



A specialist Civil Engineer with 35 years investigation and design experience in the fields of coastal, ocean and offshore engineering, statistical modelling, risk analysis, applied meteorology, data measurement and analysis and systems analysis and design.

Qualifications:

- Bachelor of Engineering - Civil (Hons), James Cook University (1975)
- Doctor of Philosophy in Civil Engineering (Numerical Fluid Dynamics), James Cook University (1982)
- Chartered Professional Engineer (CPEng)
- National Professional Engineer Register (NPER)
- Registered Professional Engineer, Queensland. (RPEQ No. 4987)
- APEC Registered 811866

Affiliations:

- Fellow, Engineers Australia (FIEAust)
- Member, College of Civil Engineers, Engineers Australia.
- Chairman, 1996/97 National Committee on Coastal and Ocean Engineering, Engineers Australia; Member 1989 to 2008.
- Member, Australian Wind Engineering Society (AWES).
- Member, Australian Meteorological and Oceanographical Society (AMOS).
- Member, American Meteorological Society (AMS).
- Member, Standards Australia, BD6 Wind Actions Sub-Committee 2006+.
- WMO TMRP Expert Panel of Tropical Cyclone Landfall Processes 2009+.
- Willis Research Network

Postnominals:

BE(Hons) PhD
FIEAust CPEng NPER RPEQ

EXPERIENCE

WIND RISK ASSESSMENT

- Wind Risk and Design Recommendations, Central Queensland, Aspec Engineering Pty Ltd, Brisbane.
Advice on wind risks applicable to specialised facilities, interpretation of design standards and alternative design philosophies.
- Wind Storm Damage Investigations, Brisbane, JCU Cyclone Testing Station, April 2009.
Meteorological aspects of "The Gap" severe thunderstorm event, November 2008.
- Dysart/Seraji Severe Storm, Powerlink Qld, April 2009.
Investigation of impacts of storm of 8th Dec, 2008.
- Wind Risk in Darwin, Willis Reinsurance Australia, Sydney, Jan 2009.
Development of housing damage models and calibration against TC Tracy, 1974 (also with JCU Cyclone Testing Station).
- Member, Expert Elicitation on Future Hurricane Activity, Risk Management Solutions Inc., Miami, Oct, 2008.
- Wind Damage, Powerlink Queensland, Brisbane, 2007.
Site inspection and assessment of the storm characteristics and likely downburst wind speeds associated with transmission line damage near Baralaba.
- Insurance Loss Risk Assessments, Willis Reinsurance Australia, Sydney, 2006/07/08.
Tropical cyclone wind and storm tide risk model development and application to Queensland coastal centres. Severe thunderstorm wind and hail risk modelling for SE Queensland. Clients including RACQI, SUNCORP, IAG, TIO.
- Wind Loading, Electricity Network Association, 2007.
Advice on wind risk issues regarding the update of Cb(1) guidelines, in association with Powerlink Queensland.
- TC Larry Impacts, Powerlink Queensland, Brisbane, 2006.
Field survey and interpretation of wind damage by TC Larry to transmission line towers in the Innisfail region.
- TC Larry Impacts, Willis Reinsurance Australia, Sydney, 2006.
Field survey and modelling of wind, storm tide, housing damage and insured losses from TC Larry in the Innisfail region.
- Assessment of Wind Damage, Powerlink Queensland, Brisbane, 2006.
Site inspection and assessment of the storm characteristics and likely downburst wind speeds associated with transmission line damage near Tarong.
- Assessment of Non-Cyclonic Wind Risks at Hay Point, Dalrymple Bay Coal terminal Pty Ltd, Mackay, 2005.
Examination of risk of extreme non-cyclonic winds capable of affecting coal export port operations.
- Tropical Cyclone Track Data, Applied Research Associates Inc, NC USA, 2005.

- Investigation and supply of historical tropical cyclone track data for American Samoa for US HAZUS model development.
- Wind Criteria, West Wind Laboratory Inc, CA USA, 2005.
Assessment of extreme winds for design of “Green Bridge” crossing of the Brisbane River at St Lucia, Brisbane.
- Winds at Hay Point, Aspec Engineering Pty Ltd, Brisbane, 2005.
Examination of risk of unforeseen strong winds capable of affecting coal export port operations.
- Cairns Tropical Cyclone Catastrophe Scenario, Geoscience Australia for AEMC / OWG Catastrophic Disasters Working Group, Cairns, 2004.
Provision of numerical wind and surge model time histories representing a tropical cyclone having a 1000 y storm tide return period for assessing emergency services response capabilities.
- Tropical Cyclone Track Data, Risk Management Solutions Inc, CA USA, 2004.
Supply of tropical cyclone track dataset for the Australian region for development of the RMS insurance loss model for Australia.
- Exmouth Salt Development Risk Assessment Workshop, Parsons Brinckerhoff, Perth, 2004.
Specialist tropical cyclone invitee to the project risk assessment workshop.
- Contributor to Economic Analysis of Identified Impacts of Climate Change - A Scoping Study undertaken for the Australian Greenhouse Office by CSIRO Atmospheric Research, Oct, 2003.
SEA provided estimated insurance related community losses from tropical cyclone wind and storm tide due to specific climate change scenarios.
- Climate Change and Tropical Cyclone Impact on Coastal Communities’ Vulnerability, James Cook University Cyclone Testing Station, prepared for Queensland Dept Emergency Services and Dept Natural Resources and Mines, July, 2003.
This study was a collaborative development between JCU and SEA of a numerical model for estimating the potential damage to domestic housing caused by extreme tropical cyclone winds. The SEACATd deterministic wind damage model was combined with newly developed wind damage functions developed by the Cyclone Testing Station in Townsville. The model allows emergency managers to simulate and compare the potential damage to the communities of Cairns, Townsville and Mackay from cyclones with specific parameters.
- Wind Tunnel Model of Cape Moreton, Bureau of Meteorology, Brisbane, 2002.
Assistance with study undertaken by the James Cook University Cyclone Testing Station.
- Wind Risk Assessment of Transmission Line Structures, Powerlink Queensland, 2002.
Determination of risks to high voltage power transmission structures throughout Queensland. In South East Queensland the study included the impacts of severe thunderstorms while tropical cyclones were considered throughout the rest of coastal Queensland. A line-risk methodology was developed to allow the accumulation of risks for transmission lines and varying topographic and terrain effects were analysed using LANDSAT data. This project was awarded an Engineers Australia (Queensland Division) Engineering Excellence Award in 2003.
- Weather Data Analyses, Thiess Contractors, Brisbane, 2002.
Design meteorological data for proposed Burrup Fertiliser Plant.

- AGSO Cities Project, Bureau of Meteorology, Queensland, 2000.
Provision of technical input, staff liaison and compilation of report material on behalf of the Queensland Regional Office of the Bureau of Meteorology for supply to the Australian Geological Survey Organisation for the *Cities Project* for Mackay and South East Queensland. Scope included all meteorological and oceanographic hazards such as tropical cyclone wind and storm surge, climate change, severe thunderstorms, east coast lows and flooding.
- Multi-Hazard Risk Study for Hervey Bay, Mackay and Cairns, Dept. of Emergency Services, State of Queensland, 1999.
Sub-consultant to BHP Engineering and Queensland Risk Management Consultants. Expert assessment of tropical cyclone wind, storm surge and severe thunderstorm risks and impacts.
- Flood Insurance Rating Study, RACQ-GIO Insurance Limited, 2000.
Investigation into the feasibility of developing a risk-based rating system for residential flood insurance in Queensland; completion of a pilot study using GIS-based flood data; local government liaison etc.
- Severe Thunderstorm Data for SE Queensland, Natural Hazards Research Centre, Macquarie University, Sydney, 1998.
Provided extensive data sets and interpretation summarising the frequency and intensity of severe winds, hail and tornadoes in the SE Queensland region.
- Scoping Study for the Development of a Public Wind Field Model for Tropical Cyclones, The Risk Prediction Initiative, Bermuda, 1998.
Jointly with the Bureau of Meteorology Research Centre, Melbourne, Mesoscale Meteorology Research Group. A review of historical developments in parametric wind field modelling, a functional specification and logical work packages to develop an updated model.
- Tropical Cyclone Risk Assessment Study for Queensland, Commercial Union Insurance (now CGU Insurance), Melbourne, 1997 and 2001.
Insurance risk assessment addressing tropical cyclone wind damage to housing throughout coastal Queensland (beyond Brisbane).
- Wind Risk Assessment for Norman Reef, Great Adventures Reef Tours, Cairns.
An assessment on the suitability of locating a mooring pontoon for day trips to the Great Barrier Reef following damage to the existing facility by Tropical Cyclone Justin.
- Severe Thunderstorm Risk Assessment Study, SUNCORP Insurance and Finance, Brisbane, 1997.
Insurance risk assessment of severe wind and hail damage to domestic dwellings in South East Queensland.
- Tropical Cyclone Risk Assessment, Brisbane, RACQ-GIO Insurance, Brisbane, 1996, 2001, 2003.
Insurance risk assessment addressing tropical cyclone wind damage to housing in South East Queensland.
- Tropical Cyclone Risk Assessment, Brisbane, Sun Alliance and Royal Insurance, Sydney.
Insurance risk assessment addressing tropical cyclone wind damage to housing in South East Queensland.
- Tropical Cyclone Risk Assessment, Brisbane, Commercial Union Insurance (now CGU Insurance), Melbourne; 1997, 2000.
Insurance risk assessment addressing tropical cyclone wind damage to housing in South East Queensland.
- Tropical Cyclone Risk Assessment, Brisbane, FAI Insurance.
Insurance risk assessment addressing tropical cyclone wind damage to

- housing in South East Queensland.
- Tropical Cyclone Insurance Risk Assessment, SUNCORP Insurance and Finance, 1994 to 2001.
Insurance risk assessment addressing tropical cyclone wind and storm surge damage to housing in North Queensland (1995, 1996, 2000) and South East Queensland (1994, 1997, 1999, 2001).
- Tropical Cyclone Risk Survey, Northern Territory Museum of Arts and Sciences.
Performed a tropical cyclone risk survey and audit of the nearshore museum facilities, Fannie Bay, Darwin.
- Integrity Review, North Rankin 'A' Platform, Woodside Offshore Petroleum Pty Ltd.
Review of environmental loadings on the North Rankin 'A' gas production platform - the largest of its type in Australia.
- Statistical Water Level and Wind Speed Study, Queensland and Northern Territory Coast, Commercial Union Assurance Co of Australia.
Performed a statistical water level and wind speed study to provide a more accurate basis for insurance assessments in Northern Australia.

COASTAL AND OCEAN INVESTIGATIONS

- Torres Strait Inundation Study, Torres Strait Regional Authority, Qld, 2009-2010.
A comprehensive assessment of storm tide influences in the Torres Strait, taking account of a variety of influences and considering potential future climate change impacts.
- High Resolution Darwin Storm Tide Study, Dept Lands and Planning, NT, Mar, 2010.
Extension of 2006 storm tide study using high resolution LiDar and with consideration of potential climate change impacts.
- Storm Surge Assessment – Cape Ferguson, Australian Institute of Marine Science, Townsville, Aug 2009.
- Milingimbi Storm Surge Study, NT Dept Planning and Infrastructure, May 2009.
Numerical modelling to recommend storm surge shelter locations.
- Cooloola Coast Storm Tide Review, GHD Pty Ltd, April 2009.
Review and recommendations for planning, Gympie Regional Council.
- Kakadu Storm Tide Study, BMT-WBM, March 2009.
Contribution to sensitivity to climate change impacts for DECC study.
- Impacts of Tropical Cyclone Charlotte, Townsville City, March 2009.
Documentation of coastal impacts of TC Charlotte in Jan 2009.
- Sunrise LNG Development, Woodside Energy Ltd, Perth, Nov, 2008.
Analysis of historical tropical cyclone and associated wind data to assist in estimating storm scale parameters.
- Hamilton Is Pipeline Design Criteria, GHD Pty Ltd, Brisbane, Nov 2008.
Assessment of wave, current and storm tide design criteria.
- Storm Tide Study, NT, Water Technology Pty Ltd, Sep 2009.
Deterministic and probabilistic storm tide assessment of a tourist facility.
- Peer Review, Joint Probability Analysis of Waves and Storm Surge, Mouchel International, Abu Dhabi, 2008.
Review of analyses undertaken for the design and construction of the Khalifa Port facilities.
- Johnstone Shire Storm Tide Study, GHD Pty Ltd, Brisbane, 2008.
Estimation of the risk of extreme storm tide levels (surge plus tide plus wave setup) caused by tropical cyclones in the Innisfail region of North

Queensland (now Cassowary Coast Regional Council). Also included detailed storm tide calibration of TC *Larry*.

- Assessment of the Effectiveness of the Australian Tsunami Warning System for Queensland, EPA Coastal Sciences, Brisbane, 2007.
- Review of Storm Tide Studies in South East Queensland, SEQDMAG, Brisbane, 2007
In association with GHD, all historical storm tide studies in the region were compared and ranked, leading to the development of a best practice work scope for future investigations.
- Cairns Base Hospital Storm Tide Investigation, Parsons Brinckerhoff, Brisbane, 2007.
Review of the assessment of storm tide risks at Cairns Base Hospital for Queensland Dept Public Works.
- Haughton Highway Storm Tide, Kellogg Brown and Root Pty Ltd, Brisbane, 2007.
Review of storm tide levels within Moreton Bay for the duplication of the Haughton Highway viaduct by Main Roads Queensland.
- Storm Tide Advice, Townsville City Council, Townsville, 2007, 2008/09.
Specialist advice on storm tide analyses and interpretation.
- Gove Storm Tide Study, Alcan Gove Pty Ltd, Gove, 2007.
Storm tide risk assessment of the Gove Peninsula in eastern Arnhem Land, comprising the town of Nhulunbuy and Gove Harbour. Undertaken in association with the James Cook University Cyclone Testing Station, Townsville.
- Scope of Work for Moreton Bay Councils Storm Tide, Study SEQDMAG, Brisbane, 2007.
Based on review recommendations.
- Review of SE Qld Storm Tide Studies, SEQDMAG, Brisbane, 2007.
In association with GHD Pty Ltd.
- Darwin Storm Tide Study, NT Dept Emergency Services, Darwin, 2006.
An update of the storm tide risk to Darwin and surrounds using an extension of the methodology developed for the BoM Storm Tide Warning System (refer below).
- Tropical Cyclone Wind Data Analysis, Woodside Energy Ltd, Perth, 2006.
An analysis and assessment of recorded offshore wind data at various elevations during tropical cyclone conditions.
- Advice on Hayman Island Storm Tide Levels, Whitsunday Shire Council, 2006.
Interpretation of design levels and wave runup estimates.
- Climate Change Trends in Tropical Cyclone Archives, Woodside Energy Ltd, Perth, 2006.
An examination of possible climate change trends in Australian tropical cyclone archived intensities for Western Australia and the Northern Territory since 1968 with implications for low probability design.
- Townsville/Thuringowa Storm Tide Study, GHD Pty Ltd, Brisbane, Qld, for Townsville City Council, 2004/2005.
Refer similar scope below for Whitsunday coast but including the supply of a real-time storm tide warning system (SEAtide).
- Rarotonga Coastal Protection Study, GHD Pty Ltd, Brisbane, Qld, for SOPAC, 2004/2005.
Assessment of the impacts of tropical cyclones on the mid-Pacific island of Rarotonga (Cook Islands) and implications for long term coastal management and protection. SEA undertook tropical cyclone climatology analyses, historical wind speed analyses, numerical wind and spectral

- wave modelling, development of parametric and statistical models to provide return period estimates. GHD provided overall management, assessment of coastal protection options and costings.
- NT Storm Tide Prediction Project, Bureau of Meteorology, Darwin, 2004/2005. (In association with James Cook University Marine Modelling Unit).
Development of an automated storm tide modelling and warning system (SEAtide) for the entire Northern Territory coastline, extending to the Kimberley coast of Western Australia. Numerical storm surge and spectral wave modelling, climatology analyses, parametric model development and Monte Carlo storm tide prediction system for use by Bureau forecasters.
 - Cooloola Shire Storm Surge, GHD Pty Ltd, Brisbane, 2004.
Advice on storm surge estimates for the Cooloola Shire region.
 - Queensland Climate Change and Coastal Vulnerability to Tropical Cyclones, Synthesis Report, Bureau of Meteorology, Queensland, 2004.
Summary reporting of stages 1, 1a, 2 and 3 of the Queensland Climate Change and Coastal Vulnerability to Tropical Cyclones project.
 - Illawarra Ocean Outfall Wave Analysis, McConnell Dowell Constructors, Port Kembla, 2004.
Analysis of historical wave height data and comment on statistical matters pertaining to construction of a nearshore ocean outfall.
 - NSW Coastal Lands Risk Assessment Project, Dept Infrastructure Planning and Natural Resources, Sydney, 2003/04.
Member of expert panel of review to oversee study progress by Patterson Britton and Associates.
 - Whitsunday Storm Surge Study, GHD Pty Ltd, Brisbane, Qld, for Whitsunday Shire Council, 2003.
Estimation of the risk of extreme storm tide levels (surge plus tide plus wave setup) caused by tropical cyclones in the Whitsunday Islands region of North Queensland. SEA undertook tropical cyclone climatology analyses, provision of model wind and pressure fields, numerical spectral wave modelling and statistical modelling to provide the return period estimates. GHD provided overall management, numerical hydrodynamic modelling, asset risk identification and mapping.
 - Queensland Climate Change and Coastal Vulnerability to Tropical Cyclones, Stage II, Bureau of Meteorology, Queensland, 2002. (Jointly with James Cook University Marine Modelling Unit).
Development of a methodology for parametric modelling of coastal wave height, period and direction for use in estimating the breaking wave setup component of storm tide.
 - 10⁻⁴ Waves Study, Woodside Energy Ltd, Perth, WA, 2001-2002.
Technical management of a range of studies and investigations aimed at improving the estimate of 10,000 year return period design conditions on the North West Shelf and Timor Sea.
 - Patricia/Baleen Metocean Design, OMV Australia, Perth, 2001.
Peer review of pipeline metocean design criteria study.
 - Review of Metocean Design Conditions, Bayu Undan Project Pipeline, Kvaerner E&C Australia Pty Ltd, Perth, WA, 2001.
A review of preliminary and final design conditions for the Bayu-Darwin LNG pipeline project in the Timor Sea.
 - Cocos (Keeling) Island Storm Surge Study, GHD Pty Ltd, Perth, for Commonwealth Department of Transport and Regional Services, 2001.
Determination of extreme tropical cyclone storm tide levels for the Cocos (Keeling) Islands, an Australian Territory in the Southern Indian Ocean.

The study was commissioned to assess the suitability of existing storm surge shelters for the island population. A combination of storm surge, spectral wave modelling and statistical tide+surge+setup simulation was used. A particular feature of the island response was the interplay between lagoon wind-induced surge and fringing reef wave setup, the latter being very sensitive to the stillwater ocean level.

- Queensland Climate Change and Coastal Vulnerability to Tropical Cyclones, Stage I, Bureau of Meteorology, Queensland, 2000. (Jointly with James Cook University Marine Modelling Unit).
A multi-agency study intended to update and extend the present understanding of the threat of storm tide inundation in Queensland on a State-wide scale, including the effects of storm wave conditions in selected areas and estimates of potential Greenhouse impacts. The Stage 1 technical review also leads to the provision of a numerical storm surge model for application by the Bureau to devise an operational storm surge forecasting system based on the MEOW methodology. Other funding partners included the Environmental Protection Agency, Dept Natural Resources and Dept Emergency Services. This project was awarded an Institution of Engineers Australia (Qld Division) Engineering Excellence Award in 2002.
- Mackay Coastal Processes Investigation, Coastal Management Branch, Dept of Environment, State of Queensland, 1999.
Numerical modelling of tide response, design water levels, waves, study coordination and report preparation.
- Tweed River Entrance Sand Bypassing Project, Dept of Environment and Heritage, Coastal Management Branch, Brisbane, 1998.
Project administrative and technical support, assessment of tenders, simulation modelling.
- Review of Scott Reef Metocean Program, Woodside Energy Ltd, Perth, 1998.
Review, recommendation and specification of measurement programs and numerical modelling requirements for gas field development.
- Advice on Storm Surge Levels in The Broadwater, Max Winders & Associates, Brisbane, 1998.
Review of technical reports, analysis of tide levels, recommendations.
- Review of Consultant Proposals and Peer Review of Outcomes, Dept of Environment and Natural Resources, State of Victoria, 1998.
Technical review of numerical modelling options for the Lonsdale Bight coastal process investigation. Final peer review of consultant's technical reports and recommendations.
- Mackay Coastal Processes Investigation, Coastal Management Branch, Dept of Environment, State of Queensland, 1997/1998.
Preparation of a long term wind-wave climate for the Mackay region in North Queensland for numerical modelling of sediment transport and development of a sediment transport model.
- Technical Review, Woodside Offshore Petroleum Pty Ltd, Laminaria/Corallina Project, 1997.
Technical review of preliminary design criteria for an FPSO and advice on numerical modelling of winds, waves and currents.
- Storm Tide Threat in Queensland, Coastal Management Branch, Dept of Environment, State of Queensland, 1996.
Compiled a review of the threat to the coastal margin in Queensland due to the potential effects of tropical cyclone storm surge.
- Extreme Wave Height Analysis, Coastal Management Branch, Dept of Environment, State of Queensland, 1996.

- Undertook a review of available methods for extreme wave height analysis of departmental wave data records and recommended a standard analysis procedure.
- Design Conditions Analysis, Oman LNG Project, Kellogg/JGC.
Modelling and analysis of extreme environmental wind and wave conditions due to tropical cyclones for Shell LNG loading jetty design.
 - Offshore Warning System Review, Mermaid Sound, Woodside Offshore Petroleum Pty Ltd.
Undertook a detailed review of the operation of a remote offshore warning system for LNG tanker operations, Dampier, WA.
 - Breakwater Design, East Arm Port Development, Roche Bros Pty Ltd.
Developed alternative design options for Darwin harbour breakwater protection.
 - Extreme Wave Analysis, Goodwyn 'A' Platform, Woodside Offshore Petroleum Pty Ltd.
Performed a directional and monthly analysis of extreme wave conditions on the North West Shelf for the installation of the offshore platform.
 - Preliminary Breakwater Design Investigation, Norfolk Island Harbour Facilities, Norfolk Island Administration.
Performed a preliminary investigation for the provision of harbour facilities on Norfolk Island - breakwater design aspects.
 - Offshore Warning System Design Modelling, Mermaid Sound, Woodside Offshore Petroleum Pty Ltd.
Numerical wave modelling study to determine the feasibility and operational needs for providing a remote offshore warning system for LNG tanker operations, Dampier, WA. Provision of numerical algorithms for operational warning system.
 - Environmental Design Conditions, Wanaea Project, Woodside Offshore Petroleum Pty Ltd.
Provision of environmental design conditions for a major oil and gas field development on the North West Shelf of Australia.
 - Tropical Cyclone Wave Design Parameters, Cossack Project, Woodside Offshore Petroleum Pty Ltd.
Developed detailed wave design parameters for a floating oil production system (FPSO) based on assessments of spectral shape and directionality of extreme tropical cyclone waves.
 - Offshore Warning System Design and Development, Mermaid Sound, Woodside Offshore Petroleum Pty Ltd.
Research and development of an early warning system for wave conditions in Mermaid Sound affecting port operability for LNG and condensate tankers. Long range HF Radar research and development with University group.
 - Environmental Design Criteria, Goodwyn 'A' Platform, North West Shelf, Woodside Offshore Petroleum Pty Ltd.
Performed a complete review of offshore environmental criteria involving extensive numerical modelling of tropical cyclone wind, waves and currents over the North West Shelf. Stochastic modelling based on storm statistics used to formulate structural design criteria extending to return periods of 2000 years.
 - Numerical Wave Modelling, Hay Point Tug Harbour, DBCT-UDCL JV.
Investigation of wave height design criteria for the construction of a tug harbour to service Hay Point at Half Tide (Central Queensland). Numerical spectral wave modelling of tropical cyclones and related events. Stochastic simulation of long-term effects of surge and waves.
 - Storm Surge Study, Greater Darwin Storm Surge Study (Parts 3 & 4),

Commonwealth Department of Housing and Construction.

Performed a storm surge study including both statistical water level predictions and surge inundation effects on buildings.

- Extreme Water Level Study, Beach Protection Authority of Queensland. Statistical study based on meteorological analyses, numerical storm surge and wave modelling and stochastic long-term modelling of extreme events.
- Interdisciplinary Environmental Study, The Three Bays Project, James Cook University.
Part of a team researching the physical and biological makeup of a section of the North Queensland Coast near Townsville with the aim of numerically modelling the ecosystem behaviour.
- Numerical Simulation of Tropical Cyclone Storm Surge, James Cook University, Beach Protection Authority Queensland.
Research officer responsible for the development of a numerical modelling facility for the generation and propagation of tropical cyclone storm surge. Extensive statistical analysis of meteorological data to determine storm recurrence criteria. Comprehensive sensitivity testing was undertaken and the model calibrated against historically recorded data. Over 90 model storms were generated to determine the storm surge hazard at each of 10 sites along the Queensland coast.

POLICY & MANAGEMENT STRATEGIES

- National Emergency Risk Assessment Guidelines, GHD Pty Ltd, May 2008.
Participation in stakeholder consultation workshop and other contributions.
- Guidelines for Responding to the Effects of Climate Change, Institution of Engineers, Australia, National Committee on Coastal and Ocean Engineering, 1999/2004 and 2009.
Research and preparation of a coastal engineering guidelines document to address climate change issues.
- Coastal Engineering Guidelines, Institution of Engineers, Australia, 1999/2004.
Coordination of National Committee on Coastal and Ocean Engineering inputs to the Environment Australia, Coasts and Clean Seas Initiative Program.
- Topographic Mapping, Beaudesert Shire Council.
Review of procedures for classifying design wind categories for housing building approvals.
- Coastal Zone Management Research, Institution of Engineers, Australia.
Review of coastal zone management research needs in Australia for the Dept of Environment, Sport and Territories.

RESEARCH

- Member, Willis Research Network, 2007+.
Tropical cyclone hazards, climate change and insurance loss modelling.
Refer: <http://www.willisresearchnetwork.com/>
- Guidelines for Converting Between Wind Averaging Periods in Tropical Cyclone Conditions, World Meteorological Organization, Geneva, 2004/09.
A review of current scientific knowledge and available datasets leading to the recommendation of gust factor conversions for use by tropical

cyclone forecasters.

- Tropical Cyclone Parameter Estimation in the Australian Region, Woodside Energy Ltd, 2002.
An investigation into the use of the Dvorak tropical cyclone intensity method in the Australian region.
- Tropical Cyclone Coastal Impacts Program, 1999-2003.
Joint risk model development with the James Cook Cyclone Structural Testing Station, Townsville.
- Stability of Highly Permeable Breakwaters, Australian Marine Sciences and Technologies Research Grant, 1985.
Physical and numerical modelling of the behaviour of mass armoured breakwater structures.
- Numerical Simulation of Tropical Cyclone Storm Surge, James Cook University, Beach Protection Authority Queensland.
Development of a generalised numerical model for the generation and propagation of tropical cyclone storm surge.

WASTEWATER / COASTAL DISPERSION

- Comparative Air Testing of Sewers, Public Works Dept NSW.
Development of reliable and easily implemented methods for insitu testing of permeable clay gravity sewer lines.
- Wybung Head Ocean Outfall Study, NSW Central Coast, Public Works Dept NSW.
Project Engineer for the design and siting of a sewage effluent outfall on the Central Coast region of NSW. Extensive field monitoring of nearshore currents and dispersion characteristics; in-field measuring and analysis techniques, software development, portable mini-computer system for survey boat, numerical modelling of dispersion processes.
- Norah Head Ocean Outfall Study, NSW Central Coast, Public Works Dept NSW.
Project Engineer for the design and siting of a sewage effluent outfall on the Central Coast region of NSW. Extensive field monitoring of nearshore currents and dispersion; in-field measuring and analysis techniques; software development; customised electronic data logger for survey boat use; numerical modelling of dispersion processes
- Culburra Ocean Outfall Study, NSW Central Coast, Public Works Dept NSW
Involved in design and siting of sewage effluent outfall for small coastal community. Interpretation of field measurements and numerical prediction of dispersion rates.
- Forster Ocean Outfall Investigation, NSW North Coast, Public Works Dept NSW.
Involved in design and siting of sewage effluent outfall for small coastal community. Interpretation of field measurements and numerical prediction of dispersion rates.
- Wonga Point Ocean Outfall Study, NSW Central Coast, Public Works Dept NSW.
Involved in augmentation design of sewage effluent outfall for growing coastal community. Interpretation of field measurements and numerical prediction of dispersion rates.

MONITORING AND PHYSICAL MODELLING

- Integrated Mooring Load and Environmental Monitoring System (MEMS) Development, Mermaid Sound, Woodside offshore Petroleum Pty Ltd.
Development of a real-time ship mooring load and environmental (wind, wave, current, tide etc) system to assist port operations in Mermaid Sound.
- Environmental Measurement Programmes, North West Shelf, Woodside Offshore Petroleum Pty Ltd.
Specification and supervision of environmental measurement programmes in support of Woodside activities, eg. winds, waves, dredge spoil monitoring, long wave propagation, near bottom shelf currents, etc.
- Numerical Modelling (Hydraulics) Survey, NSW Public Works Hydraulics Laboratory.
Conducted a comprehensive international survey and review of commercially available numerical models for hydraulic analysis.
- Physical Hydraulic Model, Georges River Proposed Bridge, NSW Public Works.
Design and construction of physical river model to investigate potential flooding increase due to freeway crossing.
- Physical Hydraulic Modelling, Aeration in a Sewer Main, NSW Public Works.
Physical modelling of effects of aeration in a sewer main.

SYSTEMS ANALYSIS

- Environmental Data Base development, Woodside Offshore Petroleum Pty Ltd.
Specification of an extensive relational data base system for environmental parameters (through SIPM) to upgrade the handling, storage and retrieval of environmental data for Shell operating companies worldwide.
- Grain Terminal Software System Specification, Gladstone Grain Terminal, Bulk Grains Queensland.
System software design, supervision and provision of computing facilities for upgrade of an export facility, Gladstone.
- Data Retrieval System, Laboratory Library, NSW Public Works Dept.
Development of a computer based bibliographic data base to enable the rapid retrieval of laboratory library holdings.
- Regional Simulation Study, Albury/Wodonga, Commonwealth Department of Housing and Community Development.
Implementation of a computer-based design tool (expert system) to study the long term effects of economic policy decisions on the dynamics of communities. The model was based on Systems Dynamics principles.
- Farm Dynamics Model, James Cook University, Civil & Systems Engin.
Implementation of a Systems Dynamics model to study farming management practice in under-developed countries.

PUBLICATIONS

- Harper, B.A., Modelling the Tracy Storm Surge - Implications for Storm Structure and Intensity Estimation. Proc. Cyclone Tracy Special Session, AMOS Conference 2008, *Australian Meteorological and Oceanographic Journal*, (submitted 2009).
- Masters F., Vickery P., Harper B., Powell M., and Reinhold T., [Engineering Guidance Regarding Wind-Caused Damage Descriptors](#). Provided to the NOAA Saffir-Simpson Hurricane Wind Scale Review Committee. 10pp, Dec, 2009.
- Dube S.K, Murty T.S., Feyen J.C., Cabrera R., Harper B.A., Bales J.D. and Amer S. Storm surge modeling and applications in coastal areas. In Chan J. and Kepert J. (Eds.) [Global Perspectives on Tropical Cyclones](#), *World Scientific*, April, 2010, 448pp.
- Harper B. [Managing Sea Level Rise and Climate Change](#), Proc. IPWEA Conference on Climate Change Response, Coffs Harbour, Aug, 2008.
- Harper B., Stroud S., McCormack M. and West S., A review of historical tropical cyclone intensity in north-western Australia and implications for climate change trend analysis. [Aust. Met. Mag.](#), Vol. 57, No. 2, June, 121-141, 2008.
- Harper B., Kepert J. and Ginger J. Wind speed time averaging conversions for tropical cyclone conditions. Proc. 28th Conf Hurricanes and Tropical Meteorology, AMS, Orlando, [4B.1](#), April, 2008.
- Harper B., Hardy T., Mason L. and Fryar, R., Developments in Storm Tide Modelling and Risk Assessment in the Australian Region. Proc. WMO/IOC JCOMM 1st Scientific and Technical Symposium on Storm Surges, Seoul, Korea, 2-6 Oct, 2007 (*Natural Hazards*, Vol 51, 1, Oct 2009, 225-238; [DOI 10.1007/s11069-009-9382-3](#), 2009).
- Kossin J.P., Knapp K.R., Vimont D.J., Murnane R.J., and B.A. Harper, A globally consistent reanalysis of hurricane variability and trends, *Geophys. Res. Lett.*, 34, [L04815](#), 2007.
- Velden C., Harper B., Wells F., Beven J.L., Zehr R., Olander T., Mayfield M., Guard C., Lander M., Edson R., Avila L., Burton A., Turk M., Kikuchi A., Christian A., Caroff P. and McCrone P, The Dvorak tropical cyclone intensity estimation technique: a satellite-based method that has endured for over 30 years. *Bulletin American Meteorological Society*, [Vol 87](#), 1195-1210, Sept, 2006. [plus online supplement].
- Landsea C.W., Harper B.A., Hoarau K., and Knaff J., Can we detect trends in extreme tropical cyclones? *Science*, Vol 313, 28 July 2006, ([10.1126/science.1128448](#)).
- Harper B.A. and Callaghan J., On the importance of reviewing historical tropical cyclone intensities. Proc. 27th Conf Hurricanes and Trop Meteorology, AMS, Monterey, [2C.1](#), April, 2006.
- Harper B.A., Recent advances in storm tide modelling in Australia, WMO International Workshop on Tropical Cyclone Landfall Processes, p17-21, Macau, China, March, 2005.
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AWARDS

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- Emergency Management Australia, Queensland Safer Communities Award 2004 for *Queensland Climate Change and Community Vulnerability to Tropical Cyclones Project*.
- Emergency Management Australia, National Safer Communities Award 2004 for *Queensland Climate Change and Community Vulnerability to Tropical Cyclones Project*.

REFEREE AND REVIEW ACTIVITY

Australian Meteorological Magazine (AMM)
Australian Meteorological and Oceanographic Journal (AMOJ)
Bulletin of the American Meteorological Society (AMS)
Journal of Applied Meteorology and Climatology (AMS)
Journal of Marine and Freshwater Research (CSIRO)
Journal of Performance of Constructed Facilities (ASCE)
Monthly Weather Review (AMS)
National Science Foundation Proposals (USA)
Natural Hazards (Springer)
Natural Sciences and Engineering Research Council of Canada
Quarterly Journal of the Royal Meteorological Society
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