

# Robert W. Jacobsen, PE

## Coastal/Environmental Engineering

### Education

- Louisiana State University, Coursework completed toward a Ph.D in Civil Engineering on low turbulence wetland hydrodynamics.
- Louisiana State University, M.S., 1994, Civil (Environmental) Engineering.
- Louisiana State University, M.A., 1981, Political Science (Environmental Policy).
- Louisiana State University, B.S., 1977, General Studies (Engineering and Economics).

### Professional Registration and Affiliations

- Louisiana Professional Environmental Engineer.
- American Society of Civil Engineers. Baton Rouge Branch Board (2004–09), 2008-09 President. 2010 Recipient of the ASCE Baton Rouge Branch Outstanding Civil Engineer Award. Louisiana Section Board (2010–14), 2013-14 President.

### Qualifications Overview

**Business and Organizational Leadership**—Mr. Jacobsen has decades of highly successful management experience at the office, program, and project levels for environmental/coastal engineering/construction firms, including work sponsored by both public and private sector clients. In this capacity he has held/overseen the full range of organizational responsibilities, including: business planning, profit/loss, cash flow, business development/marketing, IDIQ and project contract negotiation, human resources/recruitment, subcontracts/vendors, and quality/satisfaction assurance. Mr. Jacobsen founded and managed a Gulf Coast regional office for an environmental remediation division of a Fortune 50 firm (1988–91). Under his management, the profit center grew to a staff of over 50, with revenues reaching over \$1 million per month, and led the division in profitability and cash flow performance. Mr. Jacobsen has seven years of experience as the owner and principal of a small engineering LLC.

Based on his broad environmental and management background, Mr. Jacobsen was contracted in 1995 to perform a comprehensive evaluation by the Louisiana Department of Environmental Quality to document the agency's organization, functions, statutory mandates, personnel resources, expenditures, revenues, and total quality management programs. The project responded to mounting concerns for LDEQ fiscal and programmatic accountability. He presented findings to the LDEQ Transition Team for the newly elected Governor. LDEQ was subsequently reorganized along functional lines.

In 2002 he initiated and led the coastal restoration business practice for the Louisiana division of a nationally prominent engineering design firm and the effort to win the multi-million dollar study/design phase for the first state-led Mississippi River diversion project.

During his tenure as ASCE Louisiana Section President Mr. Jacobsen led several activities celebrating the Section's Centennial Anniversary, including the Gala Honoring the State of Louisiana's Top Civil Engineering Achievements.

**Technical Leadership**—Mr. Jacobsen has a 35-year career in environmental and water resource engineering program fields—specializing since 2001 in hurricane storm surge and coastal restoration. His career focus has been state-of-the-art planning studies and conceptual designs for complex water-related challenges. He has led work on an array of technical problems spanning: the hydrology of a 2,000-cfs Mississippi River freshwater diversion; revising estimates of 100- and 500-yr surge hazards for comprehensive (beyond NFIP) risk management; remediation of petroleum contaminated sediments in a scenic water body; and removal of carcinogens from a regional metropolitan drinking water aquifer. His expertise is *appropriate application of advanced professional-level approaches* to: investigations, data collection/management/quality, GIS, modeling, feasibility studies, risk assessment, permitting/impact studies, economic evaluation, design, and construction. He possesses a unique blend of management, analytical, and practical skills and experience, and has a mature sensitivity to the dynamics of both environmental sustainability and client priorities. He has worked with numerous federal/state/local agencies, industries, and teams of professional colleagues at all levels.

## Detailed Experience

The following are detailed descriptions of Mr. Jacobsen's technical experience in the fields of coastal protection and restoration, coastal rivers and upland hydrology, coastal environmental remediation, and industrial environmental engineering and remediation.

**Coastal Protection and Restoration**—Since 2001 Mr. Jacobsen's career has focused primarily on high-level coastal hydrodynamic studies—particularly the application of High Performance Computing/High-Resolution modeling and advanced joint probability analysis to hurricane storm surge protection and wetland hydrologic restoration.

- Mr. Jacobsen is a highly qualified user of the ADCIRC hydrodynamic model both for coastal storm surge and circulation applications. He has been working with the authors of the ADCIRC hydrodynamic model since 2004 and has attended the annual ADCIRC User Group Workshop every year since 2007, at which he has been a frequent presenter.
- Technical presenter/consultant for several professional and news organizations during the Hurricane Katrina 10<sup>th</sup> Anniversary commemoration, including ASDSO, ASTM, ASCE, ASCE-COPRI, and the Weather Channel. Authored and presented (see [www.bobjacobsenpe.com](http://www.bobjacobsenpe.com)):
  - ❖ *Hurricane Surge Hazard Uncertainty in Coastal Flood Protection Design*, The Journal of Dam Safety, Vol 13, Issue 3, 2015.
  - ❖ *Managing Hurricane Surge Risks in the Supercomputing Era, Part I: Pre-Katrina Evolution of Surge Hazard Estimation and Risk Management, and Part II: Post-Katrina Progress and Limitations in Surge Hazard Estimation and Implications for Surge Risk Management*, The Louisiana Civil Engineer, May and August 2015.
  - ❖ *Hurricane Katrina Lessons Learned and The Hurricane Katrina 10<sup>th</sup> Anniversary Test*.
  - ❖ *New Orleans Hurricane Surge Risk Management—A Short Course*.
- Lead hurricane surge consultant to the Southeast Louisiana Flood Protection Authority—East (2010 to present). Project manager, lead investigator, and author of several reports, including two major studies:
  - ❖ *Hurricane Surge Hazard Analysis: The State of the Practice and Recent Applications for Southeast Louisiana (May 2013)*. The Report examined the latest scientific and technical literature on hurricane climatology for the Gulf of Mexico, hurricane storm surge SWL and wave modeling, development of regional SWL and wave return frequencies, and the hurricane surge levee design elevation criteria. The Report provided an assessment of the USACE's 100-yr and 500-yr surge hazard analyses for Southeast Louisiana, as well as the elevation criteria for over 100 individual SLFPA-E levee reaches.
  - ❖ *Metropolitan New Orleans East-Bank Hurricane Surge Inundation Residual Risk Reduction (February 2016)*. This CDBG-funded study examined residual hurricane surge inundation hazard/risk for the three principal polders in the SLFPA-E jurisdiction as well as a range of approaches to reduce risk. For this study Mr. Jacobsen developed three high resolution ADCIRC models—one for each polder, each validated using the Hurricane Katrina inundation—to assess the implications of a 30,000-acre-ft breach at over 30 different locations. The models were used to assess interior compartmentalization alternatives. Five compartmentalization alternatives were subsequently evaluated in detail and the study provided recommendations for follow-on engineering.
- Hurricane surge hazard consultant to the Louisiana Coastal Protection and Restoration Authority (2012-14). Served on a team investigating a range of surge hazard analysis issues, including regional hurricane climatology, ADCIRC surge model validation, surge response functions, joint probability, analysis, uncertainty analysis, levee overtopping analysis, and residual risk assessment.
- Project Manager and technical director for preliminary studies for a FEMA coastal FIS for Georgia and northeast Florida (2009-11). Led a comprehensive evaluation of available data and data gaps for developing the FIS ADCIRC hurricane surge model. Data needs encompassed topography, bathymetry, land cover, and specific information on thousands of regional coastal features (dunes, seawalls, inlets, etc.). Oversaw the planning and execution of sensitivity tests with 18 supercomputer simulations to assess critical aspects of future ADCIRC model development, including mesh spacing, size and four key ADCIRC settings and parameters.

- Two-Dimensional Modeling of Hurricane Katrina Storm Surge for the Inner Harbor Navigation Canal and Southeast Louisiana (2007–08) — Project manager/lead engineer; used the 2D hydrodynamic ADCIRC model for storm surge modeling of Hurricane Katrina. The model applies the publicly released code and mesh developed by the U.S. Army Corps of Engineers (USACE) and its contractors for the post-Katrina Interagency Performance Evaluation Team (IPET). The modeling efforts will evaluate the impacts of surge protection features on the inundation of the Lower 9th Ward/St. Bernard Parish Polder.
- Mississippi River Re-Introduction into the Maurepas Swamp, Southeast Louisiana (2003–07) — Task Manager, lead investigator, and principal author for a \$1.4 million feasibility study, funded under the federal CWPPRA, to evaluate hydrologic and environmental impacts for a proposed 1,500 cfs diversion of freshwater from the Mississippi River to the Maurepas Swamp, near Garyville, Louisiana. Saltwater intrusion, subsidence, and the elimination of nutrient inputs threaten the 50,000-acre cypress-tupelo swamp, a consequence largely of the century-plus long isolation of the swamp from the annual nourishment of Mississippi River overbank floods.
  - ❖ To correct this problem and restore the natural health of a fragile wetland ecosystem, the feasibility study team developed detailed hydrodynamic models of the project study area — including a 2D wetland circulation model (ADCIRC) and a 1D channel network drainage model (SWMM and HEC-RAS). A one-year field program supported model development and included 1) establishment of high accuracy project area vertical benchmarks; 2) extensive cross sectioning and profiling of more than 70 channels; 3) extensive topographic and bathymetric spot inspections and surveying; 4) preparation of a high resolution digital terrain model (DTM); 5) collection and analysis of continuous stage data at 13 locations and rigorous vertical correction; 5) collection and analysis of ADCP data; and 6) development of a comprehensive Conceptual Hydrologic Model describing project area characteristics for both tidal and low frequency signal propagation.
  - ❖ State-of-the-art numeric hydrodynamic models evaluated the benefits and impacts of various diversion alternatives and operating scenarios. 2D swamp circulation model development depended on a high-resolution representation of the wetland topography/bathymetry. Modelers used swamp terrain data to develop a detailed 2D finite element mesh (consisting of 160,000 nodes). A 2D hydrodynamic model using ADCIRC was prepared and calibrated to four periods (totaling over 120 days) of hydrographic data and simulations run on a parallel supercomputer. The model results allowed study of diversion rates, operating requirements under various seasonal constraints, the need for wetland circulation controls to optimize flow distribution and retention times, and potential backwater flooding in nearby populated area drainage systems.
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- Pontchartrain Basin Tidal Circulation, Southeast Louisiana (2007) — Project Manager, lead investigator, and principal author for a detailed harmonic analysis of tidal constituents in the Pontchartrain Basin (including over 110 time series from 40 gages), together with an evaluation of the capability of a high resolution ADCIRC SL15 model to replicate regional tidal propagation in the large, complex estuary. The study, contracted with USACE New Orleans District and funded as part of the Louisiana Coastal Protection and Restoration Study (Category 5 Protection), also included analysis of the model’s capability to assess the relative impact of possible hurricane surge control structures on tidal prism.
- Mississippi River Gulf Outlet (MRGO), Southeast Louisiana (2005–06) — Project Manager, lead investigator, and principal author for an assessment of the direct impact of the MRGO on regional hurricane storm surge. The Louisiana Department of Natural Resources (LA DNR) project included modeling three Category 4 storms under present and fully closed MRGO scenarios and conducting a sensitivity test of surge results to levee alignments with the ADCIRC 2D hydrodynamic model.

**Coastal Rivers and Upland Hydrology**—Mr. Jacobsen’s hydrology and hydraulics background extends to evaluations of coastal riverine and upland environments.

- Comite River Watershed Modeling Phase 1, East Baton Rouge Parish, Louisiana (2007–08) — Senior review and co-author of a HEC-HEM/HEC-RAS study of the Comite River for the Amite River Basin Commission to support floodplain management decision-making and to preserve flood reduction benefits for the Comite River Diversion Canal Project.
- Senior review of a detailed hydraulic modeling study of the lower Amite River and the Amite River Diversion Canal for the Louisiana Office of Coastal Protection and Restoration (2010). The modeler employed HEC-RAS Unsteady to evaluate flow between the main channels of the lower Amite River system (the Amite River, the Diversion Canal, Old River, Bayou Chene Blanc, and the Petite Amite) and surrounding wetlands, which are largely stagnant. The study evaluated the potential improvements to swamp hydrology with several proposed new exchange channels. The modeler examined the exchange using one-dimensional flow storage areas and weirs and investigated a variety of flow conditions. Also co-authored final report.
- Amite River Basin Floodplain Management Plan (2006) — The FPMP was the culmination of two years of intensive planning effort on the part of the ARBC and the local communities to address measures, practices, and policies to reduce the impacts of future flooding and preserve levels of protection provided by the Comite River Diversion project. The FPMP supports the preservation, enhancement, and restoration of natural floodplain values for fish and wildlife habitat, groundwater interaction, moderation of floods, water quality improvement, and reduced erosion and sedimentation. A major portion of the Amite River floodplain extends into the coastal regions of lower Livingston and Ascension parishes.
- Senior review of detailed HEC-RAS hydraulic modeling studies of the lower Amite River for the Pontchartrain Levee District. The modeler assessed changes to peak flood conditions on the lower Amite River, Bayou Manchac, and Ward’s Creek associated with a potential flood control structure on Bayou Manchac and improved flood control on Alligator and Frog Bayous. Also co-authored final report.
- Regional Water Resource Study, Kisatchie-Delta Regional Planning District, Central Louisiana (2002) — Researched and authored a regional study of surface and groundwater resources within an eight-parish Louisiana region. Inventoried regional stream segments, lakes, and aquifers; reviewed water quality and quantity information; researched historic uses and trends; identified emerging problems in availability, quality, and over-use; developed recommendations for sustainable use.

**Coastal Environmental Remediation**—Mr. Jacobsen’s work in environmental remediation has included major efforts in contaminated sediments in estuarine waters. Two notable examples are:

- Bayou Trepagnier Remediation and Restoration Feasibility Study (2003) — Project Manager for remediation engineering of two miles of petroleum-contaminated sediments in a designated coastal estuarine scenic bayou; the project was being addressed under a federal NRDA and state CERCLIS action (Louisiana).
- Lake Charles Industrial Task Force: Calcasieu Estuary TMDL Study (2002) — Co-author of detailed reviews of TMDL water quality investigations prepared by the USEPA and LDEQ for a variety of pollutants including nutrients, heavy metals, and organic toxics for the Calcasieu Estuary. The work included critiques of an integrated 2-D water quality model of DO and nutrient uptake in the Estuary. As a result of this work, proposed TMDL for the Calcasieu Estuary were significantly modified.

**Industrial Environmental Engineering and Remediation**—During the first two decades of his career Mr. Jacobsen worked with numerous clients to address facility wastewater, stormwater, and waste management issues in light of changing environmental regulatory programs (RCRA, solid waste, NPDES, OPA, etc.). He also worked on the remediation of many legacy waste sites under federal and state CERCLA (Superfund) programs. His environmental experience encompasses a range of industries, including: petroleum refining, petrochemicals, pulp and paper, wood treating, alumina refining, aluminum, steel works, and electric and gas utilities. Some examples of this experience include the following:

- Industrial Wastewater and Stormwater Hydraulics, Southern Louisiana (1997–2007) — Conducted engineering evaluations for numerous south Louisiana facility wastewater and stormwater hydraulics — including analysis of design storms and analysis and hydraulic design of conveyance systems, storage capacity, pumps, etc.
- Remediation Design/Construction, Southeast Louisiana (1998–2001) — Managed a \$3 million environmental remediation project for three wastewater surface impoundments at a major petroleum refinery located on the Mississippi River. The project exceeded design objectives and was completed under budget.
- Refinery Nitrate Study, Baton Rouge, Louisiana (1997–98) — Project Manager and author for a detailed study of nitrogen cycling — nitrification and denitrification — for a significant ammonia/nitrate point source loading to the Mississippi River. Evaluated alternatives for denitrification consistent with expected kinetics of nitrate removal.
- Gulf Coast site remediation projects (1984–98) — Lead engineer for more than 20 hazardous waste site remediation feasibility studies (including RCRA and CERCLA sites). Responsible for rigorous application of recognized approaches to identifying, screening, and evaluating alternatives. Developed conceptual designs. Traditional and state-of-the-practice engineering analyses, including modeling, supported the evaluations.
- Manual for Designing Cost-Effective Risk-Based Groundwater Remediation. Louisiana (1997) — Authored a manual to address the selection and optimization of groundwater remediation through the application of health/environmental risk analysis. The manual reviews key analytical and numerical models for evaluating groundwater remediation design variables. The manual assessed an example design problem using MODFLOW and MT3D numerical modeling.
- Southeast Louisiana Remediation Construction Management (1988–91) — Served as the Gulf Coast general manager for a division of a Fortune 50 company, which successfully performed over \$20 million in large-scale remediation construction projects.
- Chlorinated Hydrocarbon Contaminated Sediment Remediation, Southwest Louisiana (1991) — Managed a project for the hydraulic dredging of contaminated sediments from a channeled portion of the Calcasieu River near a facility loading dock.
- Petroleum Contaminated Sediment Remediation, Southwest Louisiana (1991) — Provided senior technical consulting services for a project to remove several hundred thousand cubic yards of contaminated sediments with a hydraulic dredge. Transport of sediments to a solids processing area allowed for mechanical dewatering and stabilization prior to shipment offsite.
- Groundwater Investigations, Gulf Coast (1983–88) — Conducted groundwater hydrology, groundwater quality, and groundwater contamination investigations for RCRA and CERCLA (Superfund) sites in the Gulf Coast region. Sites have included refineries, petrochemical plants, specialty chemical plants, paper mills, wood treating facilities, and defense installations, with contaminants ranging from petroleum hydrocarbons, chlorinated solvents, PCBs, dioxins, and heavy metals. Activities included installation and sampling of piezometers, monitoring wells, pump tests, flow and transport modeling, remediation planning, horizontal wells, in situ remediation, and pump-and-treat.
- Old Inger Superfund Site Feasibility Study, Southeast Louisiana (1984) — Lead investigator and principal author for remediation of an abandoned waste oil refinery located on the Mississippi River near Darrow, Louisiana. Project was under contract with the Louisiana Department of Environmental Quality (under U.S. Environmental Protection Agency grant).