Education

M.S., Ocean Engineering – 2005
University of Rhode Island
B.S., Civil Engineering – 1996
Tufts University

Licenses and Registrations

- P.E., Professional Engineer, Connecticut License PEN.0030884
- P.E., Professional Engineer, Louisiana License PE.0036650
- P.E., Professional Engineer, Massachusetts License 47832

Professional Affiliations

Member, American Shore & Beach Preservation Association (ASBPA)

Member, Coasts, Oceans, Ports, and Rivers Institute (COPRI)

Member, American Society of Civil Engineers (ASCE)

Publications and Presentations

11

Matthew F. Shultz, M.S., B.S., P.E.
Senior Coastal Engineer

Expertise

Modeling of coastal and estuarine hydrodynamics, waves, and sediment transport processes and in the evaluation of structural and non-structural shoreline protection alternatives. Project management of large-scale coastal modeling studies, the development of models for assessment of coastal hazards and adaptation measures, as well as large-scale marsh restoration and the assessment of hydraulic structures. Extensive experience in programming languages and in developing software to present, analyze, and solve engineering and scientific problems. Experience in areas of marine structure design, waterfront construction, and construction project management.

Qualification Summary

- More than thirteen years of diverse professional experience in the fields of coastal, civil and software engineering
- Experienced with modeling coastal hydrodynamics, sediment and particulate transport, coastal wave dynamics, and tidal hydraulics
- Strong programming skills and knowledgeable in software design and advanced concepts
- Numerical model experience with CMS, MIKE21, EFDC, DELFT3D, HEC-RAS, ADCIRC, SWAN, RMA, STWAVE, SBEACH, CSHORE GENESIS, DYNLET, CORMIX, and ACES
- Programming experience with MATLAB, FORTRAN, C++, JAVA, VBScript, JavaScript, HTML, XML, XSL
- Database experience: Oracle, SQL Server, SQL Anywhere, MS Access

Work Experience

2016-present	Senior Coastal Engineer, Woods Hole Group
2010-2016	Senior Coastal Engineer/PM, Dewberry
2005-2010	Coastal Engineer, Woods Hole Group
2004	Graduate Assistant, University of Rhode Island
1998-2004	Senior Consultant, WinMill Software
1997-1998	Field Engineer, Modern Continental Construction

Key Projects

Hudson River Project: Resist, Delay, Store, Discharge NEPA EIS, Hudson County, NJ. -Lead Coastal Engineer
Feasibility Study and EIS for a $230-million comprehensive urban water strategy conceived to protect the Hoboken waterfront, as well as parts of Weehawken and Jersey City. Known as Resist, Delay, Store, Discharge, the project incorporates hard and nature-based infrastructure measures to address surge protection, coastal defense, and systemic drainage issues. Responsible for developing a MIKE21 coastal hydrodynamic model that was integrated with a MIKE URBAN stormwater model using MIKE FLOOD. Work also involved preliminary design of flood protection concepts through wave runup and overtopping analysis, overland wave modeling using a 1-D wave transformation model, computing dynamic wave loading and forces, and evaluating landward hazards to developments and built infrastructure.

Oakwood Beach Flood Attenuation Feasibility Study, Staten Island, NY - Lead Coastal Engineer
Integrated water resources study evaluating the feasibility of coastal storm damage reduction, storm water drainage and BMPs with added nature-based-infrastructure to increase ecological restoration opportunities for a community impacted by Hurricane Sandy. Responsible for the development and evaluation of alternatives to USACE's proposed revetment including the assessment of design waves and water levels to be used in wave runup and overtopping assessments. Conducted technical oversight and QAQC for 2-D hydrodynamic model used to evaluate newly proposed channels and revetment alignment combined with flow-control structures under tidal and extreme storm conditions. Working with regional offices consulted with NY DEC, USACE, The Nature Conservancy, NYC and other stakeholders to help ensure combined needs were properly assessed and incorporated into the project.

Coastal A Zone Maps, Massachusetts - Senior Coastal Engineer
Served as technical advisor and provided quality assurance and control for the development of new Coastal A Zone Maps for the Commonwealth of Massachusetts. Developed the technical review process and administered quality reviews for new and revised mapping of the Limit of Moderate Wave Action (LiMWA) to advise community officials of hazards due to waves and where Massachusetts State Building Code requirements and other regulations would apply. Coastal A Zone maps were developed for over 1,100 miles in eight coastal counties in Massachusetts keeping with the new FEMA guidance for delineating wave hazards.

FEMA Risk MAP Production & Technical Services (PTS), Federal Emergency Management Agency, Nationwide - Senior Coastal Engineer and Project Manager
Led several countywide coastal updates in FEMA Regions II and III. Projects included task management of terrain processing, field reconnaissance, coastal hydrodynamics and wave modeling, erosion analyses, hazard risk assessment, mitigation, outreach, and floodplain mapping. Provided technical oversight for storm surge modeling and coastal hazard assessments. Also provided direction and input on coastal appeal resolution, as well as the development of new coastal guidelines and procedures for FEMA's coastal flood studies.

Levee Analysis and Mapping Pilot Studies, FEMA Region VI – Lead Coastal Engineer
Served as lead engineer and subject matter expert for new Levee Analysis and Mapping Procedures being implemented by FEMA HQ and Region VI for assessing non-accredited levees. Led working group in the development of new procedures for non-accredited levees subject to coastal flooding. Work involved developing consensus among multiple agencies including representative FEMA regions and the USACE. Conducted pilot studies in LA (Plaquemines and Lafourche Parishes) and TX (Freeport Levee System) to apply and evaluate new methodologies in assessing coastal risk in areas protected by non-accredited levees. Work involved levee breach assessments and the integration of 1-D to 2-D coastal hydraulic models to define the hazards within the polder.

Key Projects (continued)

Coastal Hazard Assessment for Lake Erie, FEMA Region V – Senior Coastal Engineer
Provided technical oversight and input on the 2-D coupled surge and wave model setup including the historical storm characterization, mesh development, and model validation. Assisted in the development of a Coastal Modeling and Analysis framework for the implementation of new methodologies and guidelines for the assessment of coastal hazards in the Great Lakes. Integrated modules to assess response-based (multi-event) erosion and wave runup using CSHORE-1D model and extreme statistical distributions. Using joint probability distributions, evaluated five combinations of waves and water levels for the assessment of hazards at the 1% and 0.2% annual return frequencies

NY-NJ Storm Surge Study, FEMA Region II - Senior Coastal Engineer
Served as lead engineer for storm surge model development tasks including ADCIRC and SWAN mesh development, model validation, and the QAQC of over 175 storm surge model simulations. Validation was conducted through hindcasts of both tropical and extratropical storms and the verification of simulated maximum surge and wave conditions. Storms were developed using the Joint Probability Method-Optimum Sampling and modeling was conducted on a high-performance computing environment. Provided technical oversight and review of computed storm surge return frequencies developed for coastal hazard assessments.

Big Bend FL Storm Surge Study, FEMA Region IV - Senior Coastal Engineer
Storm surge study encompassing Taylor, Dixie, and Levy Counties in Florida. Provided technical oversight and input for storm selection, the statistical methods (JPM) developed for study area, and model validation. Conducted detailed reviews of the seamless bathymetry/terrain surface developed for mesh generation and of the ADCIRC and SWAN modeling meshes to ensure features were adequately represented.

Climate Change Adaptation Strategies for Coastal Community, East Boston, MA – Coastal Engineer
Managed development of coastal engineering alternatives to protect coastal community against varying levels of projected sea level rise combined with extreme coastal storm events. Investigated retrofitting techniques, including floodproofing and other adaptation strategies, for an urban community to address impacts of climate change. Drafted design concepts and estimated projected costs for alternatives to assist in a scenario-based risk assessment. Participated in outreach activities to inform community of potential impacts, coastal engineering alternatives, and other community-specific adaptation strategies

Numerical Modeling of Hydrodynamics and Constituent Transport for Stony Brook Wetlands Restoration Feasibility Study, Brewster, MA – Coastal Engineer
The project consisted of implementation of a field data collection program, development and calibration of a two-dimensional numerical circulation model using the Environmental Fluid Dynamics Code (EFDC), and the application of the calibrated model to conduct an alternatives analysis aimed at restoring tidal flow to the Stony Brook estuarine system. The hydrodynamics and salinity model was utilized to simulate existing conditions, as well as alternatives involving the replacement of two culvert structures which convey tidal flow under the Route 6A roadway to the upstream/landward portion of the marsh. The potential benefit and impacts of the each proposed restoration alternative were evaluated including upland flooding, sediment transport/scour of the channel bed or adjacent roadway, effects on drainage/infrastructure, and any effects on migratory anadromous fish. The alternatives were simulated under typical tidal, low-flow, and storm conditions to fully assess their performance and to make a recommendation on how to best achieve restoration with minimal impacts.

Coastal Structure Design for Fisheries and Marina Facilities, KSA - Lead Coastal Engineer
Evaluation and design of revetment and composite breakwater structures for fishing port developments in the Eastern Province. Conducted nearshore wave transformation modeling using STWAVE to arrive at design wave conditions. Computed wave runup, overtopping, and transmission for design scenarios and determined static and dynamic loading for composite rubble-mound/vertical wall structure.

Key Projects (continued)

Flood Plain Analysis for Cameron Parish, LA – Coastal Engineer
Reviewed Flood Insurance Rate Maps (FIRMs) and Base Flood Elevations (BFEs) established by the Federal Emergency Management Agency (FEMA) for coastal parish. Gathered LIDAR topographic data for the parish communities and performed comparison with elevation data used within the two-dimensional model to establish the flood zone boundaries. Developed wind field for Hurricane Ike using data from various sources for input into an ADCIRC model. Performed hindcast of Hurricane Ike using a two-dimensional ADCIRC model in order to compare simulated storm surge levels with data recorded locally within the parish, during the storm.

Numerical Modeling of Hydrodynamics for Proposed Arabian Canal, Dubai, UAE, Limitless – Coastal Engineer
In order to evaluate the conceptual design of a proposed canal in Dubai, two separate hydrodynamic models (1-D and 2-D) were developed. The models were used for a preliminary analysis of the flushing characteristics of the proposed 75-kilometer canal which would be connected to the Arabian Gulf. A one-dimensional analytical model and a two-dimensional numerical model of the canal were developed. The analytical model provided preliminary results that were used to determine whether certain design concepts warranted more detailed analysis, and to guide the development of the numerical model. Sensitivity analyses were then conducted to assist in developing components of the canal design, including the locations, size, and operation of tide gates, channel dimensions, and potential marina developments. The components of the canal design were varied within the models, water flushing/refreshment periods were computed, and areas having potential water quality issues were identified. Recommendations were made in order to achieve the water quality objectives while also preserving the design objectives for the development.

Evaluation of Shoreline Protection at Beach Facility, Bristol, RI. - Lead Coastal Engineer
Responsible for conducting field investigation of existing shoreline protection measures at neighborhood association beach facility in order to propose alternatives for remediating erosion incurred at the site. Analyzed average annual and extreme storm conditions in conducting desktop study to evaluate alternatives to replace or repair the existing degraded seawall structure at the beach facility. Evaluation of alternatives included an assessment of overall effectiveness, structural lifetime, construction feasibility, as well as estimates of permitting, engineering, and construction costs. Developed recommendations for the neighborhood association to effectively control erosion at the site, to retain the upland facility, and to provide safe access to the recreational resource.

Hydrodynamic Characterization and Sediment Transport Evalution at the Former Callahan Mine Property, Brooksville, ME – Coastal Engineer
The Goose Pond estuary is a site of environmental concern and is classified as a Superfund site on the National Priorities List by the Environmental Protection Agency (EPA). The site is the former location of a zinc/copper open-pit mine where mining operations were conducted adjacent to and beneath the tidal estuary. Supported the Maine Department of Transportation (DOT) for an evaluation of contaminant transport and fate at the former Callahan Mine site connected to the Penobscot River in Brooksville, ME. Characterized the hydrodynamics and transport processes within the flooded former mine property influenced by the tides of Penobscot Bay. The project consists of a field data collection program, and the development of a three-dimensional hydrodynamic and sediment transport model to evaluate overall circulation patterns and transport within Goose Pond. Processed measured water level, salinity, and current speed/direction data to characterize baseline conditions at the site and to calibrate the model. Applied numerical model to simulate significant precipitation and storm surge events to assess the potential for sediment mobility under extreme conditions.

Key Projects (continued)

Evaluation of Shoreline Restoration at Nantasket Beach, Hull, MA. – Coastal Engineer
Responsible for developing wave and sediment transport models to simulate existing conditions and conduct an alternative analysis in support of a comprehensive coastal processes study to address ongoing coastal erosion at Nantasket Beach. Quantified site-specific wave conditions using measured wind and wave data, and the STWAVE numerical wave transformation model. Simulated transport processes along the barrier beach using a state-of-the-art sediment transport model to evaluate the performance of the existing seawall, as well as structural and non-structural shore protection measures under various environmental conditions. Assessed the performance and lifetime of the selected shore protection measures to provide guidance on potential long-term solutions for the area.

Numerical Modeling of Reverse Osmosis Water Treatment Facility Discharge Dilution, Melbourne, FL, Reiss Environmental – Coastal Engineer
Developed a three-dimensional model of the Eau Gallie River using the Environmental Fluid Dynamics Code (EFDC) to simulate the hydrodynamics and particulate transport within the estuarine system. The modeling effort was for the continued evaluation of the City of Melbourne's reverse osmosis concentrate discharge into the Eau Gallie River. Application of EFDC model involved the development of a curvilinear-orthogonal grid defining the geometry of the system, as well as defining conditions at both upstream and downstream boundaries of the Eau Gallie River, the atmospheric conditions, and the concentrate discharge into the model domain. Existing conditions were simulated and the model was calibrated and verified using collected field data. The model was then applied to simulate DEP specified design flow conditions (7Q10) to characterize the concentrate dilution and the extent of mixing zones for the parameters of interest.

Hydraulic Modeling and Scour Assessment for WM. T Morrissey Boulevard Bridge at Pattens Cove, Dorchester, MA – Project Manager/Coastal Engineer
The potential for scour was assessed for the Morrissey Boulevard Bridge crossing at Pattens Cove for both 100-year and 500-year storms. The DYNLET1 numerical model was employed to evaluate the hydraulic characteristics of the tidal waterway. The model was driven and calibrated using field data collected at the site. The tidal current velocities and water elevations obtained from the storm simulations were used to compute the maximum scour potential for the open-bottom box culvert. The scour analysis, performed following FHWA and USACE methodologies, assisted in determining the single-digit code under Item 113 of the *FHWA Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges* for the Morrissey Boulevard/Pattens Cove bridge crossing. Recommendations of scour countermeasures were made for the site to offer protection from future extreme storm events.

Flood Plain Analysis for Federal Emergency Management Agency (FEMA) Letter of Map Revision (LOMR), Falmouth, MA – Project Manager/Coastal Engineer
Conducted flood plain analysis to support a FEMA LOMR application to revise the base flood elevations and flood zone map for coastal properties fronting Vineyard Sound in Falmouth, MA. The 100-year return period wave height and storm surge levels were established and wave transformation and wave runup modeling were completed utilizing the FEMA Coastal Hazard Analysis Modeling Program (CHAMP) and US Army Corps of Engineers methodologies. The potential for erosion was estimated and flood zone delineations were made based on the model results.

Mixing Zone Evaluation in Lake Michigan, Indiana Dept. of Environmental Management - Coastal Engineer
Conducted study to support the review of a permit renewal application for a discharge into Lake Michigan. The study included a literature review on Lake Michigan currents to help characterize receiving waters in the vicinity of the discharge. Observations of currents in Lake Michigan were also made over a 45-day period using two Acoustic Doppler Current Profiler (ADCP) systems in order to better determine the discharge site-specific ambient conditions. The current data were processed and an attempt was made to correlate the

Key Projects (continued)

currents with wind observations obtained from nearby locations in order to model long-term conditions. This data was then analyzed to define the appropriate ambient water input conditions to use in modeling the discharge's dilution and mixing zone.

Numerical modeling of a ship-to-shore causeway in waves, N. Kingstown, MA, University of Rhode Island/Vibtech Inc. - Coastal Engineer
Developed numerical model to analyze the motion of an articulated ship-to-shore causeway system in nearshore areas. The vertical motions of the floating structure were evaluated for sea state 3 conditions. The model was developed using potential flow theory to solve the equations of motion. The work involved conducting a wave simulation from a wave spectrum to construct the time history of the structure's response. Results from the model were compared with those obtained from experimental data. A study was then completed to analyze the sensitivity of the system's dynamics to the variation of critical parameters.

Material testing and transport for casting basin at Fort Point Channel, Boston, MA, Modern Continental Construction - Engineer
Managed the environmental testing, transport, and disposal of over 500,000 cubic yards of dredge and excavate material taken from and around Fort Point Channel. Portions of the channel were dredged for the construction of a series of cofferdam cells used to close off a casting basin (dry dock) at the waterfront. Material was also excavated to form the casting basin used to construct concrete tunnel sections. The material was transported to a temporary storage location for sorting and testing. Material was then transported to various locations throughout the Northeast following DEP regulations.

Construction management at Fort Point Channel Crossing, Boston, MA, Modern Continental Construction - Engineer
Oversaw areas of construction related to the fabrication of concrete tunnel tube sections for the Fort Point Channel Crossing Central Artery/Tunnel project. Managed implementation of a multi-media groundwater filter system. Monitored and managed operation of technical systems, including groundwater control, construction noise control, and geotechnical instrumentation. Also worked with subcontractors in obtaining project approval and in reviewing and procuring necessary submittals.

Publications and Presentations

Shultz, M.F., L. Xu, R. Parab. and S. McCormick. 2015. "Incorporating a Blend of Solutions for Flood Mitigation in Hurricane Sandy Recovery", Coastal Structures and Solutions to Coastal Disasters Joint Conference, September 9-11, Boston, MA.

Shultz, M.F. and T. Graupensperger. 2014. "Conceptual Nature-Based and Gray Infrastructure for Flood Resiliency at Oakwood Beach, NY After Hurricane Sandy" Restore America's Estuaries 7th National Summit on Coastal and Estuarine Restoration, November 1-6, National Harbor, MD.

Shultz, M.F. 2014. "Hurricane Isabel – A Look Back and to the Future." American Shore & Beach Preservation Association National Conference, October 15-17, Virginia Beach, VA.

Shultz, M.F. 2013. "Post-Hurricane Sandy Advisory Base Flood Elevations" 2013 NJ Society of Professional Land Surveyors General Membership Meeting, January 8, Toms River, NJ.

Shultz, M.F. 2012. "FEMA Region III Coastal Hazard Analyses and FIRM Updates" 2012 MD Association of Floodplain and Stormwater Managers Annual Conference, October 25, Linthicum Heights, MD.

Shultz, M.F, 2012. "Coastal Hazard Analyses within Delaware Bay and River" Delaware River Basin Commission Flood Advisory Committee September 2012 Meeting, Trenton, NJ.

Publications and Presentations (continued)

Shultz, M.F., A. Farhadzadeh, and V. D. Nimmala. 2011. "Inundation due to Levee Wave Overtopping - An Integrated Modeling approach ." 2011American Shore & Beach Preservation Association Fall Conference, October 19-21, New Orleans, LA.

Douglas, E., P. Kirshen, C. Watson, J. Wiggin, M. Shultz, and M. Paolisso. 2010. "Coastal Flooding and Environmental Justice: Identifying Vulnerable Communities and Feasible Adaptation Strategies for the Boston Metro Area." 2010 EWRI Congress, May 16-20, Providence, RI.

Hamilton, B. and M.F. Shultz. 2010. "Salt Marsh and Anadromous Fish Run Restoration at Stony Brook, Brewster, MA." Restore America's Estuaries Annual Conference, November 13-17, Galveston, TX.

Shultz, M.F. and K.F. Bosma. 2007. "3-D Hydrodynamic and Water Quality Modeling to Assess the Impacts of a Reverse Osmosis Water Treatment Discharge." 2007 American Shore & Beach Preservation Association Fall Conference, October 21-24, Galveston, TX.

Shultz, M.F. 2005. "Simulation of a Ship-to-Shore Causeway System in Waves." Master's Thesis, University of Rhode Island, Kingston, RI.