



Curriculum Vitae

Evan Watterson

Principal Coastal Engineer
Director

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Evan is a principal coastal engineer and director of Bluecoast Consulting Engineers. He has over 17 years of experience in coastal, ocean and environmental engineering. He previously worked within specialised coastal and marine teams at Royal HaskoningDHV, SMEC, WorleyParsons and Cardno Lawson Treloar.

He graduated from University of New South Wales with a first class honours degree in Environmental Engineering in 2005. Evan also has a Science degree majoring in Physical Oceanography. He has completed specialised post-graduate courses and presented technical papers at a number of state, national and international conferences.

Evan has worked on all aspects of coastal engineering design from feasibility to detailed design including the development of technical specification and tender documentation. Evan has demonstrated leadership having acted as manager, team leader and company director. He has managed and directed a range of national and international investigation and design projects spanning in size from small residential developments to large multi-disciplinary projects.

Nationality

Australian

Years of experience

17 years

Years with Bluecoast

4 years

Professional memberships

Member, Institution of Engineers, Australia

Qualifications and specialist training

2005 University of NSW, BEng (Honours 1)

2005 University of NSW, BSc (Oceanography)

2006 MIKE by DHI Software Training (Brisbane, QLD)

2008 WorleyParsons Project Management Course (Newcastle, NSW)

2012 Port Operability (Perth, WA)

Languages

English

Professional experience

Detailed Design of Artificial Surfing Reef

Bluecoast was engaged by the City of Albany to provide detailed design services for the Albany Artificial Surf Reef project. This project involves the design of an artificial reef situated at Middleton Beach, Albany, Western Australia to deliver surf amenity improvements. Evan acted as project director, overseeing 10-months of intensive design investigations. This required the management of eight specialist sub-consultants or peer reviewers to deliver the tender ready design to schedule and budget. The detailed design follows on from feasibility study completed in 2015 for which Evan acted in a technical review capacity.

In addition to leading the design development, undertaking the numerical modelling investigations and providing technical review of the detailed technical analysis, Evan provided a range of stakeholder engagement activities and presented to local and state government representatives.

Tuvalu Coastal Adaptation Project

Bluecoast was engaged by the United Nations Development Programme (UNDP) to undertake concept design options for coastal defence measures on Nanumea Island, one of three of Tuvalu's most at-risk islands. This investigation was part of Government of Tuvalu (GoT) and the Green Climate Fund's (GCF) jointly funded US\$38 million for the 'Tuvalu Coastal Adaptation Project'. Following a review of the atoll's coastal processes and environmental context, five concept designs were developed and evaluation of the coastal protection performance. Recommendations were provided on option to be progressed through to detailed design and implementation stage.

Main Beach Shoreline Project

Byron Shire Council engaged Bluecoast Consulting Engineers (Bluecoast) to deliver the first stage of the Main Beach Shoreline Project (MBSPP). The project's first stage is focused on finding the solution for modification of the coastal protection works (also known as the Jonson Street Protection Works) that will give the best possible outcomes for Main Beach, Byron Bay and adjacent areas. Evan is Bluecoast's project manager and principal project engineer and is involved in all aspects of the

Main Beach Shoreline Project from various coastal processes investigations, community engagement to engineering design.

Tugun Seawall Detailed Design and Construction Supervision

Bluecoast were engaged by the City of Gold Coast to produce a detailed design for over 250 linear metres of rock seawall and associated civil works at Tugun on the Gold Coast. Evan oversaw all aspects of the design including the management of sub-consultants (stormwater engineers and quality surveyors) commissioned by Bluecoast to complete the design team. Various City departments acted as key stakeholders in a transparent design process to ensure that the final design incorporated appropriate stormwater, road and Oceanway design elements within the framework of the City's Ocean Beaches Strategy and ongoing CAPEX and OPEX budgets. Safety design processes were documented including workshops and risk register development, evaluation and sign-off.

Stockton Beach Coastal Management Program

The City of Newcastle engaged Bluecoast to undertake a review of coastal processes and sediment budget as well as a probabilistic coastal hazard assessment as part of a Coastal Management Program (CMP) for Stockton Beach. A cost benefit analysis (CBA) was undertaken in support of the CMP by Bluecoast and their sub-consultants Rhelm. The CBA assessed three identified coastal management options for Stockton Beach. The CMP was developed in accordance with the Coastal Management Act (2016) and outlined long-term actions to address on-going beach erosion and shoreline recession. The CMP was completed in a record time. It was the first program of its type to be certified by the NSW Minister for Local Government.

Palm Beach Shoreline Project

Through this project the City of Gold Coast aims to reduce the vulnerability of Palm Beach to coastal erosion as well as enhance the amenity value of the areas for both beach goers and the surfing community. It consists of two main elements, mass beach nourishment which was successfully delivered in 2017 followed by the construction of an artificial reef in 2019. Evan has acted in the role of project manager for the design team since 2015, overseeing the design investigations, design

development, detailed design, technical specifications, tender documentation and evaluation and went on to complete the quality assurance for the structures construction in 2019.

Design investigation were undertaken using a multiple-lines of evidence approach and included: site specific coastal processes understanding, development of a basis of design and key performance indicators, site investigations (survey, geotechnical and metocean), physical modelling (stability and wave transmission in 3D in 10m basin and mobile bed in large basin), numerical modelling (wave, hydrodynamic, shoreline modelling and CFD), constructability, cost estimates and a quantified conceptual coastal processes model.

Cocos (Keeling) Islands Coastal Vulnerability Study

On behalf of the WA Department of Planning, Lands and Heritage, Evan acts in the role of project manager and technical lead. The Cocos (Keeling) Islands are a remote Indian Ocean Territory of Australia. These islands form a low-lying coral atoll that are vulnerable to coastal hazards and the effects of climate change. The scope involves a large-scale metocean and coastal monitoring project over a 12-month periods, modelling of coastal erosion and shoreline change (XBeach and Delft-3D), modelling of tropical cyclones and coastal inundation (Delft-3D) as well as a coastal vulnerability assessment. The project is the first step in the CHRMAP process for these unique islands.

Investigation and Design of Six Wharves Upgrades in Fiji

Bluecoast were commissioned to undertake coastal and environmental assessments as well as coastal engineering design as part of a multi-discipline team for six wharf upgrades in on the outer islands of Fiji. Evan role in the project was to support Bluecoast's project manager by undertaking the coastal engineering design aspects for each wharf and provide technical review across all aspects of Bluecoast's input. Working with both Australian and Fijian engineers through the inspection and field investigations of the six remotely located wharves. The project involves site reconnaissance to determine structure characteristics, metocean conditions and capacity for an appropriate re-design of each facilities. The work is for the Fiji Roads Authority.

Emu Point and Middleton Beach Coastal Adaptation and Protection Strategy

Evan was the Project Director and technical lead for this project. The project involved coastal data analysis along with wave, hydrodynamic and sediment transport modelling to inform an assessment of the coastal hazards at Emu Point and Middleton Beach. Wave hindcasting included the use of a local transformation model forced offshore by a global hindcast model but also by spatial uniform local winds to determine the local ambient and extreme wave climate at the site. This project required a comprehensive understanding of the coastal processes which was informed by an extensive review of historical data and numerical modelling to determine an 'evidence based' quantified conceptual coastal processes model. Coastal erosion and inundation hazards were determined and mapped in accordance with SSP 2.6.

Duranbah Beach Surf Quality investigation

Evan was part of the Bluecoast team which undertook a study to identify the morphological conditions that dictate high surf quality at Duranbah Beach on NSW's far north coast. The study aimed to find a relationship between surf amenity at Duranbah Beach and Tweed Sand Bypass (TSB) dredging, sand pumping and placement operations. The study developed options for future TSB operational strategies that could be managed with the aim of optimising surfing amenity at Duranbah Beach.

Queen Salote International Wharf Upgrade Project, Kingdom of Tonga

Evan has been involved in the metocean, climate and disaster risk components of the project. His work included deployment of wave and current measuring devices as well as drone and bathymetric surveys. Following this, a comprehensive climate and disaster risk analysis was undertaken, including numerical modelling of future scenarios to inform future designs and capacity of the QSIW. Stakeholder engagement has been successfully undertaken with Government and other groups. The climate and disaster risk assessments were completed in accordance with the latest Asian Development Bank guidelines and client feedback indicated they will act as examples for future assessments of this nature.

NSW Entrance Tailwater Study

Lead engineer/scientist in a federally funded project to investigate tidal anomalies of the NSW coastline and the metocean driving forces that cause them. This included investigating water level processes for a full range of estuaries from large rivers to small coastal lagoons.

Swansea Channel Foreshore Stabilisation

Evan worked for NSW Department of Primary Industries to provide expert advice following the partial collapse of the Pelican Marina building in 2016. The adjustment of the Swansea Channel to training of the entrance has resulted in erosion of sand from unprotected foreshore, primarily historically from Salts Bay, and scour of the channel. In particular, significant and ongoing channel erosion has recently occurred along the Pelican Foreshore. Erosion of this foreshore has predominately occurred because of channel deepening and migration caused by the strong tidal currents. Evan was the technical lead and project manager for this study. The scope included conceptual analysis of processes, metocean data collection, numerical modelling and development of concept designs for the foreshore protection.

Lotus Island Development, Vietnam

This project is a large-scale reclamation project in southern Vietnam. In a similar fashion to the Palm Island in Dubai the plan is to build a Lotus flower shaped island for residential and tourist development. Evan acted in the role of expert reviewer for the hydrodynamic, wave and typhoon modelling as well as the field data collection program. He was also responsible for leading the team undertaking the water quality assessment and design modification to optimise the water quality outcomes of the project.

Beresford Foreshore Coastal Protection and Enhancement Project

Concept design and associated technical investigations for a foreshore coastal protection and enhancement project in Beresford, WA. This project required a comprehensive understanding of the coastal processes which influence the area to ensure design options would be effective. The team undertook coastal investigations including metocean data collection, detailed wave transformation modelling, sediment transport modelling and optimisation of design options to meet

the client's requirements. Construction supervision was undertaken over a 9-month period. The contractor delivered the \$22m coastal protection works to design specification within the planned construction schedule.

Surfers Paradise Sand Backpassing Project (City of Gold Coast)

As part the Surfers Paradise Sand Backpassing Project, the Burleigh office worked closely with the City of Gold Coast to: Provide the City with an economical sand backpassing design to deliver sand to Surfers Paradise and Main Beach for beach replenishment; Deliver a practical operational procedure which can integrate with the existing Gold Coast Seaway Sand Bypassing System (GCSSBS) infrastructure and maintenance dredging operations; Provide a solution which has no unacceptable impact on natural coastal processes. The Surfers Paradise Sand Backpassing Study completed the forward planning stage of the Project and resulted in the development of a detailed, costed concept design. Evan was the technical lead for the metocean and coastal investigation for this study.

Albany Artificial Surf Reef - Preliminary Shoreline Assessment

Evan was the Project Director and technical reviewer for this project. The project involved wave, hydrodynamic and sediment transport modelling to determine the envelope of shoreline impacts for the proposed Albany Artificial Surfing Reef (ASR). MIKE 21 SW, MIKE 21 HD and MIKE LITPACK were used for the numerical modelling which was further supported by empirical methods. The envelope of possible shoreline effects was determined including the long-term coastal response.

Samoa Tropical Cyclone Modelling

The inundation risk of key infrastructure on Savaii and Upolu Island, Samoa was assessed. Several historic tropical cyclone wind fields were generated to force a coupled spectral wave and 2D hydrodynamic model. Evan was the technical reviewer for this work.

International peer review work

Evan has acted to provide technical review on several international projects including wave climate studies in the

Philippines, Indonesian and Sohar. Similarly, he has reviewed water quality monitoring programs for dredging works and siltation studies in Indonesia, Sierra Leone and Myanmar.

Tonkolili Iron Ore Project

Evan was the technical lead for metocean data collection and coastal processes investigations to assess design and dredging options for the port component of a large green field iron project in Sierra Leone, West Africa. Leading a small group of the coastal engineers/scientist the key component of this project has been the assessment of siltation rates in very large and highly river estuary with current speed exceeding 1.5 m/s and mobile sand wave up to 10 m high. Extensive field data collection provided in-situ wet and dry season sediment transport rates that were used to calibrate 2D/3D numerical models.

Port of Hastings

This project involved hydrodynamics and dredge material management investigations and design for the proposed Port of Hastings development located in Western Port, Victoria. Evan was responsible for data collection, hydrodynamic and water quality modelling, geomorphological assessment and dredge material management. He managed the \$3.5M hydrodynamic baseline data collection program that incorporated 28 sites monitoring key meteorological, oceanographic and water quality parameters throughout the Western Port embayment. The extensive program also incorporated bathymetrical and intertidal survey, drogue tracking, ADCP transects, water quality profiling and remote sensing. In collaboration with the client, Evan designed and oversaw the successful implementation of this baseline monitoring program. Fundamental to the successful data collection design was a sound conceptual understanding of the embayment processes, a good project appreciation and Evan's extensive modelling expertise.

Tweed River Entrance Sand Bypassing Project - Sediment Tracing Study

In 2016 the NSW Department of Primary Industries (Lands) engaged a team which included Evan to undertake a sediment tracing study. The study was proposed to confirm the hypothetical sediment transport pathways and quantify the relative material transport between Queensland and NSW

following placement of material dredged from the entrance bar. Evan was the technical lead and project director for this study. A follow-up study was also completed to assess the fate of sand from the Tweed River Entrance Sand Bypassing discharge outlet.

Surabaya Port Siltation Study

Evan was involved in 3D hydrodynamic and sediment transport modelling of siltation patterns and dredge design option assessment for existing port facility in Surabaya, Indonesia. Surabaya port is in a highly dynamic tidal environment with mixed tides.

Sydney Harbour Tunnels EIS

Evan was part of a team engaged by RMS to undertake 3D modelling of Sydney Harbour to assess dredging impacts to water quality at the proposed tunnel alignments. This included an extensive data collection campaign over 6 month at four sites including the monitoring of currents, water levels and turbidity as well as discharge measurements with ADCP transects. The data was successfully used to validate numerical models. The 3D modelling results showing sediment plume dispersion and deposition areas were used to inform the EIS.

Tauranga Bridge Marina Wave Climate Investigation

Evan developed a SWAN wave hindcast model to investigate the wave climate for an existing marina in Tauranga, NZ. Wave climate modelling included both design and operational wave conditions. Taking account of observations that showed the importance of tidal currents of wave conditions, a hydrodynamic model was also developed to simulate tidal flows. While the resulting flow information was used in the wave hindcast model, the limitation of the SWAN model to accurately account for the wave-current interactions was considered when determining the reported wave climate.

Palm Beach Coastal Protection Works

This project was undertaken in collaboration with DHI. Work on this project included the review of the effectiveness of previous sand nourishment campaigns, options for future beach and concept designs for coastal protection works at one of the Gold Coasts most iconic beaches.

Watsons Bay and Barangaroo Wave Climate Assessment

Managing all aspects of a wave climate assessment to support the design of a new ferry terminals in Watson's Bay and Barangaroo (Sydney Harbour). This project involves wave monitoring, SWAN wind wave modelling and detailed Boussinesq swell penetration modelling resulting in a hindcasting of the local wave climate. All wave models are accurately calibrated and verified to field observations. Evan will then work with maritime structures engineers to optimise the facilities design.

Solomon Islands (confidential location) Physical Marine Assessment

Evan directed the development of a metocean monitoring campaign and comprehensive physical marine assessment as part of an Environmental and Social Impact Assessment. Evan oversaw the selection, procurement and installation of metocean equipment in a remote Pacific Island location ensuring project timelines and budgets were met and international trade agreements were adhered.

Sierra Leone Wharf Upgrade

Evan was the lead engineer on the coastal processes modelling, design criteria, vessel mooring modelling, analysis and design. A detailed coastal process study was undertaken to develop foreshore protection options and impact assessment for several kilometres of foreshore (African Minerals Ltd).

Coffs Harbour Eastern Breakwater Restoration

Detailed investigation and design of breakwater restoration works including rock and concrete hand bar units. Initial work involved determining the key design parameters including waves and water levels, to inform design and modification of one of the most exposed breakwaters along the NSW coast. This was followed by physical modelling of concept designs with further refinement of the design following scale testing.

T4 Hunter River Estuary Modelling

Undertaking Hunter River Estuary hydrodynamic modelling as part of the T4 EAR process. This included tidal discharge data collection exercise for model calibration / verification.

Gladstone Tug Harbour Development

Located within the Port Curtis estuary, this project involved the construction of a new Tug berthing facility to provide on-going service to coal industry and provide for the proposed LNG tankers. Evan's role included the definition of design criteria parameters, advice on design risk and design of coastal protection structures for tug vessel facility. Investigation included modelling of ambient and cyclone wave condition including tidal hydrodynamics and cyclone surge, wave and current data collection and physical modelling of wave loads for steel pontoons.

Townsville Marina Precinct, Review of Wave Climate Assessment

Lead third-party reviewer for wave climate assessment at a recently constructed marina located adjacent to Cleveland Bay, Townsville, Queensland.

Tanilba Bay Foreshore Protection

Investigation and design for low cost, locally appropriate community endorsed and adaptive foreshore protections options with strong economic, social and environmental credentials to achieve the revitalisation of the Tanilba Bay (Port Stephens, NSW).

Coffs Harbour North Breakwater Risk Management Plan

Public safety assessment of an existing breakwater on NSW coast subject to dangerous wave overtopping. This included recommendations for an automated forecasting system to improve the implementation of restricted access to the breakwater and greatly reduce the risk of injury.

Former BHP Site Silt Curtain Design

Design and assessment of environmental performance for proposed silt curtain designed to reduce the dispersion of contaminated sediments during remedial dredging works. South arm of the Hunter River, adjacent to the former Newcastle BHP steel works.

Coastline Hazard Definition Studies

Currently leading a number of coastal hazard assessments including the entire Gosford Council LGA (NSW Central Coast), Blueys and Boomerang Beach (NSW Mid-North Coast) and a

large housing release area north of Tuncurry (NSW Mid-North Coast).

Jimmys Beach Coastline Management Plan

Review of coastal hazards and current management options. Concept design of update coastal protection options including beach nourishment (sand shifting) option and a terminal seawall. Options assessment and preferred concept selection.

Tidal Prism Modelling of Lake Macquarie

Hydrodynamic, wave and morphological modelling to assess the impact of climate change on the tidal prism of Lake Macquarie. This study involved gaining a detailed understanding of the historical changes to the Swansea Channel entrance and the subsequent morphological change. Conceptual and numerical modelling was used to provide estimates of the morphological changes due to sea level rise.

Trinity Point Marina 3D Hydrodynamic and Water Quality Modelling

High level 3D hydrodynamic and water quality modelling for an environmental impact assessment of large marina development proposed for Lake Macquarie, NSW. Numerical simulation techniques used to assess wind driven circulation and flushing response. Spill analysis completed using particle tracking techniques.

Ex-HMAS Adelaide as an Artificial Reef

Detailed numerical modelling of wave climate, shoreline change and hydrodynamics to assess impacts of a proposed artificial reef on local coastal processes. Wave climate modelling included 12-month simulation encompassing seasonal variability to assess long-term existing and design wave conditions. Hydrodynamic modelling included forcing from meso-scale influences such as the East Australian Current.

Norfolk Island Naval Facility Wave Climate Investigation

Project included numerical wave climate modelling at a variety of scales, from global wave modelling (e.g. WaveWatch III) to site scale harbour penetration modelling. Wave penetration modelling included assessing the performance of various breakwater configurations.

Old Bar Coastline Hazard Definition Study

Coastal processes and hazards assessment for 32 km stretch of coastline on NSW's mid north coast. Significant parts of this coastline are prone to erosion with several properties recently evacuated. The coastal processes are highly complex with large open beaches separated by twin river entrances.

Coastal Hazard Assessment Projects

Foreshore Restoration and Stabilisation Projects

Investigation and concept and detailed design for foreshore restoration works at several sites within NSW. Foreshore erosion investigation included wave, sediment transport and shoreline response modelling.

South East Queensland Storm Tide Study

Investigation into the impact of severe weather events, typically tropical cyclones, on coastal water levels in South East Queensland. Project involved extensive analysis of cyclone data, cyclone wind field modelling, hydrodynamic and coupled wave modelling of storm surge events, Monte Carlo based forecasting and risk analysis.

Maritime Industrial Development in Sungai Pulai, Malaysia

Environmental impact assessment of large petro-chemical and port development in a sensitive estuarine environment located on the Southern Johor Peninsula. 3D modelling and concept design of navigation/drainage channels; dredge plume dispersion modelling and shoreline erosion from vessel wakes.

Wakefield Waters E.I.S

Coastal processes investigation of proposed marina development in northern Gulf of St Vincent, South Australia. Concept design and performance assessment of flushing system; heat flux and salinity modelling; channel siltation investigations; wave climate modelling and reporting.

Port Hughes Desalination Outfall Modelling

Near- and far-field modelling of saline effluent discharge from proposed desalinisation operation in Spencer Gulf, South Australia. Near-field negative buoyant plume dynamics simulated using CORMIX. Far-field dispersion modelling

completed using coupled 3D model with full range of forcing mechanisms.

Gove Sub-sea Gas Pipeline

Ocean data collection program aimed at providing metocean design parameters for a proposed LNG sub-sea pipeline. Pipeline crossed Gulf of Carpentaria from Weipa to Gove. Monitoring included both land fill sites and sub-sea route.

Sydney Water Seawater Sampling

Conducting a program of seawater offshore CTD sampling and data checking for the proposed desalination plant at Kurnell.

Anglican Retirement Village Flood Impact Assessment

1D/2D hydraulic modelling and reporting for a site with complex hydraulic behaviour in Warriewood Valley.

Penrith Overland Flow Flood Study

Development of a SOBEK 2D hydraulic flood model for a detailed overland flow study for the entire Penrith Local Government Area (LGA).

Brisbane Water Foreshore Flood Study

Responsible for hydrological modelling for catchment inputs to the Brisbane Waters estuary.

Sydney Water Warriewood Depot Upgrade

Flood impact investigation to ensure compliance with councils Development Control Plan for depot upgrade works.

Shell Cove Boat Harbour

Development of 1D/2D hydraulic models to assess flooding impacts of a proposed marina development in a coastal wetlands area.

Second Ponds Creek Water Quality Assessment

Water quality modelling, stormwater treatment measures and pond design for a proposed residential development in western Sydney.

Fern Creek Footbridge Concept Design

Concept footbridge design and hydraulic modelling for Pittwater Council.

Warriewood Valley Water Quality Monitoring

Conducting regular water quality testing in a catchment currently undergoing rapid development.

Publications

Knight S., Watterson E., Britton G., Messiter D., Kroef G., Hollstein M., Hunt S., Elliott Z. and Prenzler P. Construction of the Palm Beach Artificial Reef. PIANC APAC, 2020

Watterson E, Loehr H, Lewis J, Messiter D, Shoreline Vulnerability of an Indian Ocean Atoll, Coasts and Ports 2019, Hobart, September 2019.

Loehr H, Watterson E, Lewis J, Messiter D, Observed Nearshore Wave Dynamics at Indian Ocean Atoll, Coasts and Ports 2019, Hobart, September 2019.

Watterson E and Loehr H. Responding to Coastal Hazards and Climate Change in the Cocos (Keeling) Islands, Indian Ocean Territories, Australia, Special Issue in Ocean & Coastal Management on "The Unusual Suspects in Climate Change Adaptation – Small Coastal Cities and Towns, January 2020.

Watterson E, Messiter D, Nose T, Blacka and M, Warren L, 2013, Optimising Design of Gladstone Tug Berth Marina. Coasts and Ports, Sydney, NSW, 2013.

Watterson E, Messiter D and Burston J, 2010. The Hydraulic and Morphological Response of a Large Coastal Lake to Rising Sea Levels. 19th NSW Coastal Conference, Batemans Bay, NSW.