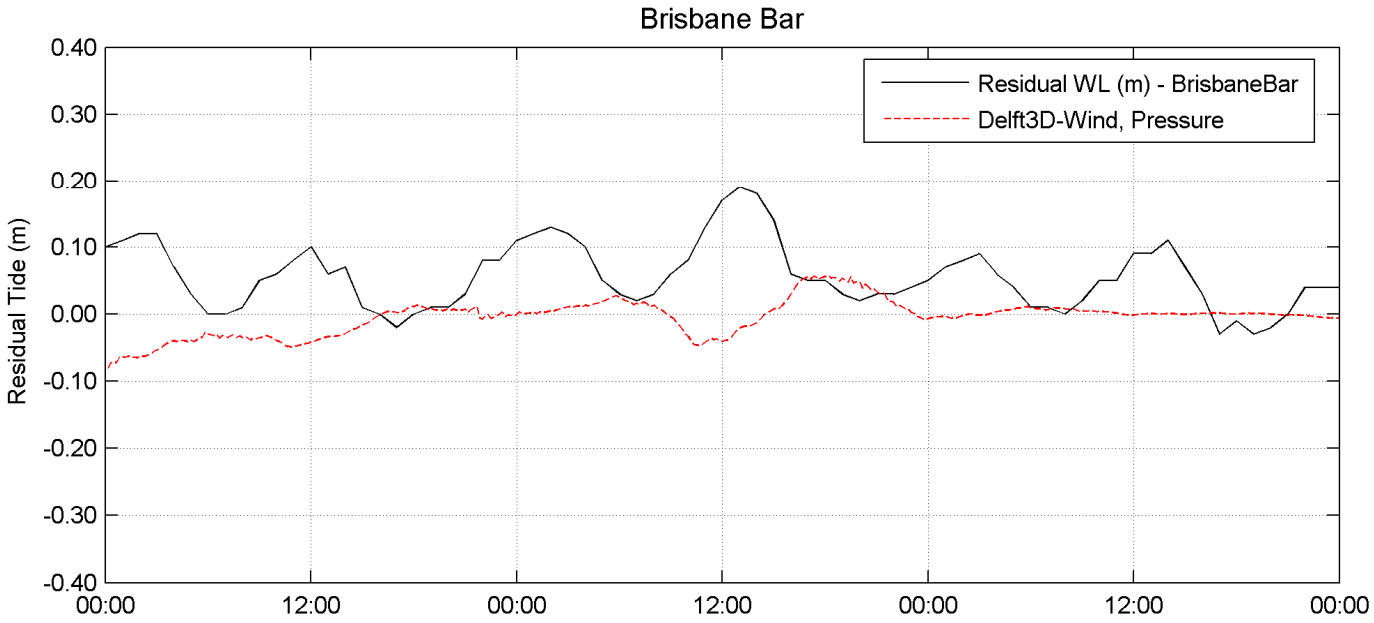
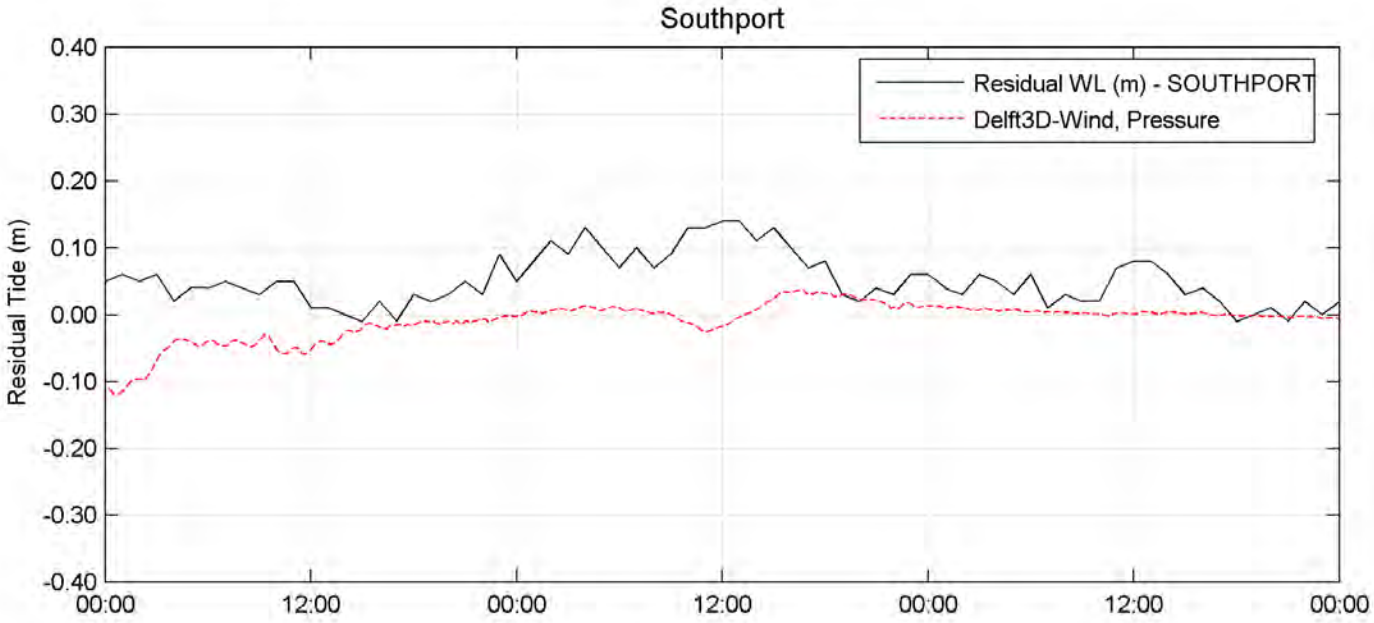
File: J:\CM\LJ8824\Figures\R2461\Figure6.3.png

Storm Tide Hazard Study - Moreton Bay Regional Council
JULY 2001 EVENT - RESIDUAL TIDES
Brisbane Bar, Mooloolaba and Southport
Figure 6.3







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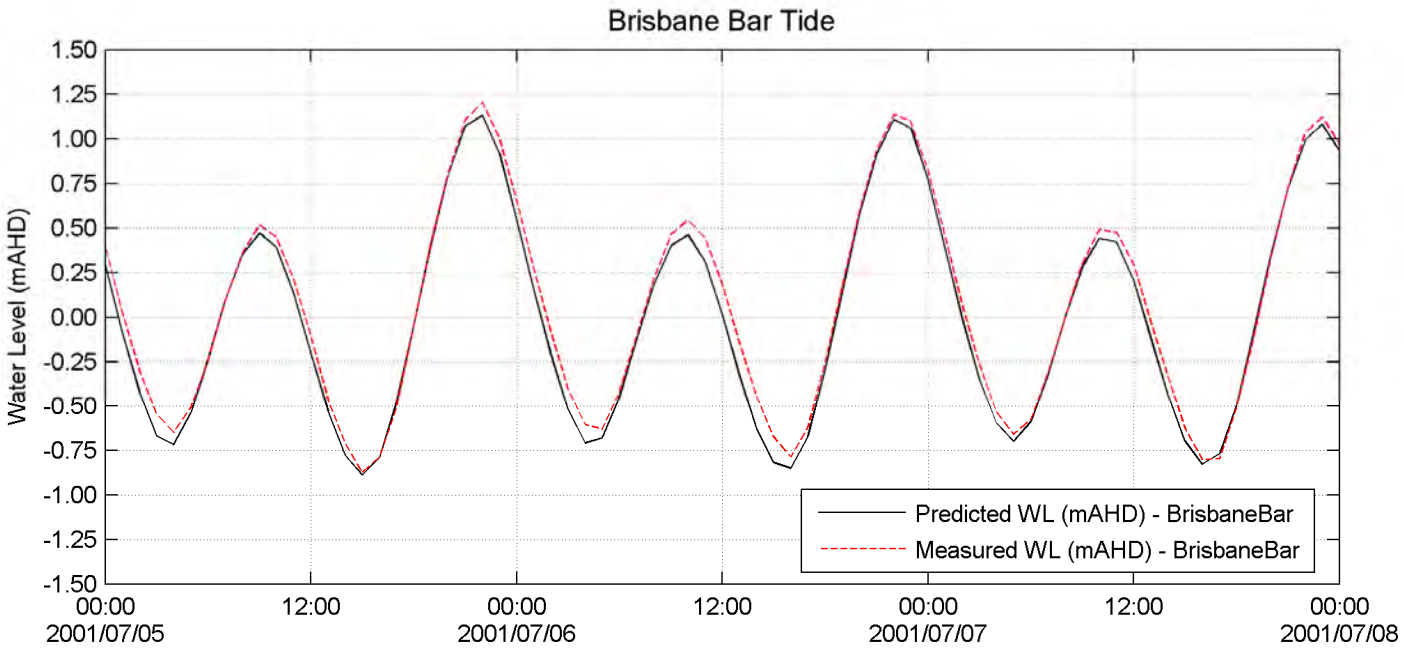
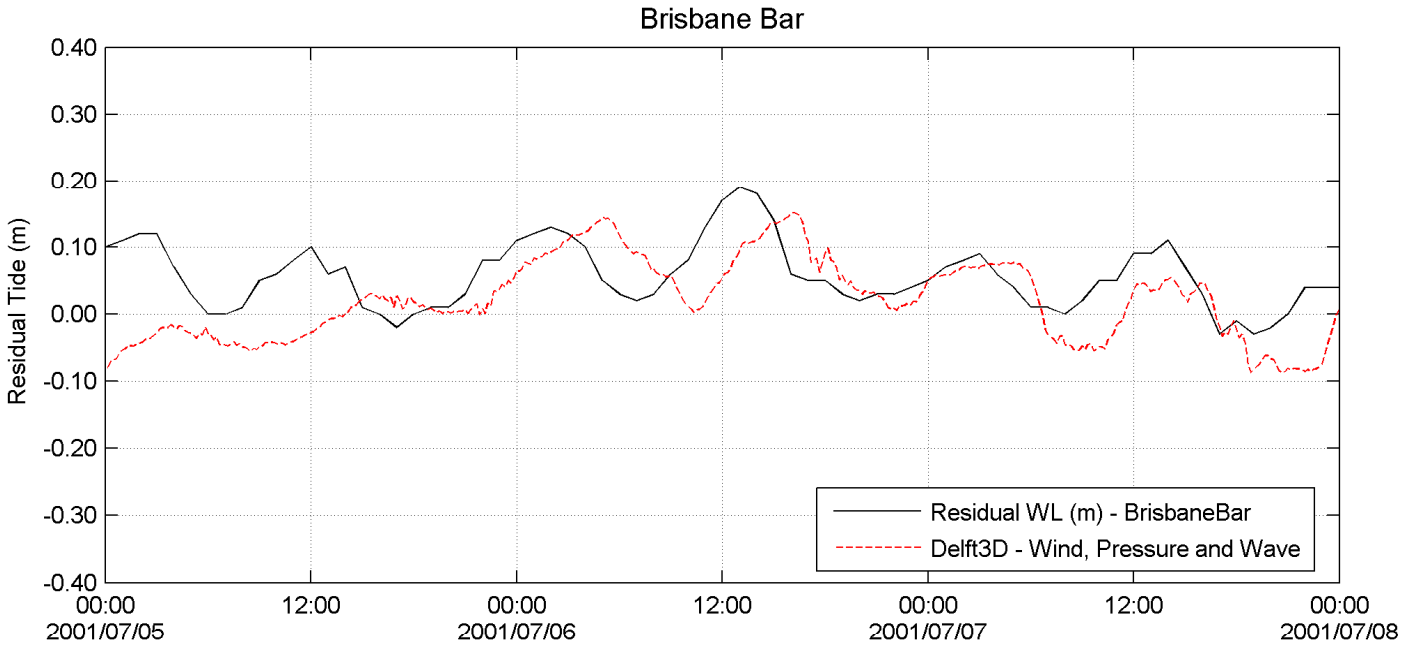
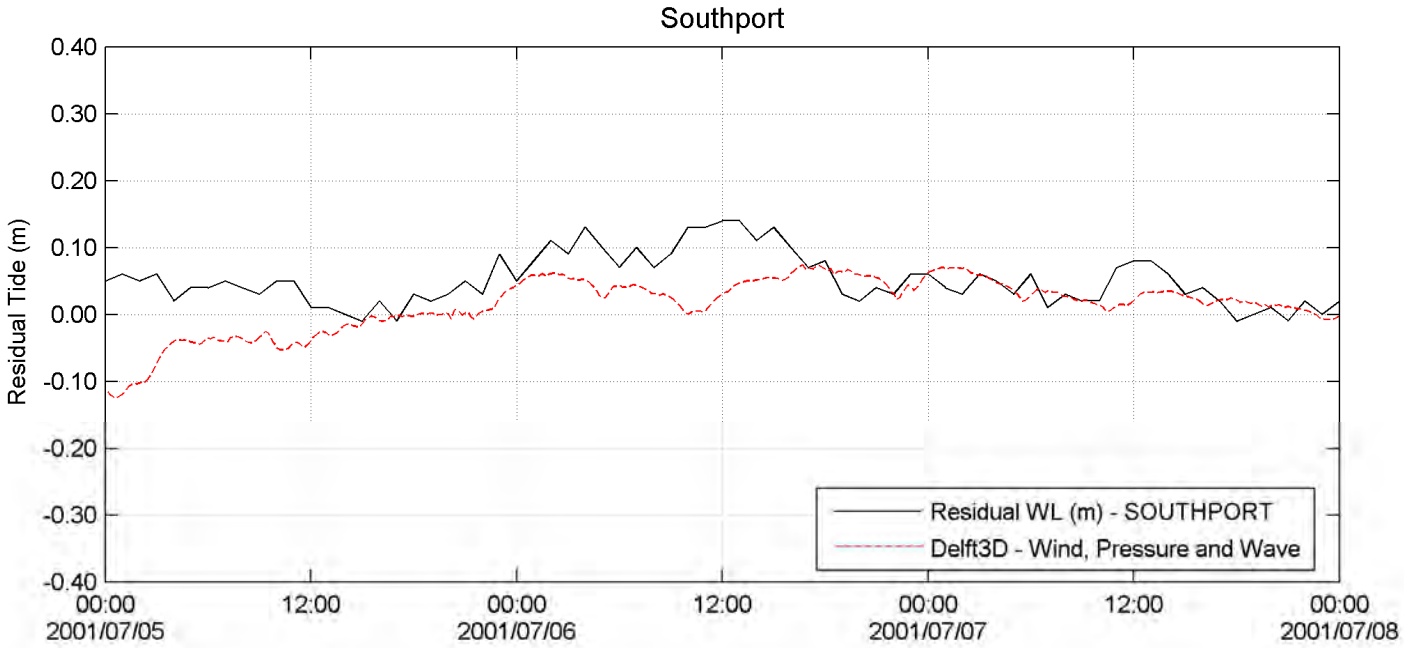
File: J:\CM\LJ8824\Figures\R2461\Figure6.4.png

Storm Tide Hazard Study - Moreton Bay Regional Council
DELFT3D MODELLED RESIDUAL TIDE - JULY 2001
Wind and Pressure Forcing Only
Figure 6.4







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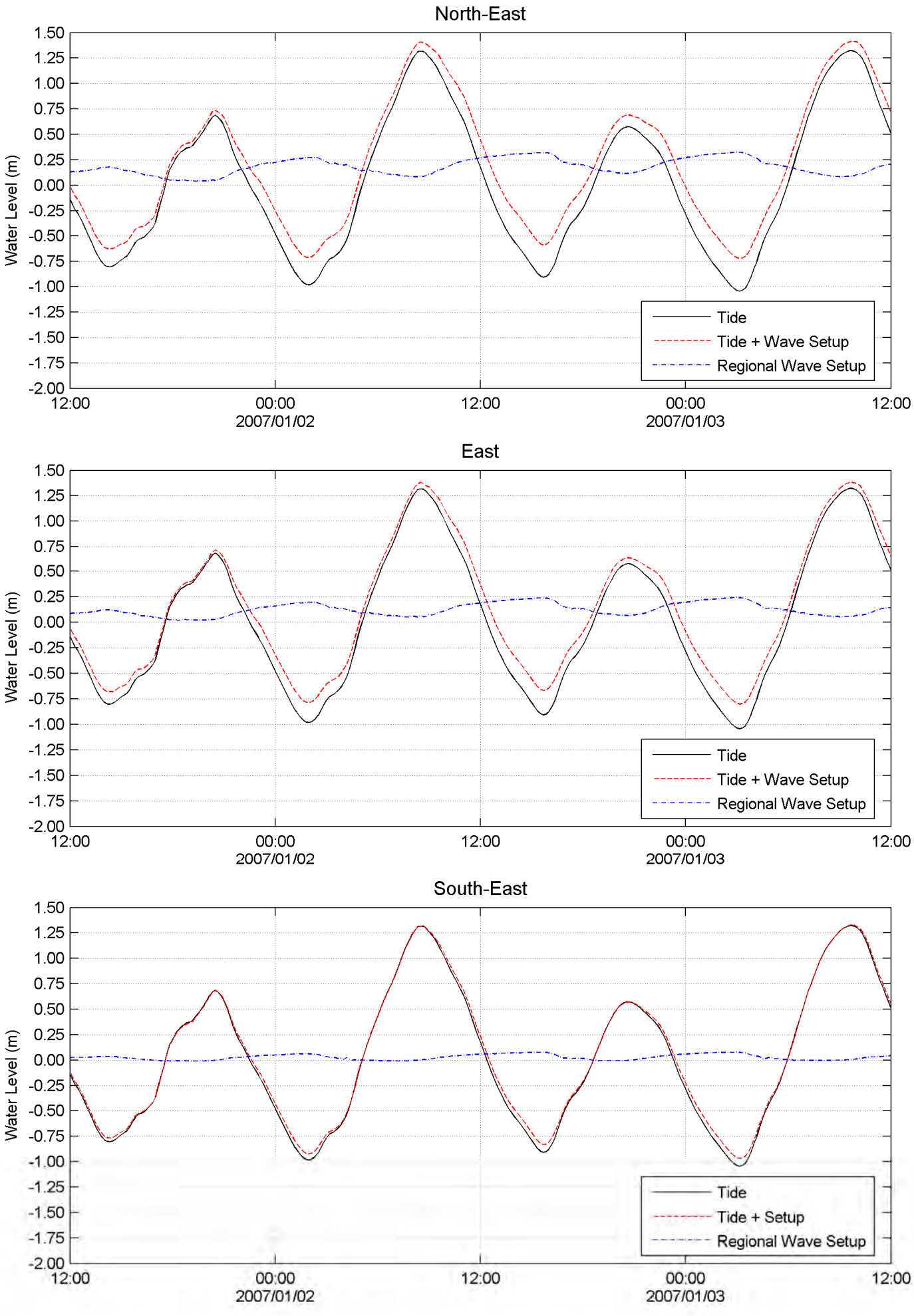
File: J:\CM\LJ8824\Figures\R2461\Figure6.5.png

Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED RESIDUAL TIDE - JULY 2001
Wind, Pressure and Wave Forcing
Figure 6.5



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LJ8824/R2461 February 2009

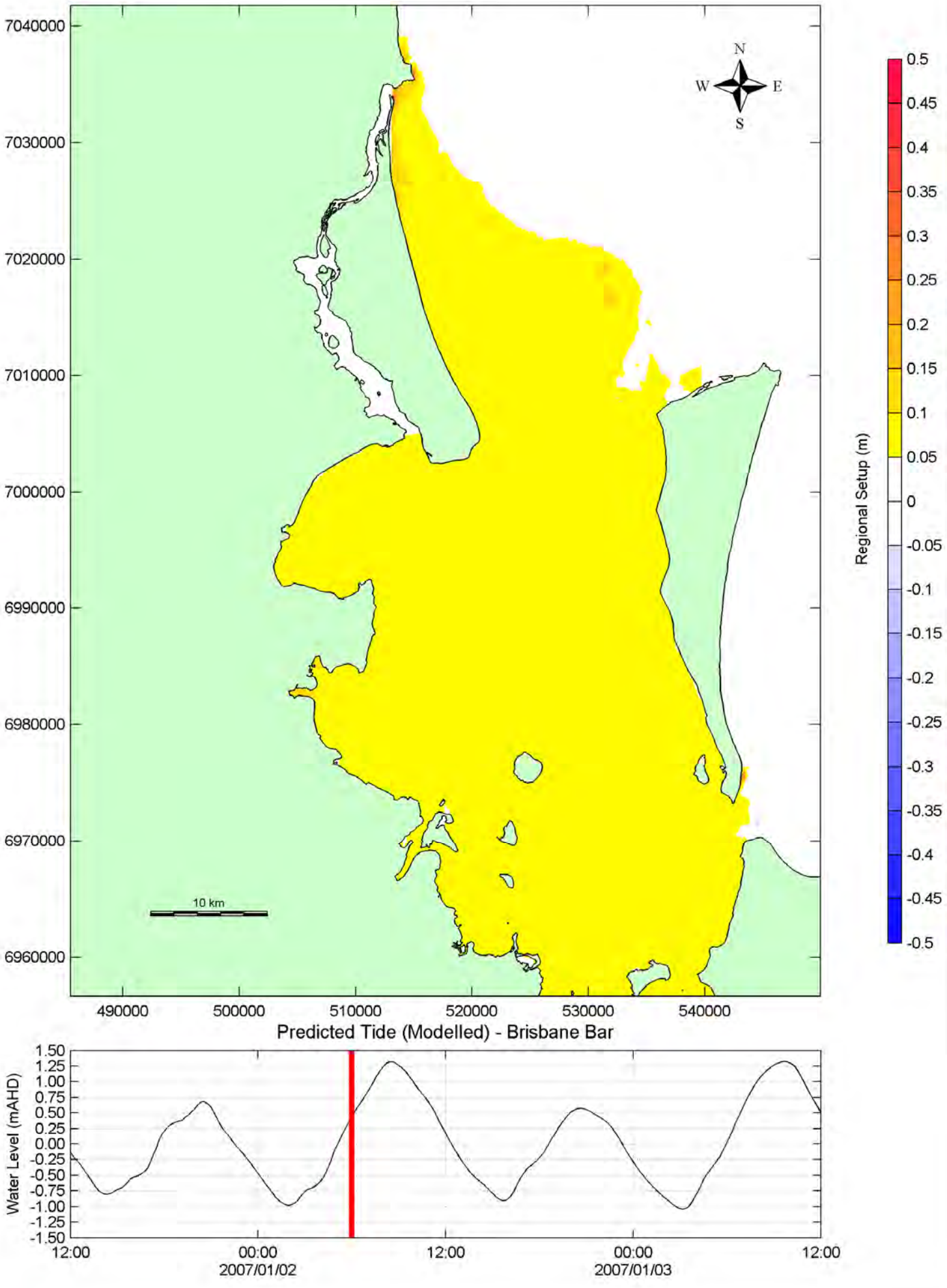
File: J:\CM\LJ8824\Figures\R2461\Figure6.6..png

Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

H_s=7m, T_z=8s, Dir=45°, 90°, 135°

Figure 6.6



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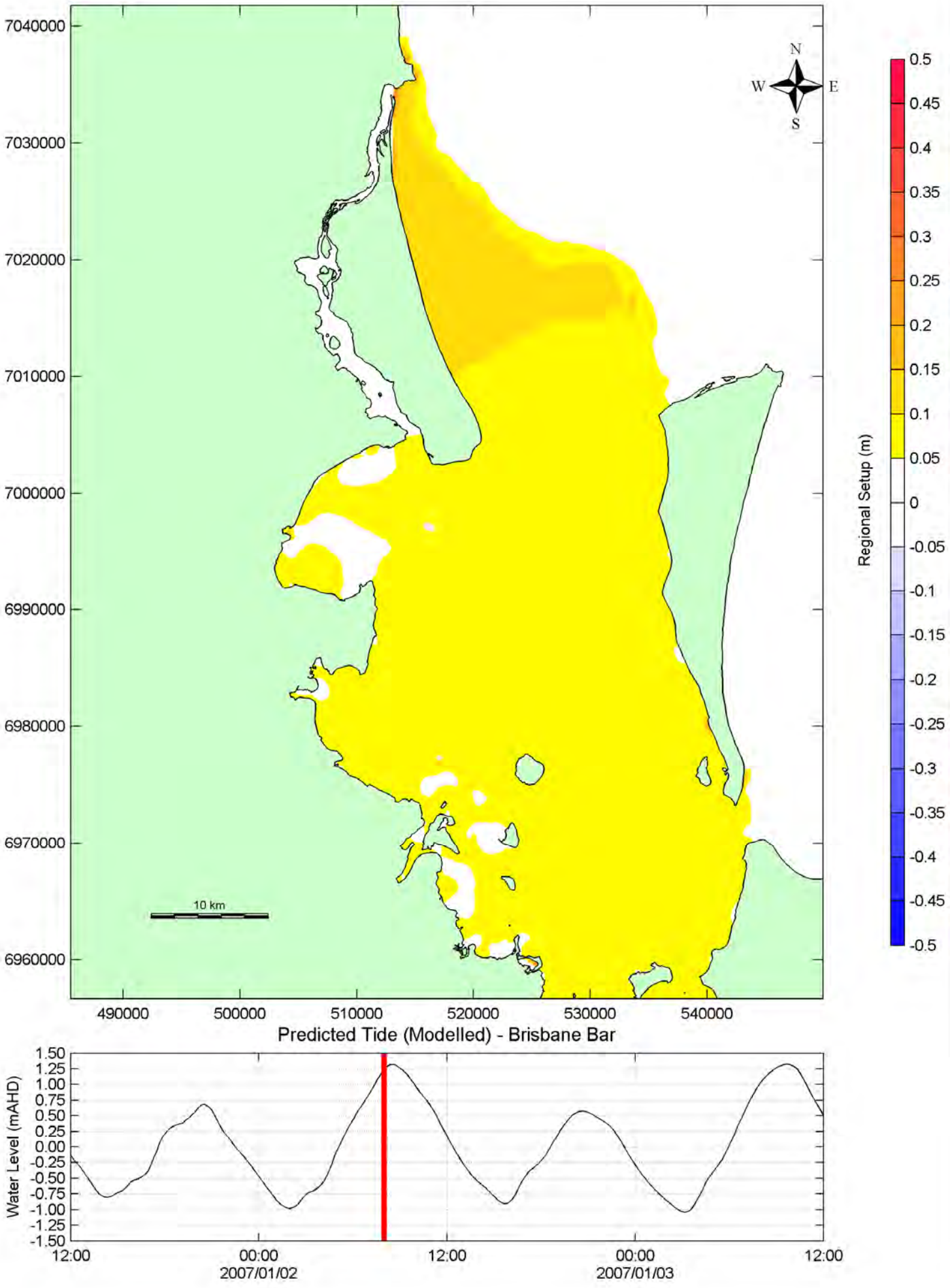
File: J:\CM\LJ8824\Figures\R2461\Figure6.7.png

Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 06:00

Figure 6.7



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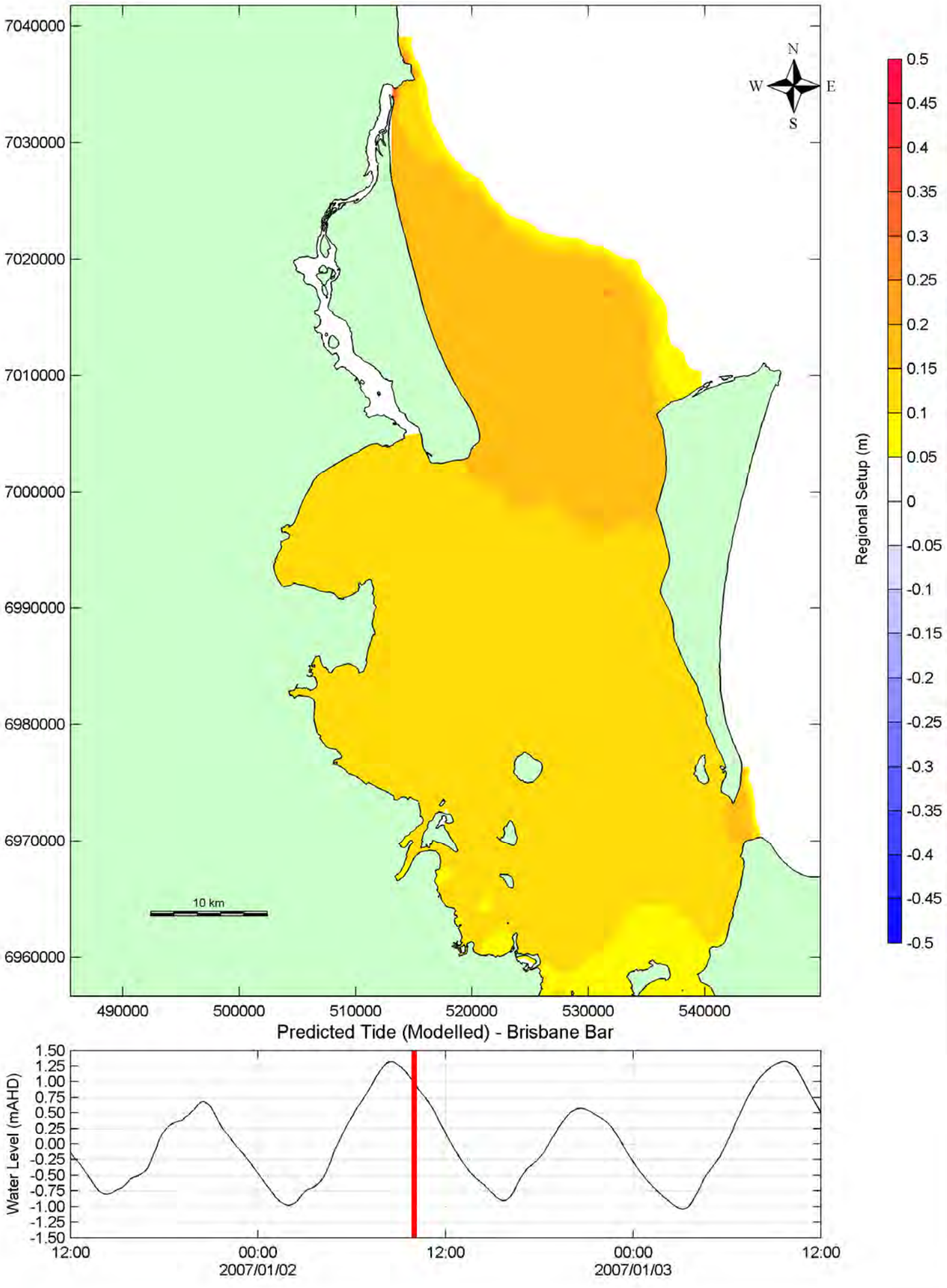
File: J:\CM\LJ8824\Figures\R2461\Figure6.8.png

Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 08:00

Figure 6.8



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LJ8824/R2461 February 2009

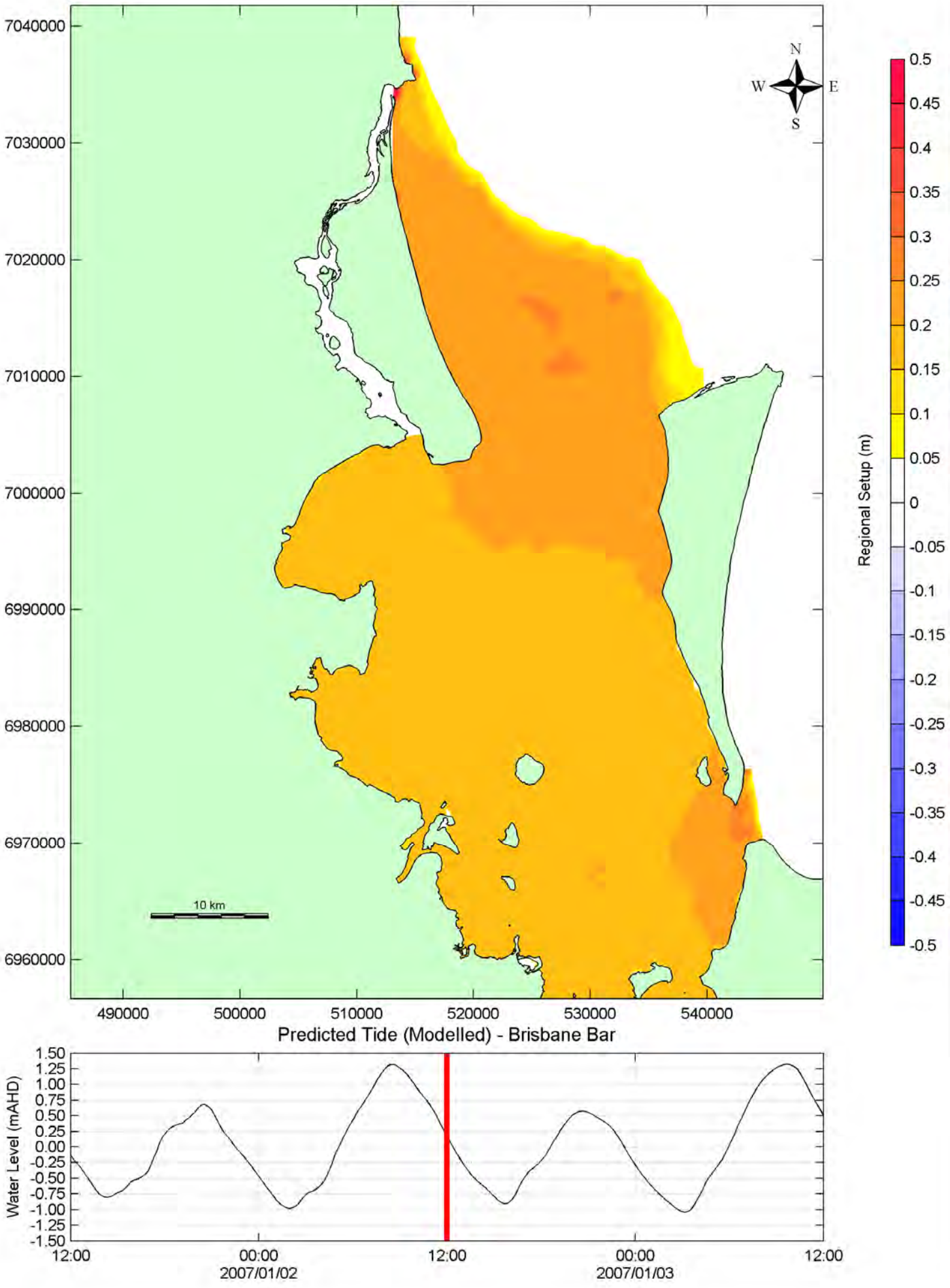
File: J:\CM\LJ8824\Figures\R2461\Figure6.9.png

Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 10:00

Figure 6.9



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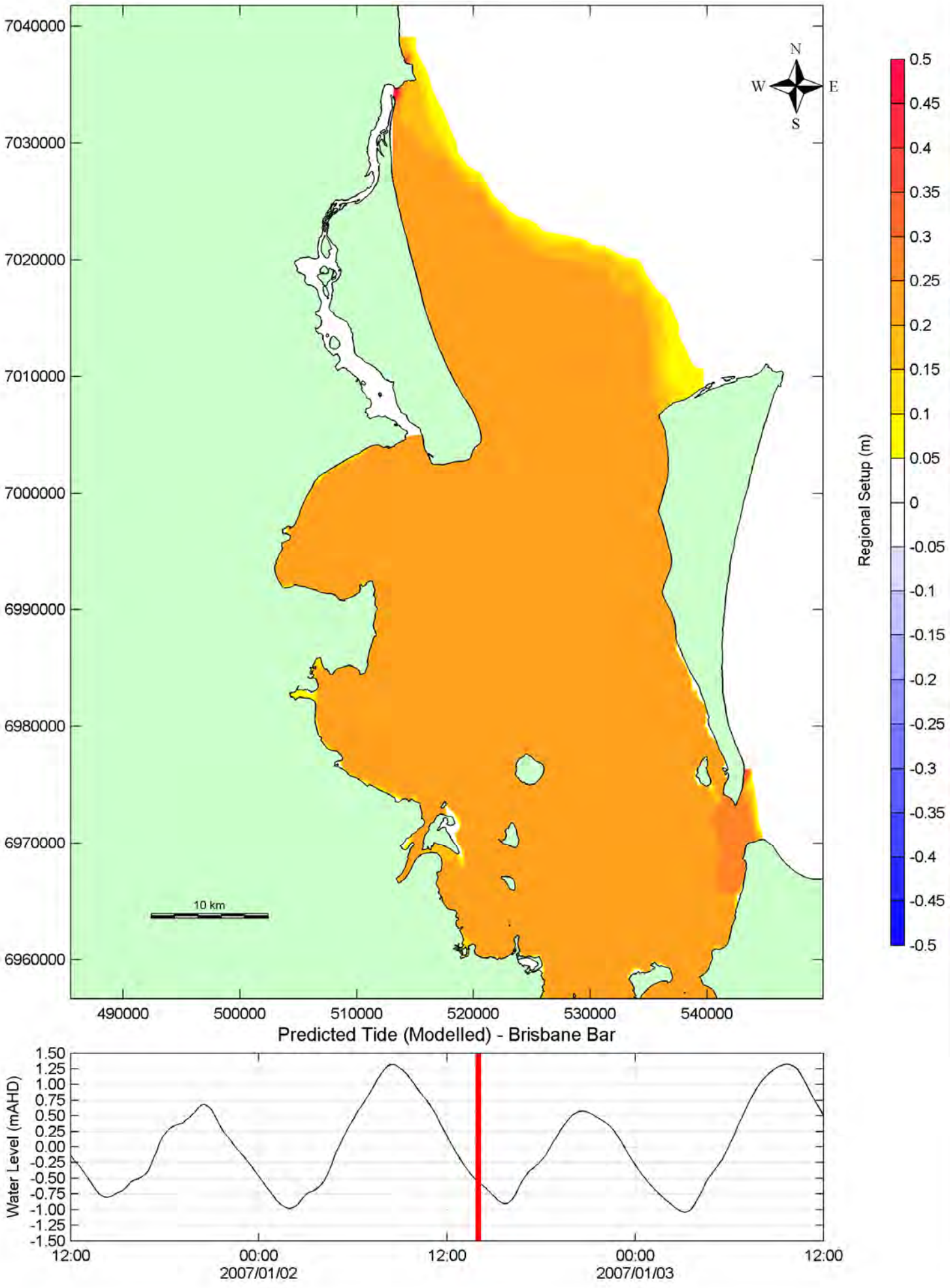
Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 12:00

Figure 6.10



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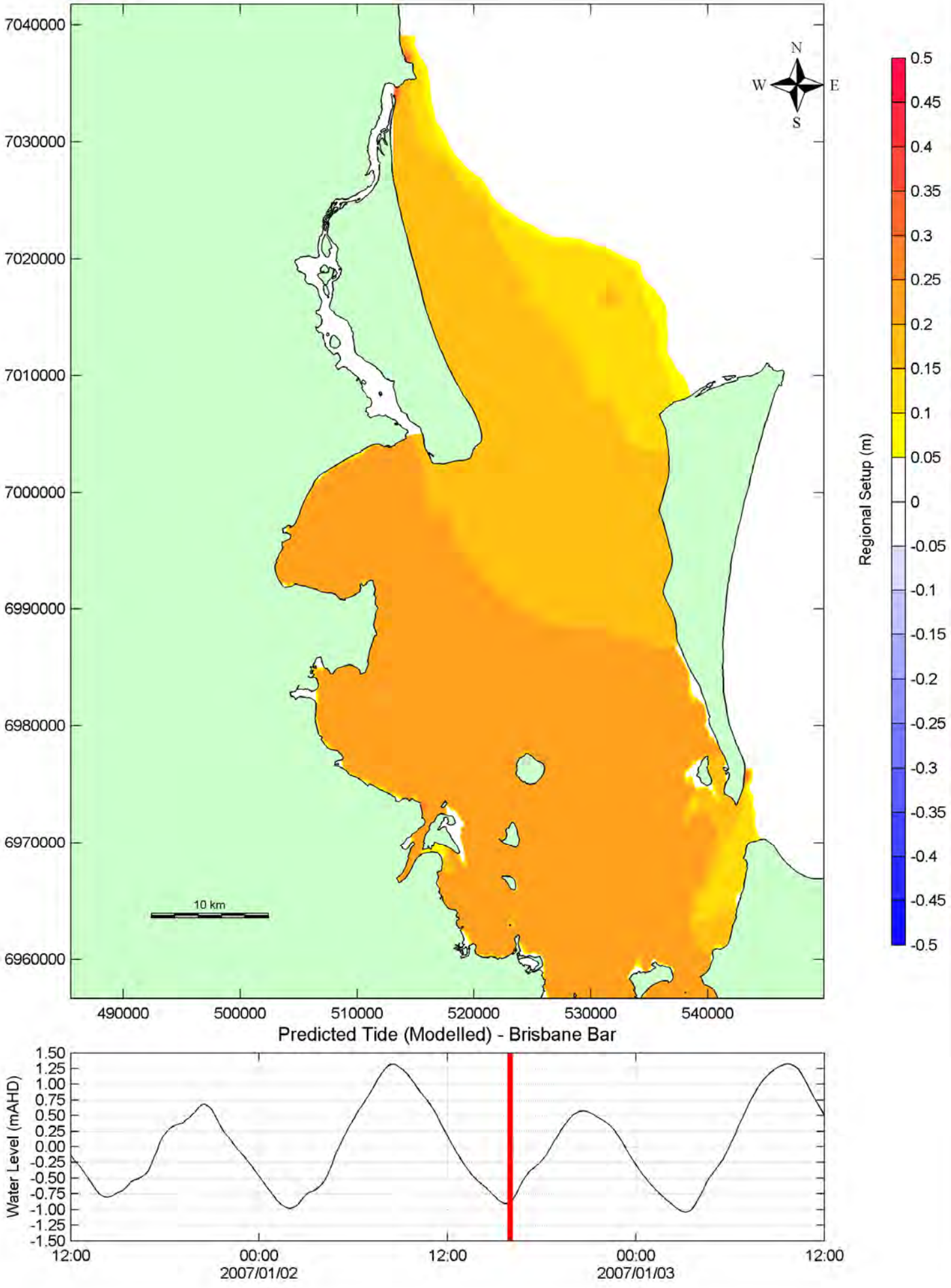
Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 14:00

Figure 6.11



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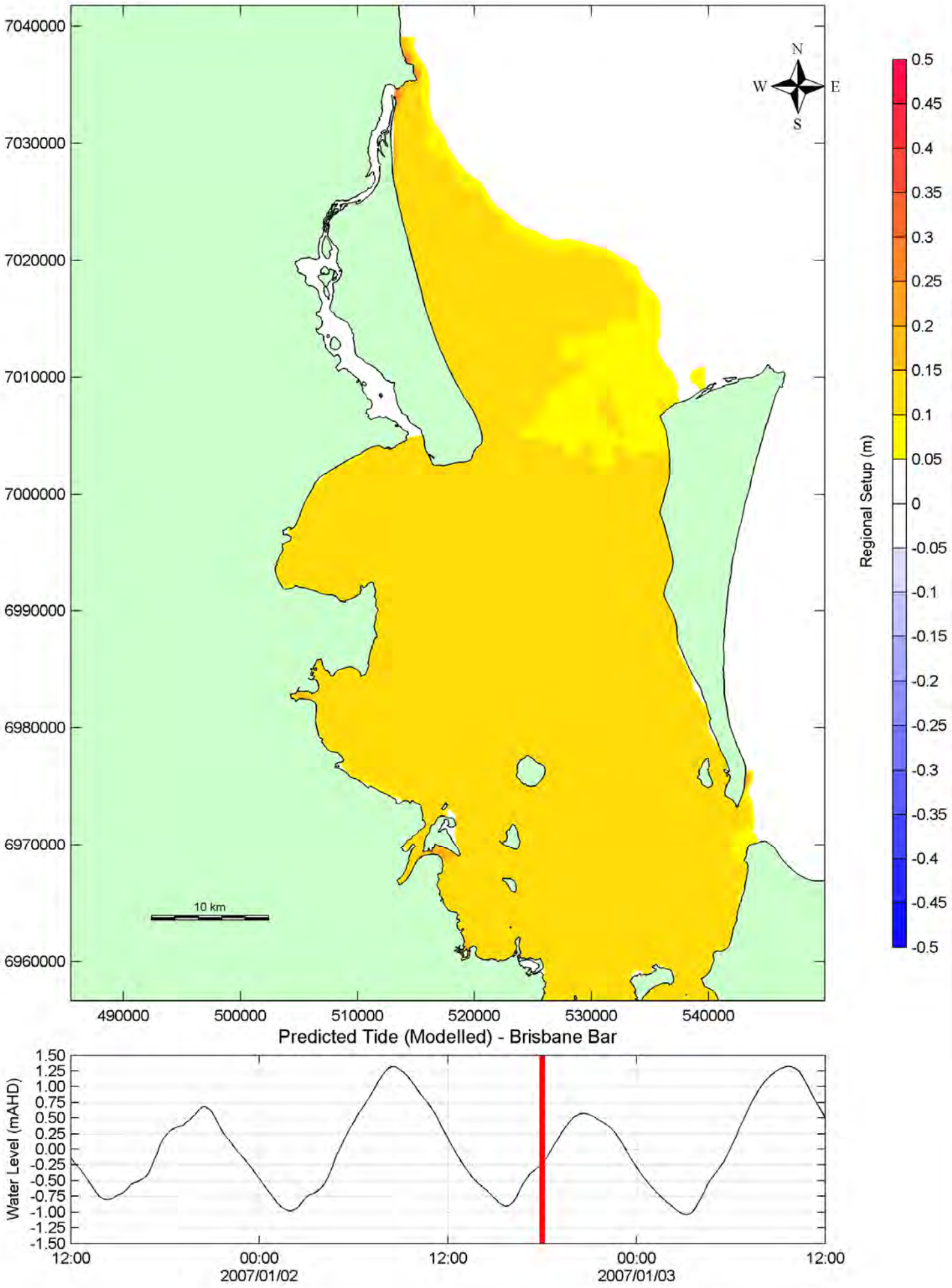
Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODELLED REGIONAL WAVE SETUP

Northern Moreton Bay - 16:00

Figure 6.12



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LJ8824/R2461 February 2009

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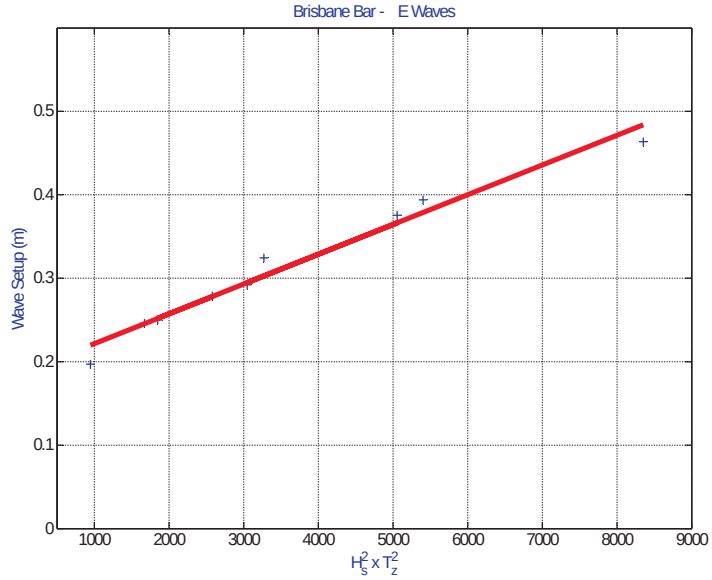
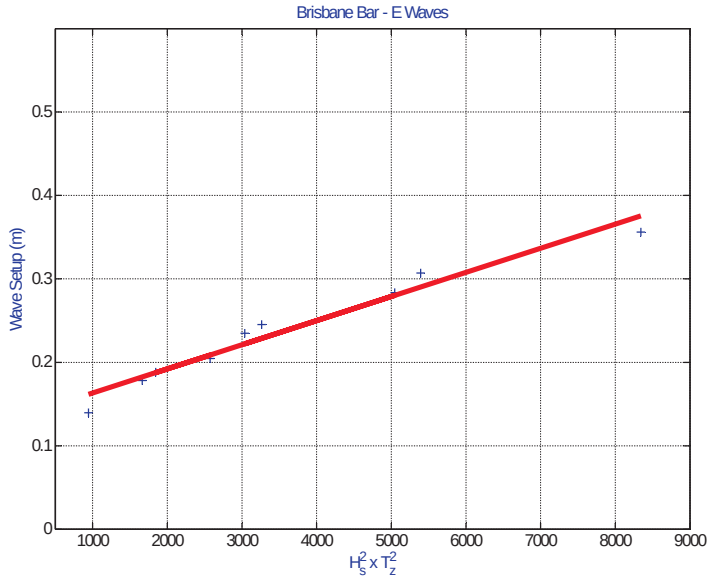
Storm Tide Hazard Study - Moreton Bay Regional Council

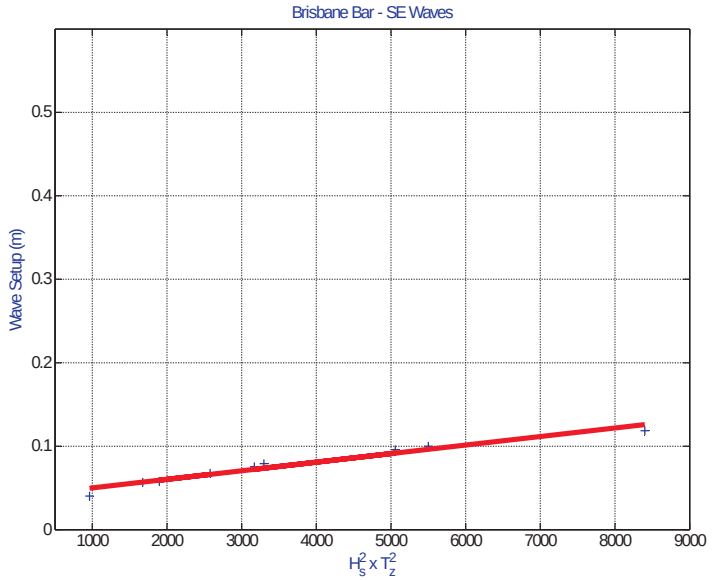
DELFT3D MODELLED REGIONAL WAVE SETUP

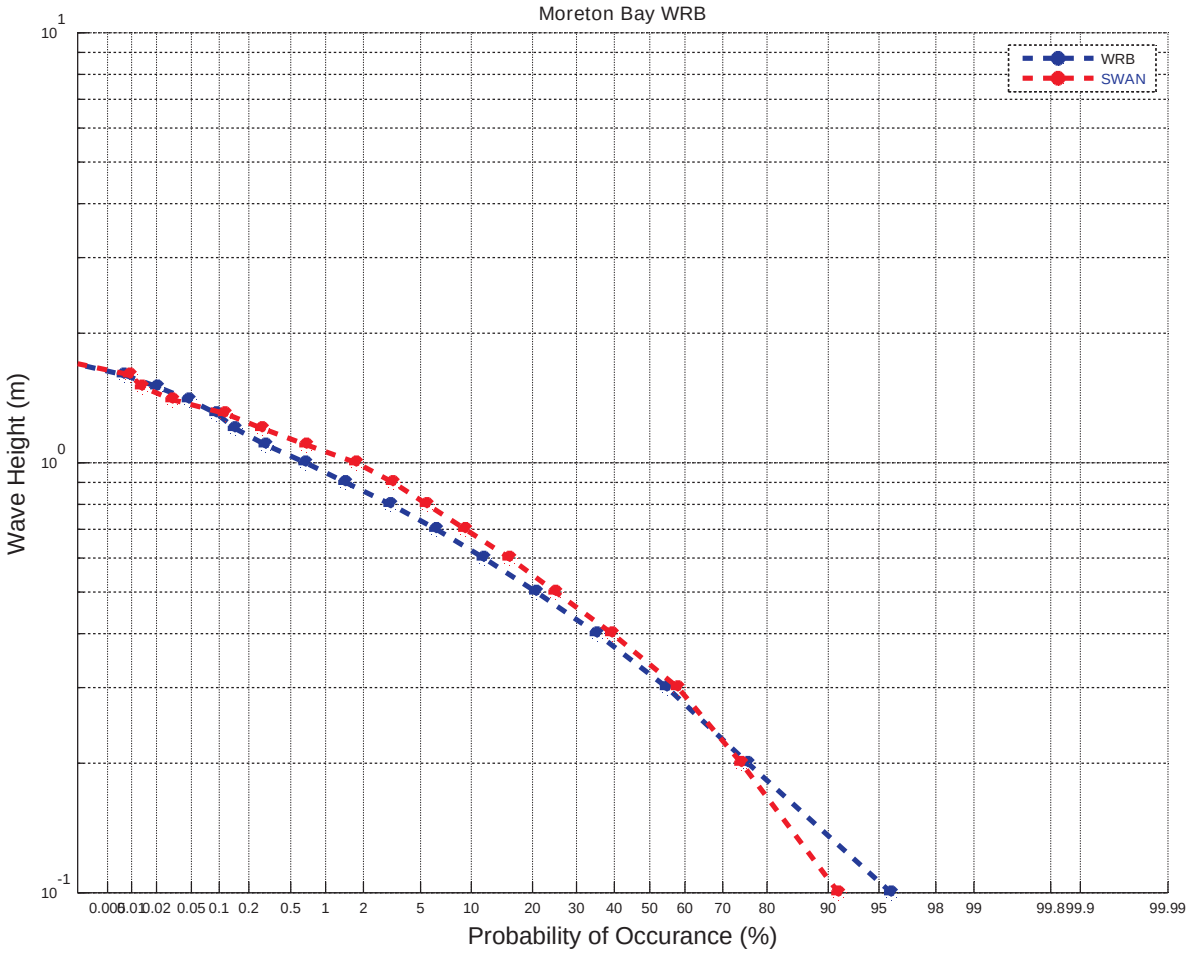
Northern Moreton Bay - 18:00

Figure 6.13


Brisbane Bar - E Waves
Wave Setup (m)
0
0.1
0.2
0.3
0.4
0.5
1000
2000
3000
4000
5000
6000
7000
8000
9000
$H_s^2 \times T_z^2$


Brisbane Bar - E Waves
Wave Setup (m)
0
0.1
0.2
0.3
0.4
0.5
1000
2000
3000
4000
5000
6000
7000
8000
9000
$H_s^2 \times T_z^2$


Brisbane Bar - SE Waves
Wave Setup (m)
0
0.1
0.2
0.3
0.4
0.5
1000
2000
3000
4000
5000
6000
7000
8000
9000
$H_s^2 \times T_z^2$



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LJ8824/R2461 February 2009
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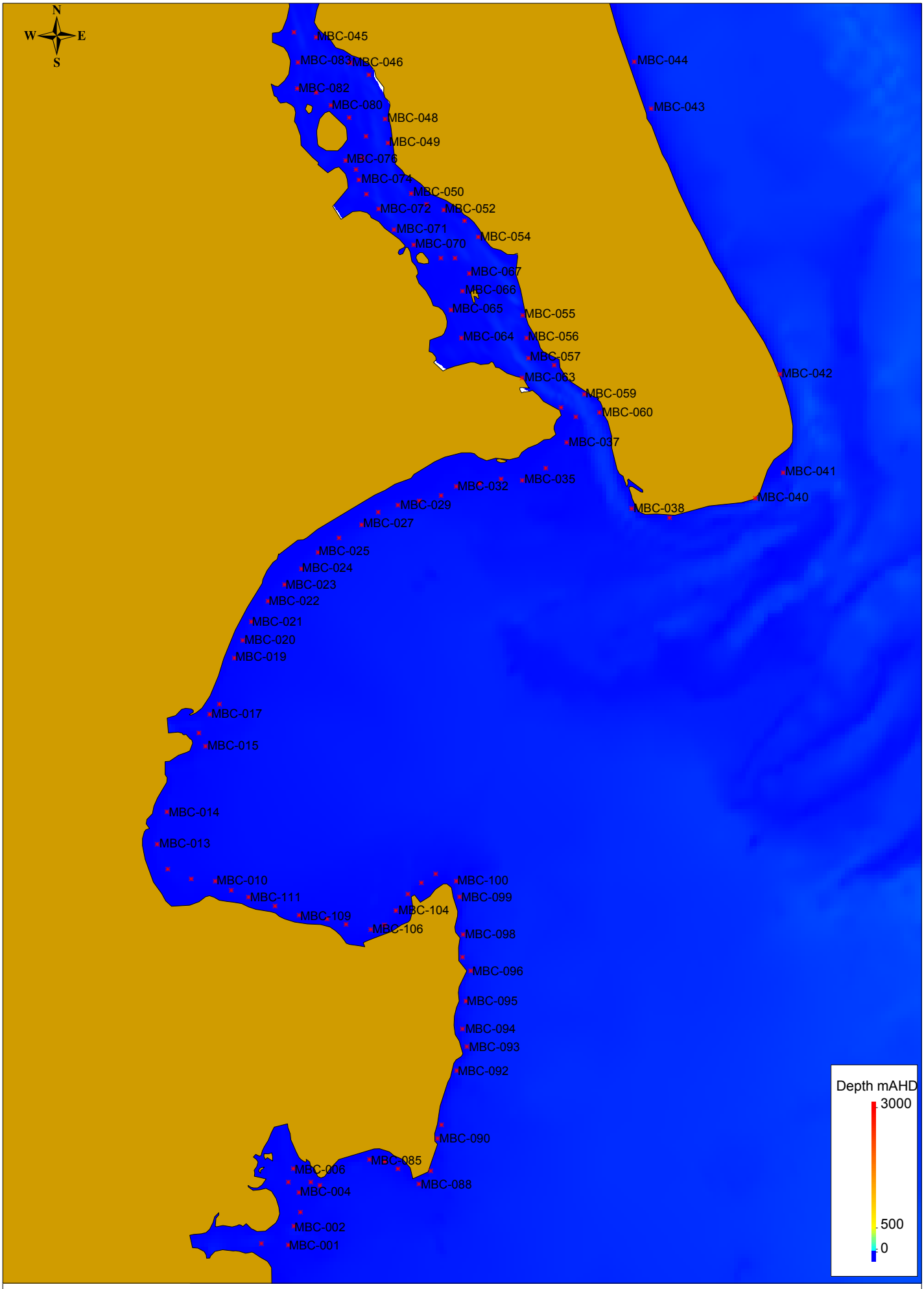
Storm Tide Hazard Study - Moreton Bay Regional Council
SWAN MODEL CALIBRATION
MORETON BAY WRB
Figure 7.1



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REPORTED OUTPUT LOCATIONS

Figure 7.2

LJ8824/R2461 February 2009
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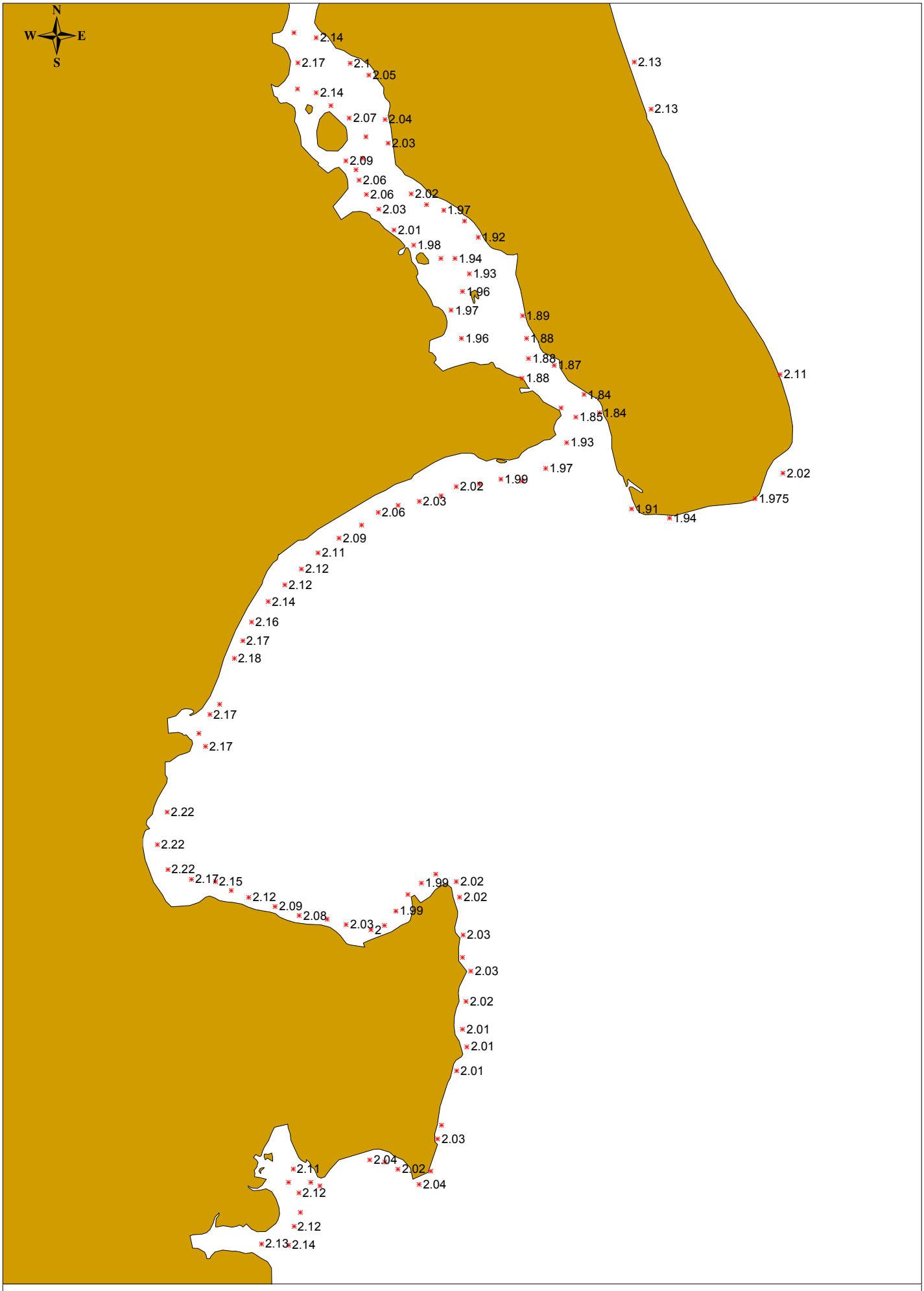

Storm Tide Hazard Study - Moreton Bay Regional Council

100-YEAR ARI NON-CYCLONIC DESIGN WATER LEVELS (mAHD)

Figure 7.3

LJ8824/R2461 February 2009
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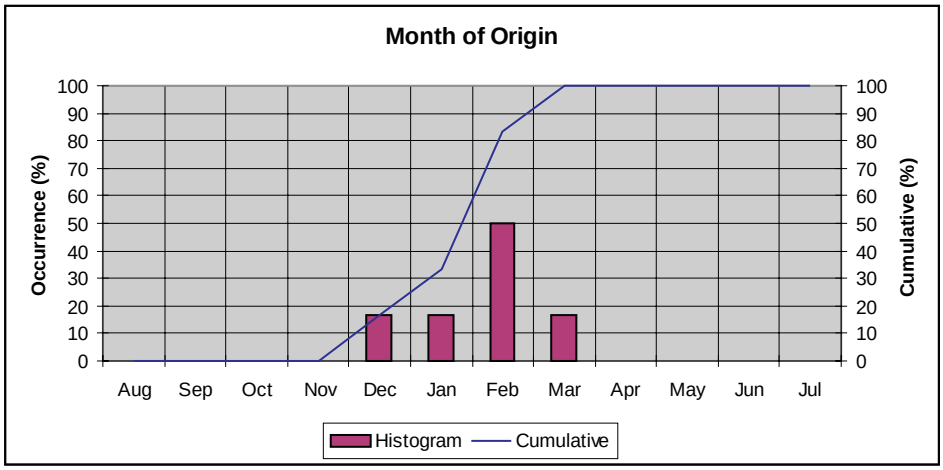
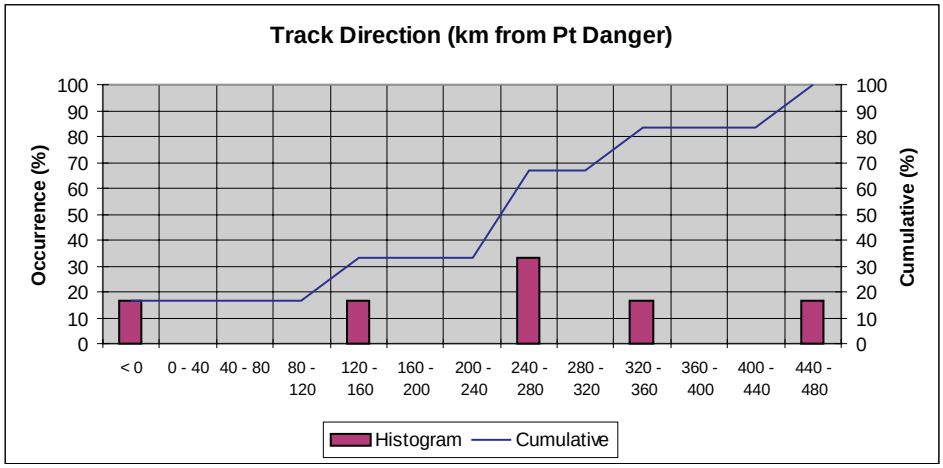
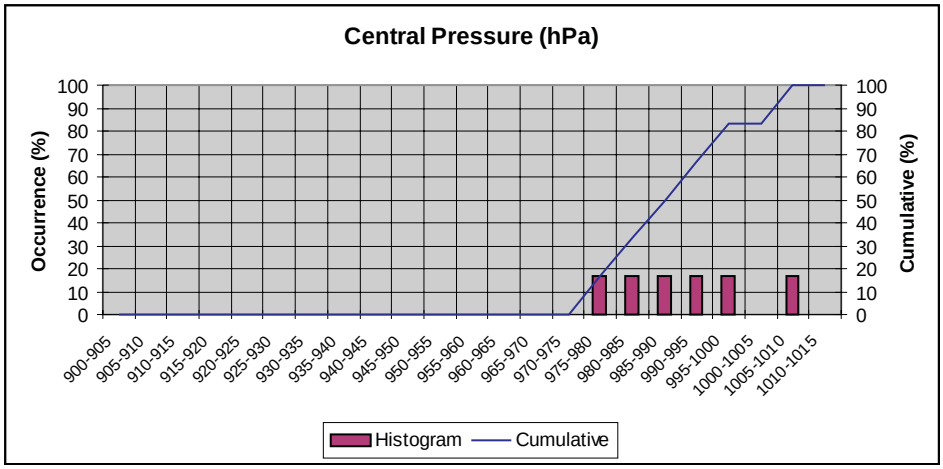
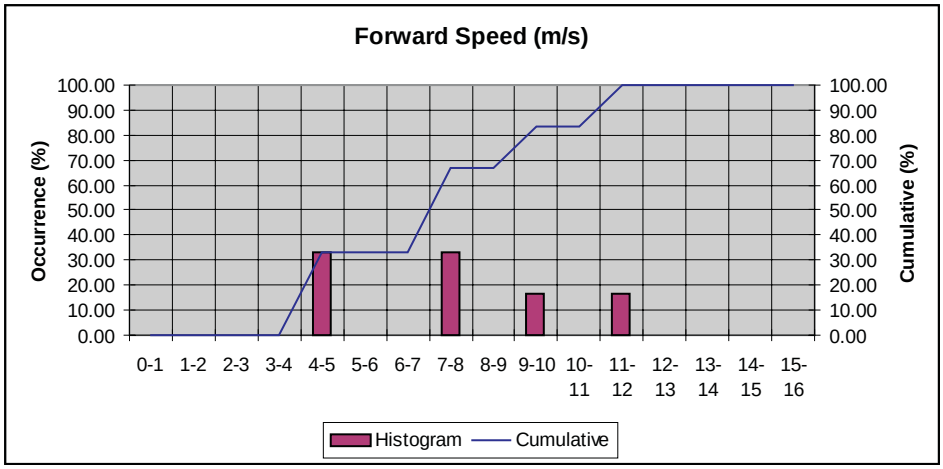
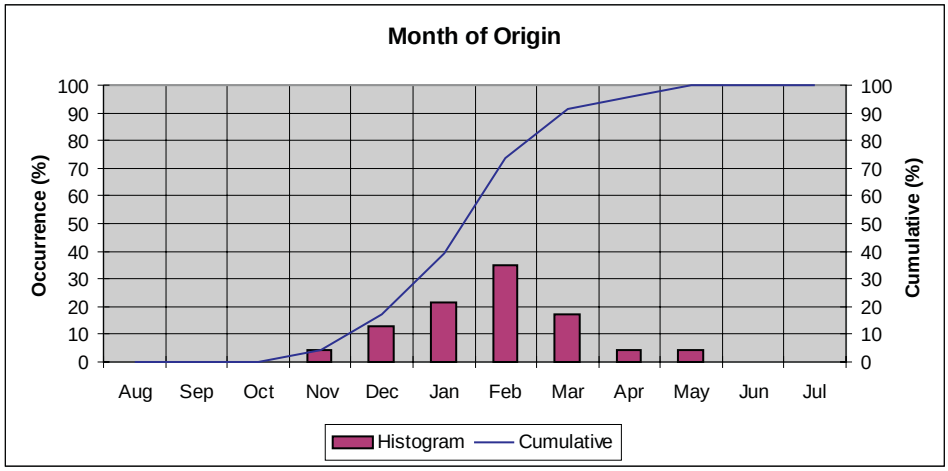
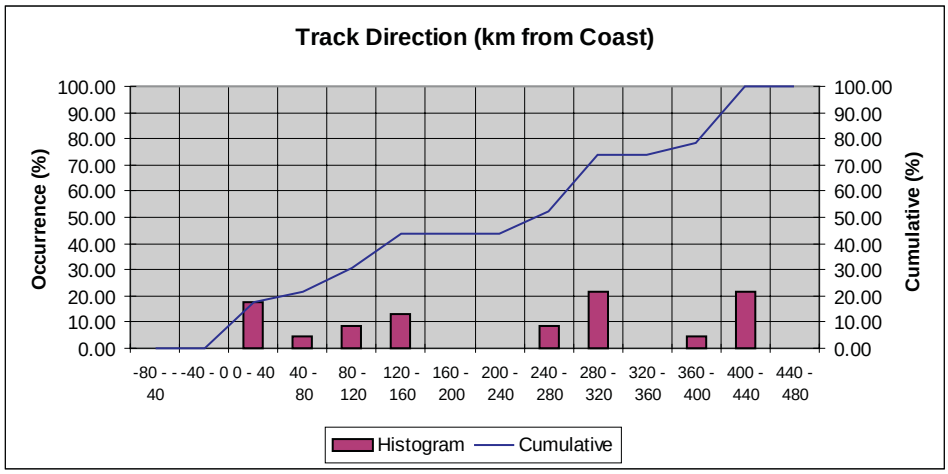

Month of Origin
Occurrence (%)
Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Histogram
Cumulative

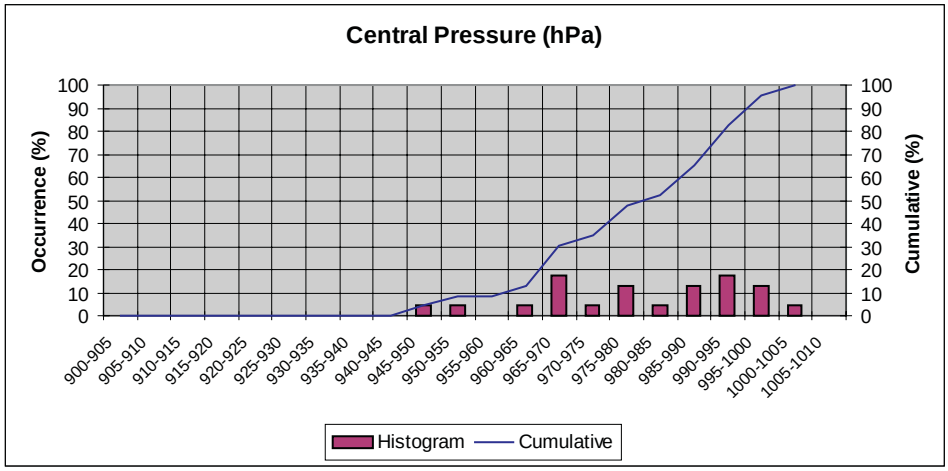

Track Direction (km from Pt Danger)
Occurrence (%)
Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
< 0
0 - 40
40 - 80
80 - 120
120 - 160
160 - 200
200 - 240
240 - 280
280 - 320
320 - 360
360 - 400
400 - 440
440 - 480
Histogram
Cumulative

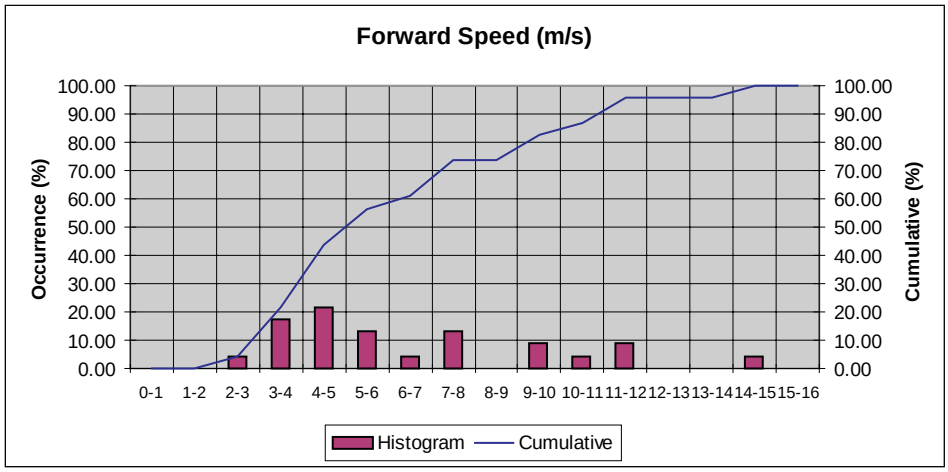

Central Pressure (hPa)
Occurrence (%)
Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
900-905
905-910
910-915
915-920
920-925
925-930
930-935
935-940
940-945
945-950
950-955
955-960
960-965
965-970
970-975
975-980
980-985
985-990
990-995
995-1000
1000-1005
1005-1010
1010-1015
Histogram
Cumulative

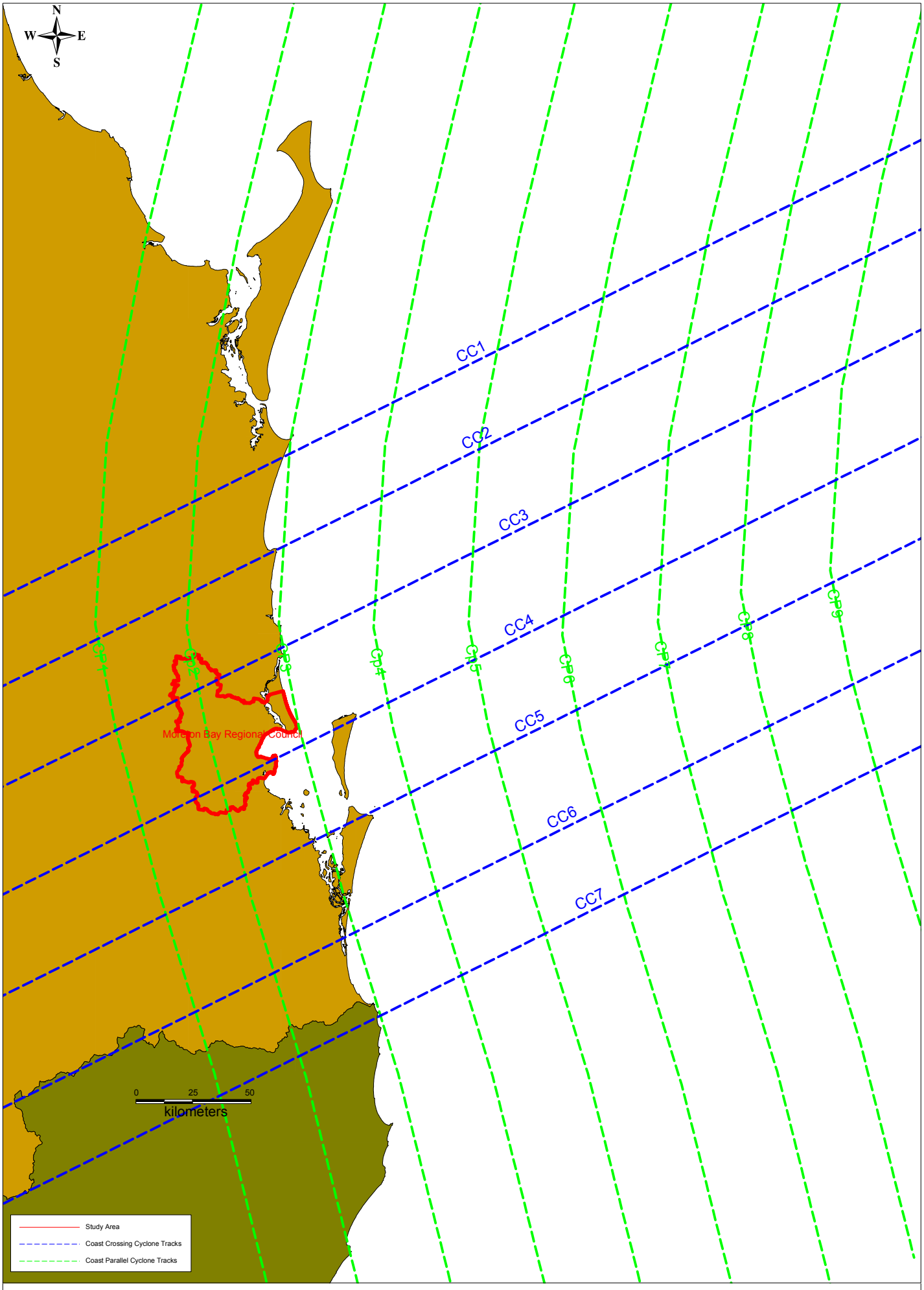

Forward Speed (m/s)
Occurrence (%)
Cumulative (%)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
Histogram
Cumulative


Month of Origin
Occurrence (%)
Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Histogram
Cumulative


Track Direction (km from Coast)
Occurrence (%)
Cumulative (%)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-80 - -40
-40 - 0
0 - 40
40 - 80
80 - 120
120 - 160
160 - 200
200 - 240
240 - 280
280 - 320
320 - 360
360 - 400
400 - 440
440 - 480
Histogram
Cumulative


Central Pressure (hPa)
Occurrence (%)
Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
900-905
905-910
910-915
915-920
920-925
925-930
930-935
935-940
940-945
945-950
950-955
955-960
960-965
965-970
970-975
975-980
980-985
985-990
990-995
995-1000
1000-1005
1005-1010
Histogram
Cumulative


Forward Speed (m/s)
Occurrence (%)
Cumulative (%)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
Histogram
Cumulative



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Storm Tide Hazard Study - Moreton Bay Regional Council

DELFT3D MODEL DESIGN CYCLONE TRACKS

Figure 8.3

LJ8824/R2461 February 2009
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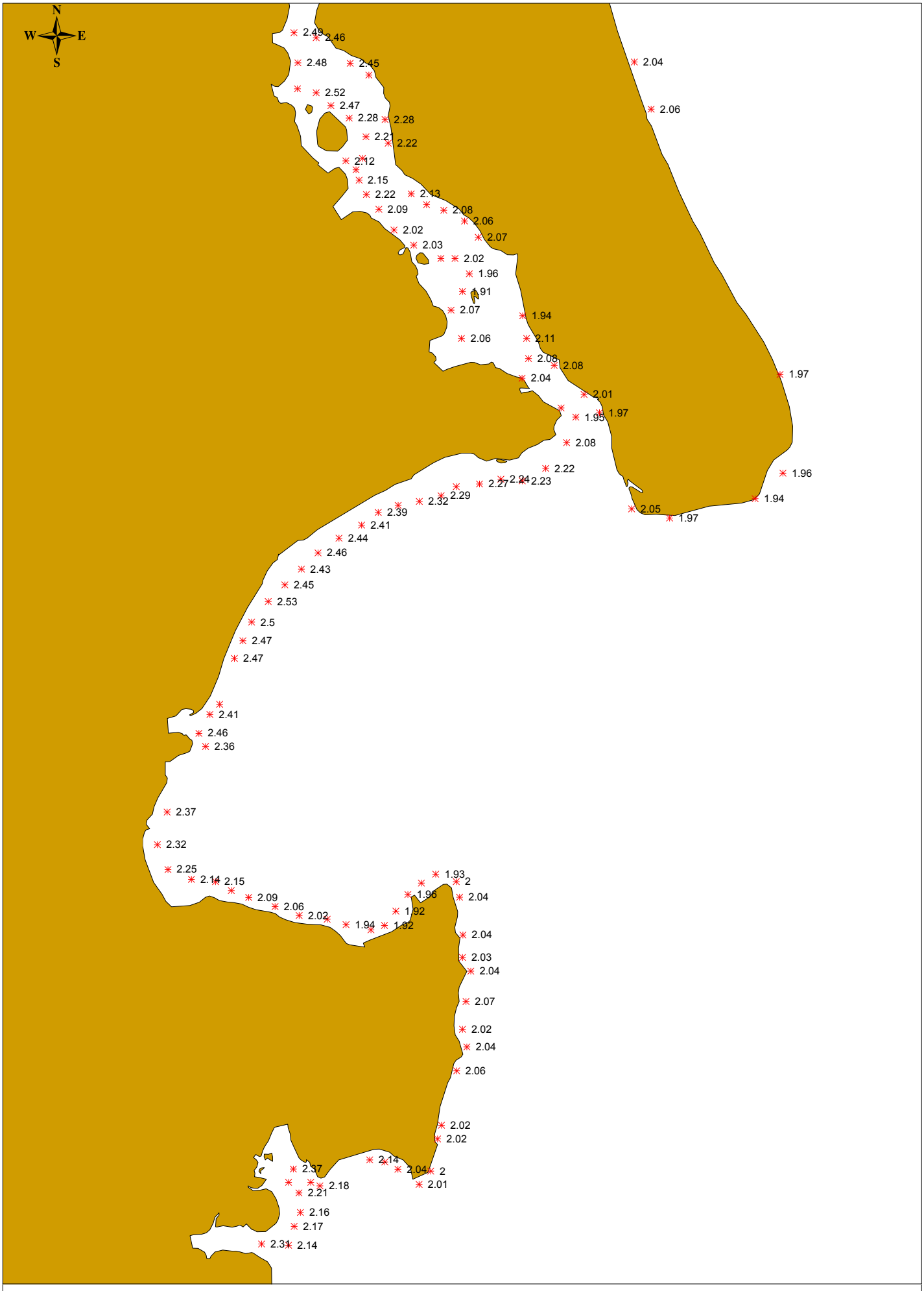

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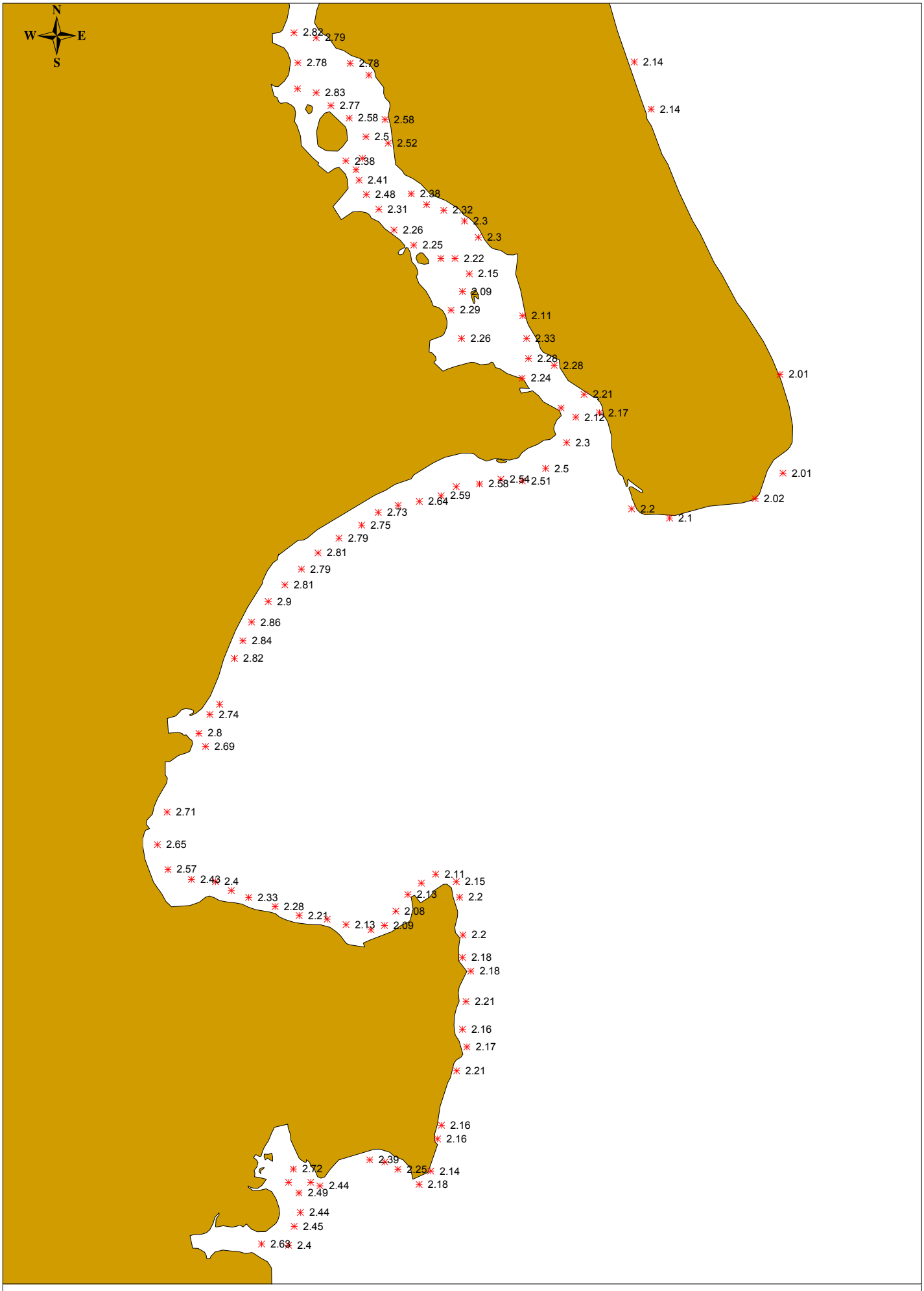
LJ8824/R2461 February 2009
File: J:\CM\LJ8824\Figures\R2461\Figure8.4.Wor

Storm Tide Hazard Study - Moreton Bay Regional Council

100-YEAR ARI CYCLONIC DESIGN WATER LEVELS (mAHD)
PRESENT CLIMATE CONDITION

Figure 8.4



Cardno Lawson Treloar

LJ8824/R2461 February 2009
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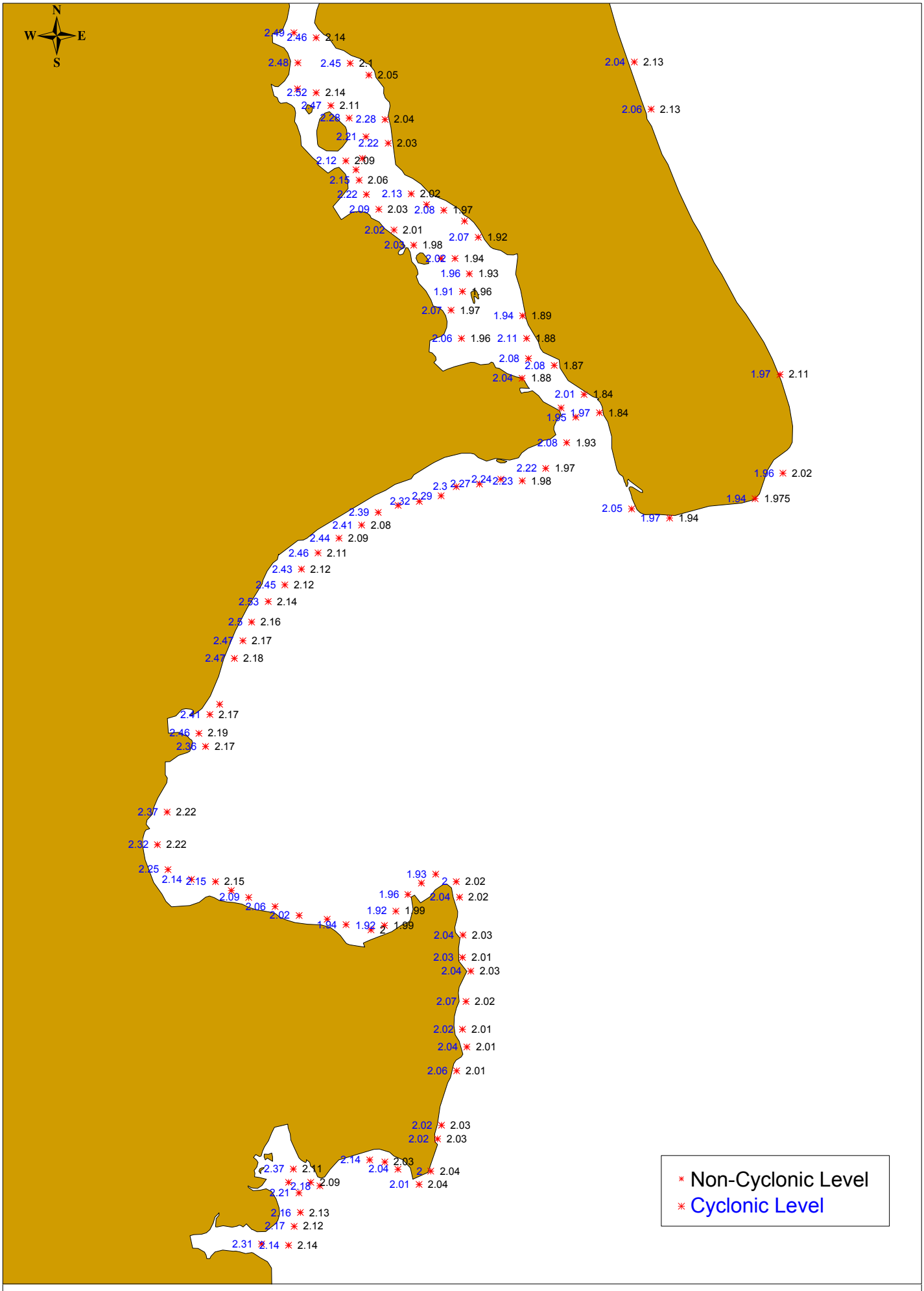
Storm Tide Hazard Study - Moreton Bay Regional Council

100-YEAR ARI CYCLONIC DESIGN WATER LEVELS (mAHD)
GREENHOUSE RELATED CLIMATE CHANGE CONDITIONS

Figure 8.5



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LJ8824/R2461 February 2009
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Storm Tide Hazard Study - Moreton Bay Regional Council

100-YEAR ARI DESIGN WATER LEVELS (mAHD)
NON-CYCLONIC AND CYCLONIC COMPARISION

Figure 9.1

Cardno Lawson Treloar

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Storm Tide Hazard Study - Moreton Bay Regional Council

100-YEAR ARI, 100-YEAR (2109) PLANNING LEVELS (mAHD) GREENHOUSE RELATED CLIMATE CHANGE CONDITIONS, INCLUDES FREEBOARD AND SLR

Figure 10.1

APPENDIX A

Glossary of Terms

GLOSSARY*

Australian Height Datum (AHD)	A common national plane of level corresponding approximately to mean sea level.
ARI	Average Recurrence Interval
Barometric Set-up	A rise in sea level caused by the low central pressure of a cyclone drawing in water to balance total water level and atmospheric pressure
CD	Chart Datum, common datum for navigation charts - 1.243m below AHD at Brisbane Bar. Equal to Lowest Astronomical Tide (LAT).
Coriolis Force	The force on a moving body caused by changing distance from the polar axis of the Earth.
Diurnal	A daily variation, as in day and night.
Ebb Tide	The outgoing tidal movement of water within an estuary.
Estuary	An enclosed or semi-enclosed body of water having an open or intermittently open connection to coastal waters and in which water levels vary in a periodic fashion in response to ocean tides.
Flood Tide	The incoming tidal movement of water within an estuary.
Foreshore	The area of shore between low and high tide marks and land adjacent thereto.
Fortnightly Tides	The variation in tide levels caused by the monthly variation of Spring and Neap Tides.
H_s (Significant Wave Height)	H_s may be defined as the average of the highest 1/3 of wave heights in a wave record ($H_{1/3}$), or from the zeroth spectral moment (H_{mo}), though there is a difference of about 5 to 8%. The Hmo parameter is used in wave modelling; hence in this study. This is a slightly conservative position.
Intertidal	Pertaining to those areas of land covered by water at high tide, but exposed at low tide, eg. intertidal habitat.
Mathematical/ Computer Models	The mathematical representation of the physical processes involved in runoff, stream flow and estuarine/sea flows. These models are often run on computers due to the complexity of the mathematical relationships. In this report, the models referred to are mainly involved with wave and current processes.
MSL	Mean Sea Level
Neap Tides	Tides with the smallest range in a monthly cycle. Neap tides occur when the sun and moon lie at right angles relative to the earth (the gravitational effects of the moon and sun act in opposition on the ocean).

Numerical Model	A mathematical representation of a physical, chemical or biological process of interest. Computers are often required to solve the underlying equations.
Phase Lag	Difference in time of the occurrence between high (or low water) and maximum flood (or ebb) velocity at some point in an estuary or sea area.
Semi-diurnal	A twice-daily variation, e.g. two high waters per day.
Shoals	Shallow areas in an estuary created by the deposition and build-up of sediments.
Slack Water	The period of still water before the flood tide begins to ebb (high water slack) or the ebb tide begins to flood (low water slack).
Spring Tides	Tides with the greatest range in a monthly cycle, which occur when the sun, moon and earth are in alignment (the gravitational effects of the moon and sun act in concert on the ocean)
Storm Surge	The increase in coastal water levels caused by the barometric and wind set-up effects of storms. Barometric set-up refers to the increase in coastal water levels associated with the lower atmospheric pressures characteristic of storms. Wind set-up refers to the increase in coastal water levels caused by an onshore wind driving water shorewards and piling it up against the coast.
Tidal Exchange	The proportion of the tidal prism that is flushed away and replaced with 'fresh' coastal water each tide cycle.
Tidal Excursion	The distance travelled by a water particle from low water slack to high water slack and vice versa.
Tidal Lag	The delay between the state of the tide at the estuary mouth (eg. high water slack) and the same state of tide at an upstream location.
Tidal Limit	The most upstream location where a tidal rise and fall of water levels is discernible. The location of the tidal limit changes with freshwater inflows and tidal range.
Tidal Planes	A series of water levels that define standard tides, eg. 'Mean High Water Spring' (MHWS) refers to the average high water level of Spring Tides.
Tidal Prism	The total volume of water moving past a fixed point in an estuary during each flood tide or ebb tide.

Tidal Propagation	The movement of the astronomical tide into and out of an estuary.
Tidal Range	The difference between successive high water and low water levels. Tidal range is maximum during Spring Tides and minimum during Neap Tides.
Tidally Varying Models	Numerical models that predict estuarine behaviour within a tidal cycle, i.e., the temporal resolution is of the order of minutes or hours.
Tides	The regular rise and fall in sea level in response to the gravitational attraction of the Sun, Moon and Earth.
T_z (Zero Crossing Period)	The average period of a set of waves. Common wave period parameter used for wave run-up calculation.
Wind Set-up	Onshore winds push water against the coastline causing it to 'pile-up'. Additional wind set-up is caused by northward flowing wind caused coast parallel currents through the Coriolis force and refraction on the continental shelf.

* A number of definitions have been derived from the NSW Estuary Management Manual (1992).

APPENDIX B

Oceanic Storm Climatologies

(from DRAFT SEQ Storm Tide Study Review, Systems Engineering Australia)

There are several classes of large scale oceanic weather systems capable of affecting the South-East Queensland (SEQ) region and generating significant storm tide effects. As the characteristics of these systems vary considerably (frequency, size, strength) it is important that their relative effects are correctly accounted for in any statistical storm tide studies in this region.

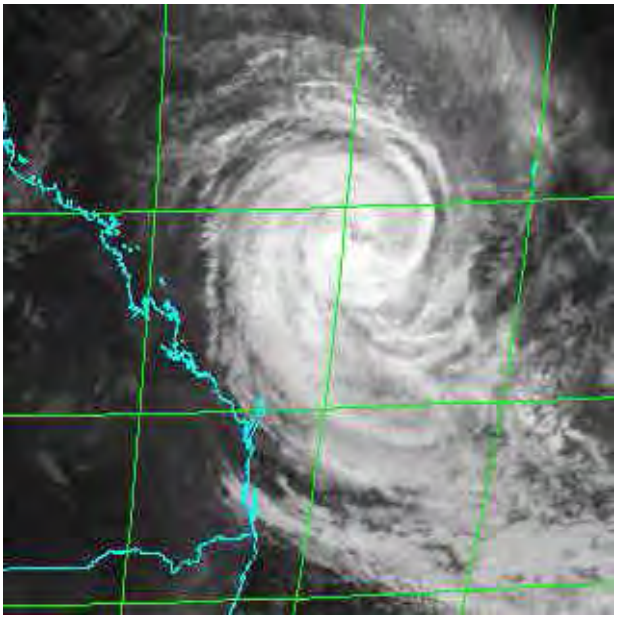
The risk of severe tropical cyclones begins to diminish rapidly with lowering Sea Surface Temperatures (SST) south of Gladstone, meaning that SEQ is on the fringe of exposure to the most intense of these cyclonic storms, at least in current climate conditions. In fact, the majority of "cyclones" that have been officially recorded as affecting the SEQ region would now typically be described as decaying tropical cyclones, transitioning extra-tropical storms, sub-tropical storms or "east coast lows". One of the challenges of modelling the correct climatology of these various storm systems is being to be able to identify their characteristics in the historical records, as the official database has not separated out these events and the definitions of each class are not always clear. Also, individual storms may move through a number of transitions as they approach the SEQ area, with subsequent changes to wind structure and strength.

Tropical Cyclones

The *Tropical Cyclone* (TC) is a large scale and potentially very severe low pressure weather system and represents the principal threat of extreme storm tides. TCs affect the Queensland region typically between November and April, with an average incidence of around 1 storm per year since 1959/60 within a 500 km radius of Brisbane. In the southern hemisphere, TC winds circulate clockwise around the centre. The Bureau of Meteorology (BoM 1999) uses a five-category system classifying tropical cyclone intensity in Australia for public warning purposes. Severe cyclones are those of Category 3 and above (referred to as hurricanes or typhoons in some countries) with average, or sustained, surface wind speeds exceeding 120 kmh^{-1}.

The main structural features of a severe tropical cyclone at the earth's surface are the eye, the eye wall and the spiral rainbands (refer satellite image in Figure 3). The eye is the area at the centre of the cyclone at which the surface atmospheric pressure is lowest. It is typically 20 to 50 km in diameter, skies are often clear and winds are light. The eye wall is an area of cumulonimbus clouds, which swirls around the eye. Tornado-like vortices of even more extreme winds may also occur associated with the eye wall and outer rain bands. The rain bands spiral inwards towards the eye and can extend over 1000 km or more in diameter. The heaviest rainfall and the strongest winds, however, are usually associated with the eye wall.

For any given central pressure, the spatial size of individual tropical cyclones can vary enormously. Generally, smaller cyclones occur close to the Equator, for example, Cape York, and larger cyclones



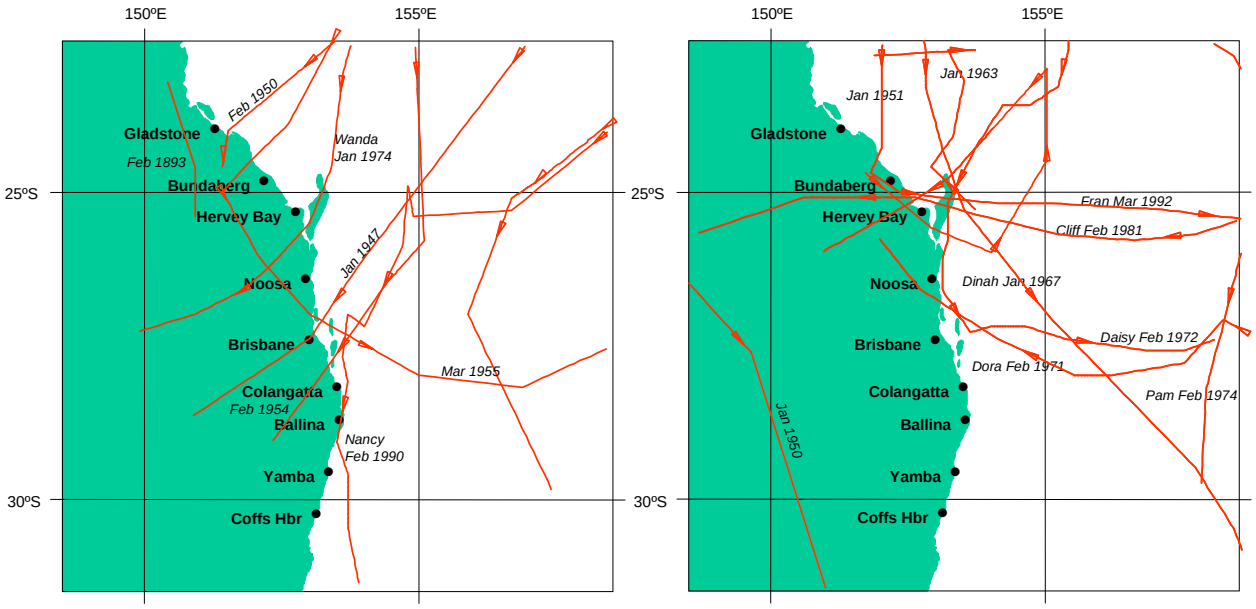
further south, but there are many exceptions. For example, because it is difficult for a cyclone to form south of 25ºS in the Queensland region, the vast majority affecting South-East Queensland have travelled from further north and are likely to be either fully mature, undergoing decay or tending extra-tropical. In those circumstances, small cyclones are relatively rare. Large cyclones can have impacts far from their track, especially on waves and storm tide. For example, David crossed the coast near Yeppoon in 1976 and caused significant coastal impacts in SEQ. This was caused by large scale ridge interaction to the south of the storm, a feature common to TC impacts in SEQ.

Figure 3 TC *Fran* approaching the Queensland coast in March 1992.
(Bureau of Meteorology image)

Given specifically favourable conditions, tropical cyclones can continue to intensify until they are efficiently utilising all of the available energy from the immediate atmospheric and oceanic sources. This Maximum Potential Intensity (MPI) is thought to be a function of the climatology of regional SST and atmospheric temperature and humidity profiles. When applying a thermodynamic MPI model for the Queensland coast (Tonkin et al. 2000), indicative values for the MPI increased northwards from about 960 hPa at Brisbane to 920 hPa at Townsville. However the MPI of coast-threatening storms in SEQ is likely to be higher, with a value of 940 hPa recommended generally for SEQ (Holland 1997, pers. comm.). It is rare for any cyclone to reach its MPI because external environmental conditions such as continental and synoptic influences often act to limit intensities in the Queensland region.

The Bureau of Meteorology National Climate Centre maintains a database of tropical cyclone tracks but care must be taken in interpretation of much of the information (refer Harper 2001). Figure 4 provides a selection of tracks of officially-named cyclones that have resulted in significant impacts in the SEQ region. Figure 3a presents the tracks of 7 cyclones which caused severe flooding impacts. These include the infamous floods of February 1893 (907 mm rainfall at Crohamhurst in 24 h) and January 1974 (TC *Wanda*[1]) in the Brisbane River, as well as a number of smaller but still significant events. Typically, these storms either crossed the coast and decayed inland or spent considerable time near the coast creating strong moist onshore flows. Figure 3b presents a selection of 9 cyclones whose impacts were more concentrated on the coast or caused significant wind damage. These include the January 1950 cyclone which originated in the Gulf of Carpentaria and actually passed 300 km inland but was accompanied by a strong and extensive circulation which created a 0.58 m storm surge in Moreton Bay.

[1] Interestingly, *Wanda* would not now be classified as a TC, but rather as a weaker sub-tropical cyclone as discussed in the next section (J. Callaghan, pers. comm.).



(a) Flood

(b) Wind, wave and surge

Figure 4 Selected tracks of tropical cyclones impacting SE Queensland.

(from Granger and Hayne 2001 – after Harper)

Sub-Tropical Cyclones

Sub-Tropical cyclones (STC) form over water in tropical areas and are normally associated with the monsoon. While appearing similar to a tropical cyclone in some respects, STCs lack the extreme eye-wall winds and are typically large in scale and bring strong and widespread wind and rain on their southern side. If they move southwards, the presence of land can actually lead to their intensification. In certain circumstances, such storms can also transform into the extra-tropical form or the east coast low form and may remain near-stationary for extended periods near the coast.

Figure 5 is an example of a significant STC event in March 2006, which produced a 0.4 m storm surge at the Gold Coast Seaway and significant wave heights typically between 5 and 6 m from Mooloolaba south to Tweed Heads. The maximum single wave height recorded off Brisbane was 17 m. The low pressure centre can be seen deepening as it moves southwards, with satellite-sensed surface winds (where available) further emphasising the severe wind field.

There is no specific database of sub-tropical storm systems available for the Queensland region.

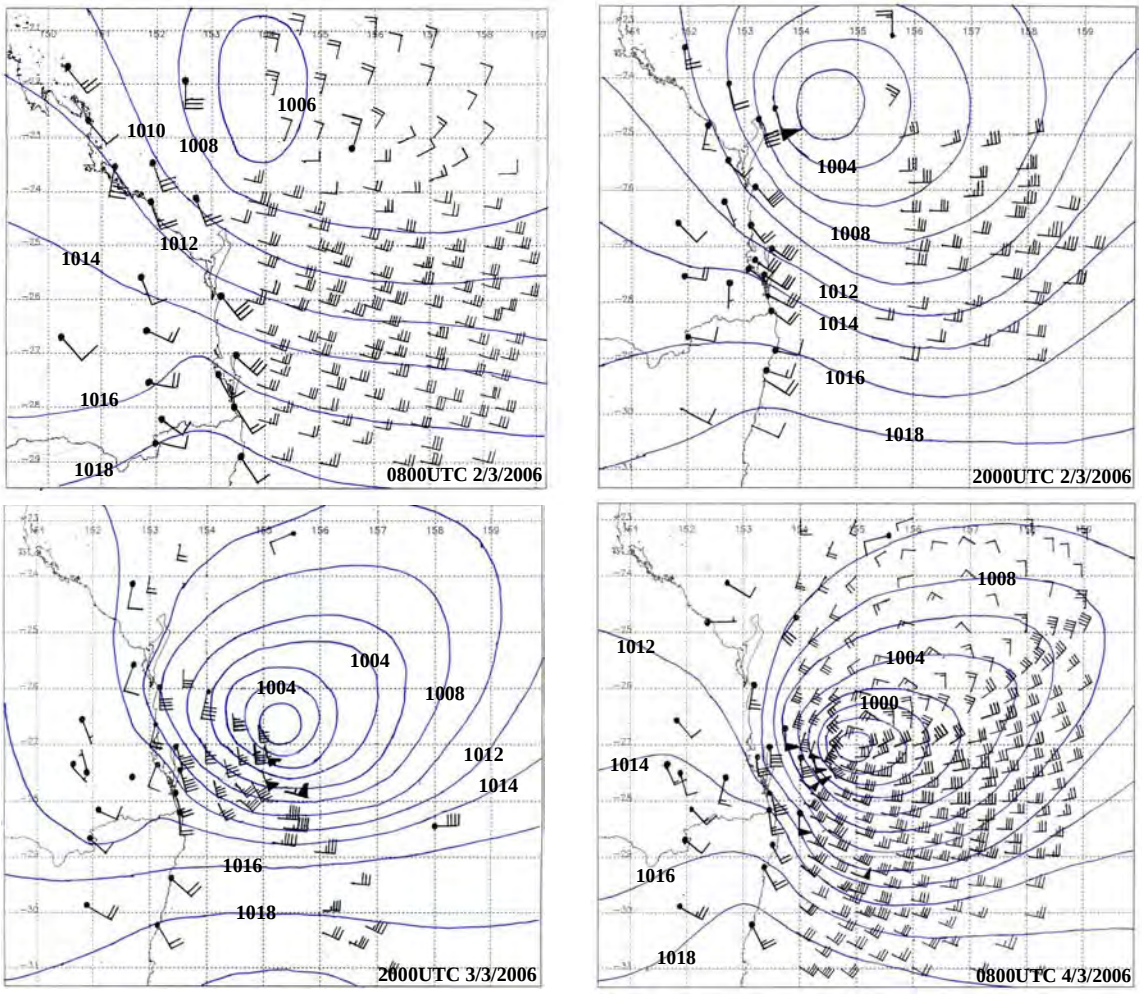


Figure 5 Significant sub-tropical event in March 2006.

(J. Callaghan pers. comm.)

Extra-Tropical Cyclones

Extra-tropical cyclones (ETC) result from a process that a tropical or sub-tropical cyclone can undergo if it moves into higher latitudes before dissipating and begins to interact with larger scale synoptic features. Rather than simply decaying as a tropical cyclone, which largely relies on the ocean heat content to sustain it, a transitioning storm gains energy from the adjacent weather patterns and may maintain its strength or even increase in strength, depending on the circumstances. Other structural changes often mean that the storm typically becomes much larger in extent, thus increasing the available fetch for generating storm surge and high waves. Due to the geometry of SEQ, the tracks of extra-tropical storms will tend to take such storms south and to the east, although impact on the coast is a possibility.

An example of a tropical system undergoing this type of potentially destructive transition at higher latitudes is tropical cyclone Lance in April 1984. History now also records Lance as an “east coast low” in terms of its impact on South East Queensland (refer 0). Figure 6 illustrates the sequence of development of this system whereby Lance had decayed into a low pressure system east of Proserpine late on April 6th, losing its “tropical cyclone” status. However, as it drifted south its remnant circulation interacted with the surrounding synoptic structures and underwent rapid extra-tropical transition to the north and offshore of Brisbane, buffeting parts of the southern coast with 110 km/h winds over the next three days. Fortunately it maintained its distance off the coast, thus avoiding more major impact.

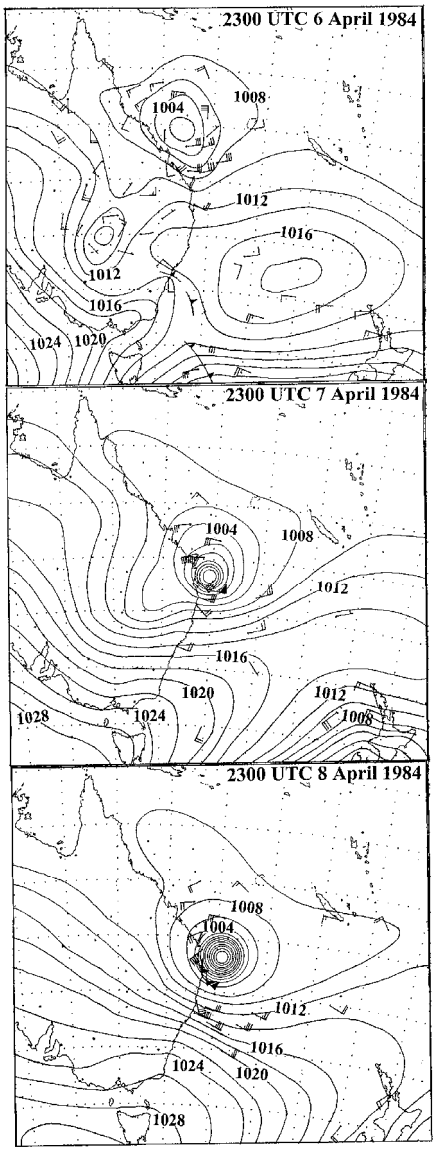
There is no specific database available that identifies storms that have become extra-tropical in structure.

East Coast Lows

East Coast Lows (ECL) are a specific class of large scale cyclonic systems that tend to form just offshore of the east coast anywhere south of Gladstone and can extend southwards along much of the New South Wales coastline. These types of cyclonic storms, which most often develop during the winter months, are also the most common wind, wave and flooding events affecting the SEQ coastline.

These storm systems draw their energy from a combination of strong ocean temperature gradients, coastal convergence, uplift and a supply of moist sub-tropical air at the surface. The East Australian Current and the Great Dividing Range are principal players in the development of these storms, the circulation centres of which often track very close to the coast over considerable distances. Their impacts can extend over considerable distances, as can be seen in the three examples in Figure 7 where the steep gradients in the surface pressure fields and regions of strong onshore winds are indicated. The onshore flow is responsible for the heavy rains and, combined with the extended fetch regions over the ocean, the generation of high waves. Storm surge is also possible, whereby the strong clockwise winds create a net onshore flow at the surface causing a rise in water levels along the coast. The “inverted barometer” pressure effect can also be significant, with some east coast lows having central pressures below 990 hPa. Wave setup caused by breaking wave processes at the coast also contributes to the total storm tide impact.

Figure 6 Extra-tropical transition of tropical cyclone Lance in April 1984.



(from Granger and Hayne 2001 – after Callaghan)

Prior to the introduction of satellite imagery in the early 1960s, many east coast lows were classified as tropical cyclones. While their impacts may be similar or even possibly greater in some cases, the east coast low has a different physical mechanism and a highly asymmetrical pole ward cloud pattern where the heaviest rainfall frequently occurs. Another feature of east coast low development is the tendency for clustering of events when conditions remain favourable. For example, near Brisbane, almost one third of events occur within 20 days of a preceding event (Allen and Callaghan 2000).

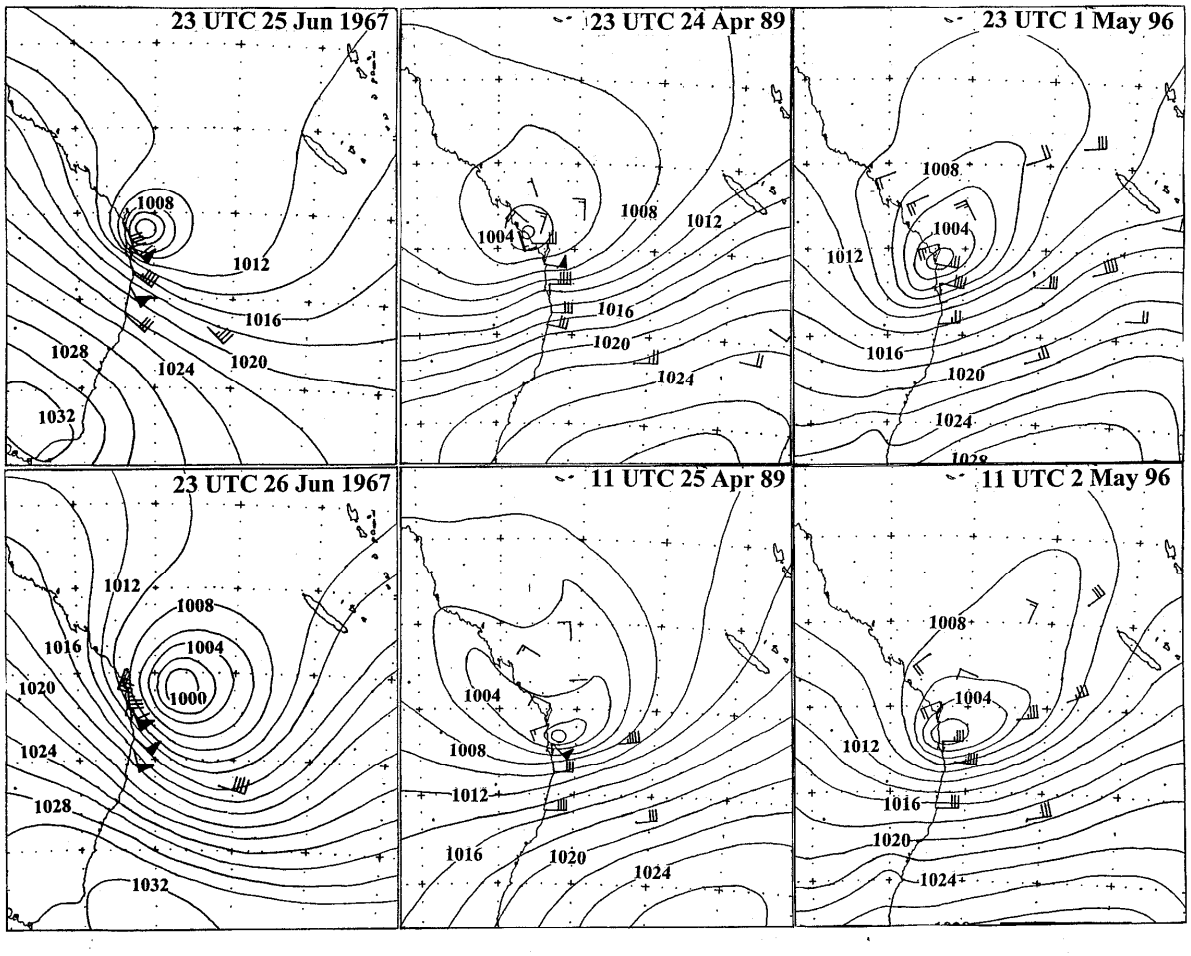


Figure 7 Examples of three east coast low synoptic developments.

(from Granger and Hayne 2001 – after Callaghan)

There have been a number of studies into the frequency of occurrence and relative intensity of ECLs. PWD (1985) addressed the coastal impacts of these systems on the NSW coastline, especially from a storm surge and wave setup perspective. Callaghan (1986) and Holland et al. (1987) considered the synoptic precursors to storm development as an aid to forecasting. Hopkins and Holland (1997) looked at the association between ECLS and heavy-rain days. Allen and Callaghan (2000) considered the impacts of ECLs on extreme wave heights in the SE Queensland coastal region.

Unfortunately, ECLs have not been systematically recorded in the manner that tropical cyclones have been since the turn of the century. They are typically more complex systems which are often difficult to categorise. Accordingly, many of the studies have concentrated on detailed investigations of historical weather charts and station observations to reconstruct a time history of occurrences. The longest assembled record available (1880 to 1980) is from PWD (1985), which considered the region from Tweed Heads south to Gabo Island, near Bass Strait. This study classified the various storm systems into six categories, depending on the synoptic situation, as summarised in Kemp and Douglas (1981). Holland et al. (1987) considered the period 1970-1985 and used three broad classifications. Hopkins and Holland (1997) broadened this to 1958-1992 and Allen and Callaghan (2000) focused on 1976-1997 when wave data was available. A composite SEQ data set was created by Harper (Granger and Hayne 2001) covering the 118 year period 1880 – 1997. The incidence of these types of storms can fluctuate quite widely from one year to the next, with none in some years and the highest incidence being twelve in 1978/79. The long term average annual

occurrence is about 2.5 storms per year but since 1960 the average has increased to 3.7. While the frequency of occurrence prior to 1960 will be affected to some extent by the lack of routine satellite coverage, the approximate doubling of frequency of storms over the past 30 years appears highly significant (Hopkins and Holland, 1997) and to some extent appears linked to broader climatic indices such as the Southern Oscillation Index (SOI). It is noted that the incidence of ECLs is significantly greater than that of TCs in the SE Queensland region.

Hybrid Storms

As mentioned previously, the distinction between the various large scale storm systems is sometimes difficult to classify and this can present problems for the Bureau of Meteorology in formulating a warning strategy. An example of a significant storm that proved difficult to classify was an event in March 2001. Figure 8 shows the storm centred just south of the Queensland border, as depicted by radar. The strongly asymmetric structure is highlighted in this view, whereby the strongest convection, wind and rain is located well to the south and seawards of the "eye" of the storm, with little impact on the northern side. In these cases, highlighting the "centre" of the storm for public warnings is misleading, given that the impacts are far removed from the apparent centre.

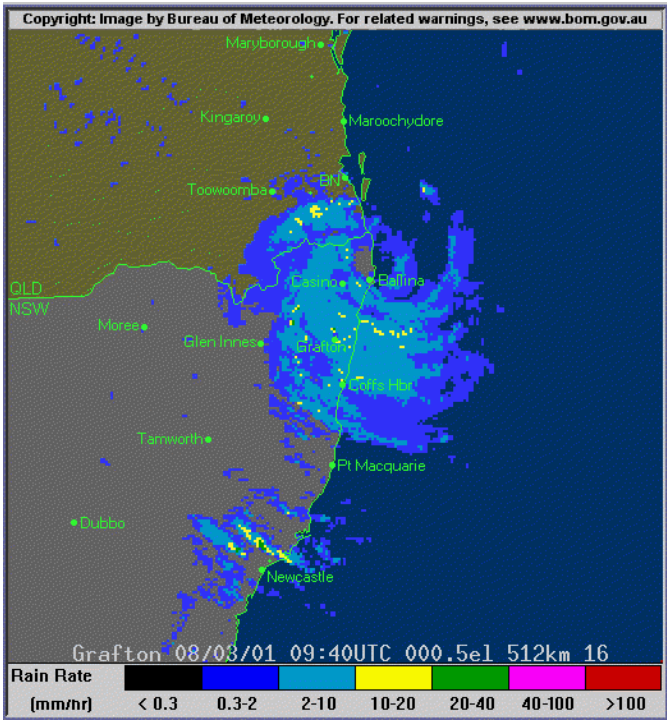
Figure 8 An example of a "hybrid" storm in March 2001, as depicted by radar.

(Bureau of Meteorology image)

Recommended Practice

It is recommended that representative storm climatologies for storm tide studies in SEQ be based on:

- Close consultation with the Bureau of Meteorology;
- Identifying the significant differences between the various storm structures;
- Determining the temporal and spatial distributions of storms;
- Quantifying the intensity and scale of the various storm systems;
- Accessing the manner and extent of synoptic scale interaction with cyclonic storms in SEQ and the degree to which that influences the surface wind and pressure structures.



APPENDIX C

Physical Processes

The purpose of this section is to describe the physical processes that are important to the overall storm tide and wave processes in the Moreton Bay region. These processes are: -

- Waves
- Currents
- Water Levels
- Winds

Wave Processes

Ocean waves may have energy in two distinct frequency bands, leaving aside long period waves. These are principally related to the generation and propagation of ocean swell and local sea. Swell is the term used to describe waves that have propagated beyond the storm that caused the waves to develop. Local sea is the term often ascribed to waves that are are still growing in the storm wind field. Large ocean waves generated by a storm are generally categorised as sea because wind energy is still being transferred to the ocean.

Waves are irregular in height and period and so it is necessary to describe wave conditions using a range of statistical parameters. In this study the following have been used:-

- H_{mo} significant wave height (H_s) based on $4\sqrt{M_o}$ where M_o is the zeroth moment of the wave energy spectrum (rather than the time domain $H_{1/3}$ parameter).

- H_{max}maximum wave height in a specified time period

- T_p wave energy spectral peak period, that is, the wave period related to the highest ordinate in the wave energy spectrum

- T_z average zero crossing period based on upward zero crossings of the still water line. An alternative definition is based on the zeroth and second spectral moments.

Wave heights defined by zero up-crossings of the still water line fulfil the Rayleigh Distribution in deep water and thereby provide a basis for estimating other wave height parameters from H_s. In shallow water, significant wave height defined from the wave spectrum, H_{mo}, is normally larger (typically 5% to 8%) than $H_{1/3}$ defined from a time series analysis.

Water waves also have a dominant direction of wave propagation and directional spread about that direction that can be defined by a Gaussian or generalised cosine ($\cos^n$) distribution (amongst others), and a wave grouping tendency. Directional spread is reduced by refraction as waves propagate into the shallow, nearshore regions and the wave crests become more parallel with each other and the seabed contours. Although neither of these characteristics is addressed explicitly in this study, directional spreading was included in the numerical wave modelling work. Directional spreading causes the sea surface to have a more short-crested wave structure in deep water.

Waves propagating into shallow water may undergo changes caused by refraction, shoaling, bed friction, wave breaking and, to some extent, diffraction.

Wave refraction is caused by differential wave propagation speeds. That part of the shoreward propagating wave which is in the more shallow water has a lower speed than those parts in deeper water. When waves approach a coastline obliquely these differences cause the wave fronts to turn and become more coast parallel. Associated with this

directional change there are changes in wave heights. On irregular seabeds wave refraction becomes a very complex process.

Waves propagating shoreward develop reduced speeds in shallow water. In order to maintain constancy of wave energy flux (ignoring energy dissipation processes) their heights must increase. This phenomenon is termed shoaling and leads to a significant increase in wave height near the shoreline.

A turbulent boundary layer forms above the seabed with associated wave energy losses that are manifested as a continual reduction in wave height in the direction of wave propagation - leaving aside further wind input, refraction, shoaling and wave breaking. The rate of energy dissipation increases non-linearly with greater wave height.

Wave breaking occurs in shallow water when the wave crest speed becomes greater than the wave phase speed. For irregular waves this wave-breaking occurs in different depths so that there is a breaker zone rather than a breaker line. Seabed slope, wave period and water depth are important parameters affecting the wave breaking phenomenon. As a consequence of this energy dissipation, wave set-up (a rise in still water level caused by wave breaking), develops shoreward from the breaker zone in order to maintain conservation of momentum flux. This rise in water level increases non-linearly in the shoreward direction and allows larger waves to propagate shoreward before breaking. Field measurements have shown that the slope of the water surface is normally concave upward. Wave set-up at the shoreline can be in the order of 15% of the equivalent deep-water significant wave height. Smaller set-up occurs in estuarine entrances, but the momentum flux remains the same. Wave set-up is smaller where waves approach a beach obliquely, but then a longshore current can be developed. Wave grouping and the consequent surf beats also cause fluctuations in the still water level.

In a random wave field each wave may be considered to have a period different from its predecessors and successors and the distribution of wave energy is often described by a wave energy spectrum. In fact, the whole wave train structure changes continuously and individual waves appear and disappear until quite shallow water is reached and dispersive processes are reduced. In developed sea states, that is swell, the Bretschneider modified Pierson-Moskowitz spectral form has generally been found to provide a realistic wave energy description. For developing sea states the JONSWAP spectral form, which is generally more ‘peaky’, has been found to provide a better spectral description.

For structural design in the marine environment it may be necessary to define the H_{max} parameter related to storms having average recurrence intervals (ARI) of R years. However, the expected H_{max}, relative to H_s in statistically stationary wave conditions, increases as storm/sea state duration increases. Based on the Rayleigh Distribution the usual relationship is:-

$$H_{max} = H_s \sqrt{(0.5 \ell n Nz)}$$

where Nz is the number of waves occurring during the time period being considered, where individual waves are defined by Tz.
ln is the natural logarithm

This relationship has been found to overestimate H_{max} by about 10% in severe ocean storms. In shallow water the relationship is not fulfilled. In very shallow water H_{max} is replaced by the breaking wave height, H_b, a limiting wave height based on a percentage of the water depth.

Waves propagating through an area affected by a current field are caused to turn in the direction of the current. The extent of this direction change depends on wave celerity, current speed and relative directions. Wave height is also changed. Opposing currents cause wave lengths to shorten and wave heights to increase and may lead to wave breaking. When the current speed is greater than one quarter of the phase speed, the waves are blocked. Conversely, a following current reduces wave heights and extends wave lengths.

Currents

Currents within the region are caused by a range of phenomena, including: -

- Astronomical Tides
- Winds
- Nearshore Wave Processes

The astronomical tides are caused by the relative motions of the Earth, Moon and Sun. The regular rise and fall of the tide level in the sea causes a periodic inflow (flood tide) and outflow (ebb tide) of oceanic water to the estuary. A consequence of this process is the generation of tidal currents. The volume of sea water that enters the estuary or leaves it on flood and ebb tides, respectively, is termed the tidal prism; which parameter varies due to the inequality between tidal ranges. The tidal prism is affected by changes in inter-tidal areas, but not by dredging areas below low tide.

Wind forcing is applied to the water surface as interfacial shear; the drag coefficient and consequent drag force varying with wind speed. Momentum from the wind is gradually transferred down through the water column by vorticity, the maximum depth of this effect being termed the Ekman depth. At the surface, wind caused currents are in the direction of the wind, but in the southern hemisphere they gradually turn to the left of the wind direction until they flow in the opposite direction at the Ekman depth. The Bay is too shallow for this condition to develop fully and wind driven currents are affected more by the seabed boundary layer. Wind driven currents diminish with depth. Because wind forcing is applied at the water surface, the relative effect is greater in shallow water where there is less water column volume per unit plan area. Therefore wind driven currents can be greater in more shallow areas. Maximum surface current speed is in the order of 1% to 3% of the wind speed, depending on water depth. Where water is piled up against a coastline by wind forcing, a reverse flow develops near the seabed.

The propagation of waves into the near shore region leads to wave breaking and energy dissipation. Where waves propagate obliquely to the shoreline this process leads to the generation of a longshore current in the surf zone, and to some extent seaward of that line.

Water Levels

Water level variations in the estuary and at the coastline result from one or more of the following natural causes:-

- Eustatic and Tectonic Changes
- Tides
- Wind Set-up and the Inverse Barometer Effect
- Wave Set-up
- Wave Run-up
- Tsunami
- Greenhouse Effect
- Global Changes in Meteorological Conditions

Eustatic sea level changes are long term world wide changes in sea level relative to the land mass and are generally caused by changes to the polar ice caps. No rapid changes are believed to be occurring at present and this aspect has not been addressed. Nevertheless, a minimum rise of 1mm per annum is now generally accepted. Tectonic changes are caused by movement of the Earth's crust; they may be vertical and/or horizontal.

Tides are caused by the relative motions of the Earth, Moon and Sun and their gravitational attractions. While the vertical tidal fluctuations are generated as a result of these forces, the distribution of land masses, bathymetric variation and the Coriolis force determine the local tidal characteristics.

Wind set-up and the inverse barometer effect are caused by regional meteorological conditions. When the wind blows over an open body of water, drag forces develop between the air and the water surface. These drag forces are proportional to the square of the wind speed. The result is that a wind drift current is generated. This current may transport water towards the coast upon which it piles up causing wind set-up. Wind set-up is inversely proportional to depth.

In addition, the drop in atmospheric pressure, which accompanies severe meteorological events, causes water to flow from high pressure areas on the periphery of the meteorological formation to the low pressure area. This is called the 'inverse barometer effect' and results in water level increases up to 1cm for each hecta-Pascal (hPa) drop in central pressure below the average sea level atmospheric pressure in the area for the particular time of year, typically about 1010 hPa. The actual increase depends on the speed of the meteorological system and 1cm is only achieved if it is moving slowly. The phenomenon causes daily variations from predicted tide levels up to 0.05m. The combined result of wind set-up and the inverse barometer effect is called storm surge.

Wave run-up is the vertical distance between the maximum height a wave runs up the beach or a coastal structure and the still water level, comprising tide plus storm surge. Additionally, run-up level varies with surf-beat, which arises from wave grouping effects.

Tsunami are caused by sudden crustal movements of the Earth and are commonly, but incorrectly, called 'tidal waves'. They are very infrequent and unlikely to occur during a storm and so have not been included in this study. Nevertheless, in the context of events having recurrence intervals in the order of 100 years, one should keep this point in mind.

Global meteorological and oceanographic changes cause medium term variations in mean sea level. The former phenomenon may persist for a year or more. The causes are not properly understood, but analyses of long term data from tide gauges indicate that annual mean sea level may vary up to 0.1m from the long term trend.

General scientific consensus predicts that under enhanced greenhouse conditions sea levels will rise in response to isothermic expansion and melting of polar ice shelves. Predictions of global sea level rise due to the Greenhouse effect vary considerably. It is impossible to state conclusively by how much the sea may rise, and no policy yet exists regarding the appropriate provision that should be made in the design of new coastal developments.

Based on a number of global greenhouse models, a guide to future ocean level rises is presented in Table C.1.

Table C.1: Predicted Greenhouse Related Mean Sea Level Rises (International Panel on Climate Change (IPCC), 2001)

	Total Sea Level Rise (m) to Year 2100		
Greenhouse Scenario	**Min**	**Max**	**Central**
IP92a	0.11	0.77	0.44
SRES	0.09	0.88	0.48

The 4th IPCC report on climate change published in mid-2007 predicts slightly lower estimates of sea level rise compared to Table C.1. The report range for IPCC 2007 is for a sea level rise of between 0.18m and 0.59m by 2100. This excludes potential sea level rise should recent ice-sheet melting in polar regions continue. If this were to occur, the additional sea-level rise is estimated to be between 0.1 and 0.2m. This results in the IPCC (2001) and IPCC (2007) estimates being broadly similar. From a planning perspective the reported results from IPCC 2007 are consistent with the previous report.

A rise of 0.3m has been included in the results reported in this study for a 50-year planning period. For a 100-year planning period, Council should consult with the EPA so that any adopted 100-year sea-level rise allowance is consistent with general Queensland guidelines.

Winds

Wind causes both the waves and storm tides. Details are discussed in the main sections of the report.

APPENDIX D

Calibration Data – Pumicestone Passage

Report to Caboolture Shire Council on:

Options for the Management of Beach Erosion Along the South-western Foreshore of Bribie Island, Caboolture Shire

December 2003

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1. Introduction

Since 1999 both the Caboolture Shire Council and the Bribie Island Environmental Protection Association have approached the Environmental Protection Agency (EPA) on several occasions with concerns regarding erosion of the shoreline at Banksia and Sylvan Beaches on the western foreshore of Bribie Island.

The parkland adjacent to the foreshore within the study area has a high public amenity value due to the proximity of residential development and Pumicestone Passage. Currently, a toilet block at Banksia Beach and a boardwalk and amphitheatre at Sylvan Beach may be threatened by erosion in the medium-term. Community concerns have been raised regarding the loss of mature trees and parkland amenity. Caboolture Shire Council has managed erosion along this coast by using beach nourishment to reduce the severity of the erosion and has moves structures further landward to avoid loss.

As a result of discussions between officers of the Caboolture Shire Council and the EPA, the EPA agreed to undertake a study of the beach erosion from Bongaree to Banksia Beach to assist Caboolture Shire Council in managing the erosion problem along this section of coast.

The aims of the study are to:

- describe the coastal processes occurring in the vicinity of Bongaree to Banksia Beach;
- identify the cause and magnitude of erosion problems from Bongaree to Banksia Beach;
- discuss means of managing the erosion problem; and
- provide technical advice on shoreline erosion management for consideration by the Council

Results and analysis of data collected for the study are discussed in section 3 along with the potential causes of coastal recession. Other potential causes of erosion in the area are discussed in Section 4. Possible solutions to the problem are discussed in Section 5.

4. Data collection and analysis

Data used in the study comprised current meter recordings, aerial photography, beach profile survey data and hydrographic survey data.

4.1. Current measurements

Tidal flows are the primary cause of currents within the Passage. Table 1 presents the tidal planes at Bongaree (Queensland Tide Tables 2003) and shows a spring tide range of 1.6m.

Current measurements were undertaken from 19 June 2001 to 19 July 2001 to help assess the tidal flow characteristics in the area. Two Interocean S4 current meters were deployed in Pumicestone Passage, one at Bellara, near Sylvan Beach and one immediately offshore of Banksia Beach. The two recording sites are shown in Figure 2 and the site details for the two recording sites are presented in Appendix A.

The method of deployment consisted of anchoring the current meters at approximately mid depth in a "taut line" mooring configuration. Figure 16 shows a schematic diagram of the field set-up and Figure 17 presents a photograph of the deployed current meter at Banksia Beach.

Table 1. Tidal planes for Bongaree.

Tidal Plane	**Level (m AHD)**
Highest Astronomical Tide	1.23
Mean High Water Spring Tide	0.76
Mean High Water Neap Tide	0.41
Mean Sea Level	0.00
Mean Low Water Neap Tide	-0.45
Mean Low Water Spring Tide	-0.80
Lowest Astronomical Tide	-1.10

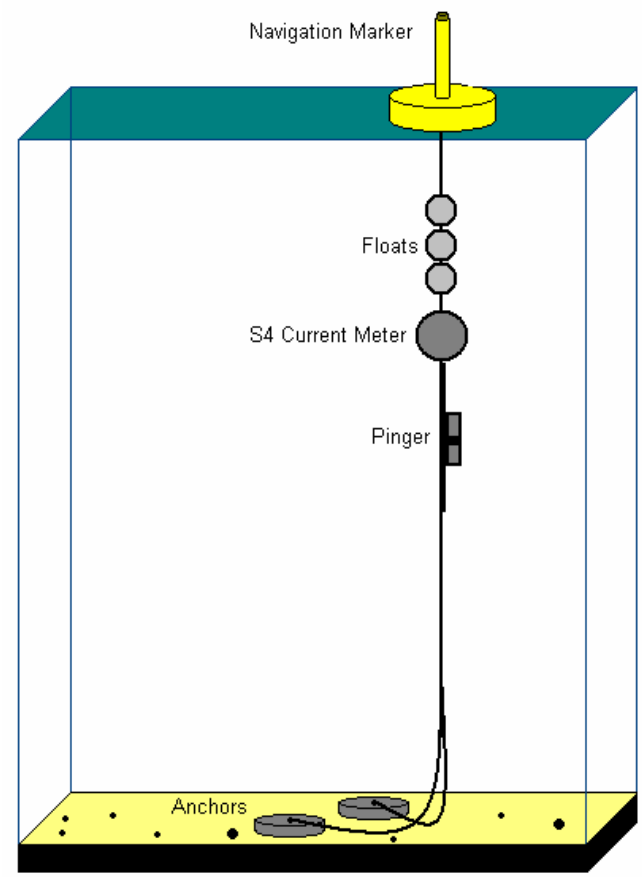


Figure 16. Field set-up of Interocean S4 Current Meter.

Figure 17. Deployed Interocean S4 Current Meter (Banksia Beach).

4.1.1. **Results and analysis**

The current speed and direction data collected as part of this study is summarised in Figures 18 to 20. Figures 18 and 19 present comparative time series plots for the two sites and Figure 20 shows a scatter plot of current speed and direction for both sites. Key characteristics of the tidal flows determined from the data are as follows:

- Tidal currents from Site 1 offshore of Bellara (Sylvan Beach) have higher velocities on the flood tide than the ebb tide. Alternatively, currents offshore from Banksia Beach have higher peak velocities on the ebb tide.
- Figures 18 and 19 also show that flood tides run longer at Bellara compared to flood tides at Banksia Beach.
- Tidal currents tend to run parallel with the shoreline at both sites although the Banksia Beach flood tide shows a greater directional variability than elsewhere, as indicated by the broader shape in Figure 20. The data show that as the flood tide begins, the current directions are in a northerly direction. However, during the flood tide period (as the water levels increase) the flow changes direction toward the north north-west. The current speeds also tend to reduce in the latter part of the flood tide period. This pattern is likely to be influenced by the sand banks located offshore of Banksia Beach. When these banks are exposed at lower water levels, the inflowing currents are constrained to the channel however once the sand banks are inundated, water tends to move in a more north-westerly direction across the entire width of the passage, therefore altering the flow pattern in close to shore.
- A comparison of tidal velocities with corresponding water levels indicates that higher water levels generally coincide with flood tide flows at both sites. Therefore the upper beach is exposed to northerly tidal currents. This effect is more pronounced at the southern (Bellara) site than the Banksia Beach site.

Overall, it is clear that the southern (Bellara) site is flood tide dominated in contrast to the Banksia Beach site, which is more influenced by ebb tidal flows.

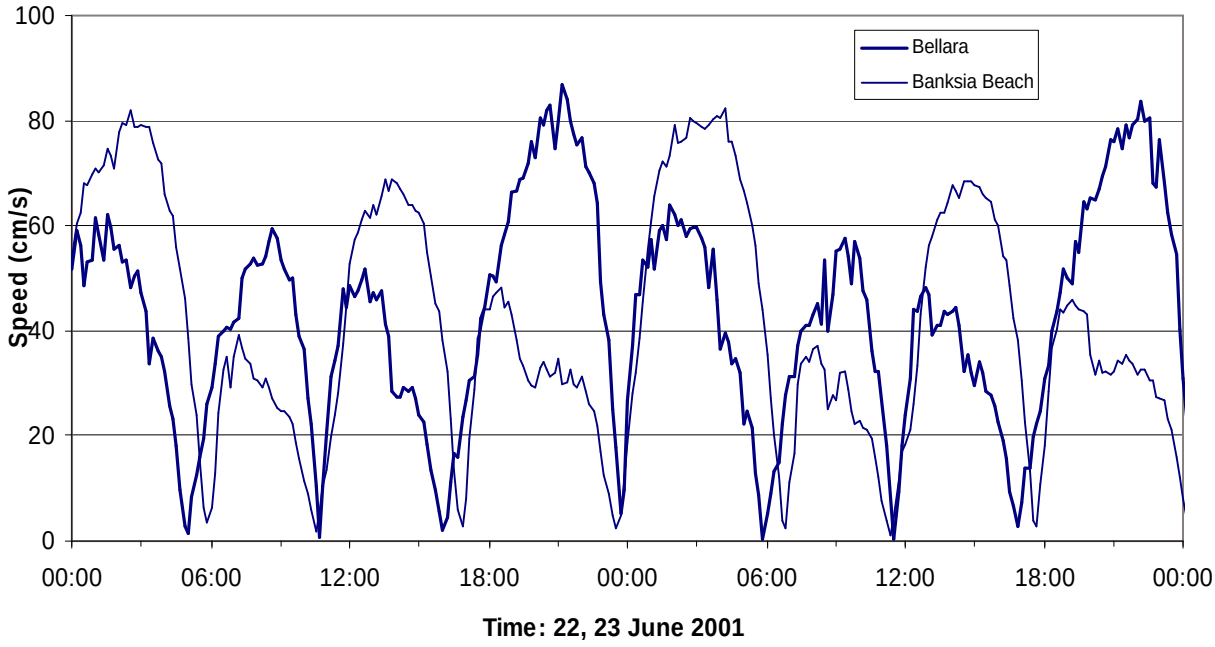


Figure 18. Tidal current speeds at the two sites over two days during a spring tide.

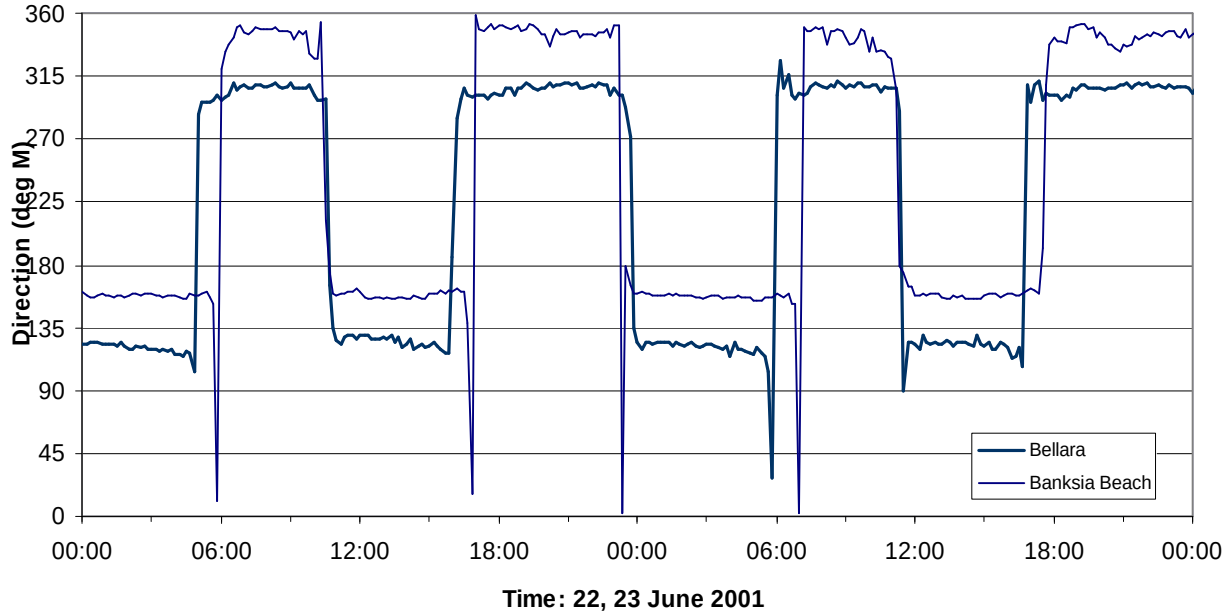


Figure 19. Tidal current directions at the two sites over two days during a spring tide. (Note: values indicate direction in which currents are flowing)

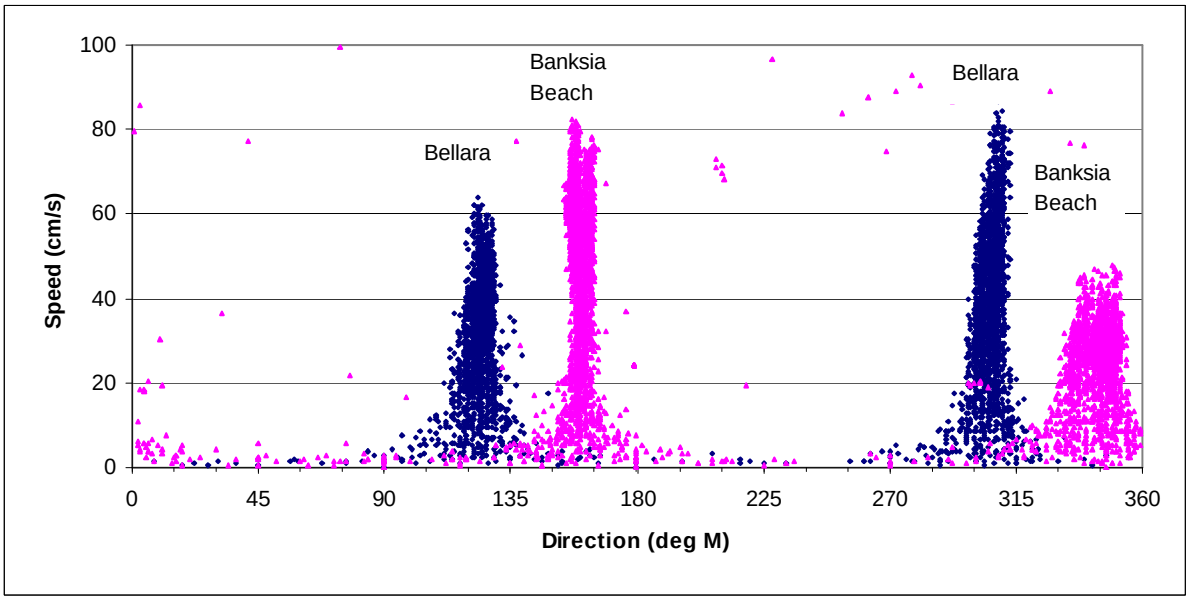


Figure 20. Tidal speed versus direction for all of the data collected at the two sites.

4.2. Wave measurements

The wave conditions within Pumicestone Passage are generally very limited due to the protection afforded by the mainland and Bribie Island. Waves within the passage are comprised of low energy locally generated wind waves, and occasionally higher-energy waves propagated across Moreton Bay entering the passage from southerly directions.

During periods of south to south-easterly winds, considerable wave energy can propagate across Moreton Bay and into the southern section of Pumicestone Passage. Wave energy dissipates rapidly moving northward into the study area. At the northern end of Sylvan Beach the Passage alignment changes to a more north-south axis. Therefore, in the northern part of the study area wave conditions would be limited to local wind waves generated by winds in the south-west to north-west sectors.

4.2.1. Data collection and analysis

The two Interocean S4 current meters used to collect current data were also programmed to record wave data over a one-month period from 19 June 2001 to 19 July 2001. The recorded data enabled estimates of directional wave spectra to be calculated for three-hourly time steps over the recording period.

Standard wave parameters representing the recorded wave spectra were extracted from the data. Due to the generally low wave energy and the limitations of the current meter recording configuration only wave height and period parameters are reported. The depth of the current meters relative to the typical wave length of the incident waves did not allow realistic estimates of wave direction to be determined.

A summary of the wave data obtained from both locations is shown in Figures 21 and 22. In general terms, the recorded wave heights are very small and are close to the limit of resolution of the current meters. Given that the deployment consisted of a one-month record only, the recorded data does not allow any conclusions to be drawn on the local wave climate within the study area.

4.3. Aerial photography

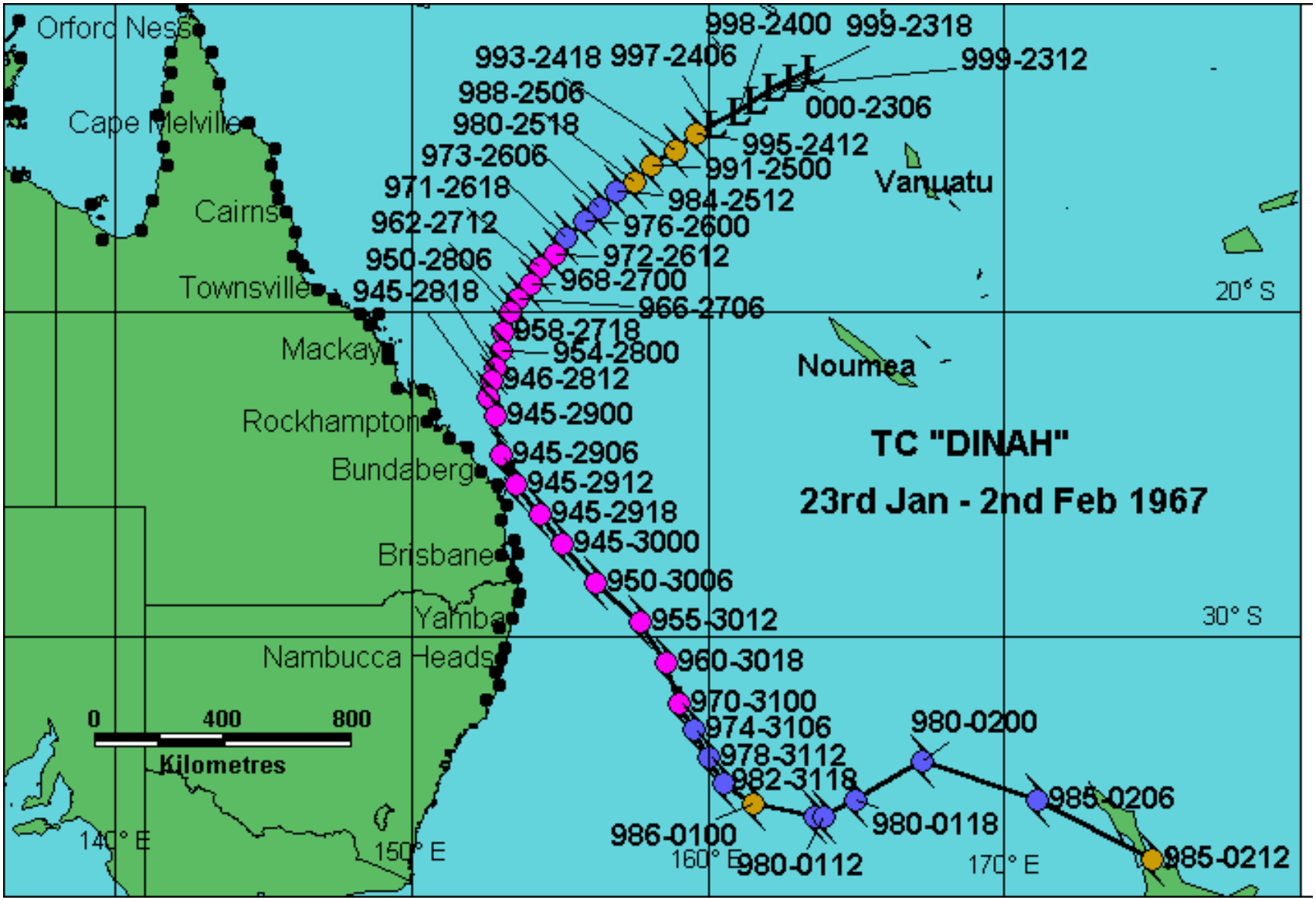
An aerial photograph from 1958 was sourced from the Department of Natural Resources and Mines to determine the state of the coastline at Banksia Beach and Sylvan Beaches before development (Figure 23) as shown on the most recent aerial photography taken in 1999 (Figure24). Aerial photography from 1975, 1982, 1990 and 1999 were rectified and the shorelines plotted and compared to determine the shoreline changes over this 24-year period. Figure 25 presents this photography from 1975, 1982 and 1990.

Aerial photography of the study area taken in 1999 was rectified following the methods outlined in Appendix B. To rectify the 1975, 1982 & 1990 aerial photography, a system known as photo-to-photo rectification was used. This process involved fixing the 1990 aerial photography to the 1999 rectified aerial photography, using stationary features common to each time series such as houses, roads, jetties and bridges. This process was repeated for the 1982 and 1975 photographs. Once all aerial photos in each time series were rectified, all the photos were joined to produce a mosaic for each year.

Spatially referenced data was then obtained from the 1975, 1982, 1990 and 1999 rectified mosaics. The shorelines for each time series were digitised from the rectified aerial photography to help determine coastal processes within the determined study area. Also captured were sand banks situated in Pumicestone Passage adjacent to the wreck offshore from Banksia Beach.

APPENDIX E

Cyclone Dinah Information – Bureau of Meteorology


Orford Ness
Cape Melville
Cairns
Townsville
Mackay
Rockhampton
Bundaberg
Brisbane
Yamba
Nambucca Heads
0
400
800
Kilometres
140° E
150° E
160° E
170° E
20° S
30° S
Vanuatu
Noumea
TC "DINAH"
23rd Jan - 2nd Feb 1967
998-2400
999-2318
999-2312
993-2418
997-2406
988-2506
980-2518
973-2606
971-2618
962-2712
950-2806
945-2818
000-2306
995-2412
991-2500
984-2512
976-2600
972-2612
968-2700
966-2706
958-2718
954-2800
946-2812
945-2900
945-2906
945-2912
945-2918
945-3000
950-3006
955-3012
960-3018
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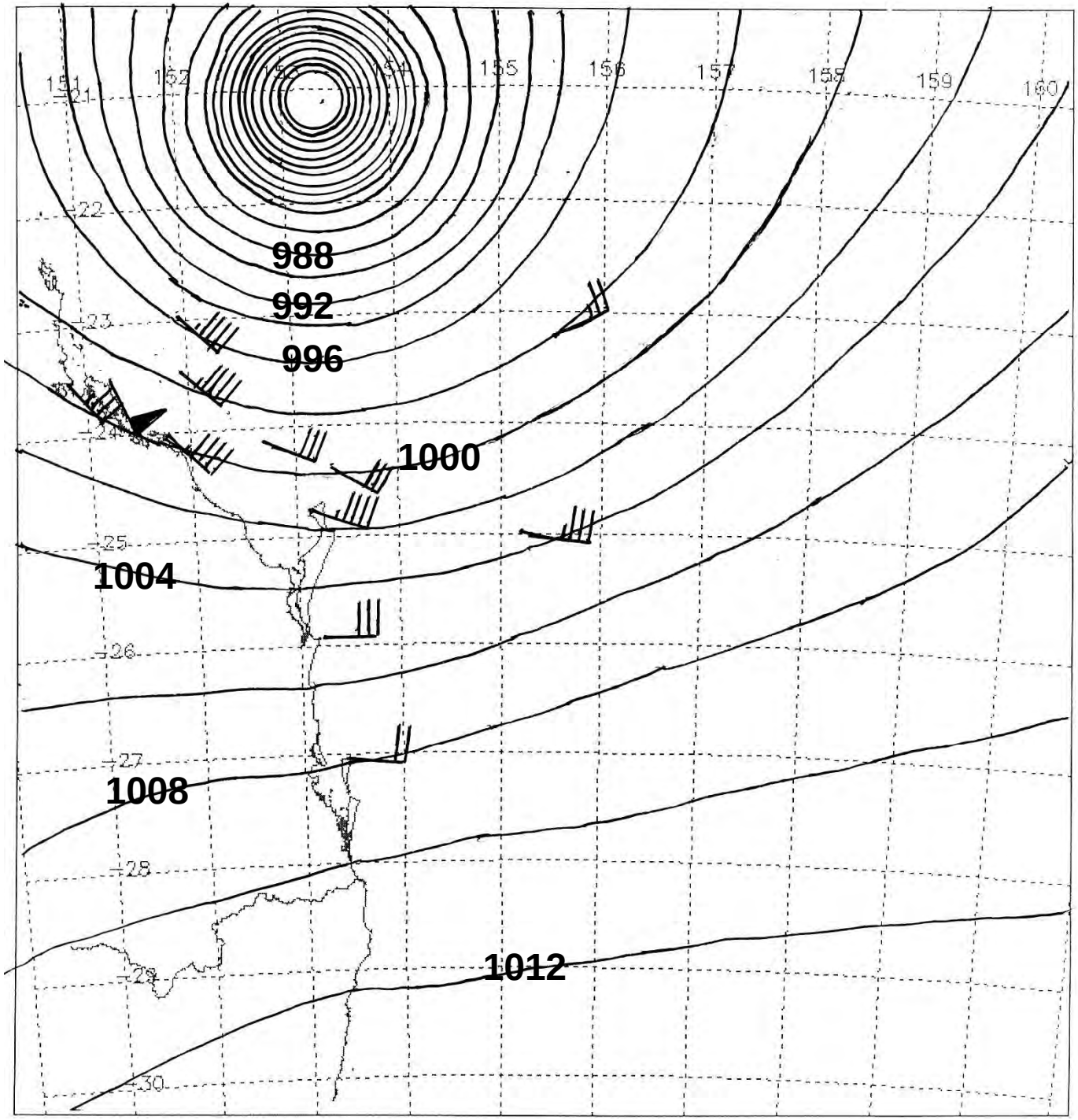
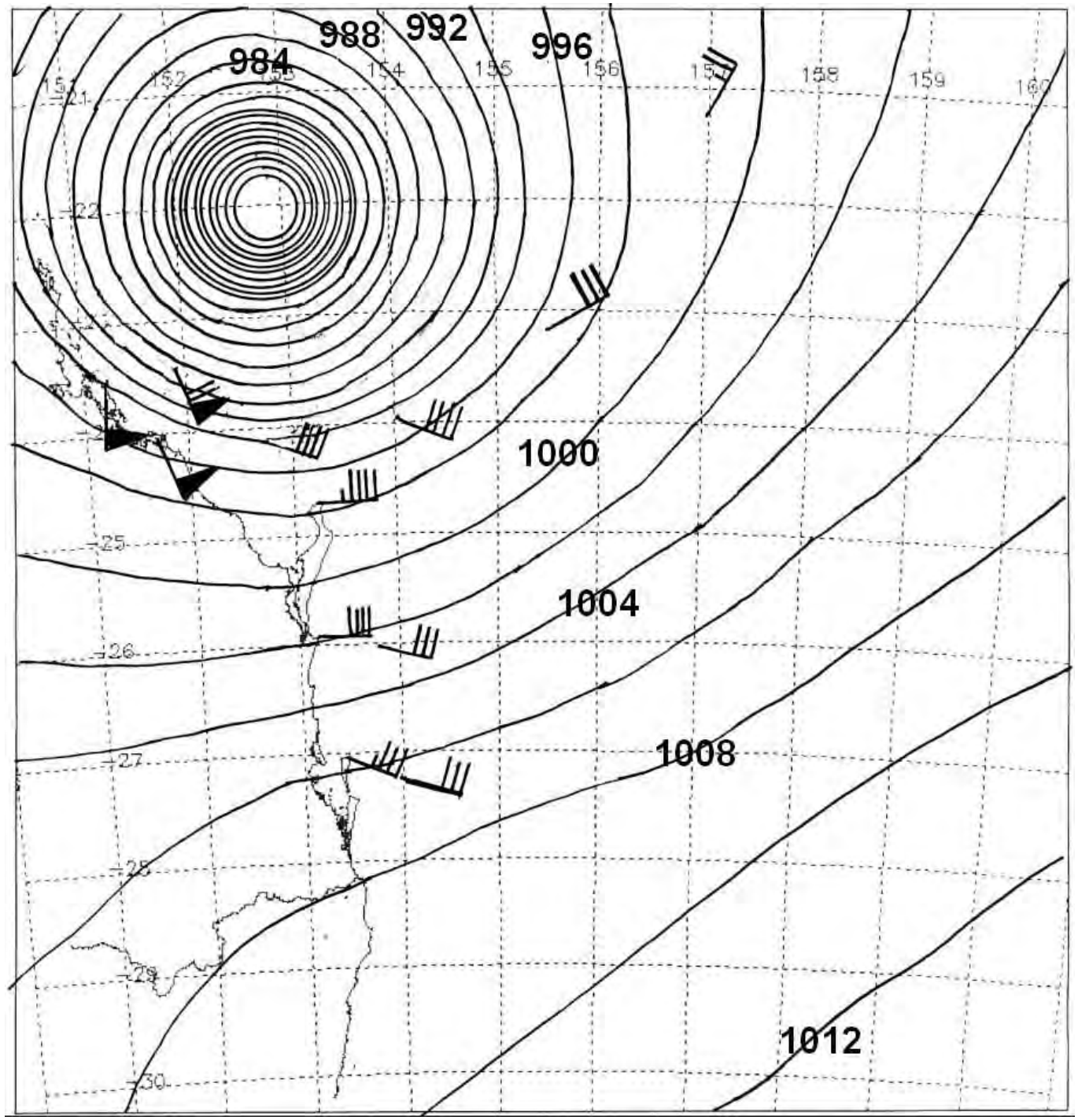
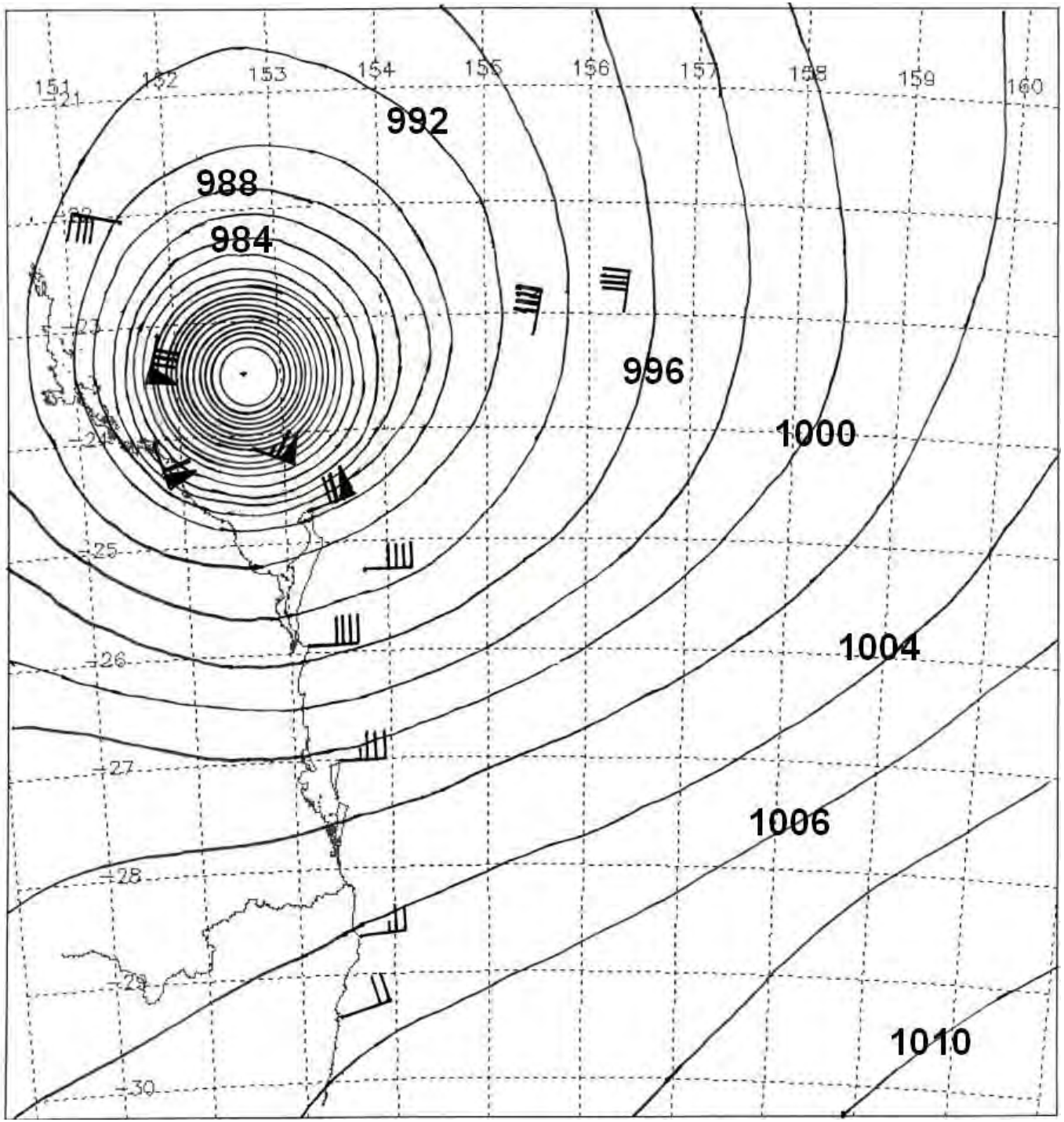
980-0112
985-0212



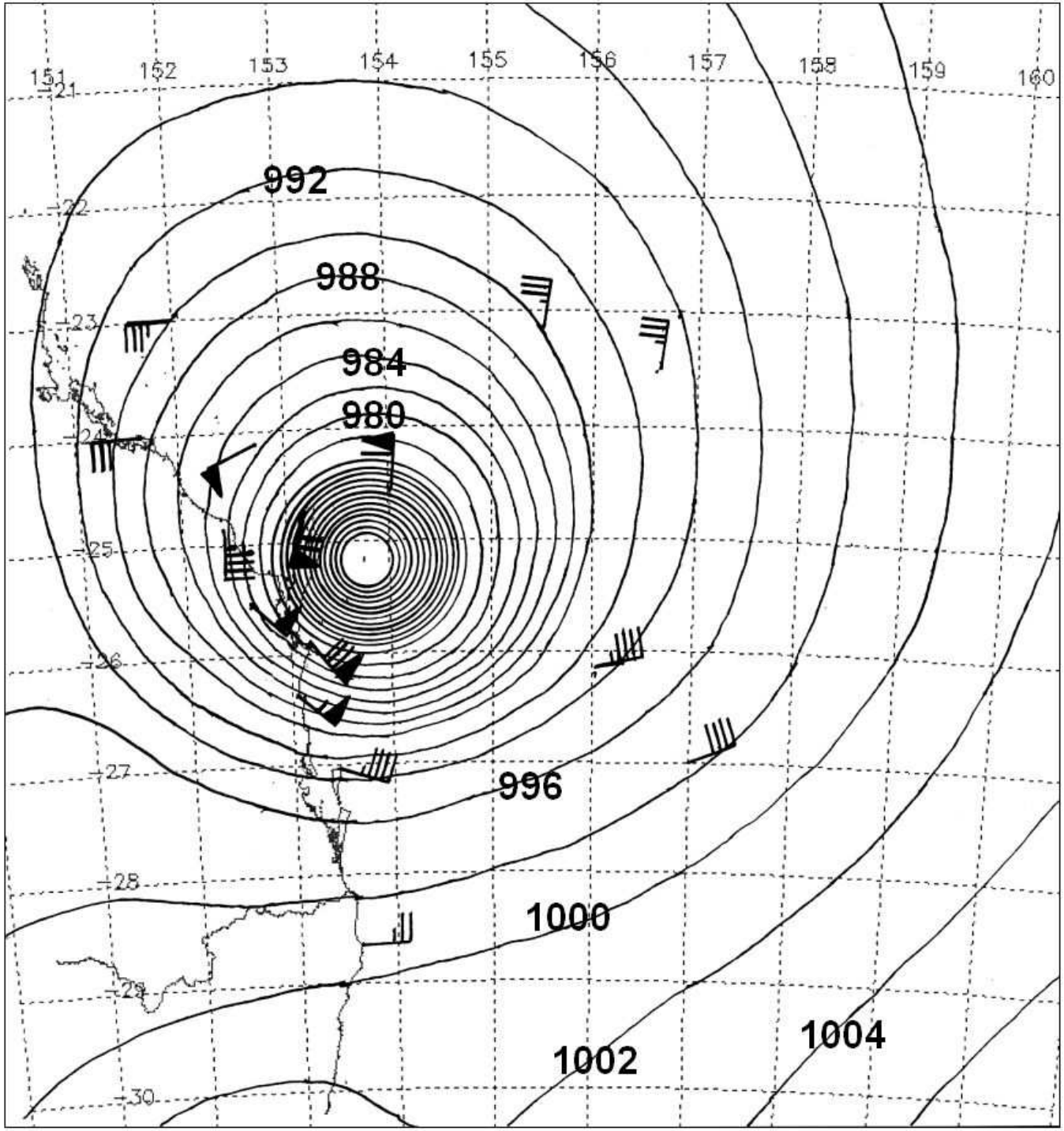
2300UTC
27/1/1967



1100UTC
28/1/1967

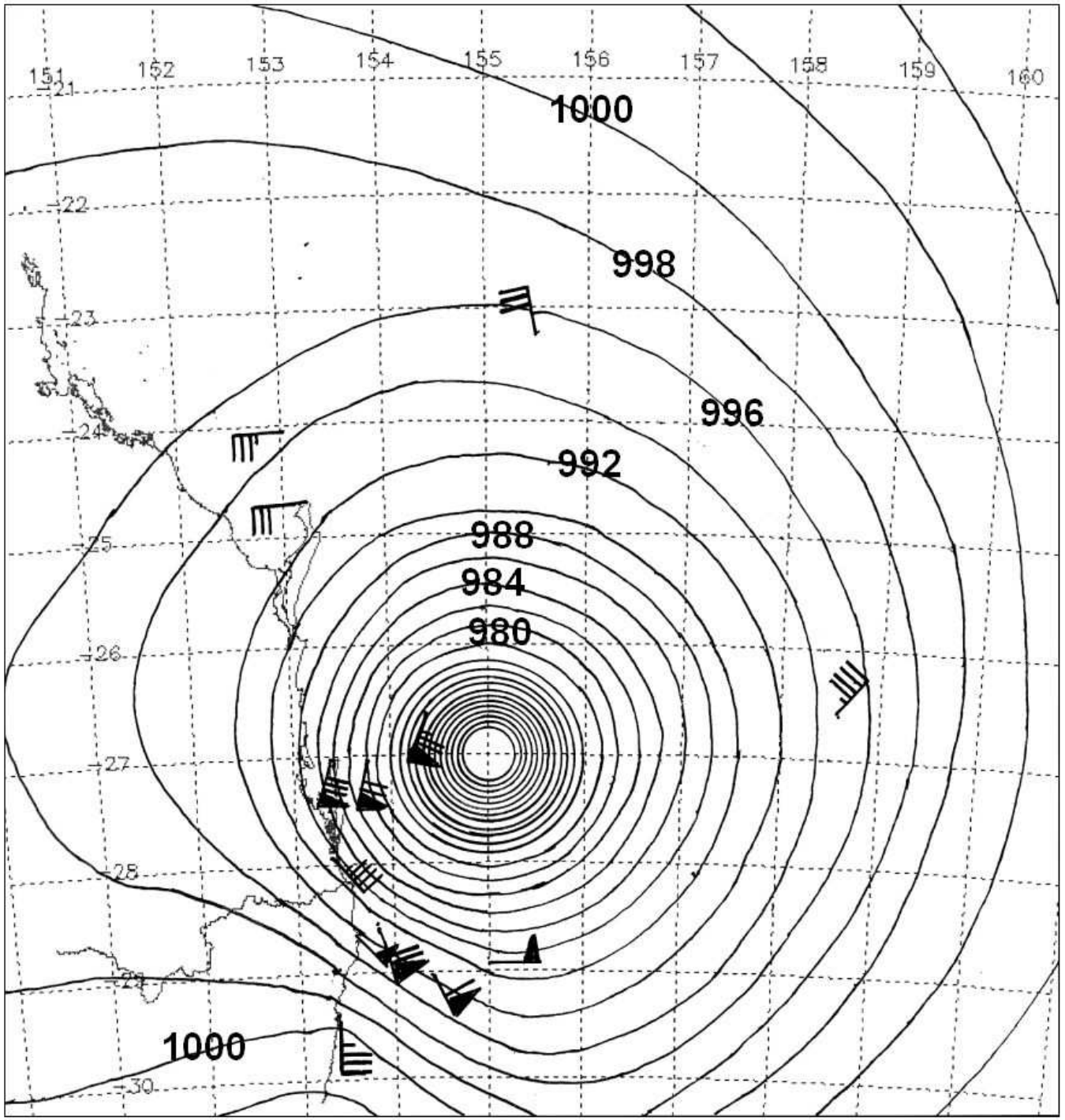


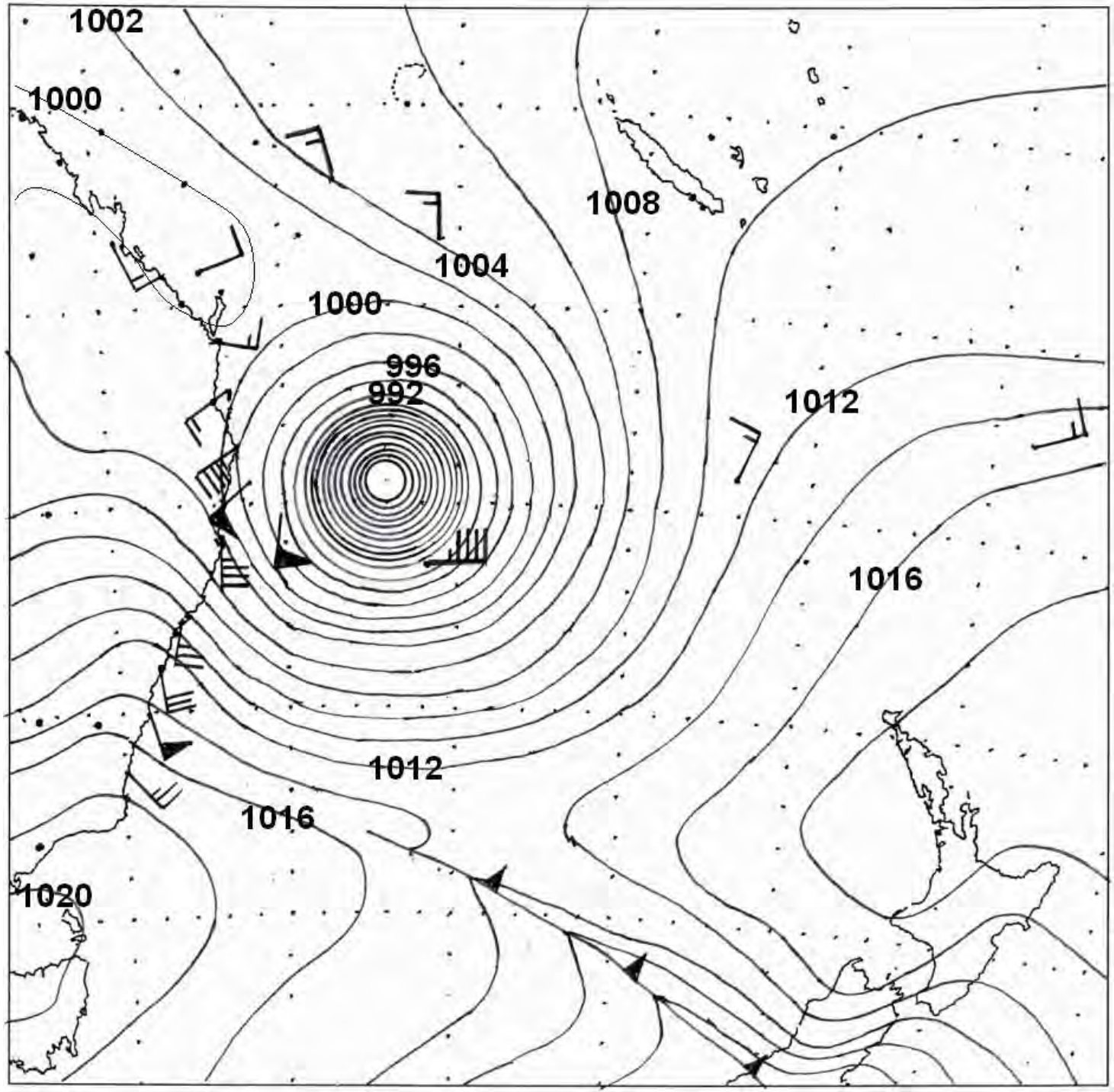
2300UTC
28/1/1967



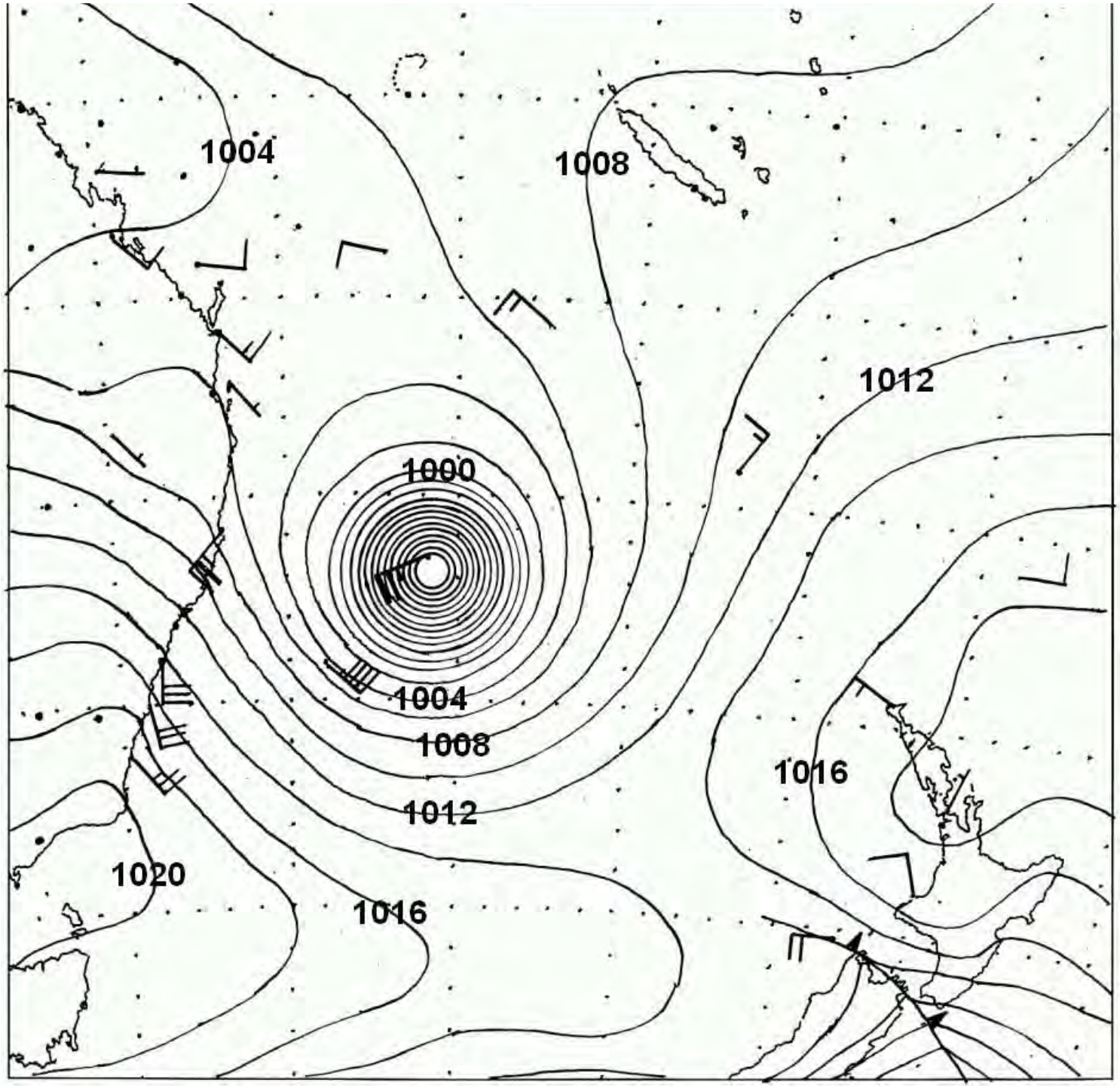
1100UTC
29/1/1967

2300UTC
29/1/1967

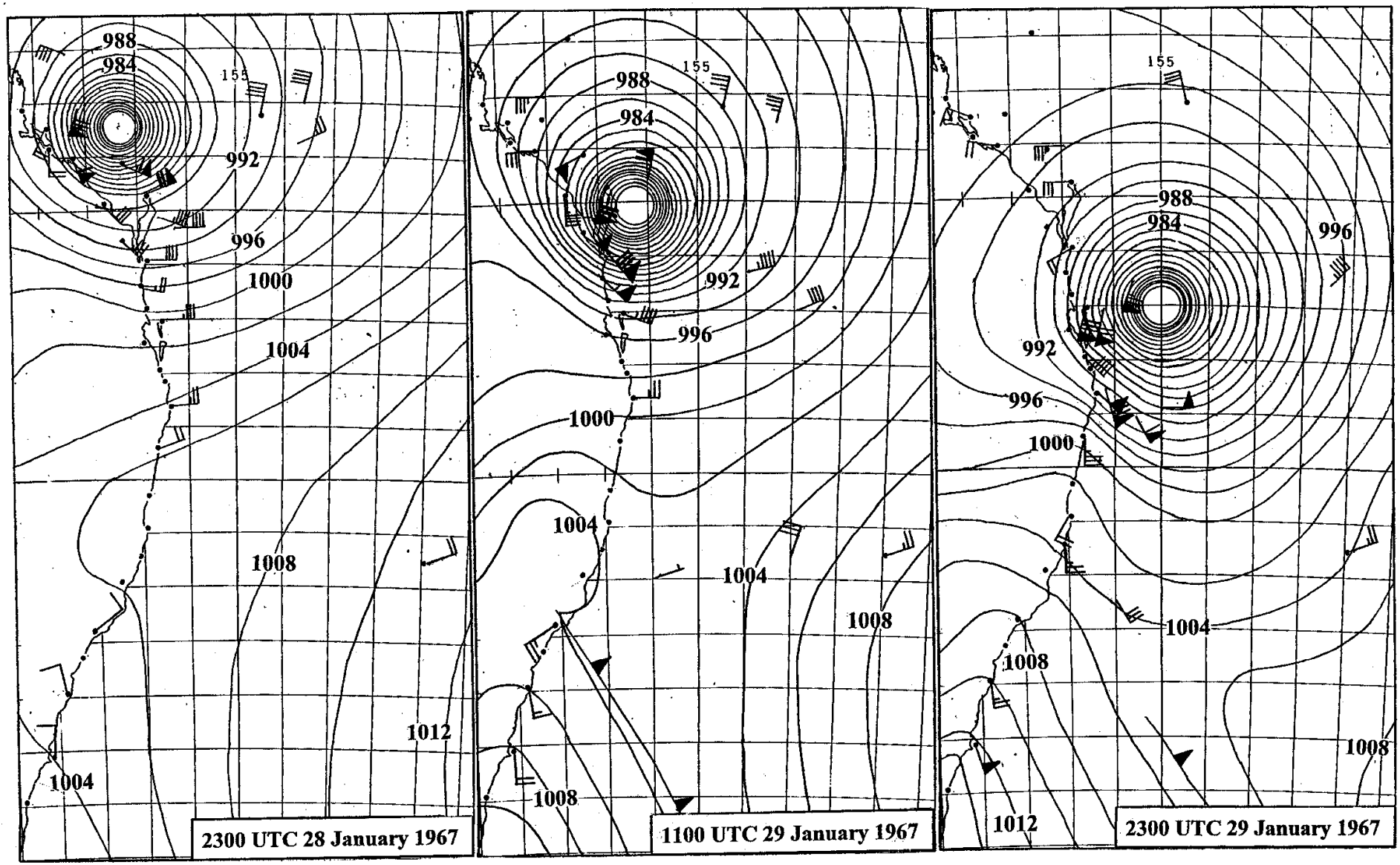




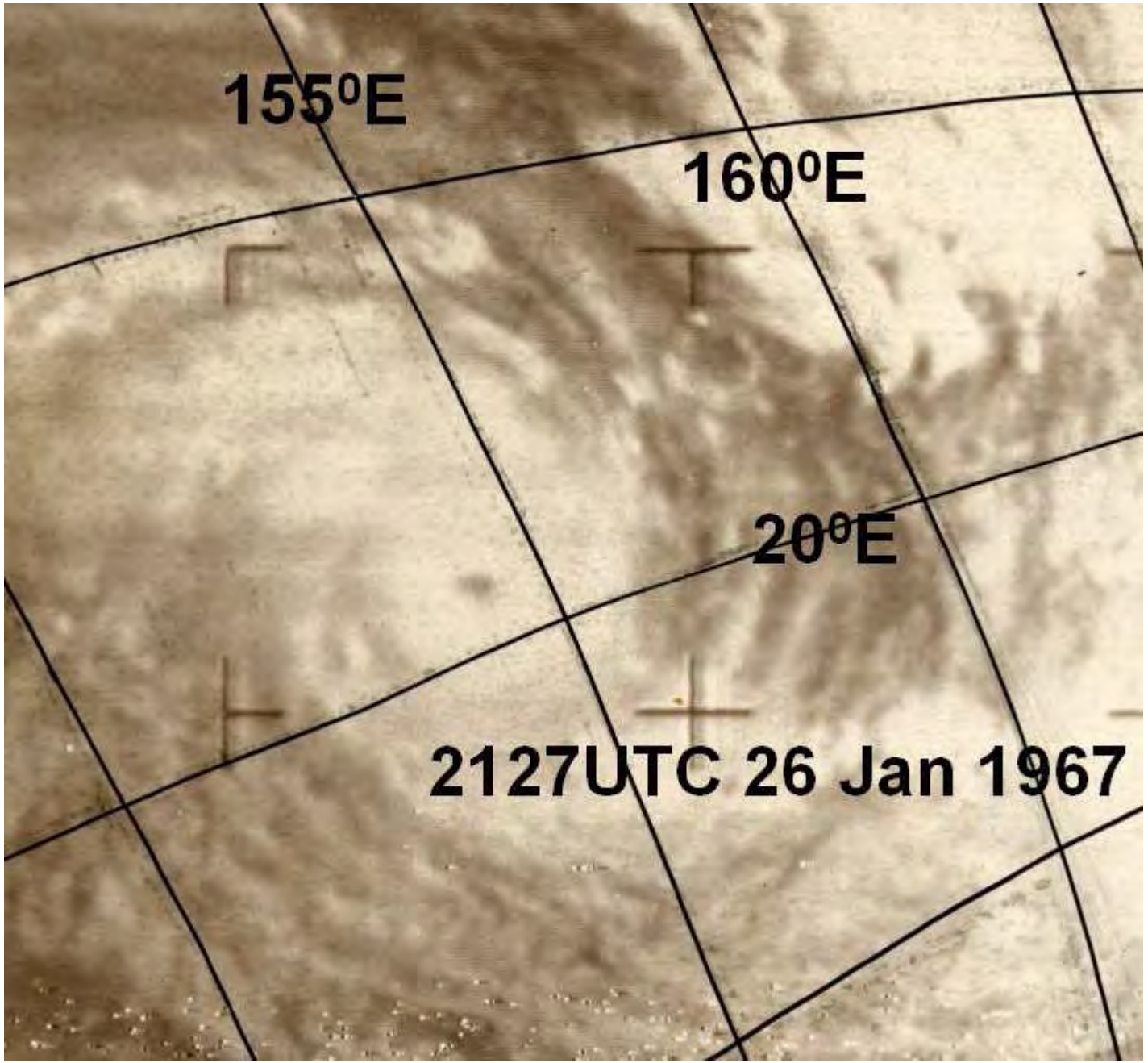
1100UTC
30/1/1967

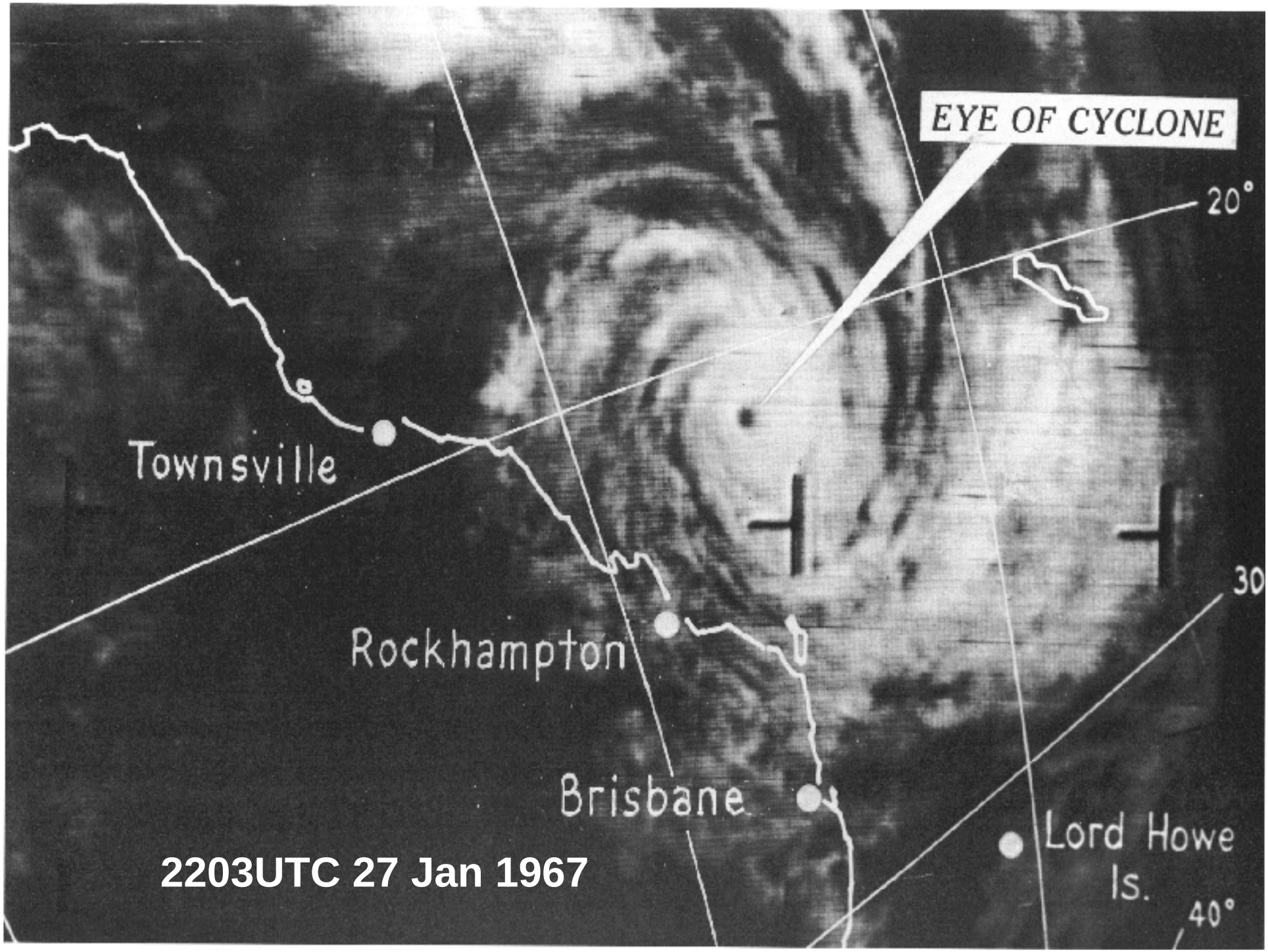


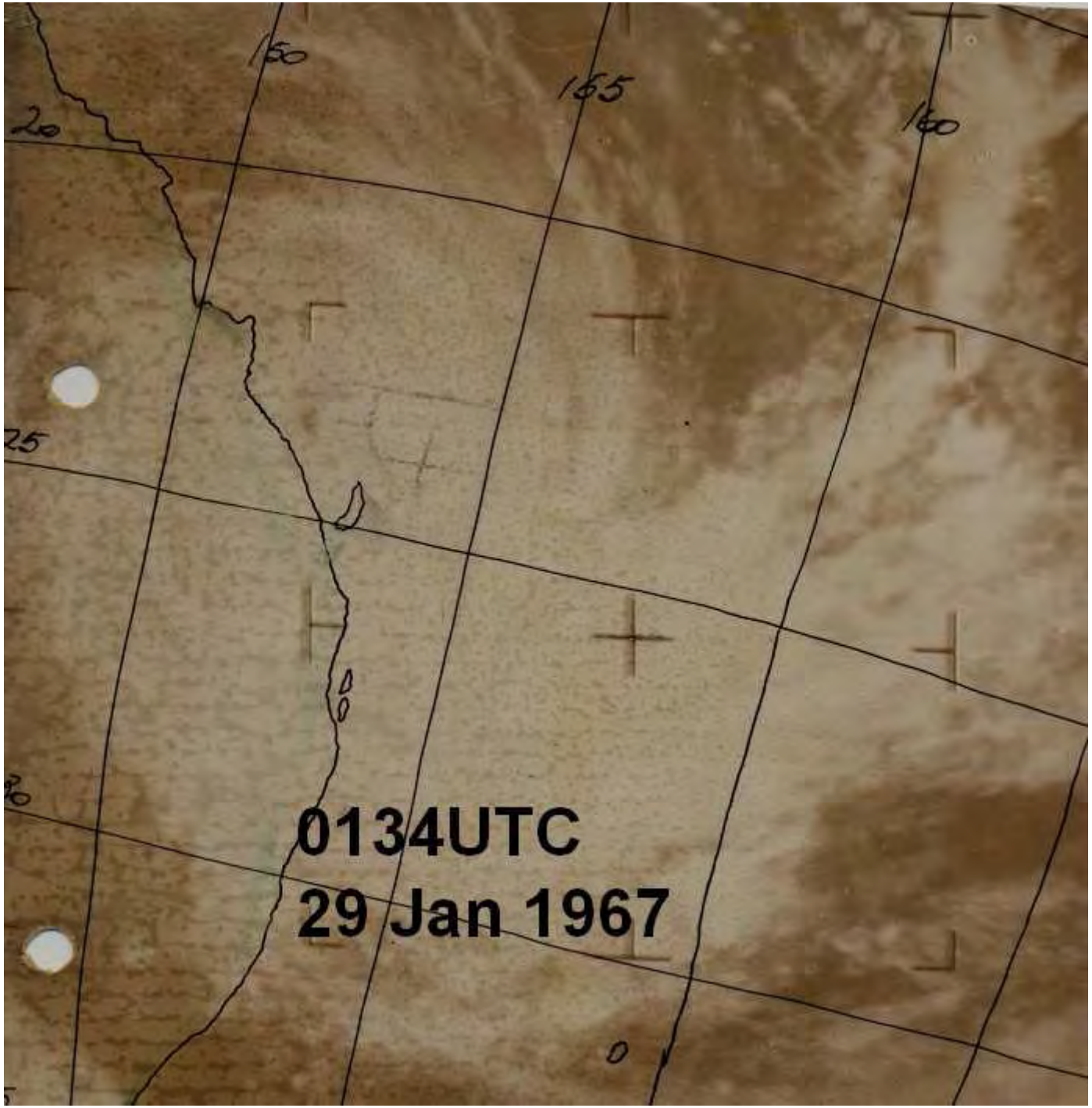
2300UTC
30/1/1967



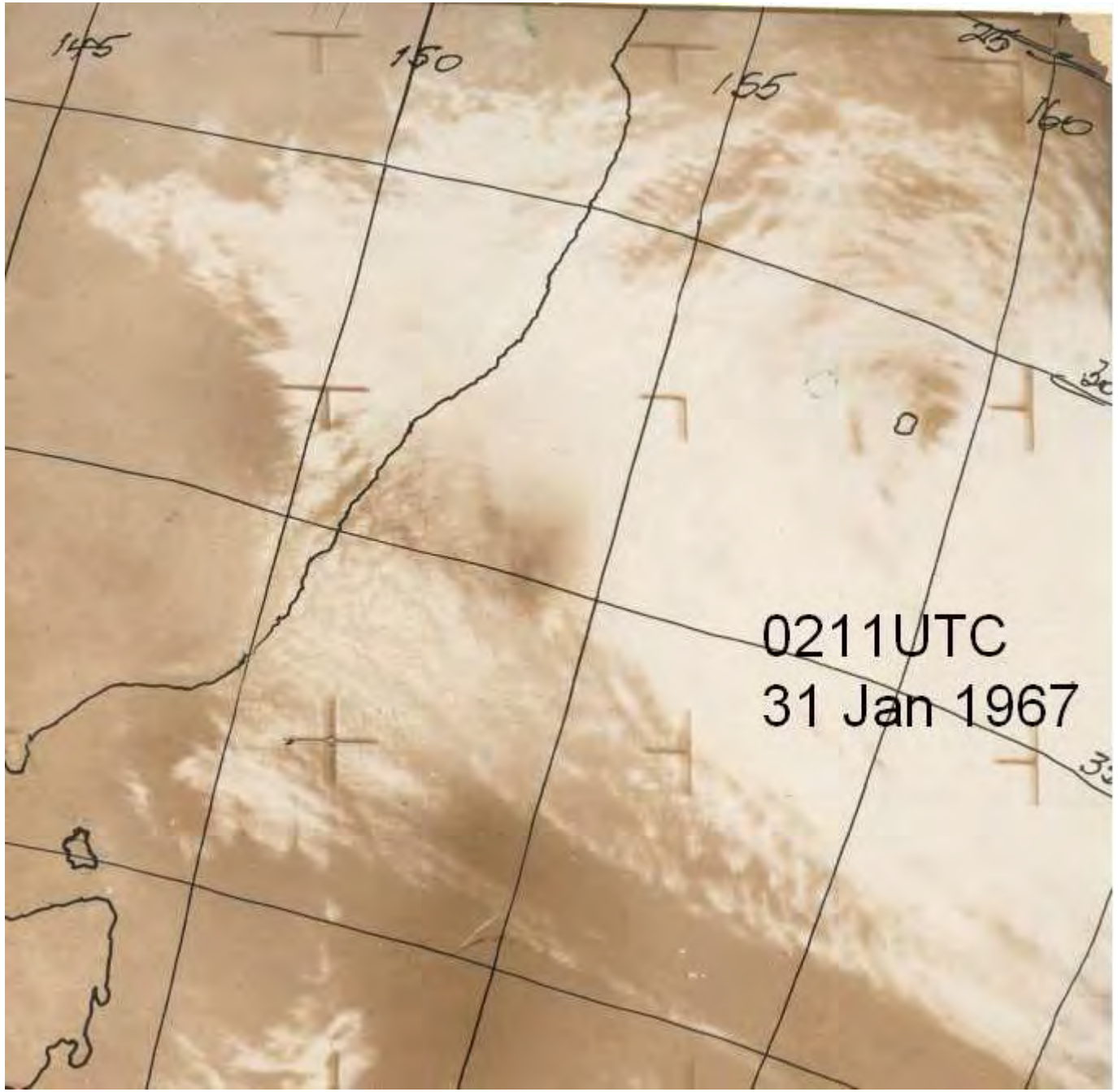
***Dinah* -Storm surge Gold Coast water reached about 1.5 metres above highest astronomical tide on the high tide around 0200UTC 30 January 1967.**

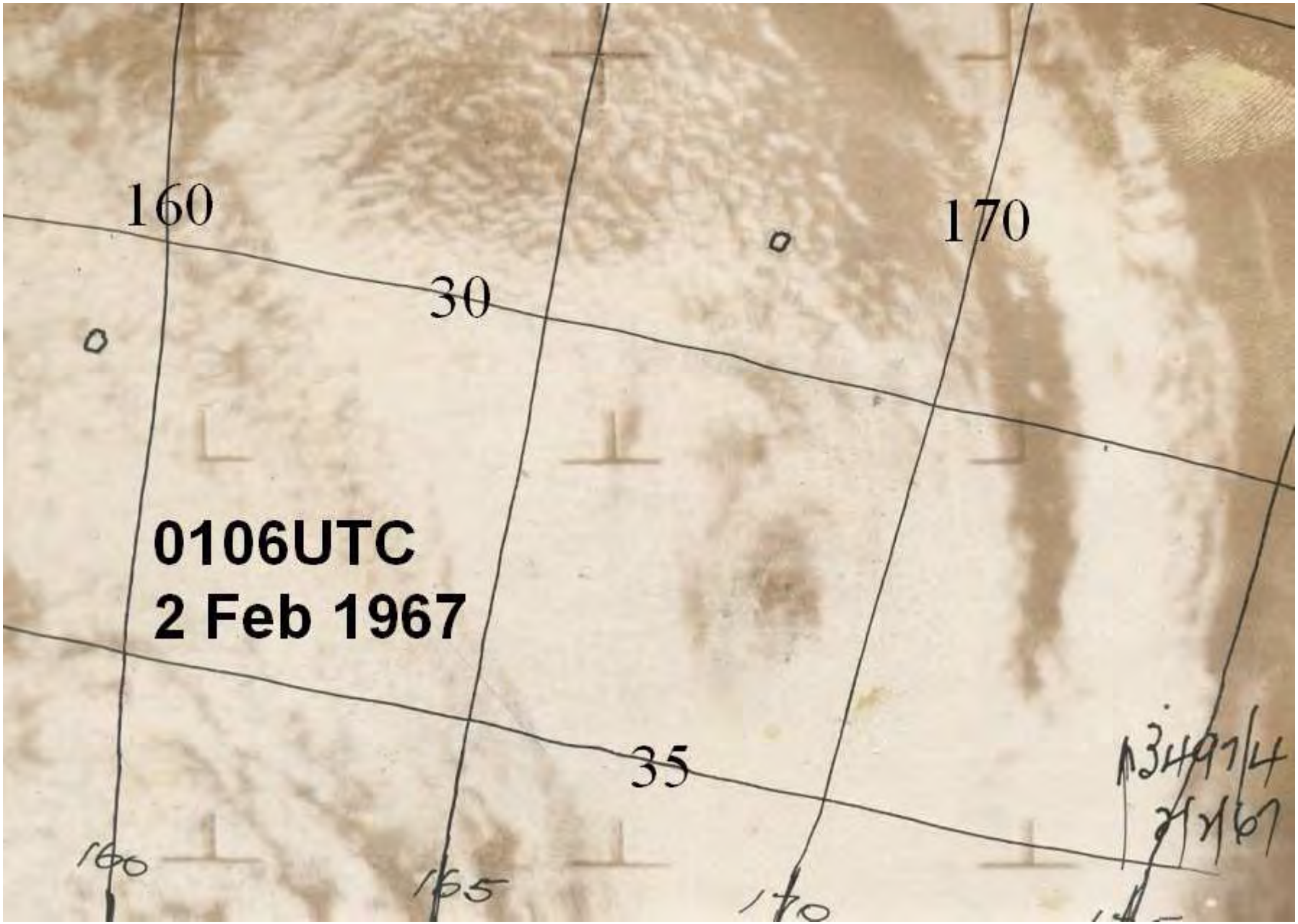

155°E
160°E
20°E
2127UTC 26 Jan 1967

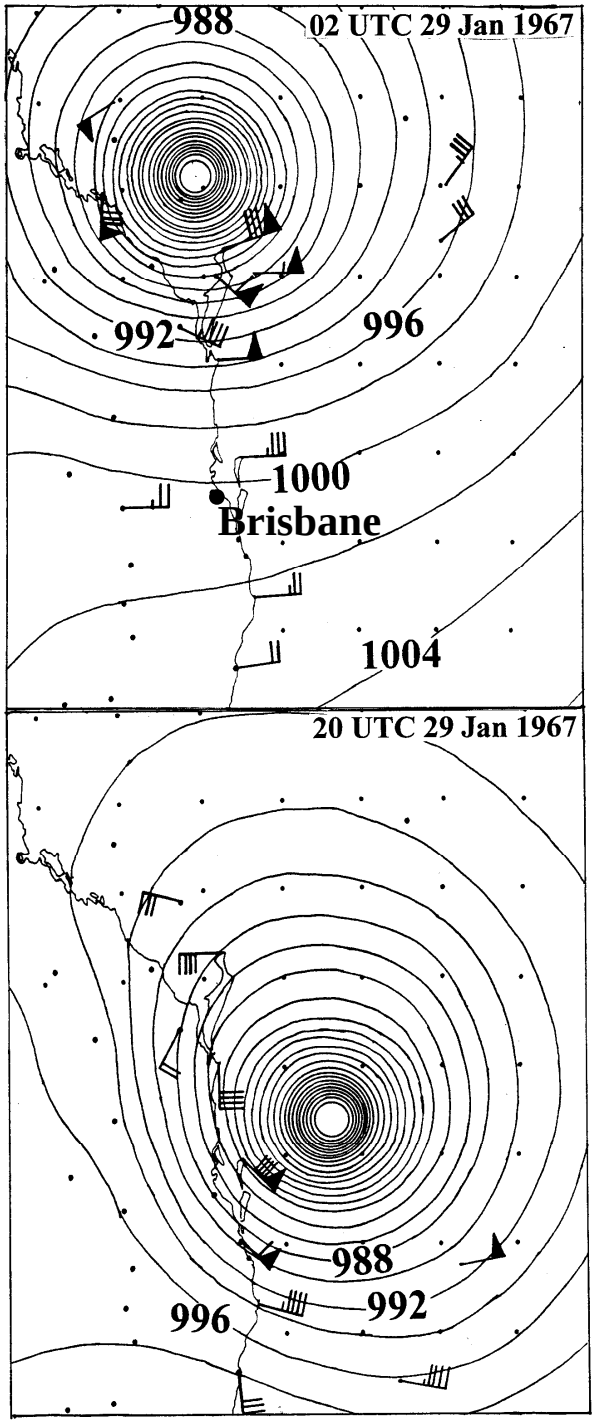

EYE OF CYCLONE
20°
Townsville
Rockhampton
30
Brisbane
Lord Howe
Is.
40°
2203UTC 27 Jan 1967


150
165
160
20
25
0134UTC
29 Jan 1967

2329UTC 29 January 1967
embedded eye east of Brisbane

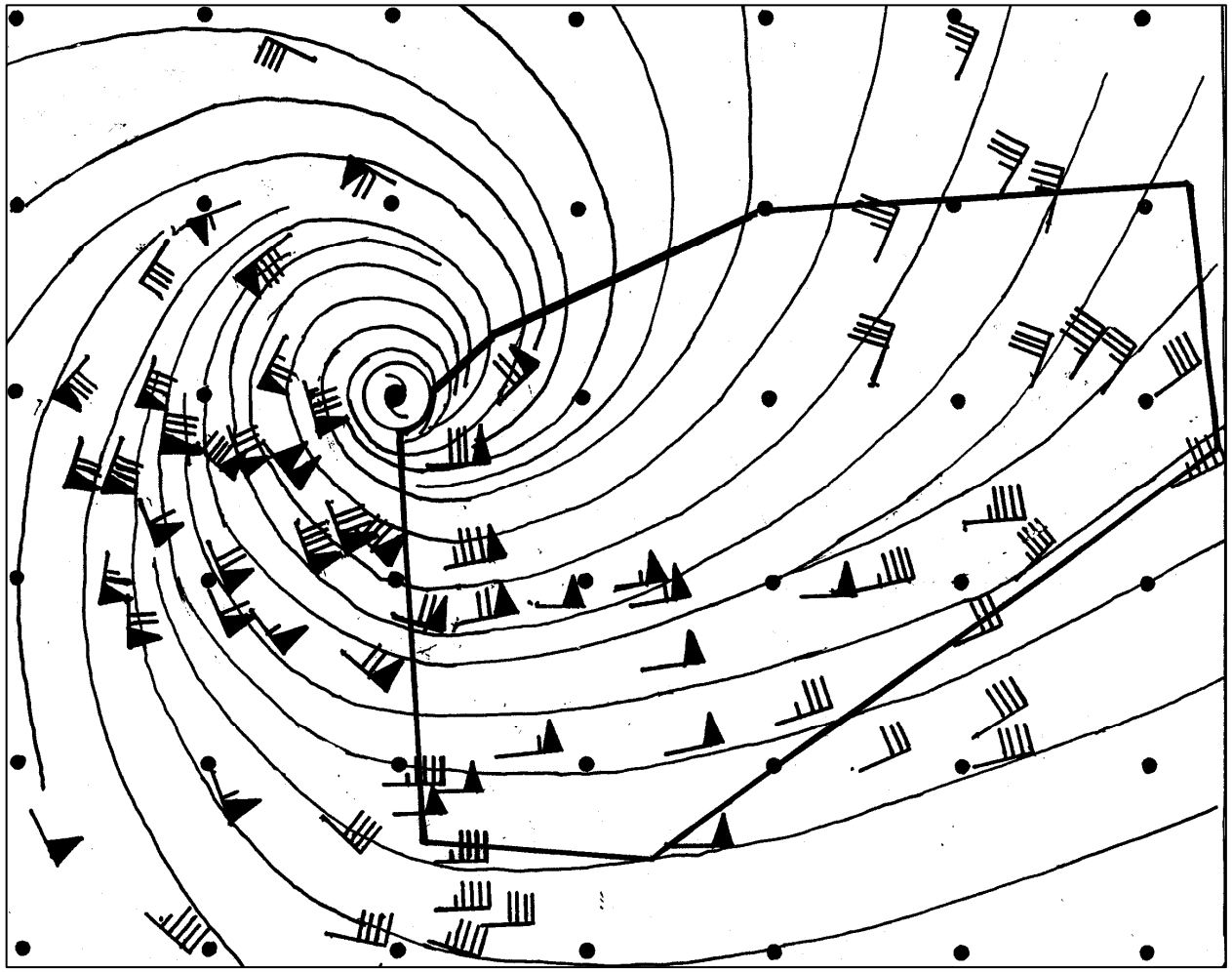

145
150
155
160
0211UTC
31 Jan 1967


160
170
30
35
0106UTC
2 Feb 1967



Tropical cyclone *Dinah* recurved and passed over Sandy Cape which recorded a central pressure of 944.8 hPa. The lighthouse keeper stated ‘ High seas together with very high tides brought the sea level up to within 20 feet of the boatshed, approximately 30 feet higher than usual’

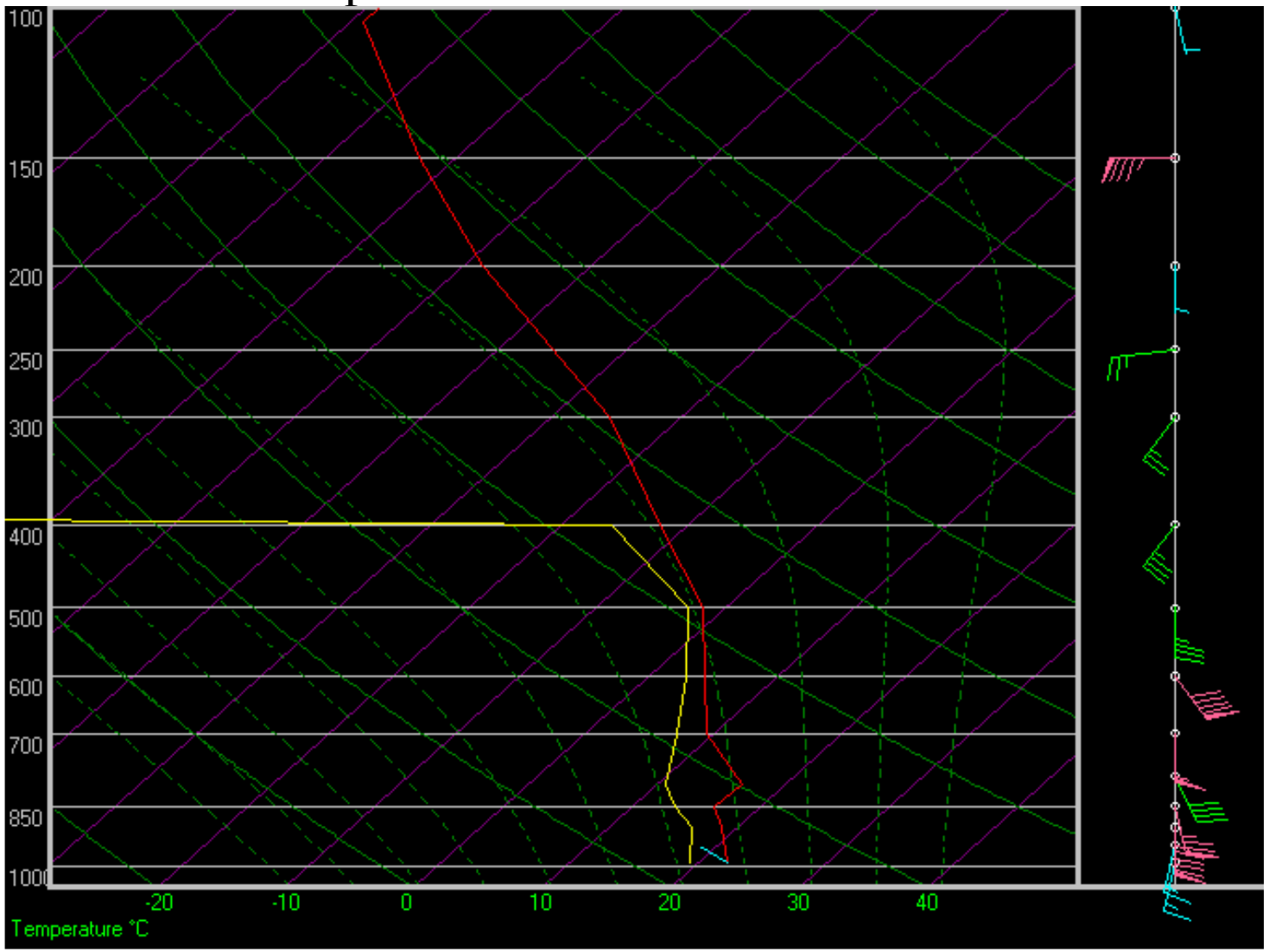
Storm surge flooded the flats behind Double Island Point to 2 metres depth and storm surge inundated cane farms and shops on the Sunshine Coast



Surface wind observations over 48h period from 2300UTC 28/1/1967 to 2300UTC 29/1/1967. Griding denotes one degree latitude and longitude spacing.

29/01/1967 23:00:00	500	180	35.0	-1.3	5710
29/01/1967 23:00:00	600	150	91.5	4.7	4230
29/01/1967 23:00:00	700	180	56.4	9.8	2950
29/01/1967 23:00:00	750	160	38.9		
29/01/1967 23:00:00	850	170	75.9	16.8	1310
29/01/1967 23:00:00	900	180	93.4	19.2	820

Brisbane Airport winds and sonde 2300UTC 29 Jan 1967



Storm surge effects from Dinah SEQ

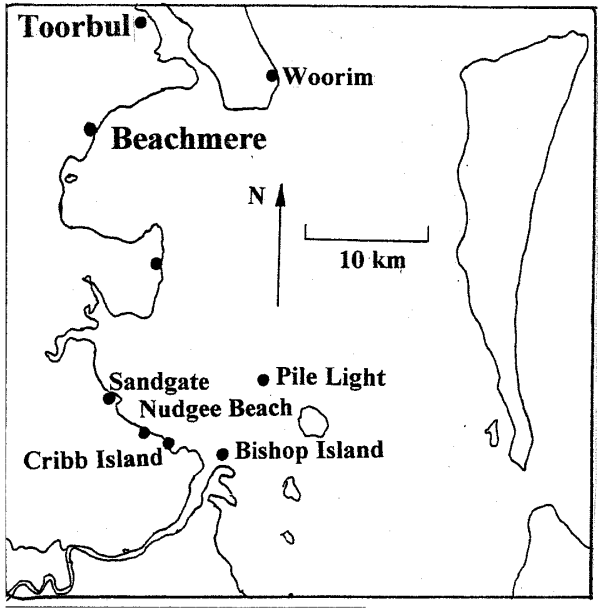
Storm surge inundated cane farms at Bli Bli and was knee deep in Hastings St Noosa. Around Sandgate seawater 1.5 metres deep came into houses. More than one hundred homes were flooded and at Cribb Island one house was washed into the sea.
Storm surge also affected the Gold Coast and water lapped the decking of the Jubilee Bridge which is about 1.5 metres above highest astronomical tide. A similar storm occurred on the Tweed River isolating Fingal. A section of the esplanade collapsed at Surfers Paradise

Storm surge effects from Daisy SEQ

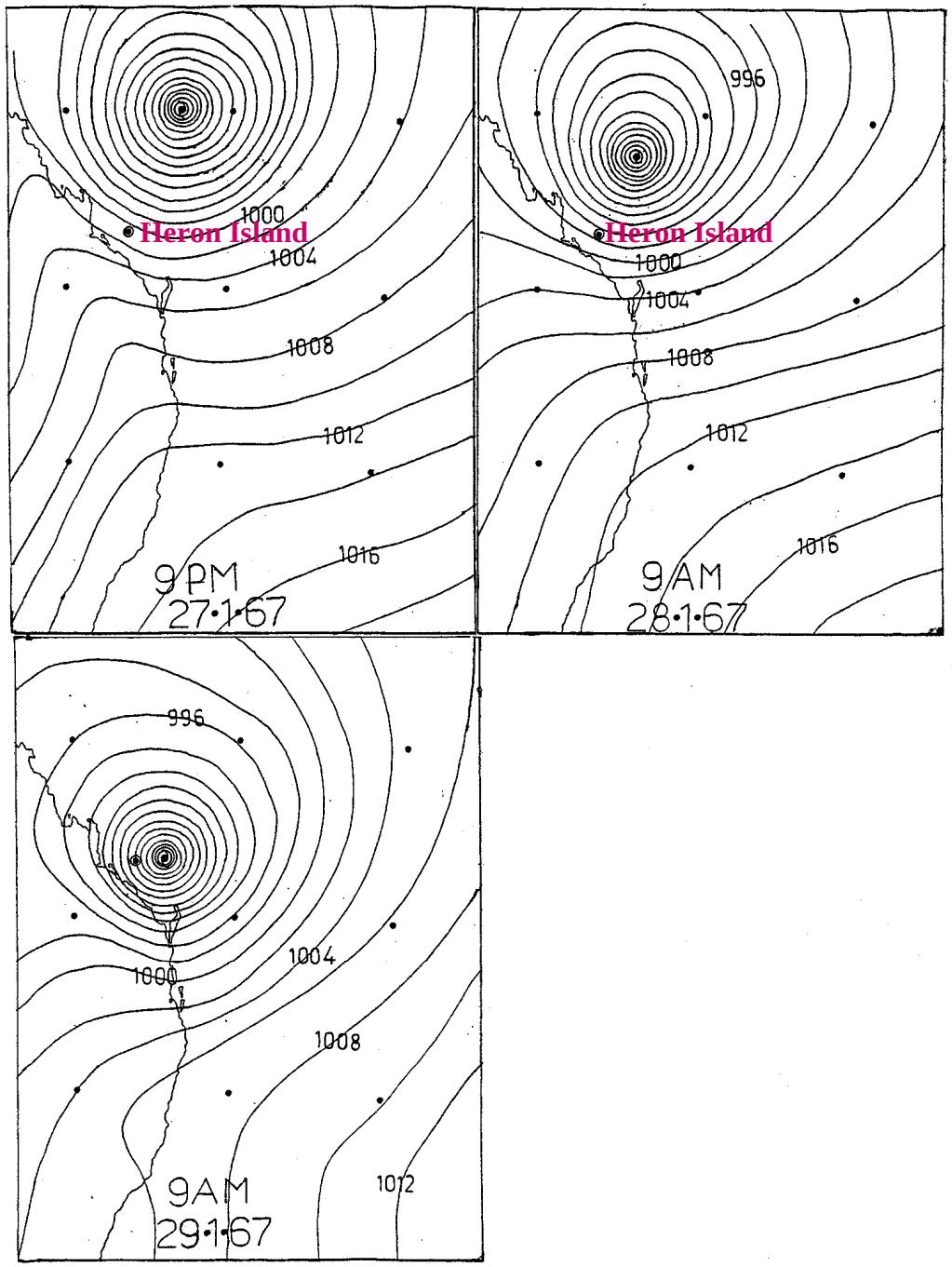
A noticeable storm surge at time of high tide was observed at; Sandy Cape, North Stradbroke, Woorim, Coolum, Tangalooma, Torquay, Sunshine Beach, and Brunswick Heads. At Tweeds Heads the surge brought high water an extra 2 ft (0.6 m) whilst Pumicestone reported a 2 ft 8in surge (0.8m).
A 10 foot (3m) surge was reported on the western side of Fraser Island

Around Moreton Bay the worst inundation from the sea were felt at the high tide around 0200 UTC 29 January 1967. The area from Sandgate to Cribb Island was flooded when wave run up overtopped seawalls and dunes. This brought water up to 1.5 metres deep into some houses. More than one hundred homes were flooded and at Cribb Island one house was washed into the sea while several others were nearly lost. At Cribb Island the water rose over man made barriers 2 metres high. In 1967 tide readings in Moreton Bay were taken at the West Inner Beacon which was located about two hundred metres west of Bishop Island. The tide levels as Dinah passed reached a maximum of only 0.46 metres above predicted levels and this occurred at 0900 UTC 29 January 1967. This was near low tide and hours after the worst inundation. Therefore a seiche appears to be the chief cause of inundation rather than a general rise in sea level over the whole bay.

Observations from the *Eastern Moon* sheltered near the Pile Light indicated that at the time of maximum inundation 1.2 metre waves and 12.5 ms^{-1} winds were being directed towards Sandgate. After this the winds and waves approached from a southeasterly direction, which was parallel to the coast near Sandgate. The strongest winds reported from the ship were at 2000 UTC 29 January 1967 when they reached near hurricane force. By this time the direction had turned southerly and were causing serious inundation and cutting roads around Toorbul in the far northern end of *the Bay*.



Wind								
Wave height (metres)	1.2	1.2	1.5	2.5	2.1	2.5	3.1	3.1
Wave direction								
Time UTC	00	03	06	09	12	15	18	21



Dinah approaching Heron Island

APPENDIX F

March 2004 Storm Event – Queensland EPA

APPENDIX G

Irish J.L., Canizares R., Grosskopf W.G. and Williams B.P. (2004) "The Effect of Hindcasted Waves on Coastal Storm Water Levels During the Blizzard of 2003". *Proceedings of the 8th International Workshop on Wave Hindcasting and Forecasting*

THE EFFECT OF HINDCASTED WAVES ON COASTAL STORM WATER LEVELS DURING THE BLIZZARD OF 2003

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New York, New York, USA

Rafael Cañizares
Moffatt and Nichol
New York, New York, USA

William G. Grosskopf
Offshore and Coastal Technologies, Inc. – East Coast
Chadds Ford, Pennsylvania USA

and

Brian P. Williams
US Army Corps of Engineers New York District
New York, New York, USA

1. INTRODUCTION

A shore protection and storm damage reduction study for the south shore of Long Island, New York, USA, from Fire Island Inlet to Montauk Point is being conducted by the U.S. Army Corps of Engineers. The study area includes the barrier islands, Atlantic Ocean shorelines, and adjacent back bays. These low-lying areas are subject to flooding by tropical and extratropical storm surge from the Atlantic Ocean, surge propagation through tidal inlets, wave setup and runup, and barrier island overwash and breaching. By using meteorological hindcasts and coupling hydrodynamic, wave, and sediment transport models, accurate storm surge levels can be calculated throughout the study area.

This paper discusses the application and performance of hindcasted wind fields and wave models to simulate ocean wave setup and its impact on back-bay water levels during storm events by presenting model simulations and measurements from the blizzard of 2003.

2. STUDY AREA

The project area is located entirely in Suffolk County, Long Island, along the Atlantic and the bay shores of the towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton (Figure 1). The overall study area is approximately 135 km long and includes three large estuarial bays: Great South Bay (connected to the ocean by Fire Island Inlet), Moriches Bay (connected to the ocean by Moriches Inlet), and Shinnecock Bay (connected to the ocean by Shinnecock Inlet). The westernmost portion of the overall study area, the Nassau/Suffolk County border at Great South Bay, is located about 75 km east of The Battery, in New York City.

3. STORM SURGE MODELING METHODOLOGY

Coastal storm water levels are governed by a number of complex physical processes: wind conditions, barometric pressure, astronomic tide, wave conditions, and morphologic response. The numerical modeling strategy for this study addresses all of these processes by combining a number of numerical models, some with external communication and others with integrated dynamic communication. The strategy also employs state-of-the-art meteorological methods. Figure 2 illustrates the complexity of the numerical modeling strategy. The numerical models and methods used to simulate storm water levels resulting from ocean stage, wave setup, surge propagation

Figure 1. Study area.

through the tidal inlets into the bays, and localized wind setup are*:

- Planetary Boundary Layer model (PBL)
- Interactive Kinematic Objective Analysis (IKOA)
- ADvanced CIRCulation model (ADCIRC)
- WISWAVE
- DELFT3D-FLOW
- DELFT3D-WAVE (HISWA)

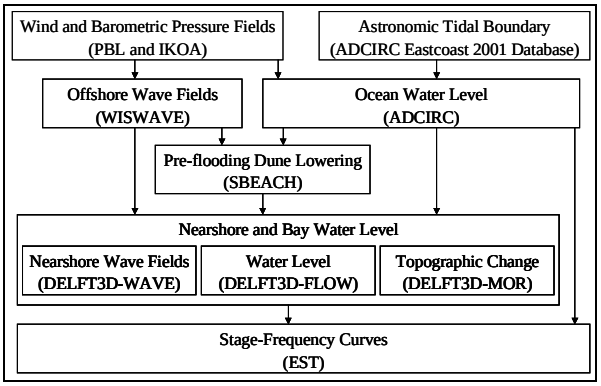

Figure 2. Modeling strategy.

* The impact of morphological response on storm water levels is beyond the scope of this paper. See Cañizares *et al.* (in press) for a discussion of morphological impacts on storm water levels for this study.

3.1 Meteorological Forcing

For this study, Oceanweather, Inc developed meteorological forcing for 37 tropical and extratropical storms. Tropical wind velocity fields, 10-m above the water surface, and barometric pressure fields were developed using PBL, a tropical cyclone model (Thompson and Cardone, 1996). PBL describes the vortex pressure field using existing historical information on storm track, scale radius of the storm radial pressure profile, and other parameters.

Storm tracks and initial estimates of intensity of an historical North Atlantic basin tropical storm to be analyzed were taken, with some modification, from the NOAA Tropical Prediction Center's database (Jarvinen *et al.*, 1984). Surface winds generated from PBL are then imported into a graphical interface at 6-hourly intervals and evaluated against available surface data and aircraft reconnaissance wind observations adjusted to the surface as described by Powell and Black (1989). This process is iterated until a solution for the surface wind fields that is most consistent with all of the available data is achieved. The final wind field is this best fit model solution.

Wind fields, 10-m above the water surface, for extratropical storm events were developed using IKOA. The benefits of IKOA enhancement to the performance of ocean response modeling over wind fields produced by strictly automated methods for extratropical storms are well established (e.g., Cardone *et al.*, 1995). The IKOA starts from a first-guess

background wind field and then proceeds to assimilate observations of surface winds from ships, buoys, coastal stations, and remote sensing sources. If available, background winds were taken from the AES40 hindcast (Swail and Cox, 1999).

For extratropical events, barometric pressure fields were taken directly from NOAA's NCEP (National Center for Environmental Prediction) database (www.ncep.noaa.gov).

Tropical and extratropical wind and pressure fields were produced on a grid domain extending from 30° N to 47° N and from 64° W to 82° W to capture far-field surge and wave field generation (Figure 3). Wind fields were reported at a grid spacing of 0.0625° latitude by 0.0625° longitude (about 7 km) and 0.625° latitude by 0.833° longitude, for tropical and extratropical events respectively. Temporal resolution for tropical and extratropical events was 30 minutes and 3 hours, respectively.

No land effects were considered during wind field development. Therefore, a 30 percent reduction in wind speed for all offshore-directed winds in nearshore areas was adopted for this study (Resio, personal communications).

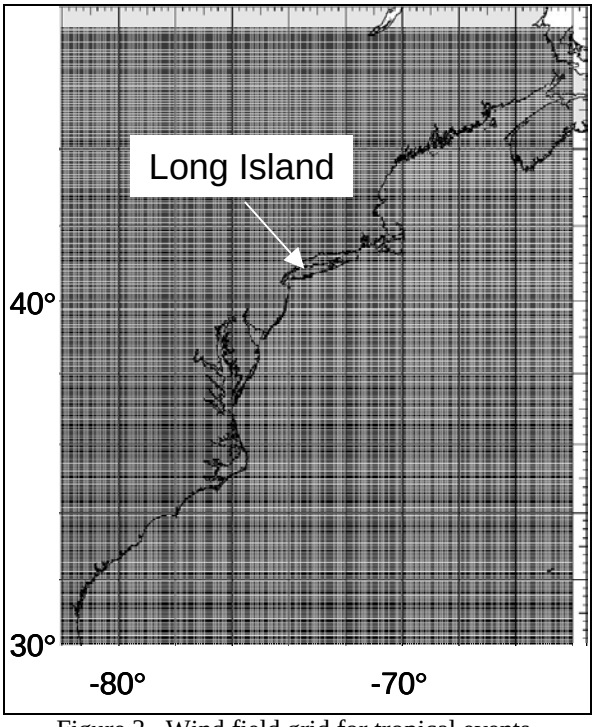

Figure 3. Wind field grid for tropical events.

3.2 Offshore Hydrodynamic Modeling

Using ADCIRC, ocean and nearshore, outside the surf zone, storm water levels for this study were simulated by the US Army Corps of Engineers and Coastal Analysis LLC (Luettich *et al.*, 1992; Irish *et al.*, in press). ADCIRC is a long-wave hydrodynamic numerical model that simulates water surface elevations and currents from astronomic tides, wind, and barometric pressure by solving the two-dimensional, depth-integrated momentum and continuity equations.

The ADCIRC model's finite-element grid is presented in Figure 4. Grid resolution varies from very coarse at the open ocean boundaries to 50-m in some nearshore locations. ADCIRC was forced with the hindcasted storm wind and barometric pressure fields to capture meteorological effects on water levels. ADCIRC was also forced with astronomic tidal constituents from the ADCIRC East Coast 2001 Tidal Constituent Database for seven main tidal constituents (Mukai *et al.*, 2002). Water level time series were output, at 6-minute intervals, at 20-m depths offshore of the study area. These time series were used to force a nearshore hydrodynamic model, DELFT3D-FLOW (WL| Delft Hydraulics, 2001).

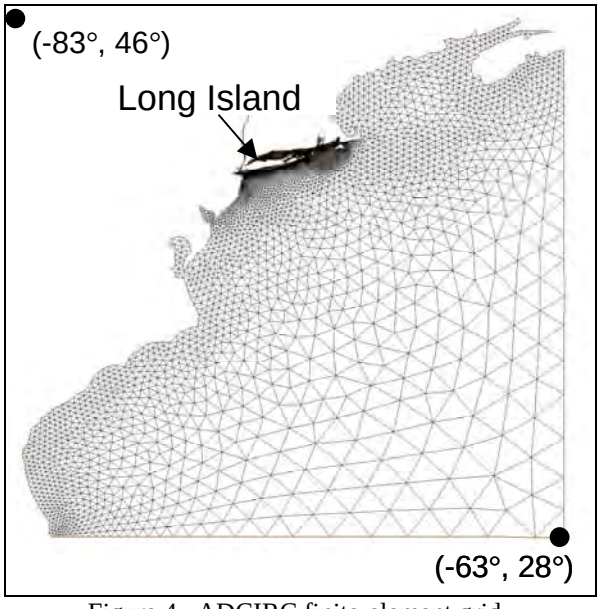

Figure 4. ADCIRC finite-element grid.

3.3 Offshore Wave Modeling

Offshore and Coastal Technologies, Inc, used WISWAVE (also WAVAD), a directional spectral, temporally sensitive wave model, to simulate bulk directional spectra, at hourly intervals, at 30-m depths (Resio and Perrie, 1989; Hubertz, 1992). WISWAVE solves the time-dependent wave action balance equation and simulates wave growth from wind following the combined Phillips and Miles mechanism. The model includes weak nonlinear wave-wave interaction and accounts for linear refraction, shoaling, and dissipation.

For this study, WISWAVE was forced with the hindcasted storm wind fields discussed in section 3.1. WISWAVE computed directional wave spectra using 15 frequency bands, 0.03 to 0.31 Hz, and 16 direction bands. To capture both far-field generation and the spatial resolution desired inshore, a nested-grid approach was adopted. The coarsest grid, at 1° resolution, extended from 50° to 80° west longitude and from 20° to 45° north latitude while the finest grids, at 0.083° resolution, cover inshore areas from west of Fire Island inlet to Montauk Point (Figure 5).

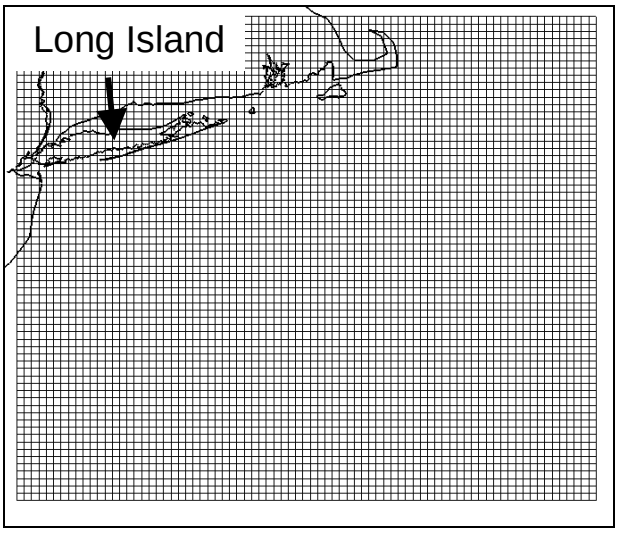

Figure 5. WISWAVE 0.083° fine grid.

3.4 Nearshore Hydrodynamic Modeling

Water levels in the nearshore and in the back bays were computed by Moffatt and Nichol (Cañizares, 2004) using DELFT3D-FLOW (WL| Delft Hydraulics, 2001). DELFT3D-FLOW simulates water level and currents from tidal, meteorological, and wave forcing by solving either the two-dimensional depth-integrated or three-dimensional flow and transport phenomena. The two-dimensional mode was adopted for this study.

The DELFT3D-FLOW orthogonal curvilinear grid for this study extends from East Rockaway Inlet eastward to the east side of Shinnecock Bay (Figure 6). The model grid includes Great South, Moriches, and Shinnecock Bays, and their inlets, and extends up to 5 km from across the nearshore. The model grid (top pane of Figure 6) has variable resolution throughout the domain. The cross-shore resolution varies from values of 15-20 m at the barrier island and the intertidal zone, to around 350 m at the offshore boundary. The typical model's longshore resolution is around 200-300 m. At Moriches and Shinnecock inlets (lower center and right panes of Figure 6) the grid size is in the order of 30 m. Grid resolution is on the order of 75 m at Fire Island inlet (lower left pane of Figure 6). To simulate storm water levels, DELFT3D-FLOW was forced along its offshore boundary with water level time series from ADCIRC, throughout its domain with the storm wind and pressure fields, and with wave radiation stress fields simulated with HISWA (discussed below).

3.5 Nearshore Wave Modeling

Moffatt and Nichol used the stationary wave model HISWA (DELFT3D-WAVE) to compute nearshore wave climate and resulting surf-zone radiation stresses (Holthuijsen ***et al.***, 1989). HISWA is a second generation wave model that computes wave propagation; wave generation by wind; non-linear wave-wave interactions and dissipation for a given bottom topography; and stationary wind, water level, and current field in waters of deep, intermediate and finite depth. The model accounts for the following physics: wave refraction over a bottom of variable depth and/or spatially varying ambient current; depth and current induced shoaling; wave generation by wind; dissipation by depth-induced breaking and/or bottom friction; and wave blocking by strong counter currents. HISWA is based on the action balance equation and wave propagation is based on linear wave theory (including the effect of currents).

HISWA wave computations are carried out on a rectangular grid. A nested grid approach was also used for nearshore wave modeling and spans from East Rockaway Inlet to Montauk Point (Figure 7). The offshore grid, with 250 m alongshore by 50 m across-shore resolution, was forced on its offshore boundary with significant wave height, peak period, and mean wave direction. These inputs were

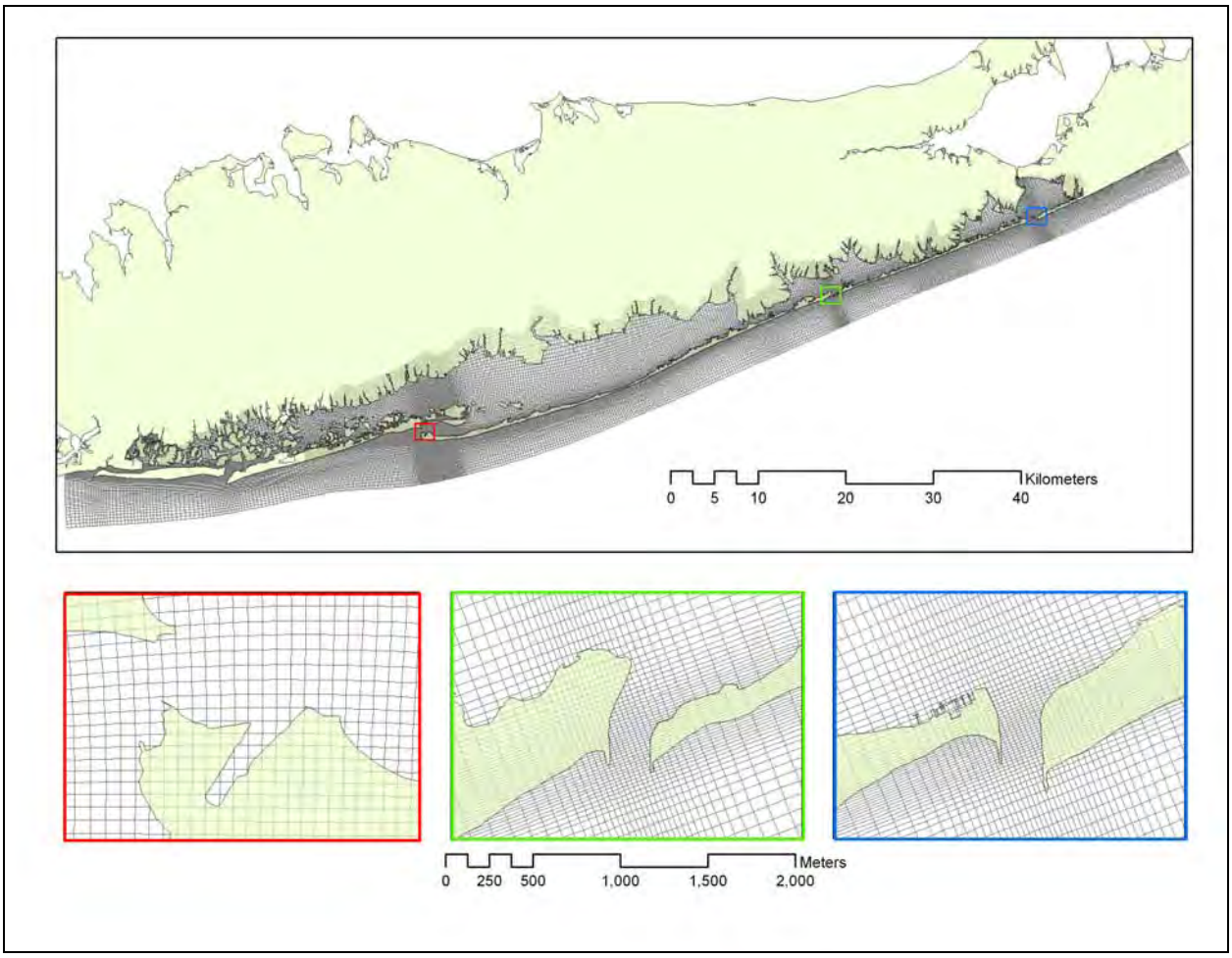

Figure 6. DELFT3D-FLOW computational grid.

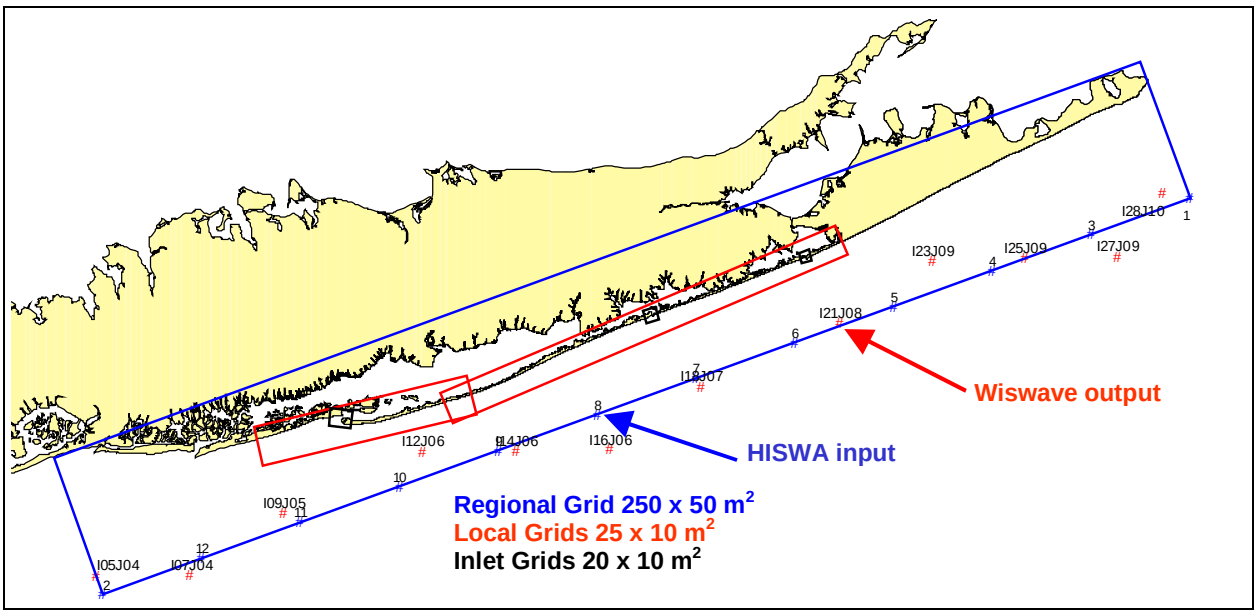

Figure 7. HISWA (DELFT3D-WAV) computational grid.

computed from the bulk spectra from WISWAVE simulations.

Non-stationary conditions may be simulated with HISWA as quasi-stationary with repeated model runs. For this study, HISWA simulated wave conditions for each hourly input condition from WISWAVE.

3.6 Nearshore Wave and Water Level Coupling

The HISWA model has a dynamic interaction with DELFT3D-FLOW (i.e. two way wave-current interaction). By this, the effect of waves on current and the effect of flow on waves, including wave setup, are accounted for. The resulting radiation stresses obtained from the HISWA local rectangular grids are automatically transferred to DELFT3D-FLOW, which simulates the flow on a curvilinear grid. This process allows direct simulation of the impacts of wave setup on hydrodynamics, specifically water level at the coastline and in the estuarial bays.

This modeling strategy uses high quality wind hindcasts to drive offshore wave and hydrodynamic models and coupled nearshore wave and hydrodynamic models. This allows major physical processes, as they impact water level, to be effectively simulated in the study area.

4. BLIZZARD OF 2003 MEASUREMENTS

A field investigation conducted in February 2003, afforded the opportunity to assess the performance of the modeling approach for simulating storm water levels. Offshore and Coastal Technologies, Inc. installed water level gages at six locations in Great South and Moriches Bays (Figure 8). In addition, water level measurements were also available for NOAA stations at Sandy Hook, New Jersey; The Battery, New York; Montauk Fort Pond, New York; and Newport, Rhode Island. Finally, NDBC Buoy 44025, offshore of Long Island, provided measurements of wave characteristics, wind speed, and barometric pressure.

The blizzard in mid-February 2003, impacting the entire northeastern USA, occurred during the field deployment and resulted in minor coastal flooding and significant snowfall. This extratropical event was characterized by peak offshore wind speeds near 20 m/s resulting in elevated ocean water levels that were as much as 0.5 m above astronomical predictions for 1.5 days. Offshore wave heights over 4 m were sustained for 1 day with maximum wave height around 6 m.

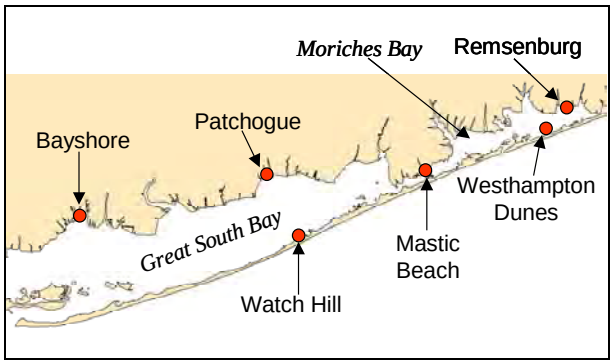

Figure 8. Location of bay water level gages.

5. BLIZZARD OF 2003 SIMULATION COMPARISON TO MEASUREMENTS

Following the meteorological hindcasting and storm surge modeling methodology outlined in Section 3, water levels were simulated for the blizzard of 2003. Computed wind speed, barometric pressure, wave characteristics, and water levels were compared with measurements at a number of locations.

5.1 Meteorology

Wind fields developed using IKOA and barometric pressure from NCEP for the 2003 storm were compared with offshore measurements at NDBC Buoy 44025 (Figure 9 and Figure 10). Wind speed time series shape and magnitude matches well with measured time series, showing that the IKOA performs well for this storm. Peak wind speed comparisons with the offshore buoy are very good, with peak speed differing by less than 1 m/s. NCEP barometric pressure compares very well with measured pressure at the offshore buoy with the peak NCEP pressure only 0.03 m, water, below the measured peak.

5.2 Wave Characteristics

Spectral wave height, period and direction computed with WISWAVE were compared with measurements at NDBC Buoy 44025 (Figure 11, Figure 12, and Figure 13). Time series for all three wave parameters compare well with measurements. Differences in maximum significant wave height and peak period are 0.8 m and 2.5 s, respectively.

5.3 Offshore Water Levels

ADCIRC simulated storm water levels were compared with NOAA measurements at the four NOAA measurement locations near the study area. Time series comparisons at Sandy Hook and Montauk Fort Pond are given in Figure 14 and Figure 15, respectively. ADCIRC performs well for simulating water levels for this storm. Differences between measured and simulated peak water levels are 9 cm (9%) or better at all four locations. Further, hydrograph shape is very similar to measured hydrograph shape at all four locations.

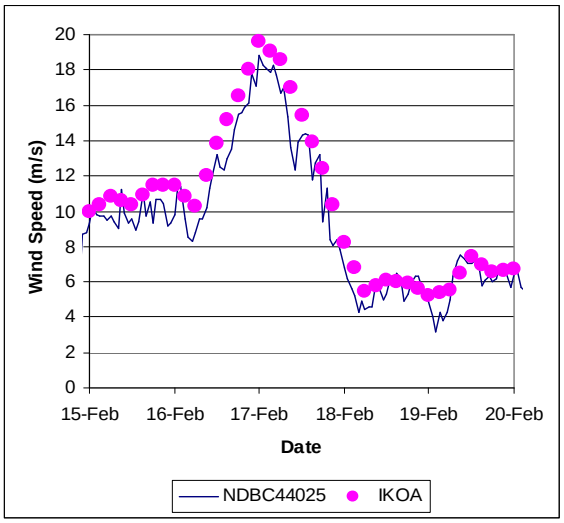

Figure 9. Wind speed comparison at offshore NDBC buoy 44025.

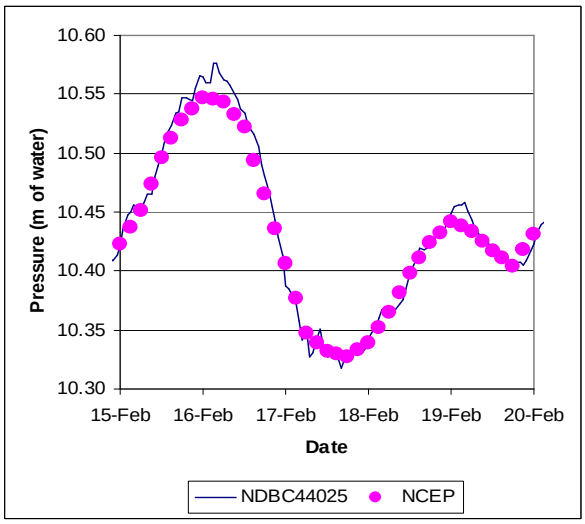

Figure 10. Barometric pressure comparison at offshore NDBC buoy 44025.

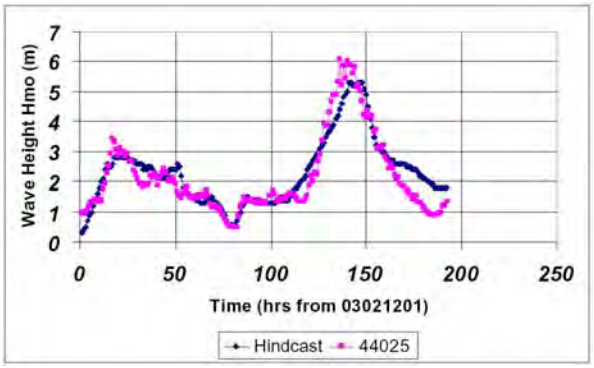

Figure 11. Significant wave height comparison at offshore NDBC buoy 44025.

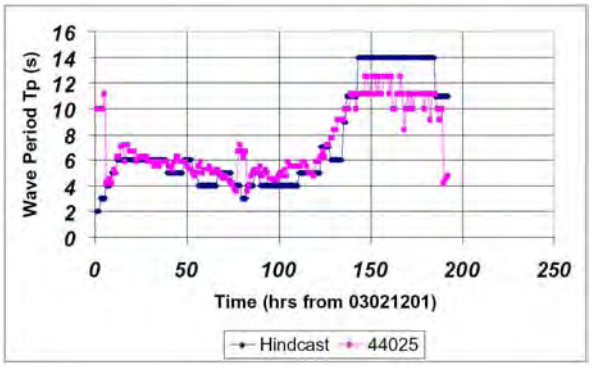

Figure 12. Peak wave period comparison at offshore NDBC buoy 44025.

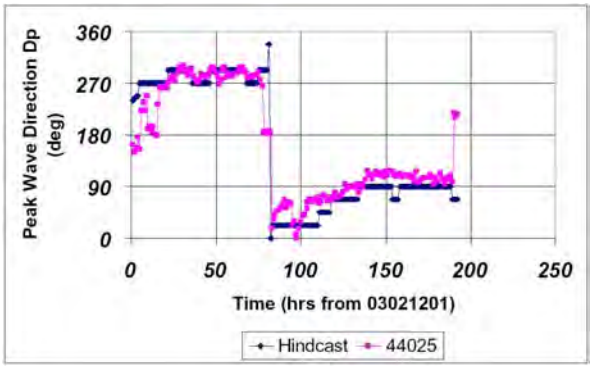

Figure 13. Wave direction comparison at offshore NDBC buoy 44025.

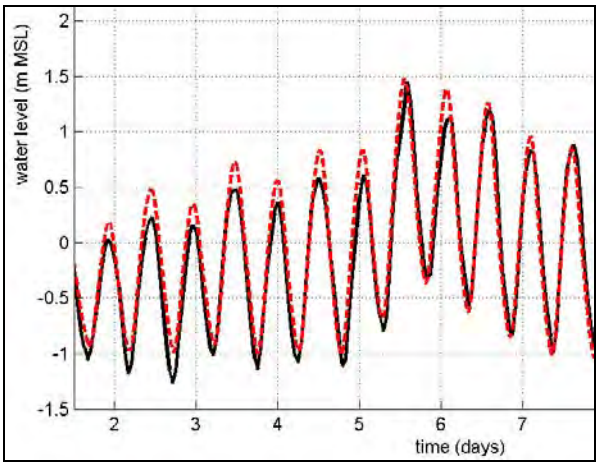

Figure 14. Water level at Sandy Hook, New Jersey starting at 0000 GMT on 12 February 2003.

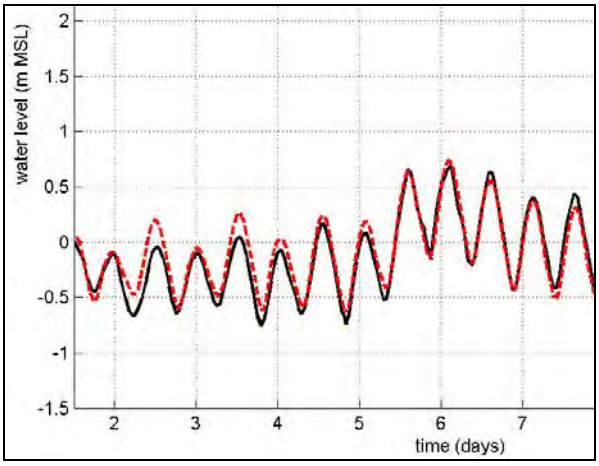

Figure 15. Water level at Montauk Fort Pond, New York starting at 0000 GMT on 12 February 2003.

5.4 Bay Water Levels

The DELFT3D-FLOW simulation of the 2003 blizzard included ocean surge, local wind and pressure fields, and ocean waves. The simulation water levels were compared with the measured water levels at the six bay locations. Figure 16 shows the simulated and measured results at Watch Hill in Great South Bay. Simulated hydrograph shapes at all locations compare well with measured hydrograph shape, showing that DEFLT3D-FLOW performs well for this storm. This storm is characterized by two peak water levels. Simulated peak water levels for the first peak at the three measurement stations in Moriches Bay are within 3 cm, or 4%, of the measured peak water levels. The model also performs well at Watch Hill and Bayshore, in Great South Bay, with simulated peak water levels for the first peak within 5 cm, or 9%, of measured peak water levels. Maximum water level comparisons at Patchogue are within 2 cm, or 4%.

Comparisons between measured data and simulation results for meteorological forcing, wave characteristics, and ocean and bay water levels show that the modeling strategy performs well for the blizzard of 2003.

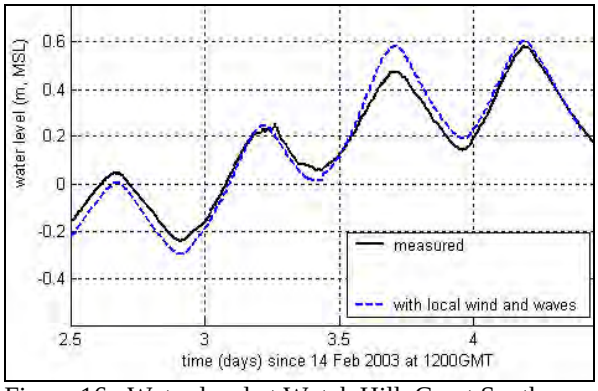

Figure 16. Water level at Watch Hill, Great South Bay, during blizzard of 2003.

6. BAY WATER LEVEL CONTRIBUTIONS

To understand the water level contributions of individual physical processes, a series of DELFT3D-FLOW simulations were performed for the blizzard of 2003:

1. Only offshore boundary forcing with ocean hydrographs from ADCIRC.
2. Simulation 1 plus local wind and barometric pressure forcing throughout the DELFT3D-FLOW model domain.
3. Simulation 2 plus ocean wave forcing from HISWA.

These three simulations allow separation of the effects on bay water levels from: astronomical tide; propagation of ocean surge through tidal inlets; propagation of flow generated by ocean wave setup through tidal inlets; and localized wind setup and setdown.

Figure 17 and Figure 18 compare the water level time series for three test simulations to measured bay water levels, and Figure 19 and Figure 20 summarize water level contributions from each process. For the blizzard of 2003, the combined effect of tidal amplitude and tidally generated superelevation makes

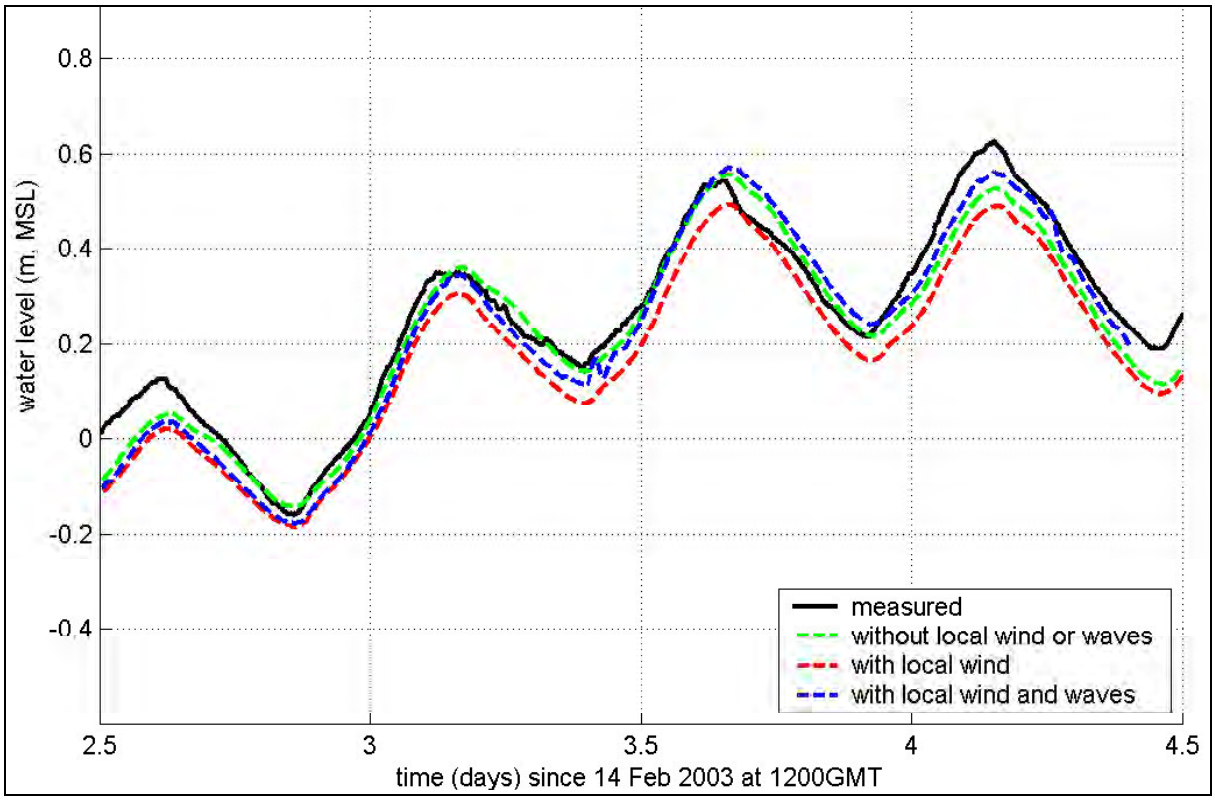

Figure 17. Water level contributions from physical processes at Bayshore, Great South Bay.

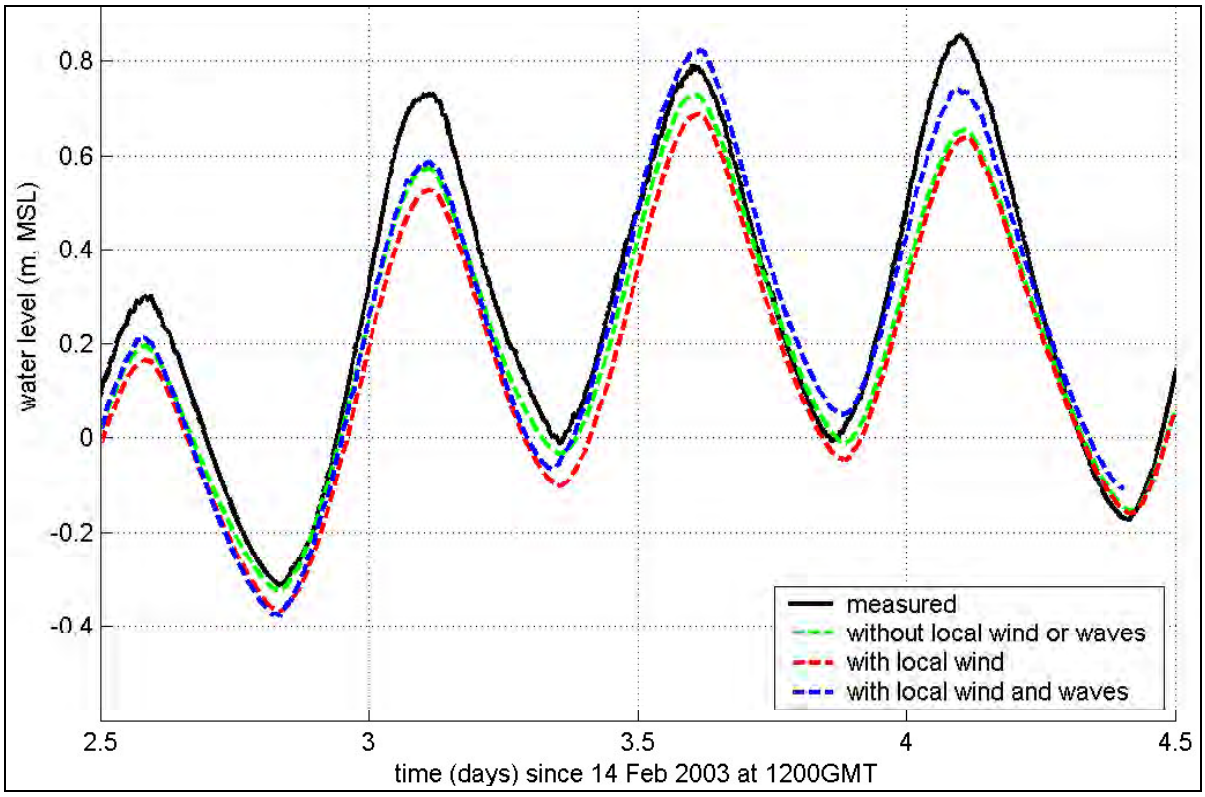

Figure 18. Water level contributions from physical processes at Westhampton Dunes, Moriches Bay.

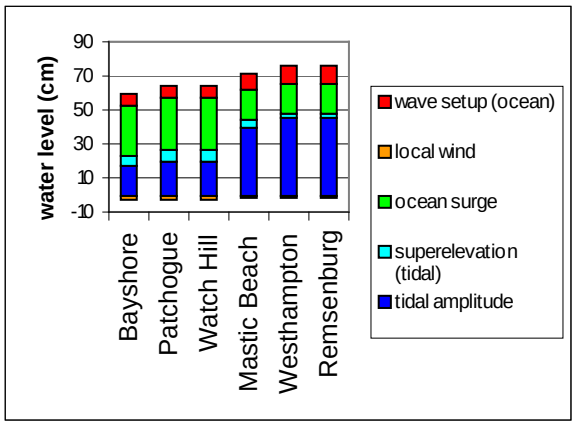

Figure 19. Water level contributions from physical processes for peak occurring 18 February 2003 at 0300 GMT.

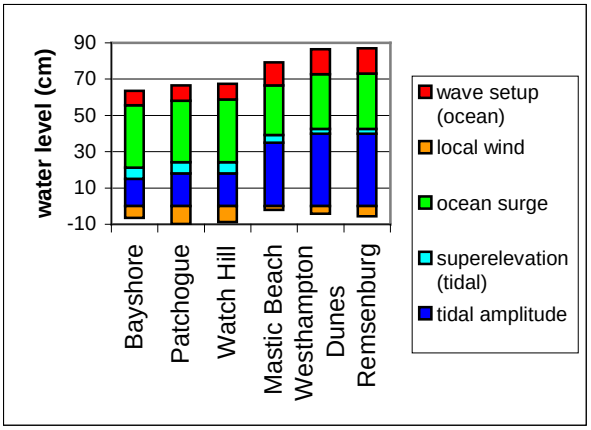

Figure 20. Water level contributions from physical processes for peak occurring 18 February 2003 at 1500 GMT.

up about 40% (25cm) of the total peak water level in Great South Bay and 50% (40 cm) of the peak water level in Moriches Bay. Water level contributions from ocean surge alone are about 35 cm in Great South Bay and 30 cm in Moriches Bay.

The addition of local wind has only a small effect on Moriches Bay water levels: DELFT3D-FLOW predicts a small setdown, on the order of 5 cm, at Westhampton Dunes and Remsenburg, on the eastern side of the bay, while the contribution from local wind at Mastic Beach, on the western side of the bay, is negligible. In contrast, the model predicts setdown of 10 cm at Patchogue and Watch Hill, at the eastern end of Great South Bay, and setdown of 6 cm at Bayshore, near the center of Great South Bay.

Wave setup from ocean waves is a significant contributor to water levels in both Great South and Moriches Bays. At all three measurement locations in Great South Bay, water level contribution from wave setup is around 9 cm. At all three measurement locations in Moriches Bay, water level contributions are around 14 cm. For the same offshore wave height, water level contribution from ocean wave setup is 50% larger in Moriches Bay than in Great South Bay. This indicates that inlet and bay geometry, and its effects on hydrodynamics, are important for accurate prediction of bay water levels associated with ocean wave setup. For the blizzard of 2003, flow through the inlets created by ocean wave setup accounts for 15% of the total water levels in the bays.

7. CONCLUSIONS

Model simulation comparisons with measurements during the blizzard of 2003 prove the modeling strategy, and its individual model components, accurately simulate storm water levels. In particular, high-quality wind and wave hindcasts are essential for accurately simulating storm water levels. This modeling approach was adopted for storm surge analysis of the south shore of Long Island. In total, 14 hurricanes and 23 extratropical storms were simulated using this modeling strategy. Peak simulated water levels will be used for economic analyses and engineering design.

Additionally, model simulations indicate that propagation of ocean wave setup into back bays is a major contributor to total water level within the study area. For the blizzard of 2003, sustained wave heights over 4 m for 1 day, with peak height over 5 m, increased bay water levels by a measurable 10 to 15 cm. For more severe storms, the increase in bay water levels is likely to be even more, perhaps as much as 30 cm. When considering economic damages, an increase as little as 15 cm in bay water level translates to a significant increase in damages. Therefore, small changes in water level for small events are important for economic analyses and design.

The results from the blizzard of 2003 indicate that the impact of ocean wave setup propagation through the tidal inlets is dependent on the inlet and bay geometry. This finding demonstrates the importance of simulating nearshore wave conditions and including the resulting radiation stresses when computing hydrodynamic response in estuarial bays.

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APPENDIX H

Non-Cyclonic Design Water Level and Concurrent Wave Parameters

				Water Level mAHD 20yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{om}
516482	6972941	BrisbaneBar		1.69	1.69		0.60	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.00	1.87	0.13	0.88	2.9	114	0	2.12	2.53	2.39	3.26	2.45	3.41	1.91
507065	6983136	PineRiver-002	MBC-002	1.98	1.86	0.12	0.79	2.9	122	0	2.08	2.46	2.33	3.13	2.38	3.28	2.00
507237	6983516	PineRiver-003	MBC-003	2.00	1.86	0.14	0.89	3.0	118	0	2.11	2.54	2.38	3.29	2.44	3.45	1.99
507198	6984049	PineRiver-004	MBC-004	1.98	1.86	0.12	0.82	2.7	123	0	2.09	2.47	2.35	3.14	2.40	3.29	1.88
506913	6984334	PineRiver-005	MBC-005	1.98	1.88	0.10	0.70	2.5	124	0	2.08	2.40	2.30	2.97	2.34	3.09	1.87
507046	6984696	PineRiver-006	MBC-006	1.97	1.88	0.09	0.63	2.2	139	0	2.06	2.34	2.25	2.83	2.29	2.93	1.75
507522	6984334	PineRiver-007	MBC-007	1.95	1.84	0.11	0.77	2.7	131	0	2.06	2.41	2.30	3.05	2.35	3.18	1.89
507769	6984239	PineRiver-008	MBC-008	1.97	1.83	0.14	0.96	2.9	126	0	2.10	2.54	2.40	3.32	2.46	3.48	1.84
506179	6982661	PineRiver-009	MBC-009	1.98	1.88	0.10	0.70	2.5	124	0	2.08	2.40	2.30	2.97	2.34	3.09	1.87
504927	6992513	Caboolture-001	MBC-010	2.02	1.90	0.12	0.78	2.7	50	0	2.12	2.48	2.36	3.12	2.41	3.25	1.87
504270	6992575	Caboolture-002	MBC-011	2.01	1.91	0.10	0.70	2.5	59	0	2.11	2.43	2.33	2.99	2.37	3.11	1.84
503633	6992841	Caboolture-003	MBC-012	2.07	1.97	0.10	0.67	2.4	71	0	2.16	2.46	2.37	3.00	2.41	3.11	1.82
503346	6993519	Caboolture-004	MBC-013	2.07	1.97	0.10	0.66	2.4	92	0	2.16	2.46	2.36	3.00	2.40	3.11	1.87
503613	6994402	Caboolture-005	MBC-014	2.06	1.95	0.11	0.69	2.6	108	0	2.14	2.47	2.36	3.04	2.41	3.17	1.93
504658	6996186	Caboolture-009	MBC-015	2.03	1.90	0.13	0.85	2.8	115	0	2.14	2.53	2.40	3.24	2.46	3.39	1.90
504477	6996546	Caboolture-010	MBC-016	2.02	1.91	0.11	0.76	2.7	114	0	2.12	2.48	2.36	3.11	2.41	3.24	1.91
504774	6997055	Caboolture-012	MBC-017	2.03	1.90	0.13	0.85	2.8	120	0	2.14	2.53	2.40	3.23	2.46	3.38	1.90
505039	6997331	Caboolture-013	MBC-018	2.02	1.89	0.13	0.83	2.9	121	0	2.12	2.52	2.38	3.23	2.44	3.38	2.00
505442	6998582	Caboolture-016	MBC-019	2.03	1.88	0.15	0.98	3.1	122	0	2.15	2.62	2.45	3.44	2.52	3.62	1.95
505671	6999062	Caboolture-017	MBC-020	2.02	1.87	0.15	0.91	3.2	122	0	2.12	2.58	2.40	3.37	2.46	3.55	2.12
505909	6999567	Caboolture-018	MBC-021	2.03	1.87	0.16	0.95	3.3	124	0	2.12	2.60	2.41	3.43	2.48	3.62	2.10
506361	7000127	Caboolture-019	MBC-022	2.01	1.85	0.16	1.01	3.2	130	0	2.13	2.61	2.43	3.47	2.50	3.65	1.98
506813	7000580	Caboolture-020	MBC-023	1.98	1.83	0.15	0.95	3.2	128	0	2.09	2.56	2.38	3.38	2.44	3.56	2.05
507266	7001010	Caboolture-021	MBC-024	1.98	1.82	0.16	1.02	3.3	129	0	2.09	2.60	2.40	3.47	2.47	3.67	2.03
507718	7001452	Caboolture-022	MBC-025	1.99	1.82	0.17	1.06	3.4	134	0	2.10	2.63	2.42	3.54	2.49	3.74	2.04
508289	7001850	Caboolture-023	MBC-026	1.96	1.79	0.17	1.07	3.4	136	0	2.08	2.61	2.40	3.52	2.47	3.72	2.02
508903	7002206	Caboolture-024	MBC-027	1.96	1.79	0.17	1.10	3.4	139	0	2.08	2.63	2.41	3.57	2.49	3.78	2.03
509355	7002550	Caboolture-025	MBC-028	1.95	1.78	0.17	1.06	3.3	143	0	2.07	2.59	2.39	3.49	2.46	3.69	2.01
509894	7002744	Caboolture-026	MBC-029	1.94	1.77	0.17	1.03	3.3	149	0	2.05	2.56	2.36	3.45	2.43	3.64	2.05
510475	7002852	Caboolture-027	MBC-030	1.93	1.76	0.17	1.02	3.4	150	0	2.03	2.54	2.34	3.43	2.41	3.62	2.07
511067	7003003	Caboolture-028	MBC-031	1.93	1.76	0.17	1.07	3.4	152	0	2.04	2.58	2.37	3.51	2.44	3.72	2.08
511477	7003251	Caboolture-029	MBC-032	1.91	1.75	0.16	0.98	3.4	154	0	2.01	2.51	2.31	3.38	2.37	3.58	2.16
512112	7003326	Caboolture-030	MBC-033	1.91	1.74	0.17	1.06	3.4	156	0	2.02	2.55	2.34	3.47	2.41	3.67	2.06
512694	7003455	Caboolture-031	MBC-034	1.88	1.72	0.16	0.99	3.4	159	0	1.98	2.49	2.28	3.35	2.35	3.55	2.12
513275	7003412	Caboolture-032	MBC-035	1.87	1.71	0.16	1.02	3.3	156	0	1.98	2.49	2.29	3.37	2.36	3.56	2.05
513911	7003746	Caboolture-033	MBC-036	1.88	1.73	0.15	0.91	3.2	148	0	1.98	2.43	2.26	3.22	2.32	3.40	2.09
514481	7004446	Caboolture-034	MBC-037	1.83	1.71	0.12	0.78	2.6	152	0	1.93	2.29	2.17	2.93	2.23	3.06	1.87
516248	7002647	Caboolture-038	MBC-038	1.84	1.68	0.16	0.92	3.4	174	0	1.92	2.40	2.20	3.23	2.26	3.42	2.21
517280	7002397	Caboolture-040	MBC-039	1.91	1.67	0.24	0.64	10.5	156	0	1.78	2.46	1.95	3.64	2.00	4.03	8.21
519611	7002925	Caboolture-044	MBC-040	1.88	1.64	0.24	0.65	10.9	89	0	1.75	2.44	1.92	3.66	1.98	4.06	8.47
520367	7003619	Caboolture-046	MBC-041	1.90	1.65	0.25	0.71	11.3	62	0	1.77	2.53	1.96	3.85	2.02	4.29	8.35
520284	7006303	Caboolture-051	MBC-042	2.02	1.65	0.37	1.20	9.2	71	0	1.87	2.91	2.17	4.65	2.26	5.16	5.22
516778	7013518	Caboolture-060	MBC-043	2.01	1.64	0.37	1.31	10.7	73	0	1.87	3.07	2.20	5.09	2.30	5.70	5.85
516320	7014796	Caboolture-061	MBC-044	2.01	1.64	0.37	1.31	10.7	73	0	1.87	3.07	2.20	5.09	2.30	5.70	5.85
507667	7015461	Caboolture-067	MBC-045	1.99	1.91	0.08	0.52	1.8	163	0	2.05	2.27	2.20	2.66	2.23	2.73	1.56
508591	7014764	Caboolture-069	MBC-046	1.96	1.88	0.08	0.55	1.8	167	0	2.03	2.26	2.19	2.66	2.22	2.74	1.52
509101	7014442	Caboolture-070	MBC-047	1.92	1.84	0.08	0.52	1.9	175	0	1.98	2.21	2.14	2.60	2.17	2.68	1.63
509543	7013236	Caboolture-072	MBC-048	1.91	1.83	0.08	0.47	1.7	231	0	1.96	2.16	2.09	2.51	2.12	2.57	1.57
509623	7012592	Caboolture-073	MBC-049	1.89	1.82	0.07	0.44	1.7	254	0	1.94	2.13	2.07	2.46	2.09	2.53	1.61
510253	7011212	Caboolture-075	MBC-050	1.88	1.80	0.08	0.55	1.9	152	0	1.95	2.18	2.11	2.59	2.14	2.67	1.56
510669	7010917	Caboolture-076	MBC-051	1.86	1.78	0.08	0.56	1.9	152	0	1.94	2.17	2.10	2.58	2.13	2.67	1.56
511138	7010769	Caboolture-077	MBC-052	1.85	1.77	0.08	0.58	1.9	156	0	1.93	2.18	2.10	2.61	2.13	2.69	1.57
511701	7010475	Caboolture-078	MBC-053	1.84	1.76	0.08	0.57	1.9	166	0	1.92	2.16	2.08	2.59	2.12	2.67	1.59
512076	7010032	Caboolture-079	MBC-054	1.82	1.74	0.08	0.47	2.0	166	0	1.87	2.08	2.01	2.46	2.04	2.54	1.79
513283	7007901	Caboolture-083	MBC-055	1.79	1.71	0.08	0.47	1.7	174	0	1.84	2.03	1.97	2.37	2.00	2.44	1.50

				Water Level mAHD 20yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{om}
513390	7007284	Caboolture-084	MBC-056	1.79	1.71	0.08	0.49	1.7	252	0	1.84	2.05	1.98	2.41	2.01	2.47	1.49
513444	7006735	Caboolture-085	MBC-057	1.79	1.71	0.08	0.50	1.7	267	0	1.85	2.05	1.99	2.42	2.02	2.49	1.50
514141	7006547	Caboolture-086	MBC-058	1.77	1.70	0.07	0.43	1.5	166	0	1.82	2.00	1.94	2.31	1.96	2.36	1.47
514958	7005756	Caboolture-088	MBC-059	1.76	1.70	0.06	0.38	1.5	172	0	1.80	1.96	1.91	2.24	1.93	2.29	1.51
515374	7005260	Caboolture-089	MBC-060	1.75	1.69	0.06	0.38	1.6	311	0	1.79	1.96	1.90	2.24	1.92	2.30	1.59
514730	7005140	Caboolture-090	MBC-061	1.76	1.70	0.06	0.39	1.6	337	0	1.81	1.97	1.92	2.26	1.94	2.31	1.55
514328	7005394	Caboolture-091	MBC-062	1.76	1.69	0.07	0.41	1.7	339	0	1.80	1.98	1.92	2.29	1.94	2.35	1.61
513269	7006199	Caboolture-093	MBC-063	1.79	1.71	0.08	0.47	1.7	199	0	1.84	2.04	1.97	2.39	2.00	2.45	1.57
511621	7007284	Caboolture-096	MBC-064	1.85	1.77	0.08	0.48	1.8	115	0	1.90	2.11	2.04	2.47	2.07	2.54	1.60
511339	7008048	Caboolture-097	MBC-065	1.86	1.78	0.08	0.48	1.7	120	0	1.91	2.12	2.05	2.47	2.08	2.54	1.57
511648	7008558	Caboolture-098	MBC-066	1.85	1.77	0.08	0.52	1.8	140	0	1.91	2.13	2.06	2.52	2.09	2.59	1.56
511835	7009040	Caboolture-099	MBC-067	1.83	1.75	0.08	0.53	1.8	147	0	1.90	2.12	2.05	2.51	2.08	2.58	1.54
511446	7009456	Caboolture-100	MBC-068	1.84	1.76	0.08	0.51	1.8	143	0	1.90	2.11	2.05	2.49	2.08	2.56	1.55
511058	7009456	Caboolture-101	MBC-069	1.85	1.77	0.08	0.50	1.8	135	0	1.91	2.12	2.05	2.49	2.08	2.56	1.55
510321	7009818	Caboolture-102	MBC-070	1.88	1.80	0.08	0.49	1.8	122	0	1.93	2.14	2.08	2.51	2.11	2.58	1.59
509784	7010233	Caboolture-103	MBC-071	1.87	1.80	0.07	0.46	1.8	109	0	1.93	2.13	2.06	2.47	2.09	2.54	1.63
509369	7010796	Caboolture-104	MBC-072	1.90	1.82	0.08	0.48	1.8	108	0	1.95	2.16	2.09	2.52	2.12	2.59	1.62
509034	7011198	Caboolture-105	MBC-073	1.93	1.85	0.08	0.49	1.8	114	0	1.98	2.19	2.13	2.56	2.16	2.63	1.59
508833	7011587	Caboolture-106	MBC-074	1.93	1.85	0.08	0.50	1.9	119	0	1.99	2.21	2.13	2.59	2.16	2.67	1.66
508752	7011869	Caboolture-107	MBC-075	1.95	1.87	0.08	0.53	1.9	125	0	2.02	2.24	2.17	2.64	2.20	2.72	1.62
508471	7012110	Caboolture-108	MBC-076	1.95	1.88	0.07	0.45	1.8	119	0	2.00	2.20	2.13	2.54	2.16	2.61	1.63
508926	7012177	Caboolture-109	MBC-077	1.93	1.85	0.08	0.55	1.9	137	0	2.00	2.24	2.16	2.65	2.20	2.73	1.59
509020	7012767	Caboolture-110	MBC-078	1.92	1.84	0.08	0.54	1.8	149	0	1.99	2.22	2.15	2.61	2.18	2.69	1.56
508565	7013276	Caboolture-111	MBC-079	1.93	1.85	0.08	0.47	1.7	143	0	1.98	2.18	2.11	2.52	2.14	2.59	1.53
508069	7013611	Caboolture-112	MBC-080	1.96	1.89	0.07	0.46	1.7	141	0	2.02	2.21	2.15	2.54	2.17	2.61	1.52
507667	7013960	Caboolture-113	MBC-081	1.99	1.91	0.08	0.48	1.7	135	0	2.04	2.24	2.18	2.59	2.21	2.66	1.52
507157	7014067	Caboolture-114	MBC-082	2.00	1.93	0.07	0.45	1.6	120	0	2.05	2.24	2.18	2.57	2.21	2.63	1.53
507171	7014777	Caboolture-115	MBC-083	2.01	1.93	0.08	0.51	1.8	129	0	2.07	2.29	2.22	2.67	2.25	2.74	1.58
507063	7015595	Caboolture-116	MBC-084	2.01	1.93	0.08	0.49	1.8	132	0	2.06	2.27	2.21	2.64	2.23	2.71	1.57
509121	6984944	Redcliffe-005	MBC-085	1.93	1.80	0.13	0.84	2.9	149	0	2.03	2.43	2.30	3.14	2.35	3.29	1.96
509533	6984891	Redcliffe-006	MBC-086	1.92	1.78	0.14	0.91	2.8	159	0	2.04	2.45	2.32	3.20	2.38	3.35	1.86
509892	6984691	Redcliffe-007	MBC-087	1.90	1.77	0.13	0.90	2.9	159	0	2.02	2.44	2.30	3.18	2.36	3.34	1.88
510464	6984279	Redcliffe-009	MBC-088	1.94	1.76	0.18	1.06	3.5	122	0	2.04	2.58	2.35	3.52	2.43	3.73	2.15
510783	6984638	Redcliffe-010	MBC-089	1.94	1.75	0.19	1.23	3.5	122	0	2.08	2.67	2.44	3.70	2.52	3.92	1.94
510969	6985516	Redcliffe-012	MBC-090	1.92	1.74	0.18	1.19	3.5	115	0	2.06	2.64	2.41	3.64	2.48	3.86	1.98
511076	6985889	Redcliffe-013	MBC-091	1.92	1.74	0.18	1.19	3.5	118	0	2.05	2.65	2.41	3.66	2.48	3.88	2.01
511488	6987365	Redcliffe-016	MBC-092	1.90	1.72	0.18	1.15	3.4	121	0	2.03	2.59	2.37	3.57	2.45	3.79	2.00
511768	6988017	Redcliffe-018	MBC-093	1.90	1.72	0.18	1.14	3.5	119	0	2.02	2.59	2.36	3.58	2.43	3.80	2.06
511648	6988496	Redcliffe-019	MBC-094	1.90	1.72	0.18	1.11	3.6	113	0	2.01	2.58	2.34	3.56	2.41	3.77	2.12
511741	6989254	Redcliffe-021	MBC-095	1.91	1.72	0.19	1.24	3.6	120	0	2.04	2.66	2.41	3.72	2.49	3.95	2.01
511874	6990079	Redcliffe-023	MBC-096	1.93	1.73	0.20	1.36	3.6	125	0	2.09	2.75	2.49	3.88	2.57	4.12	1.92
511648	6990451	Redcliffe-024	MBC-097	1.90	1.72	0.18	1.09	3.6	111	0	2.00	2.57	2.33	3.54	2.40	3.75	2.16
511661	6991063	Redcliffe-025	MBC-098	1.93	1.74	0.19	1.27	3.5	123	0	2.08	2.70	2.45	3.76	2.53	3.99	1.96
511568	6992087	Redcliffe-027	MBC-099	1.93	1.74	0.19	1.18	3.6	115	0	2.05	2.65	2.40	3.67	2.47	3.89	2.06
511475	6992513	Redcliffe-028	MBC-100	1.91	1.73	0.18	1.09	3.5	120	0	2.02	2.57	2.34	3.53	2.41	3.74	2.11
510916	6992713	Redcliffe-029	MBC-101	1.89	1.74	0.15	0.94	3.1	65	0	2.00	2.45	2.29	3.25	2.35	3.43	2.00
510531	6992472	Redcliffe-030	MBC-102	1.88	1.75	0.13	0.90	2.7	13	0	2.01	2.41	2.28	3.13	2.34	3.28	1.79
510161	6992164	Redcliffe-031	MBC-103	1.87	1.76	0.11	0.78	2.5	319	0	1.98	2.33	2.23	2.95	2.28	3.08	1.79
509833	6991712	Redcliffe-032	MBC-104	1.88	1.77	0.11	0.76	2.4	329	0	1.99	2.32	2.22	2.92	2.27	3.04	1.74
509525	6991322	Redcliffe-033	MBC-105	1.89	1.78	0.11	0.75	2.4	348	0	1.99	2.32	2.22	2.91	2.27	3.02	1.72
509155	6991199	Redcliffe-034	MBC-106	1.90	1.79	0.11	0.78	2.4	12	0	2.01	2.35	2.25	2.96	2.30	3.08	1.71
508478	6991343	Redcliffe-035	MBC-107	1.92	1.80	0.12	0.83	2.6	18	0	2.04	2.40	2.29	3.06	2.35	3.19	1.75
507965	6991487	Redcliffe-036	MBC-108	1.93	1.81	0.12	0.85	2.6	20	0	2.05	2.43	2.32	3.10	2.37	3.23	1.75
507205	6991589	Redcliffe-037	MBC-109	1.95	1.83	0.12	0.83	2.6	20	0	2.07	2.44	2.32	3.09	2.38	3.23	1.78
506548	6991836	Redcliffe-038	MBC-110	1.97	1.85	0.12	0.81	2.6	27	0	2.08	2.44	2.33	3.08	2.38	3.22	1.77
505830	6992082	Redcliffe-039	MBC-111	1.99	1.87	0.12	0.81	2.6	32	0	2.10	2.46	2.35	3.10	2.40	3.24	1.78

				Water Level mAHD 20yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
505358	6992267	Redcliffe-040	MBC-112	2.00	1.88	0.12	0.78	2.6	35	0	2.10	2.46	2.34	3.09	2.40	3.23	1.86

				Water Level mAHD 50yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar		1.74	1.74		0.61	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.07	1.94	0.13	0.90	2.9	114	0	2.19	2.61	2.47	3.35	2.53	3.51	1.89
507065	6983136	PineRiver-002	MBC-002	2.07	1.94	0.13	0.81	2.9	122	0	2.17	2.55	2.42	3.24	2.47	3.39	1.98
507237	6983516	PineRiver-003	MBC-003	2.08	1.94	0.14	0.92	3.0	118	0	2.20	2.63	2.48	3.41	2.54	3.57	1.96
507198	6984049	PineRiver-004	MBC-004	2.06	1.94	0.12	0.84	2.7	123	0	2.18	2.56	2.44	3.25	2.49	3.39	1.86
506913	6984334	PineRiver-005	MBC-005	2.07	1.96	0.11	0.72	2.5	124	0	2.16	2.49	2.39	3.08	2.44	3.20	1.84
507046	6984696	PineRiver-006	MBC-006	2.04	1.95	0.09	0.66	2.2	139	0	2.14	2.42	2.33	2.94	2.38	3.04	1.71
507522	6984334	PineRiver-007	MBC-007	2.03	1.91	0.12	0.80	2.7	131	0	2.14	2.50	2.38	3.15	2.44	3.29	1.86
507769	6984239	PineRiver-008	MBC-008	2.06	1.91	0.15	1.00	2.9	126	0	2.19	2.64	2.50	3.45	2.56	3.61	1.80
506179	6982661	PineRiver-009	MBC-009	2.07	1.96	0.11	0.72	2.5	124	0	2.16	2.49	2.39	3.08	2.44	3.20	1.84
504927	6992513	Caboolture-001	MBC-010	2.09	1.97	0.12	0.81	2.7	50	0	2.20	2.57	2.45	3.22	2.50	3.36	1.84
504270	6992575	Caboolture-002	MBC-011	2.11	2.00	0.11	0.73	2.5	59	0	2.21	2.53	2.44	3.12	2.48	3.24	1.80
503633	6992841	Caboolture-003	MBC-012	2.15	2.05	0.10	0.70	2.4	71	0	2.25	2.56	2.46	3.12	2.51	3.23	1.78
503346	6993519	Caboolture-004	MBC-013	2.16	2.06	0.10	0.68	2.4	92	0	2.25	2.56	2.46	3.11	2.51	3.23	1.84
503613	6994402	Caboolture-005	MBC-014	2.16	2.05	0.11	0.71	2.6	108	0	2.25	2.58	2.47	3.17	2.52	3.29	1.90
504658	6996186	Caboolture-009	MBC-015	2.11	1.98	0.13	0.89	2.8	115	0	2.23	2.64	2.51	3.37	2.56	3.52	1.86
504477	6996546	Caboolture-010	MBC-016	2.12	2.00	0.12	0.79	2.7	114	0	2.22	2.59	2.47	3.23	2.52	3.37	1.87
504774	6997055	Caboolture-012	MBC-017	2.11	1.98	0.13	0.88	2.8	120	0	2.23	2.63	2.50	3.35	2.56	3.50	1.86
505039	6997331	Caboolture-013	MBC-018	2.10	1.97	0.13	0.86	2.9	121	0	2.21	2.62	2.48	3.34	2.54	3.50	1.97
505442	6998582	Caboolture-016	MBC-019	2.11	1.96	0.15	1.02	3.1	122	0	2.24	2.72	2.55	3.57	2.62	3.75	1.91
505671	6999062	Caboolture-017	MBC-020	2.10	1.95	0.15	0.94	3.2	122	0	2.20	2.67	2.49	3.49	2.56	3.67	2.09
505909	6999567	Caboolture-018	MBC-021	2.10	1.94	0.16	0.99	3.3	124	0	2.21	2.70	2.51	3.55	2.57	3.74	2.06
506361	7000127	Caboolture-019	MBC-022	2.09	1.93	0.16	1.05	3.2	130	0	2.22	2.72	2.54	3.60	2.61	3.79	1.94
506813	7000580	Caboolture-020	MBC-023	2.07	1.91	0.16	0.98	3.2	128	0	2.18	2.66	2.48	3.49	2.54	3.68	2.02
507266	7001010	Caboolture-021	MBC-024	2.06	1.89	0.17	1.06	3.3	129	0	2.18	2.69	2.50	3.59	2.57	3.79	2.00
507718	7001452	Caboolture-022	MBC-025	2.06	1.89	0.17	1.10	3.4	134	0	2.18	2.73	2.51	3.66	2.58	3.86	2.00
508289	7001850	Caboolture-023	MBC-026	2.04	1.87	0.17	1.12	3.4	136	0	2.17	2.72	2.50	3.66	2.58	3.87	1.98
508903	7002206	Caboolture-024	MBC-027	2.03	1.85	0.18	1.15	3.4	139	0	2.16	2.72	2.50	3.69	2.58	3.91	1.99
509355	7002550	Caboolture-025	MBC-028	2.02	1.85	0.17	1.11	3.3	143	0	2.15	2.69	2.48	3.62	2.56	3.83	1.97
509894	7002744	Caboolture-026	MBC-029	2.00	1.83	0.17	1.06	3.3	149	0	2.12	2.64	2.44	3.54	2.51	3.74	2.02
510475	7002852	Caboolture-027	MBC-030	1.99	1.82	0.17	1.05	3.4	150	0	2.10	2.62	2.41	3.53	2.48	3.72	2.04
511067	7003003	Caboolture-028	MBC-031	1.99	1.81	0.18	1.11	3.4	152	0	2.11	2.66	2.44	3.61	2.51	3.82	2.04
511477	7003251	Caboolture-029	MBC-032	1.98	1.81	0.17	1.01	3.4	154	0	2.08	2.59	2.38	3.48	2.45	3.68	2.13
512112	7003326	Caboolture-030	MBC-033	1.96	1.79	0.17	1.10	3.4	156	0	2.08	2.63	2.41	3.57	2.49	3.78	2.02
512694	7003455	Caboolture-031	MBC-034	1.95	1.78	0.17	1.02	3.4	159	0	2.05	2.57	2.36	3.45	2.43	3.65	2.08
513275	7003412	Caboolture-032	MBC-035	1.94	1.77	0.17	1.05	3.3	156	0	2.05	2.57	2.37	3.47	2.44	3.67	2.02
513911	7003746	Caboolture-033	MBC-036	1.93	1.78	0.15	0.93	3.2	148	0	2.03	2.49	2.32	3.30	2.38	3.48	2.07
514481	7004446	Caboolture-034	MBC-037	1.89	1.77	0.12	0.81	2.6	152	0	2.00	2.37	2.25	3.02	2.30	3.16	1.83
516248	7002647	Caboolture-038	MBC-038	1.88	1.72	0.16	0.96	3.4	174	0	1.97	2.47	2.26	3.32	2.33	3.51	2.17
517280	7002397	Caboolture-040	MBC-039	1.90	1.71	0.19	1.27	3.6	156	0	2.04	2.67	2.42	3.74	2.50	3.97	1.97
519611	7002925	Caboolture-044	MBC-040	1.94	1.68	0.26	0.71	10.9	89	0	1.80	2.54	1.99	3.84	2.05	4.26	8.10
520367	7003619	Caboolture-046	MBC-041	1.96	1.68	0.28	0.81	11.3	62	0	1.82	2.66	2.03	4.12	2.10	4.59	7.81
520284	7006303	Caboolture-051	MBC-042	2.06	1.68	0.38	1.26	9.2	71	0	1.91	2.99	2.23	4.80	2.32	5.32	5.09
516778	7013518	Caboolture-060	MBC-043	2.08	1.68	0.40	1.48	10.7	73	0	1.95	3.27	2.32	5.47	2.43	6.13	5.50
516320	7014796	Caboolture-061	MBC-044	2.08	1.68	0.40	1.48	10.7	73	0	1.95	3.27	2.32	5.47	2.43	6.13	5.50
507667	7015461	Caboolture-067	MBC-045	2.07	1.99	0.08	0.54	1.8	163	0	2.14	2.36	2.30	2.76	2.33	2.84	1.53
508591	7014764	Caboolture-069	MBC-046	2.03	1.95	0.08	0.57	1.8	167	0	2.11	2.35	2.27	2.76	2.30	2.83	1.49
509101	7014442	Caboolture-070	MBC-047	1.99	1.91	0.08	0.54	1.9	175	0	2.06	2.29	2.22	2.69	2.25	2.77	1.60
509543	7013236	Caboolture-072	MBC-048	1.99	1.91	0.08	0.49	1.7	231	0	2.04	2.25	2.18	2.61	2.21	2.68	1.53
509623	7012592	Caboolture-073	MBC-049	1.96	1.89	0.07	0.46	1.7	254	0	2.02	2.21	2.15	2.55	2.17	2.62	1.57
510253	7011212	Caboolture-075	MBC-050	1.95	1.87	0.08	0.57	1.9	152	0	2.03	2.27	2.19	2.68	2.23	2.76	1.53
510669	7010917	Caboolture-076	MBC-051	1.93	1.85	0.08	0.58	1.9	152	0	2.01	2.25	2.18	2.68	2.21	2.76	1.53
511138	7010769	Caboolture-077	MBC-052	1.92	1.83	0.09	0.61	1.9	156	0	2.00	2.25	2.18	2.70	2.21	2.79	1.54
511701	7010475	Caboolture-078	MBC-053	1.90	1.81	0.09	0.60	1.9	166	0	1.98	2.23	2.15	2.67	2.19	2.75	1.55
512076	7010032	Caboolture-079	MBC-054	1.88	1.80	0.08	0.49	2.0	166	0	1.93	2.16	2.08	2.54	2.11	2.62	1.76
513283	7007901	Caboolture-083	MBC-055	1.85	1.77	0.08	0.49	1.7	174	0	1.90	2.11	2.04	2.46	2.07	2.52	1.47
513390	7007284	Caboolture-084	MBC-056	1.84	1.76	0.08	0.51	1.7	252	0	1.90	2.11	2.05	2.47	2.07	2.53	1.46

				Water Level mAHD 50yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	1.84	1.76	0.08	0.51	1.7	267	0	1.90	2.12	2.05	2.49	2.07	2.55	1.49
514141	7006547	Caboolture-086	MBC-058	1.82	1.75	0.07	0.46	1.5	166	0	1.87	2.06	2.00	2.38	2.02	2.43	1.42
514958	7005756	Caboolture-088	MBC-059	1.81	1.74	0.07	0.40	1.5	172	0	1.85	2.02	1.96	2.30	1.98	2.35	1.47
515374	7005260	Caboolture-089	MBC-060	1.80	1.73	0.07	0.39	1.6	311	0	1.84	2.00	1.95	2.29	1.97	2.35	1.57
514730	7005140	Caboolture-090	MBC-061	1.81	1.74	0.07	0.40	1.6	337	0	1.85	2.02	1.96	2.31	1.98	2.37	1.53
514328	7005394	Caboolture-091	MBC-062	1.81	1.74	0.07	0.42	1.7	339	0	1.85	2.04	1.98	2.35	2.00	2.41	1.59
513269	7006199	Caboolture-093	MBC-063	1.84	1.76	0.08	0.48	1.7	199	0	1.89	2.09	2.03	2.45	2.06	2.52	1.55
511621	7007284	Caboolture-096	MBC-064	1.91	1.83	0.08	0.50	1.8	115	0	1.97	2.18	2.11	2.55	2.14	2.62	1.57
511339	7008048	Caboolture-097	MBC-065	1.93	1.85	0.08	0.49	1.7	120	0	1.98	2.19	2.12	2.55	2.15	2.62	1.55
511648	7008558	Caboolture-098	MBC-066	1.91	1.83	0.08	0.54	1.8	140	0	1.98	2.20	2.14	2.60	2.17	2.68	1.53
511835	7009040	Caboolture-099	MBC-067	1.89	1.81	0.08	0.55	1.8	147	0	1.96	2.19	2.12	2.59	2.15	2.67	1.52
511446	7009456	Caboolture-100	MBC-068	1.90	1.82	0.08	0.53	1.8	143	0	1.97	2.19	2.12	2.57	2.15	2.65	1.52
511058	7009456	Caboolture-101	MBC-069	1.91	1.83	0.08	0.52	1.8	135	0	1.97	2.19	2.12	2.57	2.15	2.64	1.52
510321	7009818	Caboolture-102	MBC-070	1.94	1.86	0.08	0.51	1.8	122	0	2.00	2.22	2.15	2.59	2.18	2.67	1.56
509784	7010233	Caboolture-103	MBC-071	1.95	1.87	0.08	0.48	1.8	109	0	2.00	2.21	2.14	2.57	2.17	2.64	1.60
509369	7010796	Caboolture-104	MBC-072	1.97	1.89	0.08	0.50	1.8	108	0	2.03	2.24	2.17	2.61	2.20	2.69	1.59
509034	7011198	Caboolture-105	MBC-073	2.01	1.93	0.08	0.51	1.8	114	0	2.07	2.29	2.22	2.66	2.25	2.74	1.56
508833	7011587	Caboolture-106	MBC-074	2.01	1.93	0.08	0.51	1.9	119	0	2.07	2.29	2.22	2.68	2.25	2.76	1.64
508752	7011869	Caboolture-107	MBC-075	2.02	1.94	0.08	0.54	1.9	125	0	2.09	2.32	2.25	2.73	2.28	2.81	1.61
508471	7012110	Caboolture-108	MBC-076	2.02	1.95	0.07	0.46	1.8	119	0	2.08	2.27	2.21	2.62	2.24	2.69	1.61
508926	7012177	Caboolture-109	MBC-077	2.00	1.92	0.08	0.57	1.9	137	0	2.08	2.32	2.24	2.74	2.28	2.82	1.56
509020	7012767	Caboolture-110	MBC-078	1.99	1.91	0.08	0.56	1.8	149	0	2.06	2.30	2.23	2.71	2.26	2.79	1.53
508565	7013276	Caboolture-111	MBC-079	2.01	1.93	0.08	0.48	1.7	143	0	2.06	2.26	2.20	2.61	2.23	2.68	1.51
508069	7013611	Caboolture-112	MBC-080	2.05	1.97	0.08	0.48	1.7	141	0	2.10	2.31	2.24	2.66	2.26	2.71	1.49
507667	7013960	Caboolture-113	MBC-081	2.07	1.99	0.08	0.50	1.7	135	0	2.13	2.34	2.27	2.71	2.29	2.77	1.49
507157	7014067	Caboolture-114	MBC-082	2.08	2.01	0.07	0.46	1.6	120	0	2.13	2.33	2.27	2.66	2.29	2.73	1.51
507171	7014777	Caboolture-116	MBC-083	2.10	2.02	0.08	0.53	1.8	129	0	2.17	2.39	2.32	2.78	2.35	2.86	1.55
507063	7015595	Caboolture-116	MBC-084	2.09	2.01	0.08	0.51	1.8	132	0	2.15	2.36	2.30	2.74	2.33	2.81	1.54
509121	6984944	Redcliffe-005	MBC-085	1.99	1.86	0.13	0.88	2.9	149	0	2.11	2.52	2.38	3.25	2.44	3.40	1.91
509533	6984891	Redcliffe-006	MBC-086	1.99	1.85	0.14	0.96	2.8	159	0	2.12	2.55	2.42	3.33	2.48	3.49	1.81
509892	6984691	Redcliffe-007	MBC-087	1.97	1.83	0.14	0.94	2.9	159	0	2.09	2.52	2.38	3.29	2.45	3.45	1.84
510464	6984279	Redcliffe-009	MBC-088	2.00	1.82	0.18	1.09	3.5	122	0	2.11	2.66	2.43	3.62	2.50	3.83	2.12
510783	6984638	Redcliffe-010	MBC-089	2.00	1.81	0.19	1.28	3.5	122	0	2.15	2.77	2.53	3.82	2.61	4.05	1.90
510969	6985516	Redcliffe-012	MBC-090	1.99	1.80	0.19	1.24	3.5	115	0	2.13	2.73	2.50	3.77	2.57	3.99	1.93
511076	6985889	Redcliffe-013	MBC-091	1.99	1.80	0.19	1.23	3.5	118	0	2.13	2.73	2.49	3.77	2.57	3.99	1.98
511488	6987365	Redcliffe-016	MBC-092	1.96	1.78	0.18	1.20	3.4	121	0	2.10	2.69	2.46	3.69	2.54	3.91	1.96
511768	6988017	Redcliffe-018	MBC-093	1.96	1.78	0.18	1.18	3.5	119	0	2.09	2.68	2.44	3.69	2.52	3.91	2.02
511648	6988496	Redcliffe-019	MBC-094	1.96	1.78	0.18	1.15	3.6	113	0	2.08	2.67	2.42	3.67	2.49	3.89	2.08
511741	6989254	Redcliffe-021	MBC-095	1.98	1.78	0.20	1.29	3.6	120	0	2.12	2.76	2.50	3.84	2.58	4.08	1.97
511874	6990079	Redcliffe-023	MBC-096	1.99	1.78	0.21	1.42	3.6	125	0	2.16	2.84	2.57	4.00	2.66	4.25	1.88
511648	6990451	Redcliffe-024	MBC-097	1.96	1.78	0.18	1.13	3.6	111	0	2.07	2.66	2.41	3.65	2.48	3.87	2.12
511661	6991063	Redcliffe-025	MBC-098	1.99	1.79	0.20	1.33	3.5	123	0	2.14	2.78	2.54	3.89	2.62	4.12	1.91
511568	6992087	Redcliffe-027	MBC-099	1.98	1.79	0.19	1.23	3.6	115	0	2.11	2.73	2.47	3.78	2.55	4.01	2.02
511475	6992513	Redcliffe-028	MBC-100	1.97	1.79	0.18	1.13	3.5	120	0	2.09	2.66	2.42	3.64	2.50	3.86	2.07
510916	6992713	Redcliffe-029	MBC-101	1.94	1.79	0.15	0.98	3.1	65	0	2.06	2.53	2.36	3.35	2.43	3.53	1.96
510531	6992472	Redcliffe-030	MBC-102	1.93	1.80	0.13	0.93	2.7	13	0	2.06	2.48	2.35	3.21	2.41	3.36	1.76
510161	6992164	Redcliffe-031	MBC-103	1.92	1.81	0.11	0.81	2.5	319	0	2.04	2.40	2.29	3.04	2.35	3.17	1.76
509833	6991712	Redcliffe-032	MBC-104	1.94	1.83	0.11	0.80	2.4	329	0	2.06	2.40	2.30	3.02	2.35	3.15	1.70
509525	6991322	Redcliffe-033	MBC-105	1.95	1.84	0.11	0.78	2.4	348	0	2.06	2.40	2.30	3.00	2.35	3.12	1.68
509155	6991199	Redcliffe-034	MBC-106	1.96	1.85	0.11	0.81	2.4	12	0	2.08	2.43	2.33	3.05	2.38	3.18	1.68
508478	6991343	Redcliffe-035	MBC-107	1.98	1.86	0.12	0.86	2.6	18	0	2.11	2.48	2.37	3.15	2.43	3.29	1.72
507965	6991487	Redcliffe-036	MBC-108	2.00	1.88	0.12	0.89	2.6	20	0	2.13	2.52	2.41	3.21	2.47	3.35	1.71
507205	6991589	Redcliffe-037	MBC-109	2.03	1.91	0.12	0.87	2.6	20	0	2.16	2.54	2.43	3.22	2.48	3.36	1.73
506548	6991836	Redcliffe-038	MBC-110	2.04	1.92	0.12	0.84	2.6	27	0	2.16	2.53	2.42	3.19	2.47	3.32	1.74
505830	6992082	Redcliffe-039	MBC-111	2.06	1.94	0.12	0.84	2.6	32	0	2.18	2.55	2.44	3.21	2.49	3.35	1.74
505358	6992267	Redcliffe-040	MBC-112	2.08	1.96	0.12	0.82	2.6	35	0	2.19	2.56	2.45	3.22	2.50	3.36	1.81

				Water Level mAHD 100yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar		1.78	1.78		0.62	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.14	2.00	0.14	0.92	2.9	114	0	2.26	2.68	2.54	3.44	2.60	3.59	1.87
507065	6983136	PineRiver-002	MBC-002	2.12	1.99	0.13	0.83	2.9	122	0	2.22	2.62	2.48	3.31	2.54	3.46	1.95
507237	6983516	PineRiver-003	MBC-003	2.13	1.99	0.14	0.94	3.0	118	0	2.25	2.70	2.54	3.48	2.61	3.65	1.94
507198	6984049	PineRiver-004	MBC-004	2.12	1.99	0.13	0.86	2.7	123	0	2.23	2.62	2.50	3.32	2.56	3.47	1.84
506913	6984334	PineRiver-005	MBC-005	2.13	2.02	0.11	0.74	2.5	124	0	2.23	2.56	2.46	3.16	2.51	3.28	1.81
507046	6984696	PineRiver-006	MBC-006	2.11	2.01	0.10	0.67	2.2	139	0	2.20	2.49	2.40	3.01	2.44	3.11	1.69
507522	6984334	PineRiver-007	MBC-007	2.09	1.97	0.12	0.82	2.7	131	0	2.20	2.57	2.46	3.24	2.51	3.38	1.83
507769	6984239	PineRiver-008	MBC-008	2.11	1.96	0.15	1.03	2.9	126	0	2.25	2.71	2.57	3.53	2.63	3.70	1.78
506179	6982661	PineRiver-009	MBC-009	2.13	2.02	0.11	0.74	2.5	124	0	2.23	2.56	2.46	3.16	2.51	3.28	1.81
504927	6992513	Caboolture-001	MBC-010	2.15	2.03	0.12	0.84	2.7	50	0	2.27	2.65	2.53	3.32	2.58	3.46	1.81
504270	6992575	Caboolture-002	MBC-011	2.17	2.06	0.11	0.75	2.5	59	0	2.27	2.61	2.51	3.20	2.56	3.33	1.77
503633	6992841	Caboolture-003	MBC-012	2.22	2.12	0.10	0.72	2.4	71	0	2.32	2.64	2.55	3.21	2.59	3.33	1.75
503346	6993519	Caboolture-004	MBC-013	2.22	2.12	0.10	0.70	2.4	92	0	2.32	2.63	2.53	3.20	2.58	3.31	1.81
503613	6994402	Caboolture-005	MBC-014	2.22	2.11	0.11	0.73	2.6	108	0	2.32	2.65	2.54	3.25	2.59	3.38	1.88
504658	6996186	Caboolture-009	MBC-015	2.17	2.04	0.13	0.91	2.8	115	0	2.30	2.71	2.58	3.45	2.64	3.60	1.84
504477	6996546	Caboolture-010	MBC-016	2.19	2.07	0.12	0.80	2.7	114	0	2.30	2.66	2.54	3.31	2.60	3.45	1.86
504774	6997055	Caboolture-012	MBC-017	2.17	2.04	0.13	0.90	2.8	120	0	2.29	2.70	2.57	3.44	2.63	3.59	1.84
505039	6997331	Caboolture-013	MBC-018	2.16	2.03	0.13	0.88	2.9	121	0	2.28	2.69	2.55	3.43	2.61	3.59	1.94
505442	6998582	Caboolture-016	MBC-019	2.18	2.02	0.16	1.05	3.1	122	0	2.31	2.80	2.63	3.66	2.70	3.85	1.88
505671	6999062	Caboolture-017	MBC-020	2.17	2.01	0.16	0.97	3.2	122	0	2.27	2.75	2.57	3.59	2.64	3.77	2.05
505909	6999567	Caboolture-018	MBC-021	2.16	2.00	0.16	1.01	3.3	124	0	2.27	2.77	2.58	3.64	2.64	3.83	2.04
506361	7000127	Caboolture-019	MBC-022	2.14	1.98	0.16	1.07	3.2	130	0	2.27	2.78	2.60	3.67	2.67	3.86	1.93
506813	7000580	Caboolture-020	MBC-023	2.12	1.96	0.16	1.00	3.2	128	0	2.23	2.72	2.54	3.57	2.60	3.75	2.00
507266	7001010	Caboolture-021	MBC-024	2.12	1.95	0.17	1.09	3.3	129	0	2.24	2.77	2.57	3.69	2.64	3.89	1.97
507718	7001452	Caboolture-022	MBC-025	2.11	1.94	0.17	1.13	3.4	134	0	2.24	2.79	2.58	3.75	2.65	3.95	1.97
508289	7001850	Caboolture-023	MBC-026	2.09	1.92	0.17	1.15	3.4	136	0	2.23	2.79	2.57	3.75	2.65	3.96	1.95
508903	7002206	Caboolture-024	MBC-027	2.08	1.90	0.18	1.18	3.4	139	0	2.22	2.79	2.57	3.78	2.64	4.00	1.96
509355	7002550	Caboolture-025	MBC-028	2.06	1.89	0.17	1.14	3.3	143	0	2.20	2.75	2.54	3.70	2.62	3.90	1.94
509894	7002744	Caboolture-026	MBC-029	2.05	1.88	0.17	1.09	3.3	149	0	2.17	2.71	2.50	3.63	2.58	3.83	1.99
510475	7002852	Caboolture-027	MBC-030	2.03	1.86	0.17	1.08	3.4	150	0	2.15	2.68	2.47	3.60	2.54	3.80	2.01
511067	7003003	Caboolture-028	MBC-031	2.04	1.86	0.18	1.14	3.4	152	0	2.16	2.73	2.51	3.70	2.58	3.91	2.01
511477	7003251	Caboolture-029	MBC-032	2.02	1.85	0.17	1.03	3.4	154	0	2.12	2.65	2.43	3.55	2.50	3.75	2.10
512112	7003326	Caboolture-030	MBC-033	2.01	1.83	0.18	1.12	3.4	156	0	2.13	2.68	2.46	3.64	2.54	3.84	2.01
512694	7003455	Caboolture-031	MBC-034	1.99	1.82	0.17	1.04	3.4	159	0	2.10	2.62	2.41	3.52	2.48	3.72	2.06
513275	7003412	Caboolture-032	MBC-035	1.98	1.81	0.17	1.07	3.3	156	0	2.10	2.62	2.42	3.53	2.49	3.73	2.00
513911	7003746	Caboolture-033	MBC-036	1.97	1.82	0.15	0.94	3.2	148	0	2.08	2.54	2.36	3.35	2.43	3.53	2.05
514481	7004446	Caboolture-034	MBC-037	1.93	1.81	0.12	0.83	2.6	152	0	2.05	2.42	2.30	3.09	2.36	3.23	1.81
516248	7002647	Caboolture-038	MBC-038	1.91	1.75	0.16	0.99	3.4	174	0	2.01	2.52	2.31	3.39	2.38	3.59	2.13
517280	7002397	Caboolture-040	MBC-039	1.94	1.74	0.20	1.30	3.6	156	0	2.08	2.72	2.46	3.81	2.54	4.04	1.95
519611	7002925	Caboolture-044	MBC-040	1.98	1.71	0.27	0.76	10.9	89	0	1.84	2.62	2.04	3.99	2.10	4.43	7.83
520367	7003619	Caboolture-046	MBC-041	2.02	1.72	0.30	0.89	11.3	62	0	1.87	2.78	2.10	4.34	2.18	4.84	7.45
520284	7006303	Caboolture-051	MBC-042	2.11	1.72	0.39	1.30	9.2	71	0	1.96	3.07	2.29	4.91	2.38	5.45	5.01
516778	7013518	Caboolture-060	MBC-043	2.13	1.71	0.42	1.61	10.7	73	0	2.00	3.41	2.40	5.76	2.52	6.45	5.28
516320	7014796	Caboolture-061	MBC-044	2.13	1.71	0.42	1.61	10.7	73	0	2.00	3.41	2.40	5.76	2.52	6.45	5.28
507667	7015461	Caboolture-067	MBC-045	2.14	2.06	0.08	0.56	1.8	163	0	2.21	2.45	2.38	2.85	2.41	2.93	1.50
508591	7014764	Caboolture-069	MBC-046	2.10	2.01	0.09	0.59	1.8	167	0	2.17	2.42	2.34	2.84	2.37	2.91	1.46
509101	7014442	Caboolture-070	MBC-047	2.05	1.97	0.08	0.56	1.9	175	0	2.12	2.36	2.29	2.78	2.32	2.86	1.57
509543	7013236	Caboolture-072	MBC-048	2.04	1.96	0.08	0.50	1.7	231	0	2.10	2.31	2.24	2.67	2.27	2.74	1.52
509623	7012592	Caboolture-073	MBC-049	2.03	1.95	0.08	0.47	1.7	254	0	2.08	2.28	2.21	2.62	2.24	2.69	1.56
510253	7011212	Caboolture-075	MBC-050	2.02	1.93	0.09	0.59	1.9	152	0	2.09	2.34	2.27	2.76	2.30	2.85	1.50
510669	7010917	Caboolture-076	MBC-051	1.98	1.89	0.09	0.60	1.9	152	0	2.06	2.30	2.23	2.74	2.27	2.82	1.51
511138	7010769	Caboolture-077	MBC-052	1.97	1.88	0.09	0.62	1.9	156	0	2.05	2.31	2.23	2.76	2.27	2.85	1.52
511701	7010475	Caboolture-078	MBC-053	1.95	1.86	0.09	0.62	1.9	166	0	2.03	2.29	2.21	2.74	2.25	2.83	1.52
512076	7010032	Caboolture-079	MBC-054	1.92	1.84	0.08	0.51	2.0	166	0	1.98	2.21	2.13	2.61	2.16	2.69	1.72
513283	7007901	Caboolture-083	MBC-055	1.89	1.81	0.08	0.51	1.7	174	0	1.95	2.16	2.10	2.52	2.12	2.58	1.44
513390	7007284	Caboolture-084	MBC-056	1.88	1.80	0.08	0.53	1.7	252	0	1.95	2.16	2.10	2.53	2.12	2.59	1.43

				Water Level mAHD 100yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	1.88	1.80	0.08	0.53	1.7	267	0	1.95	2.16	2.10	2.54	2.12	2.60	1.46
514141	7006547	Caboolture-086	MBC-058	1.87	1.79	0.08	0.47	1.5	166	0	1.92	2.10	2.05	2.42	2.07	2.48	1.40
514958	7005756	Caboolture-088	MBC-059	1.84	1.77	0.07	0.41	1.5	172	0	1.88	2.05	2.00	2.34	2.01	2.39	1.45
515374	7005260	Caboolture-089	MBC-060	1.84	1.77	0.07	0.40	1.6	311	0	1.88	2.05	1.99	2.34	2.01	2.40	1.55
514730	7005140	Caboolture-090	MBC-061	1.85	1.78	0.07	0.41	1.6	337	0	1.89	2.06	2.01	2.36	2.03	2.42	1.51
514328	7005394	Caboolture-091	MBC-062	1.85	1.78	0.07	0.43	1.7	339	0	1.90	2.08	2.02	2.40	2.05	2.46	1.57
513269	7006199	Caboolture-093	MBC-063	1.88	1.80	0.08	0.50	1.7	199	0	1.94	2.15	2.08	2.51	2.11	2.58	1.52
511621	7007284	Caboolture-096	MBC-064	1.96	1.88	0.08	0.51	1.8	115	0	2.02	2.24	2.17	2.61	2.20	2.69	1.56
511339	7008048	Caboolture-097	MBC-065	1.97	1.89	0.08	0.51	1.7	120	0	2.03	2.24	2.18	2.61	2.20	2.69	1.52
511648	7008558	Caboolture-098	MBC-066	1.96	1.88	0.08	0.56	1.8	140	0	2.03	2.27	2.20	2.67	2.23	2.75	1.50
511835	7009040	Caboolture-099	MBC-067	1.93	1.85	0.08	0.57	1.8	147	0	2.01	2.25	2.17	2.66	2.20	2.73	1.49
511446	7009456	Caboolture-100	MBC-068	1.94	1.86	0.08	0.54	1.8	143	0	2.01	2.23	2.17	2.62	2.20	2.70	1.50
511058	7009456	Caboolture-101	MBC-069	1.96	1.88	0.08	0.53	1.8	135	0	2.03	2.25	2.18	2.63	2.21	2.70	1.51
510321	7009818	Caboolture-102	MBC-070	1.98	1.90	0.08	0.52	1.8	122	0	2.04	2.26	2.19	2.64	2.22	2.72	1.54
509784	7010233	Caboolture-103	MBC-071	2.01	1.93	0.08	0.49	1.8	109	0	2.06	2.27	2.21	2.64	2.23	2.71	1.58
509369	7010796	Caboolture-104	MBC-072	2.03	1.95	0.08	0.51	1.8	108	0	2.09	2.31	2.24	2.69	2.27	2.76	1.57
509034	7011198	Caboolture-105	MBC-073	2.06	1.98	0.08	0.52	1.8	114	0	2.12	2.34	2.27	2.72	2.30	2.80	1.54
508833	7011587	Caboolture-106	MBC-074	2.06	1.98	0.08	0.53	1.9	119	0	2.13	2.35	2.28	2.75	2.31	2.83	1.61
508752	7011869	Caboolture-107	MBC-075	2.08	2.00	0.08	0.56	1.9	125	0	2.15	2.39	2.32	2.81	2.35	2.89	1.58
508471	7012110	Caboolture-108	MBC-076	2.09	2.01	0.08	0.47	1.8	119	0	2.14	2.34	2.28	2.69	2.30	2.76	1.59
508926	7012177	Caboolture-109	MBC-077	2.05	1.97	0.08	0.58	1.9	137	0	2.13	2.37	2.30	2.80	2.33	2.88	1.55
509020	7012767	Caboolture-110	MBC-078	2.04	1.96	0.08	0.58	1.8	149	0	2.12	2.36	2.29	2.78	2.32	2.86	1.50
508565	7013276	Caboolture-111	MBC-079	2.07	1.99	0.08	0.50	1.7	143	0	2.13	2.34	2.27	2.70	2.29	2.76	1.48
508069	7013611	Caboolture-112	MBC-080	2.11	2.03	0.08	0.49	1.7	141	0	2.16	2.37	2.30	2.72	2.33	2.78	1.47
507667	7013960	Caboolture-113	MBC-081	2.14	2.06	0.08	0.51	1.7	135	0	2.20	2.41	2.35	2.78	2.37	2.84	1.48
507157	7014067	Caboolture-114	MBC-082	2.16	2.08	0.08	0.47	1.6	120	0	2.21	2.41	2.34	2.75	2.36	2.81	1.49
507171	7014777	Caboolture-116	MBC-083	2.17	2.09	0.08	0.54	1.8	129	0	2.24	2.47	2.40	2.86	2.43	2.94	1.54
507063	7015595	Caboolture-116	MBC-084	2.16	2.08	0.08	0.52	1.8	132	0	2.22	2.44	2.37	2.82	2.40	2.89	1.52
509121	6984944	Redcliffe-005	MBC-085	2.04	1.91	0.13	0.90	2.9	149	0	2.16	2.58	2.44	3.32	2.50	3.48	1.89
509533	6984891	Redcliffe-006	MBC-086	2.03	1.89	0.14	0.99	2.8	159	0	2.17	2.61	2.48	3.40	2.54	3.57	1.78
509892	6984691	Redcliffe-007	MBC-087	2.02	1.88	0.14	0.97	2.9	159	0	2.15	2.59	2.45	3.37	2.52	3.54	1.81
510464	6984279	Redcliffe-009	MBC-088	2.04	1.86	0.18	1.12	3.5	122	0	2.15	2.72	2.49	3.70	2.56	3.91	2.09
510783	6984638	Redcliffe-010	MBC-089	2.04	1.85	0.19	1.32	3.5	122	0	2.20	2.83	2.59	3.91	2.67	4.14	1.88
510969	6985516	Redcliffe-012	MBC-090	2.03	1.84	0.19	1.28	3.5	115	0	2.18	2.80	2.56	3.85	2.64	4.08	1.90
511076	6985889	Redcliffe-013	MBC-091	2.03	1.84	0.19	1.27	3.5	118	0	2.18	2.80	2.55	3.86	2.63	4.09	1.95
511488	6987365	Redcliffe-016	MBC-092	2.01	1.82	0.19	1.24	3.4	121	0	2.15	2.75	2.52	3.78	2.60	4.00	1.93
511768	6988017	Redcliffe-018	MBC-093	2.01	1.82	0.19	1.21	3.5	119	0	2.14	2.74	2.50	3.77	2.58	3.99	2.00
511648	6988496	Redcliffe-019	MBC-094	2.01	1.82	0.19	1.18	3.6	113	0	2.13	2.72	2.48	3.74	2.55	3.97	2.06
511741	6989254	Redcliffe-021	MBC-095	2.02	1.82	0.20	1.33	3.6	120	0	2.17	2.82	2.56	3.93	2.64	4.17	1.94
511874	6990079	Redcliffe-023	MBC-096	2.03	1.82	0.21	1.46	3.6	125	0	2.21	2.90	2.63	4.09	2.72	4.34	1.86
511648	6990451	Redcliffe-024	MBC-097	2.01	1.82	0.19	1.16	3.6	111	0	2.12	2.71	2.46	3.73	2.54	3.95	2.09
511661	6991063	Redcliffe-025	MBC-098	2.03	1.83	0.20	1.37	3.5	123	0	2.20	2.85	2.60	3.97	2.68	4.21	1.88
511568	6992087	Redcliffe-027	MBC-099	2.02	1.83	0.19	1.26	3.6	115	0	2.16	2.79	2.53	3.86	2.61	4.09	2.00
511475	6992513	Redcliffe-028	MBC-100	2.02	1.84	0.18	1.16	3.5	120	0	2.15	2.73	2.49	3.73	2.57	3.95	2.05
510916	6992713	Redcliffe-029	MBC-101	1.98	1.83	0.15	1.01	3.1	65	0	2.11	2.59	2.42	3.43	2.49	3.61	1.93
510531	6992472	Redcliffe-030	MBC-102	1.99	1.85	0.14	0.96	2.7	13	0	2.12	2.54	2.42	3.30	2.48	3.45	1.73
510161	6992164	Redcliffe-031	MBC-103	1.98	1.86	0.12	0.84	2.5	319	0	2.10	2.47	2.36	3.12	2.41	3.26	1.72
509833	6991712	Redcliffe-032	MBC-104	1.99	1.88	0.11	0.82	2.4	329	0	2.11	2.47	2.37	3.10	2.42	3.22	1.68
509525	6991322	Redcliffe-033	MBC-105	1.99	1.88	0.11	0.80	2.4	348	0	2.11	2.45	2.35	3.06	2.40	3.19	1.66
509155	6991199	Redcliffe-034	MBC-106	2.00	1.89	0.11	0.84	2.4	12	0	2.13	2.49	2.39	3.13	2.44	3.26	1.65
508478	6991343	Redcliffe-035	MBC-107	2.03	1.91	0.12	0.88	2.6	18	0	2.16	2.54	2.43	3.23	2.49	3.37	1.70
507965	6991487	Redcliffe-036	MBC-108	2.07	1.94	0.13	0.92	2.6	20	0	2.20	2.60	2.49	3.31	2.54	3.45	1.68
507205	6991589	Redcliffe-037	MBC-109	2.08	1.96	0.12	0.89	2.6	20	0	2.21	2.60	2.49	3.29	2.55	3.44	1.71
506548	6991836	Redcliffe-038	MBC-110	2.09	1.97	0.12	0.87	2.6	27	0	2.22	2.60	2.49	3.27	2.54	3.41	1.71
505830	6992082	Redcliffe-039	MBC-111	2.12	2.00	0.12	0.87	2.6	32	0	2.25	2.63	2.52	3.30	2.57	3.44	1.71
505358	6992267	Redcliffe-040	MBC-112	2.14	2.02	0.12	0.84	2.6	35	0	2.26	2.63	2.52	3.31	2.57	3.45	1.79

				Water Level mAHD 200yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar		1.82	1.82		0.63	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.20	2.06	0.14	0.94	2.9	114	0	2.32	2.76	2.61	3.52	2.68	3.68	1.85
507065	6983136	PineRiver-002	MBC-002	2.18	2.05	0.13	0.85	2.9	122	0	2.29	2.69	2.55	3.40	2.61	3.55	1.93
507237	6983516	PineRiver-003	MBC-003	2.20	2.05	0.15	0.96	3.0	118	0	2.32	2.77	2.61	3.57	2.68	3.74	1.92
507198	6984049	PineRiver-004	MBC-004	2.18	2.05	0.13	0.88	2.7	123	0	2.30	2.70	2.57	3.41	2.63	3.55	1.82
506913	6984334	PineRiver-005	MBC-005	2.19	2.08	0.11	0.76	2.5	124	0	2.30	2.64	2.53	3.24	2.58	3.37	1.79
507046	6984696	PineRiver-006	MBC-006	2.17	2.07	0.10	0.69	2.2	139	0	2.26	2.56	2.47	3.09	2.51	3.20	1.67
507522	6984334	PineRiver-007	MBC-007	2.15	2.03	0.12	0.84	2.7	131	0	2.27	2.65	2.53	3.32	2.58	3.46	1.81
507769	6984239	PineRiver-008	MBC-008	2.16	2.01	0.15	1.06	2.9	126	0	2.31	2.78	2.64	3.62	2.70	3.79	1.75
506179	6982661	PineRiver-009	MBC-009	2.19	2.08	0.11	0.76	2.5	124	0	2.30	2.64	2.53	3.24	2.58	3.37	1.79
504927	6992513	Caboolture-001	MBC-010	2.20	2.08	0.12	0.86	2.7	50	0	2.32	2.71	2.59	3.39	2.65	3.54	1.78
504270	6992575	Caboolture-002	MBC-011	2.24	2.13	0.11	0.77	2.5	59	0	2.35	2.69	2.59	3.30	2.64	3.42	1.75
503633	6992841	Caboolture-003	MBC-012	2.29	2.19	0.10	0.74	2.4	71	0	2.40	2.72	2.63	3.30	2.67	3.42	1.73
503346	6993519	Caboolture-004	MBC-013	2.29	2.19	0.10	0.72	2.4	92	0	2.39	2.72	2.62	3.29	2.66	3.41	1.79
503613	6994402	Caboolture-005	MBC-014	2.29	2.18	0.11	0.75	2.6	108	0	2.39	2.74	2.63	3.35	2.68	3.47	1.85
504658	6996186	Caboolture-009	MBC-015	2.24	2.10	0.14	0.93	2.8	115	0	2.36	2.78	2.65	3.53	2.71	3.69	1.82
504477	6996546	Caboolture-010	MBC-016	2.26	2.14	0.12	0.82	2.7	114	0	2.37	2.74	2.63	3.41	2.68	3.55	1.83
504774	6997055	Caboolture-012	MBC-017	2.23	2.10	0.13	0.92	2.8	120	0	2.36	2.78	2.64	3.52	2.70	3.67	1.82
505039	6997331	Caboolture-013	MBC-018	2.22	2.08	0.14	0.90	2.9	121	0	2.33	2.75	2.61	3.50	2.67	3.66	1.92
505442	6998582	Caboolture-016	MBC-019	2.24	2.08	0.16	1.07	3.1	122	0	2.38	2.87	2.70	3.75	2.77	3.93	1.87
505671	6999062	Caboolture-017	MBC-020	2.22	2.06	0.16	0.99	3.2	122	0	2.33	2.82	2.63	3.67	2.70	3.85	2.03
505909	6999567	Caboolture-018	MBC-021	2.22	2.06	0.16	1.04	3.3	124	0	2.34	2.85	2.65	3.74	2.72	3.93	2.01
506361	7000127	Caboolture-019	MBC-022	2.21	2.04	0.17	1.10	3.2	130	0	2.34	2.86	2.68	3.77	2.75	3.96	1.90
506813	7000580	Caboolture-020	MBC-023	2.17	2.01	0.16	1.02	3.2	128	0	2.29	2.78	2.60	3.64	2.67	3.83	1.98
507266	7001010	Caboolture-021	MBC-024	2.17	2.00	0.17	1.12	3.3	129	0	2.30	2.84	2.64	3.78	2.71	3.98	1.94
507718	7001452	Caboolture-022	MBC-025	2.17	1.99	0.18	1.16	3.4	134	0	2.30	2.86	2.65	3.83	2.72	4.04	1.95
508289	7001850	Caboolture-023	MBC-026	2.15	1.97	0.18	1.18	3.4	136	0	2.29	2.85	2.64	3.84	2.71	4.05	1.93
508903	7002206	Caboolture-024	MBC-027	2.12	1.94	0.18	1.21	3.4	139	0	2.26	2.85	2.63	3.86	2.70	4.08	1.94
509355	7002550	Caboolture-025	MBC-028	2.12	1.94	0.18	1.17	3.3	143	0	2.26	2.82	2.61	3.79	2.68	3.99	1.92
509894	7002744	Caboolture-026	MBC-029	2.09	1.92	0.17	1.12	3.3	149	0	2.22	2.77	2.56	3.71	2.63	3.91	1.97
510475	7002852	Caboolture-027	MBC-030	2.08	1.91	0.17	1.11	3.4	150	0	2.21	2.75	2.54	3.69	2.61	3.89	1.99
511067	7003003	Caboolture-028	MBC-031	2.08	1.90	0.18	1.16	3.4	152	0	2.21	2.78	2.56	3.76	2.63	3.98	1.99
511477	7003251	Caboolture-029	MBC-032	2.06	1.89	0.17	1.05	3.4	154	0	2.17	2.70	2.48	3.61	2.55	3.81	2.08
512112	7003326	Caboolture-030	MBC-033	2.05	1.87	0.18	1.15	3.4	156	0	2.18	2.74	2.52	3.71	2.60	3.92	1.98
512694	7003455	Caboolture-031	MBC-034	2.04	1.87	0.17	1.07	3.4	159	0	2.16	2.69	2.48	3.61	2.55	3.81	2.03
513275	7003412	Caboolture-032	MBC-035	2.02	1.85	0.17	1.09	3.3	156	0	2.14	2.68	2.47	3.60	2.54	3.80	1.99
513911	7003746	Caboolture-033	MBC-036	2.01	1.86	0.15	0.95	3.2	148	0	2.12	2.59	2.41	3.40	2.47	3.58	2.04
514481	7004446	Caboolture-034	MBC-037	1.97	1.85	0.12	0.85	2.6	152	0	2.09	2.47	2.36	3.15	2.41	3.29	1.79
516248	7002647	Caboolture-038	MBC-038	1.95	1.78	0.17	1.02	3.4	174	0	2.05	2.57	2.36	3.46	2.43	3.66	2.10
517280	7002397	Caboolture-040	MBC-039	1.98	1.78	0.20	1.34	3.6	156	0	2.13	2.78	2.52	3.90	2.61	4.14	1.92
519611	7002925	Caboolture-044	MBC-040	2.03	1.75	0.28	0.81	10.9	89	0	1.89	2.71	2.10	4.14	2.17	4.60	7.58
520367	7003619	Caboolture-046	MBC-041	2.07	1.75	0.32	0.97	11.3	62	0	1.92	2.89	2.17	4.55	2.25	5.08	7.14
520284	7006303	Caboolture-051	MBC-042	2.15	1.75	0.40	1.34	9.2	71	0	2.00	3.13	2.33	5.02	2.43	5.56	4.94
516778	7013518	Caboolture-060	MBC-043	2.17	1.74	0.43	1.73	10.7	73	0	2.05	3.54	2.49	6.02	2.61	6.74	5.09
516320	7014796	Caboolture-061	MBC-044	2.17	1.74	0.43	1.73	10.7	73	0	2.05	3.54	2.49	6.02	2.61	6.74	5.09
507667	7015461	Caboolture-067	MBC-045	2.20	2.12	0.08	0.58	1.8	163	0	2.28	2.52	2.45	2.94	2.47	3.01	1.48
508591	7014764	Caboolture-069	MBC-046	2.16	2.07	0.09	0.61	1.8	167	0	2.24	2.48	2.41	2.91	2.44	2.98	1.44
509101	7014442	Caboolture-070	MBC-047	2.11	2.03	0.08	0.58	1.9	175	0	2.19	2.43	2.36	2.86	2.39	2.94	1.54
509543	7013236	Caboolture-072	MBC-048	2.09	2.01	0.08	0.52	1.7	231	0	2.15	2.37	2.30	2.75	2.33	2.82	1.49
509623	7012592	Caboolture-073	MBC-049	2.08	2.00	0.08	0.48	1.7	254	0	2.13	2.33	2.27	2.69	2.30	2.75	1.54
510253	7011212	Caboolture-075	MBC-050	2.07	1.98	0.09	0.60	1.9	152	0	2.15	2.40	2.32	2.84	2.35	2.91	1.49
510669	7010917	Caboolture-076	MBC-051	2.03	1.94	0.09	0.62	1.9	152	0	2.11	2.37	2.29	2.82	2.32	2.90	1.48
511138	7010769	Caboolture-077	MBC-052	2.01	1.92	0.09	0.64	1.9	156	0	2.10	2.37	2.28	2.84	2.31	2.92	1.50
511701	7010475	Caboolture-078	MBC-053	1.99	1.90	0.09	0.64	1.9	166	0	2.08	2.35	2.26	2.82	2.29	2.90	1.50
512076	7010032	Caboolture-079	MBC-054	1.96	1.88	0.08	0.53	2.0	166	0	2.03	2.26	2.18	2.67	2.22	2.75	1.69
513283	7007901	Caboolture-083	MBC-055	1.93	1.85	0.08	0.52	1.7	174	0	1.99	2.20	2.14	2.56	2.17	2.62	1.43
513390	7007284	Caboolture-084	MBC-056	1.92	1.84	0.08	0.54	1.7	252	0	1.99	2.20	2.14	2.58	2.17	2.64	1.42

				Water Level mAHD 200yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	1.92	1.84	0.08	0.54	1.7	267	0	1.99	2.21	2.14	2.59	2.17	2.65	1.44
514141	7006547	Caboolture-086	MBC-058	1.91	1.83	0.08	0.49	1.5	166	0	1.96	2.15	2.10	2.48	2.12	2.53	1.37
514958	7005756	Caboolture-088	MBC-059	1.87	1.80	0.07	0.43	1.5	172	0	1.92	2.09	2.04	2.39	2.06	2.43	1.42
515374	7005260	Caboolture-089	MBC-060	1.87	1.80	0.07	0.41	1.6	311	0	1.91	2.08	2.03	2.38	2.05	2.44	1.53
514730	7005140	Caboolture-090	MBC-061	1.88	1.81	0.07	0.42	1.6	337	0	1.92	2.10	2.04	2.41	2.06	2.46	1.49
514328	7005394	Caboolture-091	MBC-062	1.89	1.82	0.07	0.44	1.7	339	0	1.94	2.13	2.07	2.45	2.09	2.51	1.55
513269	7006199	Caboolture-093	MBC-063	1.92	1.84	0.08	0.51	1.7	199	0	1.98	2.19	2.13	2.56	2.15	2.63	1.50
511621	7007284	Caboolture-096	MBC-064	2.00	1.92	0.08	0.52	1.8	115	0	2.06	2.28	2.21	2.66	2.24	2.74	1.54
511339	7008048	Caboolture-097	MBC-065	2.02	1.94	0.08	0.52	1.7	120	0	2.08	2.30	2.23	2.67	2.26	2.75	1.51
511648	7008558	Caboolture-098	MBC-066	2.00	1.92	0.08	0.57	1.8	140	0	2.08	2.32	2.24	2.73	2.27	2.80	1.49
511835	7009040	Caboolture-099	MBC-067	1.98	1.89	0.09	0.59	1.8	147	0	2.05	2.30	2.22	2.72	2.25	2.79	1.46
511446	7009456	Caboolture-100	MBC-068	1.99	1.91	0.08	0.56	1.8	143	0	2.06	2.30	2.23	2.70	2.25	2.77	1.48
511058	7009456	Caboolture-101	MBC-069	2.00	1.92	0.08	0.54	1.8	135	0	2.07	2.30	2.23	2.70	2.25	2.76	1.50
510321	7009818	Caboolture-102	MBC-070	2.03	1.95	0.08	0.53	1.8	122	0	2.10	2.32	2.25	2.70	2.28	2.78	1.53
509784	7010233	Caboolture-103	MBC-071	2.06	1.98	0.08	0.50	1.8	109	0	2.12	2.33	2.26	2.70	2.29	2.77	1.56
509369	7010796	Caboolture-104	MBC-072	2.08	2.00	0.08	0.52	1.8	108	0	2.14	2.36	2.29	2.75	2.32	2.82	1.56
509034	7011198	Caboolture-105	MBC-073	2.12	2.04	0.08	0.53	1.8	114	0	2.19	2.41	2.34	2.79	2.37	2.87	1.53
508833	7011587	Caboolture-106	MBC-074	2.12	2.04	0.08	0.54	1.9	119	0	2.19	2.42	2.35	2.82	2.38	2.90	1.60
508752	7011869	Caboolture-107	MBC-075	2.14	2.06	0.08	0.57	1.9	125	0	2.22	2.46	2.38	2.88	2.42	2.96	1.56
508471	7012110	Caboolture-108	MBC-076	2.15	2.07	0.08	0.49	1.8	119	0	2.20	2.41	2.35	2.77	2.37	2.84	1.56
508926	7012177	Caboolture-109	MBC-077	2.12	2.03	0.09	0.60	1.9	137	0	2.20	2.45	2.37	2.88	2.41	2.97	1.52
509020	7012767	Caboolture-110	MBC-078	2.11	2.02	0.09	0.59	1.8	149	0	2.18	2.43	2.35	2.86	2.38	2.93	1.49
508565	7013276	Caboolture-111	MBC-079	2.13	2.05	0.08	0.51	1.7	143	0	2.19	2.40	2.34	2.77	2.36	2.83	1.47
508069	7013611	Caboolture-112	MBC-080	2.16	2.08	0.08	0.50	1.7	141	0	2.22	2.42	2.36	2.78	2.38	2.84	1.46
507667	7013960	Caboolture-113	MBC-081	2.20	2.12	0.08	0.52	1.7	135	0	2.26	2.48	2.41	2.85	2.44	2.91	1.46
507157	7014067	Caboolture-114	MBC-082	2.22	2.14	0.08	0.48	1.6	120	0	2.27	2.47	2.41	2.82	2.43	2.88	1.48
507171	7014777	Caboolture-115	MBC-083	2.23	2.15	0.08	0.56	1.8	129	0	2.30	2.54	2.47	2.94	2.50	3.02	1.51
507063	7015595	Caboolture-116	MBC-084	2.22	2.14	0.08	0.54	1.8	132	0	2.29	2.52	2.45	2.92	2.47	2.98	1.50
509121	6984944	Redcliffe-005	MBC-085	2.09	1.95	0.14	0.93	2.9	149	0	2.21	2.64	2.50	3.40	2.56	3.56	1.86
509533	6984891	Redcliffe-006	MBC-086	2.09	1.94	0.15	1.02	2.8	159	0	2.23	2.68	2.54	3.49	2.61	3.65	1.76
509892	6984691	Redcliffe-007	MBC-087	2.06	1.92	0.14	1.00	2.9	159	0	2.20	2.65	2.51	3.45	2.57	3.61	1.79
510464	6984279	Redcliffe-009	MBC-088	2.09	1.91	0.18	1.15	3.5	122	0	2.21	2.79	2.56	3.79	2.63	4.01	2.06
510783	6984638	Redcliffe-010	MBC-089	2.08	1.89	0.19	1.36	3.5	122	0	2.25	2.90	2.65	4.00	2.74	4.23	1.85
510969	6985516	Redcliffe-012	MBC-090	2.07	1.88	0.19	1.32	3.5	115	0	2.23	2.86	2.62	3.94	2.70	4.17	1.88
511076	6985889	Redcliffe-013	MBC-091	2.07	1.88	0.19	1.30	3.5	118	0	2.23	2.85	2.61	3.93	2.69	4.17	1.92
511488	6987365	Redcliffe-016	MBC-092	2.06	1.87	0.19	1.28	3.4	121	0	2.21	2.83	2.60	3.88	2.68	4.11	1.90
511768	6988017	Redcliffe-018	MBC-093	2.06	1.87	0.19	1.24	3.5	119	0	2.20	2.81	2.57	3.85	2.65	4.08	1.97
511648	6988496	Redcliffe-019	MBC-094	2.06	1.87	0.19	1.21	3.6	113	0	2.19	2.79	2.54	3.83	2.62	4.06	2.03
511741	6989254	Redcliffe-021	MBC-095	2.07	1.87	0.20	1.36	3.6	120	0	2.23	2.89	2.63	4.02	2.71	4.26	1.92
511874	6990079	Redcliffe-023	MBC-096	2.07	1.86	0.21	1.51	3.6	125	0	2.26	2.97	2.70	4.19	2.79	4.45	1.82
511648	6990451	Redcliffe-024	MBC-097	2.06	1.87	0.19	1.19	3.6	111	0	2.18	2.78	2.53	3.81	2.61	4.04	2.07
511661	6991063	Redcliffe-025	MBC-098	2.07	1.87	0.20	1.41	3.5	123	0	2.25	2.91	2.66	4.06	2.75	4.31	1.86
511568	6992087	Redcliffe-027	MBC-099	2.07	1.87	0.20	1.30	3.6	115	0	2.21	2.85	2.59	3.95	2.67	4.18	1.97
511475	6992513	Redcliffe-028	MBC-100	2.07	1.88	0.19	1.19	3.5	120	0	2.19	2.79	2.55	3.80	2.62	4.03	2.02
510916	6992713	Redcliffe-029	MBC-101	2.03	1.87	0.16	1.04	3.1	65	0	2.16	2.65	2.48	3.51	2.54	3.69	1.90
510531	6992472	Redcliffe-030	MBC-102	2.03	1.89	0.14	0.99	2.7	13	0	2.17	2.60	2.48	3.37	2.54	3.53	1.71
510161	6992164	Redcliffe-031	MBC-103	2.02	1.90	0.12	0.86	2.5	319	0	2.15	2.52	2.41	3.19	2.47	3.32	1.70
509833	6991712	Redcliffe-032	MBC-104	2.03	1.92	0.11	0.84	2.4	329	0	2.16	2.52	2.42	3.16	2.47	3.29	1.66
509525	6991322	Redcliffe-033	MBC-105	2.04	1.93	0.11	0.82	2.4	348	0	2.16	2.51	2.42	3.14	2.47	3.26	1.64
509155	6991199	Redcliffe-034	MBC-106	2.06	1.94	0.12	0.86	2.4	12	0	2.19	2.55	2.45	3.20	2.50	3.33	1.63
508478	6991343	Redcliffe-035	MBC-107	2.08	1.96	0.12	0.91	2.6	18	0	2.22	2.61	2.50	3.31	2.56	3.45	1.68
507965	6991487	Redcliffe-036	MBC-108	2.12	1.99	0.13	0.94	2.6	20	0	2.26	2.66	2.55	3.38	2.61	3.52	1.66
507205	6991589	Redcliffe-037	MBC-109	2.14	2.01	0.13	0.92	2.6	20	0	2.27	2.67	2.56	3.38	2.62	3.52	1.69
506548	6991836	Redcliffe-038	MBC-110	2.15	2.03	0.12	0.89	2.6	27	0	2.28	2.67	2.56	3.35	2.62	3.49	1.69
505830	6992082	Redcliffe-039	MBC-111	2.18	2.06	0.12	0.90	2.6	32	0	2.32	2.70	2.60	3.40	2.65	3.54	1.69
505358	6992267	Redcliffe-040	MBC-112	2.20	2.08	0.12	0.87	2.6	35	0	2.33	2.71	2.60	3.40	2.65	3.54	1.76

				Water Level mAHD 500yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar		1.88	1.88		0.64	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.27	2.13	0.14	0.97	2.9	114	0	2.40	2.84	2.70	3.62	2.77	3.79	1.82
507065	6983136	PineRiver-002	MBC-002	2.25	2.12	0.13	0.87	2.9	122	0	2.36	2.77	2.63	3.49	2.69	3.64	1.91
507237	6983516	PineRiver-003	MBC-003	2.27	2.12	0.15	0.99	3.0	118	0	2.40	2.86	2.70	3.67	2.77	3.85	1.89
507198	6984049	PineRiver-004	MBC-004	2.25	2.12	0.13	0.91	2.7	123	0	2.38	2.79	2.66	3.51	2.72	3.66	1.79
506913	6984334	PineRiver-005	MBC-005	2.27	2.16	0.11	0.78	2.5	124	0	2.38	2.73	2.63	3.35	2.68	3.47	1.77
507046	6984696	PineRiver-006	MBC-006	2.24	2.14	0.10	0.71	2.2	139	0	2.34	2.64	2.55	3.18	2.60	3.29	1.65
507522	6984334	PineRiver-007	MBC-007	2.22	2.10	0.12	0.87	2.7	131	0	2.35	2.74	2.62	3.43	2.67	3.57	1.78
507769	6984239	PineRiver-008	MBC-008	2.23	2.08	0.15	1.10	2.9	126	0	2.39	2.87	2.73	3.73	2.80	3.91	1.72
506179	6982661	PineRiver-009	MBC-009	2.27	2.16	0.11	0.78	2.5	124	0	2.38	2.73	2.63	3.35	2.68	3.47	1.77
504927	6992513	Caboolture-001	MBC-010	2.29	2.16	0.13	0.90	2.7	50	0	2.42	2.81	2.69	3.52	2.75	3.67	1.74
504270	6992575	Caboolture-002	MBC-011	2.32	2.21	0.11	0.80	2.5	59	0	2.44	2.79	2.69	3.41	2.74	3.54	1.72
503633	6992841	Caboolture-003	MBC-012	2.39	2.28	0.11	0.77	2.4	71	0	2.50	2.83	2.74	3.43	2.78	3.55	1.69
503346	6993519	Caboolture-004	MBC-013	2.39	2.28	0.11	0.75	2.4	92	0	2.49	2.82	2.72	3.42	2.77	3.54	1.75
503613	6994402	Caboolture-005	MBC-014	2.38	2.27	0.11	0.77	2.6	108	0	2.49	2.84	2.73	3.46	2.78	3.59	1.83
504658	6996186	Caboolture-009	MBC-015	2.32	2.18	0.14	0.96	2.8	115	0	2.45	2.88	2.75	3.65	2.81	3.81	1.79
504477	6996546	Caboolture-010	MBC-016	2.35	2.23	0.12	0.85	2.7	114	0	2.47	2.85	2.73	3.53	2.79	3.68	1.80
504774	6997055	Caboolture-012	MBC-017	2.31	2.17	0.14	0.95	2.8	120	0	2.44	2.87	2.73	3.62	2.79	3.78	1.79
505039	6997331	Caboolture-013	MBC-018	2.30	2.16	0.14	0.93	2.9	121	0	2.42	2.85	2.71	3.62	2.77	3.78	1.89
505442	6998582	Caboolture-016	MBC-019	2.32	2.16	0.16	1.11	3.1	122	0	2.47	2.98	2.81	3.88	2.88	4.06	1.83
505671	6999062	Caboolture-017	MBC-020	2.30	2.14	0.16	1.02	3.2	122	0	2.42	2.92	2.73	3.78	2.80	3.97	2.00
505909	6999567	Caboolture-018	MBC-021	2.30	2.13	0.17	1.08	3.3	124	0	2.42	2.95	2.75	3.86	2.82	4.05	1.97
506361	7000127	Caboolture-019	MBC-022	2.28	2.11	0.17	1.14	3.2	130	0	2.42	2.96	2.77	3.89	2.84	4.08	1.87
506813	7000580	Caboolture-020	MBC-023	2.25	2.09	0.16	1.05	3.2	128	0	2.38	2.88	2.70	3.76	2.77	3.95	1.95
507266	7001010	Caboolture-021	MBC-024	2.24	2.07	0.17	1.15	3.3	129	0	2.38	2.93	2.73	3.88	2.80	4.09	1.92
507718	7001452	Caboolture-022	MBC-025	2.24	2.06	0.18	1.20	3.4	134	0	2.38	2.96	2.74	3.95	2.82	4.17	1.92
508289	7001850	Caboolture-023	MBC-026	2.22	2.04	0.18	1.22	3.4	136	0	2.37	2.95	2.73	3.95	2.81	4.17	1.89
508903	7002206	Caboolture-024	MBC-027	2.19	2.01	0.18	1.25	3.4	139	0	2.35	2.94	2.72	3.98	2.80	4.20	1.90
509355	7002550	Caboolture-025	MBC-028	2.18	2.00	0.18	1.22	3.3	143	0	2.33	2.91	2.70	3.91	2.78	4.12	1.88
509894	7002744	Caboolture-026	MBC-029	2.15	1.98	0.17	1.16	3.3	149	0	2.29	2.85	2.64	3.82	2.72	4.02	1.93
510475	7002852	Caboolture-027	MBC-030	2.14	1.97	0.17	1.14	3.4	150	0	2.28	2.83	2.62	3.79	2.69	3.99	1.96
511067	7003003	Caboolture-028	MBC-031	2.14	1.96	0.18	1.20	3.4	152	0	2.28	2.87	2.64	3.87	2.72	4.09	1.96
511477	7003251	Caboolture-029	MBC-032	2.12	1.95	0.17	1.08	3.4	154	0	2.24	2.78	2.56	3.71	2.63	3.91	2.06
512112	7003326	Caboolture-030	MBC-033	2.11	1.93	0.18	1.19	3.4	156	0	2.25	2.83	2.60	3.82	2.68	4.04	1.95
512694	7003455	Caboolture-031	MBC-034	2.09	1.92	0.17	1.10	3.4	159	0	2.21	2.76	2.54	3.69	2.61	3.90	2.01
513275	7003412	Caboolture-032	MBC-035	2.08	1.91	0.17	1.12	3.3	156	0	2.21	2.75	2.55	3.70	2.62	3.90	1.96
513911	7003746	Caboolture-033	MBC-036	2.07	1.92	0.15	0.97	3.2	148	0	2.18	2.66	2.48	3.49	2.54	3.67	2.02
514481	7004446	Caboolture-034	MBC-037	2.02	1.90	0.12	0.87	2.6	152	0	2.15	2.53	2.42	3.22	2.47	3.37	1.77
516248	7002647	Caboolture-038	MBC-038	2.00	1.83	0.17	1.06	3.4	174	0	2.11	2.64	2.43	3.56	2.50	3.76	2.06
517280	7002397	Caboolture-040	MBC-039	2.02	1.82	0.20	1.39	3.6	156	0	2.19	2.85	2.59	4.00	2.68	4.24	1.89
519611	7002925	Caboolture-044	MBC-040	2.08	1.79	0.29	0.87	10.9	89	0	1.94	2.82	2.17	4.33	2.24	4.81	7.29
520367	7003619	Caboolture-046	MBC-041	2.13	1.79	0.34	1.07	11.3	62	0	1.98	3.02	2.25	4.81	2.34	5.37	6.80
520284	7006303	Caboolture-051	MBC-042	2.20	1.79	0.41	1.40	9.2	71	0	2.05	3.22	2.40	5.17	2.50	5.73	4.83
516778	7013518	Caboolture-060	MBC-043	2.23	1.78	0.45	1.90	10.7	73	0	2.13	3.73	2.60	6.38	2.73	7.14	4.86
516320	7014796	Caboolture-061	MBC-044	2.23	1.78	0.45	1.90	10.7	73	0	2.13	3.73	2.60	6.38	2.73	7.14	4.86
507667	7015461	Caboolture-067	MBC-045	2.30	2.21	0.09	0.60	1.8	163	0	2.38	2.62	2.55	3.05	2.58	3.12	1.45
508591	7014764	Caboolture-069	MBC-046	2.23	2.14	0.09	0.63	1.8	167	0	2.31	2.56	2.50	3.00	2.53	3.07	1.42
509101	7014442	Caboolture-070	MBC-047	2.19	2.10	0.09	0.60	1.9	175	0	2.27	2.51	2.44	2.95	2.48	3.03	1.52
509543	7013236	Caboolture-072	MBC-048	2.16	2.08	0.08	0.54	1.7	231	0	2.23	2.45	2.38	2.84	2.41	2.90	1.46
509623	7012592	Caboolture-073	MBC-049	2.15	2.07	0.08	0.50	1.7	254	0	2.21	2.42	2.35	2.78	2.38	2.85	1.51
510253	7011212	Caboolture-075	MBC-050	2.14	2.05	0.09	0.63	1.9	152	0	2.23	2.48	2.41	2.93	2.44	3.00	1.46
510669	7010917	Caboolture-076	MBC-051	2.09	2.00	0.09	0.64	1.9	152	0	2.18	2.44	2.36	2.90	2.39	2.97	1.46
511138	7010769	Caboolture-077	MBC-052	2.07	1.98	0.09	0.67	1.9	156	0	2.17	2.44	2.36	2.92	2.39	3.00	1.46
511701	7010475	Caboolture-078	MBC-053	2.05	1.96	0.09	0.66	1.9	166	0	2.14	2.42	2.34	2.90	2.37	2.97	1.48
512076	7010032	Caboolture-079	MBC-054	2.02	1.94	0.08	0.55	2.0	166	0	2.09	2.33	2.26	2.75	2.29	2.84	1.66
513283	7007901	Caboolture-083	MBC-055	1.98	1.90	0.08	0.54	1.7	174	0	2.05	2.26	2.20	2.63	2.23	2.69	1.40
513390	7007284	Caboolture-084	MBC-056	1.97	1.89	0.08	0.56	1.7	252	0	2.04	2.26	2.20	2.64	2.23	2.70	1.39

				Water Level mAHD 500yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	1.98	1.90	0.08	0.56	1.7	267	0	2.05	2.27	2.21	2.66	2.24	2.73	1.42
514141	7006547	Caboolture-086	MBC-058	1.96	1.88	0.08	0.51	1.5	166	0	2.02	2.20	2.16	2.54	2.18	2.59	1.35
514958	7005756	Caboolture-088	MBC-059	1.92	1.85	0.07	0.45	1.5	172	0	1.97	2.14	2.10	2.45	2.12	2.50	1.39
515374	7005260	Caboolture-089	MBC-060	1.91	1.84	0.07	0.43	1.6	311	0	1.96	2.14	2.08	2.46	2.10	2.51	1.50
514730	7005140	Caboolture-090	MBC-061	1.92	1.85	0.07	0.43	1.6	337	0	1.97	2.15	2.09	2.46	2.11	2.51	1.48
514328	7005394	Caboolture-091	MBC-062	1.94	1.87	0.07	0.45	1.7	339	0	1.99	2.18	2.12	2.51	2.15	2.58	1.54
513269	7006199	Caboolture-093	MBC-063	1.98	1.90	0.08	0.52	1.7	199	0	2.04	2.26	2.19	2.64	2.22	2.71	1.49
511621	7007284	Caboolture-096	MBC-064	2.06	1.98	0.08	0.54	1.8	115	0	2.13	2.35	2.29	2.74	2.32	2.82	1.51
511339	7008048	Caboolture-097	MBC-065	2.08	2.00	0.08	0.54	1.7	120	0	2.15	2.38	2.30	2.77	2.33	2.83	1.48
511648	7008558	Caboolture-098	MBC-066	2.07	1.98	0.09	0.59	1.8	140	0	2.14	2.39	2.31	2.81	2.34	2.88	1.46
511835	7009040	Caboolture-099	MBC-067	2.04	1.95	0.09	0.61	1.8	147	0	2.12	2.36	2.29	2.79	2.32	2.86	1.44
511446	7009456	Caboolture-100	MBC-068	2.05	1.97	0.08	0.58	1.8	143	0	2.13	2.37	2.30	2.78	2.32	2.85	1.45
511058	7009456	Caboolture-101	MBC-069	2.06	1.98	0.08	0.56	1.8	135	0	2.13	2.37	2.30	2.77	2.32	2.84	1.47
510321	7009818	Caboolture-102	MBC-070	2.08	2.00	0.08	0.55	1.8	122	0	2.15	2.39	2.31	2.79	2.34	2.86	1.50
509784	7010233	Caboolture-103	MBC-071	2.14	2.06	0.08	0.52	1.8	109	0	2.20	2.42	2.35	2.80	2.38	2.87	1.53
509369	7010796	Caboolture-104	MBC-072	2.15	2.07	0.08	0.53	1.8	108	0	2.22	2.44	2.37	2.83	2.40	2.90	1.54
509034	7011198	Caboolture-105	MBC-073	2.19	2.11	0.08	0.55	1.8	114	0	2.26	2.50	2.42	2.90	2.45	2.97	1.50
508833	7011587	Caboolture-106	MBC-074	2.19	2.11	0.08	0.56	1.9	119	0	2.26	2.50	2.43	2.92	2.46	3.00	1.57
508752	7011869	Caboolture-107	MBC-075	2.22	2.13	0.09	0.59	1.9	125	0	2.29	2.54	2.47	2.97	2.50	3.06	1.54
508471	7012110	Caboolture-108	MBC-076	2.22	2.14	0.08	0.50	1.8	119	0	2.28	2.49	2.42	2.85	2.45	2.93	1.55
508926	7012177	Caboolture-109	MBC-077	2.19	2.10	0.09	0.62	1.9	137	0	2.27	2.54	2.45	2.99	2.48	3.07	1.50
509020	7012767	Caboolture-110	MBC-078	2.18	2.09	0.09	0.62	1.8	149	0	2.26	2.51	2.44	2.95	2.47	3.03	1.45
508565	7013276	Caboolture-111	MBC-079	2.20	2.12	0.08	0.52	1.7	143	0	2.26	2.48	2.41	2.85	2.44	2.91	1.45
508069	7013611	Caboolture-112	MBC-080	2.24	2.16	0.08	0.52	1.7	141	0	2.30	2.51	2.45	2.87	2.48	2.93	1.43
507667	7013960	Caboolture-113	MBC-081	2.29	2.21	0.08	0.54	1.7	135	0	2.36	2.57	2.51	2.95	2.54	3.02	1.44
507157	7014067	Caboolture-114	MBC-082	2.31	2.23	0.08	0.50	1.6	120	0	2.37	2.57	2.51	2.93	2.53	2.98	1.45
507171	7014777	Caboolture-115	MBC-083	2.32	2.24	0.08	0.58	1.8	129	0	2.40	2.64	2.57	3.07	2.59	3.14	1.48
507063	7015595	Caboolture-116	MBC-084	2.31	2.23	0.08	0.56	1.8	132	0	2.38	2.62	2.55	3.02	2.57	3.09	1.47
509121	6984944	Redcliffe-005	MBC-085	2.16	2.02	0.14	0.97	2.9	149	0	2.29	2.73	2.59	3.51	2.66	3.68	1.82
509533	6984891	Redcliffe-006	MBC-086	2.15	2.00	0.15	1.06	2.8	159	0	2.30	2.77	2.63	3.59	2.69	3.76	1.72
509892	6984691	Redcliffe-007	MBC-087	2.13	1.98	0.15	1.05	2.9	159	0	2.28	2.74	2.60	3.57	2.67	3.74	1.74
510464	6984279	Redcliffe-009	MBC-088	2.16	1.97	0.19	1.18	3.5	122	0	2.28	2.87	2.63	3.88	2.71	4.11	2.04
510783	6984638	Redcliffe-010	MBC-089	2.15	1.95	0.20	1.41	3.5	122	0	2.33	2.99	2.74	4.12	2.83	4.36	1.81
510969	6985516	Redcliffe-012	MBC-090	2.14	1.94	0.20	1.37	3.5	115	0	2.31	2.95	2.71	4.06	2.79	4.30	1.84
511076	6985889	Redcliffe-013	MBC-091	2.14	1.94	0.20	1.35	3.5	118	0	2.30	2.95	2.70	4.06	2.78	4.29	1.89
511488	6987365	Redcliffe-016	MBC-092	2.11	1.92	0.19	1.33	3.4	121	0	2.28	2.91	2.67	3.99	2.76	4.22	1.86
511768	6988017	Redcliffe-018	MBC-093	2.11	1.92	0.19	1.28	3.5	119	0	2.26	2.88	2.64	3.95	2.72	4.18	1.94
511648	6988496	Redcliffe-019	MBC-094	2.11	1.92	0.19	1.25	3.6	113	0	2.25	2.87	2.61	3.93	2.69	4.16	2.00
511741	6989254	Redcliffe-021	MBC-095	2.12	1.92	0.20	1.41	3.6	120	0	2.29	2.97	2.70	4.13	2.79	4.38	1.89
511874	6990079	Redcliffe-023	MBC-096	2.14	1.92	0.22	1.56	3.6	125	0	2.33	3.06	2.79	4.31	2.88	4.57	1.80
511648	6990451	Redcliffe-024	MBC-097	2.11	1.92	0.19	1.23	3.6	111	0	2.24	2.86	2.60	3.91	2.68	4.15	2.03
511661	6991063	Redcliffe-025	MBC-098	2.14	1.93	0.21	1.46	3.5	123	0	2.32	3.00	2.75	4.18	2.84	4.43	1.82
511568	6992087	Redcliffe-027	MBC-099	2.13	1.93	0.20	1.35	3.6	115	0	2.29	2.94	2.68	4.07	2.76	4.31	1.93
511475	6992513	Redcliffe-028	MBC-100	2.13	1.94	0.19	1.23	3.5	120	0	2.27	2.87	2.63	3.91	2.71	4.14	1.99
510916	6992713	Redcliffe-029	MBC-101	2.09	1.93	0.16	1.07	3.1	65	0	2.23	2.73	2.55	3.60	2.62	3.79	1.88
510531	6992472	Redcliffe-030	MBC-102	2.08	1.94	0.14	1.03	2.7	13	0	2.23	2.68	2.55	3.47	2.62	3.63	1.67
510161	6992164	Redcliffe-031	MBC-103	2.08	1.96	0.12	0.89	2.5	319	0	2.22	2.60	2.49	3.28	2.55	3.42	1.67
509833	6991712	Redcliffe-032	MBC-104	2.10	1.98	0.12	0.87	2.4	329	0	2.23	2.60	2.50	3.25	2.55	3.39	1.63
509525	6991322	Redcliffe-033	MBC-105	2.10	1.99	0.11	0.85	2.4	348	0	2.23	2.59	2.49	3.23	2.55	3.36	1.61
509155	6991199	Redcliffe-034	MBC-106	2.12	2.00	0.12	0.89	2.4	12	0	2.26	2.63	2.53	3.29	2.58	3.43	1.60
508478	6991343	Redcliffe-035	MBC-107	2.15	2.02	0.13	0.94	2.6	18	0	2.29	2.69	2.58	3.40	2.64	3.55	1.65
507965	6991487	Redcliffe-036	MBC-108	2.19	2.06	0.13	0.98	2.6	20	0	2.34	2.75	2.64	3.49	2.70	3.64	1.63
507205	6991589	Redcliffe-037	MBC-109	2.21	2.08	0.13	0.96	2.6	20	0	2.36	2.76	2.65	3.49	2.71	3.64	1.65
506548	6991836	Redcliffe-038	MBC-110	2.23	2.10	0.13	0.93	2.6	27	0	2.37	2.76	2.65	3.47	2.71	3.61	1.65
505830	6992082	Redcliffe-039	MBC-111	2.26	2.13	0.13	0.93	2.6	32	0	2.40	2.79	2.68	3.50	2.74	3.65	1.66
505358	6992267	Redcliffe-040	MBC-112	2.29	2.16	0.13	0.90	2.6	35	0	2.42	2.81	2.70	3.52	2.75	3.66	1.73

				Water Level mAHD 1000yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.92	1.92		0.65	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.33	2.19	0.14	0.99	2.9	114	0	2.47	2.92	2.77	3.71	2.84	3.87	1.80
507065	6983136	PineRiver-002	MBC-002	2.31	2.18	0.13	0.88	2.9	122	0	2.43	2.84	2.70	3.56	2.76	3.72	1.90
507237	6983516	PineRiver-003	MBC-003	2.32	2.17	0.15	1.01	3.0	118	0	2.45	2.92	2.76	3.75	2.83	3.92	1.87
507198	6984049	PineRiver-004	MBC-004	2.30	2.17	0.13	0.93	2.7	123	0	2.43	2.85	2.72	3.58	2.78	3.74	1.77
506913	6984334	PineRiver-005	MBC-005	2.33	2.22	0.11	0.79	2.5	124	0	2.45	2.79	2.69	3.42	2.74	3.55	1.76
507046	6984696	PineRiver-006	MBC-006	2.30	2.20	0.10	0.73	2.2	139	0	2.41	2.72	2.63	3.27	2.67	3.38	1.62
507522	6984334	PineRiver-007	MBC-007	2.29	2.16	0.13	0.89	2.7	131	0	2.41	2.81	2.69	3.51	2.74	3.66	1.76
507769	6984239	PineRiver-008	MBC-008	2.29	2.14	0.15	1.13	2.9	126	0	2.46	2.95	2.81	3.83	2.88	4.01	1.70
506179	6982661	PineRiver-009	MBC-009	2.33	2.22	0.11	0.79	2.5	124	0	2.45	2.79	2.69	3.42	2.74	3.55	1.76
504927	6992513	Caboolture-001	MBC-010	2.34	2.21	0.13	0.92	2.7	50	0	2.47	2.87	2.76	3.59	2.81	3.74	1.73
504270	6992575	Caboolture-002	MBC-011	2.39	2.28	0.11	0.82	2.5	59	0	2.52	2.87	2.77	3.50	2.82	3.63	1.70
503633	6992841	Caboolture-003	MBC-012	2.45	2.34	0.11	0.79	2.4	71	0	2.57	2.90	2.81	3.51	2.86	3.63	1.67
503346	6993519	Caboolture-004	MBC-013	2.46	2.35	0.11	0.76	2.4	92	0	2.57	2.90	2.80	3.50	2.85	3.62	1.74
503613	6994402	Caboolture-005	MBC-014	2.45	2.34	0.11	0.79	2.6	108	0	2.56	2.92	2.81	3.55	2.86	3.69	1.81
504658	6996186	Caboolture-009	MBC-015	2.38	2.24	0.14	0.99	2.8	115	0	2.52	2.96	2.83	3.74	2.89	3.91	1.76
504477	6996546	Caboolture-010	MBC-016	2.42	2.30	0.12	0.86	2.7	114	0	2.54	2.93	2.81	3.62	2.87	3.76	1.79
504774	6997055	Caboolture-012	MBC-017	2.37	2.23	0.14	0.97	2.8	120	0	2.50	2.94	2.80	3.71	2.87	3.87	1.78
505039	6997331	Caboolture-013	MBC-018	2.36	2.22	0.14	0.95	2.9	121	0	2.49	2.93	2.78	3.70	2.84	3.87	1.87
505442	6998582	Caboolture-016	MBC-019	2.38	2.22	0.16	1.14	3.1	122	0	2.54	3.06	2.88	3.97	2.96	4.16	1.81
505671	6999062	Caboolture-017	MBC-020	2.36	2.20	0.16	1.05	3.2	122	0	2.49	2.99	2.81	3.88	2.88	4.07	1.97
505909	6999567	Caboolture-018	MBC-021	2.36	2.19	0.17	1.11	3.3	124	0	2.49	3.02	2.82	3.95	2.90	4.15	1.94
506361	7000127	Caboolture-019	MBC-022	2.34	2.17	0.17	1.16	3.2	130	0	2.49	3.03	2.84	3.97	2.91	4.17	1.85
506813	7000580	Caboolture-020	MBC-023	2.30	2.14	0.16	1.08	3.2	128	0	2.44	2.95	2.76	3.85	2.83	4.04	1.92
507266	7001010	Caboolture-021	MBC-024	2.30	2.13	0.17	1.18	3.3	129	0	2.45	3.01	2.80	3.98	2.88	4.19	1.89
507718	7001452	Caboolture-022	MBC-025	2.30	2.12	0.18	1.23	3.4	134	0	2.45	3.04	2.82	4.05	2.89	4.27	1.89
508289	7001850	Caboolture-023	MBC-026	2.28	2.10	0.18	1.26	3.4	136	0	2.44	3.03	2.81	4.06	2.89	4.28	1.86
508903	7002206	Caboolture-024	MBC-027	2.24	2.05	0.19	1.28	3.4	139	0	2.39	3.00	2.78	4.05	2.86	4.28	1.88
509355	7002550	Caboolture-025	MBC-028	2.22	2.04	0.18	1.25	3.3	143	0	2.38	2.97	2.76	3.98	2.83	4.20	1.85
509894	7002744	Caboolture-026	MBC-029	2.21	2.03	0.18	1.18	3.3	149	0	2.35	2.91	2.70	3.89	2.78	4.10	1.91
510475	7002852	Caboolture-027	MBC-030	2.19	2.01	0.18	1.17	3.4	150	0	2.32	2.89	2.67	3.86	2.75	4.07	1.93
511067	7003003	Caboolture-028	MBC-031	2.18	2.00	0.18	1.23	3.4	152	0	2.33	2.92	2.70	3.95	2.78	4.17	1.94
511477	7003251	Caboolture-029	MBC-032	2.17	2.00	0.17	1.10	3.4	154	0	2.29	2.84	2.62	3.79	2.70	3.99	2.04
512112	7003326	Caboolture-030	MBC-033	2.15	1.97	0.18	1.22	3.4	156	0	2.30	2.88	2.66	3.90	2.74	4.12	1.92
512694	7003455	Caboolture-031	MBC-034	2.13	1.96	0.17	1.13	3.4	159	0	2.26	2.82	2.60	3.77	2.67	3.98	1.98
513275	7003412	Caboolture-032	MBC-035	2.12	1.95	0.17	1.15	3.3	156	0	2.26	2.81	2.61	3.77	2.68	3.98	1.93
513911	7003746	Caboolture-033	MBC-036	2.11	1.96	0.15	0.98	3.2	148	0	2.23	2.71	2.53	3.54	2.59	3.72	2.01
514481	7004446	Caboolture-034	MBC-037	2.07	1.94	0.13	0.89	2.6	152	0	2.19	2.59	2.47	3.29	2.53	3.43	1.75
516248	7002647	Caboolture-038	MBC-038	2.03	1.86	0.17	1.09	3.4	174	0	2.15	2.69	2.48	3.63	2.55	3.83	2.03
517280	7002397	Caboolture-040	MBC-039	2.05	1.85	0.20	1.43	3.6	156	0	2.23	2.91	2.64	4.08	2.73	4.32	1.86
519611	7002925	Caboolture-044	MBC-040	2.13	1.82	0.31	0.92	10.9	89	0	1.98	2.89	2.22	4.47	2.29	4.97	7.09
520367	7003619	Caboolture-046	MBC-041	2.18	1.82	0.36	1.15	11.3	62	0	2.02	3.13	2.32	5.02	2.41	5.60	6.56
520284	7006303	Caboolture-051	MBC-042	2.24	1.82	0.42	1.44	9.2	71	0	2.09	3.29	2.45	5.27	2.55	5.84	4.76
516778	7013518	Caboolture-060	MBC-043	2.28	1.81	0.47	2.03	10.7	73	0	2.18	3.87	2.69	6.65	2.83	7.44	4.70
516320	7014796	Caboolture-061	MBC-044	2.28	1.81	0.47	2.03	10.7	73	0	2.18	3.87	2.69	6.65	2.83	7.44	4.70
507667	7015461	Caboolture-067	MBC-045	2.36	2.27	0.09	0.62	1.8	163	0	2.44	2.69	2.62	3.12	2.65	3.19	1.43
508591	7014764	Caboolture-069	MBC-046	2.29	2.20	0.09	0.65	1.8	167	0	2.38	2.63	2.57	3.07	2.60	3.14	1.39
509101	7014442	Caboolture-070	MBC-047	2.25	2.16	0.09	0.62	1.9	175	0	2.33	2.59	2.51	3.05	2.54	3.12	1.49
509543	7013236	Caboolture-072	MBC-048	2.22	2.14	0.08	0.55	1.7	231	0	2.29	2.51	2.45	2.90	2.47	2.97	1.45
509623	7012592	Caboolture-073	MBC-049	2.21	2.13	0.08	0.51	1.7	254	0	2.27	2.49	2.42	2.86	2.44	2.92	1.50
510253	7011212	Caboolture-075	MBC-050	2.19	2.10	0.09	0.65	1.9	152	0	2.28	2.54	2.47	2.99	2.50	3.07	1.43
510669	7010917	Caboolture-076	MBC-051	2.13	2.04	0.09	0.66	1.9	152	0	2.22	2.49	2.42	2.95	2.45	3.03	1.44
511138	7010769	Caboolture-077	MBC-052	2.12	2.03	0.09	0.69	1.9	156	0	2.22	2.50	2.42	2.99	2.46	3.07	1.44
511701	7010475	Caboolture-078	MBC-053	2.09	2.00	0.09	0.68	1.9	166	0	2.19	2.46	2.39	2.95	2.42	3.03	1.45
512076	7010032	Caboolture-079	MBC-054	2.06	1.98	0.08	0.57	2.0	166	0	2.14	2.38	2.31	2.81	2.34	2.90	1.63
513283	7007901	Caboolture-083	MBC-055	2.02	1.94	0.08	0.56	1.7	174	0	2.09	2.30	2.25	2.68	2.28	2.74	1.38
513390	7007284	Caboolture-084	MBC-056	2.01	1.93	0.08	0.58	1.7	252	0	2.09	2.30	2.25	2.69	2.28	2.76	1.37

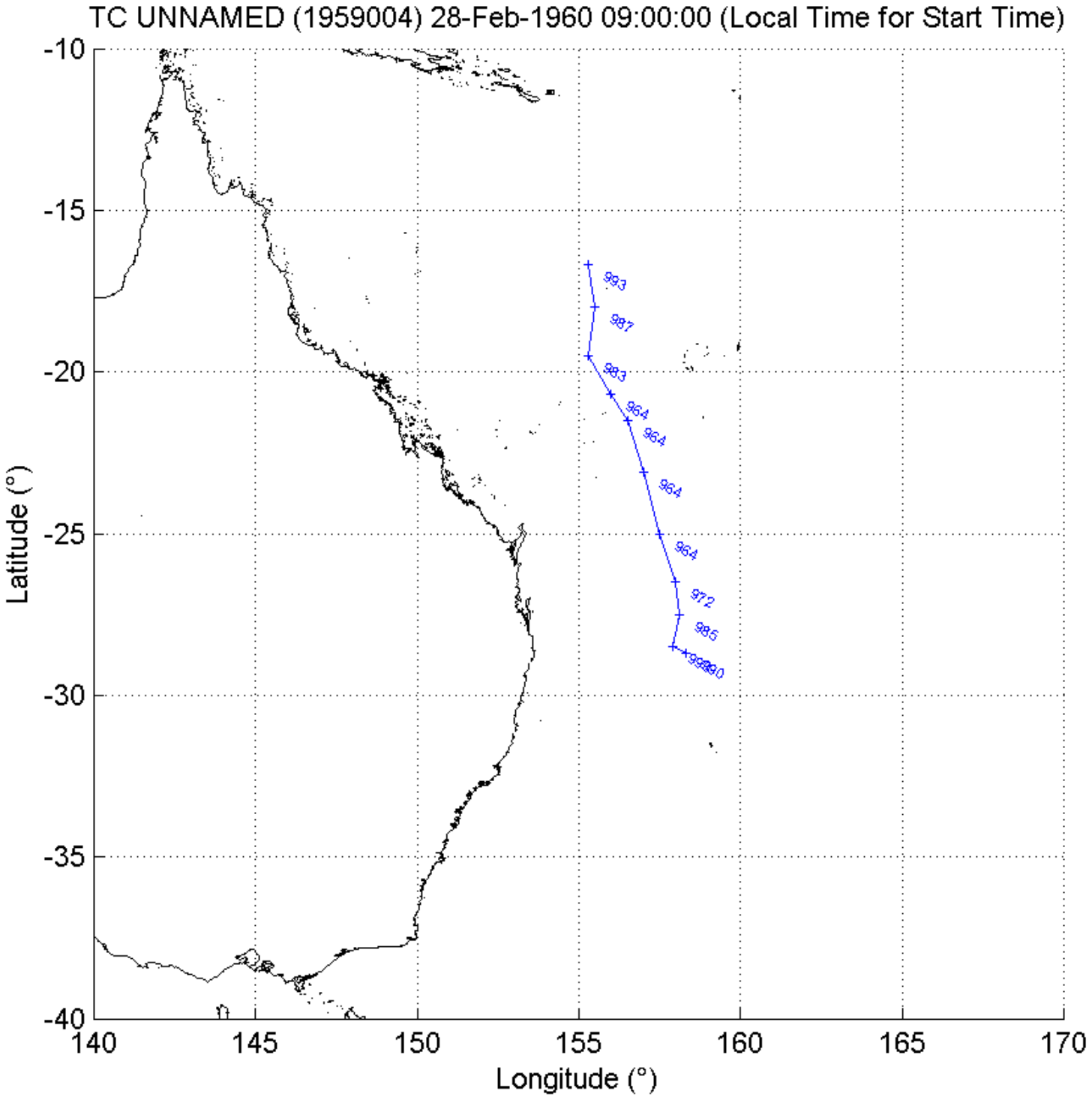
				Water Level mAHD 1000yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.02	1.94	0.08	0.57	1.7	267	0	2.10	2.32	2.26	2.71	2.29	2.77	1.41
514141	7006547	Caboolture-086	MBC-058	2.00	1.92	0.08	0.53	1.5	166	0	2.06	2.25	2.21	2.59	2.24	2.65	1.32
514958	7005756	Caboolture-088	MBC-059	1.95	1.88	0.07	0.46	1.5	172	0	2.00	2.18	2.13	2.49	2.15	2.54	1.37
515374	7005260	Caboolture-089	MBC-060	1.95	1.88	0.07	0.44	1.6	311	0	2.00	2.19	2.12	2.50	2.14	2.56	1.48
514730	7005140	Caboolture-090	MBC-061	1.96	1.89	0.07	0.44	1.6	337	0	2.01	2.19	2.13	2.51	2.15	2.56	1.46
514328	7005394	Caboolture-091	MBC-062	1.98	1.91	0.07	0.46	1.7	339	0	2.04	2.23	2.17	2.56	2.19	2.63	1.52
513269	7006199	Caboolture-093	MBC-063	2.02	1.94	0.08	0.53	1.7	199	0	2.09	2.31	2.24	2.69	2.26	2.75	1.48
511621	7007284	Caboolture-096	MBC-064	2.11	2.03	0.08	0.55	1.8	115	0	2.18	2.42	2.34	2.82	2.37	2.89	1.50
511339	7008048	Caboolture-097	MBC-065	2.12	2.04	0.08	0.55	1.7	120	0	2.19	2.42	2.35	2.81	2.37	2.88	1.47
511648	7008558	Caboolture-098	MBC-066	2.12	2.03	0.09	0.61	1.8	140	0	2.20	2.44	2.37	2.87	2.40	2.94	1.44
511835	7009040	Caboolture-099	MBC-067	2.09	2.00	0.09	0.62	1.8	147	0	2.17	2.42	2.35	2.85	2.38	2.92	1.43
511446	7009456	Caboolture-100	MBC-068	2.10	2.01	0.09	0.59	1.8	143	0	2.17	2.41	2.34	2.83	2.37	2.89	1.44
511058	7009456	Caboolture-101	MBC-069	2.11	2.03	0.08	0.58	1.8	135	0	2.19	2.42	2.36	2.83	2.38	2.90	1.44
510321	7009818	Caboolture-102	MBC-070	2.13	2.05	0.08	0.56	1.8	122	0	2.20	2.44	2.37	2.85	2.39	2.92	1.49
509784	7010233	Caboolture-103	MBC-071	2.19	2.11	0.08	0.53	1.8	109	0	2.26	2.48	2.41	2.86	2.44	2.94	1.52
509369	7010796	Caboolture-104	MBC-072	2.21	2.13	0.08	0.55	1.8	108	0	2.28	2.51	2.44	2.91	2.47	2.99	1.52
509034	7011198	Caboolture-105	MBC-073	2.25	2.17	0.08	0.56	1.8	114	0	2.32	2.56	2.49	2.97	2.51	3.04	1.49
508833	7011587	Caboolture-106	MBC-074	2.25	2.17	0.08	0.57	1.9	119	0	2.33	2.57	2.49	2.99	2.53	3.07	1.56
508752	7011869	Caboolture-107	MBC-075	2.28	2.19	0.09	0.60	1.9	125	0	2.36	2.61	2.53	3.04	2.57	3.13	1.52
508471	7012110	Caboolture-108	MBC-076	2.28	2.20	0.08	0.51	1.8	119	0	2.34	2.55	2.49	2.93	2.52	3.00	1.53
508926	7012177	Caboolture-109	MBC-077	2.25	2.16	0.09	0.64	1.9	137	0	2.34	2.60	2.52	3.07	2.55	3.14	1.48
509020	7012767	Caboolture-110	MBC-078	2.24	2.15	0.09	0.63	1.8	149	0	2.32	2.58	2.51	3.02	2.54	3.09	1.44
508565	7013276	Caboolture-111	MBC-079	2.26	2.18	0.08	0.54	1.7	143	0	2.33	2.54	2.48	2.92	2.51	2.98	1.43
508069	7013611	Caboolture-112	MBC-080	2.30	2.22	0.08	0.53	1.7	141	0	2.37	2.57	2.52	2.94	2.54	3.00	1.42
507667	7013960	Caboolture-113	MBC-081	2.35	2.27	0.08	0.55	1.7	135	0	2.42	2.64	2.58	3.02	2.60	3.08	1.42
507157	7014067	Caboolture-114	MBC-082	2.37	2.29	0.08	0.51	1.6	120	0	2.43	2.63	2.57	2.99	2.60	3.05	1.43
507171	7014777	Caboolture-115	MBC-083	2.40	2.31	0.09	0.59	1.8	129	0	2.47	2.72	2.64	3.14	2.67	3.21	1.47
507063	7015595	Caboolture-116	MBC-084	2.37	2.29	0.08	0.57	1.8	132	0	2.45	2.68	2.61	3.09	2.64	3.15	1.46
509121	6984944	Redcliffe-005	MBC-085	2.20	2.06	0.14	0.99	2.9	149	0	2.34	2.79	2.64	3.58	2.71	3.74	1.80
509533	6984891	Redcliffe-006	MBC-086	2.19	2.04	0.15	1.10	2.8	159	0	2.35	2.83	2.69	3.68	2.76	3.85	1.69
509892	6984691	Redcliffe-007	MBC-087	2.18	2.03	0.15	1.08	2.9	159	0	2.34	2.81	2.67	3.65	2.74	3.82	1.72
510464	6984279	Redcliffe-009	MBC-088	2.20	2.01	0.19	1.21	3.5	122	0	2.33	2.93	2.69	3.96	2.77	4.19	2.01
510783	6984638	Redcliffe-010	MBC-089	2.20	2.00	0.20	1.45	3.5	122	0	2.39	3.06	2.81	4.22	2.90	4.46	1.79
510969	6985516	Redcliffe-012	MBC-090	2.18	1.98	0.20	1.41	3.5	115	0	2.36	3.02	2.77	4.15	2.86	4.39	1.81
511076	6985889	Redcliffe-013	MBC-091	2.18	1.98	0.20	1.39	3.5	118	0	2.35	3.01	2.76	4.14	2.85	4.38	1.86
511488	6987365	Redcliffe-016	MBC-092	2.15	1.96	0.19	1.37	3.4	121	0	2.33	2.97	2.74	4.08	2.82	4.31	1.84
511768	6988017	Redcliffe-018	MBC-093	2.15	1.96	0.19	1.32	3.5	119	0	2.31	2.95	2.70	4.04	2.78	4.28	1.91
511648	6988496	Redcliffe-019	MBC-094	2.15	1.96	0.19	1.28	3.6	113	0	2.30	2.93	2.67	4.01	2.75	4.24	1.98
511741	6989254	Redcliffe-021	MBC-095	2.17	1.96	0.21	1.45	3.6	120	0	2.34	3.03	2.77	4.22	2.85	4.47	1.86
511874	6990079	Redcliffe-023	MBC-096	2.18	1.96	0.22	1.61	3.6	125	0	2.39	3.13	2.85	4.41	2.95	4.67	1.77
511648	6990451	Redcliffe-024	MBC-097	2.15	1.96	0.19	1.27	3.6	111	0	2.29	2.92	2.67	4.00	2.75	4.24	2.00
511661	6991063	Redcliffe-025	MBC-098	2.18	1.97	0.21	1.50	3.5	123	0	2.37	3.07	2.81	4.27	2.90	4.52	1.80
511568	6992087	Redcliffe-027	MBC-099	2.17	1.97	0.20	1.38	3.6	115	0	2.33	3.00	2.74	4.14	2.82	4.39	1.91
511475	6992513	Redcliffe-028	MBC-100	2.17	1.98	0.19	1.26	3.5	120	0	2.31	2.93	2.69	3.99	2.77	4.22	1.96
510916	6992713	Redcliffe-029	MBC-101	2.13	1.97	0.16	1.10	3.1	65	0	2.28	2.78	2.61	3.68	2.68	3.87	1.85
510531	6992472	Redcliffe-030	MBC-102	2.13	1.99	0.14	1.06	2.7	13	0	2.29	2.74	2.62	3.55	2.68	3.71	1.65
510161	6992164	Redcliffe-031	MBC-103	2.12	2.00	0.12	0.92	2.5	319	0	2.27	2.65	2.55	3.35	2.61	3.50	1.65
509833	6991712	Redcliffe-032	MBC-104	2.15	2.03	0.12	0.89	2.4	329	0	2.29	2.66	2.56	3.33	2.61	3.46	1.61
509525	6991322	Redcliffe-033	MBC-105	2.15	2.03	0.12	0.88	2.4	348	0	2.28	2.65	2.55	3.30	2.60	3.43	1.58
509155	6991199	Redcliffe-034	MBC-106	2.17	2.05	0.12	0.91	2.4	12	0	2.31	2.69	2.59	3.37	2.64	3.50	1.58
508478	6991343	Redcliffe-035	MBC-107	2.19	2.06	0.13	0.97	2.6	18	0	2.34	2.75	2.64	3.48	2.70	3.62	1.62
507965	6991487	Redcliffe-036	MBC-108	2.25	2.12	0.13	1.01	2.6	20	0	2.41	2.83	2.72	3.59	2.78	3.74	1.60
507205	6991589	Redcliffe-037	MBC-109	2.27	2.14	0.13	0.98	2.6	20	0	2.42	2.83	2.72	3.58	2.78	3.73	1.63
506548	6991836	Redcliffe-038	MBC-110	2.29	2.16	0.13	0.95	2.6	27	0	2.43	2.83	2.73	3.55	2.78	3.70	1.63
505830	6992082	Redcliffe-039	MBC-111	2.32	2.19	0.13	0.96	2.6	32	0	2.47	2.87	2.76	3.60	2.82	3.74	1.63
505358	6992267	Redcliffe-040	MBC-112	2.35	2.22	0.13	0.93	2.6	35	0	2.49	2.89	2.77	3.61	2.83	3.76	1.70

				Water Level mAHD 10000yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	1V:15H Slope	Revetment 1V:2H	1V:15H Slope	Revetment 1V:2H	1V:15H Slope	Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	2.05	2.05		0.68	2.2	24	0							
506913	6982622	PineRiver-001	MBC-001	2.53	2.38	0.15	1.06	2.9	114	0	2.68	3.15	3.01	3.98	3.07	4.15	1.74
507065	6983136	PineRiver-002	MBC-002	2.51	2.37	0.14	0.93	2.9	122	0	2.63	3.06	2.92	3.81	2.98	3.97	1.85
507237	6983516	PineRiver-003	MBC-003	2.52	2.36	0.16	1.08	3.0	118	0	2.66	3.15	3.00	4.02	3.07	4.20	1.81
507198	6984049	PineRiver-004	MBC-004	2.50	2.36	0.14	0.99	2.7	123	0	2.64	3.07	2.95	3.84	3.01	4.00	1.71
506913	6984334	PineRiver-005	MBC-005	2.54	2.42	0.12	0.85	2.5	124	0	2.66	3.03	2.93	3.69	2.98	3.82	1.69
507046	6984696	PineRiver-006	MBC-006	2.49	2.39	0.10	0.79	2.2	139	0	2.61	2.94	2.85	3.52	2.90	3.64	1.56
507522	6984334	PineRiver-007	MBC-007	2.48	2.35	0.13	0.95	2.7	131	0	2.62	3.03	2.91	3.77	2.97	3.92	1.70
507769	6984239	PineRiver-008	MBC-008	2.48	2.32	0.16	1.22	2.9	126	0	2.67	3.19	3.04	4.11	3.11	4.29	1.63
506179	6982661	PineRiver-009	MBC-009	2.54	2.42	0.12	0.85	2.5	124	0	2.66	3.03	2.93	3.69	2.98	3.82	1.69
504927	6992513	Caboolture-001	MBC-010	2.54	2.40	0.14	1.00	2.7	50	0	2.69	3.11	2.99	3.88	3.06	4.03	1.65
504270	6992575	Caboolture-002	MBC-011	2.62	2.50	0.12	0.89	2.5	59	0	2.76	3.13	3.03	3.80	3.09	3.94	1.63
503633	6992841	Caboolture-003	MBC-012	2.68	2.57	0.11	0.86	2.4	71	0	2.82	3.18	3.08	3.82	3.13	3.95	1.60
503346	6993519	Caboolture-004	MBC-013	2.68	2.57	0.11	0.83	2.4	92	0	2.81	3.16	3.06	3.80	3.11	3.93	1.67
503613	6994402	Caboolture-005	MBC-014	2.69	2.57	0.12	0.85	2.6	108	0	2.81	3.19	3.08	3.85	3.13	3.99	1.74
504658	6996186	Caboolture-009	MBC-015	2.59	2.44	0.15	1.07	2.8	115	0	2.74	3.21	3.07	4.04	3.14	4.21	1.70
504477	6996546	Caboolture-010	MBC-016	2.66	2.53	0.13	0.92	2.7	114	0	2.79	3.20	3.08	3.92	3.13	4.06	1.73
504774	6997055	Caboolture-012	MBC-017	2.58	2.43	0.15	1.05	2.8	120	0	2.73	3.19	3.05	4.00	3.12	4.17	1.71
505039	6997331	Caboolture-013	MBC-018	2.57	2.42	0.15	1.03	2.9	121	0	2.71	3.17	3.03	4.00	3.09	4.17	1.80
505442	6998582	Caboolture-016	MBC-019	2.59	2.42	0.17	1.23	3.1	122	0	2.76	3.31	3.14	4.28	3.21	4.48	1.74
505671	6999062	Caboolture-017	MBC-020	2.56	2.39	0.17	1.13	3.2	122	0	2.70	3.23	3.04	4.17	3.12	4.37	1.90
505909	6999567	Caboolture-018	MBC-021	2.56	2.38	0.18	1.20	3.3	124	0	2.71	3.27	3.07	4.25	3.14	4.46	1.87
506361	7000127	Caboolture-019	MBC-022	2.53	2.35	0.18	1.26	3.2	130	0	2.70	3.27	3.08	4.27	3.16	4.48	1.77
506813	7000580	Caboolture-020	MBC-023	2.49	2.32	0.17	1.15	3.2	128	0	2.64	3.17	2.98	4.11	3.06	4.31	1.86
507266	7001010	Caboolture-021	MBC-024	2.49	2.31	0.18	1.27	3.3	129	0	2.66	3.24	3.04	4.27	3.12	4.48	1.82
507718	7001452	Caboolture-022	MBC-025	2.48	2.29	0.19	1.33	3.4	134	0	2.65	3.27	3.04	4.34	3.13	4.56	1.82
508289	7001850	Caboolture-023	MBC-026	2.47	2.28	0.19	1.37	3.4	136	0	2.65	3.28	3.06	4.37	3.14	4.60	1.79
508903	7002206	Caboolture-024	MBC-027	2.39	2.20	0.19	1.39	3.4	139	0	2.58	3.22	2.99	4.33	3.07	4.57	1.81
509355	7002550	Caboolture-025	MBC-028	2.39	2.20	0.19	1.36	3.3	143	0	2.57	3.19	2.98	4.27	3.06	4.50	1.78
509894	7002744	Caboolture-026	MBC-029	2.36	2.18	0.18	1.28	3.3	149	0	2.53	3.12	2.91	4.16	2.99	4.38	1.84
510475	7002852	Caboolture-027	MBC-030	2.34	2.16	0.18	1.25	3.4	150	0	2.50	3.09	2.87	4.11	2.95	4.33	1.87
511067	7003003	Caboolture-028	MBC-031	2.34	2.15	0.19	1.32	3.4	152	0	2.51	3.13	2.90	4.21	2.98	4.44	1.87
511477	7003251	Caboolture-029	MBC-032	2.32	2.14	0.18	1.17	3.4	154	0	2.45	3.02	2.80	4.01	2.88	4.23	1.97
512112	7003326	Caboolture-030	MBC-033	2.30	2.11	0.19	1.31	3.4	156	0	2.46	3.08	2.85	4.15	2.93	4.37	1.86
512694	7003455	Caboolture-031	MBC-034	2.29	2.11	0.18	1.21	3.4	159	0	2.44	3.02	2.80	4.02	2.87	4.23	1.91
513275	7003412	Caboolture-032	MBC-035	2.27	2.09	0.18	1.22	3.3	156	0	2.42	3.00	2.79	4.00	2.87	4.21	1.88
513911	7003746	Caboolture-033	MBC-036	2.26	2.10	0.16	1.02	3.2	148	0	2.38	2.87	2.69	3.73	2.76	3.92	1.97
514481	7004446	Caboolture-034	MBC-037	2.21	2.08	0.13	0.96	2.6	152	0	2.36	2.77	2.65	3.51	2.71	3.66	1.68
516248	7002647	Caboolture-038	MBC-038	2.15	1.97	0.18	1.19	3.4	174	0	2.29	2.87	2.64	3.86	2.72	4.08	1.95
517280	7002397	Caboolture-040	MBC-039	2.16	1.95	0.21	1.55	3.6	156	0	2.36	3.08	2.81	4.32	2.90	4.57	1.79
519611	7002925	Caboolture-044	MBC-040	2.26	1.92	0.34	1.08	10.9	89	0	2.11	3.14	2.39	4.91	2.47	5.46	6.56
520367	7003619	Caboolture-046	MBC-041	2.33	1.92	0.41	1.40	11.3	62	0	2.17	3.46	2.52	5.64	2.63	6.30	5.94
520284	7006303	Caboolture-051	MBC-042	2.36	1.92	0.44	1.58	9.2	71	0	2.21	3.51	2.61	5.63	2.72	6.23	4.55
516778	7013518	Caboolture-060	MBC-043	2.42	1.90	0.52	2.44	10.7	73	0	2.35	4.30	2.95	7.48	3.12	8.36	4.29
516320	7014796	Caboolture-061	MBC-044	2.42	1.90	0.52	2.44	10.7	73	0	2.35	4.30	2.95	7.48	3.12	8.36	4.29
507667	7015461	Caboolture-067	MBC-045	2.58	2.49	0.09	0.68	1.8	163	0	2.68	2.93	2.87	3.38	2.91	3.45	1.36
508591	7014764	Caboolture-069	MBC-046	2.48	2.39	0.09	0.71	1.8	167	0	2.59	2.84	2.79	3.30	2.82	3.38	1.33
509101	7014442	Caboolture-070	MBC-047	2.44	2.35	0.09	0.68	1.9	175	0	2.54	2.81	2.74	3.28	2.77	3.36	1.42
509543	7013236	Caboolture-072	MBC-048	2.41	2.32	0.09	0.60	1.7	231	0	2.48	2.71	2.66	3.12	2.68	3.19	1.39
509623	7012592	Caboolture-073	MBC-049	2.39	2.31	0.08	0.56	1.7	254	0	2.46	2.69	2.62	3.08	2.65	3.14	1.43
510253	7011212	Caboolture-075	MBC-050	2.36	2.27	0.09	0.70	1.9	152	0	2.47	2.72	2.67	3.20	2.70	3.28	1.38
510669	7010917	Caboolture-076	MBC-051	2.29	2.20	0.09	0.72	1.9	152	0	2.40	2.67	2.61	3.15	2.64	3.23	1.38
511138	7010769	Caboolture-077	MBC-052	2.27	2.18	0.09	0.75	1.9	156	0	2.39	2.67	2.61	3.18	2.64	3.26	1.38
511701	7010475	Caboolture-078	MBC-053	2.25	2.15	0.10	0.75	1.9	166	0	2.36	2.64	2.58	3.15	2.61	3.23	1.38
512076	7010032	Caboolture-079	MBC-054	2.22	2.13	0.09	0.62	2.0	166	0	2.30	2.56	2.49	3.02	2.52	3.11	1.56
513283	7007901	Caboolture-083	MBC-055	2.17	2.08	0.09	0.61	1.7	174	0	2.25	2.46	2.42	2.85	2.45	2.92	1.32
513390	7007284	Caboolture-084	MBC-056	2.15	2.06	0.09	0.63	1.7	252	0	2.23	2.45	2.41	2.85	2.44	2.92	1.31
513444	7006735	Caboolture-085	MBC-057	2.16	2.07	0.09	0.62	1.7	267	0	2.24	2.46	2.42	2.87	2.45	2.94	1.35

				Water Level mAHD 10000yr ARI Sea-Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	1V:15H Slope	Revetment 1V:2H	1V:15H Slope	Revetment 1V:2H	1V:15H Slope	Revetment 1V:2H	ξ_m
514141	7006547	Caboolture-086	MBC-058	2.13	2.05	0.08	0.58	1.5	166	0	2.21	2.39	2.37	2.75	2.40	2.81	1.26
514958	7005756	Caboolture-088	MBC-059	2.07	1.99	0.08	0.52	1.5	172	0	2.13	2.31	2.28	2.63	2.30	2.69	1.29
515374	7005260	Caboolture-089	MBC-060	2.07	1.99	0.08	0.47	1.6	311	0	2.12	2.31	2.25	2.64	2.27	2.69	1.43
514730	7005140	Caboolture-090	MBC-061	2.08	2.00	0.08	0.47	1.6	337	0	2.13	2.31	2.26	2.64	2.28	2.69	1.41
514328	7005394	Caboolture-091	MBC-062	2.13	2.05	0.08	0.49	1.7	339	0	2.18	2.39	2.32	2.74	2.35	2.80	1.47
513269	7006199	Caboolture-093	MBC-063	2.15	2.07	0.08	0.57	1.7	199	0	2.23	2.45	2.39	2.85	2.42	2.91	1.42
511621	7007284	Caboolture-096	MBC-064	2.27	2.18	0.09	0.59	1.8	115	0	2.34	2.58	2.51	3.00	2.54	3.07	1.45
511339	7008048	Caboolture-097	MBC-065	2.29	2.20	0.09	0.59	1.7	120	0	2.36	2.59	2.53	3.00	2.56	3.07	1.41
511648	7008558	Caboolture-098	MBC-066	2.27	2.18	0.09	0.66	1.8	140	0	2.36	2.61	2.55	3.06	2.58	3.13	1.38
511835	7009040	Caboolture-099	MBC-067	2.23	2.14	0.09	0.68	1.8	147	0	2.33	2.58	2.52	3.03	2.56	3.10	1.36
511446	7009456	Caboolture-100	MBC-068	2.25	2.16	0.09	0.65	1.8	143	0	2.34	2.58	2.53	3.02	2.56	3.09	1.37
511058	7009456	Caboolture-101	MBC-069	2.27	2.18	0.09	0.62	1.8	135	0	2.35	2.59	2.53	3.01	2.56	3.08	1.40
510321	7009818	Caboolture-102	MBC-070	2.29	2.20	0.09	0.60	1.8	122	0	2.37	2.60	2.54	3.03	2.57	3.10	1.44
509784	7010233	Caboolture-103	MBC-071	2.37	2.29	0.08	0.57	1.8	109	0	2.45	2.68	2.61	3.09	2.64	3.16	1.46
509369	7010796	Caboolture-104	MBC-072	2.40	2.31	0.09	0.58	1.8	108	0	2.47	2.71	2.64	3.13	2.66	3.20	1.48
509034	7011198	Caboolture-105	MBC-073	2.44	2.35	0.09	0.60	1.8	114	0	2.52	2.75	2.69	3.18	2.72	3.25	1.44
508833	7011587	Caboolture-106	MBC-074	2.44	2.35	0.09	0.62	1.9	119	0	2.52	2.78	2.70	3.24	2.73	3.31	1.49
508752	7011869	Caboolture-107	MBC-075	2.47	2.38	0.09	0.65	1.9	125	0	2.56	2.83	2.75	3.29	2.78	3.37	1.46
508471	7012110	Caboolture-108	MBC-076	2.47	2.39	0.08	0.55	1.8	119	0	2.54	2.77	2.70	3.17	2.73	3.23	1.47
508926	7012177	Caboolture-109	MBC-077	2.43	2.34	0.09	0.69	1.9	137	0	2.53	2.80	2.73	3.28	2.77	3.36	1.42
509020	7012767	Caboolture-110	MBC-078	2.42	2.33	0.09	0.69	1.8	149	0	2.52	2.78	2.72	3.24	2.75	3.32	1.38
508565	7013276	Caboolture-111	MBC-079	2.45	2.37	0.08	0.58	1.7	143	0	2.53	2.75	2.69	3.14	2.72	3.20	1.38
508069	7013611	Caboolture-112	MBC-080	2.50	2.42	0.08	0.57	1.7	141	0	2.58	2.79	2.74	3.17	2.77	3.23	1.36
507667	7013960	Caboolture-113	MBC-081	2.58	2.49	0.09	0.59	1.7	135	0	2.65	2.87	2.82	3.27	2.85	3.33	1.37
507157	7014067	Caboolture-114	MBC-082	2.59	2.51	0.08	0.55	1.6	120	0	2.66	2.87	2.82	3.24	2.84	3.30	1.38
507171	7014777	Caboolture-115	MBC-083	2.62	2.53	0.09	0.64	1.8	129	0	2.71	2.96	2.89	3.40	2.92	3.47	1.41
507063	7015595	Caboolture-116	MBC-084	2.60	2.51	0.09	0.62	1.8	132	0	2.68	2.92	2.86	3.34	2.89	3.41	1.40
509121	6984944	Redcliffe-005	MBC-085	2.37	2.22	0.15	1.09	2.9	149	0	2.53	3.01	2.86	3.86	2.93	4.03	1.72
509533	6984891	Redcliffe-006	MBC-086	2.36	2.20	0.16	1.20	2.8	159	0	2.54	3.05	2.91	3.95	2.98	4.13	1.62
509892	6984691	Redcliffe-007	MBC-087	2.34	2.18	0.16	1.18	2.9	159	0	2.52	3.02	2.88	3.92	2.95	4.10	1.64
510464	6984279	Redcliffe-009	MBC-088	2.35	2.16	0.19	1.30	3.5	122	0	2.51	3.14	2.89	4.22	2.97	4.46	1.94
510783	6984638	Redcliffe-010	MBC-089	2.35	2.14	0.21	1.58	3.5	122	0	2.57	3.28	3.03	4.51	3.12	4.76	1.71
510969	6985516	Redcliffe-012	MBC-090	2.34	2.13	0.21	1.53	3.5	115	0	2.54	3.24	2.99	4.44	3.08	4.69	1.74
511076	6985889	Redcliffe-013	MBC-091	2.34	2.13	0.21	1.51	3.5	118	0	2.54	3.23	2.98	4.44	3.07	4.69	1.78
511488	6987365	Redcliffe-016	MBC-092	2.31	2.11	0.20	1.49	3.4	121	0	2.51	3.19	2.95	4.37	3.05	4.61	1.76
511768	6988017	Redcliffe-018	MBC-093	2.31	2.11	0.20	1.42	3.5	119	0	2.49	3.16	2.91	4.31	2.99	4.56	1.84
511648	6988496	Redcliffe-019	MBC-094	2.31	2.11	0.20	1.37	3.6	113	0	2.47	3.13	2.87	4.27	2.96	4.51	1.91
511741	6989254	Redcliffe-021	MBC-095	2.33	2.11	0.22	1.57	3.6	120	0	2.53	3.26	2.98	4.51	3.08	4.77	1.79
511874	6990079	Redcliffe-023	MBC-096	2.33	2.10	0.23	1.76	3.6	125	0	2.57	3.36	3.08	4.72	3.18	5.00	1.69
511648	6990451	Redcliffe-024	MBC-097	2.31	2.11	0.20	1.37	3.6	111	0	2.47	3.14	2.87	4.28	2.96	4.52	1.93
511661	6991063	Redcliffe-025	MBC-098	2.33	2.11	0.22	1.64	3.5	123	0	2.55	3.29	3.03	4.57	3.13	4.84	1.72
511568	6992087	Redcliffe-027	MBC-099	2.32	2.11	0.21	1.50	3.6	115	0	2.51	3.22	2.94	4.43	3.04	4.68	1.83
511475	6992513	Redcliffe-028	MBC-100	2.33	2.13	0.20	1.35	3.5	120	0	2.49	3.14	2.89	4.25	2.97	4.49	1.90
510916	6992713	Redcliffe-029	MBC-101	2.28	2.11	0.17	1.20	3.1	65	0	2.44	2.98	2.81	3.94	2.89	4.13	1.77
510531	6992472	Redcliffe-030	MBC-102	2.28	2.13	0.15	1.15	2.7	13	0	2.46	2.94	2.81	3.79	2.88	3.96	1.58
510161	6992164	Redcliffe-031	MBC-103	2.28	2.15	0.13	1.00	2.5	319	0	2.44	2.85	2.75	3.59	2.81	3.74	1.58
509833	6991712	Redcliffe-032	MBC-104	2.30	2.18	0.12	0.97	2.4	329	0	2.46	2.85	2.75	3.56	2.81	3.70	1.54
509525	6991322	Redcliffe-033	MBC-105	2.30	2.18	0.12	0.95	2.4	348	0	2.45	2.84	2.74	3.53	2.80	3.66	1.52
509155	6991199	Redcliffe-034	MBC-106	2.34	2.21	0.13	0.99	2.4	12	0	2.50	2.89	2.80	3.61	2.85	3.75	1.52
508478	6991343	Redcliffe-035	MBC-107	2.36	2.22	0.14	1.05	2.6	18	0	2.52	2.95	2.84	3.73	2.91	3.88	1.56
507965	6991487	Redcliffe-036	MBC-108	2.44	2.30	0.14	1.10	2.6	20	0	2.62	3.06	2.95	3.87	3.02	4.03	1.54
507205	6991589	Redcliffe-037	MBC-109	2.46	2.32	0.14	1.07	2.6	20	0	2.63	3.07	2.96	3.86	3.02	4.01	1.56
506548	6991836	Redcliffe-038	MBC-110	2.47	2.34	0.13	1.04	2.6	27	0	2.64	3.07	2.96	3.83	3.02	3.98	1.56
505830	6992082	Redcliffe-039	MBC-111	2.52	2.38	0.14	1.04	2.6	32	0	2.68	3.11	3.00	3.88	3.06	4.03	1.57
505358	6992267	Redcliffe-040	MBC-112	2.55	2.41	0.14	1.01	2.6	35	0	2.70	3.13	3.01	3.89	3.07	4.04	1.63

APPENDIX I

Cyclone Tracks – Monte Carlo Sample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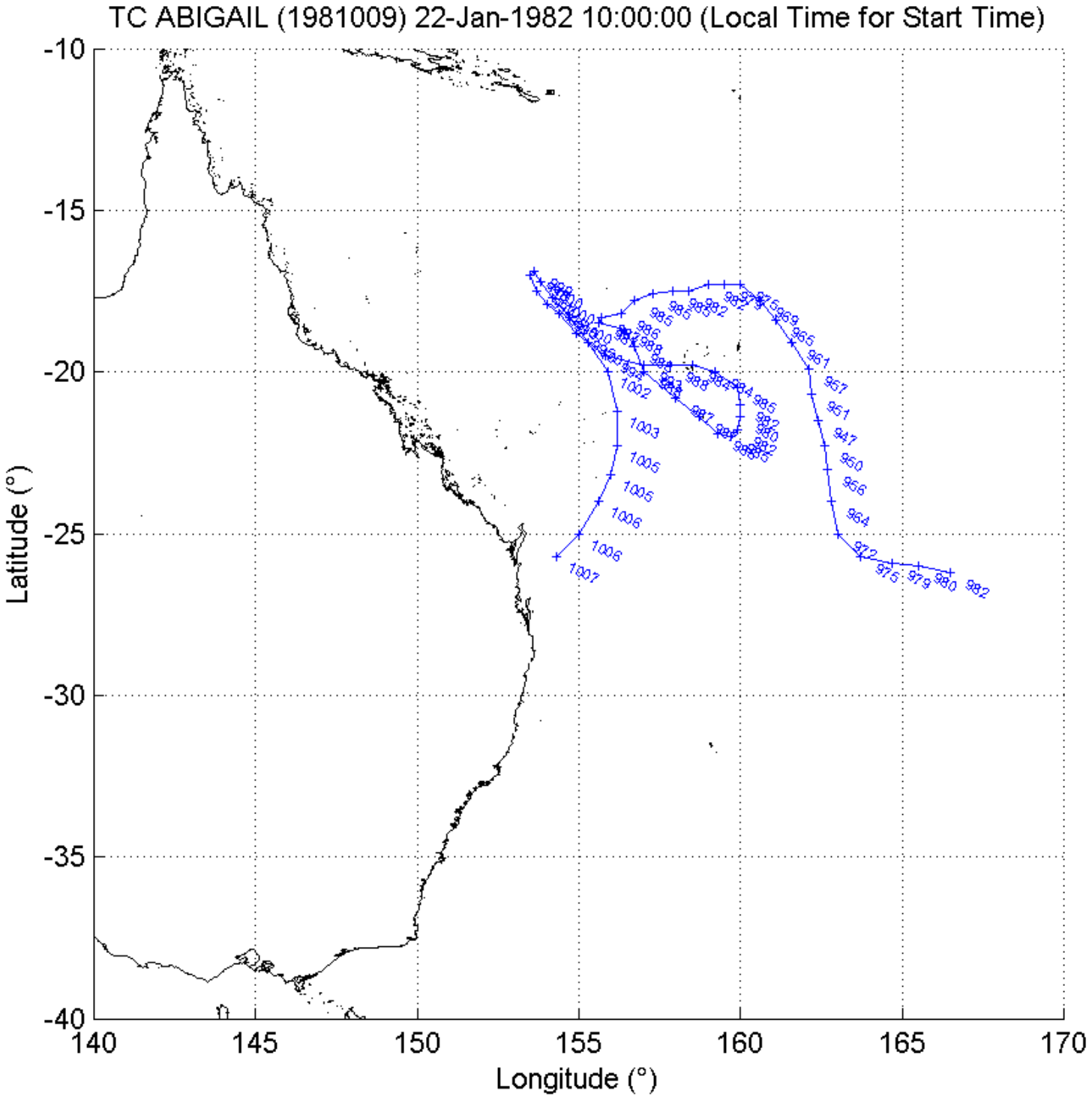
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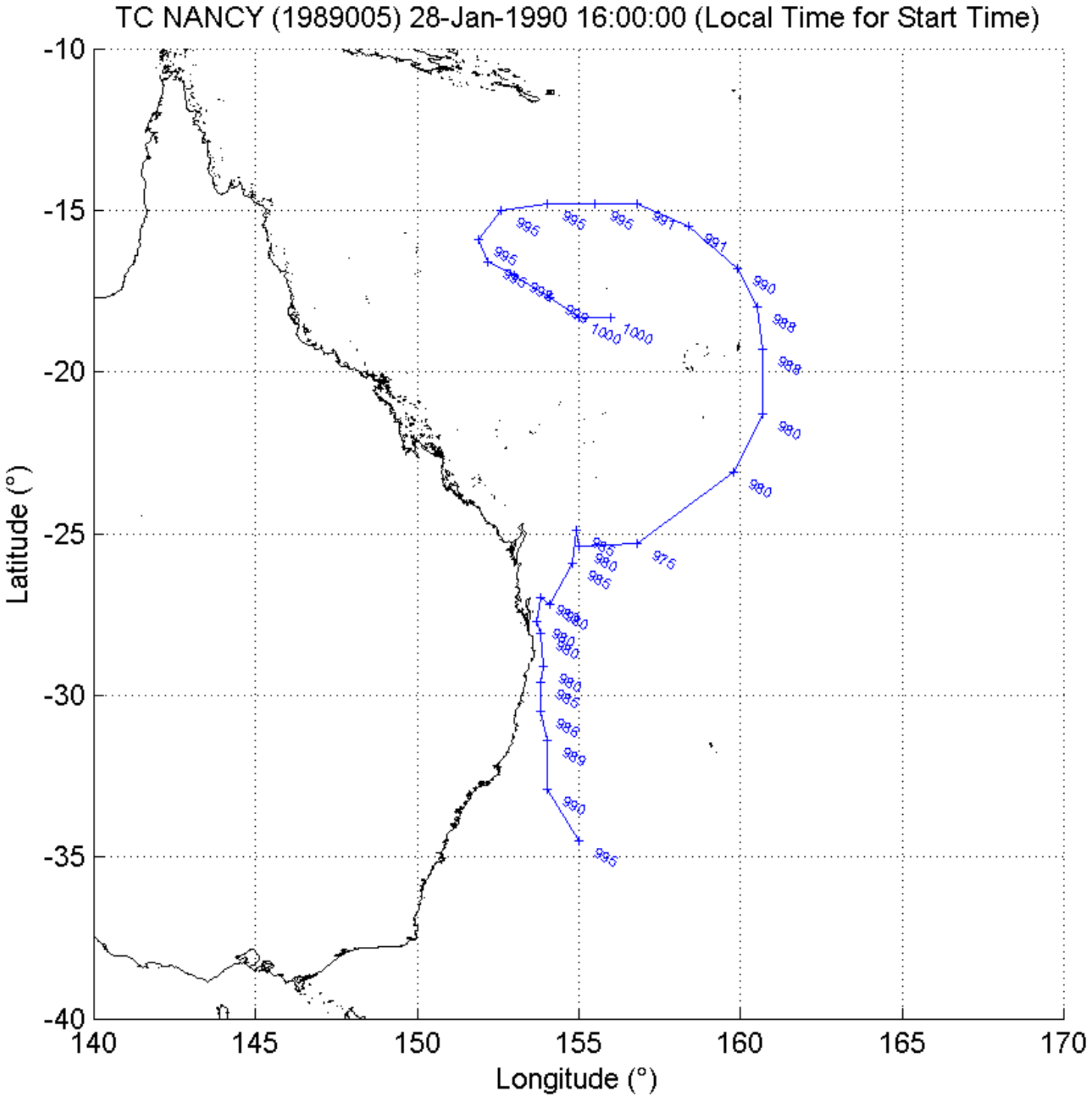
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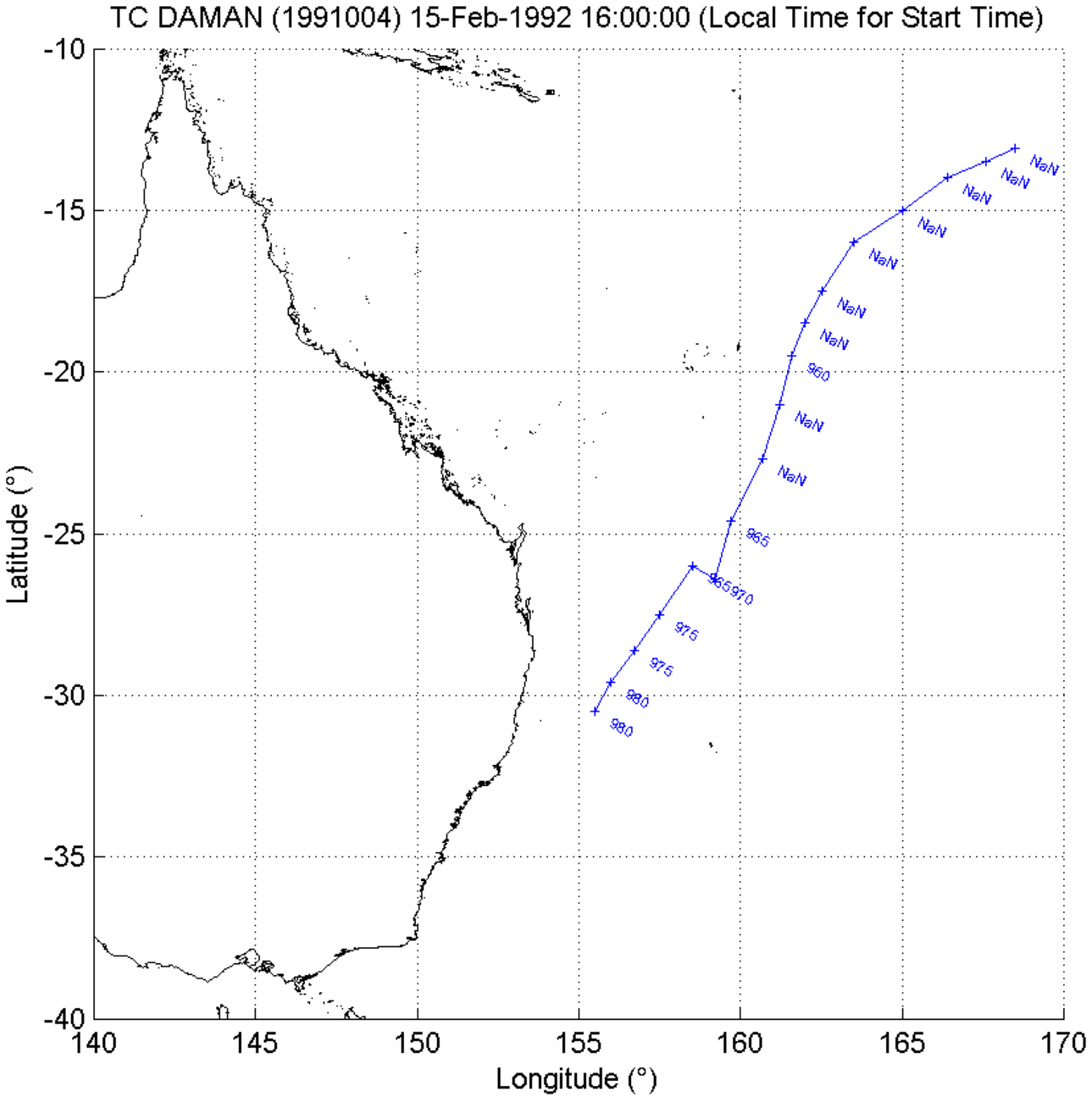
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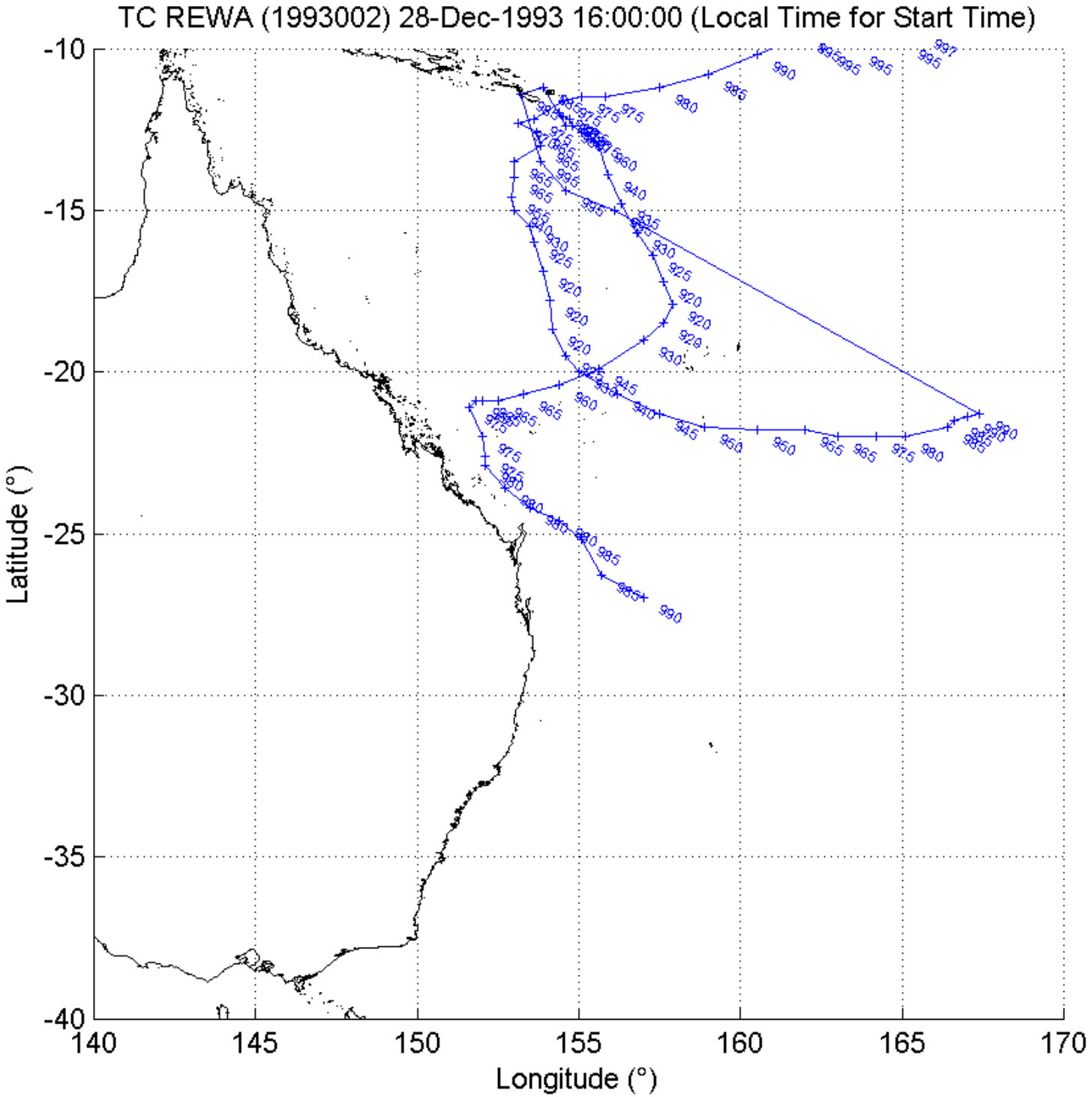
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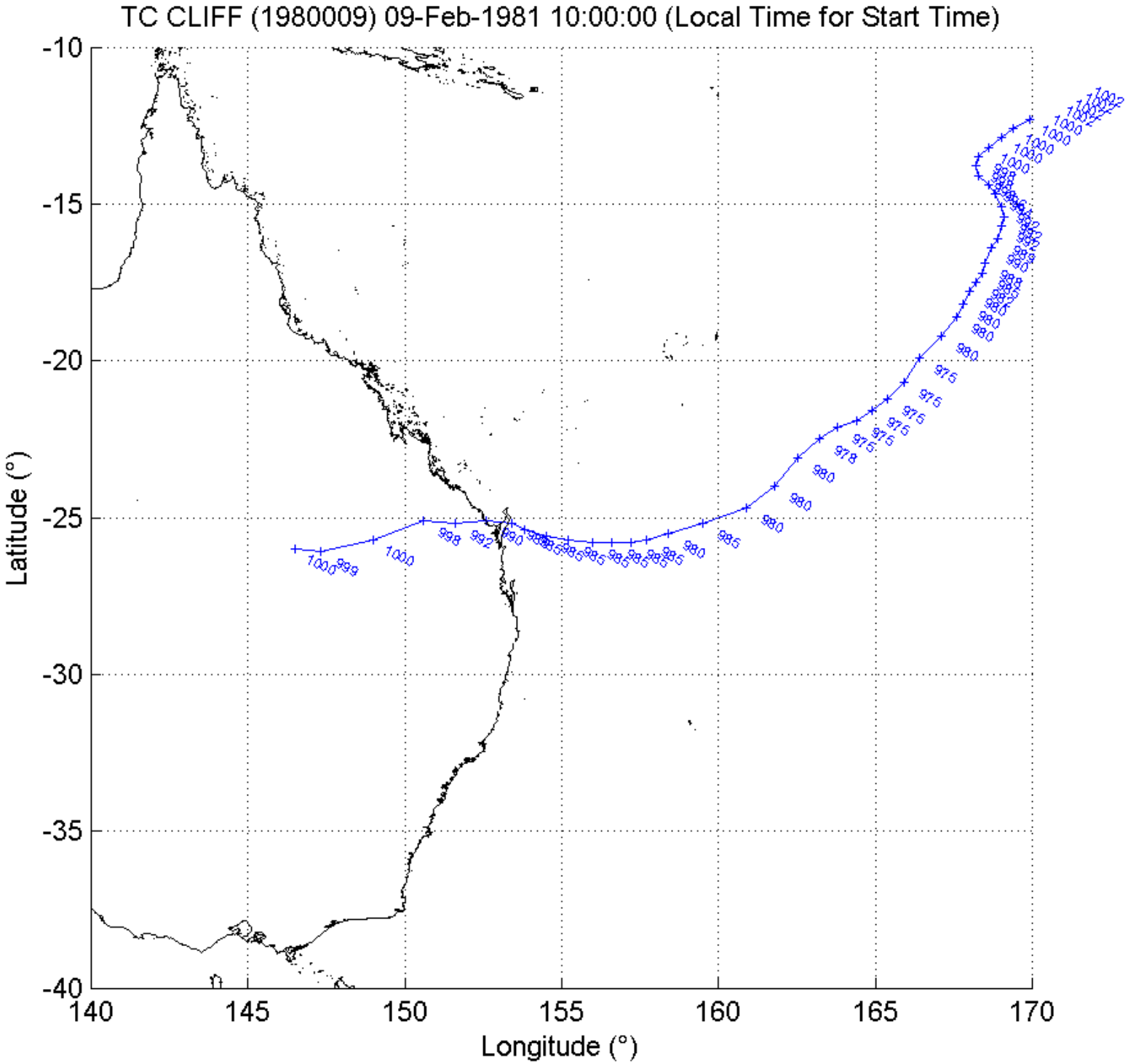
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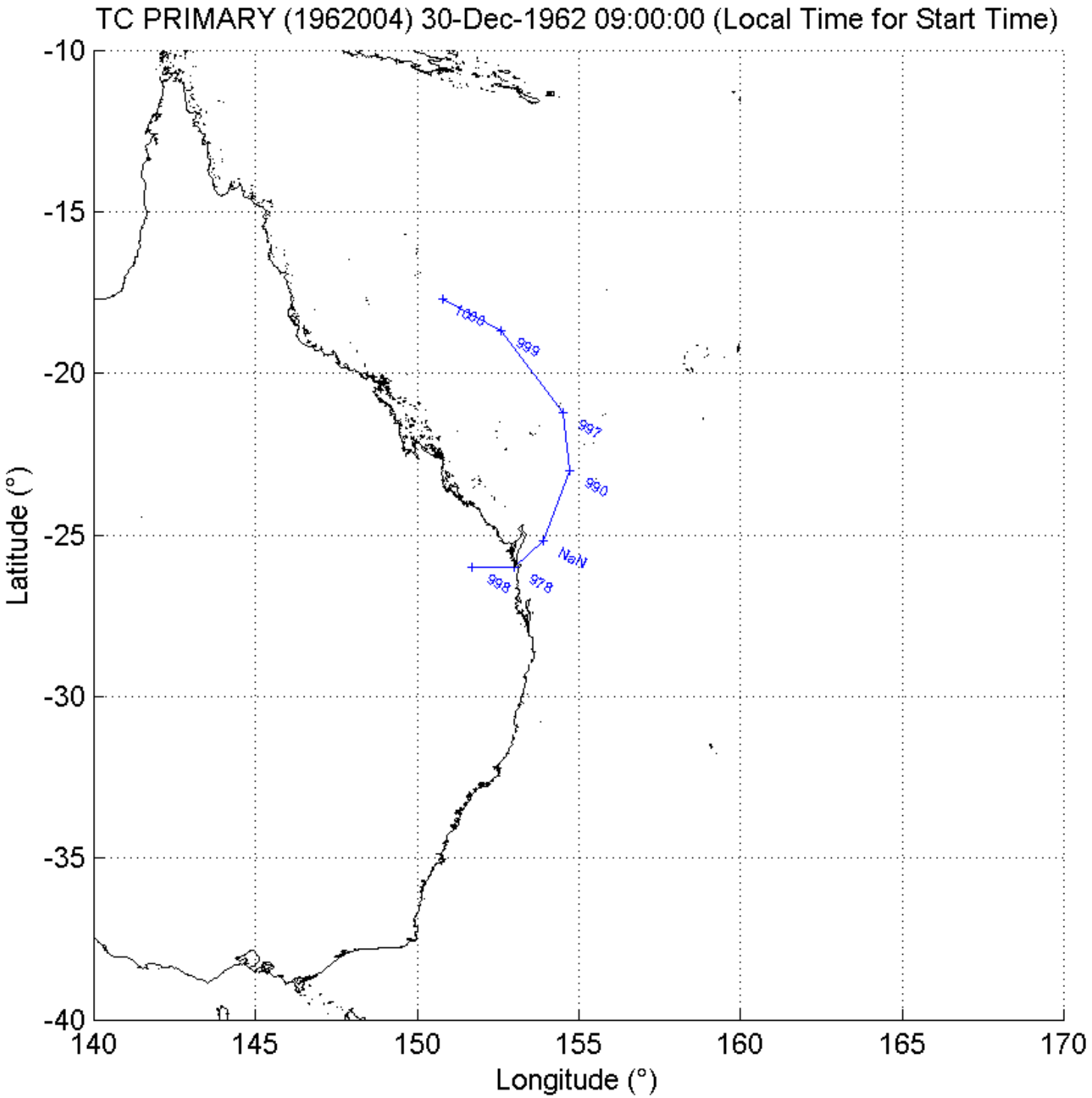
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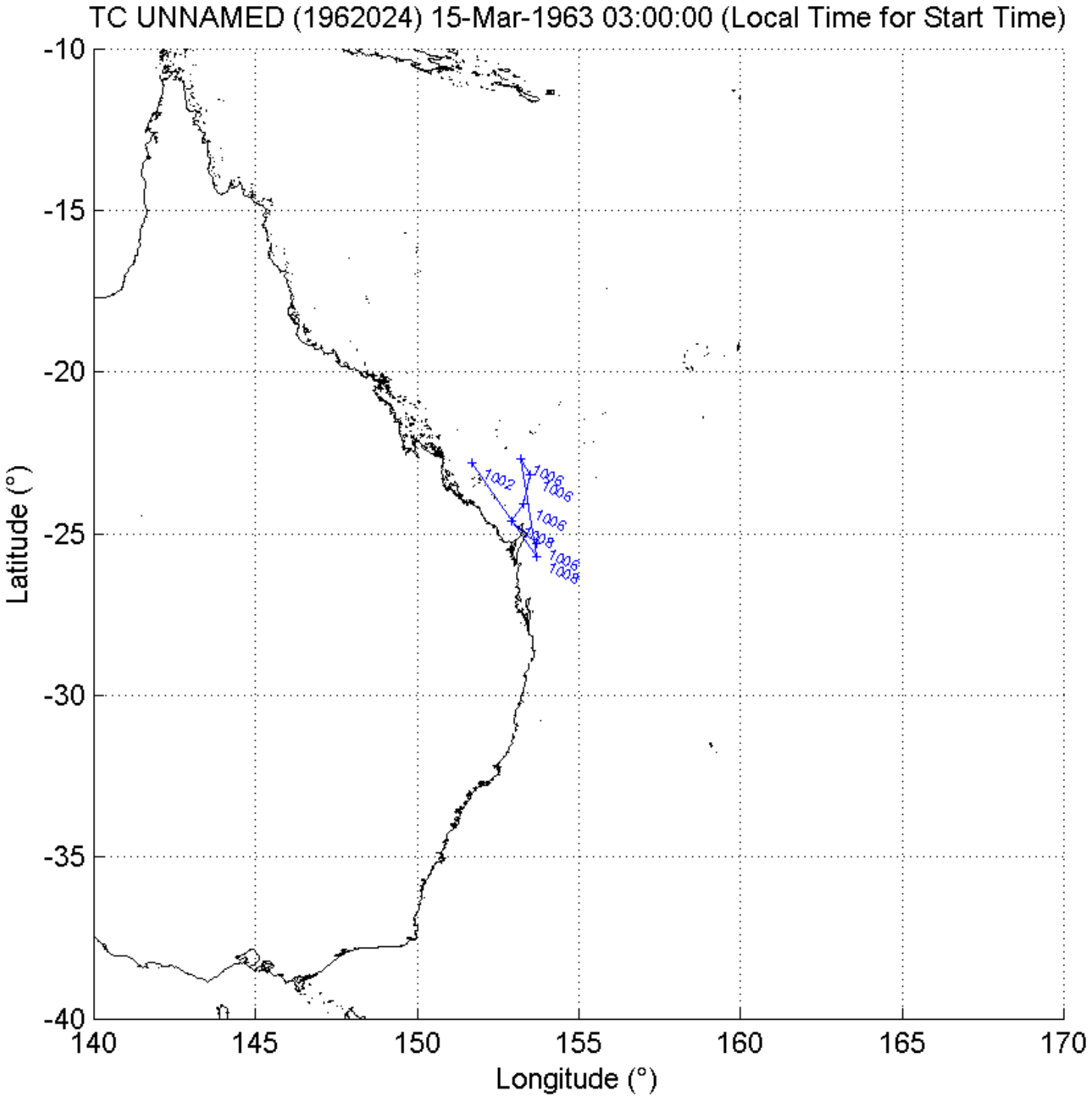
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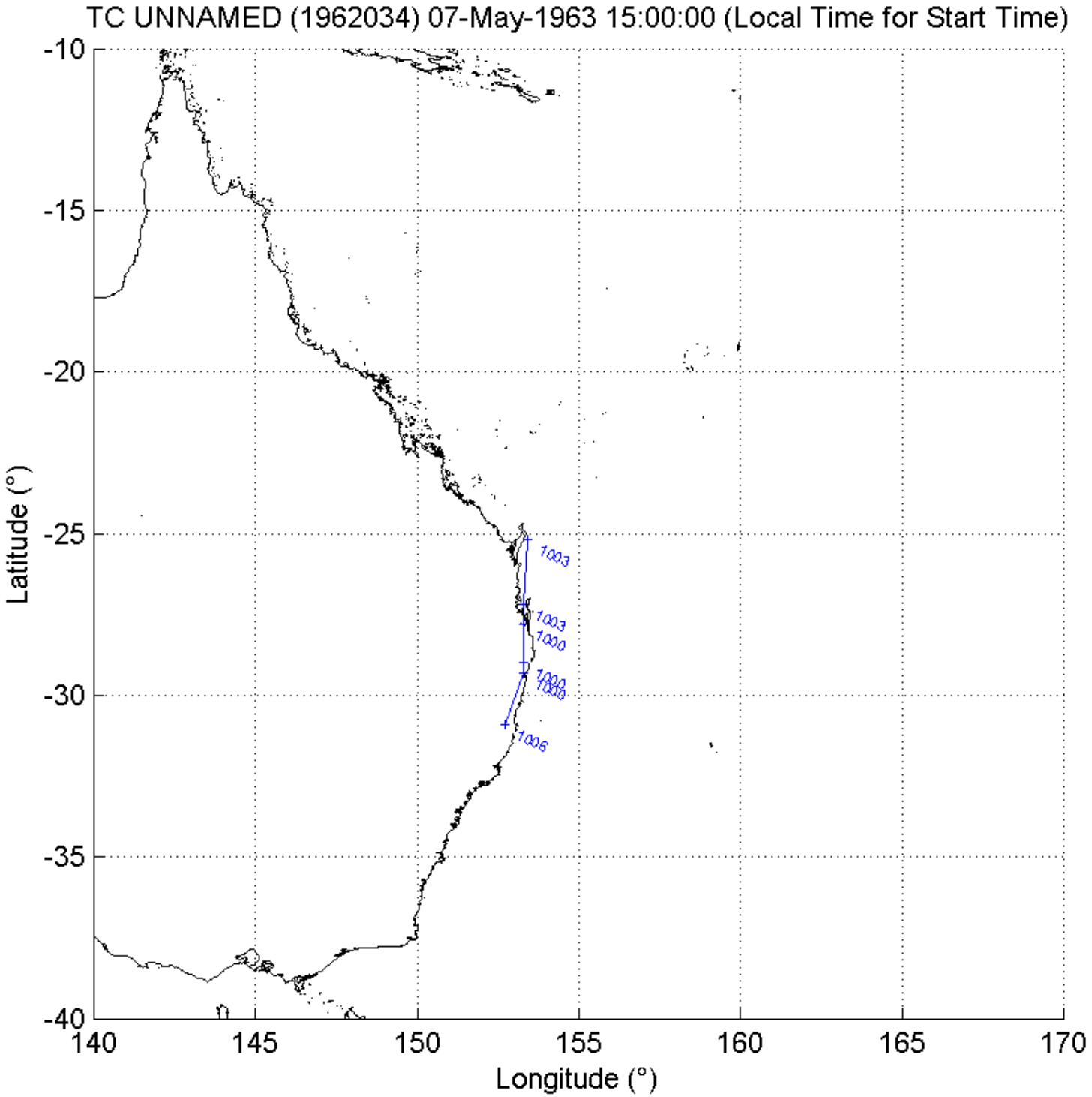
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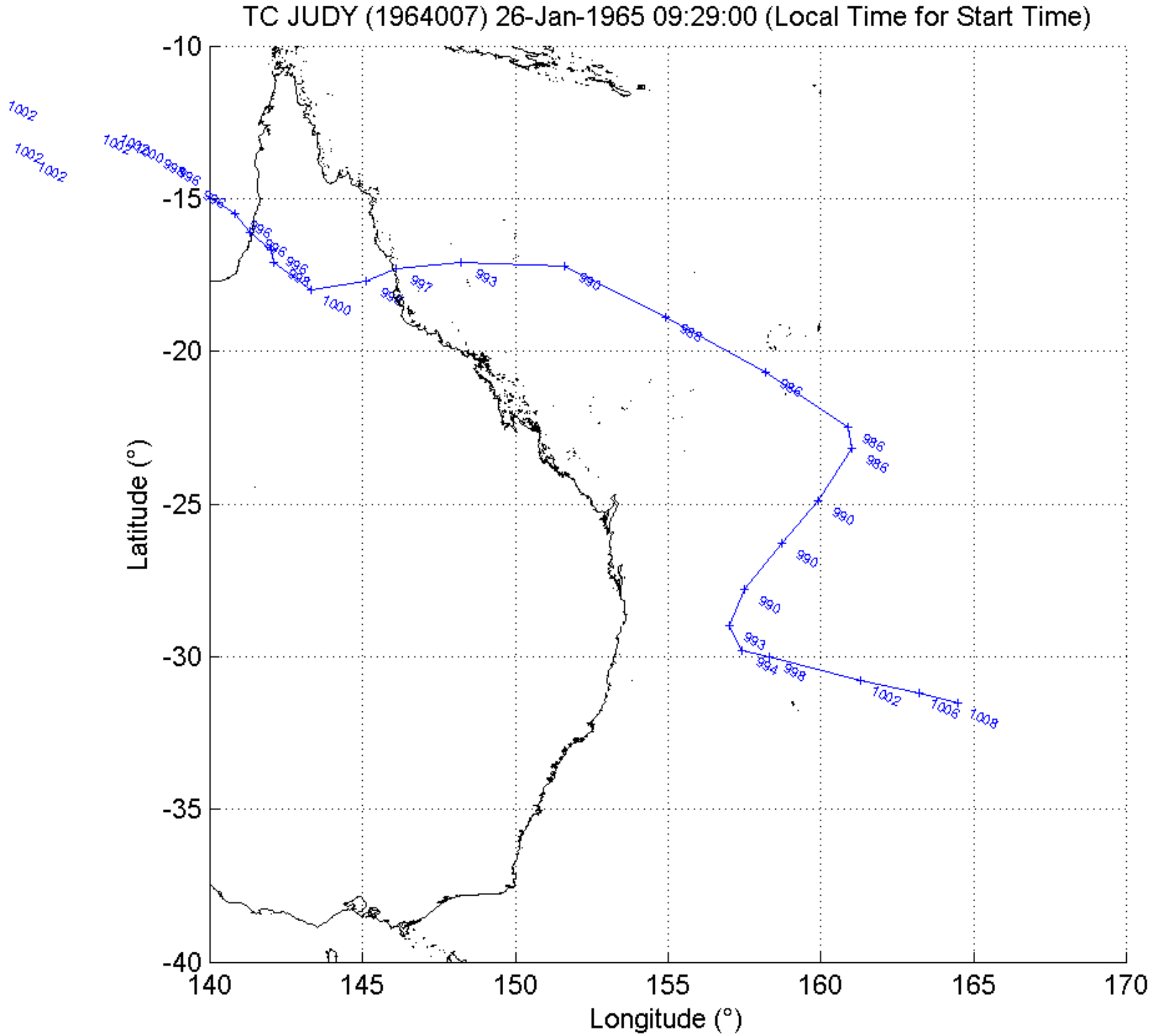
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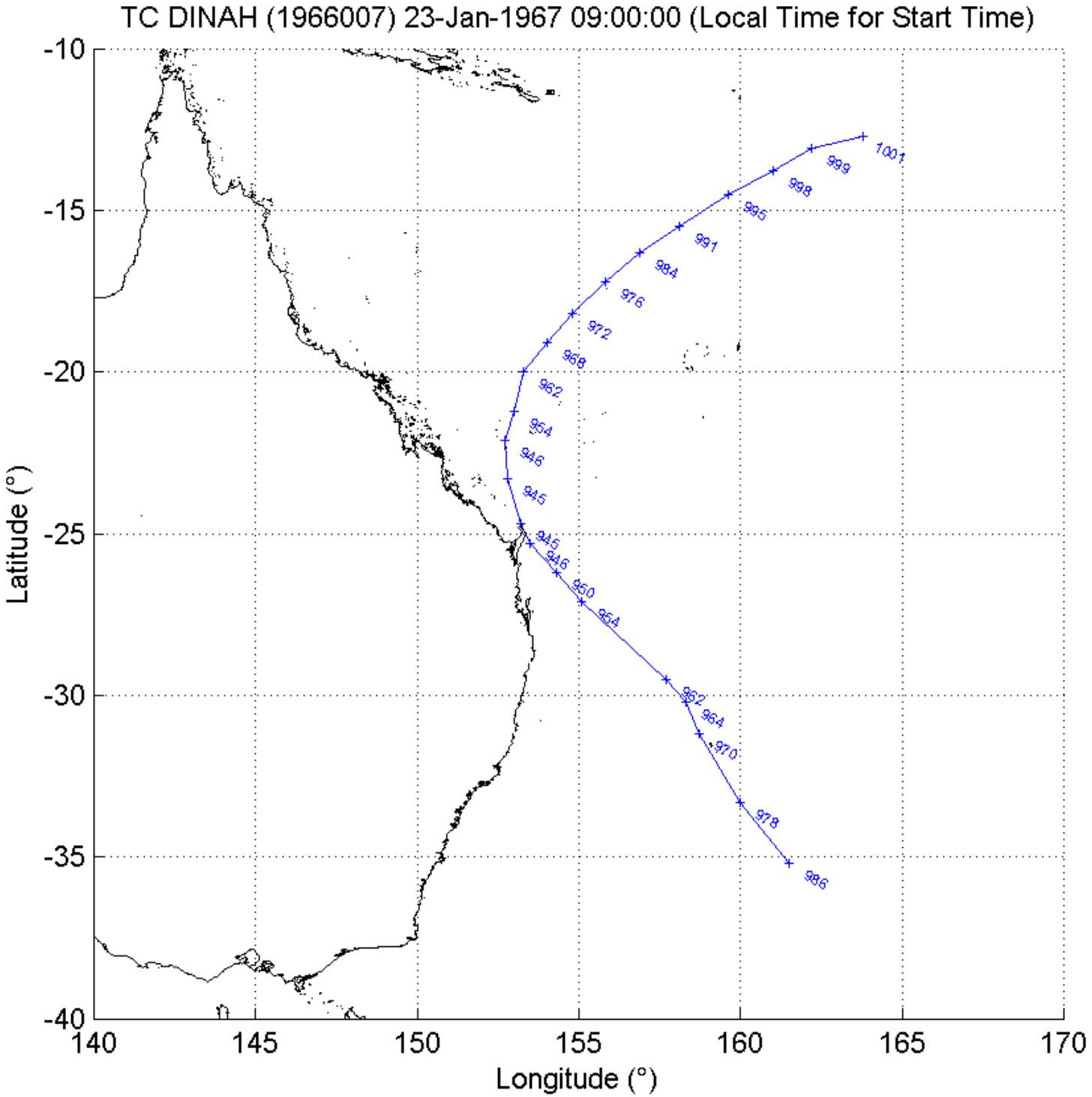
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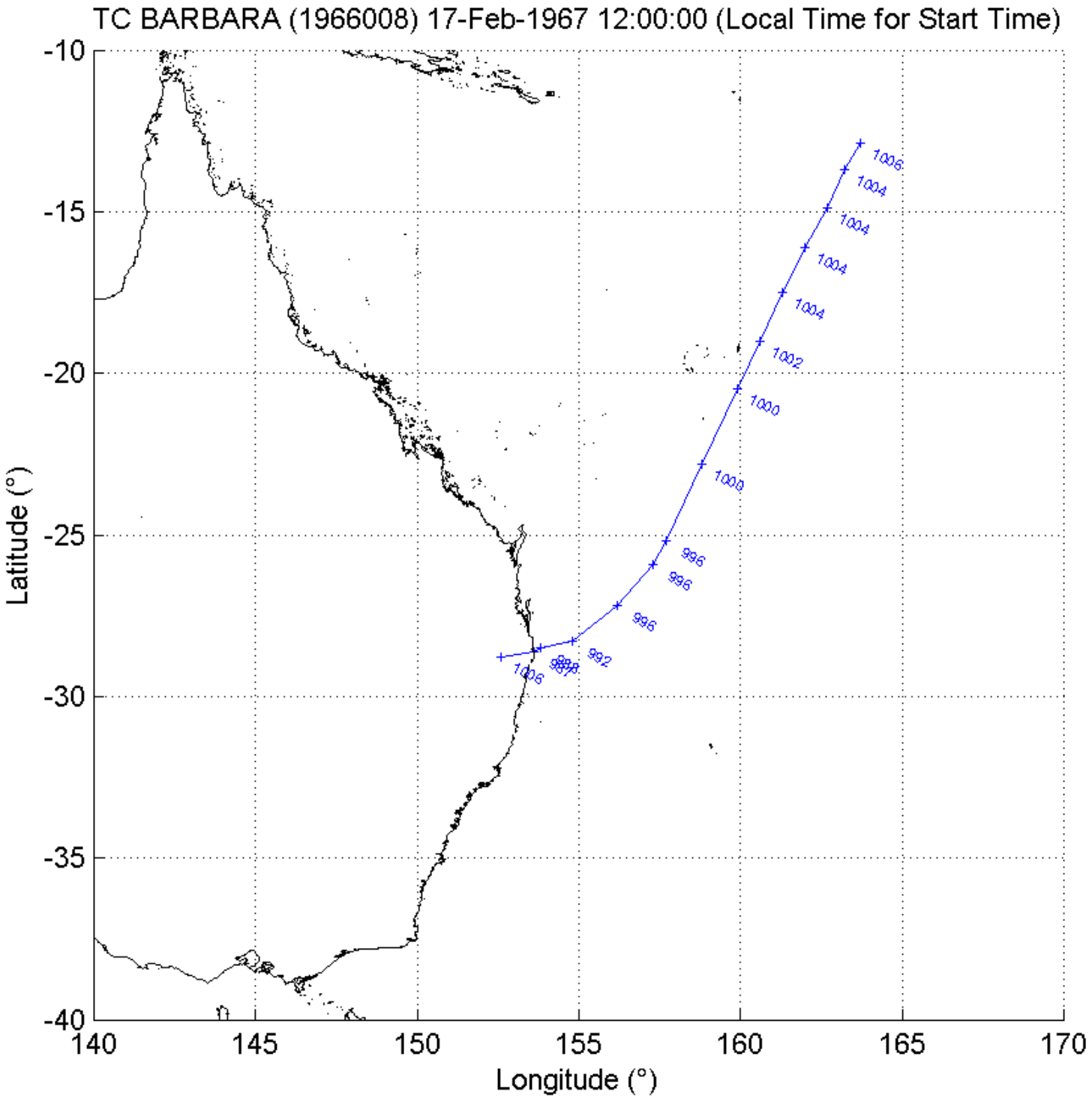
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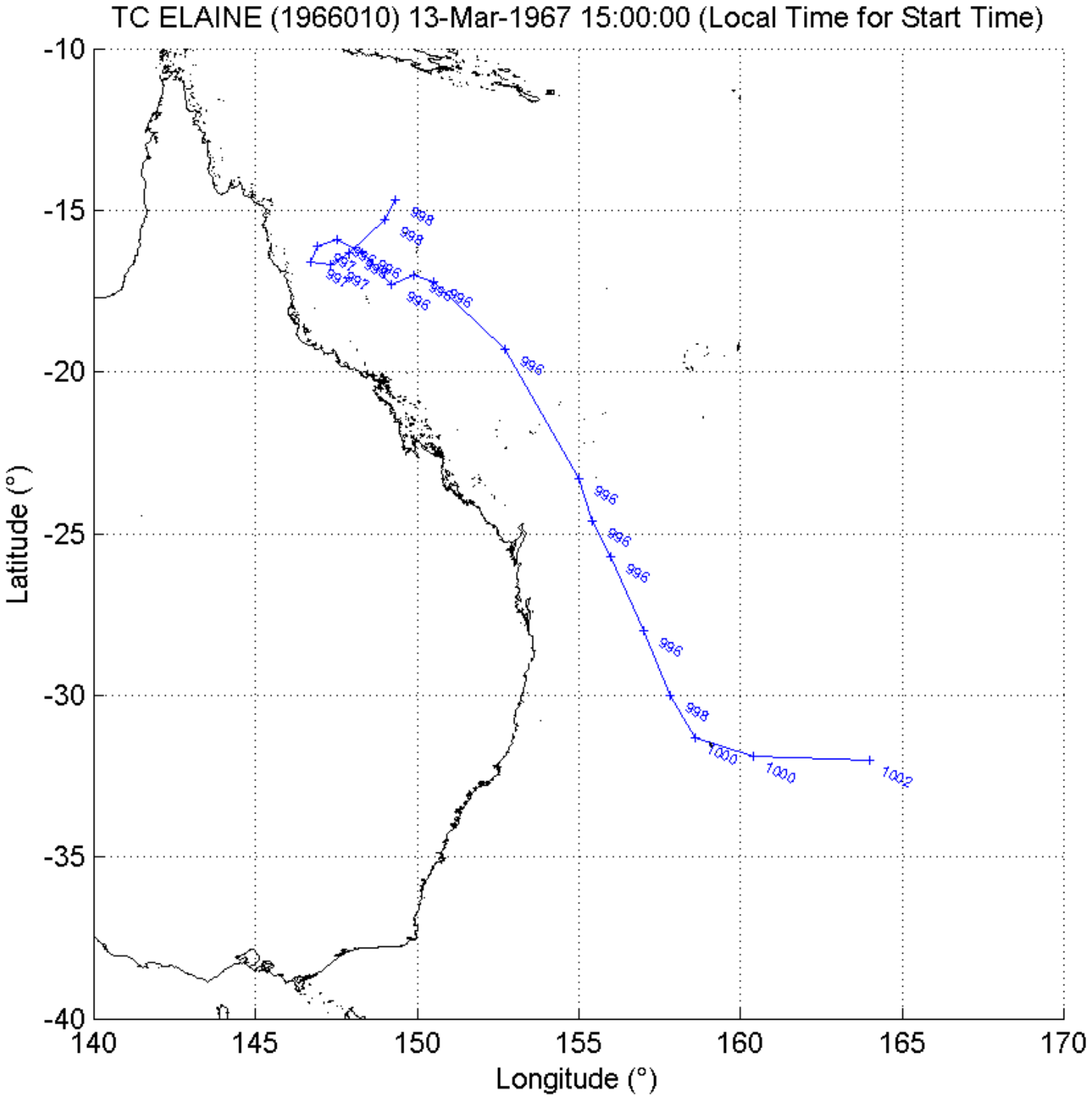
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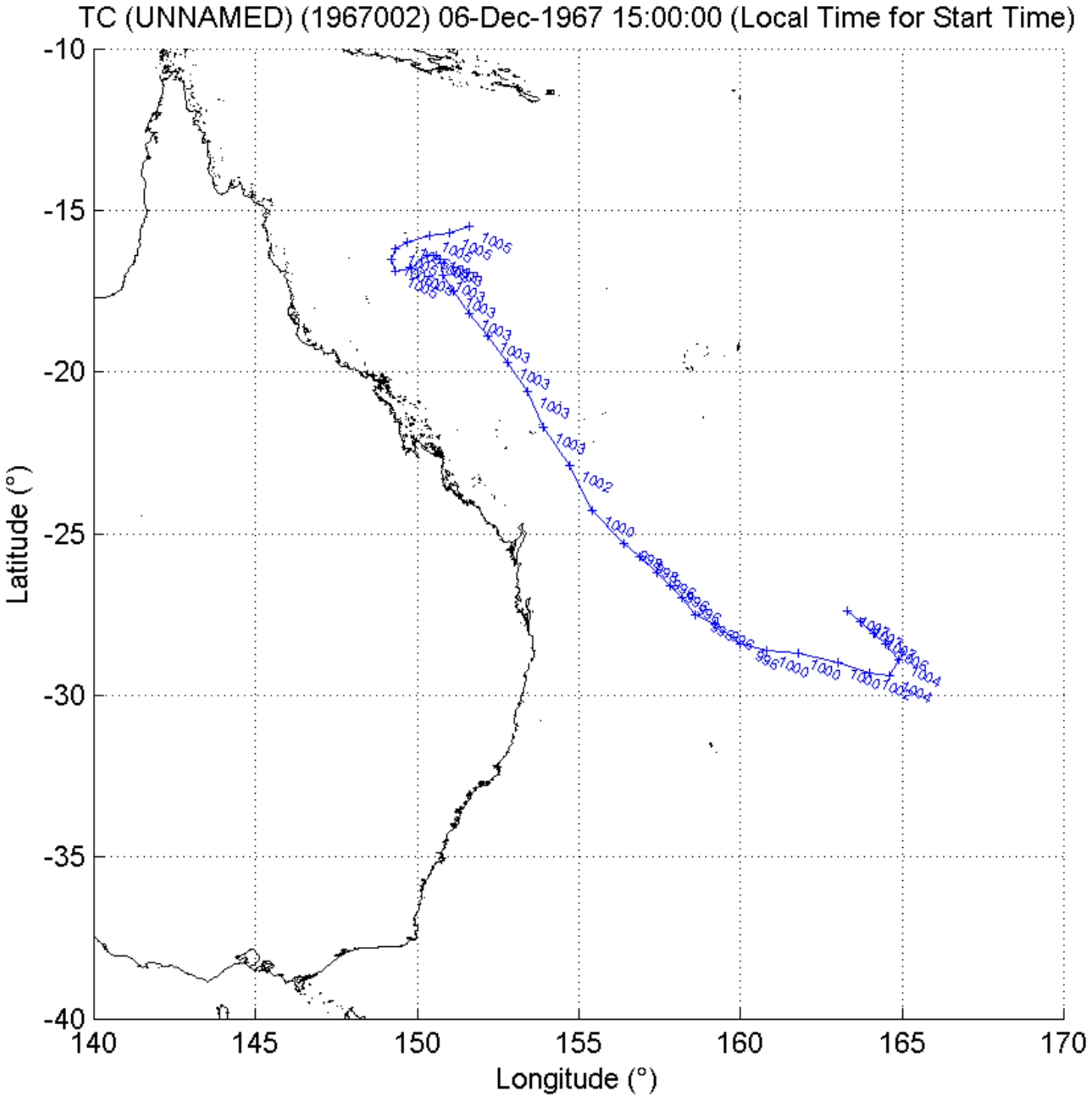
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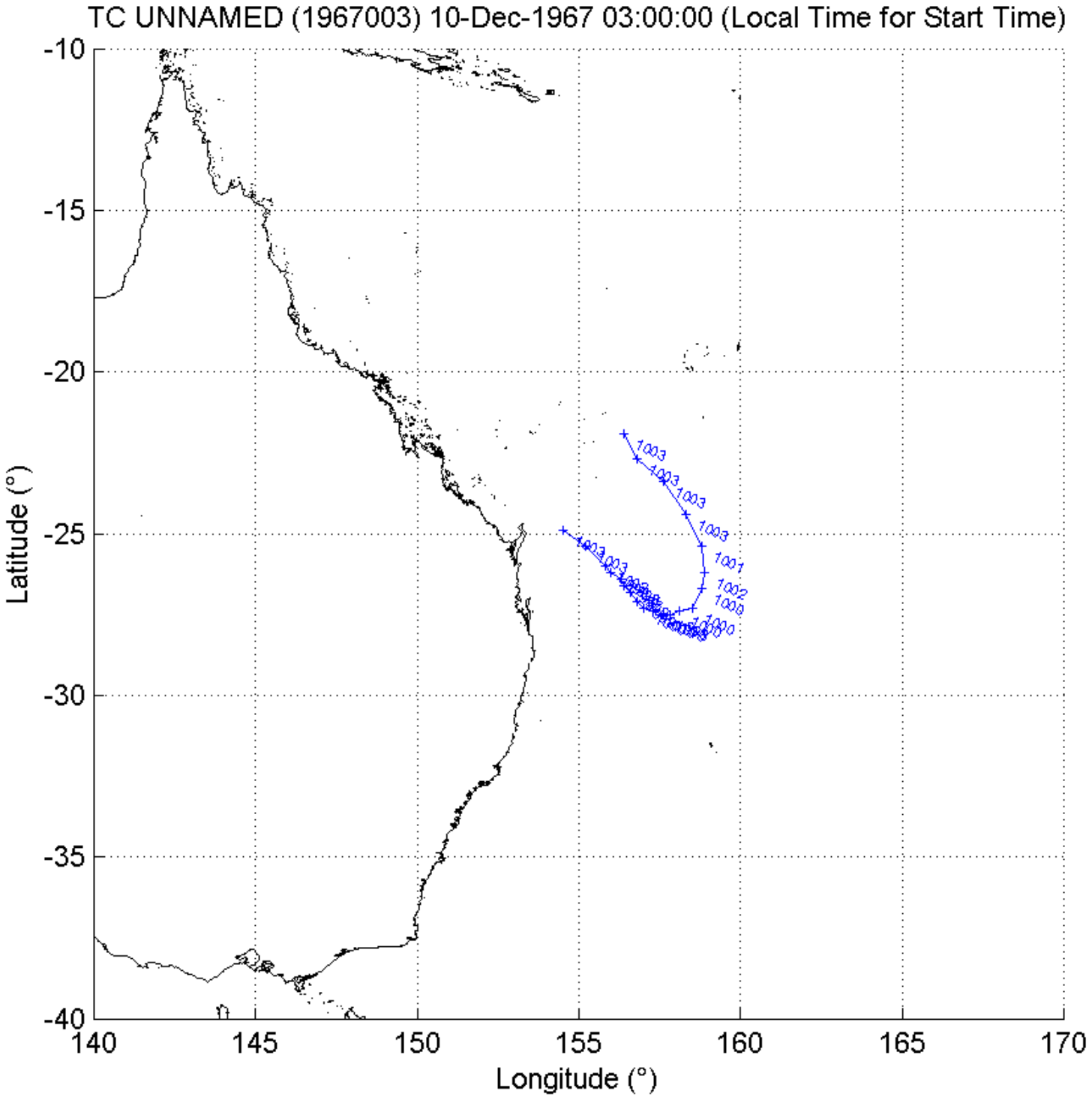
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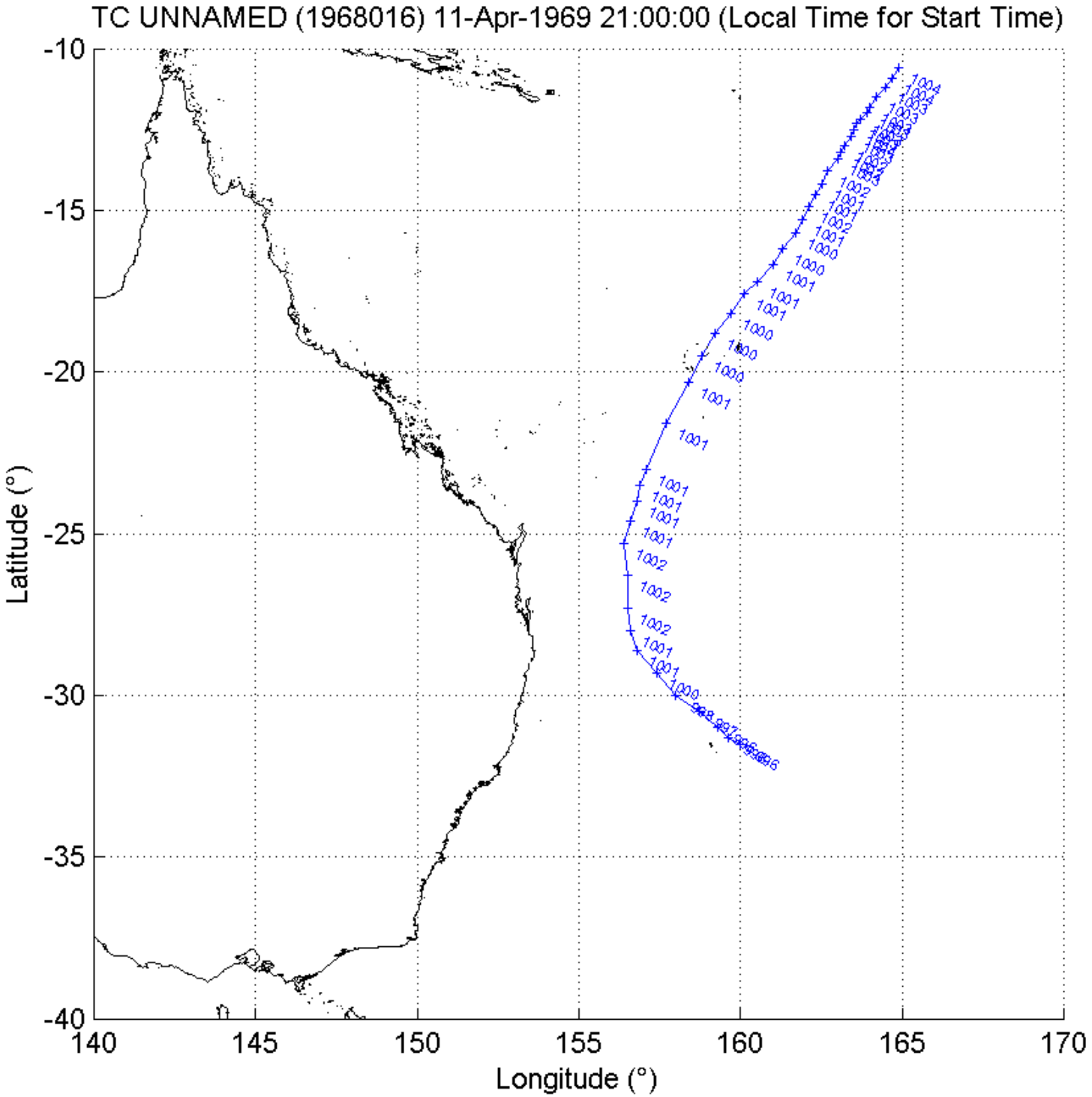
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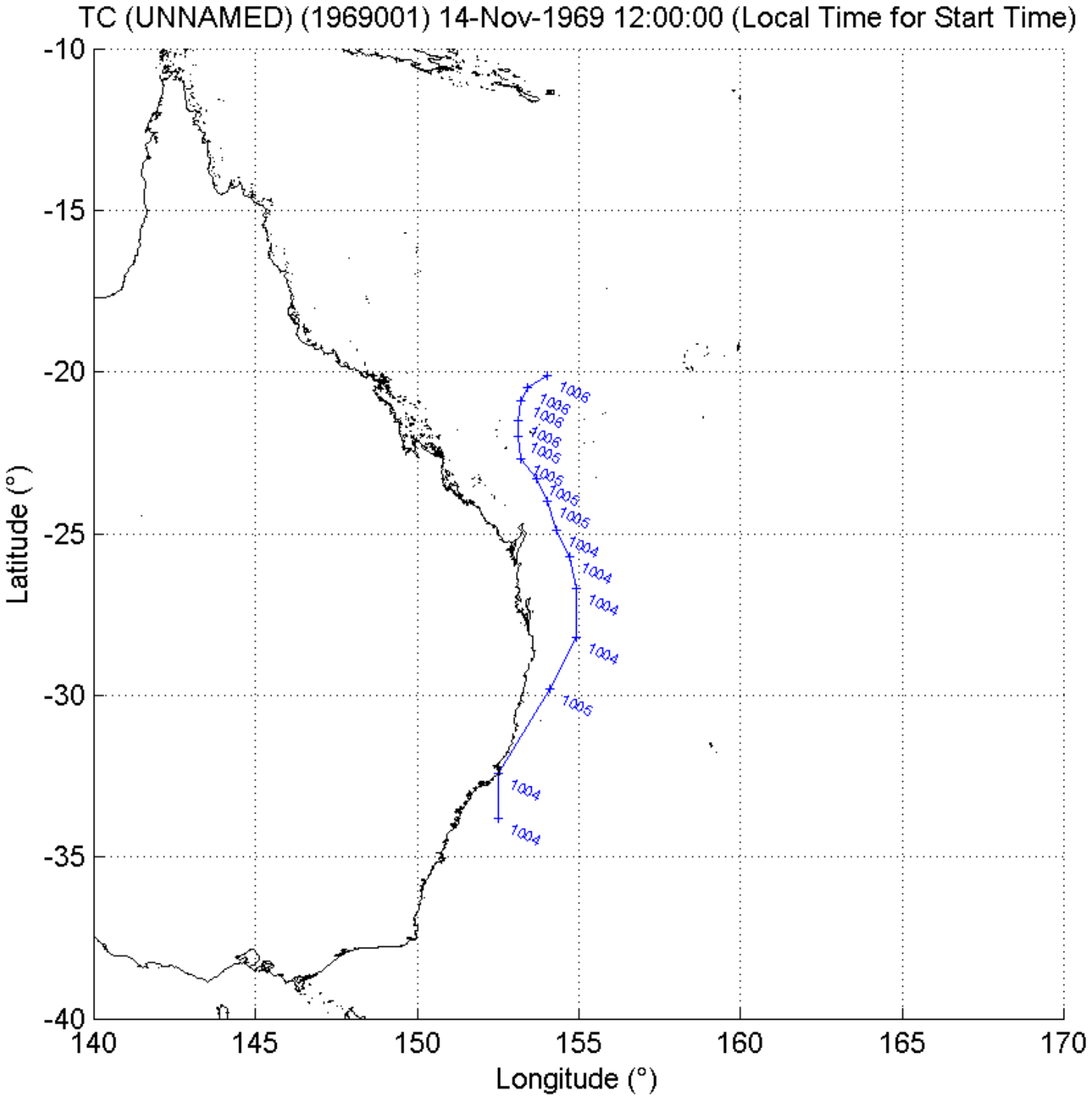
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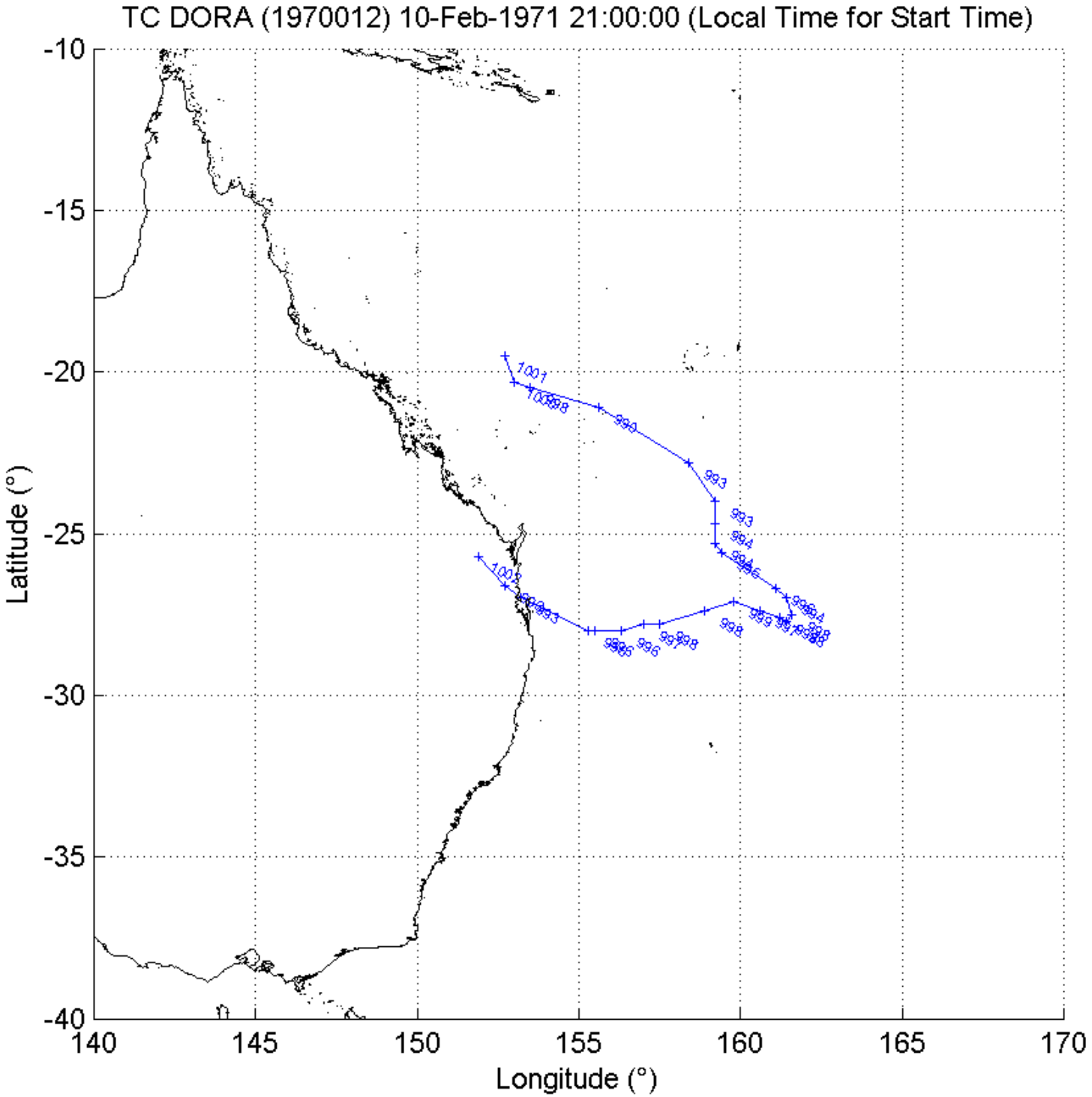
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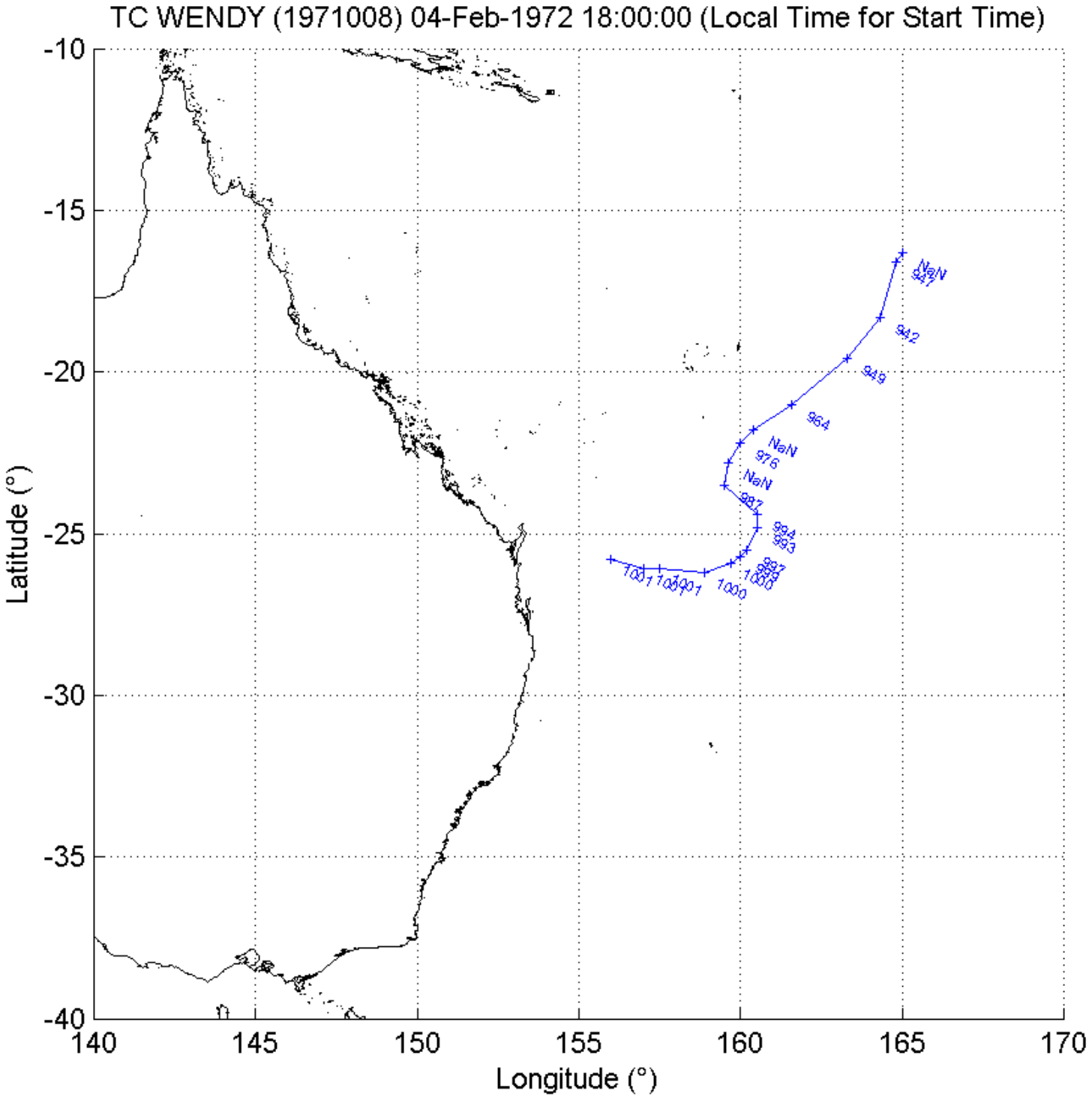
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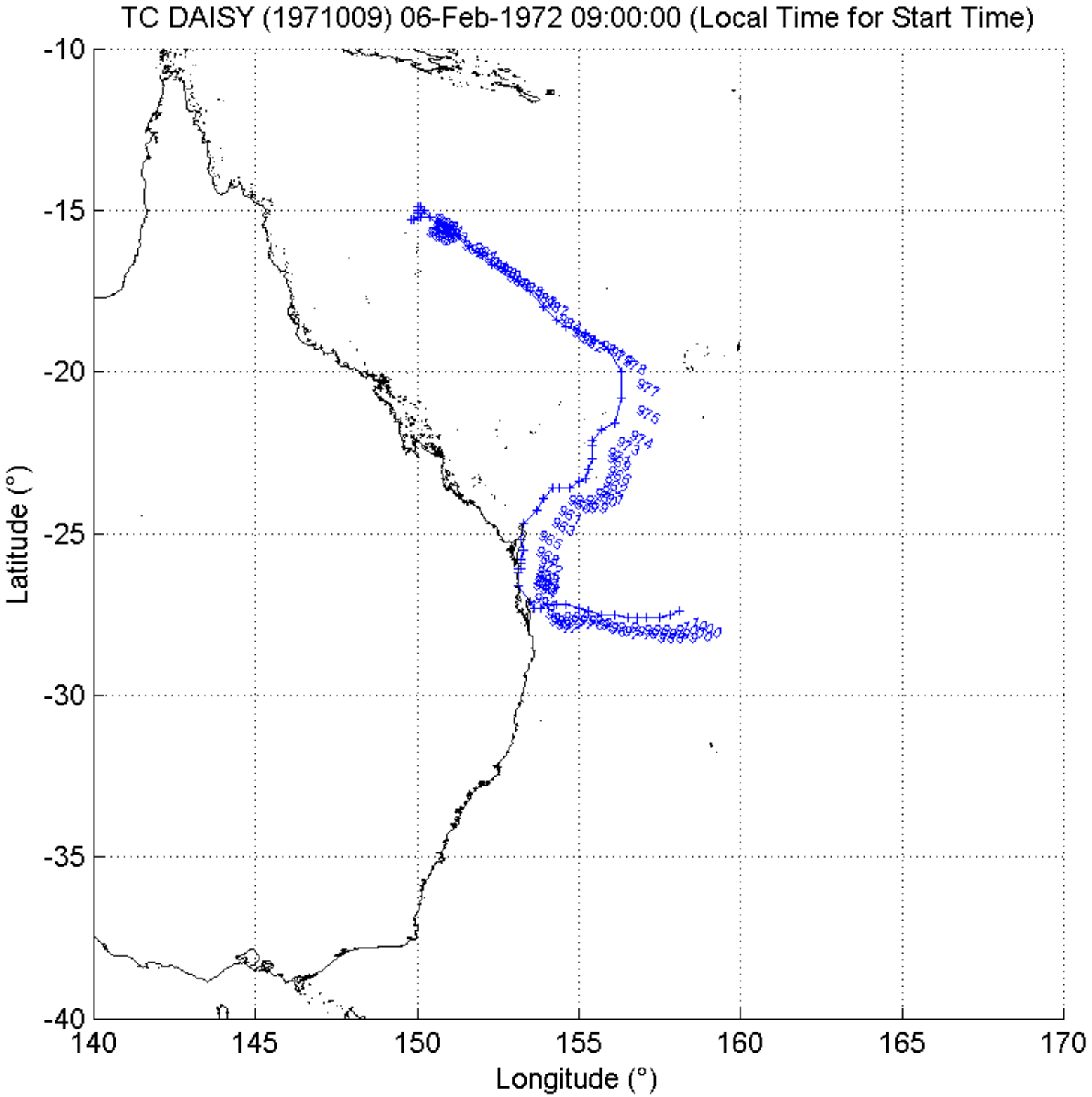
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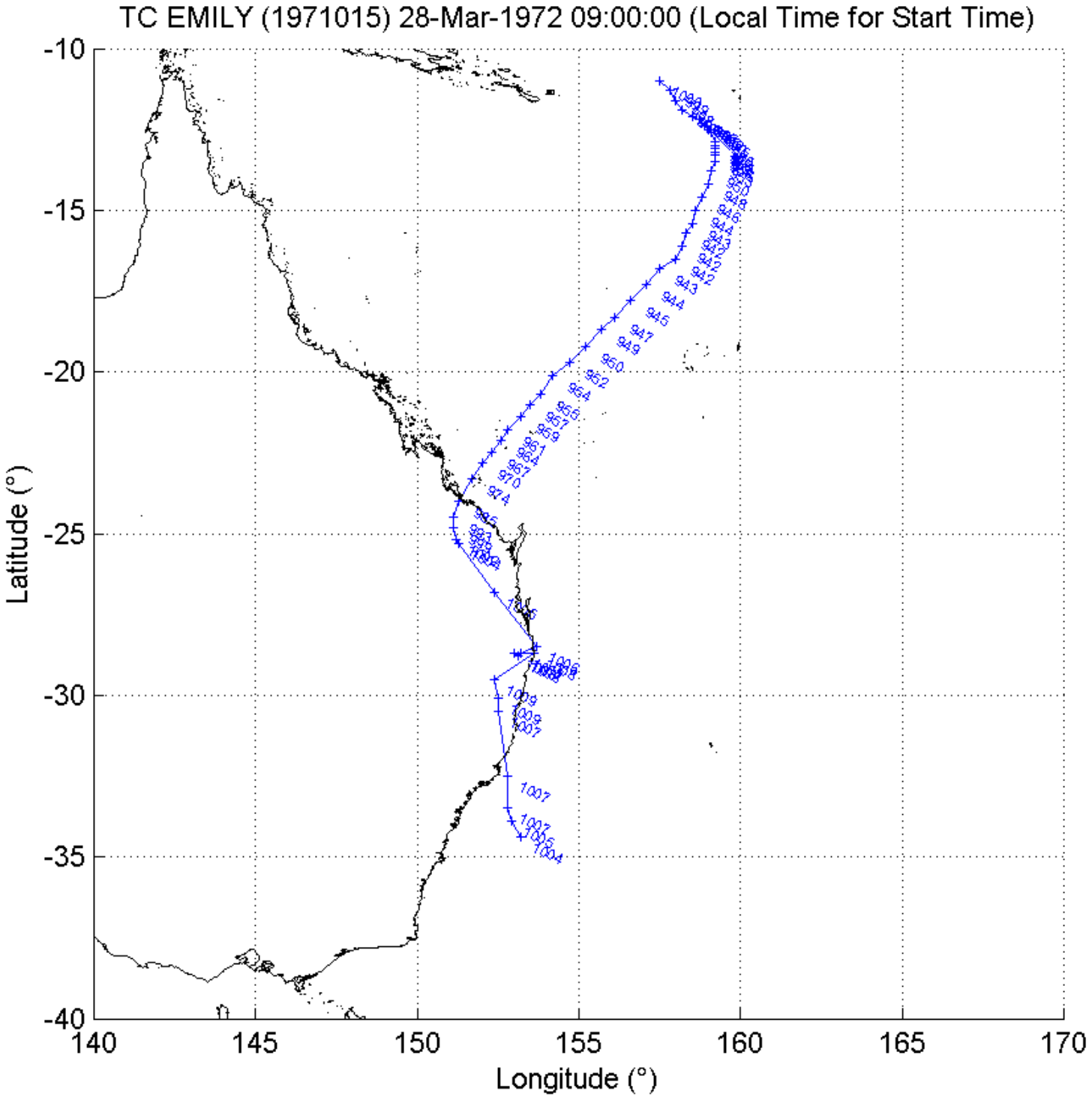
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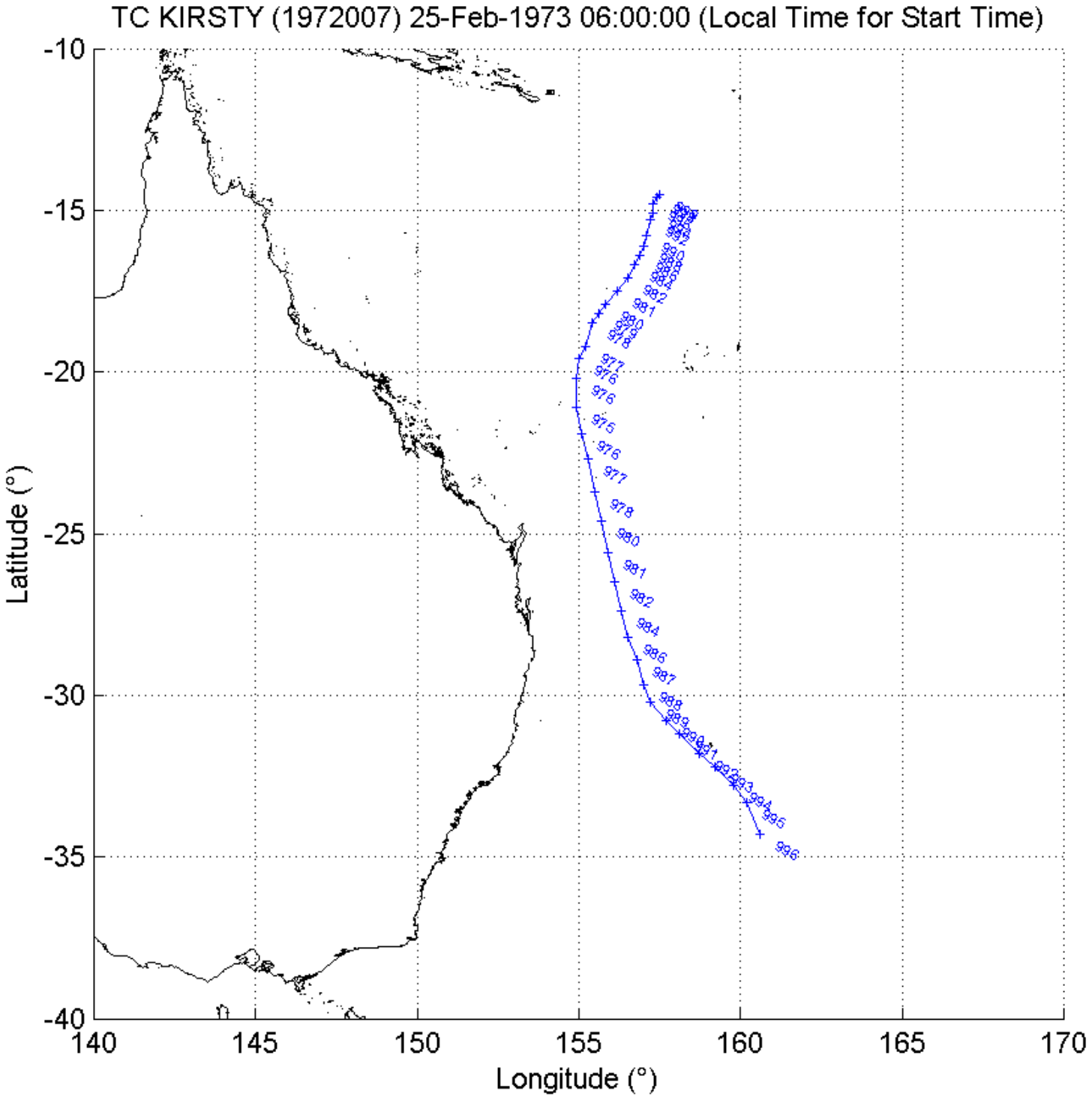
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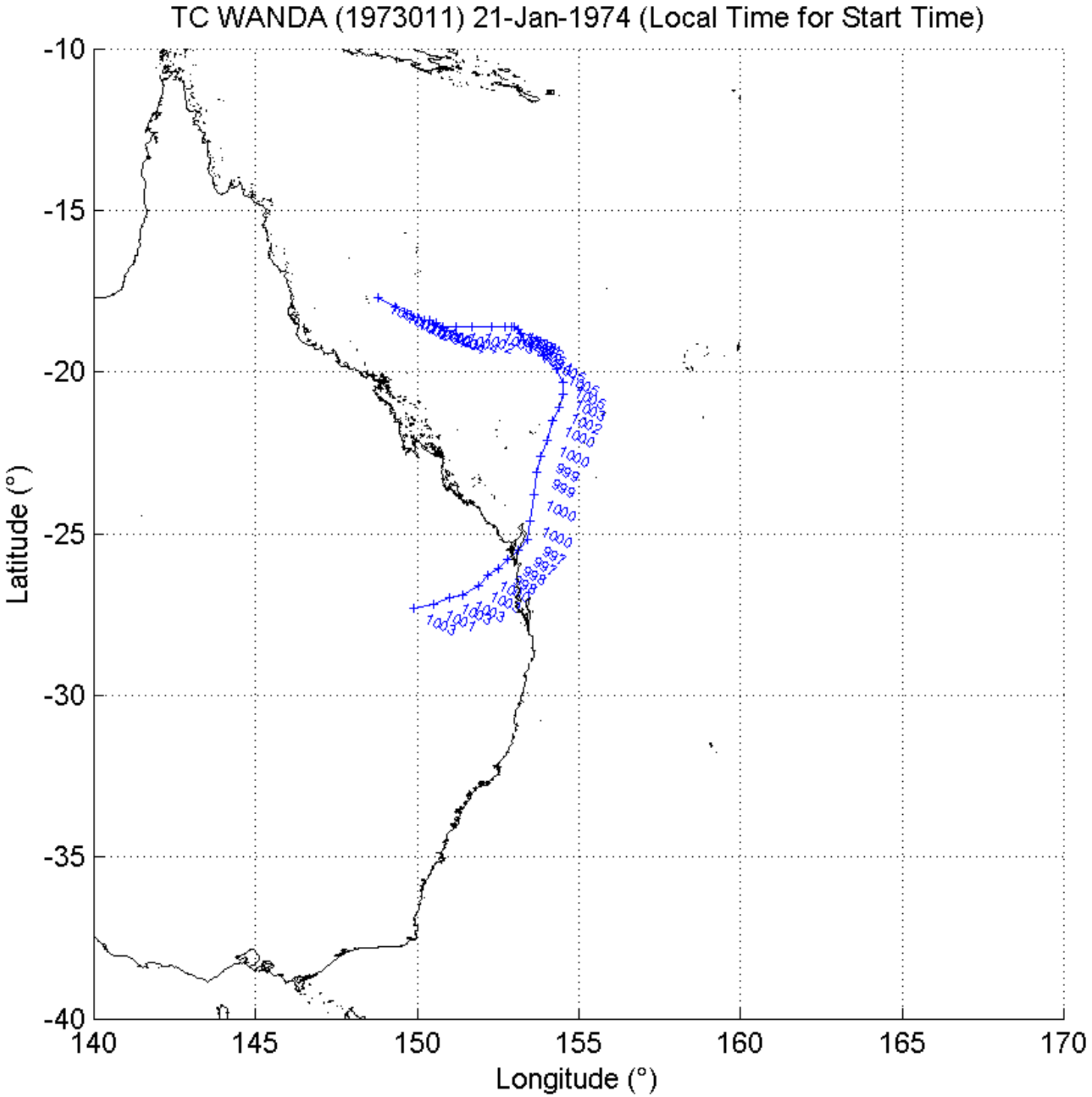
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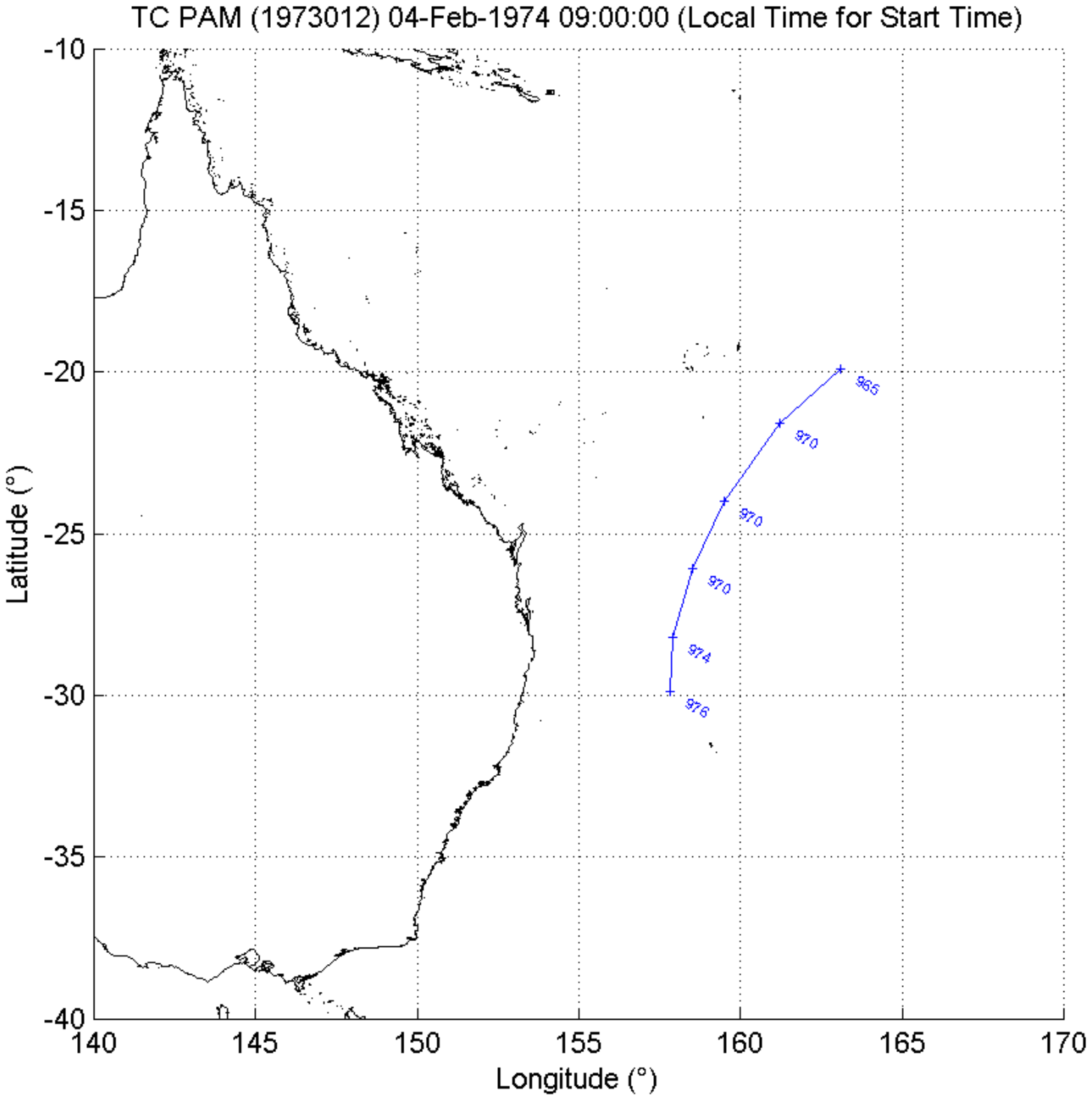
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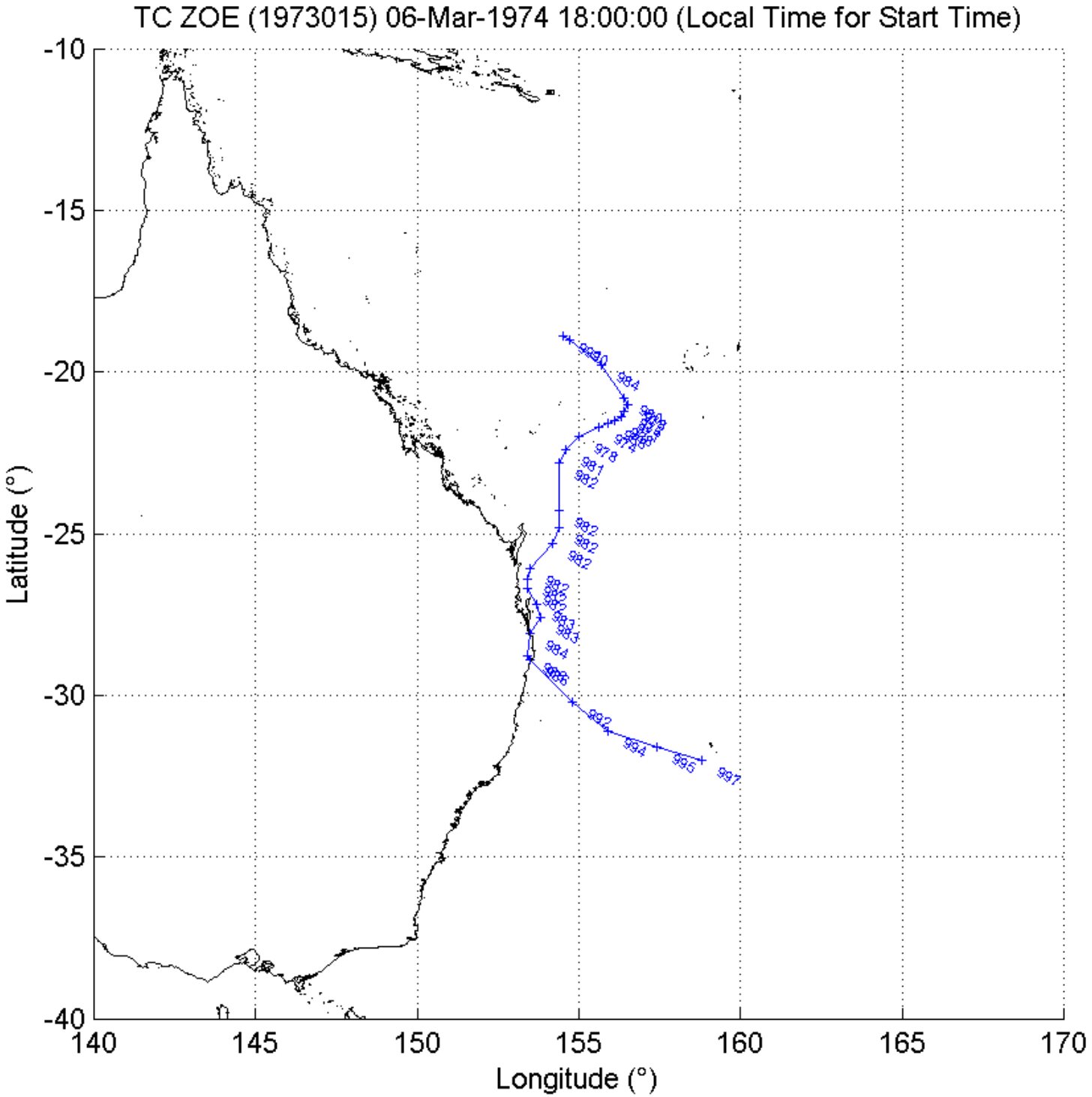
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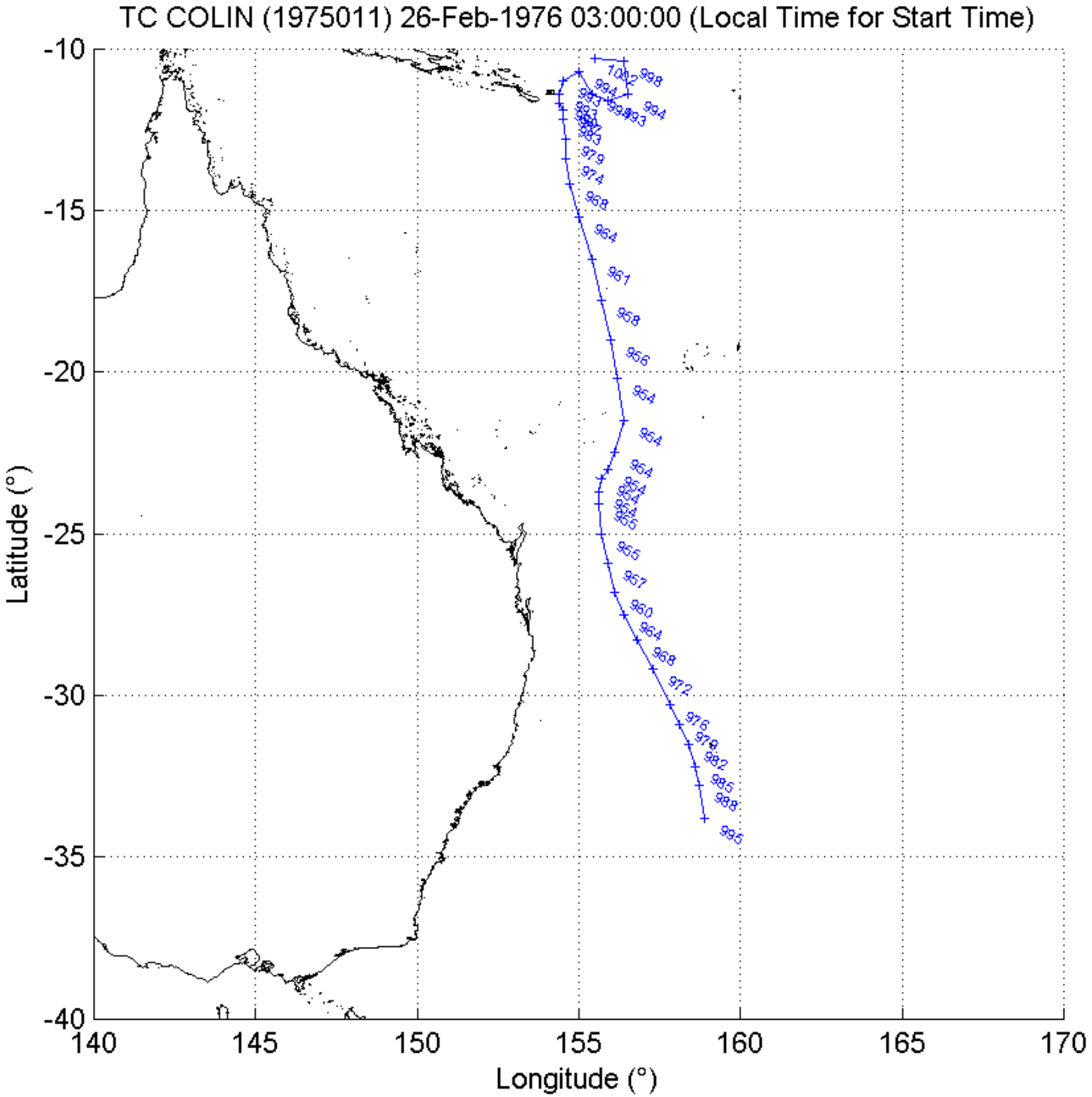
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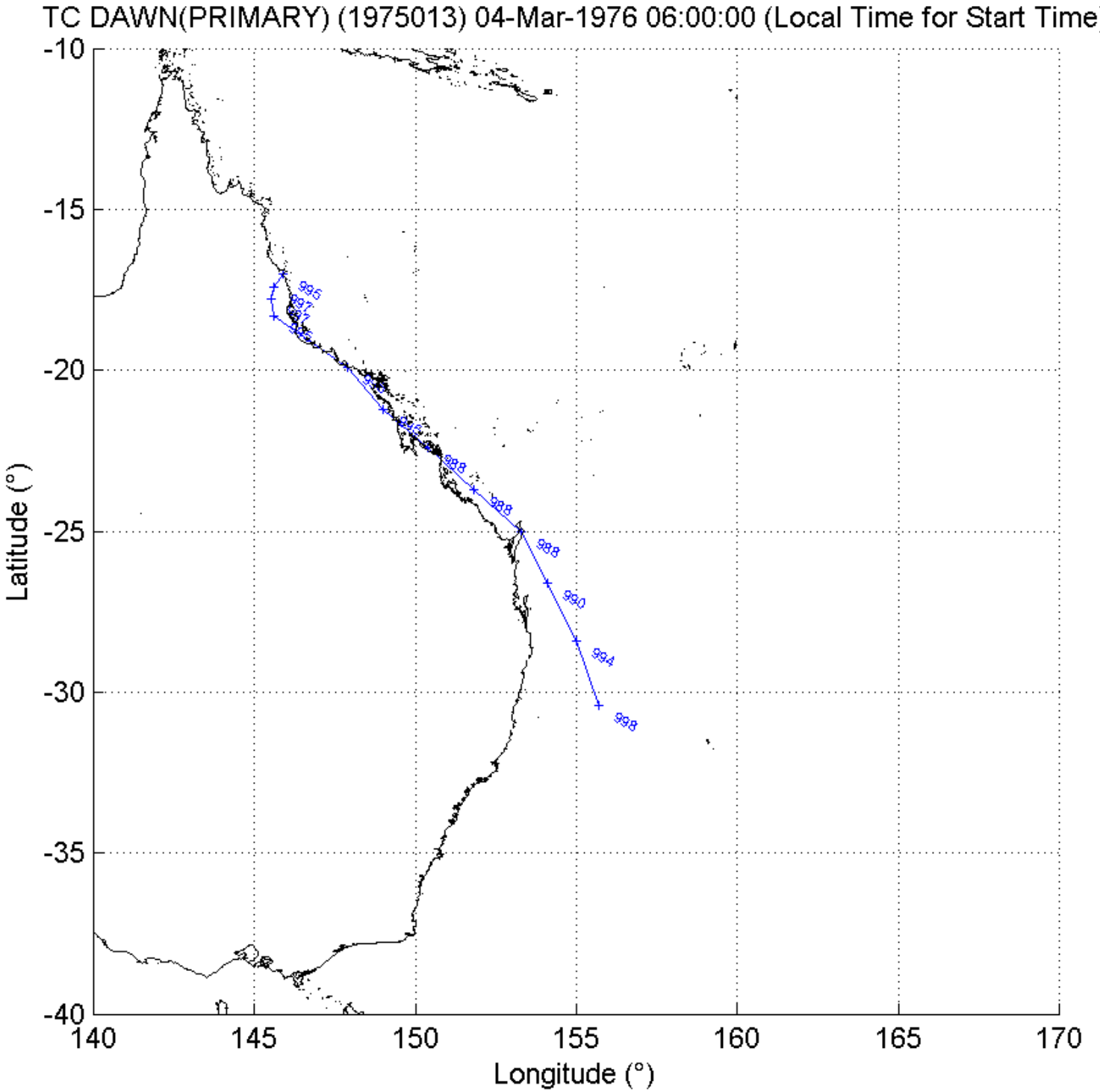
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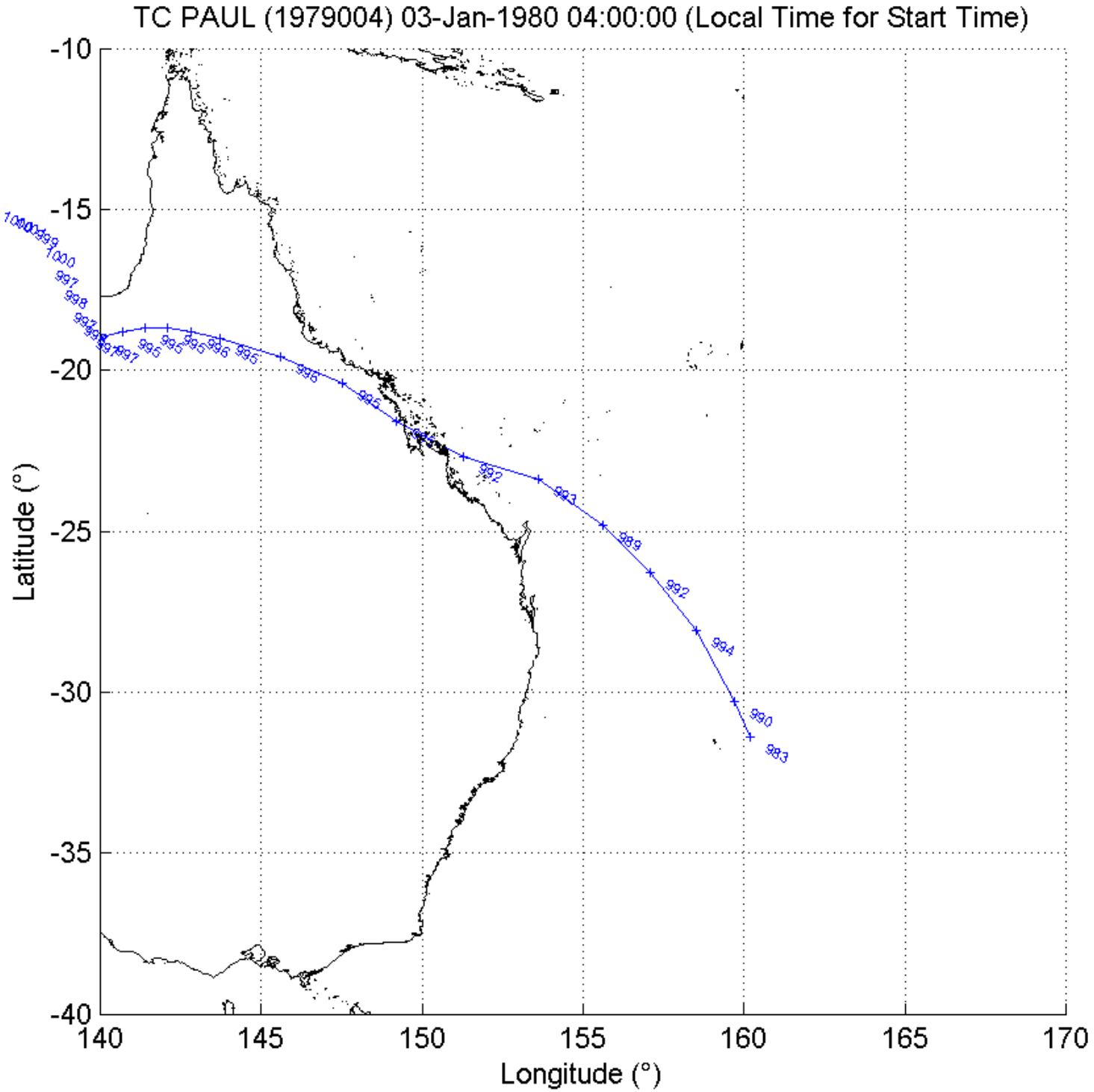
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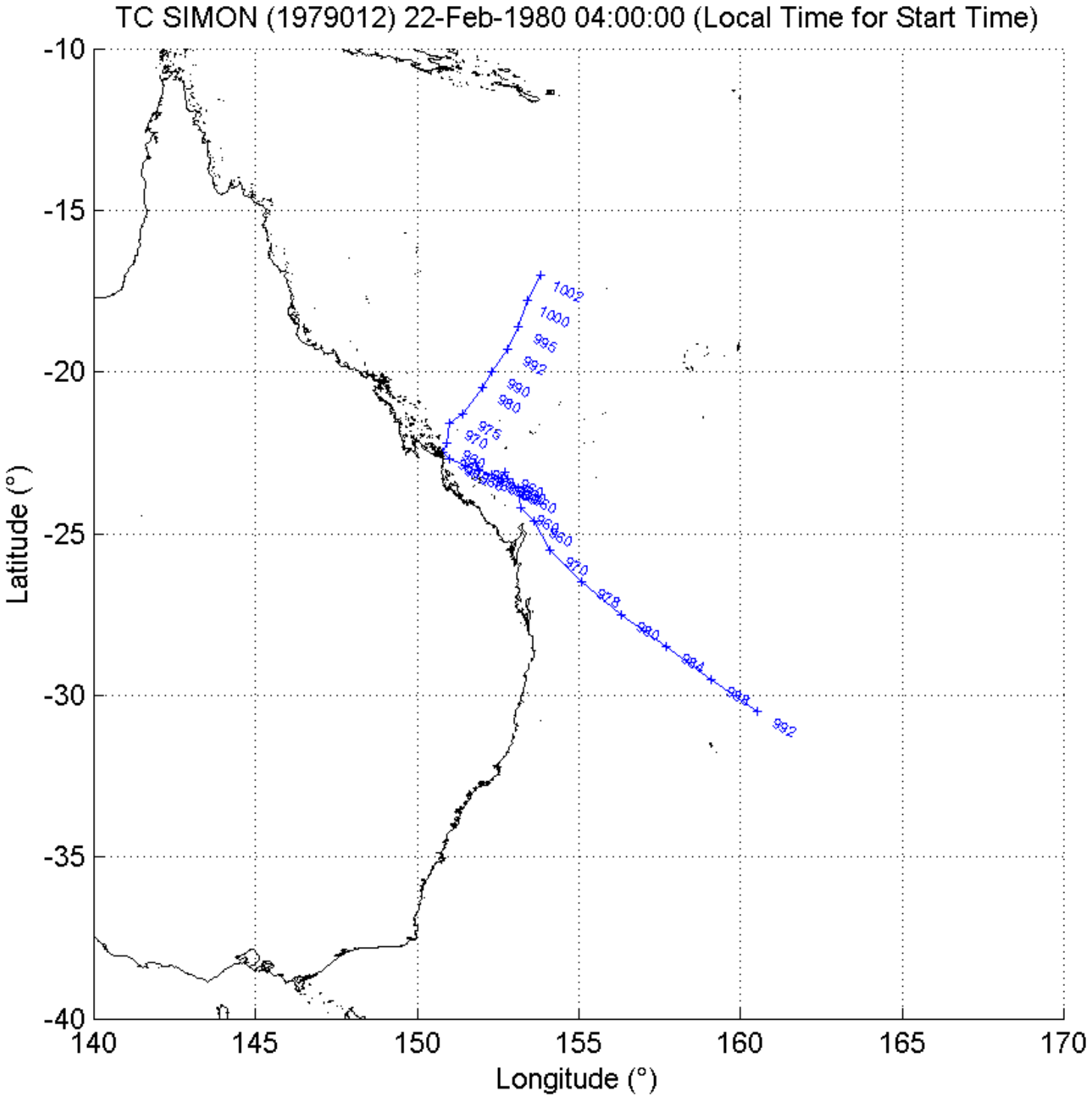
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APPENDIX J

Cyclonic Design Water Level and Concurrent Wave Parameters - Excluding Greenhouse Related Climate Change

				Water Level mAHD 20yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	1.62	1.62		0.96	2.5	153	0							
506913	6982622	PineRiver-001	MBC-001	1.92	1.78	0.14	1.07	2.6	128	0	2.09	2.52	2.42	3.31	2.48	3.46	1.55
507065	6983136	PineRiver-002	MBC-002	1.95	1.81	0.14	1.11	2.7	135	0	2.13	2.59	2.47	3.41	2.54	3.58	1.58
507237	6983516	PineRiver-003	MBC-003	1.94	1.81	0.13	1.03	2.6	126	0	2.11	2.53	2.42	3.30	2.49	3.45	1.58
507198	6984049	PineRiver-004	MBC-004	1.97	1.85	0.12	0.92	2.5	135	0	2.12	2.50	2.40	3.19	2.46	3.33	1.62
506913	6984334	PineRiver-005	MBC-005	2.03	1.92	0.11	0.83	2.2	132	0	2.16	2.50	2.40	3.10	2.45	3.22	1.53
507046	6984696	PineRiver-006	MBC-006	2.08	1.97	0.11	0.85	2.2	143	0	2.21	2.57	2.47	3.19	2.51	3.29	1.49
507522	6984334	PineRiver-007	MBC-007	1.98	1.85	0.13	0.95	2.5	146	0	2.12	2.52	2.42	3.24	2.48	3.38	1.63
507769	6984239	PineRiver-008	MBC-008	1.96	1.80	0.16	1.22	2.9	127	0	2.15	2.67	2.52	3.59	2.59	3.78	1.65
506179	6982661	PineRiver-009	MBC-009	2.03	1.92	0.11	0.83	2.2	132	0	2.16	2.50	2.40	3.10	2.45	3.22	1.53
504927	6992513	Caboolture-001	MBC-010	1.94	1.79	0.15	1.02	3.0	66	0	2.08	2.54	2.39	3.36	2.46	3.54	1.82
504270	6992575	Caboolture-002	MBC-011	1.93	1.80	0.13	0.93	2.7	70	0	2.06	2.47	2.35	3.20	2.41	3.35	1.73
503633	6992841	Caboolture-003	MBC-012	1.99	1.87	0.12	0.92	2.5	107	0	2.13	2.52	2.42	3.23	2.48	3.37	1.65
503346	6993519	Caboolture-004	MBC-013	2.04	1.91	0.13	1.00	2.5	131	0	2.20	2.60	2.51	3.33	2.57	3.48	1.53
503613	6994402	Caboolture-005	MBC-014	2.08	1.96	0.12	0.91	2.4	132	0	2.22	2.60	2.50	3.27	2.55	3.40	1.56
504658	6996186	Caboolture-009	MBC-015	2.08	1.94	0.14	1.07	2.8	132	0	2.25	2.70	2.57	3.52	2.64	3.69	1.66
504477	6996546	Caboolture-010	MBC-016	2.14	2.01	0.13	0.99	2.5	132	0	2.30	2.70	2.60	3.43	2.66	3.57	1.56
504774	6997055	Caboolture-012	MBC-017	2.11	1.98	0.13	0.96	2.7	116	0	2.25	2.67	2.55	3.42	2.61	3.58	1.73
505039	6997331	Caboolture-013	MBC-018	2.11	1.97	0.14	0.91	2.9	124	0	2.23	2.65	2.51	3.40	2.57	3.55	1.89
505442	6998582	Caboolture-016	MBC-019	2.16	2.01	0.15	1.07	2.9	124	0	2.31	2.79	2.64	3.64	2.71	3.82	1.77
505671	6999062	Caboolture-017	MBC-020	2.17	2.02	0.15	0.97	3.1	123	0	2.29	2.75	2.59	3.56	2.65	3.74	1.95
505909	6999567	Caboolture-018	MBC-021	2.19	2.03	0.16	1.04	3.2	124	0	2.31	2.81	2.63	3.68	2.70	3.86	1.94
506361	7000127	Caboolture-019	MBC-022	2.21	2.05	0.16	1.12	3.0	144	0	2.37	2.86	2.71	3.74	2.78	3.92	1.74
506813	7000580	Caboolture-020	MBC-023	2.15	2.00	0.15	1.04	2.9	142	0	2.29	2.76	2.61	3.58	2.68	3.75	1.76
507266	7001010	Caboolture-021	MBC-024	2.15	1.97	0.18	1.17	3.4	123	0	2.28	2.85	2.63	3.84	2.71	4.05	1.96
507718	7001452	Caboolture-022	MBC-025	2.16	1.98	0.18	1.23	3.4	143	0	2.31	2.90	2.68	3.91	2.75	4.13	1.90
508289	7001850	Caboolture-023	MBC-026	2.15	1.96	0.19	1.25	3.5	145	0	2.29	2.90	2.66	3.94	2.74	4.16	1.93
508903	7002206	Caboolture-024	MBC-027	2.14	1.94	0.20	1.29	3.6	146	0	2.28	2.92	2.66	4.01	2.74	4.25	1.99
509355	7002550	Caboolture-025	MBC-028	2.12	1.93	0.19	1.28	3.6	149	0	2.27	2.90	2.64	3.98	2.72	4.21	1.98
509894	7002744	Caboolture-026	MBC-029	2.10	1.90	0.20	1.34	3.7	155	0	2.25	2.91	2.64	4.05	2.72	4.29	1.98
510475	7002852	Caboolture-027	MBC-030	2.08	1.88	0.20	1.30	3.6	155	0	2.22	2.87	2.60	3.97	2.69	4.21	1.99
511067	7003003	Caboolture-028	MBC-031	2.05	1.87	0.18	1.20	3.4	164	0	2.19	2.77	2.55	3.77	2.63	3.98	1.93
511477	7003251	Caboolture-029	MBC-032	2.05	1.90	0.15	1.06	2.9	145	0	2.20	2.67	2.53	3.50	2.59	3.67	1.73
512112	7003326	Caboolture-030	MBC-033	2.03	1.87	0.16	1.17	3.0	142	0	2.20	2.72	2.56	3.64	2.63	3.83	1.74
512694	7003455	Caboolture-031	MBC-034	2.01	1.85	0.16	1.11	3.2	176	0	2.16	2.67	2.49	3.58	2.56	3.77	1.87
513275	7003412	Caboolture-032	MBC-035	2.00	1.84	0.16	1.12	3.0	170	0	2.16	2.65	2.50	3.54	2.57	3.72	1.75
513911	7003746	Caboolture-033	MBC-036	1.99	1.86	0.13	1.02	2.5	128	0	2.16	2.57	2.47	3.32	2.53	3.46	1.54
514481	7004446	Caboolture-034	MBC-037	1.89	1.76	0.13	0.98	2.5	124	0	2.04	2.45	2.34	3.18	2.40	3.32	1.58
516248	7002647	Caboolture-038	MBC-038	1.90	1.66	0.24	1.54	4.1	187	0	2.04	2.84	2.48	4.17	2.57	4.47	2.06
517280	7002397	Caboolture-040	MBC-039	1.84	1.63	0.21	1.43	3.6	168	0	2.01	2.70	2.42	3.88	2.51	4.13	1.90
519611	7002925	Caboolture-044	MBC-040	1.84	1.57	0.27	1.84	4.2	126	0	2.03	2.95	2.54	4.50	2.65	4.83	1.95
520367	7003619	Caboolture-046	MBC-041	1.87	1.55	0.32	2.22	4.7	108	0	2.08	3.22	2.67	5.09	2.80	5.49	1.96
520284	7006303	Caboolture-051	MBC-042	1.88	1.54	0.34	2.08	5.6	53	0	2.00	3.23	2.53	5.20	2.66	5.66	2.42
516778	7013518	Caboolture-060	MBC-043	1.95	1.56	0.39	2.40	6.0	59	0	2.08	3.50	2.69	5.77	2.83	6.30	2.41
516320	7014796	Caboolture-061	MBC-044	1.95	1.57	0.38	2.26	6.0	59	0	2.06	3.42	2.63	5.60	2.77	6.11	2.50
507667	7015461	Caboolture-067	MBC-045	2.17	2.04	0.13	1.02	2.5	196	0	2.34	2.75	2.65	3.49	2.71	3.64	1.53
508591	7014764	Caboolture-069	MBC-046	2.15	2.01	0.14	1.13	2.6	210	0	2.34	2.79	2.68	3.62	2.75	3.78	1.53
509101	7014442	Caboolture-070	MBC-047	2.12	1.97	0.15	1.18	2.7	192	0	2.31	2.80	2.67	3.67	2.74	3.84	1.58
509543	7013236	Caboolture-072	MBC-048	2.03	1.89	0.14	1.09	2.7	209	0	2.20	2.66	2.54	3.47	2.60	3.63	1.60
509623	7012592	Caboolture-073	MBC-049	2.00	1.85	0.15	1.13	2.8	209	0	2.17	2.65	2.52	3.50	2.59	3.67	1.62
510253	7011212	Caboolture-075	MBC-050	1.93	1.78	0.15	1.22	2.7	197	0	2.13	2.63	2.50	3.52	2.58	3.69	1.54
510669	7010917	Caboolture-076	MBC-051	1.88	1.75	0.13	0.98	2.4	204	0	2.03	2.43	2.33	3.14	2.39	3.28	1.53
511138	7010769	Caboolture-077	MBC-052	1.89	1.75	0.14	1.04	2.6	169	0	2.05	2.48	2.37	3.26	2.43	3.41	1.59
511701	7010475	Caboolture-078	MBC-053	1.88	1.74	0.14	1.10	2.7	187	0	2.06	2.51	2.39	3.34	2.46	3.50	1.60
512076	7010032	Caboolture-079	MBC-054	1.89	1.73	0.16	1.16	3.0	209	0	2.06	2.57	2.41	3.47	2.49	3.65	1.71
513283	7007901	Caboolture-083	MBC-055	1.81	1.64	0.17	1.29	2.9	223	0	2.01	2.55	2.40	3.51	2.48	3.71	1.60
513390	7007284	Caboolture-084	MBC-056	1.92	1.76	0.16	1.33	2.8	252	0	2.14	2.68	2.55	3.64	2.63	3.83	1.52

				Water Level mAHD 20yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
513444	7006735	Caboolture-085	MBC-057	1.90	1.73	0.17	1.41	2.9	144	0	2.14	2.70	2.56	3.72	2.64	3.92	1.50
514141	7006547	Caboolture-086	MBC-058	1.90	1.73	0.17	1.36	2.8	249	0	2.12	2.68	2.53	3.67	2.60	3.83	1.48
514958	7005756	Caboolture-088	MBC-059	1.86	1.70	0.16	1.28	2.9	255	0	2.07	2.60	2.46	3.54	2.53	3.73	1.57
515374	7005260	Caboolture-089	MBC-060	1.83	1.68	0.15	1.25	2.7	261	0	2.04	2.54	2.42	3.44	2.50	3.62	1.50
514730	7005140	Caboolture-090	MBC-061	1.80	1.68	0.12	1.01	2.3	112	0	1.97	2.37	2.27	3.09	2.32	3.21	1.45
514328	7005394	Caboolture-091	MBC-062	1.82	1.69	0.13	0.94	2.5	108	0	1.96	2.35	2.25	3.06	2.31	3.21	1.62
513269	7006199	Caboolture-093	MBC-063	1.87	1.72	0.15	1.13	2.7	106	0	2.05	2.51	2.39	3.35	2.46	3.51	1.57
511621	7007284	Caboolture-096	MBC-064	1.88	1.74	0.14	1.09	2.5	124	0	2.06	2.50	2.39	3.30	2.44	3.43	1.49
511339	7008048	Caboolture-097	MBC-065	1.89	1.76	0.13	1.03	2.4	47	0	2.06	2.46	2.37	3.19	2.42	3.31	1.45
511648	7008558	Caboolture-098	MBC-066	1.78	1.65	0.13	1.00	2.5	145	0	1.94	2.35	2.25	3.08	2.31	3.22	1.54
511835	7009040	Caboolture-099	MBC-067	1.81	1.68	0.13	1.00	2.5	143	0	1.97	2.38	2.28	3.12	2.34	3.27	1.58
511446	7009456	Caboolture-100	MBC-068	1.84	1.71	0.13	1.01	2.5	138	0	2.00	2.41	2.31	3.15	2.37	3.30	1.54
511058	7009456	Caboolture-101	MBC-069	1.86	1.73	0.13	1.06	2.5	116	0	2.04	2.46	2.36	3.23	2.43	3.38	1.51
510321	7009818	Caboolture-102	MBC-070	1.86	1.73	0.13	0.99	2.5	117	0	2.02	2.42	2.32	3.14	2.38	3.29	1.54
509784	7010233	Caboolture-103	MBC-071	1.86	1.73	0.13	1.04	2.5	141	0	2.03	2.45	2.35	3.20	2.41	3.34	1.50
509369	7010796	Caboolture-104	MBC-072	1.89	1.76	0.13	0.99	2.4	139	0	2.05	2.45	2.35	3.17	2.40	3.31	1.53
509034	7011198	Caboolture-105	MBC-073	1.99	1.85	0.14	1.11	2.6	43	0	2.17	2.62	2.51	3.42	2.58	3.58	1.51
508833	7011587	Caboolture-106	MBC-074	1.94	1.81	0.13	1.00	2.5	44	0	2.10	2.51	2.41	3.24	2.47	3.38	1.54
508752	7011869	Caboolture-107	MBC-075	1.91	1.77	0.14	1.17	2.5	20	0	2.11	2.57	2.47	3.40	2.53	3.53	1.45
508471	7012110	Caboolture-108	MBC-076	1.92	1.79	0.13	1.11	2.4	39	0	2.11	2.54	2.45	3.33	2.50	3.46	1.45
508926	7012177	Caboolture-109	MBC-077	1.94	1.81	0.13	1.02	2.5	152	0	2.11	2.52	2.42	3.28	2.48	3.43	1.57
509020	7012767	Caboolture-110	MBC-078	1.99	1.85	0.14	1.09	2.6	147	0	2.16	2.61	2.50	3.42	2.56	3.58	1.58
508565	7013276	Caboolture-111	MBC-079	2.03	1.91	0.12	0.97	2.3	138	0	2.19	2.58	2.48	3.29	2.53	3.40	1.48
508069	7013611	Caboolture-112	MBC-080	2.17	2.02	0.15	1.19	2.6	14	0	2.37	2.85	2.73	3.71	2.79	3.86	1.48
507667	7013960	Caboolture-113	MBC-081	2.20	2.07	0.13	1.10	2.4	35	0	2.39	2.82	2.72	3.60	2.78	3.73	1.45
507157	7014067	Caboolture-114	MBC-082	2.24	2.11	0.13	1.07	2.5	39	0	2.42	2.85	2.75	3.63	2.80	3.76	1.48
507171	7014777	Caboolture-115	MBC-083	2.18	2.04	0.14	1.09	2.5	39	0	2.36	2.80	2.69	3.60	2.74	3.73	1.49
507063	7015595	Caboolture-116	MBC-084	2.18	2.05	0.13	0.99	2.4	148	0	2.34	2.74	2.64	3.46	2.69	3.60	1.53
509121	6984944	Redcliffe-005	MBC-085	1.94	1.77	0.17	1.19	3.1	151	0	2.10	2.64	2.46	3.58	2.54	3.78	1.77
509533	6984891	Redcliffe-006	MBC-086	1.90	1.74	0.16	1.15	2.9	192	0	2.07	2.56	2.42	3.45	2.49	3.63	1.68
509892	6984691	Redcliffe-007	MBC-087	1.87	1.71	0.16	1.13	2.9	193	0	2.03	2.52	2.38	3.40	2.45	3.58	1.71
510464	6984279	Redcliffe-009	MBC-088	1.86	1.66	0.20	1.30	3.6	129	0	2.00	2.65	2.38	3.75	2.46	3.99	1.99
510783	6984638	Redcliffe-010	MBC-089	1.85	1.63	0.22	1.57	3.7	126	0	2.04	2.79	2.49	4.06	2.59	4.33	1.84
510969	6985516	Redcliffe-012	MBC-090	1.88	1.64	0.24	1.64	3.9	115	0	2.06	2.86	2.52	4.21	2.62	4.49	1.88
511076	6985889	Redcliffe-013	MBC-091	1.88	1.64	0.24	1.57	4.0	118	0	2.04	2.83	2.48	4.15	2.57	4.44	1.97
511488	6987365	Redcliffe-016	MBC-092	1.92	1.64	0.28	1.84	4.5	114	0	2.08	3.05	2.58	4.64	2.69	4.99	2.05
511768	6988017	Redcliffe-018	MBC-093	1.91	1.62	0.29	1.88	4.6	114	0	2.07	3.07	2.58	4.71	2.69	5.07	2.10
511648	6988496	Redcliffe-019	MBC-094	1.89	1.63	0.26	1.57	4.6	111	0	2.00	2.88	2.43	4.31	2.53	4.64	2.27
511741	6989254	Redcliffe-021	MBC-095	1.93	1.63	0.30	1.95	4.6	117	0	2.10	3.13	2.62	4.81	2.74	5.18	2.06
511874	6990079	Redcliffe-023	MBC-096	1.91	1.62	0.29	1.89	4.7	120	0	2.07	3.09	2.57	4.75	2.69	5.12	2.13
511648	6990451	Redcliffe-024	MBC-097	1.89	1.63	0.26	1.63	4.4	109	0	2.02	2.90	2.47	4.35	2.57	4.68	2.17
511661	6991063	Redcliffe-025	MBC-098	1.91	1.64	0.27	1.74	4.3	118	0	2.07	2.97	2.55	4.48	2.65	4.81	2.05
511568	6992087	Redcliffe-027	MBC-099	1.91	1.64	0.27	1.82	4.3	114	0	2.09	3.02	2.59	4.57	2.70	4.90	2.00
511475	6992513	Redcliffe-028	MBC-100	1.86	1.64	0.22	1.51	3.7	124	0	2.03	2.77	2.47	4.01	2.56	4.28	1.90
510916	6992713	Redcliffe-029	MBC-101	1.80	1.63	0.17	1.27	3.0	258	0	1.99	2.54	2.38	3.51	2.46	3.71	1.67
510531	6992472	Redcliffe-030	MBC-102	1.80	1.63	0.17	1.27	2.9	261	0	1.99	2.53	2.38	3.49	2.46	3.68	1.62
510161	6992164	Redcliffe-031	MBC-103	1.82	1.64	0.18	1.44	3.0	258	0	2.05	2.65	2.49	3.71	2.57	3.92	1.56
509833	6991712	Redcliffe-032	MBC-104	1.77	1.64	0.13	1.08	2.4	231	0	1.95	2.38	2.28	3.16	2.33	3.29	1.47
509525	6991322	Redcliffe-033	MBC-105	1.77	1.64	0.13	1.11	2.4	232	0	1.96	2.39	2.30	3.17	2.35	3.30	1.44
509155	6991199	Redcliffe-034	MBC-106	1.80	1.65	0.15	1.10	2.9	42	0	1.96	2.44	2.30	3.29	2.37	3.47	1.70
508478	6991343	Redcliffe-035	MBC-107	1.80	1.66	0.14	0.99	2.8	57	0	1.94	2.38	2.25	3.16	2.31	3.32	1.74
507965	6991487	Redcliffe-036	MBC-108	1.83	1.68	0.15	1.02	2.9	47	0	1.97	2.43	2.28	3.25	2.35	3.42	1.81
507205	6991589	Redcliffe-037	MBC-109	1.85	1.70	0.15	1.03	2.9	50	0	1.99	2.45	2.31	3.28	2.37	3.45	1.79
506548	6991836	Redcliffe-038	MBC-110	1.87	1.72	0.15	1.06	3.0	51	0	2.02	2.50	2.34	3.36	2.41	3.54	1.83
505830	6992082	Redcliffe-039	MBC-111	1.90	1.74	0.16	1.10	3.1	53	0	2.05	2.55	2.38	3.45	2.45	3.63	1.85
505358	6992267	Redcliffe-040	MBC-112	1.91	1.76	0.15	1.01	3.0	59	0	2.04	2.51	2.35	3.33	2.42	3.51	1.86

				Water Level mAHD 50yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	1.70	1.70		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.05	1.91	0.14	1.07	2.6	128	0	2.22	2.65	2.55	3.44	2.61	3.59	1.55
507065	6983136	PineRiver-002	MBC-002	2.08	1.94	0.14	1.11	2.7	135	0	2.26	2.72	2.60	3.54	2.67	3.71	1.58
507237	6983516	PineRiver-003	MBC-003	2.07	1.94	0.13	1.03	2.6	126	0	2.24	2.66	2.55	3.43	2.62	3.58	1.58
507198	6984049	PineRiver-004	MBC-004	2.10	1.98	0.12	0.96	2.4	129	0	2.26	2.65	2.55	3.35	2.61	3.49	1.54
506913	6984334	PineRiver-005	MBC-005	2.19	2.08	0.11	0.84	2.2	130	0	2.32	2.67	2.57	3.29	2.61	3.39	1.50
507046	6984696	PineRiver-006	MBC-006	2.25	2.14	0.11	0.86	2.2	139	0	2.39	2.74	2.64	3.36	2.68	3.46	1.47
507522	6984334	PineRiver-007	MBC-007	2.12	1.99	0.13	0.98	2.5	134	0	2.27	2.68	2.57	3.40	2.63	3.55	1.58
507769	6984239	PineRiver-008	MBC-008	2.08	1.92	0.16	1.22	2.9	127	0	2.27	2.79	2.64	3.71	2.71	3.90	1.65
506179	6982661	PineRiver-009	MBC-009	2.19	2.08	0.11	0.84	2.2	130	0	2.32	2.67	2.57	3.29	2.61	3.39	1.50
504927	6992513	Caboolture-001	MBC-010	2.06	1.91	0.15	1.02	2.9	75	0	2.20	2.65	2.51	3.47	2.58	3.64	1.78
504270	6992575	Caboolture-002	MBC-011	2.05	1.93	0.12	0.95	2.3	126	0	2.20	2.60	2.49	3.30	2.53	3.41	1.50
503633	6992841	Caboolture-003	MBC-012	2.14	2.02	0.12	0.99	2.4	127	0	2.31	2.72	2.61	3.44	2.65	3.56	1.49
503346	6993519	Caboolture-004	MBC-013	2.20	2.07	0.13	1.00	2.5	131	0	2.36	2.76	2.67	3.49	2.73	3.64	1.53
503613	6994402	Caboolture-005	MBC-014	2.25	2.13	0.12	0.91	2.4	132	0	2.39	2.77	2.67	3.44	2.72	3.57	1.56
504658	6996186	Caboolture-009	MBC-015	2.24	2.10	0.14	1.07	2.8	132	0	2.41	2.86	2.73	3.68	2.80	3.85	1.66
504477	6996546	Caboolture-010	MBC-016	2.32	2.19	0.13	0.99	2.5	132	0	2.48	2.88	2.78	3.61	2.84	3.75	1.56
504774	6997055	Caboolture-012	MBC-017	2.28	2.15	0.13	1.00	2.5	132	0	2.44	2.85	2.75	3.59	2.81	3.74	1.57
505039	6997331	Caboolture-013	MBC-018	2.27	2.14	0.13	0.95	2.7	132	0	2.41	2.82	2.70	3.56	2.76	3.71	1.71
505442	6998582	Caboolture-016	MBC-019	2.33	2.18	0.15	1.10	2.8	130	0	2.49	2.96	2.83	3.80	2.90	3.97	1.64
505671	6999062	Caboolture-017	MBC-020	2.34	2.20	0.14	1.01	2.8	74	0	2.49	2.93	2.80	3.72	2.86	3.88	1.73
505909	6999567	Caboolture-018	MBC-021	2.37	2.22	0.15	1.08	3.0	130	0	2.52	3.01	2.86	3.86	2.92	4.04	1.77
506361	7000127	Caboolture-019	MBC-022	2.39	2.24	0.15	1.14	2.9	135	0	2.56	3.05	2.91	3.93	2.98	4.11	1.67
506813	7000580	Caboolture-020	MBC-023	2.32	2.17	0.15	1.06	2.8	132	0	2.47	2.93	2.80	3.76	2.86	3.93	1.71
507266	7001010	Caboolture-021	MBC-024	2.31	2.14	0.17	1.21	3.2	128	0	2.47	3.03	2.84	4.01	2.92	4.21	1.83
507718	7001452	Caboolture-022	MBC-025	2.33	2.15	0.18	1.26	3.3	134	0	2.49	3.08	2.87	4.11	2.95	4.32	1.85
508289	7001850	Caboolture-023	MBC-026	2.32	2.13	0.19	1.27	3.4	135	0	2.47	3.07	2.85	4.11	2.93	4.33	1.87
508903	7002206	Caboolture-024	MBC-027	2.29	2.09	0.20	1.31	3.5	137	0	2.44	3.07	2.82	4.16	2.91	4.40	1.93
509355	7002550	Caboolture-025	MBC-028	2.27	2.08	0.19	1.29	3.5	139	0	2.42	3.05	2.80	4.12	2.89	4.35	1.92
509894	7002744	Caboolture-026	MBC-029	2.24	2.04	0.20	1.35	3.6	144	0	2.40	3.05	2.79	4.17	2.87	4.41	1.92
510475	7002852	Caboolture-027	MBC-030	2.21	2.02	0.19	1.31	3.5	144	0	2.37	3.00	2.75	4.09	2.84	4.33	1.93
511067	7003003	Caboolture-028	MBC-031	2.18	2.00	0.18	1.20	3.4	163	0	2.32	2.90	2.68	3.89	2.76	4.11	1.92
511477	7003251	Caboolture-029	MBC-032	2.19	2.04	0.15	1.06	2.9	148	0	2.34	2.81	2.67	3.65	2.73	3.82	1.75
512112	7003326	Caboolture-030	MBC-033	2.17	2.01	0.16	1.18	3.0	144	0	2.34	2.87	2.70	3.79	2.78	3.99	1.75
512694	7003455	Caboolture-031	MBC-034	2.14	1.98	0.16	1.12	3.1	165	0	2.29	2.80	2.63	3.70	2.70	3.89	1.81
513275	7003412	Caboolture-032	MBC-035	2.13	1.97	0.16	1.12	3.0	177	0	2.29	2.79	2.63	3.68	2.70	3.86	1.78
513911	7003746	Caboolture-033	MBC-036	2.12	1.99	0.13	1.02	2.5	128	0	2.29	2.70	2.60	3.45	2.66	3.59	1.54
514481	7004446	Caboolture-034	MBC-037	2.00	1.87	0.13	0.98	2.5	124	0	2.15	2.56	2.45	3.29	2.51	3.43	1.58
516248	7002647	Caboolture-038	MBC-038	1.99	1.75	0.24	1.54	4.1	187	0	2.13	2.93	2.57	4.26	2.66	4.56	2.06
517280	7002397	Caboolture-040	MBC-039	1.91	1.70	0.21	1.43	3.7	176	0	2.07	2.77	2.49	3.96	2.58	4.21	1.92
519611	7002925	Caboolture-044	MBC-040	1.90	1.62	0.28	1.93	4.3	120	0	2.10	3.06	2.63	4.66	2.74	5.01	1.91
520367	7003619	Caboolture-046	MBC-041	1.92	1.60	0.32	2.22	4.7	108	0	2.13	3.27	2.72	5.14	2.85	5.54	1.96
520284	7006303	Caboolture-051	MBC-042	1.93	1.59	0.34	2.08	5.6	53	0	2.05	3.28	2.58	5.25	2.71	5.71	2.42
516778	7013518	Caboolture-060	MBC-043	2.01	1.62	0.39	2.40	6.0	59	0	2.14	3.56	2.75	5.83	2.89	6.36	2.41
516320	7014796	Caboolture-061	MBC-044	2.00	1.62	0.38	2.26	6.0	59	0	2.11	3.47	2.68	5.65	2.82	6.16	2.50
507667	7015461	Caboolture-067	MBC-045	2.34	2.21	0.13	1.02	2.4	210	0	2.50	2.91	2.81	3.65	2.87	3.80	1.51
508591	7014764	Caboolture-069	MBC-046	2.32	2.17	0.15	1.19	2.6	223	0	2.52	2.99	2.88	3.85	2.95	4.02	1.51
509101	7014442	Caboolture-070	MBC-047	2.28	2.12	0.16	1.23	2.8	200	0	2.47	2.98	2.85	3.88	2.92	4.06	1.55
509543	7013236	Caboolture-072	MBC-048	2.18	2.03	0.15	1.14	2.7	214	0	2.36	2.83	2.71	3.68	2.78	3.84	1.58
509623	7012592	Caboolture-073	MBC-049	2.13	1.98	0.15	1.18	2.8	221	0	2.32	2.81	2.68	3.68	2.75	3.86	1.58
510253	7011212	Caboolture-075	MBC-050	2.04	1.89	0.15	1.22	2.7	197	0	2.24	2.74	2.61	3.63	2.69	3.80	1.54
510669	7010917	Caboolture-076	MBC-051	1.99	1.86	0.13	0.98	2.4	204	0	2.14	2.54	2.44	3.25	2.50	3.39	1.53
511138	7010769	Caboolture-077	MBC-052	2.00	1.86	0.14	1.05	2.6	156	0	2.16	2.60	2.48	3.38	2.55	3.53	1.58
511701	7010475	Caboolture-078	MBC-053	1.99	1.85	0.14	1.11	2.7	193	0	2.17	2.63	2.51	3.46	2.58	3.62	1.59
512076	7010032	Caboolture-079	MBC-054	1.99	1.83	0.16	1.20	3.0	214	0	2.17	2.69	2.54	3.62	2.61	3.81	1.69
513283	7007901	Caboolture-083	MBC-055	1.89	1.72	0.17	1.29	2.9	223	0	2.09	2.63	2.48	3.59	2.56	3.79	1.60
513390	7007284	Caboolture-084	MBC-056	2.03	1.87	0.16	1.33	2.8	252	0	2.25	2.79	2.66	3.75	2.74	3.94	1.52

				Water Level mAHD 50yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
513444	7006735	Caboolture-085	MBC-057	2.00	1.83	0.17	1.41	2.9	144	0	2.24	2.80	2.66	3.82	2.74	4.02	1.50
514141	7006547	Caboolture-086	MBC-058	2.00	1.83	0.17	1.36	2.8	249	0	2.22	2.78	2.63	3.77	2.70	3.93	1.48
514958	7005756	Caboolture-088	MBC-059	1.94	1.78	0.16	1.28	2.9	255	0	2.15	2.68	2.54	3.62	2.61	3.81	1.57
515374	7005260	Caboolture-089	MBC-060	1.91	1.76	0.15	1.25	2.7	261	0	2.12	2.62	2.50	3.52	2.58	3.70	1.50
514730	7005140	Caboolture-090	MBC-061	1.88	1.76	0.12	1.01	2.3	112	0	2.05	2.45	2.35	3.17	2.40	3.29	1.45
514328	7005394	Caboolture-091	MBC-062	1.90	1.77	0.13	0.94	2.5	108	0	2.04	2.43	2.33	3.14	2.39	3.29	1.62
513269	7006199	Caboolture-093	MBC-063	1.97	1.82	0.15	1.13	2.7	106	0	2.15	2.61	2.49	3.45	2.56	3.61	1.57
511621	7007284	Caboolture-096	MBC-064	1.98	1.84	0.14	1.09	2.5	124	0	2.16	2.60	2.49	3.40	2.54	3.53	1.49
511339	7008048	Caboolture-097	MBC-065	2.00	1.87	0.13	1.03	2.4	47	0	2.17	2.57	2.48	3.30	2.53	3.42	1.45
511648	7008558	Caboolture-098	MBC-066	1.85	1.72	0.13	1.00	2.5	145	0	2.01	2.42	2.32	3.15	2.38	3.29	1.54
511835	7009040	Caboolture-099	MBC-067	1.89	1.76	0.13	1.00	2.5	143	0	2.05	2.46	2.36	3.20	2.42	3.35	1.58
511446	7009456	Caboolture-100	MBC-068	1.95	1.81	0.14	1.04	2.6	120	0	2.11	2.54	2.43	3.31	2.49	3.46	1.57
511058	7009456	Caboolture-101	MBC-069	1.96	1.83	0.13	1.06	2.5	116	0	2.14	2.56	2.46	3.33	2.53	3.48	1.51
510321	7009818	Caboolture-102	MBC-070	1.96	1.83	0.13	0.99	2.5	117	0	2.12	2.52	2.42	3.24	2.48	3.39	1.54
509784	7010233	Caboolture-103	MBC-071	1.95	1.82	0.13	1.04	2.5	141	0	2.12	2.54	2.44	3.29	2.50	3.43	1.50
509369	7010796	Caboolture-104	MBC-072	2.01	1.87	0.14	1.05	2.6	124	0	2.17	2.60	2.49	3.38	2.56	3.53	1.56
509034	7011198	Caboolture-105	MBC-073	2.12	1.98	0.14	1.11	2.6	43	0	2.30	2.75	2.64	3.55	2.71	3.71	1.51
508833	7011587	Caboolture-106	MBC-074	2.06	1.93	0.13	1.00	2.5	44	0	2.22	2.63	2.53	3.36	2.59	3.50	1.54
508752	7011869	Caboolture-107	MBC-075	2.01	1.87	0.14	1.17	2.5	20	0	2.21	2.67	2.57	3.50	2.63	3.63	1.45
508471	7012110	Caboolture-108	MBC-076	2.03	1.90	0.13	1.11	2.4	39	0	2.22	2.65	2.56	3.44	2.61	3.57	1.45
508926	7012177	Caboolture-109	MBC-077	2.06	1.93	0.13	1.02	2.5	152	0	2.23	2.64	2.54	3.40	2.60	3.55	1.57
509020	7012767	Caboolture-110	MBC-078	2.12	1.98	0.14	1.11	2.7	136	0	2.30	2.76	2.64	3.58	2.71	3.74	1.58
508565	7013276	Caboolture-111	MBC-079	2.17	2.05	0.12	0.98	2.4	132	0	2.33	2.73	2.63	3.44	2.68	3.56	1.48
508069	7013611	Caboolture-112	MBC-080	2.34	2.19	0.15	1.19	2.6	14	0	2.54	3.02	2.90	3.88	2.96	4.03	1.48
507667	7013960	Caboolture-113	MBC-081	2.38	2.25	0.13	1.10	2.4	35	0	2.57	3.00	2.90	3.78	2.96	3.91	1.45
507157	7014067	Caboolture-114	MBC-082	2.42	2.29	0.13	1.07	2.5	39	0	2.60	3.03	2.93	3.81	2.98	3.94	1.48
507171	7014777	Caboolture-116	MBC-083	2.35	2.21	0.14	1.09	2.5	39	0	2.53	2.97	2.86	3.77	2.91	3.90	1.49
507063	7015595	Caboolture-116	MBC-084	2.36	2.23	0.13	1.03	2.5	129	0	2.53	2.95	2.84	3.70	2.91	3.85	1.54
509121	6984944	Redcliffe-005	MBC-085	2.05	1.88	0.17	1.19	3.1	151	0	2.21	2.75	2.57	3.69	2.65	3.89	1.77
509533	6984891	Redcliffe-006	MBC-086	2.01	1.85	0.16	1.15	2.9	192	0	2.18	2.67	2.53	3.56	2.60	3.74	1.68
509892	6984691	Redcliffe-007	MBC-087	1.97	1.81	0.16	1.13	2.9	193	0	2.13	2.62	2.48	3.50	2.55	3.68	1.71
510464	6984279	Redcliffe-009	MBC-088	1.95	1.75	0.20	1.30	3.6	129	0	2.09	2.74	2.47	3.84	2.55	4.08	1.99
510783	6984638	Redcliffe-010	MBC-089	1.94	1.72	0.22	1.57	3.7	126	0	2.13	2.88	2.58	4.15	2.68	4.42	1.84
510969	6985516	Redcliffe-012	MBC-090	1.96	1.72	0.24	1.64	3.9	115	0	2.14	2.94	2.60	4.29	2.70	4.57	1.88
511076	6985889	Redcliffe-013	MBC-091	1.96	1.72	0.24	1.57	4.0	118	0	2.12	2.91	2.56	4.23	2.65	4.52	1.97
511488	6987365	Redcliffe-016	MBC-092	2.00	1.72	0.28	1.84	4.5	114	0	2.16	3.13	2.66	4.72	2.77	5.07	2.05
511768	6988017	Redcliffe-018	MBC-093	1.98	1.69	0.29	1.88	4.6	114	0	2.14	3.14	2.65	4.78	2.76	5.14	2.10
511648	6988496	Redcliffe-019	MBC-094	1.97	1.71	0.26	1.57	4.6	111	0	2.08	2.96	2.51	4.39	2.61	4.72	2.27
511741	6989254	Redcliffe-021	MBC-095	2.01	1.71	0.30	1.95	4.6	117	0	2.18	3.21	2.70	4.89	2.82	5.26	2.06
511874	6990079	Redcliffe-023	MBC-096	1.99	1.70	0.29	1.89	4.7	120	0	2.15	3.17	2.65	4.83	2.77	5.20	2.13
511648	6990451	Redcliffe-024	MBC-097	1.97	1.71	0.26	1.64	4.3	110	0	2.11	2.98	2.56	4.42	2.67	4.74	2.12
511661	6991063	Redcliffe-025	MBC-098	1.98	1.72	0.26	1.75	4.3	119	0	2.15	3.05	2.63	4.54	2.74	4.87	2.01
511568	6992087	Redcliffe-027	MBC-099	1.99	1.72	0.27	1.82	4.3	114	0	2.17	3.10	2.67	4.65	2.78	4.98	2.00
511475	6992513	Redcliffe-028	MBC-100	1.94	1.72	0.22	1.51	3.7	124	0	2.11	2.85	2.55	4.09	2.64	4.36	1.90
510916	6992713	Redcliffe-029	MBC-101	1.88	1.71	0.17	1.27	3.0	258	0	2.07	2.62	2.46	3.59	2.54	3.79	1.67
510531	6992472	Redcliffe-030	MBC-102	1.88	1.71	0.17	1.27	2.9	261	0	2.07	2.61	2.46	3.57	2.54	3.76	1.62
510161	6992164	Redcliffe-031	MBC-103	1.90	1.72	0.18	1.44	3.0	258	0	2.13	2.73	2.57	3.79	2.65	4.00	1.56
509833	6991712	Redcliffe-032	MBC-104	1.86	1.73	0.13	1.09	2.4	227	0	2.05	2.47	2.38	3.24	2.43	3.37	1.45
509525	6991322	Redcliffe-033	MBC-105	1.86	1.72	0.14	1.14	2.4	228	0	2.05	2.48	2.39	3.27	2.45	3.40	1.42
509155	6991199	Redcliffe-034	MBC-106	1.87	1.73	0.14	1.15	2.4	223	0	2.06	2.48	2.41	3.27	2.47	3.39	1.39
508478	6991343	Redcliffe-035	MBC-107	1.89	1.75	0.14	1.00	2.8	58	0	2.03	2.47	2.34	3.26	2.40	3.42	1.73
507965	6991487	Redcliffe-036	MBC-108	1.92	1.77	0.15	1.03	2.8	60	0	2.06	2.52	2.38	3.33	2.44	3.50	1.75
507205	6991589	Redcliffe-037	MBC-109	1.94	1.79	0.15	1.04	2.9	49	0	2.08	2.55	2.40	3.38	2.47	3.56	1.79
506548	6991836	Redcliffe-038	MBC-110	1.98	1.82	0.16	1.07	3.0	49	0	2.12	2.61	2.45	3.47	2.52	3.65	1.82
505830	6992082	Redcliffe-039	MBC-111	2.01	1.85	0.16	1.11	3.1	51	0	2.16	2.67	2.50	3.57	2.57	3.76	1.84
505357.8	6992266.6	Redcliffe-040	MBC-112	2.02	1.87	0.15	1.01	3.0	55	0	2.15	2.62	2.46	3.45	2.53	3.62	1.88

				Water Level mAHD 100yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	1.76	1.76		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.14	2.00	0.14	1.08	2.5	130	0	2.31	2.75	2.64	3.53	2.71	3.68	1.52
507065	6983136	PineRiver-002	MBC-002	2.17	2.03	0.14	1.11	2.7	135	0	2.35	2.81	2.69	3.63	2.76	3.80	1.58
507237	6983516	PineRiver-003	MBC-003	2.16	2.03	0.13	1.03	2.6	126	0	2.33	2.75	2.64	3.52	2.71	3.67	1.58
507198	6984049	PineRiver-004	MBC-004	2.21	2.09	0.12	0.96	2.4	129	0	2.37	2.76	2.66	3.46	2.72	3.60	1.54
506913	6984334	PineRiver-005	MBC-005	2.31	2.20	0.11	0.84	2.2	130	0	2.44	2.79	2.69	3.41	2.73	3.51	1.50
507046	6984696	PineRiver-006	MBC-006	2.37	2.27	0.10	0.87	2.1	47	0	2.52	2.84	2.77	3.43	2.82	3.53	1.39
507522	6984334	PineRiver-007	MBC-007	2.22	2.09	0.13	0.98	2.5	134	0	2.37	2.78	2.67	3.50	2.73	3.65	1.58
507769	6984239	PineRiver-008	MBC-008	2.18	2.02	0.16	1.22	2.9	127	0	2.37	2.89	2.74	3.81	2.81	4.00	1.65
506179	6982661	PineRiver-009	MBC-009	2.31	2.20	0.11	0.84	2.2	130	0	2.44	2.79	2.69	3.41	2.73	3.51	1.50
504927	6992513	Caboolture-001	MBC-010	2.15	2.00	0.15	1.02	2.9	75	0	2.29	2.74	2.60	3.56	2.67	3.73	1.78
504270	6992575	Caboolture-002	MBC-011	2.14	2.02	0.12	0.95	2.3	126	0	2.29	2.69	2.58	3.39	2.62	3.50	1.50
503633	6992841	Caboolture-003	MBC-012	2.25	2.13	0.12	0.99	2.4	127	0	2.42	2.83	2.72	3.55	2.76	3.67	1.49
503346	6993519	Caboolture-004	MBC-013	2.32	2.19	0.13	1.02	2.5	128	0	2.49	2.89	2.80	3.63	2.86	3.78	1.51
503613	6994402	Caboolture-005	MBC-014	2.37	2.25	0.12	0.92	2.4	129	0	2.52	2.89	2.79	3.56	2.85	3.70	1.54
504658	6996186	Caboolture-009	MBC-015	2.36	2.22	0.14	1.08	2.7	129	0	2.53	2.99	2.86	3.81	2.93	3.97	1.64
504477	6996546	Caboolture-010	MBC-016	2.46	2.33	0.13	1.01	2.5	129	0	2.62	3.03	2.93	3.77	2.99	3.91	1.53
504774	6997055	Caboolture-012	MBC-017	2.41	2.28	0.13	1.00	2.5	132	0	2.57	2.98	2.88	3.72	2.94	3.87	1.57
505039	6997331	Caboolture-013	MBC-018	2.40	2.27	0.13	0.95	2.6	70	0	2.54	2.95	2.84	3.67	2.89	3.82	1.65
505442	6998582	Caboolture-016	MBC-019	2.47	2.32	0.15	1.10	2.7	74	0	2.64	3.10	2.97	3.92	3.04	4.09	1.61
505671	6999062	Caboolture-017	MBC-020	2.47	2.33	0.14	1.01	2.8	126	0	2.62	3.06	2.93	3.86	2.99	4.02	1.75
505909	6999567	Caboolture-018	MBC-021	2.50	2.35	0.15	1.09	2.9	127	0	2.66	3.14	2.99	4.00	3.06	4.18	1.75
506361	7000127	Caboolture-019	MBC-022	2.53	2.38	0.15	1.14	2.8	132	0	2.71	3.19	3.05	4.06	3.12	4.24	1.66
506813	7000580	Caboolture-020	MBC-023	2.45	2.30	0.15	1.06	2.8	129	0	2.60	3.06	2.93	3.88	2.99	4.05	1.69
507266	7001010	Caboolture-021	MBC-024	2.43	2.26	0.17	1.21	3.2	128	0	2.59	3.15	2.96	4.13	3.04	4.33	1.83
507718	7001452	Caboolture-022	MBC-025	2.46	2.28	0.18	1.26	3.3	134	0	2.62	3.21	3.00	4.24	3.08	4.45	1.85
508289	7001850	Caboolture-023	MBC-026	2.44	2.25	0.19	1.27	3.4	135	0	2.59	3.19	2.97	4.23	3.05	4.45	1.87
508903	7002206	Caboolture-024	MBC-027	2.41	2.21	0.20	1.31	3.5	137	0	2.56	3.19	2.94	4.28	3.03	4.52	1.93
509355	7002550	Caboolture-025	MBC-028	2.39	2.20	0.19	1.29	3.5	141	0	2.54	3.17	2.92	4.24	3.01	4.47	1.92
509894	7002744	Caboolture-026	MBC-029	2.35	2.15	0.20	1.35	3.6	144	0	2.51	3.16	2.90	4.28	2.98	4.52	1.92
510475	7002852	Caboolture-027	MBC-030	2.32	2.13	0.19	1.31	3.5	144	0	2.48	3.11	2.86	4.20	2.95	4.44	1.93
511067	7003003	Caboolture-028	MBC-031	2.29	2.11	0.18	1.20	3.5	174	0	2.43	3.02	2.78	4.03	2.86	4.25	1.97
511477	7003251	Caboolture-029	MBC-032	2.30	2.15	0.15	1.06	2.8	139	0	2.45	2.91	2.78	3.73	2.84	3.90	1.70
512112	7003326	Caboolture-030	MBC-033	2.27	2.11	0.16	1.18	3.0	144	0	2.44	2.97	2.80	3.89	2.88	4.09	1.75
512694	7003455	Caboolture-031	MBC-034	2.24	2.08	0.16	1.12	3.1	165	0	2.39	2.90	2.73	3.80	2.80	3.99	1.81
513275	7003412	Caboolture-032	MBC-035	2.23	2.07	0.16	1.12	3.0	177	0	2.39	2.89	2.73	3.78	2.80	3.96	1.78
513911	7003746	Caboolture-033	MBC-036	2.22	2.09	0.13	1.02	2.5	128	0	2.39	2.80	2.70	3.55	2.76	3.69	1.54
514481	7004446	Caboolture-034	MBC-037	2.08	1.95	0.13	1.00	2.5	126	0	2.24	2.65	2.55	3.38	2.61	3.52	1.55
516248	7002647	Caboolture-038	MBC-038	2.05	1.81	0.24	1.54	4.1	187	0	2.19	2.99	2.63	4.32	2.72	4.62	2.06
517280	7002397	Caboolture-040	MBC-039	1.97	1.76	0.21	1.43	3.7	176	0	2.13	2.83	2.55	4.02	2.64	4.27	1.92
519611	7002925	Caboolture-044	MBC-040	1.94	1.66	0.28	1.93	4.3	120	0	2.14	3.10	2.67	4.70	2.78	5.05	1.91
520367	7003619	Caboolture-046	MBC-041	1.96	1.64	0.32	2.22	4.7	108	0	2.17	3.31	2.76	5.18	2.89	5.58	1.96
520284	7006303	Caboolture-051	MBC-042	1.97	1.63	0.34	2.08	5.6	53	0	2.09	3.32	2.62	5.29	2.75	5.75	2.42
516778	7013518	Caboolture-060	MBC-043	2.06	1.66	0.40	2.52	5.9	58	0	2.21	3.67	2.85	6.00	2.99	6.53	2.31
516320	7014796	Caboolture-061	MBC-044	2.04	1.66	0.38	2.35	5.8	58	0	2.17	3.55	2.77	5.75	2.91	6.26	2.38
507667	7015461	Caboolture-067	MBC-045	2.46	2.33	0.13	1.02	2.4	216	0	2.62	3.03	2.93	3.77	2.99	3.91	1.50
508591	7014764	Caboolture-069	MBC-046	2.45	2.30	0.15	1.21	2.6	227	0	2.65	3.15	3.02	4.03	3.08	4.18	1.49
509101	7014442	Caboolture-070	MBC-047	2.39	2.24	0.15	1.24	2.7	223	0	2.60	3.10	2.98	4.00	3.05	4.18	1.53
509543	7013236	Caboolture-072	MBC-048	2.28	2.13	0.15	1.14	2.7	222	0	2.46	2.93	2.81	3.77	2.87	3.93	1.56
509623	7012592	Caboolture-073	MBC-049	2.22	2.07	0.15	1.18	2.8	221	0	2.41	2.90	2.77	3.77	2.84	3.95	1.58
510253	7011212	Caboolture-075	MBC-050	2.13	1.98	0.15	1.22	2.7	213	0	2.33	2.82	2.70	3.71	2.78	3.88	1.52
510669	7010917	Caboolture-076	MBC-051	2.05	1.93	0.12	0.98	2.4	213	0	2.21	2.61	2.51	3.32	2.57	3.46	1.51
511138	7010769	Caboolture-077	MBC-052	2.08	1.94	0.14	1.05	2.6	145	0	2.24	2.68	2.56	3.46	2.63	3.61	1.58
511701	7010475	Caboolture-078	MBC-053	2.06	1.92	0.14	1.11	2.7	193	0	2.24	2.70	2.58	3.53	2.65	3.69	1.59
512076	7010032	Caboolture-079	MBC-054	2.07	1.91	0.16	1.20	3.0	214	0	2.25	2.77	2.62	3.70	2.69	3.89	1.69
513283	7007901	Caboolture-083	MBC-055	1.94	1.77	0.17	1.29	2.9	223	0	2.14	2.68	2.53	3.64	2.61	3.84	1.60
513390	7007284	Caboolture-084	MBC-056	2.11	1.95	0.16	1.33	2.8	252	0	2.33	2.87	2.74	3.83	2.82	4.02	1.52

				Water Level mAHD 100yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
513444	7006735	Caboolture-085	MBC-057	2.08	1.91	0.17	1.41	2.9	144	0	2.32	2.88	2.74	3.90	2.82	4.10	1.50
514141	7006547	Caboolture-086	MBC-058	2.08	1.91	0.17	1.36	2.8	249	0	2.30	2.86	2.71	3.85	2.78	4.01	1.48
514958	7005756	Caboolture-088	MBC-059	2.01	1.85	0.16	1.28	2.9	255	0	2.22	2.75	2.61	3.69	2.68	3.88	1.57
515374	7005260	Caboolture-089	MBC-060	1.97	1.82	0.15	1.25	2.7	261	0	2.18	2.68	2.56	3.58	2.64	3.76	1.50
514730	7005140	Caboolture-090	MBC-061	1.95	1.83	0.12	1.01	2.3	112	0	2.12	2.52	2.42	3.24	2.47	3.36	1.45
514328	7005394	Caboolture-091	MBC-062	1.97	1.84	0.13	0.94	2.5	108	0	2.11	2.50	2.40	3.21	2.46	3.36	1.62
513269	7006199	Caboolture-093	MBC-063	2.04	1.89	0.15	1.13	2.7	106	0	2.22	2.68	2.56	3.52	2.63	3.68	1.57
511621	7007284	Caboolture-096	MBC-064	2.06	1.92	0.14	1.09	2.5	124	0	2.24	2.68	2.57	3.48	2.62	3.61	1.49
511339	7008048	Caboolture-097	MBC-065	2.07	1.94	0.13	1.03	2.4	47	0	2.24	2.64	2.55	3.37	2.60	3.49	1.45
511648	7008558	Caboolture-098	MBC-066	1.91	1.78	0.13	1.00	2.5	145	0	2.07	2.48	2.38	3.21	2.44	3.35	1.54
511835	7009040	Caboolture-099	MBC-067	1.96	1.83	0.13	1.02	2.6	129	0	2.12	2.55	2.44	3.31	2.50	3.46	1.60
511446	7009456	Caboolture-100	MBC-068	2.02	1.88	0.14	1.11	2.6	16	0	2.20	2.66	2.54	3.48	2.61	3.64	1.56
511058	7009456	Caboolture-101	MBC-069	2.03	1.90	0.13	1.06	2.5	116	0	2.21	2.63	2.53	3.40	2.60	3.55	1.51
510321	7009818	Caboolture-102	MBC-070	2.03	1.90	0.13	1.02	2.5	110	0	2.20	2.61	2.51	3.36	2.57	3.51	1.55
509784	7010233	Caboolture-103	MBC-071	2.02	1.89	0.13	1.04	2.5	141	0	2.19	2.61	2.51	3.36	2.57	3.50	1.50
509369	7010796	Caboolture-104	MBC-072	2.09	1.95	0.14	1.05	2.6	124	0	2.25	2.68	2.57	3.46	2.64	3.61	1.56
509034	7011198	Caboolture-105	MBC-073	2.22	2.08	0.14	1.11	2.6	43	0	2.40	2.85	2.74	3.65	2.81	3.81	1.51
508833	7011587	Caboolture-106	MBC-074	2.15	2.02	0.13	1.00	2.5	44	0	2.31	2.72	2.62	3.45	2.68	3.59	1.54
508752	7011869	Caboolture-107	MBC-075	2.10	1.96	0.14	1.17	2.5	20	0	2.30	2.76	2.66	3.59	2.72	3.72	1.45
508471	7012110	Caboolture-108	MBC-076	2.12	1.99	0.13	1.11	2.4	39	0	2.31	2.74	2.65	3.53	2.70	3.66	1.45
508926	7012177	Caboolture-109	MBC-077	2.16	2.02	0.14	1.03	2.6	139	0	2.32	2.74	2.63	3.51	2.70	3.66	1.59
509020	7012767	Caboolture-110	MBC-078	2.21	2.07	0.14	1.11	2.6	143	0	2.39	2.84	2.73	3.66	2.80	3.82	1.56
508565	7013276	Caboolture-111	MBC-079	2.28	2.16	0.12	0.98	2.4	132	0	2.44	2.84	2.74	3.55	2.79	3.67	1.48
508069	7013611	Caboolture-112	MBC-080	2.47	2.32	0.15	1.19	2.6	14	0	2.67	3.15	3.03	4.01	3.09	4.16	1.48
507667	7013960	Caboolture-113	MBC-081	2.52	2.39	0.13	1.10	2.4	35	0	2.71	3.14	3.04	3.92	3.10	4.05	1.45
507157	7014067	Caboolture-114	MBC-082	2.56	2.43	0.13	1.07	2.5	39	0	2.74	3.17	3.07	3.95	3.12	4.08	1.48
507171	7014777	Caboolture-116	MBC-083	2.48	2.34	0.14	1.09	2.5	39	0	2.66	3.10	2.99	3.90	3.04	4.03	1.49
507063	7015595	Caboolture-116	MBC-084	2.49	2.36	0.13	1.03	2.5	129	0	2.66	3.08	2.97	3.83	3.04	3.98	1.54
509121	6984944	Redcliffe-005	MBC-085	2.14	1.97	0.17	1.19	3.1	151	0	2.30	2.84	2.66	3.78	2.74	3.98	1.77
509533	6984891	Redcliffe-006	MBC-086	2.09	1.93	0.16	1.15	2.9	192	0	2.26	2.75	2.61	3.64	2.68	3.82	1.68
509892	6984691	Redcliffe-007	MBC-087	2.04	1.89	0.15	1.14	2.9	193	0	2.21	2.70	2.56	3.58	2.63	3.75	1.67
510464	6984279	Redcliffe-009	MBC-088	2.01	1.81	0.20	1.30	3.6	129	0	2.15	2.80	2.53	3.90	2.61	4.14	1.99
510783	6984638	Redcliffe-010	MBC-089	2.00	1.78	0.22	1.57	3.7	129	0	2.19	2.94	2.64	4.21	2.74	4.48	1.84
510969	6985516	Redcliffe-012	MBC-090	2.02	1.78	0.24	1.64	3.9	115	0	2.20	3.00	2.66	4.35	2.76	4.63	1.88
511076	6985889	Redcliffe-013	MBC-091	2.02	1.78	0.24	1.57	4.0	118	0	2.18	2.97	2.62	4.29	2.71	4.58	1.97
511488	6987365	Redcliffe-016	MBC-092	2.06	1.78	0.28	1.84	4.5	114	0	2.22	3.19	2.72	4.78	2.83	5.13	2.05
511768	6988017	Redcliffe-018	MBC-093	2.04	1.75	0.29	1.88	4.6	114	0	2.20	3.20	2.71	4.84	2.82	5.20	2.10
511648	6988496	Redcliffe-019	MBC-094	2.02	1.76	0.26	1.57	4.6	111	0	2.13	3.01	2.56	4.44	2.66	4.77	2.27
511741	6989254	Redcliffe-021	MBC-095	2.07	1.77	0.30	1.95	4.6	117	0	2.24	3.27	2.76	4.95	2.88	5.32	2.06
511874	6990079	Redcliffe-023	MBC-096	2.04	1.75	0.29	1.89	4.7	120	0	2.20	3.22	2.70	4.88	2.82	5.25	2.13
511648	6990451	Redcliffe-024	MBC-097	2.03	1.77	0.26	1.64	4.3	110	0	2.17	3.04	2.62	4.48	2.73	4.80	2.12
511661	6991063	Redcliffe-025	MBC-098	2.04	1.78	0.26	1.75	4.3	119	0	2.21	3.11	2.69	4.60	2.80	4.93	2.01
511568	6992087	Redcliffe-027	MBC-099	2.04	1.77	0.27	1.82	4.3	114	0	2.22	3.15	2.72	4.70	2.83	5.03	2.00
511475	6992513	Redcliffe-028	MBC-100	2.00	1.78	0.22	1.52	3.7	125	0	2.18	2.90	2.62	4.14	2.71	4.40	1.85
510916	6992713	Redcliffe-029	MBC-101	1.93	1.77	0.16	1.28	2.9	242	0	2.14	2.67	2.53	3.62	2.60	3.81	1.59
510531	6992472	Redcliffe-030	MBC-102	1.93	1.77	0.16	1.29	2.8	249	0	2.14	2.67	2.53	3.61	2.61	3.80	1.55
510161	6992164	Redcliffe-031	MBC-103	1.96	1.78	0.18	1.44	3.0	258	0	2.19	2.79	2.63	3.85	2.71	4.06	1.56
509833	6991712	Redcliffe-032	MBC-104	1.92	1.79	0.13	1.09	2.4	227	0	2.11	2.53	2.44	3.30	2.49	3.43	1.45
509525	6991322	Redcliffe-033	MBC-105	1.92	1.78	0.14	1.14	2.4	228	0	2.11	2.54	2.45	3.33	2.51	3.46	1.42
509155	6991199	Redcliffe-034	MBC-106	1.93	1.79	0.14	1.15	2.4	223	0	2.12	2.54	2.47	3.33	2.53	3.45	1.39
508478	6991343	Redcliffe-035	MBC-107	1.94	1.82	0.12	1.02	2.3	130	0	2.11	2.51	2.42	3.23	2.47	3.35	1.44
507965	6991487	Redcliffe-036	MBC-108	1.97	1.84	0.13	1.04	2.4	129	0	2.14	2.55	2.46	3.30	2.51	3.42	1.46
507205	6991589	Redcliffe-037	MBC-109	2.02	1.87	0.15	1.04	2.9	49	0	2.16	2.63	2.48	3.46	2.55	3.64	1.79
506548	6991836	Redcliffe-038	MBC-110	2.06	1.90	0.16	1.07	3.0	49	0	2.20	2.69	2.53	3.55	2.60	3.73	1.82
505830	6992082	Redcliffe-039	MBC-111	2.09	1.93	0.16	1.11	3.1	51	0	2.24	2.75	2.58	3.65	2.65	3.84	1.84
505357.8	6992266.6	Redcliffe-040	MBC-112	2.11	1.96	0.15	1.01	3.0	55	0	2.24	2.71	2.55	3.54	2.62	3.71	1.88

				Water Level mAHD 200yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	1.82	1.82		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.23	2.09	0.14	1.08	2.5	130	0	2.40	2.84	2.73	3.62	2.80	3.77	1.52
507065	6983136	PineRiver-002	MBC-002	2.28	2.13	0.15	1.16	2.7	138	0	2.46	2.94	2.82	3.79	2.89	3.96	1.55
507237	6983516	PineRiver-003	MBC-003	2.26	2.13	0.13	1.04	2.5	129	0	2.43	2.85	2.75	3.62	2.81	3.76	1.54
507198	6984049	PineRiver-004	MBC-004	2.31	2.19	0.12	0.96	2.4	129	0	2.47	2.86	2.76	3.56	2.82	3.70	1.54
506913	6984334	PineRiver-005	MBC-005	2.43	2.32	0.11	0.84	2.2	130	0	2.56	2.91	2.81	3.53	2.85	3.63	1.50
507046	6984696	PineRiver-006	MBC-006	2.50	2.40	0.10	0.87	2.1	47	0	2.65	2.97	2.90	3.56	2.95	3.66	1.39
507522	6984334	PineRiver-007	MBC-007	2.33	2.20	0.13	0.98	2.5	134	0	2.48	2.89	2.78	3.61	2.84	3.76	1.58
507769	6984239	PineRiver-008	MBC-008	2.27	2.11	0.16	1.23	2.9	129	0	2.46	2.98	2.84	3.90	2.91	4.08	1.60
506179	6982661	PineRiver-009	MBC-009	2.43	2.32	0.11	0.84	2.2	130	0	2.56	2.91	2.81	3.53	2.85	3.63	1.50
504927	6992513	Caboolture-001	MBC-010	2.24	2.09	0.15	1.02	2.9	75	0	2.38	2.83	2.69	3.65	2.76	3.82	1.78
504270	6992575	Caboolture-002	MBC-011	2.24	2.12	0.12	0.95	2.3	126	0	2.39	2.79	2.68	3.49	2.72	3.60	1.50
503633	6992841	Caboolture-003	MBC-012	2.36	2.24	0.12	0.99	2.4	127	0	2.53	2.94	2.83	3.66	2.87	3.78	1.49
503346	6993519	Caboolture-004	MBC-013	2.43	2.30	0.13	1.02	2.5	128	0	2.60	3.00	2.91	3.74	2.97	3.89	1.51
503613	6994402	Caboolture-005	MBC-014	2.49	2.37	0.12	0.92	2.4	129	0	2.64	3.01	2.91	3.68	2.97	3.82	1.54
504658	6996186	Caboolture-009	MBC-015	2.48	2.34	0.14	1.08	2.7	129	0	2.65	3.11	2.98	3.93	3.05	4.09	1.64
504477	6996546	Caboolture-010	MBC-016	2.59	2.46	0.13	1.06	2.4	43	0	2.77	3.19	3.09	3.94	3.14	4.06	1.46
504774	6997055	Caboolture-012	MBC-017	2.53	2.40	0.13	1.02	2.5	69	0	2.70	3.11	3.01	3.85	3.07	4.00	1.53
505039	6997331	Caboolture-013	MBC-018	2.52	2.39	0.13	0.95	2.6	129	0	2.66	3.07	2.96	3.81	3.01	3.95	1.69
505442	6998582	Caboolture-016	MBC-019	2.60	2.45	0.15	1.11	2.7	127	0	2.77	3.23	3.11	4.07	3.18	4.24	1.62
505671	6999062	Caboolture-017	MBC-020	2.61	2.47	0.14	1.01	2.8	126	0	2.76	3.20	3.07	4.00	3.13	4.16	1.75
505909	6999567	Caboolture-018	MBC-021	2.64	2.49	0.15	1.09	2.9	127	0	2.80	3.28	3.13	4.14	3.20	4.32	1.75
506361	7000127	Caboolture-019	MBC-022	2.66	2.51	0.15	1.14	2.8	132	0	2.84	3.32	3.18	4.19	3.25	4.37	1.66
506813	7000580	Caboolture-020	MBC-023	2.58	2.43	0.15	1.06	2.8	129	0	2.73	3.19	3.06	4.01	3.12	4.18	1.69
507266	7001010	Caboolture-021	MBC-024	2.56	2.39	0.17	1.22	3.2	125	0	2.73	3.29	3.09	4.26	3.17	4.47	1.81
507718	7001452	Caboolture-022	MBC-025	2.58	2.40	0.18	1.27	3.3	131	0	2.75	3.34	3.13	4.36	3.21	4.58	1.83
508289	7001850	Caboolture-023	MBC-026	2.55	2.37	0.18	1.28	3.4	132	0	2.72	3.32	3.10	4.36	3.18	4.58	1.85
508903	7002206	Caboolture-024	MBC-027	2.52	2.33	0.19	1.32	3.5	134	0	2.68	3.32	3.07	4.41	3.15	4.65	1.91
509355	7002550	Caboolture-025	MBC-028	2.50	2.31	0.19	1.30	3.5	136	0	2.66	3.28	3.04	4.35	3.12	4.58	1.90
509894	7002744	Caboolture-026	MBC-029	2.46	2.26	0.20	1.35	3.5	141	0	2.62	3.27	3.02	4.38	3.10	4.62	1.90
510475	7002852	Caboolture-027	MBC-030	2.42	2.23	0.19	1.31	3.5	141	0	2.58	3.21	2.96	4.29	3.05	4.52	1.90
511067	7003003	Caboolture-028	MBC-031	2.39	2.21	0.18	1.20	3.5	174	0	2.53	3.12	2.88	4.13	2.96	4.35	1.97
511477	7003251	Caboolture-029	MBC-032	2.41	2.26	0.15	1.06	2.8	139	0	2.56	3.02	2.89	3.84	2.95	4.01	1.70
512112	7003326	Caboolture-030	MBC-033	2.37	2.21	0.16	1.18	3.0	144	0	2.54	3.07	2.90	3.99	2.98	4.19	1.75
512694	7003455	Caboolture-031	MBC-034	2.34	2.18	0.16	1.12	3.1	165	0	2.49	3.00	2.83	3.90	2.90	4.09	1.81
513275	7003412	Caboolture-032	MBC-035	2.32	2.16	0.16	1.12	3.0	177	0	2.48	2.98	2.82	3.87	2.89	4.05	1.78
513911	7003746	Caboolture-033	MBC-036	2.32	2.19	0.13	1.02	2.5	128	0	2.49	2.90	2.80	3.65	2.86	3.79	1.54
514481	7004446	Caboolture-034	MBC-037	2.16	2.03	0.13	1.00	2.5	126	0	2.32	2.73	2.63	3.46	2.69	3.60	1.55
516248	7002647	Caboolture-038	MBC-038	2.11	1.87	0.24	1.54	4.1	187	0	2.25	3.05	2.69	4.38	2.78	4.68	2.06
517280	7002397	Caboolture-040	MBC-039	2.02	1.81	0.21	1.43	3.7	176	0	2.18	2.88	2.60	4.07	2.69	4.32	1.92
519611	7002925	Caboolture-044	MBC-040	1.98	1.70	0.28	1.93	4.3	120	0	2.18	3.14	2.71	4.74	2.82	5.09	1.91
520367	7003619	Caboolture-046	MBC-041	2.00	1.67	0.33	2.27	4.8	102	0	2.21	3.39	2.80	5.30	2.93	5.71	1.97
520284	7006303	Caboolture-051	MBC-042	2.00	1.66	0.34	2.08	5.6	53	0	2.12	3.35	2.65	5.32	2.78	5.78	2.42
516778	7013518	Caboolture-060	MBC-043	2.09	1.69	0.40	2.52	5.9	58	0	2.24	3.70	2.88	6.03	3.02	6.56	2.31
516320	7014796	Caboolture-061	MBC-044	2.08	1.70	0.38	2.35	5.8	58	0	2.21	3.59	2.81	5.79	2.95	6.30	2.38
507667	7015461	Caboolture-067	MBC-045	2.59	2.46	0.13	1.02	2.4	216	0	2.75	3.16	3.06	3.90	3.12	4.04	1.50
508591	7014764	Caboolture-069	MBC-046	2.57	2.42	0.15	1.21	2.6	227	0	2.77	3.27	3.14	4.15	3.20	4.30	1.49
509101	7014442	Caboolture-070	MBC-047	2.51	2.36	0.15	1.24	2.7	223	0	2.72	3.22	3.10	4.12	3.17	4.30	1.53
509543	7013236	Caboolture-072	MBC-048	2.38	2.23	0.15	1.16	2.7	226	0	2.56	3.04	2.92	3.89	2.99	4.06	1.55
509623	7012592	Caboolture-073	MBC-049	2.32	2.17	0.15	1.20	2.8	224	0	2.51	3.01	2.88	3.90	2.95	4.08	1.57
510253	7011212	Caboolture-075	MBC-050	2.21	2.06	0.15	1.23	2.7	220	0	2.42	2.91	2.79	3.80	2.86	3.98	1.51
510669	7010917	Caboolture-076	MBC-051	2.13	2.01	0.12	0.98	2.4	213	0	2.29	2.69	2.59	3.40	2.65	3.54	1.51
511138	7010769	Caboolture-077	MBC-052	2.15	2.01	0.14	1.05	2.6	145	0	2.31	2.75	2.63	3.53	2.70	3.68	1.58
511701	7010475	Caboolture-078	MBC-053	2.14	2.00	0.14	1.11	2.7	193	0	2.32	2.78	2.66	3.61	2.73	3.77	1.59
512076	7010032	Caboolture-079	MBC-054	2.14	1.98	0.16	1.20	3.0	214	0	2.32	2.84	2.69	3.77	2.76	3.96	1.69
513283	7007901	Caboolture-083	MBC-055	2.00	1.83	0.17	1.29	2.9	241	0	2.20	2.74	2.59	3.71	2.67	3.90	1.61
513390	7007284	Caboolture-084	MBC-056	2.20	2.03	0.17	1.38	2.8	246	0	2.43	3.00	2.85	4.02	2.91	4.18	1.50

				Water Level mAHD 200yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
513444	7006735	Caboolture-085	MBC-057	2.15	1.98	0.17	1.41	2.9	144	0	2.39	2.95	2.81	3.97	2.89	4.17	1.50
514141	7006547	Caboolture-086	MBC-058	2.15	1.98	0.17	1.36	2.8	249	0	2.37	2.93	2.78	3.92	2.85	4.08	1.48
514958	7005756	Caboolture-088	MBC-059	2.08	1.92	0.16	1.28	2.9	255	0	2.29	2.82	2.68	3.76	2.75	3.95	1.57
515374	7005260	Caboolture-089	MBC-060	2.04	1.89	0.15	1.25	2.7	261	0	2.25	2.75	2.63	3.65	2.71	3.83	1.50
514730	7005140	Caboolture-090	MBC-061	2.01	1.89	0.12	1.01	2.3	112	0	2.18	2.58	2.48	3.30	2.53	3.42	1.45
514328	7005394	Caboolture-091	MBC-062	2.03	1.90	0.13	0.94	2.5	108	0	2.17	2.56	2.46	3.27	2.52	3.42	1.62
513269	7006199	Caboolture-093	MBC-063	2.11	1.96	0.15	1.13	2.7	106	0	2.29	2.75	2.63	3.59	2.70	3.75	1.57
511621	7007284	Caboolture-096	MBC-064	2.14	2.00	0.14	1.09	2.5	124	0	2.32	2.76	2.65	3.56	2.70	3.69	1.49
511339	7008048	Caboolture-097	MBC-065	2.15	2.02	0.13	1.03	2.4	47	0	2.32	2.72	2.63	3.45	2.68	3.57	1.45
511648	7008558	Caboolture-098	MBC-066	1.97	1.84	0.13	1.00	2.5	145	0	2.13	2.54	2.44	3.27	2.50	3.41	1.54
511835	7009040	Caboolture-099	MBC-067	2.02	1.89	0.13	1.02	2.6	129	0	2.18	2.61	2.50	3.37	2.56	3.52	1.60
511446	7009456	Caboolture-100	MBC-068	2.09	1.95	0.14	1.11	2.6	16	0	2.27	2.73	2.61	3.55	2.68	3.71	1.56
511058	7009456	Caboolture-101	MBC-069	2.11	1.98	0.13	1.06	2.5	116	0	2.29	2.71	2.61	3.48	2.68	3.63	1.51
510321	7009818	Caboolture-102	MBC-070	2.13	1.98	0.15	1.12	2.7	14	0	2.30	2.77	2.64	3.60	2.71	3.77	1.59
509784	7010233	Caboolture-103	MBC-071	2.11	1.97	0.14	1.12	2.6	125	0	2.29	2.75	2.64	3.56	2.70	3.72	1.53
509369	7010796	Caboolture-104	MBC-072	2.17	2.03	0.14	1.08	2.6	118	0	2.34	2.79	2.67	3.59	2.74	3.75	1.57
509034	7011198	Caboolture-105	MBC-073	2.31	2.17	0.14	1.11	2.6	43	0	2.49	2.94	2.83	3.74	2.90	3.90	1.51
508833	7011587	Caboolture-106	MBC-074	2.24	2.11	0.13	1.00	2.5	44	0	2.40	2.81	2.71	3.54	2.77	3.68	1.54
508752	7011869	Caboolture-107	MBC-075	2.18	2.04	0.14	1.17	2.5	20	0	2.38	2.84	2.74	3.67	2.80	3.80	1.45
508471	7012110	Caboolture-108	MBC-076	2.20	2.07	0.13	1.11	2.4	39	0	2.39	2.82	2.73	3.61	2.78	3.74	1.45
508926	7012177	Caboolture-109	MBC-077	2.23	2.10	0.13	1.03	2.6	148	0	2.40	2.82	2.71	3.58	2.77	3.73	1.57
509020	7012767	Caboolture-110	MBC-078	2.32	2.17	0.15	1.12	2.7	131	0	2.49	2.95	2.83	3.79	2.90	3.95	1.58
508565	7013276	Caboolture-111	MBC-079	2.39	2.27	0.12	0.98	2.4	132	0	2.55	2.95	2.85	3.66	2.90	3.78	1.48
508069	7013611	Caboolture-112	MBC-080	2.59	2.44	0.15	1.19	2.6	14	0	2.79	3.27	3.15	4.13	3.21	4.28	1.48
507667	7013960	Caboolture-113	MBC-081	2.65	2.52	0.13	1.10	2.4	35	0	2.84	3.27	3.17	4.05	3.23	4.18	1.45
507157	7014067	Caboolture-114	MBC-082	2.70	2.57	0.13	1.07	2.5	39	0	2.88	3.31	3.21	4.09	3.26	4.22	1.48
507171	7014777	Caboolture-115	MBC-083	2.60	2.46	0.14	1.09	2.5	39	0	2.78	3.22	3.11	4.02	3.16	4.15	1.49
507063	7015595	Caboolture-116	MBC-084	2.62	2.49	0.13	1.03	2.5	129	0	2.79	3.21	3.10	3.96	3.17	4.11	1.54
509121	6984944	Redcliffe-005	MBC-085	2.23	2.06	0.17	1.19	3.1	151	0	2.39	2.93	2.75	3.87	2.83	4.07	1.77
509533	6984891	Redcliffe-006	MBC-086	2.16	2.01	0.15	1.17	2.8	191	0	2.34	2.84	2.70	3.73	2.77	3.90	1.63
509892	6984691	Redcliffe-007	MBC-087	2.11	1.96	0.15	1.14	2.9	193	0	2.28	2.77	2.63	3.65	2.70	3.82	1.67
510464	6984279	Redcliffe-009	MBC-088	2.08	1.88	0.20	1.30	3.6	129	0	2.22	2.87	2.60	3.97	2.68	4.21	1.99
510783	6984638	Redcliffe-010	MBC-089	2.05	1.83	0.22	1.57	3.7	129	0	2.24	2.99	2.69	4.26	2.79	4.53	1.84
510969	6985516	Redcliffe-012	MBC-090	2.08	1.84	0.24	1.64	3.9	115	0	2.26	3.06	2.72	4.41	2.82	4.69	1.88
511076	6985889	Redcliffe-013	MBC-091	2.08	1.84	0.24	1.57	4.0	118	0	2.24	3.03	2.68	4.35	2.77	4.64	1.97
511488	6987365	Redcliffe-016	MBC-092	2.12	1.84	0.28	1.84	4.5	114	0	2.28	3.25	2.78	4.84	2.89	5.19	2.05
511768	6988017	Redcliffe-018	MBC-093	2.09	1.80	0.29	1.88	4.6	114	0	2.25	3.25	2.76	4.89	2.87	5.25	2.10
511648	6988496	Redcliffe-019	MBC-094	2.08	1.82	0.26	1.57	4.6	111	0	2.19	3.07	2.62	4.50	2.72	4.83	2.27
511741	6989254	Redcliffe-021	MBC-095	2.12	1.82	0.30	1.95	4.6	117	0	2.29	3.32	2.81	5.00	2.93	5.37	2.06
511874	6990079	Redcliffe-023	MBC-096	2.10	1.81	0.29	1.89	4.7	120	0	2.26	3.28	2.76	4.94	2.88	5.31	2.13
511648	6990451	Redcliffe-024	MBC-097	2.08	1.82	0.26	1.64	4.3	110	0	2.22	3.09	2.67	4.53	2.78	4.85	2.12
511661	6991063	Redcliffe-025	MBC-098	2.10	1.84	0.26	1.75	4.3	119	0	2.27	3.17	2.75	4.66	2.86	4.99	2.01
511568	6992087	Redcliffe-027	MBC-099	2.10	1.83	0.27	1.83	4.3	115	0	2.28	3.21	2.78	4.75	2.89	5.08	1.96
511475	6992513	Redcliffe-028	MBC-100	2.06	1.84	0.22	1.52	3.7	125	0	2.24	2.96	2.68	4.20	2.77	4.46	1.85
510916	6992713	Redcliffe-029	MBC-101	1.98	1.82	0.16	1.28	2.9	242	0	2.19	2.72	2.58	3.67	2.65	3.86	1.59
510531	6992472	Redcliffe-030	MBC-102	1.99	1.83	0.16	1.29	2.8	249	0	2.20	2.73	2.59	3.67	2.67	3.86	1.55
510161	6992164	Redcliffe-031	MBC-103	2.02	1.84	0.18	1.49	2.9	244	0	2.27	2.89	2.72	3.98	2.79	4.15	1.49
509833	6991712	Redcliffe-032	MBC-104	1.98	1.85	0.13	1.09	2.4	227	0	2.17	2.59	2.50	3.36	2.55	3.49	1.45
509525	6991322	Redcliffe-033	MBC-105	1.98	1.84	0.14	1.14	2.4	228	0	2.17	2.60	2.51	3.39	2.57	3.52	1.42
509155	6991199	Redcliffe-034	MBC-106	2.00	1.86	0.14	1.15	2.4	223	0	2.19	2.61	2.54	3.40	2.60	3.52	1.39
508478	6991343	Redcliffe-035	MBC-107	2.00	1.88	0.12	1.02	2.3	130	0	2.17	2.57	2.48	3.29	2.53	3.41	1.44
507965	6991487	Redcliffe-036	MBC-108	2.04	1.91	0.13	1.04	2.4	129	0	2.21	2.62	2.53	3.37	2.58	3.49	1.46
507205	6991589	Redcliffe-037	MBC-109	2.09	1.94	0.15	1.04	2.9	49	0	2.23	2.70	2.55	3.53	2.62	3.71	1.79
506548	6991836	Redcliffe-038	MBC-110	2.14	1.98	0.16	1.07	3.0	49	0	2.28	2.77	2.61	3.63	2.68	3.81	1.82
505830	6992082	Redcliffe-039	MBC-111	2.18	2.02	0.16	1.11	3.1	51	0	2.33	2.84	2.67	3.74	2.74	3.93	1.84
505358	6992267	Redcliffe-040	MBC-112	2.19	2.04	0.15	1.01	3.0	55	0	2.32	2.79	2.63	3.62	2.70	3.79	1.88

				Water Level mAHD 500yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.90	1.90		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.35	2.21	0.14	1.08	2.5	130	0	2.52	2.96	2.85	3.74	2.92	3.89	1.52
507065	6983136	PineRiver-002	MBC-002	2.40	2.25	0.15	1.16	2.7	138	0	2.58	3.06	2.94	3.91	3.01	4.08	1.55
507237	6983516	PineRiver-003	MBC-003	2.39	2.26	0.13	1.04	2.5	129	0	2.56	2.98	2.88	3.75	2.94	3.89	1.54
507198	6984049	PineRiver-004	MBC-004	2.45	2.33	0.12	0.98	2.4	131	0	2.61	3.01	2.91	3.71	2.97	3.85	1.51
506913	6984334	PineRiver-005	MBC-005	2.59	2.48	0.11	0.86	2.2	59	0	2.73	3.07	2.98	3.68	3.02	3.78	1.45
507046	6984696	PineRiver-006	MBC-006	2.67	2.57	0.10	0.87	2.1	47	0	2.82	3.14	3.07	3.73	3.12	3.83	1.39
507522	6984334	PineRiver-007	MBC-007	2.46	2.33	0.13	1.00	2.5	137	0	2.62	3.03	2.93	3.76	2.99	3.90	1.54
507769	6984239	PineRiver-008	MBC-008	2.39	2.23	0.16	1.23	2.9	129	0	2.58	3.10	2.96	4.02	3.03	4.20	1.60
506179	6982661	PineRiver-009	MBC-009	2.59	2.48	0.11	0.86	2.2	59	0	2.73	3.07	2.98	3.68	3.02	3.78	1.45
504927	6992513	Caboolture-001	MBC-010	2.36	2.21	0.15	1.02	2.9	75	0	2.50	2.95	2.81	3.77	2.88	3.94	1.78
504270	6992575	Caboolture-002	MBC-011	2.36	2.24	0.12	0.95	2.3	126	0	2.51	2.91	2.80	3.61	2.84	3.72	1.50
503633	6992841	Caboolture-003	MBC-012	2.50	2.38	0.12	0.99	2.4	127	0	2.67	3.08	2.97	3.80	3.01	3.92	1.49
503346	6993519	Caboolture-004	MBC-013	2.59	2.46	0.13	1.02	2.5	128	0	2.76	3.16	3.07	3.90	3.13	4.05	1.51
503613	6994402	Caboolture-005	MBC-014	2.66	2.54	0.12	0.92	2.4	129	0	2.81	3.18	3.08	3.85	3.14	3.99	1.54
504658	6996186	Caboolture-009	MBC-015	2.64	2.50	0.14	1.08	2.7	71	0	2.81	3.26	3.14	4.07	3.21	4.23	1.59
504477	6996546	Caboolture-010	MBC-016	2.77	2.64	0.13	1.06	2.4	43	0	2.95	3.37	3.27	4.12	3.32	4.24	1.46
504774	6997055	Caboolture-012	MBC-017	2.70	2.57	0.13	1.02	2.5	69	0	2.87	3.28	3.18	4.02	3.24	4.17	1.53
505039	6997331	Caboolture-013	MBC-018	2.69	2.56	0.13	0.95	2.6	129	0	2.83	3.24	3.13	3.98	3.18	4.12	1.69
505442	6998582	Caboolture-016	MBC-019	2.77	2.62	0.15	1.11	2.7	127	0	2.94	3.40	3.28	4.24	3.35	4.41	1.62
505671	6999062	Caboolture-017	MBC-020	2.78	2.64	0.14	1.01	2.8	126	0	2.93	3.37	3.24	4.17	3.30	4.33	1.75
505909	6999567	Caboolture-018	MBC-021	2.82	2.67	0.15	1.09	2.9	127	0	2.98	3.46	3.31	4.32	3.38	4.50	1.75
506361	7000127	Caboolture-019	MBC-022	2.85	2.70	0.15	1.14	2.8	132	0	3.03	3.51	3.37	4.38	3.44	4.56	1.66
506813	7000580	Caboolture-020	MBC-023	2.75	2.60	0.15	1.06	2.8	129	0	2.90	3.36	3.23	4.18	3.29	4.35	1.69
507266	7001010	Caboolture-021	MBC-024	2.72	2.55	0.17	1.22	3.2	125	0	2.89	3.45	3.25	4.42	3.33	4.63	1.81
507718	7001452	Caboolture-022	MBC-025	2.75	2.57	0.18	1.27	3.3	131	0	2.92	3.51	3.30	4.53	3.38	4.75	1.83
508289	7001850	Caboolture-023	MBC-026	2.72	2.54	0.18	1.28	3.4	132	0	2.89	3.49	3.27	4.53	3.35	4.75	1.85
508903	7002206	Caboolture-024	MBC-027	2.67	2.48	0.19	1.32	3.5	134	0	2.83	3.47	3.22	4.56	3.30	4.80	1.91
509355	7002550	Caboolture-025	MBC-028	2.65	2.46	0.19	1.30	3.5	136	0	2.81	3.43	3.19	4.50	3.27	4.73	1.90
509894	7002744	Caboolture-026	MBC-029	2.60	2.40	0.20	1.35	3.5	141	0	2.76	3.41	3.16	4.52	3.24	4.76	1.90
510475	7002852	Caboolture-027	MBC-030	2.56	2.37	0.19	1.31	3.5	141	0	2.72	3.35	3.10	4.43	3.19	4.66	1.90
511067	7003003	Caboolture-028	MBC-031	2.52	2.34	0.18	1.20	3.5	174	0	2.66	3.25	3.01	4.26	3.09	4.48	1.97
511477	7003251	Caboolture-029	MBC-032	2.55	2.40	0.15	1.06	2.8	139	0	2.70	3.16	3.03	3.98	3.09	4.15	1.70
512112	7003326	Caboolture-030	MBC-033	2.51	2.35	0.16	1.18	3.0	144	0	2.68	3.21	3.04	4.13	3.12	4.33	1.75
512694	7003455	Caboolture-031	MBC-034	2.46	2.30	0.16	1.12	3.1	165	0	2.61	3.12	2.95	4.02	3.02	4.21	1.81
513275	7003412	Caboolture-032	MBC-035	2.45	2.29	0.16	1.12	3.0	177	0	2.61	3.11	2.95	4.00	3.02	4.18	1.78
513911	7003746	Caboolture-033	MBC-036	2.44	2.31	0.13	1.04	2.5	130	0	2.61	3.03	2.93	3.78	2.99	3.92	1.51
514481	7004446	Caboolture-034	MBC-037	2.27	2.14	0.13	1.00	2.5	126	0	2.43	2.84	2.74	3.57	2.80	3.71	1.55
516248	7002647	Caboolture-038	MBC-038	2.18	1.95	0.23	1.55	4.0	211	0	2.34	3.12	2.78	4.43	2.87	4.72	1.98
517280	7002397	Caboolture-040	MBC-039	2.09	1.88	0.21	1.43	3.7	176	0	2.25	2.95	2.67	4.14	2.76	4.39	1.92
519611	7002925	Caboolture-044	MBC-040	2.04	1.76	0.28	1.93	4.3	120	0	2.24	3.20	2.77	4.80	2.88	5.15	1.91
520367	7003619	Caboolture-046	MBC-041	2.05	1.72	0.33	2.27	4.8	102	0	2.26	3.44	2.85	5.35	2.98	5.76	1.97
520284	7006303	Caboolture-051	MBC-042	2.05	1.71	0.34	2.08	5.6	53	0	2.17	3.40	2.70	5.37	2.83	5.83	2.42
516778	7013518	Caboolture-060	MBC-043	2.15	1.75	0.40	2.52	5.9	58	0	2.30	3.76	2.94	6.09	3.08	6.62	2.31
516320	7014796	Caboolture-061	MBC-044	2.13	1.75	0.38	2.35	5.8	58	0	2.26	3.64	2.86	5.84	3.00	6.35	2.38
507667	7015461	Caboolture-067	MBC-045	2.76	2.63	0.13	1.02	2.4	216	0	2.92	3.33	3.23	4.07	3.29	4.21	1.50
508591	7014764	Caboolture-069	MBC-046	2.73	2.58	0.15	1.21	2.6	227	0	2.93	3.43	3.30	4.31	3.36	4.46	1.49
509101	7014442	Caboolture-070	MBC-047	2.66	2.51	0.15	1.24	2.7	223	0	2.87	3.37	3.25	4.27	3.32	4.45	1.53
509543	7013236	Caboolture-072	MBC-048	2.52	2.37	0.15	1.16	2.7	226	0	2.70	3.18	3.06	4.03	3.13	4.20	1.55
509623	7012592	Caboolture-073	MBC-049	2.44	2.29	0.15	1.20	2.8	224	0	2.63	3.13	3.00	4.02	3.07	4.20	1.57
510253	7011212	Caboolture-075	MBC-050	2.32	2.17	0.15	1.23	2.7	220	0	2.53	3.02	2.90	3.91	2.97	4.09	1.51
510669	7010917	Caboolture-076	MBC-051	2.23	2.11	0.12	0.99	2.4	217	0	2.40	2.79	2.70	3.51	2.75	3.64	1.50
511138	7010769	Caboolture-077	MBC-052	2.26	2.12	0.14	1.05	2.6	140	0	2.42	2.85	2.74	3.63	2.81	3.79	1.57
511701	7010475	Caboolture-078	MBC-053	2.24	2.10	0.14	1.11	2.7	193	0	2.42	2.88	2.76	3.71	2.83	3.87	1.59
512076	7010032	Caboolture-079	MBC-054	2.24	2.08	0.16	1.20	3.0	214	0	2.42	2.94	2.79	3.87	2.86	4.06	1.69
513283	7007901	Caboolture-083	MBC-055	2.07	1.90	0.17	1.29	2.9	241	0	2.27	2.81	2.66	3.78	2.74	3.97	1.61
513390	7007284	Caboolture-084	MBC-056	2.31	2.14	0.17	1.38	2.8	246	0	2.54	3.11	2.96	4.13	3.02	4.29	1.50

				Water Level mAHD 500yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.26	2.08	0.18	1.51	2.9	149	0	2.52	3.14	2.97	4.24	3.05	4.42	1.49
514141	7006547	Caboolture-086	MBC-058	2.25	2.08	0.17	1.44	2.8	242	0	2.50	3.07	2.93	4.11	3.00	4.28	1.47
514958	7005756	Caboolture-088	MBC-059	2.19	2.01	0.18	1.41	3.0	250	0	2.41	2.99	2.84	4.03	2.92	4.24	1.56
515374	7005260	Caboolture-089	MBC-060	2.12	1.97	0.15	1.25	2.7	261	0	2.33	2.83	2.71	3.73	2.79	3.91	1.50
514730	7005140	Caboolture-090	MBC-061	2.10	1.97	0.13	1.07	2.4	118	0	2.28	2.70	2.60	3.46	2.66	3.58	1.45
514328	7005394	Caboolture-091	MBC-062	2.12	1.99	0.13	1.01	2.6	111	0	2.28	2.70	2.59	3.46	2.65	3.61	1.61
513269	7006199	Caboolture-093	MBC-063	2.21	2.06	0.15	1.19	2.7	110	0	2.40	2.89	2.77	3.77	2.84	3.94	1.56
511621	7007284	Caboolture-096	MBC-064	2.24	2.10	0.14	1.09	2.5	124	0	2.42	2.86	2.75	3.66	2.80	3.79	1.49
511339	7008048	Caboolture-097	MBC-065	2.26	2.13	0.13	1.03	2.4	47	0	2.43	2.83	2.74	3.56	2.79	3.68	1.45
511648	7008558	Caboolture-098	MBC-066	2.04	1.91	0.13	1.00	2.5	145	0	2.20	2.61	2.51	3.34	2.57	3.48	1.54
511835	7009040	Caboolture-099	MBC-067	2.11	1.97	0.14	1.03	2.6	123	0	2.27	2.70	2.58	3.47	2.65	3.62	1.60
511446	7009456	Caboolture-100	MBC-068	2.18	2.04	0.14	1.11	2.6	16	0	2.36	2.82	2.70	3.64	2.77	3.80	1.56
511058	7009456	Caboolture-101	MBC-069	2.22	2.07	0.15	1.14	2.6	12	0	2.40	2.86	2.75	3.70	2.82	3.86	1.54
510321	7009818	Caboolture-102	MBC-070	2.22	2.07	0.15	1.12	2.7	14	0	2.39	2.86	2.73	3.69	2.80	3.86	1.59
509784	7010233	Caboolture-103	MBC-071	2.20	2.06	0.14	1.12	2.6	125	0	2.38	2.84	2.73	3.65	2.79	3.81	1.53
509369	7010796	Caboolture-104	MBC-072	2.27	2.13	0.14	1.08	2.6	118	0	2.44	2.89	2.77	3.69	2.84	3.85	1.57
509034	7011198	Caboolture-105	MBC-073	2.44	2.30	0.14	1.11	2.6	43	0	2.62	3.07	2.96	3.87	3.03	4.03	1.51
508833	7011587	Caboolture-106	MBC-074	2.35	2.22	0.13	1.00	2.5	44	0	2.51	2.92	2.82	3.65	2.88	3.79	1.54
508752	7011869	Caboolture-107	MBC-075	2.28	2.14	0.14	1.17	2.5	20	0	2.48	2.94	2.84	3.77	2.90	3.90	1.45
508471	7012110	Caboolture-108	MBC-076	2.31	2.18	0.13	1.11	2.4	39	0	2.50	2.93	2.84	3.72	2.89	3.85	1.45
508926	7012177	Caboolture-109	MBC-077	2.36	2.22	0.14	1.04	2.6	134	0	2.52	2.95	2.84	3.72	2.90	3.88	1.59
509020	7012767	Caboolture-110	MBC-078	2.43	2.29	0.14	1.12	2.6	120	0	2.61	3.07	2.96	3.89	3.02	4.05	1.55
508565	7013276	Caboolture-111	MBC-079	2.53	2.41	0.12	0.99	2.4	107	0	2.70	3.10	3.00	3.82	3.04	3.94	1.49
508069	7013611	Caboolture-112	MBC-080	2.76	2.61	0.15	1.19	2.6	14	0	2.96	3.44	3.32	4.30	3.38	4.45	1.48
507667	7013960	Caboolture-113	MBC-081	2.82	2.69	0.13	1.10	2.4	35	0	3.01	3.44	3.34	4.22	3.40	4.35	1.45
507157	7014067	Caboolture-114	MBC-082	2.88	2.75	0.13	1.07	2.5	39	0	3.06	3.49	3.39	4.27	3.44	4.40	1.48
507171	7014777	Caboolture-115	MBC-083	2.77	2.63	0.14	1.09	2.5	39	0	2.95	3.39	3.28	4.19	3.33	4.32	1.49
507063	7015595	Caboolture-116	MBC-084	2.80	2.66	0.14	1.08	2.6	95	0	2.97	3.41	3.30	4.20	3.37	4.36	1.54
509121	6984944	Redcliffe-005	MBC-085	2.34	2.17	0.17	1.21	3.0	171	0	2.51	3.04	2.88	3.99	2.96	4.18	1.73
509533	6984891	Redcliffe-006	MBC-086	2.27	2.12	0.15	1.17	2.8	191	0	2.45	2.95	2.81	3.84	2.88	4.01	1.63
509892	6984691	Redcliffe-007	MBC-087	2.21	2.06	0.15	1.14	2.9	193	0	2.38	2.87	2.73	3.75	2.80	3.92	1.67
510464	6984279	Redcliffe-009	MBC-088	2.16	1.96	0.20	1.30	3.6	129	0	2.30	2.95	2.68	4.05	2.76	4.29	1.99
510783	6984638	Redcliffe-010	MBC-089	2.13	1.91	0.22	1.57	3.7	129	0	2.32	3.07	2.77	4.34	2.87	4.61	1.84
510969	6985516	Redcliffe-012	MBC-090	2.16	1.92	0.24	1.64	3.9	115	0	2.34	3.14	2.80	4.49	2.90	4.77	1.88
511076	6985889	Redcliffe-013	MBC-091	2.16	1.92	0.24	1.57	4.0	118	0	2.32	3.11	2.76	4.43	2.85	4.72	1.97
511488	6987365	Redcliffe-016	MBC-092	2.19	1.91	0.28	1.84	4.5	114	0	2.35	3.32	2.85	4.91	2.96	5.26	2.05
511768	6988017	Redcliffe-018	MBC-093	2.16	1.87	0.29	1.88	4.6	114	0	2.32	3.32	2.83	4.96	2.94	5.32	2.10
511648	6988496	Redcliffe-019	MBC-094	2.16	1.90	0.26	1.57	4.6	111	0	2.27	3.15	2.70	4.58	2.80	4.91	2.27
511741	6989254	Redcliffe-021	MBC-095	2.20	1.90	0.30	1.95	4.6	117	0	2.37	3.40	2.89	5.08	3.01	5.45	2.06
511874	6990079	Redcliffe-023	MBC-096	2.17	1.88	0.29	1.89	4.7	120	0	2.33	3.35	2.83	5.01	2.95	5.38	2.13
511648	6990451	Redcliffe-024	MBC-097	2.16	1.90	0.26	1.64	4.3	110	0	2.30	3.17	2.75	4.61	2.86	4.93	2.12
511661	6991063	Redcliffe-025	MBC-098	2.17	1.91	0.26	1.75	4.3	119	0	2.34	3.24	2.82	4.73	2.93	5.06	2.01
511568	6992087	Redcliffe-027	MBC-099	2.18	1.91	0.27	1.84	4.2	71	0	2.37	3.29	2.88	4.83	2.99	5.16	1.94
511475	6992513	Redcliffe-028	MBC-100	2.13	1.91	0.22	1.52	3.7	125	0	2.31	3.03	2.75	4.27	2.84	4.53	1.85
510916	6992713	Redcliffe-029	MBC-101	2.06	1.90	0.16	1.28	2.9	242	0	2.27	2.80	2.66	3.75	2.73	3.94	1.59
510531	6992472	Redcliffe-030	MBC-102	2.06	1.90	0.16	1.29	2.8	249	0	2.27	2.80	2.66	3.74	2.74	3.93	1.55
510161	6992164	Redcliffe-031	MBC-103	2.10	1.92	0.18	1.49	2.9	244	0	2.35	2.97	2.80	4.06	2.87	4.23	1.49
509833	6991712	Redcliffe-032	MBC-104	2.06	1.93	0.13	1.09	2.4	227	0	2.25	2.67	2.58	3.44	2.63	3.57	1.45
509525	6991322	Redcliffe-033	MBC-105	2.06	1.92	0.14	1.14	2.4	228	0	2.25	2.68	2.59	3.47	2.65	3.60	1.42
509155	6991199	Redcliffe-034	MBC-106	2.08	1.94	0.14	1.15	2.4	223	0	2.27	2.69	2.62	3.48	2.68	3.60	1.39
508478	6991343	Redcliffe-035	MBC-107	2.09	1.97	0.12	1.02	2.3	130	0	2.26	2.66	2.57	3.38	2.62	3.50	1.44
507965	6991487	Redcliffe-036	MBC-108	2.13	2.00	0.13	1.04	2.4	129	0	2.30	2.71	2.62	3.46	2.67	3.58	1.46
507205	6991589	Redcliffe-037	MBC-109	2.18	2.03	0.15	1.04	2.9	49	0	2.32	2.79	2.64	3.62	2.71	3.80	1.79
506548	6991836	Redcliffe-038	MBC-110	2.24	2.08	0.16	1.07	3.0	49	0	2.38	2.87	2.71	3.73	2.78	3.91	1.82
505830	6992082	Redcliffe-039	MBC-111	2.28	2.12	0.16	1.11	3.1	51	0	2.43	2.94	2.77	3.84	2.84	4.03	1.84
505358	6992267	Redcliffe-040	MBC-112	2.30	2.15	0.15	1.01	3.0	55	0	2.43	2.90	2.74	3.73	2.81	3.90	1.88

				Water Level mAHD 1000yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.96	1.96		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.44	2.30	0.14	1.08	2.5	130	0	2.61	3.05	2.94	3.83	3.01	3.98	1.52
507065	6983136	PineRiver-002	MBC-002	2.50	2.35	0.15	1.16	2.7	138	0	2.68	3.16	3.04	4.01	3.11	4.18	1.55
507237	6983516	PineRiver-003	MBC-003	2.48	2.35	0.13	1.04	2.5	129	0	2.65	3.07	2.97	3.84	3.03	3.98	1.54
507198	6984049	PineRiver-004	MBC-004	2.55	2.43	0.12	0.98	2.4	61	0	2.71	3.12	3.01	3.83	3.06	3.95	1.49
506913	6984334	PineRiver-005	MBC-005	2.70	2.59	0.11	0.86	2.2	132	0	2.84	3.18	3.09	3.80	3.13	3.90	1.47
507046	6984696	PineRiver-006	MBC-006	2.80	2.69	0.11	0.88	2.2	141	0	2.94	3.29	3.20	3.91	3.25	4.01	1.44
507522	6984334	PineRiver-007	MBC-007	2.57	2.44	0.13	1.00	2.5	137	0	2.73	3.14	3.04	3.87	3.10	4.01	1.54
507769	6984239	PineRiver-008	MBC-008	2.49	2.33	0.16	1.23	2.9	129	0	2.68	3.20	3.06	4.12	3.13	4.30	1.60
506179	6982661	PineRiver-009	MBC-009	2.70	2.59	0.11	0.86	2.2	132	0	2.84	3.18	3.09	3.80	3.13	3.90	1.47
504927	6992513	Caboolture-001	MBC-010	2.43	2.30	0.13	1.03	2.5	120	0	2.60	3.01	2.91	3.77	2.98	3.91	1.53
504270	6992575	Caboolture-002	MBC-011	2.46	2.34	0.12	0.97	2.3	132	0	2.62	3.01	2.91	3.70	2.96	3.82	1.46
503633	6992841	Caboolture-003	MBC-012	2.61	2.49	0.12	1.01	2.4	132	0	2.78	3.18	3.09	3.91	3.14	4.02	1.46
503346	6993519	Caboolture-004	MBC-013	2.70	2.57	0.13	1.04	2.4	131	0	2.87	3.29	3.19	4.05	3.24	4.17	1.48
503613	6994402	Caboolture-005	MBC-014	2.78	2.66	0.12	0.93	2.3	132	0	2.93	3.30	3.21	3.98	3.26	4.11	1.52
504658	6996186	Caboolture-009	MBC-015	2.76	2.62	0.14	1.08	2.7	71	0	2.93	3.38	3.26	4.19	3.33	4.35	1.59
504477	6996546	Caboolture-010	MBC-016	2.90	2.77	0.13	1.06	2.4	43	0	3.08	3.50	3.40	4.25	3.45	4.37	1.46
504774	6997055	Caboolture-012	MBC-017	2.83	2.70	0.13	1.02	2.5	69	0	3.00	3.41	3.31	4.15	3.37	4.30	1.53
505039	6997331	Caboolture-013	MBC-018	2.81	2.68	0.13	0.95	2.6	129	0	2.95	3.36	3.25	4.10	3.30	4.24	1.69
505442	6998582	Caboolture-016	MBC-019	2.90	2.75	0.15	1.11	2.7	127	0	3.07	3.53	3.41	4.37	3.48	4.54	1.62
505671	6999062	Caboolture-017	MBC-020	2.92	2.78	0.14	1.02	2.8	128	0	3.07	3.51	3.38	4.31	3.45	4.47	1.71
505909	6999567	Caboolture-018	MBC-021	2.95	2.80	0.15	1.10	2.9	129	0	3.11	3.59	3.45	4.44	3.52	4.62	1.70
506361	7000127	Caboolture-019	MBC-022	2.98	2.83	0.15	1.16	2.8	133	0	3.16	3.65	3.52	4.52	3.59	4.69	1.61
506813	7000580	Caboolture-020	MBC-023	2.88	2.73	0.15	1.06	2.8	129	0	3.03	3.49	3.36	4.31	3.42	4.48	1.69
507266	7001010	Caboolture-021	MBC-024	2.84	2.67	0.17	1.22	3.2	125	0	3.01	3.57	3.37	4.54	3.45	4.75	1.81
507718	7001452	Caboolture-022	MBC-025	2.87	2.69	0.18	1.27	3.3	131	0	3.04	3.63	3.42	4.65	3.50	4.87	1.83
508289	7001850	Caboolture-023	MBC-026	2.84	2.66	0.18	1.28	3.4	132	0	3.01	3.61	3.39	4.65	3.47	4.87	1.85
508903	7002206	Caboolture-024	MBC-027	2.78	2.59	0.19	1.32	3.5	134	0	2.94	3.58	3.33	4.67	3.41	4.91	1.91
509355	7002550	Caboolture-025	MBC-028	2.76	2.57	0.19	1.30	3.5	136	0	2.92	3.54	3.30	4.61	3.38	4.84	1.90
509894	7002744	Caboolture-026	MBC-029	2.71	2.51	0.20	1.35	3.5	141	0	2.87	3.52	3.27	4.63	3.35	4.87	1.90
510475	7002852	Caboolture-027	MBC-030	2.67	2.47	0.20	1.31	3.6	150	0	2.81	3.46	3.20	4.55	3.28	4.79	1.94
511067	7003003	Caboolture-028	MBC-031	2.62	2.44	0.18	1.20	3.3	157	0	2.77	3.33	3.13	4.32	3.20	4.52	1.88
511477	7003251	Caboolture-029	MBC-032	2.66	2.51	0.15	1.06	2.9	154	0	2.81	3.28	3.14	4.12	3.20	4.29	1.76
512112	7003326	Caboolture-030	MBC-033	2.61	2.45	0.16	1.18	3.1	148	0	2.78	3.31	3.14	4.24	3.21	4.43	1.76
512694	7003455	Caboolture-031	MBC-034	2.56	2.40	0.16	1.12	3.0	158	0	2.72	3.22	3.06	4.10	3.13	4.29	1.77
513275	7003412	Caboolture-032	MBC-035	2.54	2.39	0.15	1.12	2.7	142	0	2.71	3.18	3.05	4.02	3.12	4.19	1.61
513911	7003746	Caboolture-033	MBC-036	2.54	2.41	0.13	1.04	2.5	130	0	2.71	3.13	3.03	3.88	3.09	4.02	1.51
514481	7004446	Caboolture-034	MBC-037	2.34	2.21	0.13	1.00	2.5	126	0	2.50	2.91	2.81	3.64	2.87	3.78	1.55
516248	7002647	Caboolture-038	MBC-038	2.24	2.01	0.23	1.56	3.8	229	0	2.41	3.18	2.86	4.47	2.95	4.74	1.91
517280	7002397	Caboolture-040	MBC-039	2.14	1.93	0.21	1.43	3.7	176	0	2.30	3.00	2.72	4.19	2.81	4.44	1.92
519611	7002925	Caboolture-044	MBC-040	2.09	1.80	0.29	1.95	4.3	114	0	2.28	3.26	2.82	4.89	2.93	5.24	1.93
520367	7003619	Caboolture-046	MBC-041	2.09	1.76	0.33	2.27	4.8	102	0	2.30	3.48	2.89	5.39	3.02	5.80	1.97
520284	7006303	Caboolture-051	MBC-042	2.08	1.74	0.34	2.08	5.6	53	0	2.20	3.43	2.73	5.40	2.86	5.86	2.42
516778	7013518	Caboolture-060	MBC-043	2.18	1.78	0.40	2.52	5.9	58	0	2.33	3.79	2.97	6.12	3.11	6.65	2.31
516320	7014796	Caboolture-061	MBC-044	2.17	1.79	0.38	2.35	5.8	58	0	2.30	3.68	2.90	5.88	3.04	6.39	2.38
507667	7015461	Caboolture-067	MBC-045	2.89	2.76	0.13	1.02	2.4	211	0	3.05	3.46	3.36	4.20	3.42	4.35	1.51
508591	7014764	Caboolture-069	MBC-046	2.85	2.70	0.15	1.21	2.6	227	0	3.05	3.55	3.42	4.43	3.48	4.58	1.49
509101	7014442	Caboolture-070	MBC-047	2.77	2.62	0.15	1.24	2.7	223	0	2.98	3.48	3.36	4.38	3.43	4.56	1.53
509543	7013236	Caboolture-072	MBC-048	2.62	2.47	0.15	1.16	2.7	226	0	2.80	3.28	3.16	4.13	3.23	4.30	1.55
509623	7012592	Caboolture-073	MBC-049	2.54	2.39	0.15	1.20	2.8	224	0	2.73	3.23	3.10	4.12	3.17	4.30	1.57
510253	7011212	Caboolture-075	MBC-050	2.40	2.25	0.15	1.23	2.7	220	0	2.61	3.10	2.98	3.99	3.05	4.17	1.51
510669	7010917	Caboolture-076	MBC-051	2.31	2.19	0.12	0.99	2.4	217	0	2.48	2.87	2.78	3.59	2.83	3.72	1.50
511138	7010769	Caboolture-077	MBC-052	2.33	2.19	0.14	1.05	2.6	148	0	2.49	2.93	2.81	3.71	2.88	3.86	1.58
511701	7010475	Caboolture-078	MBC-053	2.31	2.17	0.14	1.11	2.7	196	0	2.49	2.95	2.83	3.78	2.90	3.94	1.59
512076	7010032	Caboolture-079	MBC-054	2.31	2.15	0.16	1.20	3.0	214	0	2.49	3.01	2.86	3.94	2.93	4.13	1.69
513283	7007901	Caboolture-083	MBC-055	2.12	1.95	0.17	1.31	2.9	249	0	2.32	2.87	2.72	3.85	2.80	4.05	1.60
513390	7007284	Caboolture-084	MBC-056	2.39	2.22	0.17	1.38	2.8	246	0	2.62	3.19	3.04	4.21	3.10	4.37	1.50

				Water Level mAHD 1000yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.33	2.15	0.18	1.51	2.9	149	0	2.59	3.21	3.04	4.31	3.12	4.49	1.49
514141	7006547	Caboolture-086	MBC-058	2.32	2.15	0.17	1.44	2.8	242	0	2.57	3.14	3.00	4.18	3.07	4.35	1.47
514958	7005756	Caboolture-088	MBC-059	2.25	2.07	0.18	1.41	3.0	250	0	2.47	3.05	2.90	4.09	2.98	4.30	1.56
515374	7005260	Caboolture-089	MBC-060	2.19	2.03	0.16	1.34	2.8	258	0	2.42	2.97	2.82	3.95	2.89	4.11	1.49
514730	7005140	Caboolture-090	MBC-061	2.16	2.03	0.13	1.07	2.4	118	0	2.34	2.76	2.66	3.52	2.72	3.64	1.45
514328	7005394	Caboolture-091	MBC-062	2.18	2.05	0.13	1.01	2.6	111	0	2.34	2.76	2.65	3.52	2.71	3.67	1.61
513269	7006199	Caboolture-093	MBC-063	2.28	2.13	0.15	1.19	2.7	110	0	2.47	2.96	2.84	3.84	2.91	4.01	1.56
511621	7007284	Caboolture-096	MBC-064	2.31	2.17	0.14	1.11	2.5	129	0	2.49	2.94	2.83	3.74	2.89	3.87	1.48
511339	7008048	Caboolture-097	MBC-065	2.33	2.20	0.13	1.03	2.3	129	0	2.50	2.89	2.81	3.62	2.86	3.74	1.43
511648	7008558	Caboolture-098	MBC-066	2.10	1.97	0.13	1.02	2.5	132	0	2.27	2.68	2.58	3.43	2.64	3.57	1.55
511835	7009040	Caboolture-099	MBC-067	2.17	2.03	0.14	1.03	2.6	123	0	2.33	2.76	2.64	3.53	2.71	3.68	1.60
511446	7009456	Caboolture-100	MBC-068	2.26	2.11	0.15	1.12	2.7	75	0	2.43	2.90	2.77	3.73	2.84	3.90	1.59
511058	7009456	Caboolture-101	MBC-069	2.30	2.15	0.15	1.14	2.6	12	0	2.48	2.94	2.83	3.78	2.90	3.94	1.54
510321	7009818	Caboolture-102	MBC-070	2.30	2.15	0.15	1.12	2.7	14	0	2.47	2.94	2.81	3.77	2.88	3.94	1.59
509784	7010233	Caboolture-103	MBC-071	2.29	2.13	0.16	1.25	2.8	79	0	2.49	3.00	2.87	3.92	2.94	4.10	1.56
509369	7010796	Caboolture-104	MBC-072	2.35	2.21	0.14	1.12	2.7	82	0	2.53	2.99	2.87	3.83	2.94	3.99	1.58
509034	7011198	Caboolture-105	MBC-073	2.53	2.39	0.14	1.11	2.6	43	0	2.71	3.16	3.05	3.96	3.12	4.12	1.51
508833	7011587	Caboolture-106	MBC-074	2.44	2.31	0.13	1.00	2.5	44	0	2.60	3.01	2.91	3.74	2.97	3.88	1.54
508752	7011869	Caboolture-107	MBC-075	2.36	2.22	0.14	1.17	2.5	20	0	2.56	3.02	2.92	3.85	2.98	3.98	1.45
508471	7012110	Caboolture-108	MBC-076	2.40	2.27	0.13	1.11	2.4	39	0	2.59	3.02	2.93	3.81	2.98	3.94	1.45
508926	7012177	Caboolture-109	MBC-077	2.45	2.31	0.14	1.04	2.6	122	0	2.61	3.04	2.93	3.82	2.99	3.97	1.60
509020	7012767	Caboolture-110	MBC-078	2.53	2.39	0.14	1.12	2.6	120	0	2.71	3.17	3.06	3.99	3.12	4.15	1.55
508565	7013276	Caboolture-111	MBC-079	2.63	2.51	0.12	0.99	2.4	107	0	2.80	3.20	3.10	3.92	3.14	4.04	1.49
508069	7013611	Caboolture-112	MBC-080	2.88	2.73	0.15	1.19	2.6	14	0	3.08	3.56	3.44	4.42	3.50	4.57	1.48
507667	7013960	Caboolture-113	MBC-081	2.95	2.82	0.13	1.10	2.4	35	0	3.14	3.57	3.47	4.35	3.53	4.48	1.45
507157	7014067	Caboolture-114	MBC-082	3.01	2.88	0.13	1.07	2.5	39	0	3.19	3.62	3.52	4.40	3.57	4.53	1.48
507171	7014777	Caboolture-115	MBC-083	2.89	2.75	0.14	1.09	2.5	39	0	3.07	3.51	3.40	4.31	3.45	4.44	1.49
507063	7015595	Caboolture-116	MBC-084	2.93	2.79	0.14	1.08	2.6	95	0	3.10	3.54	3.43	4.33	3.50	4.49	1.54
509121	6984944	Redcliffe-005	MBC-085	2.43	2.26	0.17	1.21	3.0	171	0	2.60	3.13	2.97	4.08	3.05	4.27	1.73
509533	6984891	Redcliffe-006	MBC-086	2.35	2.20	0.15	1.17	2.8	191	0	2.53	3.03	2.89	3.92	2.96	4.09	1.63
509892	6984691	Redcliffe-007	MBC-087	2.29	2.14	0.15	1.14	2.9	193	0	2.46	2.95	2.81	3.83	2.88	4.00	1.67
510464	6984279	Redcliffe-009	MBC-088	2.23	2.03	0.20	1.30	3.6	129	0	2.37	3.02	2.75	4.12	2.83	4.36	1.99
510783	6984638	Redcliffe-010	MBC-089	2.19	1.97	0.22	1.57	3.7	129	0	2.38	3.13	2.83	4.40	2.93	4.67	1.84
510969	6985516	Redcliffe-012	MBC-090	2.22	1.98	0.24	1.64	3.9	115	0	2.40	3.20	2.86	4.55	2.96	4.83	1.88
511076	6985889	Redcliffe-013	MBC-091	2.22	1.98	0.24	1.57	4.0	118	0	2.38	3.17	2.82	4.49	2.91	4.78	1.97
511488	6987365	Redcliffe-016	MBC-092	2.25	1.97	0.28	1.84	4.5	76	0	2.41	3.39	2.91	4.99	3.02	5.34	2.09
511768	6988017	Redcliffe-018	MBC-093	2.22	1.93	0.29	1.92	4.6	70	0	2.39	3.41	2.91	5.08	3.02	5.45	2.09
511648	6988496	Redcliffe-019	MBC-094	2.21	1.95	0.26	1.61	4.5	70	0	2.33	3.21	2.78	4.66	2.87	4.98	2.20
511741	6989254	Redcliffe-021	MBC-095	2.26	1.96	0.30	1.95	4.6	69	0	2.43	3.45	2.95	5.13	3.07	5.50	2.04
511874	6990079	Redcliffe-023	MBC-096	2.23	1.94	0.29	1.89	4.7	120	0	2.39	3.41	2.89	5.07	3.01	5.44	2.13
511648	6990451	Redcliffe-024	MBC-097	2.23	1.96	0.27	1.70	4.4	67	0	2.37	3.28	2.84	4.77	2.94	5.10	2.12
511661	6991063	Redcliffe-025	MBC-098	2.23	1.97	0.26	1.75	4.3	119	0	2.40	3.30	2.88	4.79	2.99	5.12	2.01
511568	6992087	Redcliffe-027	MBC-099	2.24	1.97	0.27	1.84	4.2	71	0	2.43	3.35	2.94	4.89	3.05	5.22	1.94
511475	6992513	Redcliffe-028	MBC-100	2.19	1.97	0.22	1.52	3.7	125	0	2.37	3.09	2.81	4.33	2.90	4.59	1.85
510916	6992713	Redcliffe-029	MBC-101	2.12	1.96	0.16	1.28	2.9	242	0	2.33	2.86	2.72	3.81	2.79	4.00	1.59
510531	6992472	Redcliffe-030	MBC-102	2.12	1.96	0.16	1.29	2.8	249	0	2.33	2.86	2.72	3.80	2.80	3.99	1.55
510161	6992164	Redcliffe-031	MBC-103	2.16	1.98	0.18	1.49	2.9	244	0	2.41	3.03	2.86	4.12	2.93	4.29	1.49
509833	6991712	Redcliffe-032	MBC-104	2.12	1.99	0.13	1.09	2.4	227	0	2.31	2.73	2.64	3.50	2.69	3.63	1.45
509525	6991322	Redcliffe-033	MBC-105	2.12	1.98	0.14	1.14	2.4	228	0	2.31	2.74	2.65	3.53	2.71	3.66	1.42
509155	6991199	Redcliffe-034	MBC-106	2.14	2.00	0.14	1.15	2.4	223	0	2.33	2.75	2.68	3.54	2.74	3.66	1.39
508478	6991343	Redcliffe-035	MBC-107	2.15	2.03	0.12	1.02	2.3	130	0	2.32	2.72	2.63	3.44	2.68	3.56	1.44
507965	6991487	Redcliffe-036	MBC-108	2.20	2.07	0.13	1.04	2.4	129	0	2.37	2.78	2.69	3.53	2.74	3.65	1.46
507205	6991589	Redcliffe-037	MBC-109	2.26	2.11	0.15	1.04	2.9	49	0	2.40	2.87	2.72	3.70	2.79	3.88	1.79
506548	6991836	Redcliffe-038	MBC-110	2.31	2.15	0.16	1.07	3.0	49	0	2.45	2.94	2.78	3.80	2.85	3.98	1.82
505830	6992082	Redcliffe-039	MBC-111	2.36	2.20	0.16	1.11	3.1	51	0	2.51	3.02	2.85	3.92	2.92	4.11	1.84
505358	6992267	Redcliffe-040	MBC-112	2.39	2.24	0.15	1.01	2.9	66	0	2.52	2.98	2.84	3.79	2.90	3.96	1.80

				Water Level mAHD 10000yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	2.15	2.15		1.12	2.5	147	0							
506913	6982622	PineRiver-001	MBC-001	2.74	2.60	0.14	1.08	2.5	130	0	2.91	3.35	3.24	4.13	3.31	4.28	1.52
507065	6983136	PineRiver-002	MBC-002	2.81	2.66	0.15	1.16	2.7	138	0	2.99	3.47	3.35	4.32	3.42	4.49	1.55
507237	6983516	PineRiver-003	MBC-003	2.80	2.67	0.13	1.04	2.5	65	0	2.97	3.39	3.29	4.16	3.35	4.31	1.55
507198	6984049	PineRiver-004	MBC-004	2.89	2.77	0.12	0.98	2.4	61	0	3.05	3.46	3.35	4.17	3.40	4.29	1.49
506913	6984334	PineRiver-005	MBC-005	3.09	2.98	0.11	0.86	2.2	132	0	3.23	3.57	3.48	4.19	3.52	4.29	1.47
507046	6984696	PineRiver-006	MBC-006	3.22	3.11	0.11	0.88	2.2	141	0	3.36	3.71	3.62	4.33	3.67	4.43	1.44
507522	6984334	PineRiver-007	MBC-007	2.91	2.78	0.13	1.00	2.5	137	0	3.07	3.48	3.38	4.21	3.44	4.35	1.54
507769	6984239	PineRiver-008	MBC-008	2.79	2.63	0.16	1.23	2.9	129	0	2.98	3.50	3.36	4.42	3.43	4.60	1.60
506179	6982661	PineRiver-009	MBC-009	3.09	2.98	0.11	0.86	2.2	132	0	3.23	3.57	3.48	4.19	3.52	4.29	1.47
504927	6992513	Caboolture-001	MBC-010	2.75	2.60	0.15	1.03	2.9	65	0	2.89	3.35	3.21	4.17	3.27	4.34	1.78
504270	6992575	Caboolture-002	MBC-011	2.77	2.65	0.12	0.97	2.3	132	0	2.93	3.32	3.22	4.01	3.27	4.13	1.46
503633	6992841	Caboolture-003	MBC-012	2.96	2.84	0.12	1.01	2.4	132	0	3.13	3.53	3.44	4.26	3.49	4.37	1.46
503346	6993519	Caboolture-004	MBC-013	3.09	2.96	0.13	1.07	2.5	66	0	3.27	3.70	3.60	4.48	3.65	4.61	1.48
503613	6994402	Caboolture-005	MBC-014	3.19	3.07	0.12	0.93	2.3	132	0	3.34	3.71	3.62	4.39	3.67	4.52	1.52
504658	6996186	Caboolture-009	MBC-015	3.15	3.01	0.14	1.09	2.7	131	0	3.32	3.78	3.66	4.59	3.72	4.76	1.60
504477	6996546	Caboolture-010	MBC-016	3.34	3.21	0.13	1.06	2.4	43	0	3.52	3.94	3.84	4.69	3.89	4.81	1.46
504774	6997055	Caboolture-012	MBC-017	3.24	3.11	0.13	1.02	2.5	131	0	3.41	3.82	3.72	4.56	3.78	4.71	1.53
505039	6997331	Caboolture-013	MBC-018	3.23	3.10	0.13	0.96	2.6	131	0	3.38	3.78	3.67	4.51	3.73	4.66	1.65
505442	6998582	Caboolture-016	MBC-019	3.34	3.19	0.15	1.11	2.7	127	0	3.51	3.97	3.85	4.81	3.92	4.98	1.62
505671	6999062	Caboolture-017	MBC-020	3.36	3.22	0.14	1.02	2.8	128	0	3.51	3.95	3.82	4.75	3.89	4.91	1.71
505909	6999567	Caboolture-018	MBC-021	3.40	3.25	0.15	1.10	2.9	129	0	3.56	4.04	3.90	4.89	3.97	5.07	1.70
506361	7000127	Caboolture-019	MBC-022	3.44	3.29	0.15	1.16	2.8	133	0	3.62	4.11	3.98	4.98	4.05	5.15	1.61
506813	7000580	Caboolture-020	MBC-023	3.29	3.15	0.14	1.08	2.7	131	0	3.46	3.92	3.79	4.74	3.86	4.90	1.64
507266	7001010	Caboolture-021	MBC-024	3.25	3.08	0.17	1.23	3.1	127	0	3.42	3.97	3.80	4.94	3.87	5.15	1.76
507718	7001452	Caboolture-022	MBC-025	3.28	3.10	0.18	1.28	3.2	132	0	3.45	4.03	3.84	5.05	3.92	5.27	1.78
508289	7001850	Caboolture-023	MBC-026	3.24	3.06	0.18	1.29	3.3	133	0	3.41	4.01	3.80	5.04	3.88	5.26	1.80
508903	7002206	Caboolture-024	MBC-027	3.17	2.98	0.19	1.33	3.4	135	0	3.34	3.97	3.73	5.05	3.82	5.28	1.86
509355	7002550	Caboolture-025	MBC-028	3.14	2.95	0.19	1.31	3.4	138	0	3.30	3.92	3.69	4.99	3.77	5.21	1.86
509894	7002744	Caboolture-026	MBC-029	3.07	2.87	0.20	1.37	3.5	142	0	3.24	3.88	3.64	5.00	3.72	5.23	1.85
510475	7002852	Caboolture-027	MBC-030	3.01	2.82	0.19	1.33	3.4	142	0	3.18	3.80	3.57	4.89	3.66	5.12	1.86
511067	7003003	Caboolture-028	MBC-031	2.95	2.78	0.17	1.21	3.1	145	0	3.12	3.66	3.49	4.62	3.56	4.82	1.78
511477	7003251	Caboolture-029	MBC-032	3.01	2.86	0.15	1.07	2.8	141	0	3.17	3.62	3.49	4.44	3.56	4.61	1.67
512112	7003326	Caboolture-030	MBC-033	2.95	2.79	0.16	1.19	2.9	139	0	3.13	3.64	3.49	4.55	3.57	4.74	1.67
512694	7003455	Caboolture-031	MBC-034	2.87	2.72	0.15	1.12	2.8	144	0	3.04	3.52	3.38	4.38	3.45	4.56	1.68
513275	7003412	Caboolture-032	MBC-035	2.86	2.70	0.16	1.12	3.0	177	0	3.02	3.52	3.36	4.41	3.43	4.59	1.78
513911	7003746	Caboolture-033	MBC-036	2.87	2.74	0.13	1.04	2.5	130	0	3.04	3.46	3.36	4.21	3.42	4.35	1.51
514481	7004446	Caboolture-034	MBC-037	2.61	2.48	0.13	1.00	2.5	126	0	2.77	3.18	3.08	3.91	3.14	4.05	1.55
516248	7002647	Caboolture-038	MBC-038	2.44	2.21	0.23	1.56	3.8	229	0	2.61	3.38	3.06	4.67	3.15	4.94	1.91
517280	7002397	Caboolture-040	MBC-039	2.32	2.11	0.21	1.43	3.7	176	0	2.48	3.18	2.90	4.37	2.99	4.62	1.92
519611	7002925	Caboolture-044	MBC-040	2.22	1.93	0.29	1.95	4.3	114	0	2.41	3.39	2.95	5.02	3.06	5.37	1.93
520367	7003619	Caboolture-046	MBC-041	2.22	1.89	0.33	2.27	4.8	102	0	2.43	3.61	3.02	5.52	3.15	5.93	1.97
520284	7006303	Caboolture-051	MBC-042	2.20	1.86	0.34	2.08	5.6	53	0	2.32	3.55	2.85	5.52	2.98	5.98	2.42
516778	7013518	Caboolture-060	MBC-043	2.31	1.91	0.40	2.52	5.9	58	0	2.46	3.92	3.10	6.25	3.24	6.78	2.31
516320	7014796	Caboolture-061	MBC-044	2.30	1.92	0.38	2.35	5.8	58	0	2.43	3.81	3.03	6.01	3.17	6.52	2.38
507667	7015461	Caboolture-067	MBC-045	3.31	3.18	0.13	1.04	2.4	213	0	3.48	3.91	3.80	4.67	3.85	4.80	1.49
508591	7014764	Caboolture-069	MBC-046	3.26	3.11	0.15	1.26	2.7	228	0	3.48	3.99	3.86	4.91	3.92	5.06	1.49
509101	7014442	Caboolture-070	MBC-047	3.18	3.01	0.17	1.34	2.8	220	0	3.40	3.94	3.80	4.91	3.88	5.10	1.52
509543	7013236	Caboolture-072	MBC-048	2.96	2.80	0.16	1.24	2.8	228	0	3.16	3.66	3.53	4.57	3.61	4.75	1.54
509623	7012592	Caboolture-073	MBC-049	2.85	2.70	0.15	1.20	2.8	224	0	3.04	3.54	3.41	4.43	3.48	4.61	1.57
510253	7011212	Caboolture-075	MBC-050	2.68	2.53	0.15	1.23	2.7	220	0	2.89	3.38	3.26	4.27	3.33	4.45	1.51
510669	7010917	Caboolture-076	MBC-051	2.56	2.44	0.12	0.99	2.4	217	0	2.73	3.12	3.03	3.84	3.08	3.97	1.50
511138	7010769	Caboolture-077	MBC-052	2.59	2.45	0.14	1.05	2.6	141	0	2.75	3.18	3.07	3.96	3.14	4.12	1.57
511701	7010475	Caboolture-078	MBC-053	2.56	2.42	0.14	1.11	2.7	214	0	2.74	3.20	3.08	4.02	3.15	4.18	1.58
512076	7010032	Caboolture-079	MBC-054	2.55	2.39	0.16	1.20	3.0	214	0	2.73	3.25	3.10	4.18	3.17	4.37	1.69
513283	7007901	Caboolture-083	MBC-055	2.31	2.14	0.17	1.31	2.9	249	0	2.51	3.06	2.91	4.04	2.99	4.24	1.60
513390	7007284	Caboolture-084	MBC-056	2.66	2.49	0.17	1.38	2.8	246	0	2.89	3.46	3.31	4.48	3.37	4.64	1.50

				Water Level mAHD 10000yr ARI Sea Level Rise Excluded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.58	2.40	0.18	1.51	2.9	149	0	2.84	3.46	3.29	4.56	3.37	4.74	1.49
514141	7006547	Caboolture-086	MBC-058	2.56	2.39	0.17	1.44	2.8	242	0	2.81	3.38	3.24	4.42	3.31	4.59	1.47
514958	7005756	Caboolture-088	MBC-059	2.47	2.29	0.18	1.41	3.0	250	0	2.69	3.27	3.12	4.31	3.20	4.52	1.56
515374	7005260	Caboolture-089	MBC-060	2.40	2.24	0.16	1.34	2.8	258	0	2.63	3.18	3.03	4.16	3.10	4.32	1.49
514730	7005140	Caboolture-090	MBC-061	2.37	2.24	0.13	1.07	2.4	118	0	2.55	2.97	2.87	3.73	2.93	3.85	1.45
514328	7005394	Caboolture-091	MBC-062	2.42	2.27	0.15	1.07	2.8	14	0	2.57	3.04	2.90	3.86	2.97	4.03	1.68
513269	7006199	Caboolture-093	MBC-063	2.52	2.37	0.15	1.20	2.7	20	0	2.72	3.21	3.08	4.09	3.15	4.27	1.56
511621	7007284	Caboolture-096	MBC-064	2.56	2.42	0.14	1.11	2.5	129	0	2.74	3.19	3.08	3.99	3.14	4.12	1.48
511339	7008048	Caboolture-097	MBC-065	2.59	2.46	0.13	1.03	2.3	129	0	2.76	3.15	3.07	3.88	3.12	4.00	1.43
511648	7008558	Caboolture-098	MBC-066	2.29	2.16	0.13	1.03	2.5	127	0	2.46	2.88	2.77	3.63	2.84	3.78	1.54
511835	7009040	Caboolture-099	MBC-067	2.38	2.24	0.14	1.03	2.6	123	0	2.54	2.97	2.85	3.74	2.92	3.89	1.60
511446	7009456	Caboolture-100	MBC-068	2.49	2.34	0.15	1.12	2.7	75	0	2.66	3.13	3.00	3.96	3.07	4.13	1.59
511058	7009456	Caboolture-101	MBC-069	2.54	2.39	0.15	1.14	2.6	12	0	2.72	3.18	3.07	4.02	3.14	4.18	1.54
510321	7009818	Caboolture-102	MBC-070	2.54	2.39	0.15	1.12	2.7	14	0	2.71	3.18	3.05	4.01	3.12	4.18	1.59
509784	7010233	Caboolture-103	MBC-071	2.53	2.37	0.16	1.25	2.8	79	0	2.73	3.24	3.11	4.16	3.18	4.34	1.56
509369	7010796	Caboolture-104	MBC-072	2.61	2.47	0.14	1.12	2.7	82	0	2.79	3.25	3.13	4.09	3.20	4.25	1.58
509034	7011198	Caboolture-105	MBC-073	2.85	2.71	0.14	1.11	2.6	43	0	3.03	3.48	3.37	4.28	3.44	4.44	1.51
508833	7011587	Caboolture-106	MBC-074	2.73	2.60	0.13	1.00	2.5	44	0	2.89	3.30	3.20	4.03	3.26	4.17	1.54
508752	7011869	Caboolture-107	MBC-075	2.63	2.49	0.14	1.17	2.5	20	0	2.83	3.29	3.19	4.12	3.25	4.25	1.45
508471	7012110	Caboolture-108	MBC-076	2.67	2.54	0.13	1.11	2.4	39	0	2.86	3.29	3.20	4.08	3.25	4.21	1.45
508926	7012177	Caboolture-109	MBC-077	2.74	2.60	0.14	1.04	2.6	138	0	2.90	3.33	3.22	4.10	3.28	4.25	1.58
509020	7012767	Caboolture-110	MBC-078	2.84	2.70	0.14	1.12	2.6	120	0	3.02	3.48	3.37	4.30	3.43	4.46	1.55
508565	7013276	Caboolture-111	MBC-079	2.98	2.86	0.12	1.01	2.3	129	0	3.15	3.55	3.45	4.27	3.50	4.39	1.45
508069	7013611	Caboolture-112	MBC-080	3.29	3.14	0.15	1.19	2.6	14	0	3.49	3.97	3.85	4.83	3.91	4.98	1.48
507667	7013960	Caboolture-113	MBC-081	3.39	3.26	0.13	1.10	2.4	35	0	3.58	4.01	3.91	4.79	3.97	4.92	1.45
507157	7014067	Caboolture-114	MBC-082	3.47	3.34	0.13	1.07	2.5	39	0	3.65	4.08	3.98	4.86	4.03	4.99	1.48
507171	7014777	Caboolture-115	MBC-083	3.31	3.17	0.14	1.09	2.5	39	0	3.49	3.93	3.82	4.73	3.87	4.86	1.49
507063	7015595	Caboolture-116	MBC-084	3.36	3.22	0.14	1.08	2.6	127	0	3.53	3.97	3.86	4.76	3.93	4.91	1.53
509121	6984944	Redcliffe-005	MBC-085	2.71	2.54	0.17	1.21	3.0	171	0	2.88	3.41	3.25	4.36	3.33	4.55	1.73
509533	6984891	Redcliffe-006	MBC-086	2.61	2.46	0.15	1.17	2.8	191	0	2.79	3.29	3.15	4.18	3.22	4.35	1.63
509892	6984691	Redcliffe-007	MBC-087	2.53	2.38	0.15	1.14	2.9	193	0	2.70	3.19	3.05	4.07	3.12	4.24	1.67
510464	6984279	Redcliffe-009	MBC-088	2.44	2.24	0.20	1.30	3.6	129	0	2.58	3.23	2.96	4.33	3.04	4.57	1.99
510783	6984638	Redcliffe-010	MBC-089	2.39	2.17	0.22	1.59	3.6	125	0	2.59	3.33	3.05	4.60	3.15	4.86	1.79
510969	6985516	Redcliffe-012	MBC-090	2.42	2.17	0.25	1.66	4.0	74	0	2.59	3.42	3.06	4.81	3.16	5.11	1.95
511076	6985889	Redcliffe-013	MBC-091	2.41	2.17	0.24	1.58	4.0	116	0	2.57	3.37	3.01	4.70	3.11	4.99	1.98
511488	6987365	Redcliffe-016	MBC-092	2.45	2.17	0.28	1.84	4.5	76	0	2.61	3.59	3.11	5.19	3.22	5.54	2.09
511768	6988017	Redcliffe-018	MBC-093	2.40	2.11	0.29	1.92	4.6	70	0	2.57	3.59	3.09	5.26	3.20	5.63	2.09
511648	6988496	Redcliffe-019	MBC-094	2.40	2.14	0.26	1.61	4.5	70	0	2.52	3.40	2.97	4.85	3.06	5.17	2.20
511741	6989254	Redcliffe-021	MBC-095	2.45	2.15	0.30	1.95	4.6	69	0	2.62	3.64	3.14	5.32	3.26	5.69	2.04
511874	6990079	Redcliffe-023	MBC-096	2.42	2.12	0.30	1.90	4.8	118	0	2.56	3.60	3.07	5.28	3.18	5.66	2.15
511648	6990451	Redcliffe-024	MBC-097	2.42	2.15	0.27	1.70	4.4	67	0	2.56	3.47	3.03	4.96	3.13	5.29	2.12
511661	6991063	Redcliffe-025	MBC-098	2.42	2.16	0.26	1.75	4.3	119	0	2.59	3.49	3.07	4.98	3.18	5.31	2.01
511568	6992087	Redcliffe-027	MBC-099	2.43	2.16	0.27	1.84	4.2	71	0	2.62	3.54	3.13	5.08	3.24	5.41	1.94
511475	6992513	Redcliffe-028	MBC-100	2.39	2.17	0.22	1.52	3.7	125	0	2.57	3.29	3.01	4.53	3.10	4.79	1.85
510916	6992713	Redcliffe-029	MBC-101	2.33	2.15	0.18	1.36	3.2	45	0	2.53	3.13	2.94	4.19	3.02	4.41	1.71
510531	6992472	Redcliffe-030	MBC-102	2.32	2.15	0.17	1.33	3.0	111	0	2.53	3.09	2.93	4.10	3.01	4.30	1.64
510161	6992164	Redcliffe-031	MBC-103	2.38	2.18	0.20	1.64	3.2	22	0	2.64	3.32	3.13	4.52	3.22	4.76	1.55
509833	6991712	Redcliffe-032	MBC-104	2.32	2.19	0.13	1.09	2.4	227	0	2.51	2.93	2.84	3.70	2.89	3.83	1.45
509525	6991322	Redcliffe-033	MBC-105	2.32	2.18	0.14	1.15	2.4	232	0	2.51	2.95	2.86	3.75	2.92	3.88	1.42
509155	6991199	Redcliffe-034	MBC-106	2.34	2.20	0.14	1.16	2.4	231	0	2.54	2.96	2.89	3.75	2.94	3.88	1.39
508478	6991343	Redcliffe-035	MBC-107	2.36	2.24	0.12	1.02	2.3	130	0	2.53	2.93	2.84	3.65	2.89	3.77	1.44
507965	6991487	Redcliffe-036	MBC-108	2.42	2.29	0.13	1.04	2.4	129	0	2.59	3.00	2.91	3.75	2.96	3.87	1.46
507205	6991589	Redcliffe-037	MBC-109	2.50	2.35	0.15	1.04	2.9	49	0	2.64	3.11	2.96	3.94	3.03	4.12	1.79
506548	6991836	Redcliffe-038	MBC-110	2.57	2.41	0.16	1.07	3.0	49	0	2.71	3.20	3.04	4.06	3.11	4.24	1.82
505830	6992082	Redcliffe-039	MBC-111	2.63	2.47	0.16	1.11	3.1	51	0	2.78	3.29	3.12	4.19	3.19	4.38	1.84
505358	6992267	Redcliffe-040	MBC-112	2.67	2.52	0.15	1.01	2.9	62	0	2.80	3.26	3.12	4.07	3.18	4.24	1.81

APPENDIX K

Cyclonic Design Water Level and Concurrent Wave Parameters – Including Greenhouse Related Climate Change

				Water Level mAHD 20yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.70	1.70		1.18	2.6	125	0							
506913	6982622	PineRiver-001	MBC-001	2.10	1.96	0.14	1.02	2.6	133	0	2.25	2.68	2.57	3.46	2.63	3.61	1.63
507065	6983136	PineRiver-002	MBC-002	2.13	1.99	0.14	1.04	2.7	146	0	2.29	2.73	2.61	3.51	2.67	3.67	1.63
507237	6983516	PineRiver-003	MBC-003	2.12	1.99	0.13	0.99	2.6	133	0	2.27	2.69	2.58	3.45	2.64	3.60	1.64
507198	6984049	PineRiver-004	MBC-004	2.16	2.04	0.12	0.94	2.5	133	0	2.31	2.70	2.60	3.40	2.66	3.54	1.59
506913	6984334	PineRiver-005	MBC-005	2.25	2.14	0.11	0.80	2.3	135	0	2.37	2.70	2.61	3.29	2.66	3.41	1.58
507046	6984696	PineRiver-006	MBC-006	2.32	2.21	0.11	0.82	2.2	147	0	2.44	2.78	2.69	3.37	2.74	3.49	1.52
507522	6984334	PineRiver-007	MBC-007	2.17	2.04	0.13	0.96	2.5	141	0	2.32	2.72	2.61	3.44	2.67	3.59	1.62
507769	6984239	PineRiver-008	MBC-008	2.14	1.98	0.16	1.19	3.0	131	0	2.32	2.83	2.68	3.75	2.75	3.94	1.69
506179	6982661	PineRiver-009	MBC-009	2.25	2.14	0.11	0.80	2.3	135	0	2.37	2.70	2.61	3.29	2.66	3.41	1.58
504927	6992513	Caboolture-001	MBC-010	2.12	1.97	0.15	1.03	2.9	73	0	2.26	2.72	2.58	3.54	2.64	3.70	1.77
504270	6992575	Caboolture-002	MBC-011	2.12	1.99	0.13	0.93	2.7	70	0	2.26	2.66	2.54	3.38	2.60	3.53	1.72
503633	6992841	Caboolture-003	MBC-012	2.22	2.09	0.13	0.96	2.7	74	0	2.36	2.78	2.66	3.52	2.72	3.67	1.69
503346	6993519	Caboolture-004	MBC-013	2.27	2.14	0.13	0.98	2.6	86	0	2.42	2.84	2.72	3.59	2.78	3.74	1.67
503613	6994402	Caboolture-005	MBC-014	2.31	2.19	0.12	0.90	2.4	135	0	2.45	2.82	2.72	3.49	2.78	3.62	1.58
504658	6996186	Caboolture-009	MBC-015	2.31	2.17	0.14	1.06	2.8	134	0	2.47	2.93	2.80	3.74	2.86	3.91	1.68
504477	6996546	Caboolture-010	MBC-016	2.39	2.26	0.13	1.01	2.5	64	0	2.55	2.96	2.86	3.70	2.92	3.85	1.54
504774	6997055	Caboolture-012	MBC-017	2.35	2.22	0.13	1.00	2.6	74	0	2.51	2.92	2.81	3.67	2.88	3.82	1.60
505039	6997331	Caboolture-013	MBC-018	2.34	2.21	0.13	0.94	2.7	75	0	2.48	2.89	2.77	3.63	2.83	3.78	1.73
505442	6998582	Caboolture-016	MBC-019	2.40	2.25	0.15	1.09	2.8	79	0	2.56	3.03	2.89	3.86	2.96	4.03	1.67
505671	6999062	Caboolture-017	MBC-020	2.42	2.27	0.15	1.00	2.9	85	0	2.55	3.01	2.86	3.82	2.93	3.99	1.84
505909	6999567	Caboolture-018	MBC-021	2.44	2.29	0.15	1.06	3.0	136	0	2.59	3.07	2.91	3.92	2.98	4.10	1.81
506361	7000127	Caboolture-019	MBC-022	2.47	2.31	0.16	1.13	2.9	140	0	2.63	3.12	2.98	4.00	3.05	4.18	1.72
506813	7000580	Caboolture-020	MBC-023	2.40	2.25	0.15	1.05	2.8	135	0	2.55	3.01	2.87	3.82	2.94	3.99	1.71
507266	7001010	Caboolture-021	MBC-024	2.39	2.22	0.17	1.19	3.2	134	0	2.55	3.10	2.91	4.07	2.98	4.27	1.85
507718	7001452	Caboolture-022	MBC-025	2.41	2.23	0.18	1.24	3.4	139	0	2.56	3.15	2.93	4.17	3.01	4.39	1.89
508289	7001850	Caboolture-023	MBC-026	2.40	2.21	0.19	1.26	3.4	139	0	2.55	3.15	2.92	4.19	3.00	4.41	1.90
508903	7002206	Caboolture-024	MBC-027	2.38	2.18	0.20	1.30	3.6	141	0	2.52	3.16	2.90	4.25	2.98	4.49	1.96
509355	7002550	Caboolture-025	MBC-028	2.36	2.17	0.19	1.28	3.5	143	0	2.51	3.13	2.89	4.21	2.97	4.44	1.95
509894	7002744	Caboolture-026	MBC-029	2.32	2.12	0.20	1.35	3.6	148	0	2.48	3.13	2.87	4.25	2.95	4.49	1.92
510475	7002852	Caboolture-027	MBC-030	2.29	2.10	0.19	1.31	3.5	149	0	2.45	3.08	2.83	4.17	2.92	4.41	1.93
511067	7003003	Caboolture-028	MBC-031	2.26	2.08	0.18	1.20	3.5	174	0	2.40	2.99	2.75	4.00	2.83	4.22	1.97
511477	7003251	Caboolture-029	MBC-032	2.27	2.12	0.15	1.06	2.9	149	0	2.42	2.89	2.75	3.72	2.81	3.89	1.73
512112	7003326	Caboolture-030	MBC-033	2.25	2.09	0.16	1.18	3.0	145	0	2.42	2.94	2.78	3.87	2.86	4.06	1.73
512694	7003455	Caboolture-031	MBC-034	2.22	2.06	0.16	1.12	3.1	167	0	2.37	2.88	2.71	3.78	2.78	3.97	1.82
513275	7003412	Caboolture-032	MBC-035	2.20	2.04	0.16	1.12	3.0	173	0	2.36	2.86	2.70	3.74	2.77	3.93	1.76
513911	7003746	Caboolture-033	MBC-036	2.18	2.05	0.13	1.02	2.5	125	0	2.35	2.76	2.66	3.50	2.72	3.65	1.53
514481	7004446	Caboolture-034	MBC-037	2.04	1.91	0.13	1.00	2.5	124	0	2.20	2.61	2.51	3.34	2.57	3.48	1.54
516248	7002647	Caboolture-038	MBC-038	2.01	1.78	0.23	1.57	3.9	218	0	2.18	2.96	2.63	4.28	2.72	4.56	1.95
517280	7002397	Caboolture-040	MBC-039	1.94	1.73	0.21	1.43	3.7	172	0	2.10	2.80	2.52	3.98	2.61	4.24	1.91
519611	7002925	Caboolture-044	MBC-040	1.91	1.62	0.29	1.92	4.4	113	0	2.09	3.07	2.61	4.69	2.73	5.04	1.97
520367	7003619	Caboolture-046	MBC-041	1.91	1.59	0.32	2.21	4.8	100	0	2.11	3.27	2.69	5.16	2.82	5.57	2.01
520284	7006303	Caboolture-051	MBC-042	1.92	1.58	0.34	2.05	5.6	54	0	2.03	3.25	2.56	5.21	2.68	5.67	2.46
516778	7013518	Caboolture-060	MBC-043	2.03	1.63	0.40	2.49	6.0	58	0	2.17	3.63	2.80	5.95	2.94	6.49	2.35
516320	7014796	Caboolture-061	MBC-044	2.02	1.64	0.38	2.33	5.9	58	0	2.15	3.53	2.74	5.74	2.88	6.25	2.43
507667	7015461	Caboolture-067	MBC-045	2.41	2.28	0.13	1.03	2.5	202	0	2.58	2.99	2.89	3.74	2.96	3.88	1.51
508591	7014764	Caboolture-069	MBC-046	2.40	2.25	0.15	1.20	2.6	218	0	2.60	3.08	2.96	3.94	3.03	4.11	1.51
509101	7014442	Caboolture-070	MBC-047	2.37	2.21	0.16	1.27	2.8	207	0	2.58	3.09	2.96	4.02	3.04	4.20	1.54
509543	7013236	Caboolture-072	MBC-048	2.26	2.11	0.15	1.18	2.7	218	0	2.45	2.93	2.81	3.81	2.88	3.98	1.56
509623	7012592	Caboolture-073	MBC-049	2.21	2.05	0.16	1.21	2.8	216	0	2.40	2.90	2.77	3.80	2.84	3.98	1.58
510253	7011212	Caboolture-075	MBC-050	2.11	1.96	0.15	1.24	2.7	205	0	2.32	2.82	2.70	3.72	2.77	3.90	1.53
510669	7010917	Caboolture-076	MBC-051	2.05	1.92	0.13	0.99	2.4	208	0	2.21	2.60	2.51	3.32	2.56	3.46	1.51
511138	7010769	Caboolture-077	MBC-052	2.06	1.92	0.14	1.06	2.6	151	0	2.23	2.66	2.55	3.44	2.61	3.60	1.56
511701	7010475	Caboolture-078	MBC-053	2.05	1.91	0.14	1.11	2.7	185	0	2.23	2.69	2.57	3.52	2.64	3.68	1.59
512076	7010032	Caboolture-079	MBC-054	2.05	1.89	0.16	1.18	3.0	205	0	2.22	2.74	2.58	3.65	2.66	3.84	1.70
513283	7007901	Caboolture-083	MBC-055	1.93	1.76	0.17	1.32	3.0	231	0	2.14	2.69	2.54	3.68	2.62	3.88	1.60
513390	7007284	Caboolture-084	MBC-056	2.07	1.91	0.16	1.33	2.8	231	0	2.29	2.83	2.70	3.79	2.78	3.97	1.51

				Water Level mAHD 20yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.05	1.87	0.18	1.53	3.0	144	0	2.31	2.94	2.77	4.07	2.85	4.25	1.49
514141	7006547	Caboolture-086	MBC-058	2.04	1.87	0.17	1.45	2.8	247	0	2.29	2.87	2.73	3.91	2.80	4.08	1.47
514958	7005756	Caboolture-088	MBC-059	2.00	1.82	0.18	1.44	3.0	255	0	2.23	2.82	2.67	3.88	2.75	4.09	1.56
515374	7005260	Caboolture-089	MBC-060	1.96	1.79	0.17	1.37	2.8	261	0	2.19	2.76	2.60	3.76	2.67	3.93	1.50
514730	7005140	Caboolture-090	MBC-061	1.92	1.79	0.13	1.10	2.4	112	0	2.11	2.54	2.44	3.32	2.50	3.45	1.45
514328	7005394	Caboolture-091	MBC-062	1.95	1.81	0.14	1.04	2.7	107	0	2.11	2.55	2.43	3.33	2.49	3.49	1.62
513269	7006199	Caboolture-093	MBC-063	2.01	1.85	0.16	1.23	2.8	106	0	2.20	2.71	2.58	3.62	2.65	3.80	1.57
511621	7007284	Caboolture-096	MBC-064	2.02	1.88	0.14	1.12	2.5	125	0	2.21	2.66	2.55	3.47	2.60	3.60	1.48
511339	7008048	Caboolture-097	MBC-065	2.04	1.91	0.13	1.04	2.3	126	0	2.21	2.61	2.52	3.33	2.57	3.45	1.43
511648	7008558	Caboolture-098	MBC-066	1.90	1.77	0.13	1.01	2.5	137	0	2.06	2.47	2.37	3.21	2.43	3.36	1.55
511835	7009040	Caboolture-099	MBC-067	1.94	1.81	0.13	1.02	2.6	137	0	2.10	2.53	2.42	3.28	2.48	3.43	1.58
511446	7009456	Caboolture-100	MBC-068	1.99	1.86	0.13	1.04	2.5	130	0	2.16	2.59	2.48	3.35	2.54	3.50	1.56
511058	7009456	Caboolture-101	MBC-069	2.01	1.88	0.13	1.03	2.4	134	0	2.18	2.60	2.49	3.35	2.54	3.47	1.48
510321	7009818	Caboolture-102	MBC-070	2.00	1.88	0.12	0.98	2.4	127	0	2.16	2.56	2.46	3.27	2.52	3.41	1.52
509784	7010233	Caboolture-103	MBC-071	2.02	1.88	0.14	1.10	2.5	134	0	2.20	2.64	2.54	3.43	2.60	3.59	1.51
509369	7010796	Caboolture-104	MBC-072	2.06	1.93	0.13	1.04	2.5	133	0	2.23	2.65	2.55	3.41	2.61	3.56	1.53
509034	7011198	Caboolture-105	MBC-073	2.17	2.04	0.13	1.02	2.5	114	0	2.34	2.75	2.65	3.51	2.71	3.65	1.56
508833	7011587	Caboolture-106	MBC-074	2.11	1.99	0.12	0.94	2.4	142	0	2.26	2.65	2.55	3.34	2.60	3.48	1.57
508752	7011869	Caboolture-107	MBC-075	2.08	1.94	0.14	1.07	2.5	141	0	2.25	2.68	2.58	3.46	2.64	3.61	1.52
508471	7012110	Caboolture-108	MBC-076	2.10	1.97	0.13	1.00	2.4	142	0	2.26	2.67	2.56	3.40	2.61	3.52	1.49
508926	7012177	Caboolture-109	MBC-077	2.13	2.00	0.13	1.03	2.5	146	0	2.30	2.72	2.61	3.48	2.68	3.63	1.56
509020	7012767	Caboolture-110	MBC-078	2.19	2.05	0.14	1.11	2.6	142	0	2.37	2.83	2.71	3.65	2.78	3.81	1.56
508565	7013276	Caboolture-111	MBC-079	2.24	2.12	0.12	0.97	2.3	146	0	2.40	2.79	2.69	3.48	2.74	3.60	1.46
508069	7013611	Caboolture-112	MBC-080	2.39	2.25	0.14	1.15	2.6	340	0	2.58	3.04	2.93	3.88	3.00	4.04	1.51
507667	7013960	Caboolture-113	MBC-081	2.43	2.31	0.12	1.01	2.3	129	0	2.60	2.99	2.90	3.71	2.95	3.82	1.44
507157	7014067	Caboolture-114	MBC-082	2.46	2.34	0.12	1.00	2.3	128	0	2.63	3.02	2.93	3.74	2.98	3.85	1.46
507171	7014777	Caboolture-115	MBC-083	2.39	2.27	0.12	0.94	2.4	147	0	2.54	2.92	2.83	3.61	2.88	3.75	1.54
507063	7015595	Caboolture-116	MBC-084	2.42	2.29	0.13	1.02	2.5	142	0	2.59	3.00	2.90	3.74	2.96	3.89	1.53
509121	6984944	Redcliffe-005	MBC-085	2.10	1.93	0.17	1.19	3.2	174	0	2.26	2.80	2.62	3.76	2.69	3.96	1.80
509533	6984891	Redcliffe-006	MBC-086	2.05	1.89	0.16	1.14	2.9	183	0	2.21	2.71	2.56	3.60	2.63	3.78	1.71
509892	6984691	Redcliffe-007	MBC-087	2.01	1.85	0.16	1.12	3.0	189	0	2.17	2.66	2.51	3.54	2.58	3.73	1.75
510464	6984279	Redcliffe-009	MBC-088	1.97	1.78	0.19	1.31	3.5	130	0	2.13	2.76	2.51	3.85	2.60	4.08	1.92
510783	6984638	Redcliffe-010	MBC-089	1.95	1.73	0.22	1.59	3.6	127	0	2.15	2.89	2.61	4.15	2.71	4.42	1.78
510969	6985516	Redcliffe-012	MBC-090	1.98	1.74	0.24	1.65	3.9	114	0	2.16	2.97	2.63	4.32	2.73	4.60	1.87
511076	6985889	Redcliffe-013	MBC-091	1.98	1.74	0.24	1.58	4.0	118	0	2.14	2.93	2.58	4.26	2.68	4.55	1.96
511488	6987365	Redcliffe-016	MBC-092	2.02	1.74	0.28	1.85	4.5	112	0	2.19	3.16	2.69	4.75	2.80	5.10	2.05
511768	6988017	Redcliffe-018	MBC-093	2.00	1.71	0.29	1.89	4.6	113	0	2.16	3.17	2.67	4.82	2.78	5.19	2.10
511648	6988496	Redcliffe-019	MBC-094	1.98	1.73	0.25	1.59	4.4	111	0	2.11	2.98	2.55	4.40	2.65	4.72	2.19
511741	6989254	Redcliffe-021	MBC-095	2.03	1.73	0.30	1.96	4.6	116	0	2.20	3.23	2.73	4.92	2.84	5.30	2.06
511874	6990079	Redcliffe-023	MBC-096	2.01	1.72	0.29	1.90	4.7	119	0	2.17	3.19	2.68	4.86	2.79	5.24	2.12
511648	6990451	Redcliffe-024	MBC-097	1.99	1.73	0.26	1.66	4.3	109	0	2.14	3.01	2.59	4.46	2.70	4.79	2.10
511661	6991063	Redcliffe-025	MBC-098	2.01	1.74	0.27	1.76	4.3	118	0	2.17	3.08	2.66	4.58	2.76	4.90	2.01
511568	6992087	Redcliffe-027	MBC-099	2.01	1.74	0.27	1.73	4.4	77	0	2.16	3.07	2.63	4.57	2.74	4.90	2.07
511475	6992513	Redcliffe-028	MBC-100	1.96	1.74	0.22	1.53	3.6	124	0	2.15	2.87	2.59	4.11	2.68	4.37	1.84
510916	6992713	Redcliffe-029	MBC-101	1.90	1.73	0.17	1.29	2.9	245	0	2.10	2.64	2.49	3.60	2.57	3.79	1.59
510531	6992472	Redcliffe-030	MBC-102	1.92	1.74	0.18	1.26	3.3	297	0	2.08	2.67	2.46	3.68	2.54	3.90	1.82
510161	6992164	Redcliffe-031	MBC-103	1.95	1.75	0.20	1.44	3.3	175	0	2.15	2.79	2.57	3.92	2.66	4.16	1.74
509833	6991712	Redcliffe-032	MBC-104	1.89	1.76	0.13	1.10	2.4	229	0	2.08	2.50	2.41	3.28	2.47	3.41	1.44
509525	6991322	Redcliffe-033	MBC-105	1.89	1.75	0.14	1.15	2.4	230	0	2.08	2.51	2.43	3.31	2.49	3.44	1.42
509155	6991199	Redcliffe-034	MBC-106	1.90	1.76	0.14	1.17	2.4	227	0	2.10	2.53	2.45	3.32	2.51	3.45	1.39
508478	6991343	Redcliffe-035	MBC-107	1.91	1.78	0.13	1.03	2.3	126	0	2.08	2.48	2.39	3.20	2.44	3.32	1.44
507965	6991487	Redcliffe-036	MBC-108	1.96	1.81	0.15	1.03	2.9	53	0	2.10	2.56	2.42	3.38	2.48	3.55	1.78
507205	6991589	Redcliffe-037	MBC-109	1.99	1.84	0.15	1.02	2.9	52	0	2.13	2.59	2.44	3.40	2.51	3.57	1.80
506548	6991836	Redcliffe-038	MBC-110	2.02	1.87	0.15	1.04	3.0	53	0	2.16	2.64	2.48	3.48	2.55	3.66	1.84
505830	6992082	Redcliffe-039	MBC-111	2.06	1.90	0.16	1.09	3.0	63	0	2.21	2.70	2.54	3.57	2.61	3.75	1.80
505358	6992267	Redcliffe-040	MBC-112	2.08	1.93	0.15	1.01	2.9	66	0	2.21	2.67	2.53	3.48	2.59	3.65	1.81

				Water Level mAHD 50yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.81	1.81		1.18	2.6	125	0							
506913	6982622	PineRiver-001	MBC-001	2.27	2.13	0.14	1.09	2.5	129	0	2.45	2.88	2.78	3.67	2.84	3.82	1.51
507065	6983136	PineRiver-002	MBC-002	2.32	2.17	0.15	1.17	2.7	136	0	2.51	2.98	2.86	3.84	2.93	4.01	1.55
507237	6983516	PineRiver-003	MBC-003	2.30	2.17	0.13	1.05	2.5	128	0	2.48	2.90	2.80	3.66	2.86	3.81	1.52
507198	6984049	PineRiver-004	MBC-004	2.35	2.23	0.12	0.94	2.5	133	0	2.50	2.89	2.79	3.59	2.85	3.73	1.59
506913	6984334	PineRiver-005	MBC-005	2.47	2.36	0.11	0.82	2.3	133	0	2.59	2.93	2.84	3.53	2.89	3.65	1.55
507046	6984696	PineRiver-006	MBC-006	2.54	2.44	0.10	0.85	2.1	49	0	2.68	3.00	2.93	3.59	2.97	3.69	1.41
507522	6984334	PineRiver-007	MBC-007	2.37	2.24	0.13	0.96	2.5	141	0	2.52	2.92	2.81	3.64	2.87	3.79	1.62
507769	6984239	PineRiver-008	MBC-008	2.31	2.15	0.16	1.19	3.0	131	0	2.49	3.00	2.85	3.92	2.92	4.11	1.69
506179	6982661	PineRiver-009	MBC-009	2.47	2.36	0.11	0.82	2.3	133	0	2.59	2.93	2.84	3.53	2.89	3.65	1.55
504927	6992513	Caboolture-001	MBC-010	2.29	2.14	0.15	1.03	2.9	67	0	2.43	2.89	2.75	3.72	2.81	3.89	1.79
504270	6992575	Caboolture-002	MBC-011	2.30	2.17	0.13	0.94	2.6	76	0	2.44	2.84	2.73	3.57	2.79	3.72	1.69
503633	6992841	Caboolture-003	MBC-012	2.42	2.29	0.13	0.96	2.7	74	0	2.56	2.98	2.86	3.72	2.92	3.88	1.70
503346	6993519	Caboolture-004	MBC-013	2.48	2.35	0.13	0.98	2.6	86	0	2.63	3.05	2.93	3.80	2.99	3.95	1.67
503613	6994402	Caboolture-005	MBC-014	2.54	2.42	0.12	0.90	2.4	135	0	2.68	3.05	2.95	3.72	3.01	3.85	1.58
504658	6996186	Caboolture-009	MBC-015	2.53	2.39	0.14	1.06	2.7	73	0	2.69	3.14	3.02	3.95	3.08	4.11	1.64
504477	6996546	Caboolture-010	MBC-016	2.63	2.50	0.13	1.03	2.4	53	0	2.80	3.21	3.11	3.95	3.17	4.10	1.50
504774	6997055	Caboolture-012	MBC-017	2.57	2.44	0.13	1.00	2.5	72	0	2.73	3.14	3.04	3.88	3.10	4.03	1.57
505039	6997331	Caboolture-013	MBC-018	2.57	2.44	0.13	0.94	2.7	134	0	2.71	3.12	3.00	3.86	3.06	4.01	1.73
505442	6998582	Caboolture-016	MBC-019	2.64	2.49	0.15	1.09	2.8	133	0	2.80	3.27	3.13	4.10	3.20	4.27	1.66
505671	6999062	Caboolture-017	MBC-020	2.66	2.51	0.15	1.00	2.9	85	0	2.79	3.25	3.10	4.06	3.17	4.23	1.84
505909	6999567	Caboolture-018	MBC-021	2.68	2.53	0.15	1.07	3.0	133	0	2.83	3.31	3.16	4.17	3.23	4.35	1.79
506361	7000127	Caboolture-019	MBC-022	2.71	2.56	0.15	1.13	2.9	137	0	2.88	3.37	3.23	4.25	3.30	4.43	1.70
506813	7000580	Caboolture-020	MBC-023	2.64	2.49	0.15	1.05	2.9	134	0	2.79	3.25	3.11	4.07	3.18	4.24	1.74
507266	7001010	Caboolture-021	MBC-024	2.62	2.45	0.17	1.20	3.2	131	0	2.78	3.34	3.14	4.31	3.22	4.52	1.85
507718	7001452	Caboolture-022	MBC-025	2.64	2.46	0.18	1.25	3.4	136	0	2.80	3.39	3.17	4.41	3.25	4.63	1.88
508289	7001850	Caboolture-023	MBC-026	2.63	2.44	0.19	1.27	3.4	137	0	2.78	3.39	3.16	4.43	3.24	4.65	1.89
508903	7002206	Caboolture-024	MBC-027	2.59	2.39	0.20	1.31	3.6	139	0	2.73	3.38	3.12	4.47	3.20	4.71	1.95
509355	7002550	Caboolture-025	MBC-028	2.57	2.38	0.19	1.29	3.5	144	0	2.72	3.35	3.10	4.42	3.19	4.65	1.92
509894	7002744	Caboolture-026	MBC-029	2.53	2.33	0.20	1.35	3.6	147	0	2.69	3.34	3.08	4.46	3.16	4.69	1.91
510475	7002852	Caboolture-027	MBC-030	2.50	2.30	0.20	1.31	3.6	150	0	2.64	3.28	3.03	4.38	3.11	4.61	1.94
511067	7003003	Caboolture-028	MBC-031	2.45	2.27	0.18	1.20	3.5	174	0	2.59	3.18	2.94	4.19	3.02	4.41	1.97
511477	7003251	Caboolture-029	MBC-032	2.47	2.32	0.15	1.06	2.8	136	0	2.62	3.08	2.95	3.90	3.01	4.07	1.70
512112	7003326	Caboolture-030	MBC-033	2.44	2.28	0.16	1.18	3.0	148	0	2.61	3.14	2.97	4.06	3.05	4.26	1.75
512694	7003455	Caboolture-031	MBC-034	2.40	2.24	0.16	1.12	3.0	156	0	2.56	3.05	2.90	3.94	2.97	4.12	1.76
513275	7003412	Caboolture-032	MBC-035	2.37	2.22	0.15	1.12	2.9	156	0	2.54	3.02	2.88	3.89	2.95	4.06	1.69
513911	7003746	Caboolture-033	MBC-036	2.36	2.23	0.13	1.04	2.4	127	0	2.53	2.96	2.85	3.72	2.90	3.85	1.49
514481	7004446	Caboolture-034	MBC-037	2.19	2.06	0.13	1.00	2.5	124	0	2.35	2.76	2.66	3.49	2.72	3.63	1.54
516248	7002647	Caboolture-038	MBC-038	2.12	1.89	0.23	1.57	3.9	221	0	2.29	3.07	2.74	4.38	2.83	4.66	1.94
517280	7002397	Caboolture-040	MBC-039	2.04	1.83	0.21	1.43	3.7	176	0	2.20	2.90	2.62	4.09	2.71	4.34	1.92
519611	7002925	Caboolture-044	MBC-040	1.97	1.69	0.28	1.95	4.3	117	0	2.17	3.15	2.71	4.77	2.82	5.11	1.91
520367	7003619	Caboolture-046	MBC-041	1.97	1.65	0.32	2.26	4.7	105	0	2.19	3.35	2.79	5.25	2.92	5.66	1.96
520284	7006303	Caboolture-051	MBC-042	1.97	1.63	0.34	2.05	5.6	54	0	2.08	3.30	2.61	5.26	2.73	5.72	2.46
516778	7013518	Caboolture-060	MBC-043	2.09	1.69	0.40	2.49	6.0	58	0	2.23	3.69	2.86	6.01	3.00	6.55	2.35
516320	7014796	Caboolture-061	MBC-044	2.09	1.71	0.38	2.33	5.9	58	0	2.22	3.60	2.81	5.81	2.95	6.32	2.43
507667	7015461	Caboolture-067	MBC-045	2.63	2.50	0.13	1.03	2.5	202	0	2.80	3.21	3.11	3.96	3.18	4.10	1.51
508591	7014764	Caboolture-069	MBC-046	2.62	2.47	0.15	1.20	2.6	229	0	2.82	3.32	3.18	4.20	3.24	4.34	1.50
509101	7014442	Caboolture-070	MBC-047	2.59	2.42	0.17	1.31	2.9	163	0	2.80	3.34	3.19	4.31	3.27	4.51	1.58
509543	7013236	Caboolture-072	MBC-048	2.44	2.29	0.15	1.18	2.7	218	0	2.63	3.11	2.99	3.99	3.06	4.16	1.56
509623	7012592	Caboolture-073	MBC-049	2.39	2.23	0.16	1.21	2.8	216	0	2.58	3.08	2.95	3.98	3.02	4.16	1.58
510253	7011212	Caboolture-075	MBC-050	2.26	2.11	0.15	1.24	2.7	205	0	2.47	2.97	2.85	3.87	2.92	4.05	1.53
510669	7010917	Caboolture-076	MBC-051	2.19	2.06	0.13	0.99	2.4	208	0	2.35	2.74	2.65	3.46	2.70	3.60	1.51
511138	7010769	Caboolture-077	MBC-052	2.21	2.07	0.14	1.06	2.6	151	0	2.38	2.81	2.70	3.59	2.76	3.75	1.56
511701	7010475	Caboolture-078	MBC-053	2.20	2.05	0.15	1.12	2.7	199	0	2.37	2.84	2.71	3.67	2.78	3.83	1.58
512076	7010032	Caboolture-079	MBC-054	2.19	2.03	0.16	1.22	3.0	221	0	2.38	2.90	2.75	3.84	2.82	4.04	1.68
513283	7007901	Caboolture-083	MBC-055	2.03	1.86	0.17	1.32	3.0	231	0	2.24	2.79	2.64	3.78	2.72	3.98	1.60
513390	7007284	Caboolture-084	MBC-056	2.22	2.06	0.16	1.33	2.8	231	0	2.44	2.98	2.85	3.94	2.93	4.12	1.51

				Water Level mAHD 50yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.18	2.00	0.18	1.53	3.0	144	0	2.44	3.07	2.90	4.20	2.98	4.38	1.49
514141	7006547	Caboolture-086	MBC-058	2.18	2.01	0.17	1.45	2.8	247	0	2.43	3.01	2.87	4.05	2.94	4.22	1.47
514958	7005756	Caboolture-088	MBC-059	2.12	1.94	0.18	1.44	3.0	255	0	2.35	2.94	2.79	4.00	2.87	4.21	1.56
515374	7005260	Caboolture-089	MBC-060	2.08	1.91	0.17	1.37	2.8	261	0	2.31	2.88	2.72	3.88	2.79	4.05	1.50
514730	7005140	Caboolture-090	MBC-061	2.04	1.91	0.13	1.10	2.4	112	0	2.23	2.66	2.56	3.44	2.62	3.57	1.45
514328	7005394	Caboolture-091	MBC-062	2.06	1.92	0.14	1.04	2.7	107	0	2.22	2.66	2.54	3.44	2.60	3.60	1.62
513269	7006199	Caboolture-093	MBC-063	2.14	1.98	0.16	1.23	2.8	106	0	2.33	2.84	2.71	3.75	2.78	3.93	1.57
511621	7007284	Caboolture-096	MBC-064	2.16	2.02	0.14	1.12	2.5	125	0	2.35	2.80	2.69	3.61	2.74	3.74	1.48
511339	7008048	Caboolture-097	MBC-065	2.18	2.05	0.13	1.04	2.3	126	0	2.35	2.75	2.66	3.47	2.71	3.59	1.43
511648	7008558	Caboolture-098	MBC-066	2.01	1.88	0.13	1.01	2.5	137	0	2.17	2.58	2.48	3.32	2.54	3.47	1.55
511835	7009040	Caboolture-099	MBC-067	2.06	1.93	0.13	1.02	2.6	137	0	2.22	2.65	2.54	3.40	2.60	3.55	1.58
511446	7009456	Caboolture-100	MBC-068	2.12	1.99	0.13	1.04	2.5	130	0	2.29	2.72	2.61	3.48	2.67	3.63	1.56
511058	7009456	Caboolture-101	MBC-069	2.15	2.02	0.13	1.06	2.5	110	0	2.33	2.75	2.65	3.52	2.72	3.67	1.52
510321	7009818	Caboolture-102	MBC-070	2.15	2.02	0.13	1.02	2.6	35	0	2.31	2.74	2.63	3.50	2.69	3.65	1.60
509784	7010233	Caboolture-103	MBC-071	2.15	2.01	0.14	1.10	2.5	134	0	2.33	2.77	2.67	3.56	2.73	3.72	1.51
509369	7010796	Caboolture-104	MBC-072	2.20	2.07	0.13	1.04	2.5	133	0	2.37	2.79	2.69	3.55	2.75	3.70	1.53
509034	7011198	Caboolture-105	MBC-073	2.35	2.21	0.14	1.07	2.5	22	0	2.52	2.95	2.85	3.73	2.91	3.88	1.52
508833	7011587	Caboolture-106	MBC-074	2.28	2.16	0.12	0.94	2.4	142	0	2.43	2.82	2.72	3.51	2.77	3.65	1.57
508752	7011869	Caboolture-107	MBC-075	2.23	2.09	0.14	1.07	2.5	141	0	2.40	2.83	2.73	3.61	2.79	3.76	1.52
508471	7012110	Caboolture-108	MBC-076	2.26	2.13	0.13	1.00	2.4	142	0	2.42	2.83	2.72	3.56	2.77	3.68	1.49
508926	7012177	Caboolture-109	MBC-077	2.29	2.16	0.13	1.03	2.5	146	0	2.46	2.88	2.77	3.64	2.84	3.79	1.56
509020	7012767	Caboolture-110	MBC-078	2.37	2.22	0.15	1.12	2.7	128	0	2.54	3.00	2.88	3.84	2.95	4.00	1.58
508565	7013276	Caboolture-111	MBC-079	2.45	2.32	0.13	1.02	2.4	12	0	2.62	3.02	2.92	3.76	2.97	3.87	1.47
508069	7013611	Caboolture-112	MBC-080	2.61	2.47	0.14	1.15	2.6	340	0	2.80	3.26	3.15	4.10	3.22	4.26	1.51
507667	7013960	Caboolture-113	MBC-081	2.65	2.53	0.12	1.01	2.3	129	0	2.82	3.21	3.12	3.93	3.17	4.04	1.44
507157	7014067	Caboolture-114	MBC-082	2.69	2.57	0.12	1.00	2.3	128	0	2.86	3.25	3.16	3.97	3.21	4.08	1.46
507171	7014777	Caboolture-116	MBC-083	2.62	2.49	0.13	1.06	2.5	131	0	2.80	3.24	3.12	4.01	3.18	4.14	1.50
507063	7015595	Caboolture-116	MBC-084	2.66	2.52	0.14	1.09	2.5	142	0	2.84	3.29	3.17	4.08	3.22	4.22	1.50
509121	6984944	Redcliffe-005	MBC-085	2.26	2.09	0.17	1.21	3.0	172	0	2.43	2.96	2.80	3.90	2.88	4.09	1.71
509533	6984891	Redcliffe-006	MBC-086	2.19	2.04	0.15	1.17	2.8	193	0	2.37	2.87	2.73	3.75	2.80	3.93	1.63
509892	6984691	Redcliffe-007	MBC-087	2.14	1.99	0.15	1.15	2.8	194	0	2.32	2.81	2.67	3.68	2.74	3.86	1.65
510464	6984279	Redcliffe-009	MBC-088	2.09	1.90	0.19	1.31	3.5	130	0	2.25	2.88	2.63	3.97	2.72	4.20	1.92
510783	6984638	Redcliffe-010	MBC-089	2.06	1.84	0.22	1.61	3.5	128	0	2.27	3.00	2.74	4.26	2.84	4.51	1.72
510969	6985516	Redcliffe-012	MBC-090	2.08	1.85	0.23	1.66	3.7	115	0	2.29	3.07	2.76	4.40	2.86	4.68	1.81
511076	6985889	Redcliffe-013	MBC-091	2.08	1.85	0.23	1.59	3.8	119	0	2.26	3.04	2.72	4.35	2.81	4.63	1.90
511488	6987365	Redcliffe-016	MBC-092	2.13	1.85	0.28	1.85	4.5	112	0	2.30	3.27	2.80	4.86	2.91	5.21	2.05
511768	6988017	Redcliffe-018	MBC-093	2.09	1.80	0.29	1.92	4.5	113	0	2.26	3.26	2.78	4.91	2.90	5.27	2.02
511648	6988496	Redcliffe-019	MBC-094	2.08	1.83	0.25	1.59	4.4	111	0	2.21	3.08	2.65	4.50	2.75	4.82	2.19
511741	6989254	Redcliffe-021	MBC-095	2.14	1.84	0.30	1.96	4.6	116	0	2.31	3.34	2.84	5.03	2.95	5.41	2.06
511874	6990079	Redcliffe-023	MBC-096	2.11	1.82	0.29	1.90	4.7	119	0	2.27	3.29	2.78	4.96	2.89	5.34	2.12
511648	6990451	Redcliffe-024	MBC-097	2.10	1.84	0.26	1.66	4.3	109	0	2.25	3.12	2.70	4.57	2.81	4.90	2.10
511661	6991063	Redcliffe-025	MBC-098	2.12	1.85	0.27	1.76	4.3	118	0	2.28	3.19	2.77	4.69	2.87	5.01	2.01
511568	6992087	Redcliffe-027	MBC-099	2.12	1.85	0.27	1.85	4.2	115	0	2.31	3.24	2.82	4.79	2.93	5.12	1.94
511475	6992513	Redcliffe-028	MBC-100	2.07	1.85	0.22	1.53	3.6	124	0	2.26	2.98	2.70	4.22	2.79	4.48	1.84
510916	6992713	Redcliffe-029	MBC-101	2.01	1.84	0.17	1.29	2.9	245	0	2.21	2.75	2.60	3.71	2.68	3.90	1.59
510531	6992472	Redcliffe-030	MBC-102	2.00	1.84	0.16	1.30	2.8	250	0	2.21	2.74	2.61	3.69	2.69	3.88	1.54
510161	6992164	Redcliffe-031	MBC-103	2.04	1.86	0.18	1.51	2.9	247	0	2.30	2.92	2.75	4.03	2.83	4.21	1.49
509833	6991712	Redcliffe-032	MBC-104	2.00	1.87	0.13	1.10	2.4	229	0	2.19	2.61	2.52	3.39	2.58	3.52	1.44
509525	6991322	Redcliffe-033	MBC-105	2.01	1.87	0.14	1.15	2.4	230	0	2.20	2.63	2.55	3.43	2.61	3.56	1.42
509155	6991199	Redcliffe-034	MBC-106	2.02	1.88	0.14	1.17	2.4	227	0	2.22	2.65	2.57	3.44	2.63	3.57	1.39
508478	6991343	Redcliffe-035	MBC-107	2.04	1.91	0.13	1.03	2.3	126	0	2.21	2.61	2.52	3.33	2.57	3.45	1.44
507965	6991487	Redcliffe-036	MBC-108	2.07	1.94	0.13	1.06	2.4	125	0	2.25	2.66	2.57	3.42	2.62	3.54	1.45
507205	6991589	Redcliffe-037	MBC-109	2.10	1.97	0.13	1.04	2.4	125	0	2.27	2.68	2.59	3.41	2.64	3.53	1.45
506548	6991836	Redcliffe-038	MBC-110	2.17	2.01	0.16	1.07	3.0	49	0	2.31	2.80	2.64	3.66	2.71	3.84	1.82
505830	6992082	Redcliffe-039	MBC-111	2.22	2.06	0.16	1.11	3.1	51	0	2.37	2.88	2.71	3.78	2.78	3.97	1.84
505357.8	6992266.6	Redcliffe-040	MBC-112	2.24	2.09	0.15	1.01	2.9	65	0	2.37	2.83	2.69	3.65	2.75	3.82	1.82

				Water Level mAHD 100yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.89	1.89		1.18	2.6	125	0							
506913	6982622	PineRiver-001	MBC-001	2.40	2.26	0.14	1.09	2.5	129	0	2.58	3.01	2.91	3.80	2.97	3.95	1.51
507065	6983136	PineRiver-002	MBC-002	2.45	2.30	0.15	1.17	2.7	136	0	2.64	3.11	2.99	3.97	3.06	4.14	1.55
507237	6983516	PineRiver-003	MBC-003	2.44	2.31	0.13	1.05	2.5	128	0	2.62	3.04	2.94	3.80	3.00	3.95	1.52
507198	6984049	PineRiver-004	MBC-004	2.49	2.37	0.12	0.98	2.4	130	0	2.65	3.06	2.95	3.78	3.00	3.89	1.50
506913	6984334	PineRiver-005	MBC-005	2.63	2.52	0.11	0.86	2.2	131	0	2.77	3.11	3.02	3.73	3.06	3.83	1.46
507046	6984696	PineRiver-006	MBC-006	2.72	2.61	0.11	0.88	2.2	139	0	2.86	3.20	3.12	3.82	3.17	3.93	1.44
507522	6984334	PineRiver-007	MBC-007	2.51	2.38	0.13	1.01	2.5	135	0	2.67	3.08	2.98	3.81	3.04	3.96	1.52
507769	6984239	PineRiver-008	MBC-008	2.44	2.28	0.16	1.24	2.8	128	0	2.64	3.15	3.01	4.08	3.09	4.26	1.59
506179	6982661	PineRiver-009	MBC-009	2.63	2.52	0.11	0.86	2.2	131	0	2.77	3.11	3.02	3.73	3.06	3.83	1.46
504927	6992513	Caboolture-001	MBC-010	2.40	2.27	0.13	1.04	2.5	118	0	2.57	2.99	2.89	3.75	2.95	3.90	1.53
504270	6992575	Caboolture-002	MBC-011	2.43	2.31	0.12	0.98	2.3	128	0	2.59	2.98	2.89	3.69	2.93	3.80	1.46
503633	6992841	Caboolture-003	MBC-012	2.57	2.44	0.13	0.98	2.6	71	0	2.72	3.14	3.02	3.88	3.08	4.04	1.65
503346	6993519	Caboolture-004	MBC-013	2.65	2.52	0.13	1.01	2.5	68	0	2.81	3.23	3.12	3.98	3.18	4.13	1.58
503613	6994402	Caboolture-005	MBC-014	2.71	2.59	0.12	0.92	2.4	74	0	2.85	3.24	3.13	3.92	3.19	4.06	1.59
504658	6996186	Caboolture-009	MBC-015	2.69	2.55	0.14	1.06	2.7	73	0	2.85	3.30	3.18	4.11	3.24	4.27	1.64
504477	6996546	Caboolture-010	MBC-016	2.80	2.67	0.13	1.03	2.4	53	0	2.97	3.38	3.28	4.12	3.34	4.27	1.50
504774	6997055	Caboolture-012	MBC-017	2.74	2.61	0.13	1.00	2.5	72	0	2.90	3.31	3.21	4.05	3.27	4.20	1.57
505039	6997331	Caboolture-013	MBC-018	2.74	2.61	0.13	0.94	2.7	134	0	2.88	3.29	3.17	4.03	3.23	4.18	1.73
505442	6998582	Caboolture-016	MBC-019	2.82	2.67	0.15	1.09	2.8	133	0	2.98	3.45	3.31	4.28	3.38	4.45	1.66
505671	6999062	Caboolture-017	MBC-020	2.84	2.69	0.15	1.00	2.9	85	0	2.97	3.43	3.28	4.24	3.35	4.41	1.84
505909	6999567	Caboolture-018	MBC-021	2.86	2.71	0.15	1.09	2.9	125	0	3.02	3.50	3.35	4.36	3.42	4.54	1.75
506361	7000127	Caboolture-019	MBC-022	2.90	2.75	0.15	1.14	2.8	129	0	3.08	3.56	3.42	4.43	3.49	4.61	1.66
506813	7000580	Caboolture-020	MBC-023	2.81	2.66	0.15	1.06	2.8	127	0	2.96	3.42	3.29	4.24	3.35	4.41	1.69
507266	7001010	Caboolture-021	MBC-024	2.79	2.62	0.17	1.20	3.2	131	0	2.95	3.51	3.31	4.48	3.39	4.69	1.85
507718	7001452	Caboolture-022	MBC-025	2.81	2.63	0.18	1.25	3.3	136	0	2.97	3.55	3.35	4.56	3.42	4.77	1.83
508289	7001850	Caboolture-023	MBC-026	2.79	2.61	0.18	1.27	3.3	137	0	2.96	3.55	3.34	4.58	3.42	4.80	1.85
508903	7002206	Caboolture-024	MBC-027	2.75	2.55	0.20	1.31	3.6	139	0	2.89	3.54	3.28	4.63	3.36	4.87	1.95
509355	7002550	Caboolture-025	MBC-028	2.73	2.54	0.19	1.29	3.5	148	0	2.88	3.51	3.26	4.59	3.35	4.82	1.94
509894	7002744	Caboolture-026	MBC-029	2.68	2.48	0.20	1.35	3.6	147	0	2.84	3.49	3.23	4.61	3.31	4.84	1.91
510475	7002852	Caboolture-027	MBC-030	2.64	2.44	0.20	1.31	3.6	154	0	2.78	3.43	3.17	4.53	3.25	4.77	1.96
511067	7003003	Caboolture-028	MBC-031	2.59	2.41	0.18	1.20	3.5	174	0	2.73	3.32	3.08	4.33	3.16	4.55	1.97
511477	7003251	Caboolture-029	MBC-032	2.62	2.47	0.15	1.06	2.8	147	0	2.77	3.23	3.10	4.06	3.16	4.23	1.72
512112	7003326	Caboolture-030	MBC-033	2.58	2.42	0.16	1.18	3.0	143	0	2.75	3.27	3.11	4.19	3.19	4.38	1.72
512694	7003455	Caboolture-031	MBC-034	2.54	2.38	0.16	1.12	3.0	163	0	2.70	3.20	3.04	4.09	3.11	4.28	1.79
513275	7003412	Caboolture-032	MBC-035	2.51	2.36	0.15	1.12	2.7	139	0	2.68	3.15	3.02	3.98	3.09	4.15	1.59
513911	7003746	Caboolture-033	MBC-036	2.50	2.37	0.13	1.04	2.4	127	0	2.67	3.10	2.99	3.86	3.04	3.99	1.49
514481	7004446	Caboolture-034	MBC-037	2.30	2.17	0.13	1.00	2.5	124	0	2.46	2.87	2.77	3.60	2.83	3.74	1.54
516248	7002647	Caboolture-038	MBC-038	2.20	1.97	0.23	1.57	3.9	221	0	2.37	3.15	2.82	4.46	2.91	4.74	1.94
517280	7002397	Caboolture-040	MBC-039	2.10	1.90	0.20	1.43	3.5	154	0	2.28	2.96	2.70	4.12	2.79	4.36	1.85
519611	7002925	Caboolture-044	MBC-040	2.02	1.74	0.28	1.95	4.3	117	0	2.22	3.20	2.76	4.82	2.87	5.16	1.91
520367	7003619	Caboolture-046	MBC-041	2.01	1.69	0.32	2.26	4.7	105	0	2.23	3.39	2.83	5.29	2.96	5.70	1.96
520284	7006303	Caboolture-051	MBC-042	2.01	1.67	0.34	2.05	5.6	54	0	2.12	3.34	2.65	5.30	2.77	5.76	2.46
516778	7013518	Caboolture-060	MBC-043	2.14	1.74	0.40	2.49	6.0	58	0	2.28	3.74	2.91	6.06	3.05	6.60	2.35
516320	7014796	Caboolture-061	MBC-044	2.14	1.76	0.38	2.33	5.9	58	0	2.27	3.65	2.86	5.86	3.00	6.37	2.43
507667	7015461	Caboolture-067	MBC-045	2.79	2.66	0.13	1.05	2.4	216	0	2.96	3.39	3.28	4.15	3.33	4.28	1.48
508591	7014764	Caboolture-069	MBC-046	2.78	2.63	0.15	1.27	2.7	227	0	3.00	3.52	3.38	4.44	3.45	4.59	1.49
509101	7014442	Caboolture-070	MBC-047	2.74	2.57	0.17	1.31	2.9	163	0	2.95	3.49	3.34	4.46	3.42	4.66	1.58
509543	7013236	Caboolture-072	MBC-048	2.58	2.43	0.15	1.18	2.7	218	0	2.77	3.25	3.13	4.13	3.20	4.30	1.56
509623	7012592	Caboolture-073	MBC-049	2.52	2.36	0.16	1.21	2.8	216	0	2.71	3.21	3.08	4.11	3.15	4.29	1.58
510253	7011212	Caboolture-075	MBC-050	2.38	2.23	0.15	1.24	2.7	205	0	2.59	3.09	2.97	3.99	3.04	4.17	1.53
510669	7010917	Caboolture-076	MBC-051	2.30	2.17	0.13	0.99	2.4	208	0	2.46	2.85	2.76	3.57	2.81	3.71	1.51
511138	7010769	Caboolture-077	MBC-052	2.32	2.18	0.14	1.06	2.6	151	0	2.49	2.92	2.81	3.70	2.87	3.86	1.56
511701	7010475	Caboolture-078	MBC-053	2.30	2.15	0.15	1.15	2.7	157	0	2.48	2.96	2.83	3.82	2.90	3.99	1.59
512076	7010032	Caboolture-079	MBC-054	2.30	2.13	0.17	1.27	3.0	152	0	2.49	3.04	2.88	4.02	2.96	4.21	1.68
513283	7007901	Caboolture-083	MBC-055	2.11	1.94	0.17	1.32	3.0	231	0	2.32	2.87	2.72	3.86	2.80	4.06	1.60
513390	7007284	Caboolture-084	MBC-056	2.33	2.17	0.16	1.33	2.8	231	0	2.55	3.09	2.96	4.05	3.04	4.23	1.51

				Water Level mAHD 100yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.28	2.10	0.18	1.53	3.0	144	0	2.54	3.17	3.00	4.30	3.08	4.48	1.49
514141	7006547	Caboolture-086	MBC-058	2.28	2.11	0.17	1.45	2.8	247	0	2.53	3.11	2.97	4.15	3.04	4.32	1.47
514958	7005756	Caboolture-088	MBC-059	2.21	2.03	0.18	1.44	3.0	255	0	2.44	3.03	2.88	4.09	2.96	4.30	1.56
515374	7005260	Caboolture-089	MBC-060	2.17	2.00	0.17	1.37	2.8	261	0	2.40	2.97	2.81	3.97	2.88	4.14	1.50
514730	7005140	Caboolture-090	MBC-061	2.12	1.99	0.13	1.10	2.4	112	0	2.31	2.74	2.64	3.52	2.70	3.65	1.45
514328	7005394	Caboolture-091	MBC-062	2.15	2.01	0.14	1.04	2.7	107	0	2.31	2.75	2.63	3.53	2.69	3.69	1.62
513269	7006199	Caboolture-093	MBC-063	2.24	2.08	0.16	1.23	2.8	106	0	2.43	2.94	2.81	3.85	2.88	4.03	1.57
511621	7007284	Caboolture-096	MBC-064	2.26	2.12	0.14	1.12	2.5	125	0	2.45	2.90	2.79	3.71	2.84	3.84	1.48
511339	7008048	Caboolture-097	MBC-065	2.29	2.16	0.13	1.04	2.3	126	0	2.46	2.86	2.77	3.58	2.82	3.70	1.43
511648	7008558	Caboolture-098	MBC-066	2.09	1.96	0.13	1.01	2.5	137	0	2.25	2.66	2.56	3.40	2.62	3.55	1.55
511835	7009040	Caboolture-099	MBC-067	2.15	2.02	0.13	1.02	2.6	137	0	2.31	2.74	2.63	3.49	2.69	3.64	1.58
511446	7009456	Caboolture-100	MBC-068	2.22	2.09	0.13	1.04	2.5	130	0	2.39	2.82	2.71	3.58	2.77	3.73	1.56
511058	7009456	Caboolture-101	MBC-069	2.26	2.12	0.14	1.11	2.5	117	0	2.44	2.90	2.78	3.71	2.84	3.84	1.49
510321	7009818	Caboolture-102	MBC-070	2.25	2.12	0.13	1.03	2.5	105	0	2.42	2.84	2.73	3.60	2.80	3.75	1.56
509784	7010233	Caboolture-103	MBC-071	2.26	2.12	0.14	1.10	2.5	134	0	2.44	2.88	2.78	3.67	2.84	3.83	1.51
509369	7010796	Caboolture-104	MBC-072	2.31	2.18	0.13	1.04	2.5	133	0	2.48	2.90	2.80	3.66	2.86	3.81	1.53
509034	7011198	Caboolture-105	MBC-073	2.48	2.34	0.14	1.07	2.5	22	0	2.65	3.08	2.98	3.86	3.04	4.01	1.52
508833	7011587	Caboolture-106	MBC-074	2.41	2.28	0.13	0.96	2.5	121	0	2.56	2.96	2.85	3.68	2.91	3.82	1.61
508752	7011869	Caboolture-107	MBC-075	2.34	2.20	0.14	1.11	2.6	129	0	2.52	2.97	2.86	3.78	2.93	3.93	1.52
508471	7012110	Caboolture-108	MBC-076	2.38	2.25	0.13	1.04	2.5	129	0	2.55	2.97	2.87	3.72	2.93	3.86	1.51
508926	7012177	Caboolture-109	MBC-077	2.42	2.28	0.14	1.05	2.6	135	0	2.58	3.01	2.90	3.79	2.97	3.95	1.57
509020	7012767	Caboolture-110	MBC-078	2.50	2.35	0.15	1.12	2.7	128	0	2.67	3.13	3.01	3.97	3.08	4.13	1.58
508565	7013276	Caboolture-111	MBC-079	2.58	2.46	0.12	1.02	2.3	132	0	2.75	3.15	3.06	3.87	3.11	3.99	1.44
508069	7013611	Caboolture-112	MBC-080	2.77	2.63	0.14	1.15	2.6	340	0	2.96	3.42	3.31	4.26	3.38	4.42	1.51
507667	7013960	Caboolture-113	MBC-081	2.83	2.70	0.13	1.04	2.3	130	0	3.00	3.39	3.31	4.11	3.36	4.23	1.41
507157	7014067	Caboolture-114	MBC-082	2.87	2.74	0.13	1.04	2.3	130	0	3.04	3.44	3.35	4.17	3.40	4.29	1.43
507171	7014777	Caboolture-116	MBC-083	2.78	2.65	0.13	1.06	2.5	131	0	2.96	3.40	3.28	4.17	3.34	4.30	1.50
507063	7015595	Caboolture-116	MBC-084	2.82	2.68	0.14	1.09	2.6	130	0	3.00	3.43	3.33	4.23	3.39	4.38	1.53
509121	6984944	Redcliffe-005	MBC-085	2.39	2.22	0.17	1.21	3.0	172	0	2.56	3.09	2.93	4.03	3.01	4.22	1.71
509533	6984891	Redcliffe-006	MBC-086	2.31	2.16	0.15	1.17	2.8	193	0	2.49	2.99	2.85	3.87	2.92	4.05	1.63
509892	6984691	Redcliffe-007	MBC-087	2.25	2.10	0.15	1.15	2.8	194	0	2.43	2.92	2.78	3.79	2.85	3.97	1.65
510464	6984279	Redcliffe-009	MBC-088	2.18	1.99	0.19	1.32	3.4	131	0	2.35	2.96	2.74	4.04	2.82	4.26	1.84
510783	6984638	Redcliffe-010	MBC-089	2.14	1.92	0.22	1.61	3.5	128	0	2.35	3.08	2.82	4.34	2.92	4.59	1.72
510969	6985516	Redcliffe-012	MBC-090	2.16	1.93	0.23	1.66	3.7	115	0	2.37	3.15	2.84	4.48	2.94	4.76	1.81
511076	6985889	Redcliffe-013	MBC-091	2.16	1.93	0.23	1.59	3.8	119	0	2.34	3.12	2.80	4.43	2.89	4.71	1.90
511488	6987365	Redcliffe-016	MBC-092	2.21	1.93	0.28	1.87	4.4	113	0	2.39	3.35	2.90	4.93	3.01	5.28	1.99
511768	6988017	Redcliffe-018	MBC-093	2.17	1.88	0.29	1.92	4.5	113	0	2.34	3.34	2.86	4.99	2.98	5.35	2.02
511648	6988496	Redcliffe-019	MBC-094	2.16	1.91	0.25	1.60	4.3	111	0	2.30	3.15	2.74	4.55	2.84	4.86	2.10
511741	6989254	Redcliffe-021	MBC-095	2.21	1.91	0.30	1.96	4.6	116	0	2.38	3.41	2.91	5.10	3.02	5.48	2.06
511874	6990079	Redcliffe-023	MBC-096	2.18	1.89	0.29	1.92	4.5	119	0	2.35	3.36	2.87	5.01	2.99	5.37	2.04
511648	6990451	Redcliffe-024	MBC-097	2.18	1.92	0.26	1.66	4.3	109	0	2.33	3.20	2.78	4.65	2.89	4.98	2.10
511661	6991063	Redcliffe-025	MBC-098	2.20	1.93	0.27	1.76	4.3	118	0	2.36	3.27	2.85	4.77	2.95	5.09	2.01
511568	6992087	Redcliffe-027	MBC-099	2.20	1.93	0.27	1.85	4.2	115	0	2.39	3.32	2.90	4.87	3.01	5.20	1.94
511475	6992513	Redcliffe-028	MBC-100	2.15	1.93	0.22	1.53	3.6	124	0	2.34	3.06	2.78	4.30	2.87	4.56	1.84
510916	6992713	Redcliffe-029	MBC-101	2.11	1.92	0.19	1.32	3.4	57	0	2.28	2.90	2.67	3.97	2.75	4.19	1.85
510531	6992472	Redcliffe-030	MBC-102	2.08	1.92	0.16	1.30	2.8	250	0	2.29	2.82	2.69	3.77	2.77	3.96	1.54
510161	6992164	Redcliffe-031	MBC-103	2.13	1.95	0.18	1.51	2.9	247	0	2.39	3.01	2.84	4.12	2.92	4.30	1.49
509833	6991712	Redcliffe-032	MBC-104	2.08	1.95	0.13	1.10	2.4	229	0	2.27	2.69	2.60	3.47	2.66	3.60	1.44
509525	6991322	Redcliffe-033	MBC-105	2.09	1.95	0.14	1.15	2.4	230	0	2.28	2.71	2.63	3.51	2.69	3.64	1.42
509155	6991199	Redcliffe-034	MBC-106	2.10	1.96	0.14	1.17	2.4	227	0	2.30	2.73	2.65	3.52	2.71	3.65	1.39
508478	6991343	Redcliffe-035	MBC-107	2.13	2.00	0.13	1.03	2.3	126	0	2.30	2.70	2.61	3.42	2.66	3.54	1.44
507965	6991487	Redcliffe-036	MBC-108	2.16	2.03	0.13	1.06	2.4	125	0	2.34	2.75	2.66	3.51	2.71	3.63	1.45
507205	6991589	Redcliffe-037	MBC-109	2.21	2.08	0.13	1.04	2.4	125	0	2.38	2.79	2.70	3.52	2.75	3.64	1.45
506548	6991836	Redcliffe-038	MBC-110	2.28	2.12	0.16	1.07	3.0	49	0	2.42	2.91	2.75	3.77	2.82	3.95	1.82
505830	6992082	Redcliffe-039	MBC-111	2.33	2.17	0.16	1.11	3.0	61	0	2.48	2.98	2.82	3.86	2.89	4.04	1.77
505357.8	6992266.6	Redcliffe-040	MBC-112	2.36	2.21	0.15	1.02	2.9	64	0	2.50	2.96	2.81	3.77	2.88	3.94	1.79

				Water Level mAHD 200yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	1.96	1.96		1.21	2.7	104	0							
506913	6982622	PineRiver-001	MBC-001	2.52	2.38	0.14	1.09	2.5	129	0	2.70	3.13	3.03	3.92	3.09	4.07	1.51
507065	6983136	PineRiver-002	MBC-002	2.59	2.44	0.15	1.17	2.7	136	0	2.78	3.25	3.13	4.11	3.20	4.28	1.55
507237	6983516	PineRiver-003	MBC-003	2.57	2.44	0.13	1.05	2.5	128	0	2.75	3.17	3.07	3.93	3.13	4.08	1.52
507198	6984049	PineRiver-004	MBC-004	2.63	2.51	0.12	0.98	2.4	130	0	2.79	3.20	3.09	3.92	3.14	4.03	1.50
506913	6984334	PineRiver-005	MBC-005	2.79	2.68	0.11	0.86	2.2	131	0	2.93	3.27	3.18	3.89	3.22	3.99	1.46
507046	6984696	PineRiver-006	MBC-006	2.89	2.78	0.11	0.88	2.2	139	0	3.03	3.37	3.29	3.99	3.34	4.10	1.44
507522	6984334	PineRiver-007	MBC-007	2.65	2.52	0.13	1.01	2.5	135	0	2.81	3.22	3.12	3.95	3.18	4.10	1.52
507769	6984239	PineRiver-008	MBC-008	2.57	2.41	0.16	1.24	2.8	128	0	2.77	3.28	3.14	4.21	3.22	4.39	1.59
506179	6982661	PineRiver-009	MBC-009	2.79	2.68	0.11	0.86	2.2	131	0	2.93	3.27	3.18	3.89	3.22	3.99	1.46
504927	6992513	Caboolture-001	MBC-010	2.55	2.40	0.15	1.09	2.8	60	0	2.71	3.18	3.04	4.03	3.11	4.20	1.70
504270	6992575	Caboolture-002	MBC-011	2.56	2.44	0.12	0.98	2.3	128	0	2.72	3.11	3.02	3.82	3.06	3.93	1.46
503633	6992841	Caboolture-003	MBC-012	2.72	2.59	0.13	1.02	2.6	64	0	2.88	3.31	3.20	4.07	3.26	4.22	1.59
503346	6993519	Caboolture-004	MBC-013	2.81	2.68	0.13	1.05	2.4	129	0	2.98	3.41	3.30	4.17	3.35	4.29	1.47
503613	6994402	Caboolture-005	MBC-014	2.87	2.75	0.12	0.94	2.3	130	0	3.02	3.40	3.30	4.08	3.36	4.21	1.50
504658	6996186	Caboolture-009	MBC-015	2.85	2.71	0.14	1.08	2.7	127	0	3.02	3.48	3.35	4.30	3.42	4.46	1.64
504477	6996546	Caboolture-010	MBC-016	2.98	2.85	0.13	1.03	2.4	130	0	3.15	3.57	3.46	4.33	3.51	4.45	1.50
504774	6997055	Caboolture-012	MBC-017	2.91	2.78	0.13	1.03	2.5	130	0	3.08	3.49	3.39	4.24	3.46	4.38	1.51
505039	6997331	Caboolture-013	MBC-018	2.90	2.77	0.13	0.95	2.6	126	0	3.04	3.45	3.34	4.19	3.39	4.33	1.69
505442	6998582	Caboolture-016	MBC-019	2.99	2.84	0.15	1.13	2.7	128	0	3.17	3.63	3.51	4.47	3.58	4.63	1.57
505671	6999062	Caboolture-017	MBC-020	3.01	2.87	0.14	1.03	2.8	127	0	3.16	3.61	3.48	4.41	3.54	4.57	1.69
505909	6999567	Caboolture-018	MBC-021	3.04	2.89	0.15	1.11	2.9	127	0	3.21	3.69	3.54	4.54	3.61	4.72	1.69
506361	7000127	Caboolture-019	MBC-022	3.08	2.93	0.15	1.16	2.8	132	0	3.26	3.75	3.62	4.61	3.69	4.79	1.60
506813	7000580	Caboolture-020	MBC-023	2.97	2.83	0.14	1.08	2.7	129	0	3.14	3.59	3.47	4.41	3.54	4.58	1.63
507266	7001010	Caboolture-021	MBC-024	2.95	2.78	0.17	1.23	3.2	123	0	3.12	3.68	3.49	4.67	3.57	4.88	1.81
507718	7001452	Caboolture-022	MBC-025	2.98	2.80	0.18	1.27	3.3	129	0	3.15	3.74	3.53	4.76	3.61	4.98	1.83
508289	7001850	Caboolture-023	MBC-026	2.95	2.77	0.18	1.28	3.4	130	0	3.12	3.72	3.50	4.76	3.58	4.98	1.85
508903	7002206	Caboolture-024	MBC-027	2.90	2.71	0.19	1.32	3.5	132	0	3.06	3.70	3.45	4.79	3.53	5.03	1.92
509355	7002550	Caboolture-025	MBC-028	2.88	2.69	0.19	1.30	3.5	134	0	3.04	3.66	3.42	4.73	3.50	4.96	1.90
509894	7002744	Caboolture-026	MBC-029	2.83	2.63	0.20	1.35	3.6	148	0	2.99	3.64	3.38	4.76	3.46	5.00	1.92
510475	7002852	Caboolture-027	MBC-030	2.78	2.59	0.19	1.31	3.5	148	0	2.94	3.57	3.32	4.66	3.41	4.90	1.93
511067	7003003	Caboolture-028	MBC-031	2.72	2.55	0.17	1.21	3.2	151	0	2.88	3.44	3.25	4.42	3.33	4.62	1.82
511477	7003251	Caboolture-029	MBC-032	2.76	2.62	0.14	1.08	2.7	138	0	2.93	3.39	3.26	4.21	3.33	4.37	1.64
512112	7003326	Caboolture-030	MBC-033	2.72	2.56	0.16	1.19	2.9	137	0	2.90	3.41	3.26	4.32	3.34	4.50	1.65
512694	7003455	Caboolture-031	MBC-034	2.66	2.51	0.15	1.12	2.8	141	0	2.83	3.31	3.17	4.16	3.24	4.34	1.66
513275	7003412	Caboolture-032	MBC-035	2.65	2.49	0.16	1.12	3.0	177	0	2.81	3.31	3.15	4.20	3.22	4.38	1.78
513911	7003746	Caboolture-033	MBC-036	2.63	2.50	0.13	1.04	2.4	127	0	2.80	3.23	3.12	3.99	3.17	4.12	1.49
514481	7004446	Caboolture-034	MBC-037	2.40	2.27	0.13	1.02	2.4	125	0	2.57	2.99	2.87	3.74	2.92	3.86	1.50
516248	7002647	Caboolture-038	MBC-038	2.29	2.06	0.23	1.57	3.9	221	0	2.46	3.24	2.91	4.55	3.00	4.83	1.94
517280	7002397	Caboolture-040	MBC-039	2.19	1.98	0.21	1.43	3.7	176	0	2.35	3.05	2.77	4.24	2.86	4.49	1.92
519611	7002925	Caboolture-044	MBC-040	2.07	1.79	0.28	1.95	4.3	117	0	2.27	3.25	2.81	4.87	2.92	5.21	1.91
520367	7003619	Caboolture-046	MBC-041	2.07	1.74	0.33	2.33	4.7	107	0	2.30	3.48	2.91	5.41	3.05	5.82	1.91
520284	7006303	Caboolture-051	MBC-042	2.05	1.71	0.34	2.05	5.6	54	0	2.16	3.38	2.69	5.34	2.81	5.80	2.46
516778	7013518	Caboolture-060	MBC-043	2.19	1.79	0.40	2.49	6.0	58	0	2.33	3.79	2.96	6.11	3.10	6.65	2.35
516320	7014796	Caboolture-061	MBC-044	2.19	1.81	0.38	2.33	5.9	58	0	2.32	3.70	2.91	5.91	3.05	6.42	2.43
507667	7015461	Caboolture-067	MBC-045	2.95	2.82	0.13	1.08	2.4	215	0	3.13	3.56	3.46	4.34	3.51	4.47	1.47
508591	7014764	Caboolture-069	MBC-046	2.94	2.79	0.15	1.27	2.7	227	0	3.16	3.68	3.54	4.60	3.61	4.75	1.49
509101	7014442	Caboolture-070	MBC-047	2.90	2.73	0.17	1.35	2.8	223	0	3.12	3.66	3.53	4.64	3.61	4.83	1.51
509543	7013236	Caboolture-072	MBC-048	2.73	2.57	0.16	1.26	2.8	227	0	2.93	3.45	3.32	4.37	3.39	4.55	1.54
509623	7012592	Caboolture-073	MBC-049	2.65	2.49	0.16	1.30	2.8	225	0	2.86	3.40	3.26	4.35	3.34	4.54	1.56
510253	7011212	Caboolture-075	MBC-050	2.50	2.34	0.16	1.25	2.7	219	0	2.70	3.20	3.08	4.11	3.16	4.29	1.51
510669	7010917	Caboolture-076	MBC-051	2.41	2.28	0.13	0.99	2.4	216	0	2.57	2.96	2.87	3.68	2.92	3.81	1.50
511138	7010769	Caboolture-077	MBC-052	2.42	2.28	0.14	1.10	2.6	154	0	2.60	3.04	2.93	3.85	3.00	4.01	1.54
511701	7010475	Caboolture-078	MBC-053	2.41	2.26	0.15	1.15	2.7	157	0	2.59	3.07	2.94	3.93	3.01	4.10	1.59
512076	7010032	Caboolture-079	MBC-054	2.40	2.23	0.17	1.27	3.0	152	0	2.59	3.14	2.98	4.12	3.06	4.31	1.68
513283	7007901	Caboolture-083	MBC-055	2.19	2.02	0.17	1.32	3.0	231	0	2.40	2.95	2.80	3.94	2.88	4.14	1.60
513390	7007284	Caboolture-084	MBC-056	2.44	2.27	0.17	1.34	2.9	278	0	2.66	3.20	3.06	4.18	3.14	4.37	1.54

				Water Level mAHD 200yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.38	2.20	0.18	1.53	3.0	144	0	2.64	3.27	3.10	4.40	3.18	4.58	1.49
514141	7006547	Caboolture-086	MBC-058	2.38	2.21	0.17	1.45	2.8	247	0	2.63	3.21	3.07	4.25	3.14	4.42	1.47
514958	7005756	Caboolture-088	MBC-059	2.30	2.12	0.18	1.44	3.0	255	0	2.53	3.12	2.97	4.18	3.05	4.39	1.56
515374	7005260	Caboolture-089	MBC-060	2.25	2.08	0.17	1.37	2.8	261	0	2.48	3.05	2.89	4.05	2.96	4.22	1.50
514730	7005140	Caboolture-090	MBC-061	2.21	2.08	0.13	1.10	2.4	112	0	2.40	2.83	2.73	3.61	2.79	3.74	1.45
514328	7005394	Caboolture-091	MBC-062	2.24	2.10	0.14	1.04	2.7	107	0	2.40	2.84	2.72	3.62	2.78	3.78	1.62
513269	7006199	Caboolture-093	MBC-063	2.34	2.18	0.16	1.23	2.8	106	0	2.53	3.04	2.91	3.95	2.98	4.13	1.57
511621	7007284	Caboolture-096	MBC-064	2.36	2.22	0.14	1.16	2.5	127	0	2.56	3.01	2.91	3.83	2.97	3.97	1.45
511339	7008048	Caboolture-097	MBC-065	2.39	2.26	0.13	1.06	2.3	128	0	2.56	2.96	2.88	3.69	2.93	3.80	1.40
511648	7008558	Caboolture-098	MBC-066	2.18	2.05	0.13	1.04	2.5	128	0	2.35	2.77	2.67	3.53	2.73	3.68	1.53
511835	7009040	Caboolture-099	MBC-067	2.24	2.11	0.13	1.02	2.6	137	0	2.40	2.83	2.72	3.58	2.78	3.73	1.58
511446	7009456	Caboolture-100	MBC-068	2.33	2.18	0.15	1.19	2.7	17	0	2.52	3.01	2.89	3.89	2.96	4.06	1.56
511058	7009456	Caboolture-101	MBC-069	2.37	2.22	0.15	1.22	2.7	12	0	2.57	3.07	2.94	3.95	3.02	4.13	1.53
510321	7009818	Caboolture-102	MBC-070	2.37	2.22	0.15	1.19	2.8	14	0	2.56	3.06	2.92	3.94	3.00	4.12	1.59
509784	7010233	Caboolture-103	MBC-071	2.37	2.22	0.15	1.18	2.7	119	0	2.56	3.04	2.92	3.90	2.99	4.07	1.53
509369	7010796	Caboolture-104	MBC-072	2.43	2.29	0.14	1.10	2.6	120	0	2.61	3.06	2.94	3.87	3.01	4.03	1.57
509034	7011198	Caboolture-105	MBC-073	2.60	2.47	0.13	1.07	2.5	122	0	2.78	3.22	3.11	4.00	3.16	4.12	1.49
508833	7011587	Caboolture-106	MBC-074	2.52	2.39	0.13	0.98	2.5	127	0	2.67	3.07	2.97	3.80	3.03	3.94	1.56
508752	7011869	Caboolture-107	MBC-075	2.45	2.31	0.14	1.11	2.6	129	0	2.63	3.08	2.97	3.89	3.04	4.04	1.52
508471	7012110	Caboolture-108	MBC-076	2.49	2.36	0.13	1.04	2.5	129	0	2.66	3.08	2.98	3.83	3.04	3.97	1.51
508926	7012177	Caboolture-109	MBC-077	2.54	2.40	0.14	1.05	2.6	135	0	2.70	3.13	3.02	3.91	3.09	4.07	1.57
509020	7012767	Caboolture-110	MBC-078	2.63	2.48	0.15	1.17	2.7	143	0	2.82	3.29	3.17	4.14	3.24	4.31	1.53
508565	7013276	Caboolture-111	MBC-079	2.73	2.60	0.13	1.05	2.3	133	0	2.90	3.30	3.22	4.03	3.27	4.14	1.41
508069	7013611	Caboolture-112	MBC-080	2.93	2.79	0.14	1.15	2.6	340	0	3.12	3.58	3.47	4.42	3.54	4.58	1.51
507667	7013960	Caboolture-113	MBC-081	3.00	2.87	0.13	1.04	2.3	130	0	3.17	3.56	3.48	4.28	3.53	4.40	1.41
507157	7014067	Caboolture-114	MBC-082	3.04	2.91	0.13	1.04	2.3	130	0	3.21	3.61	3.52	4.34	3.57	4.46	1.43
507171	7014777	Caboolture-115	MBC-083	2.94	2.81	0.13	1.09	2.5	132	0	3.13	3.56	3.46	4.35	3.51	4.48	1.47
507063	7015595	Caboolture-116	MBC-084	2.99	2.85	0.14	1.09	2.6	130	0	3.17	3.60	3.50	4.40	3.56	4.55	1.53
509121	6984944	Redcliffe-005	MBC-085	2.51	2.34	0.17	1.21	3.0	172	0	2.68	3.21	3.05	4.15	3.13	4.34	1.71
509533	6984891	Redcliffe-006	MBC-086	2.42	2.27	0.15	1.17	2.8	193	0	2.60	3.10	2.96	3.98	3.03	4.16	1.63
509892	6984691	Redcliffe-007	MBC-087	2.35	2.20	0.15	1.15	2.8	194	0	2.53	3.02	2.88	3.89	2.95	4.07	1.65
510464	6984279	Redcliffe-009	MBC-088	2.27	2.08	0.19	1.32	3.4	131	0	2.44	3.05	2.83	4.13	2.91	4.35	1.84
510783	6984638	Redcliffe-010	MBC-089	2.22	2.00	0.22	1.61	3.5	128	0	2.43	3.16	2.90	4.42	3.00	4.67	1.72
510969	6985516	Redcliffe-012	MBC-090	2.24	2.01	0.23	1.66	3.7	115	0	2.45	3.23	2.92	4.56	3.02	4.84	1.81
511076	6985889	Redcliffe-013	MBC-091	2.24	2.01	0.23	1.59	3.8	119	0	2.42	3.20	2.88	4.51	2.97	4.79	1.90
511488	6987365	Redcliffe-016	MBC-092	2.29	2.01	0.28	1.87	4.4	113	0	2.47	3.43	2.98	5.01	3.09	5.36	1.99
511768	6988017	Redcliffe-018	MBC-093	2.24	1.95	0.29	1.92	4.5	113	0	2.41	3.41	2.93	5.06	3.05	5.42	2.02
511648	6988496	Redcliffe-019	MBC-094	2.24	1.99	0.25	1.60	4.3	111	0	2.38	3.23	2.82	4.63	2.92	4.94	2.10
511741	6989254	Redcliffe-021	MBC-095	2.29	1.99	0.30	1.98	4.5	116	0	2.47	3.49	3.00	5.17	3.12	5.53	1.99
511874	6990079	Redcliffe-023	MBC-096	2.26	1.97	0.29	1.92	4.5	119	0	2.43	3.44	2.95	5.09	3.07	5.45	2.04
511648	6990451	Redcliffe-024	MBC-097	2.25	1.99	0.26	1.66	4.3	109	0	2.40	3.27	2.85	4.72	2.96	5.05	2.10
511661	6991063	Redcliffe-025	MBC-098	2.28	2.01	0.27	1.76	4.3	118	0	2.44	3.35	2.93	4.85	3.03	5.17	2.01
511568	6992087	Redcliffe-027	MBC-099	2.28	2.01	0.27	1.85	4.2	115	0	2.47	3.40	2.98	4.95	3.09	5.28	1.94
511475	6992513	Redcliffe-028	MBC-100	2.23	2.01	0.22	1.53	3.6	124	0	2.42	3.14	2.86	4.38	2.95	4.64	1.84
510916	6992713	Redcliffe-029	MBC-101	2.18	1.99	0.19	1.32	3.4	57	0	2.35	2.97	2.74	4.04	2.82	4.26	1.85
510531	6992472	Redcliffe-030	MBC-102	2.16	2.00	0.16	1.30	2.8	250	0	2.37	2.90	2.77	3.85	2.85	4.04	1.54
510161	6992164	Redcliffe-031	MBC-103	2.23	2.03	0.20	1.51	3.3	41	0	2.45	3.11	2.89	4.28	2.98	4.52	1.69
509833	6991712	Redcliffe-032	MBC-104	2.17	2.04	0.13	1.13	2.4	226	0	2.37	2.79	2.71	3.57	2.76	3.70	1.41
509525	6991322	Redcliffe-033	MBC-105	2.17	2.03	0.14	1.19	2.4	227	0	2.37	2.81	2.73	3.62	2.79	3.75	1.39
509155	6991199	Redcliffe-034	MBC-106	2.20	2.05	0.15	1.26	2.5	224	0	2.42	2.86	2.80	3.71	2.86	3.85	1.37
508478	6991343	Redcliffe-035	MBC-107	2.22	2.09	0.13	1.06	2.3	128	0	2.39	2.79	2.71	3.52	2.76	3.64	1.41
507965	6991487	Redcliffe-036	MBC-108	2.26	2.13	0.13	1.06	2.4	125	0	2.44	2.85	2.76	3.61	2.81	3.73	1.45
507205	6991589	Redcliffe-037	MBC-109	2.33	2.18	0.15	1.04	2.9	44	0	2.47	2.94	2.79	3.77	2.86	3.95	1.79
506548	6991836	Redcliffe-038	MBC-110	2.39	2.23	0.16	1.07	3.0	49	0	2.53	3.02	2.86	3.88	2.93	4.06	1.82
505830	6992082	Redcliffe-039	MBC-111	2.45	2.29	0.16	1.11	3.0	61	0	2.60	3.10	2.94	3.98	3.01	4.16	1.77
505358	6992267	Redcliffe-040	MBC-112	2.48	2.33	0.15	1.02	3.0	61	0	2.62	3.08	2.93	3.90	3.00	4.08	1.82

				Water Level mAHD 500yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	2.07	2.07		1.21	2.7	104	0							
506913	6982622	PineRiver-001	MBC-001	2.69	2.55	0.14	1.11	2.5	130	0	2.87	3.31	3.21	4.11	3.27	4.24	1.46
507065	6983136	PineRiver-002	MBC-002	2.76	2.61	0.15	1.23	2.7	137	0	2.97	3.46	3.34	4.35	3.41	4.53	1.51
507237	6983516	PineRiver-003	MBC-003	2.75	2.62	0.13	1.07	2.5	129	0	2.93	3.36	3.26	4.14	3.31	4.27	1.48
507198	6984049	PineRiver-004	MBC-004	2.82	2.70	0.12	0.98	2.4	130	0	2.98	3.39	3.28	4.11	3.33	4.22	1.50
506913	6984334	PineRiver-005	MBC-005	3.00	2.89	0.11	0.86	2.2	131	0	3.14	3.48	3.39	4.10	3.43	4.20	1.46
507046	6984696	PineRiver-006	MBC-006	3.11	3.00	0.11	0.88	2.2	139	0	3.25	3.59	3.51	4.21	3.56	4.32	1.44
507522	6984334	PineRiver-007	MBC-007	2.84	2.71	0.13	1.01	2.5	135	0	3.00	3.41	3.31	4.14	3.37	4.29	1.52
507769	6984239	PineRiver-008	MBC-008	2.74	2.58	0.16	1.24	2.8	128	0	2.94	3.45	3.31	4.38	3.39	4.56	1.59
506179	6982661	PineRiver-009	MBC-009	3.00	2.89	0.11	0.86	2.2	131	0	3.14	3.48	3.39	4.10	3.43	4.20	1.46
504927	6992513	Caboolture-001	MBC-010	2.72	2.57	0.15	1.09	2.8	60	0	2.88	3.35	3.21	4.20	3.28	4.37	1.70
504270	6992575	Caboolture-002	MBC-011	2.75	2.62	0.13	0.99	2.6	61	0	2.91	3.32	3.21	4.06	3.27	4.21	1.61
503633	6992841	Caboolture-003	MBC-012	2.92	2.79	0.13	1.04	2.5	66	0	3.09	3.51	3.41	4.28	3.47	4.42	1.54
503346	6993519	Caboolture-004	MBC-013	3.02	2.89	0.13	1.05	2.4	129	0	3.19	3.62	3.51	4.38	3.56	4.50	1.47
503613	6994402	Caboolture-005	MBC-014	3.10	2.98	0.12	0.94	2.3	130	0	3.25	3.63	3.53	4.31	3.59	4.44	1.50
504658	6996186	Caboolture-009	MBC-015	3.07	2.93	0.14	1.08	2.7	127	0	3.24	3.70	3.57	4.52	3.64	4.68	1.64
504477	6996546	Caboolture-010	MBC-016	3.21	3.08	0.13	1.03	2.4	130	0	3.38	3.80	3.69	4.56	3.74	4.68	1.50
504774	6997055	Caboolture-012	MBC-017	3.14	3.01	0.13	1.03	2.5	130	0	3.31	3.72	3.62	4.47	3.69	4.61	1.51
505039	6997331	Caboolture-013	MBC-018	3.13	3.00	0.13	0.95	2.6	126	0	3.27	3.68	3.57	4.42	3.62	4.56	1.69
505442	6998582	Caboolture-016	MBC-019	3.22	3.07	0.15	1.13	2.7	128	0	3.40	3.86	3.74	4.70	3.81	4.86	1.57
505671	6999062	Caboolture-017	MBC-020	3.24	3.10	0.14	1.03	2.8	127	0	3.39	3.84	3.71	4.64	3.77	4.80	1.69
505909	6999567	Caboolture-018	MBC-021	3.28	3.13	0.15	1.11	2.9	127	0	3.45	3.93	3.78	4.78	3.85	4.96	1.69
506361	7000127	Caboolture-019	MBC-022	3.32	3.17	0.15	1.16	2.8	132	0	3.50	3.99	3.86	4.85	3.93	5.03	1.60
506813	7000580	Caboolture-020	MBC-023	3.20	3.06	0.14	1.08	2.7	129	0	3.37	3.82	3.70	4.64	3.77	4.81	1.63
507266	7001010	Caboolture-021	MBC-024	3.17	3.00	0.17	1.24	3.1	126	0	3.35	3.90	3.72	4.87	3.80	5.07	1.74
507718	7001452	Caboolture-022	MBC-025	3.21	3.03	0.18	1.27	3.3	129	0	3.38	3.97	3.76	4.99	3.84	5.21	1.83
508289	7001850	Caboolture-023	MBC-026	3.17	2.99	0.18	1.30	3.3	132	0	3.35	3.94	3.73	4.98	3.81	5.19	1.79
508903	7002206	Caboolture-024	MBC-027	3.11	2.92	0.19	1.33	3.4	133	0	3.28	3.90	3.67	4.99	3.76	5.22	1.86
509355	7002550	Caboolture-025	MBC-028	3.09	2.90	0.19	1.31	3.4	136	0	3.25	3.87	3.64	4.93	3.72	5.16	1.84
509894	7002744	Caboolture-026	MBC-029	3.02	2.82	0.20	1.37	3.5	140	0	3.19	3.83	3.59	4.94	3.67	5.18	1.84
510475	7002852	Caboolture-027	MBC-030	2.97	2.78	0.19	1.33	3.4	140	0	3.14	3.76	3.53	4.84	3.62	5.07	1.85
511067	7003003	Caboolture-028	MBC-031	2.91	2.74	0.17	1.21	3.1	143	0	3.08	3.62	3.45	4.58	3.52	4.77	1.76
511477	7003251	Caboolture-029	MBC-032	2.96	2.82	0.14	1.08	2.7	138	0	3.13	3.59	3.46	4.41	3.53	4.57	1.64
512112	7003326	Caboolture-030	MBC-033	2.91	2.75	0.16	1.19	2.9	137	0	3.09	3.60	3.45	4.51	3.53	4.69	1.65
512694	7003455	Caboolture-031	MBC-034	2.85	2.69	0.16	1.12	3.0	154	0	3.01	3.50	3.35	4.39	3.42	4.57	1.75
513275	7003412	Caboolture-032	MBC-035	2.83	2.67	0.16	1.12	3.0	177	0	2.99	3.49	3.33	4.38	3.40	4.56	1.78
513911	7003746	Caboolture-033	MBC-036	2.80	2.67	0.13	1.06	2.4	127	0	2.98	3.40	3.30	4.15	3.35	4.27	1.46
514481	7004446	Caboolture-034	MBC-037	2.54	2.41	0.13	1.02	2.4	125	0	2.71	3.13	3.01	3.88	3.06	4.00	1.50
516248	7002647	Caboolture-038	MBC-038	2.40	2.17	0.23	1.57	3.9	221	0	2.57	3.35	3.02	4.66	3.11	4.94	1.94
517280	7002397	Caboolture-040	MBC-039	2.28	2.07	0.21	1.43	3.7	176	0	2.44	3.14	2.86	4.33	2.95	4.58	1.92
519611	7002925	Caboolture-044	MBC-040	2.13	1.85	0.28	1.95	4.3	117	0	2.33	3.31	2.87	4.93	2.98	5.27	1.91
520367	7003619	Caboolture-046	MBC-041	2.13	1.80	0.33	2.33	4.7	107	0	2.36	3.54	2.97	5.47	3.11	5.88	1.91
520284	7006303	Caboolture-051	MBC-042	2.11	1.77	0.34	2.05	5.6	54	0	2.22	3.44	2.75	5.40	2.87	5.86	2.46
516778	7013518	Caboolture-060	MBC-043	2.26	1.86	0.40	2.49	6.0	58	0	2.40	3.86	3.03	6.18	3.17	6.72	2.35
516320	7014796	Caboolture-061	MBC-044	2.26	1.88	0.38	2.33	5.9	58	0	2.39	3.77	2.98	5.98	3.12	6.49	2.43
507667	7015461	Caboolture-067	MBC-045	3.17	3.04	0.13	1.08	2.4	215	0	3.35	3.78	3.68	4.56	3.73	4.69	1.47
508591	7014764	Caboolture-069	MBC-046	3.16	3.00	0.16	1.32	2.7	226	0	3.38	3.92	3.78	4.87	3.85	5.03	1.48
509101	7014442	Caboolture-070	MBC-047	3.11	2.93	0.18	1.46	2.9	222	0	3.35	3.94	3.79	4.99	3.88	5.20	1.50
509543	7013236	Caboolture-072	MBC-048	2.92	2.75	0.17	1.36	2.9	227	0	3.14	3.69	3.55	4.69	3.63	4.88	1.53
509623	7012592	Caboolture-073	MBC-049	2.83	2.66	0.17	1.40	2.9	225	0	3.06	3.63	3.49	4.66	3.57	4.86	1.54
510253	7011212	Caboolture-075	MBC-050	2.65	2.49	0.16	1.29	2.7	221	0	2.86	3.38	3.26	4.31	3.33	4.49	1.50
510669	7010917	Caboolture-076	MBC-051	2.55	2.42	0.13	0.99	2.4	216	0	2.71	3.10	3.01	3.82	3.06	3.95	1.50
511138	7010769	Caboolture-077	MBC-052	2.56	2.42	0.14	1.10	2.6	154	0	2.74	3.18	3.07	3.99	3.14	4.15	1.54
511701	7010475	Caboolture-078	MBC-053	2.55	2.40	0.15	1.15	2.7	216	0	2.73	3.20	3.08	4.05	3.15	4.21	1.55
512076	7010032	Caboolture-079	MBC-054	2.54	2.37	0.17	1.29	3.0	236	0	2.74	3.29	3.13	4.28	3.21	4.48	1.66
513283	7007901	Caboolture-083	MBC-055	2.29	2.12	0.17	1.34	3.0	248	0	2.50	3.06	2.91	4.07	2.99	4.27	1.60
513390	7007284	Caboolture-084	MBC-056	2.59	2.42	0.17	1.35	2.8	250	0	2.81	3.35	3.22	4.33	3.30	4.52	1.51

				Water Level mAHD 500yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.51	2.33	0.18	1.53	3.0	144	0	2.77	3.40	3.23	4.53	3.31	4.71	1.49
514141	7006547	Caboolture-086	MBC-058	2.51	2.34	0.17	1.45	2.8	247	0	2.76	3.34	3.20	4.38	3.27	4.55	1.47
514958	7005756	Caboolture-088	MBC-059	2.42	2.24	0.18	1.44	3.0	255	0	2.65	3.24	3.09	4.30	3.17	4.51	1.56
515374	7005260	Caboolture-089	MBC-060	2.36	2.19	0.17	1.37	2.8	261	0	2.59	3.16	3.00	4.16	3.07	4.33	1.50
514730	7005140	Caboolture-090	MBC-061	2.32	2.19	0.13	1.10	2.4	112	0	2.51	2.94	2.84	3.72	2.90	3.85	1.45
514328	7005394	Caboolture-091	MBC-062	2.35	2.21	0.14	1.04	2.7	107	0	2.51	2.95	2.83	3.73	2.89	3.89	1.62
513269	7006199	Caboolture-093	MBC-063	2.47	2.31	0.16	1.23	2.8	106	0	2.66	3.17	3.04	4.08	3.11	4.26	1.57
511621	7007284	Caboolture-096	MBC-064	2.50	2.36	0.14	1.16	2.5	127	0	2.70	3.15	3.05	3.97	3.11	4.11	1.45
511339	7008048	Caboolture-097	MBC-065	2.53	2.40	0.13	1.06	2.3	128	0	2.70	3.10	3.02	3.83	3.07	3.94	1.40
511648	7008558	Caboolture-098	MBC-066	2.28	2.15	0.13	1.04	2.5	128	0	2.45	2.87	2.77	3.63	2.83	3.78	1.53
511835	7009040	Caboolture-099	MBC-067	2.36	2.22	0.14	1.06	2.6	109	0	2.53	2.96	2.85	3.74	2.91	3.89	1.55
511446	7009456	Caboolture-100	MBC-068	2.46	2.31	0.15	1.19	2.7	17	0	2.65	3.14	3.02	4.02	3.09	4.19	1.56
511058	7009456	Caboolture-101	MBC-069	2.50	2.35	0.15	1.22	2.7	12	0	2.70	3.20	3.07	4.08	3.15	4.26	1.53
510321	7009818	Caboolture-102	MBC-070	2.50	2.35	0.15	1.19	2.8	14	0	2.69	3.19	3.05	4.07	3.13	4.25	1.59
509784	7010233	Caboolture-103	MBC-071	2.50	2.35	0.15	1.20	2.7	92	0	2.70	3.19	3.06	4.07	3.13	4.24	1.56
509369	7010796	Caboolture-104	MBC-072	2.58	2.43	0.15	1.14	2.7	119	0	2.76	3.23	3.11	4.07	3.17	4.23	1.56
509034	7011198	Caboolture-105	MBC-073	2.77	2.64	0.13	1.07	2.5	122	0	2.95	3.39	3.28	4.17	3.33	4.29	1.49
508833	7011587	Caboolture-106	MBC-074	2.68	2.55	0.13	1.00	2.5	129	0	2.84	3.24	3.15	3.97	3.21	4.12	1.53
508752	7011869	Caboolture-107	MBC-075	2.60	2.46	0.14	1.11	2.6	124	0	2.78	3.23	3.12	4.04	3.19	4.20	1.54
508471	7012110	Caboolture-108	MBC-076	2.65	2.52	0.13	1.04	2.5	129	0	2.82	3.24	3.14	3.99	3.20	4.13	1.51
508926	7012177	Caboolture-109	MBC-077	2.70	2.56	0.14	1.10	2.5	135	0	2.88	3.32	3.22	4.11	3.28	4.27	1.51
509020	7012767	Caboolture-110	MBC-078	2.80	2.65	0.15	1.20	2.7	132	0	3.00	3.48	3.36	4.35	3.43	4.52	1.51
508565	7013276	Caboolture-111	MBC-079	2.91	2.78	0.13	1.05	2.3	133	0	3.08	3.48	3.40	4.21	3.45	4.32	1.41
508069	7013611	Caboolture-112	MBC-080	3.14	3.00	0.14	1.15	2.6	340	0	3.33	3.79	3.68	4.63	3.75	4.79	1.51
507667	7013960	Caboolture-113	MBC-081	3.22	3.09	0.13	1.04	2.3	130	0	3.39	3.78	3.70	4.50	3.75	4.62	1.41
507157	7014067	Caboolture-114	MBC-082	3.27	3.14	0.13	1.04	2.3	130	0	3.44	3.84	3.75	4.57	3.80	4.69	1.43
507171	7014777	Caboolture-115	MBC-083	3.15	3.02	0.13	1.09	2.5	132	0	3.34	3.77	3.67	4.56	3.72	4.69	1.47
507063	7015595	Caboolture-116	MBC-084	3.20	3.06	0.14	1.09	2.6	130	0	3.38	3.81	3.71	4.61	3.77	4.76	1.53
509121	6984944	Redcliffe-005	MBC-085	2.67	2.50	0.17	1.21	3.0	172	0	2.84	3.37	3.21	4.31	3.29	4.50	1.71
509533	6984891	Redcliffe-006	MBC-086	2.57	2.42	0.15	1.17	2.8	193	0	2.75	3.25	3.11	4.13	3.18	4.31	1.63
509892	6984691	Redcliffe-007	MBC-087	2.49	2.34	0.15	1.16	2.8	195	0	2.67	3.16	3.03	4.02	3.10	4.19	1.59
510464	6984279	Redcliffe-009	MBC-088	2.38	2.19	0.19	1.32	3.4	131	0	2.55	3.16	2.94	4.24	3.02	4.46	1.84
510783	6984638	Redcliffe-010	MBC-089	2.32	2.10	0.22	1.61	3.5	128	0	2.53	3.26	3.00	4.52	3.10	4.77	1.72
510969	6985516	Redcliffe-012	MBC-090	2.35	2.12	0.23	1.66	3.7	115	0	2.56	3.34	3.03	4.67	3.13	4.95	1.81
511076	6985889	Redcliffe-013	MBC-091	2.35	2.12	0.23	1.59	3.8	119	0	2.53	3.31	2.99	4.62	3.08	4.90	1.90
511488	6987365	Redcliffe-016	MBC-092	2.39	2.11	0.28	1.87	4.4	113	0	2.57	3.53	3.08	5.11	3.19	5.46	1.99
511768	6988017	Redcliffe-018	MBC-093	2.34	2.05	0.29	1.92	4.5	113	0	2.51	3.51	3.03	5.16	3.15	5.52	2.02
511648	6988496	Redcliffe-019	MBC-094	2.34	2.09	0.25	1.60	4.3	111	0	2.48	3.33	2.92	4.73	3.02	5.04	2.10
511741	6989254	Redcliffe-021	MBC-095	2.40	2.10	0.30	1.98	4.5	116	0	2.58	3.60	3.11	5.28	3.23	5.64	1.99
511874	6990079	Redcliffe-023	MBC-096	2.36	2.07	0.29	1.92	4.5	119	0	2.53	3.54	3.05	5.19	3.17	5.55	2.04
511648	6990451	Redcliffe-024	MBC-097	2.36	2.10	0.26	1.68	4.3	110	0	2.51	3.39	2.98	4.83	3.08	5.15	2.05
511661	6991063	Redcliffe-025	MBC-098	2.38	2.12	0.26	1.78	4.2	119	0	2.56	3.46	3.05	4.96	3.16	5.28	1.96
511568	6992087	Redcliffe-027	MBC-099	2.38	2.11	0.27	1.87	4.1	115	0	2.58	3.50	3.10	5.04	3.21	5.37	1.89
511475	6992513	Redcliffe-028	MBC-100	2.32	2.11	0.21	1.55	3.6	125	0	2.52	3.24	2.97	4.47	3.06	4.73	1.78
510916	6992713	Redcliffe-029	MBC-101	2.29	2.10	0.19	1.32	3.4	57	0	2.46	3.08	2.85	4.15	2.93	4.37	1.85
510531	6992472	Redcliffe-030	MBC-102	2.26	2.10	0.16	1.32	2.7	238	0	2.48	3.00	2.88	3.95	2.95	4.10	1.46
510161	6992164	Redcliffe-031	MBC-103	2.32	2.14	0.18	1.57	2.9	234	0	2.59	3.20	3.07	4.30	3.14	4.48	1.43
509833	6991712	Redcliffe-032	MBC-104	2.28	2.15	0.13	1.13	2.4	226	0	2.48	2.90	2.82	3.68	2.87	3.81	1.41
509525	6991322	Redcliffe-033	MBC-105	2.28	2.14	0.14	1.19	2.4	227	0	2.48	2.92	2.84	3.73	2.90	3.86	1.39
509155	6991199	Redcliffe-034	MBC-106	2.31	2.16	0.15	1.26	2.5	224	0	2.53	2.97	2.91	3.82	2.97	3.96	1.37
508478	6991343	Redcliffe-035	MBC-107	2.34	2.21	0.13	1.06	2.3	128	0	2.51	2.91	2.83	3.64	2.88	3.76	1.41
507965	6991487	Redcliffe-036	MBC-108	2.39	2.26	0.13	1.09	2.4	128	0	2.58	2.98	2.91	3.74	2.96	3.86	1.41
507205	6991589	Redcliffe-037	MBC-109	2.44	2.31	0.13	1.07	2.3	128	0	2.62	3.02	2.94	3.76	2.99	3.88	1.41
506548	6991836	Redcliffe-038	MBC-110	2.52	2.37	0.15	1.13	2.9	51	0	2.69	3.18	3.04	4.06	3.11	4.24	1.70
505830	6992082	Redcliffe-039	MBC-111	2.60	2.44	0.16	1.19	3.0	55	0	2.78	3.30	3.14	4.23	3.21	4.42	1.72
505358	6992267	Redcliffe-040	MBC-112	2.64	2.49	0.15	1.08	2.9	58	0	2.80	3.27	3.13	4.12	3.20	4.29	1.73

				Water Level mAHD 1000yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
516482	6972941	BrisbaneBar	BrisbaneBar	2.14	2.14		1.21	2.7	104	0							
506913	6982622	PineRiver-001	MBC-001	2.82	2.68	0.14	1.11	2.5	130	0	3.00	3.44	3.34	4.24	3.40	4.37	1.46
507065	6983136	PineRiver-002	MBC-002	2.90	2.75	0.15	1.23	2.7	137	0	3.11	3.60	3.48	4.49	3.55	4.67	1.51
507237	6983516	PineRiver-003	MBC-003	2.88	2.75	0.13	1.07	2.5	129	0	3.06	3.49	3.39	4.27	3.44	4.40	1.48
507198	6984049	PineRiver-004	MBC-004	2.96	2.84	0.12	1.00	2.3	131	0	3.13	3.52	3.43	4.24	3.48	4.35	1.46
506913	6984334	PineRiver-005	MBC-005	3.16	3.05	0.11	0.88	2.1	132	0	3.30	3.64	3.56	4.25	3.60	4.35	1.42
507046	6984696	PineRiver-006	MBC-006	3.28	3.17	0.11	0.91	2.1	140	0	3.43	3.77	3.70	4.39	3.74	4.50	1.40
507522	6984334	PineRiver-007	MBC-007	2.98	2.85	0.13	1.03	2.4	136	0	3.15	3.57	3.46	4.32	3.51	4.44	1.48
507769	6984239	PineRiver-008	MBC-008	2.87	2.71	0.16	1.26	2.8	129	0	3.07	3.58	3.46	4.51	3.53	4.69	1.54
506179	6982661	PineRiver-009	MBC-009	3.16	3.05	0.11	0.88	2.1	132	0	3.30	3.64	3.56	4.25	3.60	4.35	1.42
504927	6992513	Caboolture-001	MBC-010	2.85	2.70	0.15	1.10	2.8	62	0	3.01	3.48	3.35	4.32	3.42	4.49	1.66
504270	6992575	Caboolture-002	MBC-011	2.88	2.75	0.13	1.01	2.5	63	0	3.04	3.46	3.35	4.20	3.41	4.35	1.57
503633	6992841	Caboolture-003	MBC-012	3.08	2.95	0.13	1.06	2.5	64	0	3.26	3.68	3.58	4.45	3.65	4.60	1.52
503346	6993519	Caboolture-004	MBC-013	3.18	3.05	0.13	1.08	2.4	131	0	3.36	3.78	3.69	4.54	3.74	4.66	1.44
503613	6994402	Caboolture-005	MBC-014	3.26	3.14	0.12	0.96	2.3	132	0	3.42	3.80	3.70	4.49	3.75	4.60	1.46
504658	6996186	Caboolture-009	MBC-015	3.23	3.09	0.14	1.08	2.7	130	0	3.40	3.85	3.73	4.67	3.80	4.84	1.63
504477	6996546	Caboolture-010	MBC-016	3.39	3.26	0.13	1.06	2.4	132	0	3.57	3.99	3.89	4.74	3.94	4.86	1.46
504774	6997055	Caboolture-012	MBC-017	3.31	3.18	0.13	1.03	2.5	130	0	3.48	3.89	3.79	4.64	3.86	4.78	1.51
505039	6997331	Caboolture-013	MBC-018	3.29	3.16	0.13	0.96	2.6	129	0	3.44	3.85	3.73	4.58	3.79	4.73	1.67
505442	6998582	Caboolture-016	MBC-019	3.40	3.25	0.15	1.13	2.7	128	0	3.58	4.04	3.92	4.88	3.99	5.04	1.57
505671	6999062	Caboolture-017	MBC-020	3.42	3.28	0.14	1.04	2.7	128	0	3.58	4.02	3.90	4.81	3.96	4.97	1.64
505909	6999567	Caboolture-018	MBC-021	3.46	3.31	0.15	1.12	2.8	129	0	3.63	4.10	3.97	4.95	4.04	5.12	1.63
506361	7000127	Caboolture-019	MBC-022	3.51	3.36	0.15	1.18	2.7	132	0	3.70	4.18	4.06	5.05	4.13	5.22	1.55
506813	7000580	Caboolture-020	MBC-023	3.37	3.23	0.14	1.08	2.7	129	0	3.54	3.99	3.87	4.81	3.94	4.98	1.63
507266	7001010	Caboolture-021	MBC-024	3.34	3.17	0.17	1.24	3.1	126	0	3.52	4.07	3.89	5.04	3.97	5.24	1.74
507718	7001452	Caboolture-022	MBC-025	3.38	3.20	0.18	1.27	3.3	131	0	3.55	4.13	3.93	5.15	4.01	5.37	1.81
508289	7001850	Caboolture-023	MBC-026	3.34	3.16	0.18	1.30	3.3	132	0	3.52	4.11	3.90	5.15	3.98	5.36	1.79
508903	7002206	Caboolture-024	MBC-027	3.27	3.08	0.19	1.33	3.4	133	0	3.44	4.06	3.83	5.15	3.92	5.38	1.86
509355	7002550	Caboolture-025	MBC-028	3.25	3.06	0.19	1.31	3.5	151	0	3.41	4.04	3.79	5.13	3.88	5.36	1.92
509894	7002744	Caboolture-026	MBC-029	3.17	2.97	0.20	1.37	3.6	155	0	3.33	4.00	3.73	5.14	3.82	5.38	1.93
510475	7002852	Caboolture-027	MBC-030	3.12	2.92	0.20	1.33	3.6	156	0	3.27	3.92	3.66	5.03	3.74	5.27	1.94
511067	7003003	Caboolture-028	MBC-031	3.05	2.88	0.17	1.21	3.1	143	0	3.22	3.76	3.59	4.72	3.66	4.91	1.76
511477	7003251	Caboolture-029	MBC-032	3.10	2.96	0.14	1.08	2.7	138	0	3.27	3.73	3.60	4.55	3.67	4.71	1.64
512112	7003326	Caboolture-030	MBC-033	3.05	2.89	0.16	1.19	3.0	158	0	3.23	3.75	3.59	4.68	3.67	4.88	1.73
512694	7003455	Caboolture-031	MBC-034	2.98	2.82	0.16	1.12	3.0	162	0	3.14	3.63	3.48	4.52	3.55	4.70	1.76
513275	7003412	Caboolture-032	MBC-035	2.94	2.80	0.14	1.14	2.6	138	0	3.13	3.59	3.48	4.43	3.55	4.59	1.54
513911	7003746	Caboolture-033	MBC-036	2.94	2.81	0.13	1.06	2.4	127	0	3.12	3.54	3.44	4.29	3.49	4.41	1.46
514481	7004446	Caboolture-034	MBC-037	2.65	2.52	0.13	1.02	2.4	125	0	2.82	3.24	3.12	3.99	3.17	4.11	1.50
516248	7002647	Caboolture-038	MBC-038	2.48	2.25	0.23	1.65	3.8	235	0	2.68	3.47	3.15	4.80	3.25	5.09	1.84
517280	7002397	Caboolture-040	MBC-039	2.35	2.14	0.21	1.43	3.7	176	0	2.51	3.21	2.93	4.40	3.02	4.65	1.92
519611	7002925	Caboolture-044	MBC-040	2.19	1.90	0.29	1.98	4.2	118	0	2.39	3.37	2.94	4.99	3.06	5.33	1.87
520367	7003619	Caboolture-046	MBC-041	2.17	1.84	0.33	2.33	4.7	107	0	2.40	3.58	3.01	5.51	3.15	5.92	1.91
520284	7006303	Caboolture-051	MBC-042	2.15	1.81	0.34	2.05	5.6	54	0	2.26	3.48	2.79	5.44	2.91	5.90	2.46
516778	7013518	Caboolture-060	MBC-043	2.31	1.91	0.40	2.49	6.0	58	0	2.45	3.91	3.08	6.23	3.22	6.77	2.35
516320	7014796	Caboolture-061	MBC-044	2.31	1.93	0.38	2.33	5.9	58	0	2.44	3.82	3.03	6.03	3.17	6.54	2.43
507667	7015461	Caboolture-067	MBC-045	3.33	3.20	0.13	1.08	2.4	215	0	3.51	3.94	3.84	4.72	3.89	4.85	1.47
508591	7014764	Caboolture-069	MBC-046	3.32	3.16	0.16	1.32	2.7	226	0	3.54	4.08	3.94	5.03	4.01	5.19	1.48
509101	7014442	Caboolture-070	MBC-047	3.27	3.09	0.18	1.46	2.9	222	0	3.51	4.10	3.95	5.15	4.04	5.36	1.50
509543	7013236	Caboolture-072	MBC-048	3.06	2.89	0.17	1.36	2.9	227	0	3.28	3.83	3.69	4.83	3.77	5.02	1.53
509623	7012592	Caboolture-073	MBC-049	2.96	2.79	0.17	1.40	2.9	225	0	3.19	3.76	3.62	4.79	3.70	4.99	1.54
510253	7011212	Caboolture-075	MBC-050	2.76	2.60	0.16	1.35	2.8	221	0	2.99	3.54	3.40	4.53	3.47	4.69	1.49
510669	7010917	Caboolture-076	MBC-051	2.65	2.52	0.13	1.03	2.4	218	0	2.82	3.23	3.13	3.98	3.18	4.10	1.48
511138	7010769	Caboolture-077	MBC-052	2.67	2.53	0.14	1.12	2.5	141	0	2.86	3.32	3.20	4.14	3.25	4.27	1.49
511701	7010475	Caboolture-078	MBC-053	2.65	2.50	0.15	1.20	2.7	216	0	2.85	3.33	3.21	4.22	3.28	4.39	1.54
512076	7010032	Caboolture-079	MBC-054	2.65	2.47	0.18	1.40	3.1	223	0	2.86	3.46	3.29	4.53	3.37	4.74	1.64
513283	7007901	Caboolture-083	MBC-055	2.37	2.20	0.17	1.34	3.0	248	0	2.58	3.14	2.99	4.15	3.07	4.35	1.60
513390	7007284	Caboolture-084	MBC-056	2.69	2.52	0.17	1.45	2.9	246	0	2.94	3.53	3.38	4.58	3.45	4.76	1.48

				Water Level mAHD 1000yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{sm}
513444	7006735	Caboolture-085	MBC-057	2.63	2.43	0.20	1.64	3.1	146	0	2.90	3.58	3.39	4.77	3.47	4.97	1.49
514141	7006547	Caboolture-086	MBC-058	2.61	2.44	0.17	1.45	2.8	247	0	2.86	3.44	3.30	4.48	3.37	4.65	1.47
514958	7005756	Caboolture-088	MBC-059	2.51	2.33	0.18	1.44	3.0	255	0	2.74	3.33	3.18	4.39	3.26	4.60	1.56
515374	7005260	Caboolture-089	MBC-060	2.45	2.28	0.17	1.37	2.8	261	0	2.68	3.25	3.09	4.25	3.16	4.42	1.50
514730	7005140	Caboolture-090	MBC-061	2.41	2.28	0.13	1.10	2.4	112	0	2.60	3.03	2.93	3.81	2.99	3.94	1.45
514328	7005394	Caboolture-091	MBC-062	2.44	2.30	0.14	1.04	2.7	107	0	2.60	3.04	2.92	3.82	2.98	3.98	1.62
513269	7006199	Caboolture-093	MBC-063	2.57	2.40	0.17	1.32	2.9	108	0	2.78	3.32	3.18	4.30	3.26	4.49	1.57
511621	7007284	Caboolture-096	MBC-064	2.60	2.46	0.14	1.16	2.5	127	0	2.80	3.25	3.15	4.07	3.21	4.21	1.45
511339	7008048	Caboolture-097	MBC-065	2.63	2.50	0.13	1.06	2.3	128	0	2.80	3.20	3.12	3.93	3.17	4.04	1.40
511648	7008558	Caboolture-098	MBC-066	2.36	2.23	0.13	1.04	2.5	132	0	2.53	2.95	2.85	3.71	2.91	3.85	1.52
511835	7009040	Caboolture-099	MBC-067	2.45	2.31	0.14	1.10	2.6	123	0	2.63	3.08	2.96	3.89	3.03	4.05	1.56
511446	7009456	Caboolture-100	MBC-068	2.55	2.40	0.15	1.19	2.7	17	0	2.74	3.23	3.11	4.11	3.18	4.28	1.56
511058	7009456	Caboolture-101	MBC-069	2.60	2.45	0.15	1.22	2.7	12	0	2.80	3.30	3.17	4.18	3.25	4.36	1.53
510321	7009818	Caboolture-102	MBC-070	2.60	2.45	0.15	1.19	2.8	14	0	2.79	3.29	3.15	4.17	3.23	4.35	1.59
509784	7010233	Caboolture-103	MBC-071	2.61	2.45	0.16	1.28	2.8	18	0	2.82	3.34	3.21	4.28	3.28	4.46	1.55
509369	7010796	Caboolture-104	MBC-072	2.69	2.54	0.15	1.20	2.7	122	0	2.89	3.37	3.25	4.26	3.32	4.43	1.54
509034	7011198	Caboolture-105	MBC-073	2.89	2.76	0.13	1.07	2.5	122	0	3.07	3.51	3.40	4.29	3.45	4.41	1.49
508833	7011587	Caboolture-106	MBC-074	2.80	2.67	0.13	1.00	2.5	129	0	2.96	3.36	3.27	4.09	3.33	4.24	1.53
508752	7011869	Caboolture-107	MBC-075	2.71	2.57	0.14	1.17	2.5	131	0	2.91	3.37	3.27	4.21	3.33	4.35	1.46
508471	7012110	Caboolture-108	MBC-076	2.77	2.63	0.14	1.12	2.5	131	0	2.96	3.40	3.30	4.20	3.35	4.33	1.46
508926	7012177	Caboolture-109	MBC-077	2.82	2.68	0.14	1.10	2.5	135	0	3.00	3.44	3.34	4.23	3.40	4.39	1.51
509020	7012767	Caboolture-110	MBC-078	2.93	2.78	0.15	1.20	2.7	132	0	3.13	3.61	3.49	4.48	3.56	4.65	1.51
508565	7013276	Caboolture-111	MBC-079	3.05	2.92	0.13	1.05	2.3	133	0	3.22	3.62	3.54	4.35	3.59	4.46	1.41
508069	7013611	Caboolture-112	MBC-080	3.30	3.16	0.14	1.15	2.6	340	0	3.49	3.95	3.84	4.79	3.91	4.95	1.51
507667	7013960	Caboolture-113	MBC-081	3.38	3.25	0.13	1.04	2.3	130	0	3.55	3.94	3.86	4.66	3.91	4.78	1.41
507157	7014067	Caboolture-114	MBC-082	3.44	3.31	0.13	1.04	2.3	130	0	3.61	4.01	3.92	4.74	3.97	4.86	1.43
507171	7014777	Caboolture-115	MBC-083	3.31	3.18	0.13	1.09	2.5	132	0	3.50	3.93	3.83	4.72	3.88	4.85	1.47
507063	7015595	Caboolture-116	MBC-084	3.37	3.23	0.14	1.09	2.6	130	0	3.55	3.98	3.88	4.78	3.94	4.93	1.53
509121	6984944	Redcliffe-005	MBC-085	2.78	2.62	0.16	1.23	2.9	193	0	2.97	3.49	3.35	4.43	3.42	4.62	1.65
509533	6984891	Redcliffe-006	MBC-086	2.68	2.53	0.15	1.19	2.8	193	0	2.87	3.36	3.23	4.25	3.31	4.42	1.58
509892	6984691	Redcliffe-007	MBC-087	2.59	2.44	0.15	1.16	2.8	195	0	2.77	3.26	3.13	4.12	3.20	4.29	1.59
510464	6984279	Redcliffe-009	MBC-088	2.47	2.28	0.19	1.32	3.4	131	0	2.64	3.25	3.03	4.33	3.11	4.55	1.84
510783	6984638	Redcliffe-010	MBC-089	2.40	2.18	0.22	1.61	3.5	128	0	2.61	3.34	3.08	4.60	3.18	4.85	1.72
510969	6985516	Redcliffe-012	MBC-090	2.43	2.20	0.23	1.66	3.7	115	0	2.64	3.42	3.11	4.75	3.21	5.03	1.81
511076	6985889	Redcliffe-013	MBC-091	2.43	2.20	0.23	1.59	3.8	119	0	2.61	3.39	3.07	4.70	3.16	4.98	1.90
511488	6987365	Redcliffe-016	MBC-092	2.47	2.19	0.28	1.87	4.4	113	0	2.65	3.61	3.16	5.19	3.27	5.54	1.99
511768	6988017	Redcliffe-018	MBC-093	2.41	2.12	0.29	1.92	4.5	113	0	2.58	3.58	3.10	5.23	3.22	5.59	2.02
511648	6988496	Redcliffe-019	MBC-094	2.42	2.17	0.25	1.60	4.3	111	0	2.56	3.41	3.00	4.81	3.10	5.12	2.10
511741	6989254	Redcliffe-021	MBC-095	2.47	2.17	0.30	1.98	4.5	116	0	2.65	3.67	3.18	5.35	3.30	5.71	1.99
511874	6990079	Redcliffe-023	MBC-096	2.43	2.14	0.29	1.92	4.5	119	0	2.60	3.61	3.12	5.26	3.24	5.62	2.04
511648	6990451	Redcliffe-024	MBC-097	2.43	2.17	0.26	1.68	4.5	68	0	2.57	3.48	3.03	4.97	3.13	5.30	2.15
511661	6991063	Redcliffe-025	MBC-098	2.46	2.20	0.26	1.78	4.2	119	0	2.64	3.54	3.13	5.04	3.24	5.36	1.96
511568	6992087	Redcliffe-027	MBC-099	2.46	2.19	0.27	1.87	4.1	115	0	2.66	3.58	3.18	5.12	3.29	5.45	1.89
511475	6992513	Redcliffe-028	MBC-100	2.40	2.19	0.21	1.55	3.6	125	0	2.60	3.32	3.05	4.55	3.14	4.81	1.78
510916	6992713	Redcliffe-029	MBC-101	2.36	2.17	0.19	1.35	3.3	58	0	2.54	3.15	2.94	4.22	3.03	4.44	1.77
510531	6992472	Redcliffe-030	MBC-102	2.36	2.18	0.18	1.32	3.1	222	0	2.55	3.13	2.95	4.15	3.03	4.36	1.71
510161	6992164	Redcliffe-031	MBC-103	2.42	2.22	0.20	1.59	3.2	32	0	2.66	3.34	3.14	4.53	3.23	4.77	1.60
509833	6991712	Redcliffe-032	MBC-104	2.36	2.23	0.13	1.13	2.4	226	0	2.56	2.98	2.90	3.76	2.95	3.89	1.41
509525	6991322	Redcliffe-033	MBC-105	2.37	2.23	0.14	1.19	2.4	227	0	2.57	3.01	2.93	3.82	2.99	3.95	1.39
509155	6991199	Redcliffe-034	MBC-106	2.42	2.25	0.17	1.30	2.9	50	0	2.62	3.16	3.02	4.13	3.10	4.33	1.59
508478	6991343	Redcliffe-035	MBC-107	2.44	2.30	0.14	1.06	2.7	50	0	2.60	3.05	2.93	3.86	2.99	4.03	1.66
507965	6991487	Redcliffe-036	MBC-108	2.50	2.35	0.15	1.10	2.8	50	0	2.66	3.13	3.00	3.97	3.07	4.14	1.64
507205	6991589	Redcliffe-037	MBC-109	2.56	2.41	0.15	1.10	2.8	49	0	2.72	3.19	3.06	4.03	3.13	4.20	1.64
506548	6991836	Redcliffe-038	MBC-110	2.63	2.48	0.15	1.13	2.9	51	0	2.80	3.29	3.15	4.17	3.22	4.35	1.70
505830	6992082	Redcliffe-039	MBC-111	2.72	2.56	0.16	1.19	3.0	55	0	2.90	3.42	3.26	4.35	3.33	4.54	1.72
505358	6992267	Redcliffe-040	MBC-112	2.76	2.61	0.15	1.08	2.8	60	0	2.92	3.38	3.25	4.22	3.32	4.39	1.69

				Water Level mAHD 10000yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50%Exceedence		Wave Run-up (mAHD) 2%Exceedence		Wave Run-up (mAHD) 1%Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_m
516482	6972941	BrisbaneBar	BrisbaneBar	2.40	2.40		1.21	2.7	104	0.00							
506913	6982622	PineRiver-001	MBC-001	3.24	3.10	0.14	1.11	2.5	130	0.00	3.42	3.86	3.76	4.66	3.82	4.79	1.46
507065	6983136	PineRiver-002	MBC-002	3.34	3.19	0.15	1.23	2.7	137	0.00	3.55	4.04	3.92	4.93	3.99	5.11	1.51
507237	6983516	PineRiver-003	MBC-003	3.32	3.19	0.13	1.07	2.5	129	0.00	3.50	3.93	3.83	4.71	3.88	4.84	1.48
507198	6984049	PineRiver-004	MBC-004	3.43	3.31	0.12	1.00	2.3	131	0.00	3.60	3.99	3.90	4.71	3.95	4.82	1.46
506913	6984334	PineRiver-005	MBC-005	3.69	3.58	0.11	0.88	2.1	132	0.00	3.83	4.17	4.09	4.78	4.13	4.88	1.42
507046	6984696	PineRiver-006	MBC-006	3.84	3.73	0.11	0.91	2.1	140	0.00	3.99	4.33	4.26	4.95	4.30	5.06	1.40
507522	6984334	PineRiver-007	MBC-007	3.45	3.32	0.13	1.03	2.4	136	0.00	3.62	4.04	3.93	4.79	3.98	4.91	1.48
507769	6984239	PineRiver-008	MBC-008	3.30	3.14	0.16	1.26	2.8	129	0.00	3.50	4.01	3.89	4.94	3.96	5.12	1.54
506179	6982661	PineRiver-009	MBC-009	3.69	3.58	0.11	0.88	2.1	132	0.00	3.83	4.17	4.09	4.78	4.13	4.88	1.42
504927	6992513	Caboolture-001	MBC-010	3.27	3.12	0.15	1.12	2.8	61	0.00	3.44	3.91	3.78	4.76	3.85	4.93	1.62
504270	6992575	Caboolture-002	MBC-011	3.32	3.19	0.13	1.02	2.5	62	0.00	3.49	3.90	3.80	4.65	3.86	4.79	1.55
503633	6992841	Caboolture-003	MBC-012	3.58	3.45	0.13	1.06	2.5	64	0.00	3.76	4.18	4.08	4.95	4.15	5.10	1.52
503346	6993519	Caboolture-004	MBC-013	3.71	3.58	0.13	1.08	2.4	131	0.00	3.89	4.31	4.22	5.07	4.27	5.19	1.44
503613	6994402	Caboolture-005	MBC-014	3.82	3.70	0.12	0.96	2.3	132	0.00	3.98	4.36	4.26	5.05	4.31	5.16	1.46
504658	6996186	Caboolture-009	MBC-015	3.76	3.62	0.14	1.08	2.7	127	0.00	3.93	4.39	4.26	5.21	4.33	5.37	1.64
504477	6996546	Caboolture-010	MBC-016	3.97	3.84	0.13	1.06	2.4	132	0.00	4.15	4.57	4.47	5.32	4.52	5.44	1.46
504774	6997055	Caboolture-012	MBC-017	3.87	3.74	0.13	1.03	2.5	130	0.00	4.04	4.45	4.35	5.20	4.42	5.34	1.51
505039	6997331	Caboolture-013	MBC-018	3.85	3.72	0.13	0.96	2.6	129	0.00	4.00	4.41	4.29	5.14	4.35	5.29	1.67
505442	6998582	Caboolture-016	MBC-019	3.97	3.82	0.15	1.13	2.7	105	0.00	4.15	4.61	4.49	5.46	4.56	5.62	1.59
505671	6999062	Caboolture-017	MBC-020	4.00	3.86	0.14	1.04	2.7	128	0.00	4.16	4.60	4.48	5.39	4.54	5.55	1.64
505909	6999567	Caboolture-018	MBC-021	4.06	3.91	0.15	1.12	2.8	129	0.00	4.23	4.70	4.57	5.55	4.64	5.72	1.63
506361	7000127	Caboolture-019	MBC-022	4.11	3.96	0.15	1.18	2.7	132	0.00	4.30	4.78	4.66	5.65	4.73	5.82	1.55
506813	7000580	Caboolture-020	MBC-023	3.95	3.81	0.14	1.08	2.7	129	0.00	4.12	4.57	4.45	5.39	4.52	5.56	1.63
507266	7001010	Caboolture-021	MBC-024	3.90	3.73	0.17	1.24	3.1	126	0.00	4.08	4.63	4.45	5.60	4.53	5.80	1.74
507718	7001452	Caboolture-022	MBC-025	3.94	3.76	0.18	1.27	3.2	133	0.00	4.11	4.69	4.49	5.70	4.57	5.92	1.80
508289	7001850	Caboolture-023	MBC-026	3.89	3.71	0.18	1.30	3.3	132	0.00	4.07	4.66	4.45	5.70	4.53	5.91	1.79
508903	7002206	Caboolture-024	MBC-027	3.80	3.61	0.19	1.35	3.3	134	0.00	3.98	4.60	4.38	5.67	4.47	5.90	1.79
509355	7002550	Caboolture-025	MBC-028	3.76	3.57	0.19	1.33	3.3	136	0.00	3.93	4.54	4.33	5.60	4.41	5.82	1.78
509894	7002744	Caboolture-026	MBC-029	3.66	3.47	0.19	1.39	3.4	140	0.00	3.85	4.48	4.26	5.59	4.34	5.82	1.78
510475	7002852	Caboolture-027	MBC-030	3.59	3.40	0.19	1.35	3.3	140	0.00	3.77	4.39	4.17	5.46	4.26	5.69	1.78
511067	7003003	Caboolture-028	MBC-031	3.51	3.34	0.17	1.22	3.0	142	0.00	3.69	4.22	4.06	5.16	4.13	5.36	1.70
511477	7003251	Caboolture-029	MBC-032	3.59	3.45	0.14	1.08	2.7	138	0.00	3.76	4.22	4.09	5.04	4.16	5.20	1.64
512112	7003326	Caboolture-030	MBC-033	3.51	3.35	0.16	1.19	2.9	141	0.00	3.69	4.20	4.05	5.12	4.13	5.31	1.68
512694	7003455	Caboolture-031	MBC-034	3.42	3.27	0.15	1.12	2.9	146	0.00	3.59	4.07	3.93	4.94	4.00	5.11	1.69
513275	7003412	Caboolture-032	MBC-035	3.38	3.24	0.14	1.14	2.6	138	0.00	3.57	4.03	3.92	4.87	3.99	5.03	1.54
513911	7003746	Caboolture-033	MBC-036	3.38	3.25	0.13	1.06	2.4	127	0.00	3.56	3.98	3.88	4.73	3.93	4.85	1.46
514481	7004446	Caboolture-034	MBC-037	3.00	2.87	0.13	1.02	2.4	125	0.00	3.17	3.59	3.47	4.34	3.52	4.46	1.50
516248	7002647	Caboolture-038	MBC-038	2.75	2.52	0.23	1.65	3.8	235	0.00	2.95	3.74	3.42	5.07	3.52	5.36	1.84
517280	7002397	Caboolture-040	MBC-039	2.58	2.38	0.20	1.44	3.3	136	0.00	2.78	3.42	3.20	4.55	3.29	4.79	1.74
519611	7002925	Caboolture-044	MBC-040	2.36	2.07	0.29	1.98	4.2	118	0.00	2.56	3.54	3.11	5.16	3.23	5.50	1.87
520367	7003619	Caboolture-046	MBC-041	2.31	1.98	0.33	2.33	4.7	107	0.00	2.54	3.72	3.15	5.65	3.29	6.06	1.91
520284	7006303	Caboolture-051	MBC-042	2.27	1.94	0.33	2.09	5.3	74	0.00	2.41	3.60	2.95	5.52	3.08	5.96	2.29
516778	7013518	Caboolture-060	MBC-043	2.47	2.08	0.39	2.52	5.6	74	0.00	2.64	4.06	3.29	6.33	3.43	6.84	2.21
516320	7014796	Caboolture-061	MBC-044	2.47	2.10	0.37	2.34	5.6	75	0.00	2.62	3.96	3.22	6.10	3.36	6.59	2.28
507667	7015461	Caboolture-067	MBC-045	3.87	3.74	0.13	1.08	2.4	215	0.00	4.05	4.48	4.38	5.26	4.43	5.39	1.47
508591	7014764	Caboolture-069	MBC-046	3.85	3.69	0.16	1.32	2.7	226	0.00	4.07	4.61	4.47	5.56	4.54	5.72	1.48
509101	7014442	Caboolture-070	MBC-047	3.78	3.60	0.18	1.46	2.9	222	0.00	4.02	4.61	4.46	5.66	4.55	5.87	1.50
509543	7013236	Caboolture-072	MBC-048	3.52	3.35	0.17	1.36	2.9	227	0.00	3.74	4.29	4.15	5.29	4.23	5.48	1.53
509623	7012592	Caboolture-073	MBC-049	3.38	3.21	0.17	1.40	2.9	225	0.00	3.61	4.18	4.04	5.21	4.12	5.41	1.54
510253	7011212	Caboolture-075	MBC-050	3.14	2.98	0.16	1.35	2.8	221	0.00	3.37	3.92	3.78	4.91	3.85	5.07	1.49
510669	7010917	Caboolture-076	MBC-051	3.00	2.87	0.13	1.03	2.4	218	0.00	3.17	3.58	3.48	4.33	3.53	4.45	1.48
511138	7010769	Caboolture-077	MBC-052	3.03	2.89	0.14	1.12	2.5	141	0.00	3.22	3.68	3.56	4.50	3.61	4.63	1.49
511701	7010475	Caboolture-078	MBC-053	3.00	2.85	0.15	1.20	2.7	216	0.00	3.20	3.68	3.56	4.57	3.63	4.74	1.54
512076	7010032	Caboolture-079	MBC-054	2.99	2.81	0.18	1.40	3.1	223	0.00	3.20	3.80	3.63	4.87	3.71	5.08	1.64
513283	7007901	Caboolture-083	MBC-055	2.65	2.46	0.19	1.53	3.1	247	0.00	2.89	3.53	3.35	4.67	3.44	4.90	1.59
513390	7007284	Caboolture-084	MBC-056	3.05	2.88	0.17	1.45	2.9	246	0.00	3.30	3.89	3.74	4.94	3.81	5.12	1.48

				Water Level mAHD 10000yr ARI Sea Level Rise Exlcuded		Wave Parameters					Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence		
X MGA94	Y MGA94	Location Name	Location Index R2461	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)	Tide Range Correction (m)	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	ξ_{om}
513444	7006735	Caboolture-085	MBC-057	2.96	2.76	0.20	1.64	3.1	146	0.00	3.23	3.91	3.72	5.10	3.80	5.30	1.49
514141	7006547	Caboolture-086	MBC-058	2.95	2.77	0.18	1.54	2.9	244	0.00	3.21	3.82	3.68	4.92	3.75	5.10	1.45
514958	7005756	Caboolture-088	MBC-059	2.83	2.63	0.20	1.59	3.1	253	0.00	3.08	3.74	3.56	4.91	3.65	5.14	1.56
515374	7005260	Caboolture-089	MBC-060	2.74	2.56	0.18	1.48	2.9	260	0.00	2.99	3.60	3.43	4.68	3.51	4.86	1.49
514730	7005140	Caboolture-090	MBC-061	2.72	2.56	0.16	1.24	2.7	23	0.00	2.92	3.42	3.30	4.32	3.37	4.50	1.53
514328	7005394	Caboolture-091	MBC-062	2.75	2.59	0.16	1.20	3.0	14	0.00	2.93	3.45	3.30	4.38	3.37	4.56	1.69
513269	7006199	Caboolture-093	MBC-063	2.89	2.72	0.17	1.32	2.9	21	0.00	3.10	3.64	3.50	4.61	3.58	4.81	1.56
511621	7007284	Caboolture-096	MBC-064	2.93	2.79	0.14	1.16	2.5	127	0.00	3.13	3.58	3.48	4.40	3.54	4.54	1.45
511339	7008048	Caboolture-097	MBC-065	2.98	2.85	0.13	1.06	2.3	128	0.00	3.15	3.55	3.47	4.28	3.52	4.39	1.40
511648	7008558	Caboolture-098	MBC-066	2.63	2.50	0.13	1.07	2.5	129	0.00	2.81	3.25	3.14	4.03	3.19	4.16	1.49
511835	7009040	Caboolture-099	MBC-067	2.74	2.60	0.14	1.10	2.6	123	0.00	2.92	3.37	3.25	4.18	3.32	4.34	1.56
511446	7009456	Caboolture-100	MBC-068	2.87	2.72	0.15	1.19	2.7	17	0.00	3.06	3.55	3.43	4.43	3.50	4.60	1.56
511058	7009456	Caboolture-101	MBC-069	2.94	2.79	0.15	1.22	2.7	12	0.00	3.14	3.64	3.51	4.52	3.59	4.70	1.53
510321	7009818	Caboolture-102	MBC-070	2.93	2.78	0.15	1.19	2.8	14	0.00	3.12	3.62	3.48	4.50	3.56	4.68	1.59
509784	7010233	Caboolture-103	MBC-071	2.94	2.78	0.16	1.28	2.8	18	0.00	3.15	3.67	3.54	4.61	3.61	4.79	1.55
509369	7010796	Caboolture-104	MBC-072	3.05	2.90	0.15	1.20	2.7	122	0.00	3.25	3.73	3.61	4.62	3.68	4.79	1.54
509034	7011198	Caboolture-105	MBC-073	3.31	3.18	0.13	1.07	2.5	122	0.00	3.49	3.93	3.82	4.71	3.87	4.83	1.49
508833	7011587	Caboolture-106	MBC-074	3.19	3.06	0.13	1.00	2.5	129	0.00	3.35	3.75	3.66	4.48	3.72	4.63	1.53
508752	7011869	Caboolture-107	MBC-075	3.07	2.93	0.14	1.17	2.5	131	0.00	3.27	3.73	3.63	4.57	3.69	4.71	1.46
508471	7012110	Caboolture-108	MBC-076	3.16	3.02	0.14	1.12	2.5	131	0.00	3.35	3.79	3.69	4.59	3.74	4.72	1.46
508926	7012177	Caboolture-109	MBC-077	3.22	3.08	0.14	1.10	2.5	135	0.00	3.40	3.84	3.74	4.63	3.80	4.79	1.51
509020	7012767	Caboolture-110	MBC-078	3.36	3.21	0.15	1.20	2.7	132	0.00	3.56	4.04	3.92	4.91	3.99	5.08	1.51
508565	7013276	Caboolture-111	MBC-079	3.52	3.39	0.13	1.05	2.3	133	0.00	3.69	4.09	4.01	4.82	4.06	4.93	1.41
508069	7013611	Caboolture-112	MBC-080	3.82	3.68	0.14	1.15	2.6	340	0.00	4.01	4.47	4.36	5.31	4.43	5.47	1.51
507667	7013960	Caboolture-113	MBC-081	3.93	3.80	0.13	1.04	2.3	130	0.00	4.10	4.49	4.41	5.21	4.46	5.33	1.41
507157	7014067	Caboolture-114	MBC-082	4.00	3.87	0.13	1.04	2.3	130	0.00	4.17	4.57	4.48	5.30	4.53	5.42	1.43
507171	7014777	Caboolture-115	MBC-083	3.83	3.70	0.13	1.09	2.5	132	0.00	4.02	4.45	4.35	5.24	4.40	5.37	1.47
507063	7015595	Caboolture-116	MBC-084	3.91	3.77	0.14	1.10	2.6	104	0.00	4.09	4.53	4.42	5.33	4.49	5.49	1.52
509121	6984944	Redcliffe-005	MBC-085	3.17	3.01	0.16	1.23	2.9	193	0.00	3.36	3.88	3.74	4.82	3.81	5.01	1.65
509533	6984891	Redcliffe-006	MBC-086	3.05	2.90	0.15	1.19	2.8	193	0.00	3.24	3.73	3.60	4.62	3.68	4.79	1.58
509892	6984691	Redcliffe-007	MBC-087	2.94	2.79	0.15	1.16	2.8	195	0.00	3.12	3.61	3.48	4.47	3.55	4.64	1.59
510464	6984279	Redcliffe-009	MBC-088	2.77	2.58	0.19	1.32	3.4	131	0.00	2.94	3.55	3.33	4.63	3.41	4.85	1.84
510783	6984638	Redcliffe-010	MBC-089	2.66	2.44	0.22	1.61	3.5	128	0.00	2.87	3.60	3.34	4.86	3.44	5.11	1.72
510969	6985516	Redcliffe-012	MBC-090	2.70	2.47	0.23	1.66	3.7	115	0.00	2.91	3.69	3.38	5.02	3.48	5.30	1.81
511076	6985889	Redcliffe-013	MBC-091	2.70	2.47	0.23	1.59	3.8	119	0.00	2.88	3.66	3.34	4.97	3.43	5.25	1.90
511488	6987365	Redcliffe-016	MBC-092	2.74	2.46	0.28	1.87	4.4	113	0.00	2.92	3.88	3.43	5.46	3.54	5.81	1.99
511768	6988017	Redcliffe-018	MBC-093	2.65	2.36	0.29	1.92	4.5	113	0.00	2.82	3.82	3.34	5.47	3.46	5.83	2.02
511648	6988496	Redcliffe-019	MBC-094	2.68	2.42	0.26	1.60	4.5	70	0.00	2.80	3.68	3.24	5.13	3.34	5.46	2.24
511741	6989254	Redcliffe-021	MBC-095	2.73	2.43	0.30	1.98	4.5	116	0.00	2.91	3.93	3.44	5.61	3.56	5.97	1.99
511874	6990079	Redcliffe-023	MBC-096	2.68	2.39	0.29	1.92	4.5	119	0.00	2.85	3.86	3.37	5.51	3.49	5.87	2.04
511648	6990451	Redcliffe-024	MBC-097	2.69	2.43	0.26	1.68	4.5	68	0.00	2.83	3.74	3.29	5.23	3.39	5.56	2.15
511661	6991063	Redcliffe-025	MBC-098	2.72	2.46	0.26	1.78	4.2	119	0.00	2.90	3.80	3.39	5.30	3.50	5.62	1.96
511568	6992087	Redcliffe-027	MBC-099	2.72	2.45	0.27	1.87	4.1	115	0.00	2.92	3.84	3.44	5.38	3.55	5.71	1.89
511475	6992513	Redcliffe-028	MBC-100	2.67	2.46	0.21	1.55	3.6	125	0.00	2.87	3.59	3.32	4.82	3.41	5.08	1.78
510916	6992713	Redcliffe-029	MBC-101	2.62	2.43	0.19	1.35	3.3	58	0.00	2.80	3.41	3.20	4.48	3.29	4.70	1.77
510531	6992472	Redcliffe-030	MBC-102	2.62	2.44	0.18	1.33	3.2	328	0.00	2.81	3.41	3.21	4.45	3.29	4.67	1.75
510161	6992164	Redcliffe-031	MBC-103	2.69	2.49	0.20	1.59	3.2	32	0.00	2.93	3.61	3.41	4.80	3.50	5.04	1.60
509833	6991712	Redcliffe-032	MBC-104	2.64	2.51	0.13	1.13	2.4	226	0.00	2.84	3.26	3.18	4.04	3.23	4.17	1.41
509525	6991322	Redcliffe-033	MBC-105	2.65	2.50	0.15	1.19	2.7	48	0.00	2.84	3.33	3.21	4.20	3.28	4.37	1.54
509155	6991199	Redcliffe-034	MBC-106	2.70	2.53	0.17	1.37	2.9	50	0.00	2.92	3.48	3.34	4.48	3.42	4.68	1.53
508478	6991343	Redcliffe-035	MBC-107	2.73	2.59	0.14	1.09	2.6	49	0.00	2.91	3.35	3.24	4.16	3.30	4.32	1.57
507965	6991487	Redcliffe-036	MBC-108	2.81	2.67	0.14	1.13	2.7	49	0.00	3.00	3.46	3.34	4.29	3.41	4.46	1.56
507205	6991589	Redcliffe-037	MBC-109	2.89	2.75	0.14	1.12	2.7	48	0.00	3.07	3.53	3.41	4.36	3.48	4.52	1.56
506548	6991836	Redcliffe-038	MBC-110	2.99	2.84	0.15	1.16	2.8	50	0.00	3.17	3.66	3.53	4.53	3.60	4.70	1.61
505830	6992082	Redcliffe-039	MBC-111	3.10	2.94	0.16	1.22	2.9	56	0.00	3.29	3.81	3.66	4.73	3.73	4.92	1.65
505358	6992267	Redcliffe-040	MBC-112	3.16	3.01	0.15	1.10	2.8	59	0	3.32	3.79	3.66	4.63	3.73	4.80	1.66

APPENDIX L

Storm Tide Planning Levels

				Planning Levels - 100-Year ARI Event, Freeboard and SLR Included		Water Level mAHD 100yr ARI Sea-Level Rise and Freeboard Excluded													
						Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Water Level without tide Correction and without local setup (mAHD)	Wave Parameters				Tide Range Correction (m)	Wave Run-up (mAHD) 50% Exceedence		Wave Run-up (mAHD) 2% Exceedence		Wave Run-up (mAHD) 1% Exceedence	
X MGA94	Y MGA94	Location Name	Location Index R2504	100-Year Planning Level - 2109	50-Year Planning Level - 2059				Local Setup (m)	Hs (m)	Tz (s)	Dir (deg)		Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H	Beach 1V:15H Slope	Rock Revetment 1V:2H
506913	6982622	PineRiver-001	MBC-001	3.50	3.00	2.40	2.26	2.26	0.14	1.09	2.5	129	0	2.58	3.01	2.91	3.80	2.97	3.95
507065	6983136	PineRiver-002	MBC-002	3.55	3.05	2.45	2.30	2.30	0.15	1.17	2.7	136	0	2.64	3.11	2.99	3.97	3.06	4.14
507237	6983516	PineRiver-003	MBC-003	3.54	3.04	2.44	2.31	2.31	0.13	1.05	2.5	128	0	2.62	3.04	2.94	3.80	3.00	3.95
507198	6984049	PineRiver-004	MBC-004	3.59	3.09	2.49	2.37	2.37	0.12	0.98	2.4	130	0	2.65	3.06	2.95	3.78	3.00	3.89
506913	6984334	PineRiver-005	MBC-005	3.73	3.23	2.63	2.52	2.52	0.11	0.86	2.2	131	0	2.77	3.11	3.02	3.73	3.06	3.83
507046	6984696	PineRiver-006	MBC-006	3.82	3.32	2.72	2.61	2.61	0.11	0.88	2.2	139	0	2.86	3.20	3.12	3.82	3.17	3.93
507522	6984334	PineRiver-007	MBC-007	3.61	3.11	2.51	2.38	2.38	0.13	1.01	2.5	135	0	2.67	3.08	2.98	3.81	3.04	3.96
507769	6984239	PineRiver-008	MBC-008	3.54	3.04	2.44	2.28	2.28	0.16	1.24	2.8	128	0	2.64	3.15	3.01	4.08	3.09	4.26
506179	6982661	PineRiver-009	MBC-009	3.73	3.23	2.63	2.52	2.52	0.11	0.86	2.2	131	0	2.77	3.11	3.02	3.73	3.06	3.83
504927	6992513	Caboolture-001	MBC-010	3.50	3.00	2.40	2.27	2.27	0.13	1.04	2.5	118	0	2.57	2.99	2.89	3.75	2.95	3.90
504270	6992575	Caboolture-002	MBC-011	3.53	3.03	2.43	2.31	2.31	0.12	0.98	2.3	128	0	2.59	2.98	2.89	3.69	2.93	3.80
503633	6992841	Caboolture-003	MBC-012	3.67	3.17	2.57	2.44	2.44	0.13	0.98	2.6	71	0	2.72	3.14	3.02	3.88	3.08	4.04
503346	6993519	Caboolture-004	MBC-013	3.75	3.25	2.65	2.52	2.52	0.13	1.01	2.5	68	0	2.81	3.23	3.12	3.98	3.18	4.13
503613	6994402	Caboolture-005	MBC-014	3.81	3.31	2.71	2.59	2.59	0.12	0.92	2.4	74	0	2.85	3.24	3.13	3.92	3.19	4.06
504658	6996186	Caboolture-009	MBC-015	3.79	3.29	2.69	2.55	2.55	0.14	1.06	2.7	73	0	2.85	3.30	3.18	4.11	3.24	4.27
504477	6996546	Caboolture-010	MBC-016	3.90	3.40	2.80	2.67	2.67	0.13	1.03	2.4	53	0	2.97	3.38	3.28	4.12	3.34	4.27
504774	6997055	Caboolture-012	MBC-017	3.84	3.34	2.74	2.61	2.61	0.13	1.00	2.5	72	0	2.90	3.31	3.21	4.05	3.27	4.20
505039	6997331	Caboolture-013	MBC-018	3.84	3.34	2.74	2.61	2.61	0.13	0.94	2.7	134	0	2.88	3.29	3.17	4.03	3.23	4.18
505442	6998582	Caboolture-016	MBC-019	3.92	3.42	2.82	2.67	2.67	0.15	1.09	2.8	133	0	2.98	3.45	3.31	4.28	3.38	4.45
505671	6999062	Caboolture-017	MBC-020	3.94	3.44	2.84	2.69	2.69	0.15	1.00	2.9	85	0	2.97	3.43	3.28	4.24	3.35	4.41
505909	6999567	Caboolture-018	MBC-021	3.96	3.46	2.86	2.71	2.71	0.15	1.09	2.9	125	0	3.02	3.50	3.35	4.36	3.42	4.54
506361	7000127	Caboolture-019	MBC-022	4.00	3.50	2.90	2.75	2.75	0.15	1.14	2.8	129	0	3.08	3.56	3.42	4.43	3.49	4.61
506813	7000580	Caboolture-020	MBC-023	3.91	3.41	2.81	2.66	2.66	0.15	1.06	2.8	127	0	2.96	3.42	3.29	4.24	3.35	4.41
507266	7001010	Caboolture-021	MBC-024	3.89	3.39	2.79	2.62	2.62	0.17	1.20	3.2	131	0	2.95	3.51	3.31	4.48	3.39	4.69
507718	7001452	Caboolture-022	MBC-025	3.91	3.41	2.81	2.63	2.63	0.18	1.25	3.3	136	0	2.97	3.55	3.35	4.56	3.42	4.77
508289	7001850	Caboolture-023	MBC-026	3.89	3.39	2.79	2.61	2.61	0.18	1.27	3.3	137	0	2.96	3.55	3.34	4.58	3.42	4.80
508903	7002206	Caboolture-024	MBC-027	3.85	3.35	2.75	2.55	2.55	0.20	1.31	3.6	139	0	2.89	3.54	3.28	4.63	3.36	4.87
509355	7002550	Caboolture-025	MBC-028	3.83	3.33	2.73	2.54	2.54	0.19	1.29	3.5	148	0	2.88	3.51	3.26	4.59	3.35	4.82
509894	7002744	Caboolture-026	MBC-029	3.78	3.28	2.68	2.48	2.48	0.20	1.35	3.6	147	0	2.84	3.49	3.23	4.61	3.31	4.84
510475	7002852	Caboolture-027	MBC-030	3.74	3.24	2.64	2.44	2.44	0.20	1.31	3.6	154	0	2.78	3.43	3.17	4.53	3.25	4.77
511067	7003003	Caboolture-028	MBC-031	3.69	3.19	2.59	2.41	2.41	0.18	1.20	3.5	174	0	2.73	3.32	3.08	4.33	3.16	4.55
511477	7003251	Caboolture-029	MBC-032	3.72	3.22	2.62	2.47	2.47	0.15	1.06	2.8	147	0	2.77	3.23	3.10	4.06	3.16	4.23
512112	7003326	Caboolture-030	MBC-033	3.68	3.18	2.58	2.42	2.42	0.16	1.18	3.0	143	0	2.75	3.27	3.11	4.19	3.19	4.38
512694	7003455	Caboolture-031	MBC-034	3.64	3.14	2.54	2.38	2.38	0.16	1.12	3.0	163	0	2.70	3.20	3.04	4.09	3.11	4.28
513275	7003412	Caboolture-032	MBC-035	3.61	3.11	2.51	2.36	2.36	0.15	1.12	2.7	139	0	2.68	3.15	3.02	3.98	3.09	4.15
513911	7003746	Caboolture-033	MBC-036	3.60	3.10	2.50	2.37	2.37	0.13	1.04	2.4	127	0	2.67	3.10	2.99	3.86	3.04	3.99
514481	7004446	Caboolture-034	MBC-037	3.40	2.90	2.30	2.17	2.17	0.13	1.00	2.5	124	0	2.46	2.87	2.77	3.60	2.83	3.74
516248	7002647	Caboolture-038	MBC-038	3.30	2.80	2.20	1.97	1.97	0.23	1.57	3.9	221	0	2.37	3.15	2.82	4.46	2.91	4.74
517280	7002397	Caboolture-040	MBC-039	3.20	2.70	2.10	1.90	1.90	0.20	1.43	3.5	154	0	2.28	2.96	2.70	4.12	2.79	4.36
519611	7002925	Caboolture-044	MBC-040	3.12	2.62	2.02	1.74	1.74	0.28	1.95	4.3	117	0	2.22	3.20	2.76	4.82	2.87	5.16
520367	7003619	Caboolture-046	MBC-041	3.11	2.61	2.01	1.69	1.69	0.32	2.26	4.7	105	0	2.23	3.39	2.83	5.29	2.96	5.70
520284	7006303	Caboolture-051	MBC-042	3.11	2.61	2.01	1.67	1.67	0.34	2.05	5.6	54	0	2.12	3.34	2.65	5.30	2.77	5.76
516778	7013518	Caboolture-060	MBC-043	3.24	2.74	2.14	1.74	1.74	0.40	2.49	6.0	58	0	2.28	3.74	2.91	6.06	3.05	6.60
516320	7014796	Caboolture-061	MBC-044	3.24	2.74	2.14	1.76	1.76	0.38	2.33	5.9	58	0	2.27	3.65	2.86	5.86	3.00	6.37
507667	7015461	Caboolture-067	MBC-045	3.89	3.39	2.79	2.66	2.66	0.13	1.05	2.4	216	0	2.96	3.39	3.28	4.15	3.33	4.28
508591	7014764	Caboolture-069	MBC-046	3.88	3.38	2.78	2.63	2.63	0.15	1.27	2.7	227	0	3.00	3.52	3.38	4.44	3.45	4.59
509101	7014442	Caboolture-070	MBC-047	3.84	3.34	2.74	2.57	2.57	0.17	1.31	2.9	163	0	2.95	3.49	3.34	4.46	3.42	4.66
509543	7013236	Caboolture-072	MBC-048	3.68	3.18	2.58	2.43	2.43	0.15	1.18	2.7	218	0	2.77	3.25	3.13	4.13	3.20	4.30
509623	7012592	Caboolture-073	MBC-049	3.62	3.12	2.52	2.36	2.36	0.16	1.21	2.8	216	0	2.71	3.21	3.08	4.11	3.15	4.29
510253	7011212	Caboolture-075	MBC-050	3.48	2.98	2.38	2.23	2.23	0.15	1.24	2.7	205	0	2.59	3.09	2.97	3.99	3.04	4.17
510669	7010917	Caboolture-076	MBC-051	3.40	2.90	2.30	2.17	2.17	0.13	0.99	2.4	208	0	2.46	2.85	2.76	3.57	2.81	3.71
511138	7010769	Caboolture-077	MBC-052	3.42	2.92	2.32	2.18	2.18	0.14	1.06	2.6	151	0	2.49	2.92	2.81	3.70	2.87	3.86
511701	7010475	Caboolture-078	MBC-053	3.40	2.90	2.30	2.15	2.15	0.15	1.15	2.7	157	0	2.48	2.96	2.83	3.82	2.90	3.99
512076	7010032	Caboolture-079	MBC-054	3.40	2.90	2.30	2.13	2.13	0.17	1.27	3.0	152	0	2.49	3.04	2.88	4.02	2.96	4.21
513283	7007901	Caboolture-083	MBC-055	3.21	2.71	2.11	1.94	1.94	0.17	1.32	3.0	231	0	2.32	2.87	2.72	3.86	2.80	4.06
513390	7007284	Caboolture-084	MBC-056	3.43	2.93	2.33	2.17	2.17	0.16	1.33	2.8	231	0	2.55	3.09	2.96	4.05	3.04	4.23
513444	7006735	Caboolture-085	MBC-057	3.38	2.88	2.28	2.10	2.10	0.18	1.53	3.0	144	0	2.54	3.17	3.00	4.30	3.08	4.48

X MGA94	Y MGA94	Location Name	Location Index R2504	Planning Levels - 100-Year ARI Event, Freeboard and SLR Included: 100-Year Planning Level - 2109	Planning Levels - 100-Year ARI Event, Freeboard and SLR Included: 50-Year Planning Level - 2059	Total Water Level - with Setup (mAHD)	Water Level - without setup (mAHD)	Water Level without tide Correction and without local setup (mAHD)	Wave Parameters: Local Setup (m)	Wave Parameters: Hs (m)	Wave Parameters: Tz (s)	Wave Parameters: Dir (deg)	Tide Range Correction (m)	Wave Run-up (mAHD) 50% Exceedence: Beach 1V:15H Slope	Wave Run-up (mAHD) 50% Exceedence: Rock Revetment 1V:2H	Wave Run-up (mAHD) 2% Exceedence: Beach 1V:15H Slope	Wave Run-up (mAHD) 2% Exceedence: Rock Revetment 1V:2H	Wave Run-up (mAHD) 1% Exceedence: Beach 1V:15H Slope	Wave Run-up (mAHD) 1% Exceedence: Rock Revetment 1V:2H
514141	7006547	Caboolture-086	MBC-058	3.38	2.88	2.28	2.11	2.11	0.17	1.45	2.8	247	0	2.53	3.11	2.97	4.15	3.04	4.32
514958	7005756	Caboolture-088	MBC-059	3.31	2.81	2.21	2.03	2.03	0.18	1.44	3.0	255	0	2.44	3.03	2.88	4.09	2.96	4.30
515374	7005260	Caboolture-089	MBC-060	3.27	2.77	2.17	2.00	2.00	0.17	1.37	2.8	261	0	2.40	2.97	2.81	3.97	2.88	4.14
514730	7005140	Caboolture-090	MBC-061	3.22	2.72	2.12	1.99	1.99	0.13	1.10	2.4	112	0	2.31	2.74	2.64	3.52	2.70	3.65
514328	7005394	Caboolture-091	MBC-062	3.25	2.75	2.15	2.01	2.01	0.14	1.04	2.7	107	0	2.31	2.75	2.63	3.53	2.69	3.69
513269	7006199	Caboolture-093	MBC-063	3.34	2.84	2.24	2.08	2.08	0.16	1.23	2.8	106	0	2.43	2.94	2.81	3.85	2.88	4.03
511621	7007284	Caboolture-096	MBC-064	3.36	2.86	2.26	2.12	2.12	0.14	1.12	2.5	125	0	2.45	2.90	2.79	3.71	2.84	3.84
511339	7008048	Caboolture-097	MBC-065	3.39	2.89	2.29	2.16	2.16	0.13	1.04	2.3	126	0	2.46	2.86	2.77	3.58	2.82	3.70
511648	7008558	Caboolture-098	MBC-066	3.19	2.69	2.09	1.96	1.96	0.13	1.01	2.5	137	0	2.25	2.66	2.56	3.40	2.62	3.55
511835	7009040	Caboolture-099	MBC-067	3.25	2.75	2.15	2.02	2.02	0.13	1.02	2.6	137	0	2.31	2.74	2.63	3.49	2.69	3.64
511446	7009456	Caboolture-100	MBC-068	3.32	2.82	2.22	2.09	2.09	0.13	1.04	2.5	130	0	2.39	2.82	2.71	3.58	2.77	3.73
511058	7009456	Caboolture-101	MBC-069	3.36	2.86	2.26	2.12	2.12	0.14	1.11	2.5	117	0	2.44	2.90	2.78	3.71	2.84	3.84
510321	7009818	Caboolture-102	MBC-070	3.35	2.85	2.25	2.12	2.12	0.13	1.03	2.5	105	0	2.42	2.84	2.73	3.60	2.80	3.75
509784	7010233	Caboolture-103	MBC-071	3.36	2.86	2.26	2.12	2.12	0.14	1.10	2.5	134	0	2.44	2.88	2.78	3.67	2.84	3.83
509369	7010796	Caboolture-104	MBC-072	3.41	2.91	2.31	2.18	2.18	0.13	1.04	2.5	133	0	2.48	2.90	2.80	3.66	2.86	3.81
509034	7011198	Caboolture-105	MBC-073	3.58	3.08	2.48	2.34	2.34	0.14	1.07	2.5	22	0	2.65	3.08	2.98	3.86	3.04	4.01
508833	7011587	Caboolture-106	MBC-074	3.51	3.01	2.41	2.28	2.28	0.13	0.96	2.5	121	0	2.56	2.96	2.85	3.68	2.91	3.82
508752	7011869	Caboolture-107	MBC-075	3.44	2.94	2.34	2.20	2.20	0.14	1.11	2.6	129	0	2.52	2.97	2.86	3.78	2.93	3.93
508471	7012110	Caboolture-108	MBC-076	3.48	2.98	2.38	2.25	2.25	0.13	1.04	2.5	129	0	2.55	2.97	2.87	3.72	2.93	3.86
508926	7012177	Caboolture-109	MBC-077	3.52	3.02	2.42	2.28	2.28	0.14	1.05	2.6	135	0	2.58	3.01	2.90	3.79	2.97	3.95
509020	7012767	Caboolture-110	MBC-078	3.60	3.10	2.50	2.35	2.35	0.15	1.12	2.7	128	0	2.67	3.13	3.01	3.97	3.08	4.13
508565	7013276	Caboolture-111	MBC-079	3.68	3.18	2.58	2.46	2.46	0.12	1.02	2.3	132	0	2.75	3.15	3.06	3.87	3.11	3.99
508069	7013611	Caboolture-112	MBC-080	3.87	3.37	2.77	2.63	2.63	0.14	1.15	2.6	340	0	2.96	3.42	3.31	4.26	3.38	4.42
507667	7013960	Caboolture-113	MBC-081	3.93	3.43	2.83	2.70	2.70	0.13	1.04	2.3	130	0	3.00	3.39	3.31	4.11	3.36	4.23
507157	7014067	Caboolture-114	MBC-082	3.97	3.47	2.87	2.74	2.74	0.13	1.04	2.3	130	0	3.04	3.44	3.35	4.17	3.40	4.29
507171	7014777	Caboolture-116	MBC-083	3.88	3.38	2.78	2.65	2.65	0.13	1.06	2.5	131	0	2.96	3.40	3.28	4.17	3.34	4.30
507063	7015595	Caboolture-116	MBC-084	3.92	3.42	2.82	2.68	2.68	0.14	1.09	2.6	130	0	3.00	3.43	3.33	4.23	3.39	4.38
509121	6984944	Redcliffe-005	MBC-085	3.49	2.99	2.39	2.22	2.22	0.17	1.21	3.0	172	0	2.56	3.09	2.93	4.03	3.01	4.22
509533	6984891	Redcliffe-006	MBC-086	3.41	2.91	2.31	2.16	2.16	0.15	1.17	2.8	193	0	2.49	2.99	2.85	3.87	2.92	4.05
509892	6984691	Redcliffe-007	MBC-087	3.35	2.85	2.25	2.10	2.10	0.15	1.15	2.8	194	0	2.43	2.92	2.78	3.79	2.85	3.97
510464	6984279	Redcliffe-009	MBC-088	3.28	2.78	2.18	1.99	1.99	0.19	1.32	3.4	131	0	2.35	2.96	2.74	4.04	2.82	4.26
510783	6984638	Redcliffe-010	MBC-089	3.24	2.74	2.14	1.92	1.92	0.22	1.61	3.5	128	0	2.35	3.08	2.82	4.34	2.92	4.59
510969	6985516	Redcliffe-012	MBC-090	3.26	2.76	2.16	1.93	1.93	0.23	1.66	3.7	115	0	2.37	3.15	2.84	4.48	2.94	4.76
511076	6985889	Redcliffe-013	MBC-091	3.26	2.76	2.16	1.93	1.93	0.23	1.59	3.8	119	0	2.34	3.12	2.80	4.43	2.89	4.71
511488	6987365	Redcliffe-016	MBC-092	3.31	2.81	2.21	1.93	1.93	0.28	1.87	4.4	113	0	2.39	3.35	2.90	4.93	3.01	5.28
511768	6988017	Redcliffe-018	MBC-093	3.27	2.77	2.17	1.88	1.88	0.29	1.92	4.5	113	0	2.34	3.34	2.86	4.99	2.98	5.35
511648	6988496	Redcliffe-019	MBC-094	3.26	2.76	2.16	1.91	1.91	0.25	1.60	4.3	111	0	2.30	3.15	2.74	4.55	2.84	4.86
511741	6989254	Redcliffe-021	MBC-095	3.31	2.81	2.21	1.91	1.91	0.30	1.96	4.6	116	0	2.38	3.41	2.91	5.10	3.02	5.48
511874	6990079	Redcliffe-023	MBC-096	3.28	2.78	2.18	1.89	1.89	0.29	1.92	4.5	119	0	2.35	3.36	2.87	5.01	2.99	5.37
511648	6990451	Redcliffe-024	MBC-097	3.28	2.78	2.18	1.92	1.92	0.26	1.66	4.3	109	0	2.33	3.20	2.78	4.65	2.89	4.98
511661	6991063	Redcliffe-025	MBC-098	3.30	2.80	2.20	1.93	1.93	0.27	1.76	4.3	118	0	2.36	3.27	2.85	4.77	2.95	5.09
511568	6992087	Redcliffe-027	MBC-099	3.30	2.80	2.20	1.93	1.93	0.27	1.85	4.2	115	0	2.39	3.32	2.90	4.87	3.01	5.20
511475	6992513	Redcliffe-028	MBC-100	3.25	2.75	2.15	1.93	1.93	0.22	1.53	3.6	124	0	2.34	3.06	2.78	4.30	2.87	4.56
510916	6992713	Redcliffe-029	MBC-101	3.21	2.71	2.11	1.92	1.92	0.19	1.32	3.4	57	0	2.28	2.90	2.67	3.97	2.75	4.19
510531	6992472	Redcliffe-030	MBC-102	3.18	2.68	2.08	1.92	1.92	0.16	1.30	2.8	250	0	2.29	2.82	2.69	3.77	2.77	3.96
510161	6992164	Redcliffe-031	MBC-103	3.23	2.73	2.13	1.95	1.95	0.18	1.51	2.9	247	0	2.39	3.01	2.84	4.12	2.92	4.30
509833	6991712	Redcliffe-032	MBC-104	3.18	2.68	2.08	1.95	1.95	0.13	1.10	2.4	229	0	2.27	2.69	2.60	3.47	2.66	3.60
509525	6991322	Redcliffe-033	MBC-105	3.19	2.69	2.09	1.95	1.95	0.14	1.15	2.4	230	0	2.28	2.71	2.63	3.51	2.69	3.64
509155	6991199	Redcliffe-034	MBC-106	3.20	2.70	2.10	1.96	1.96	0.14	1.17	2.4	227	0	2.30	2.73	2.65	3.52	2.71	3.65
508478	6991343	Redcliffe-035	MBC-107	3.23	2.73	2.13	2.00	2.00	0.13	1.03	2.3	126	0	2.30	2.70	2.61	3.42	2.66	3.54
507965	6991487	Redcliffe-036	MBC-108	3.26	2.76	2.16	2.03	2.03	0.13	1.06	2.4	125	0	2.34	2.75	2.66	3.51	2.71	3.63
507205	6991589	Redcliffe-037	MBC-109	3.31	2.81	2.21	2.08	2.08	0.13	1.04	2.4	125	0	2.38	2.79	2.70	3.52	2.75	3.64
506548	6991836	Redcliffe-038	MBC-110	3.38	2.88	2.28	2.12	2.12	0.16	1.07	3.0	49	0	2.42	2.91	2.75	3.77	2.82	3.95
505830	6992082	Redcliffe-039	MBC-111	3.43	2.93	2.33	2.17	2.17	0.16	1.11	3.0	61	0	2.48	2.98	2.82	3.86	2.89	4.04
505358	6992267	Redcliffe-040	MBC-112	3.46	2.96	2.36	2.21	2.21	0.15	1.02	2.9	64	0	2.50	2.96	2.81	3.77	2.88	3.94