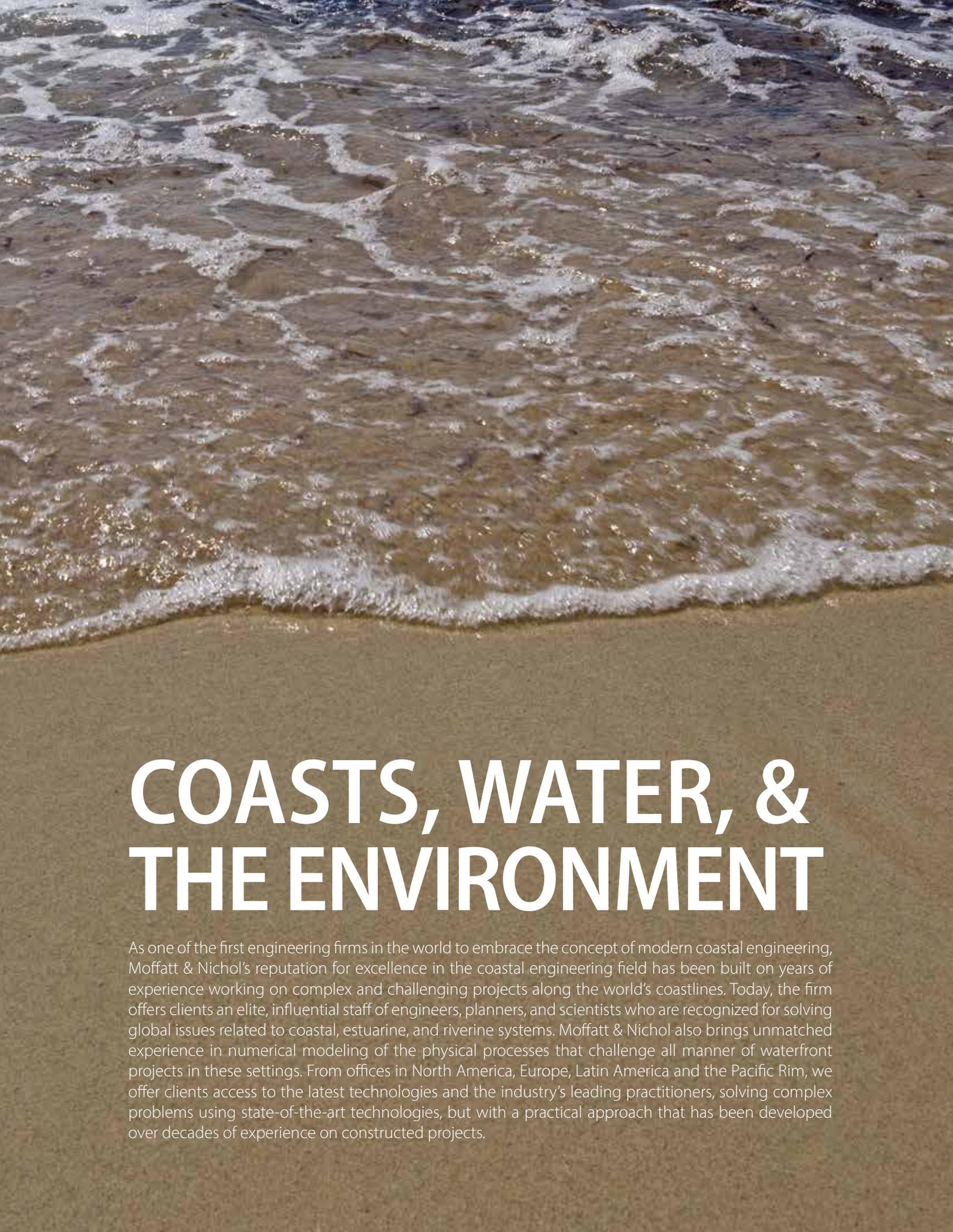


COASTS, WATER, & THE ENVIRONMENT



moffatt & nichol



COASTS, WATER, & THE ENVIRONMENT

As one of the first engineering firms in the world to embrace the concept of modern coastal engineering, Moffatt & Nichol's reputation for excellence in the coastal engineering field has been built on years of experience working on complex and challenging projects along the world's coastlines. Today, the firm offers clients an elite, influential staff of engineers, planners, and scientists who are recognized for solving global issues related to coastal, estuarine, and riverine systems. Moffatt & Nichol also brings unmatched experience in numerical modeling of the physical processes that challenge all manner of waterfront projects in these settings. From offices in North America, Europe, Latin America and the Pacific Rim, we offer clients access to the latest technologies and the industry's leading practitioners, solving complex problems using state-of-the-art technologies, but with a practical approach that has been developed over decades of experience on constructed projects.

EXPERTISE

Inlet & Sediment Management

Ecosystem & Watershed Restoration

Beach Nourishment

Bioengineering & Streambank Stabilization

Dredging & Dredged Material Management

Navigation Channels

Stormwater Management

Flood Control

Water Control Structures

Levees & Dikes

Intakes & Outfalls

Shoreline Protection

Breakwaters & Jetties

Marine Terminals

Locks, Weirs & Dams

Pumping Stations

Environmental Laws & Regulations

SERVICES

Hydrodynamic & Wave Transformation Modeling

Sediment Transport & Shoreline Change Analysis & Modeling

Storm Surge Analysis & Modeling

Hydrologic, Hydraulic & Groundwater Modeling

Watershed Planning & Assessment

Water Resource Planning & Policy Development

Water & Air Quality Analysis

Contaminated Sediment Analysis

NEPA Documentation, Permitting & Mitigation

Stormwater Best Management Practice Selection & Design

Ecosystem Restoration Planning & Design

Ship Mooring & Maneuvering Studies

Wind, Wave & Current Force Analysis

Coastal, Riverine & Hydraulic Structural Design

Construction Documents & Construction Management



INDEX



- 1-2** REGIONAL SEDIMENT MANAGEMENT
- 3-4** BEACH NOURISHMENT
- 5-6** INLET MANAGEMENT
- 7-8** SEDIMENT TRANSPORT
- 9-10** COASTAL NUMERICAL MODELING
- 11-12** COASTAL STRUCTURES & SHORELINE PROTECTION
- 13-14** COASTAL INFRASTRUCTURE VULNERABILITY
- 15-16** WATER RESOURCES
- 17-18** STORMWATER MANAGEMENT
- 19-20** FLOOD CONTROL & DRAINAGE
- 21-22** ESTUARINE & RIVERINE NUMERICAL MODELING
- 23-24** HYDRAULIC STRUCTURES
- 25-26** BRIDGE HYDRAULICS
- 27-28** NAVIGATION & VESSEL MOORINGS
- 29-30** ECOSYSTEM RESTORATION
- 31-32** WATERSHED RESTORATION
- 33-34** ENVIRONMENTAL REVIEW & REGULATORY COMPLIANCE
- 35-36** SEA LEVEL RISE & CLIMATE CHANGE
- 37-38** BENEFICIAL USE & DREDGED MATERIAL MANAGEMENT PLANS
- 39-40** CONTAMINATED SEDIMENTS
- 41-42** AIR & WATER QUALITY





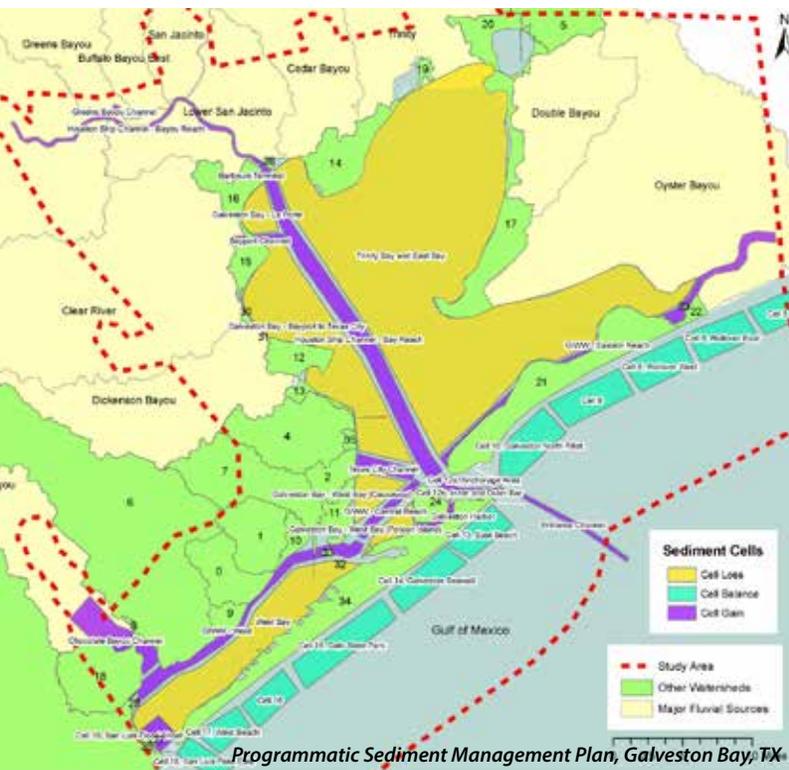
San Diego Regional Beach Sand Project, San Diego County, CA

Regional Sediment Management

Often coastal engineering projects are planned and designed on a case-by-case basis without recognizing the impact that such projects “individually or collectively” may have on the entire coastal system. Moffatt & Nichol has provided government agencies with assistance that includes stakeholder outreach, sediment transport modeling, and coast-wide comprehensive studies, to help manage coastal sediments as a regional resource and coordinate storm damage reduction efforts amongst adjacent communities.



Diamond Head to Pearl Harbor Regional Sediment Management, Diamond Head, HI



Programmatic Sediment Management Plan, Galveston Bay, TX



Beach and Inlet Management Plan, NC

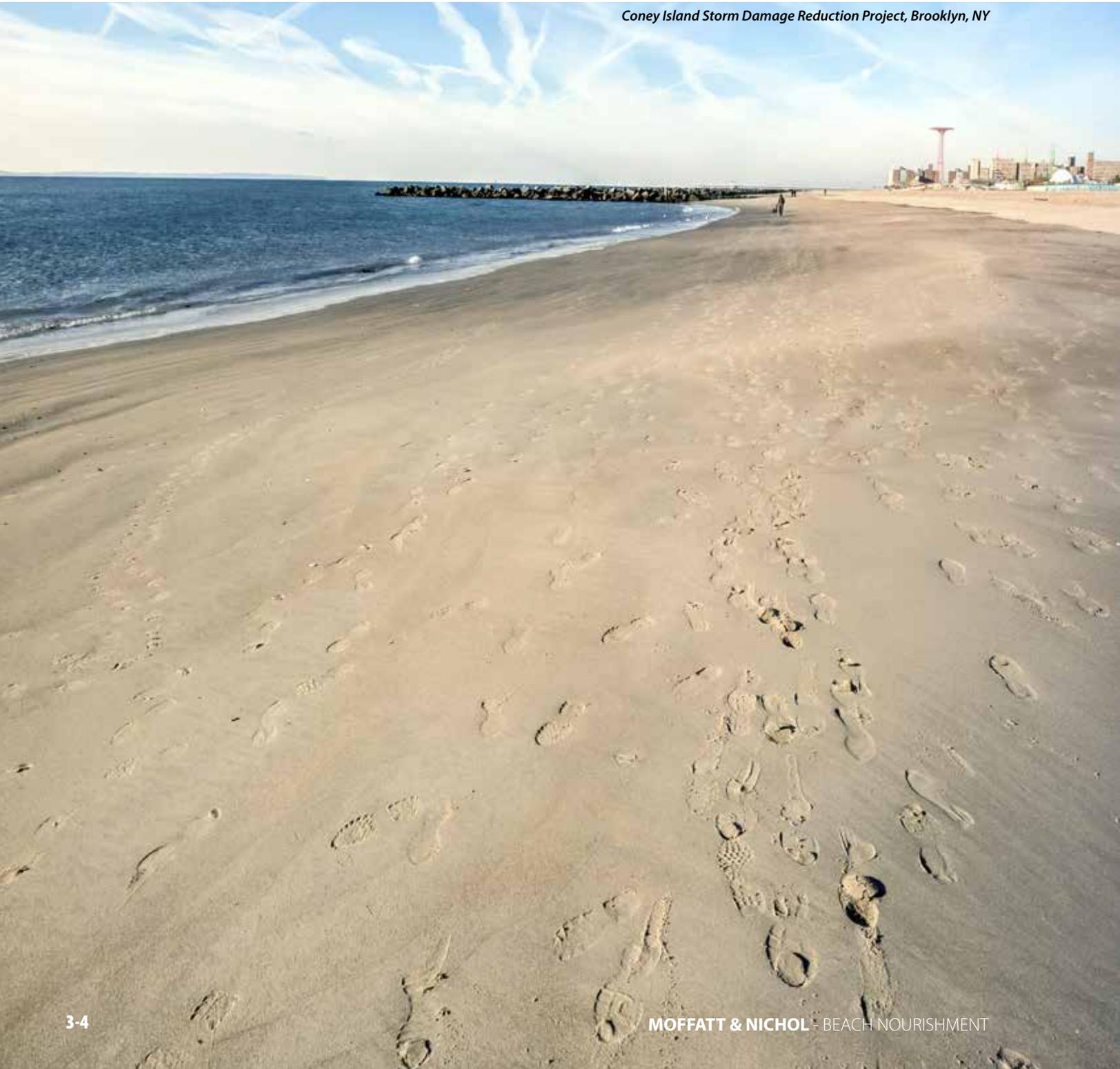


Carteret County Master Beach Nourishment Plan, Carteret County, NC

Beach Nourishment

Many of the world's shorelines are experiencing critical erosion, necessitating solutions that will allow them to continue to provide recreational opportunities and protect existing infrastructure. Moffatt & Nichol has successfully completed beach nourishment projects along shorelines that include individual private beaches, resort projects, and major urban centers. Several have included the use of structures to increase their longevity. The services that Moffatt & Nichol provides in support of such projects include planning and community outreach, shoreline modeling and analysis, littoral budget development, storm damage and benefit analysis, evaluation of sand source alternatives and dredging alternatives, permitting, engineering design, preparation of construction documents, and construction observation.

Coney Island Storm Damage Reduction Project, Brooklyn, NY





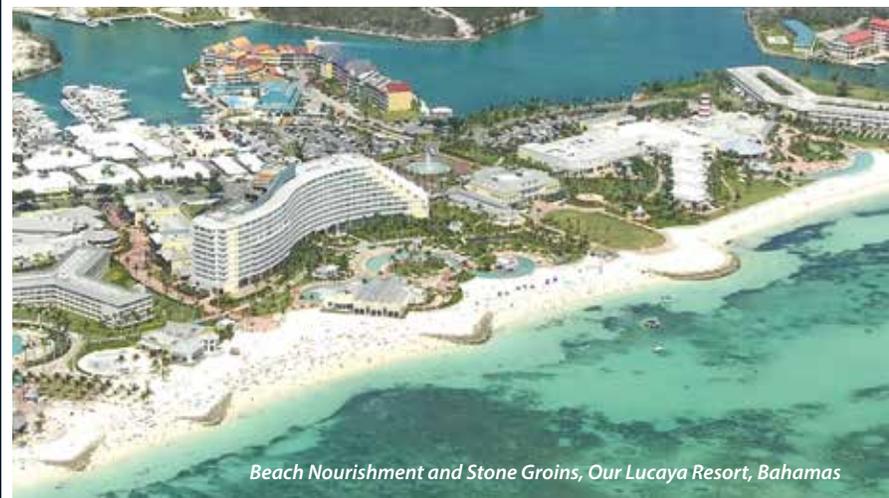
Post-Irene Beach Renourishment Project, Carteret County, NC



East Beach Sand Nourishment Project, Seal Beach, CA



Central Ocean View Beach Nourishment, Project, Norfolk, VA



Beach Nourishment and Stone Groins, Our Lucaya Resort, Bahamas



Bolsa Chica Wetlands Restoration Project, Huntington Beach, CA

Inlet Management

Inlets are among the most important elements of the coastal system. They allow for the exchange of water, sediment, and nutrients between oceans and estuaries, play a significant role in barrier island evolution processes, and affect shoreline stability and storm surge propagation into back-bay areas. Additionally, they provide important—and often irreplaceable—access for commercial and recreational navigation activities.

Extensive assessment and thorough understanding of inlet dynamics are absolutely required for successful inlet management. Moffatt & Nichol has honed the skills and tools required to address all of the relevant issues over the course of numerous projects and studies for some of the most important coastal inlets in the country. Our expertise includes:

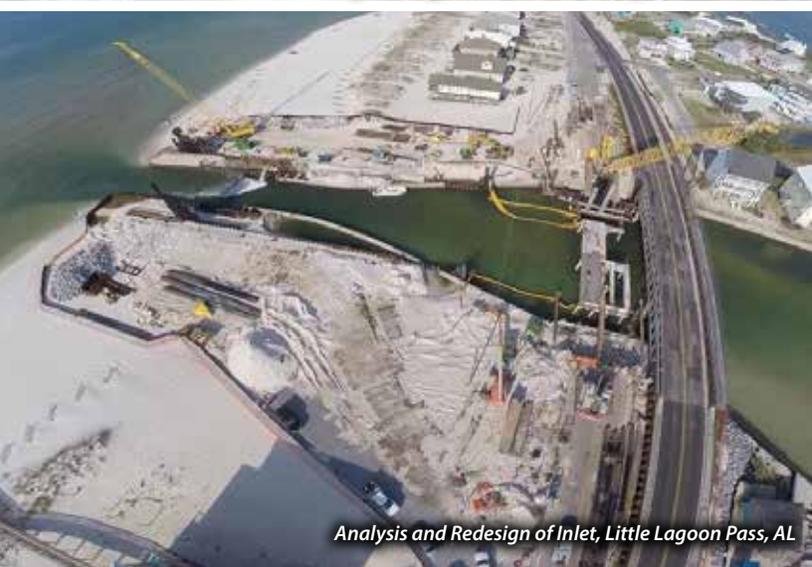
- Single and multiple inlet stability analysis,
- Barrier island breaching and new inlet development,
- Ebb and flood shoal evolution,
- Sediment budgets,
- Detailed wave, hydrodynamic, sediment transport and morphological modeling,
- Channel shoaling estimates,
- Analysis and design of stabilization structures,
- Planning and design of mechanical bypassing systems,
- Navigation analysis,
- Optimization of channel layout, and dimensions, and
- Assessment of impacts on bay hydrodynamics and water quality.



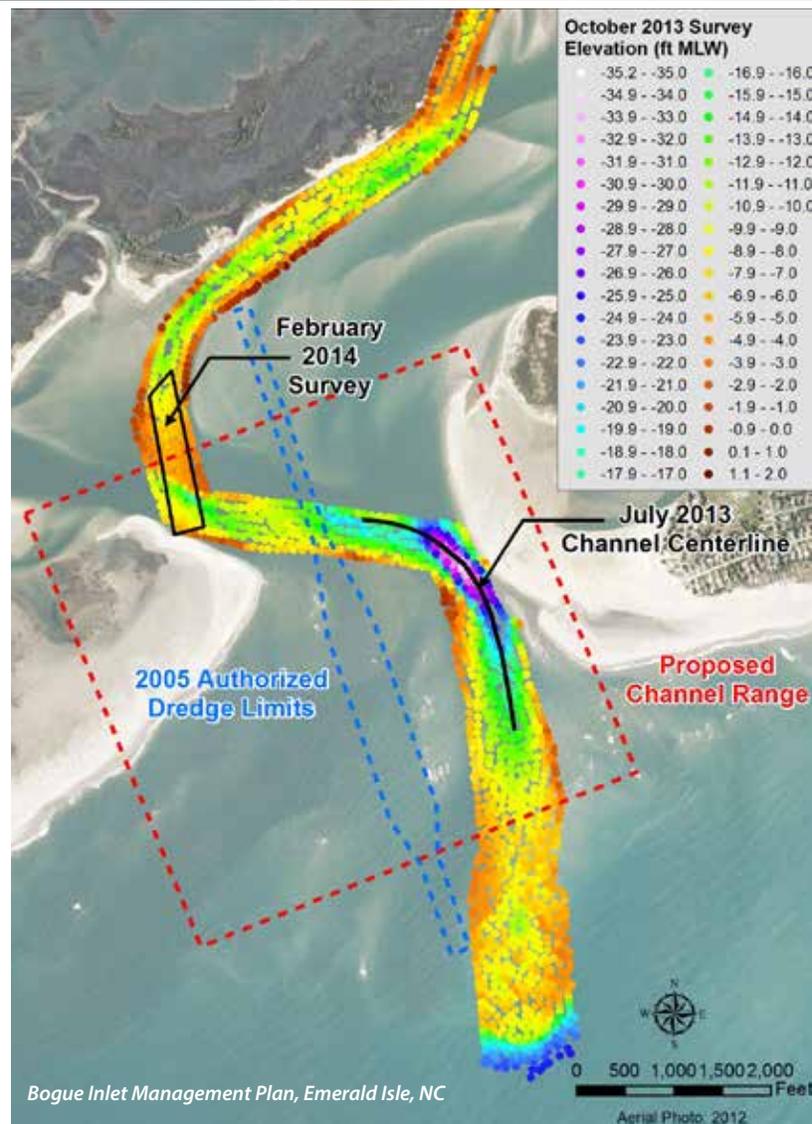
Shinnecock Inlet Management Improvements
Fire Island to Montauk Point Coastal Storm
Damage Reduction Project, Suffolk County, NY



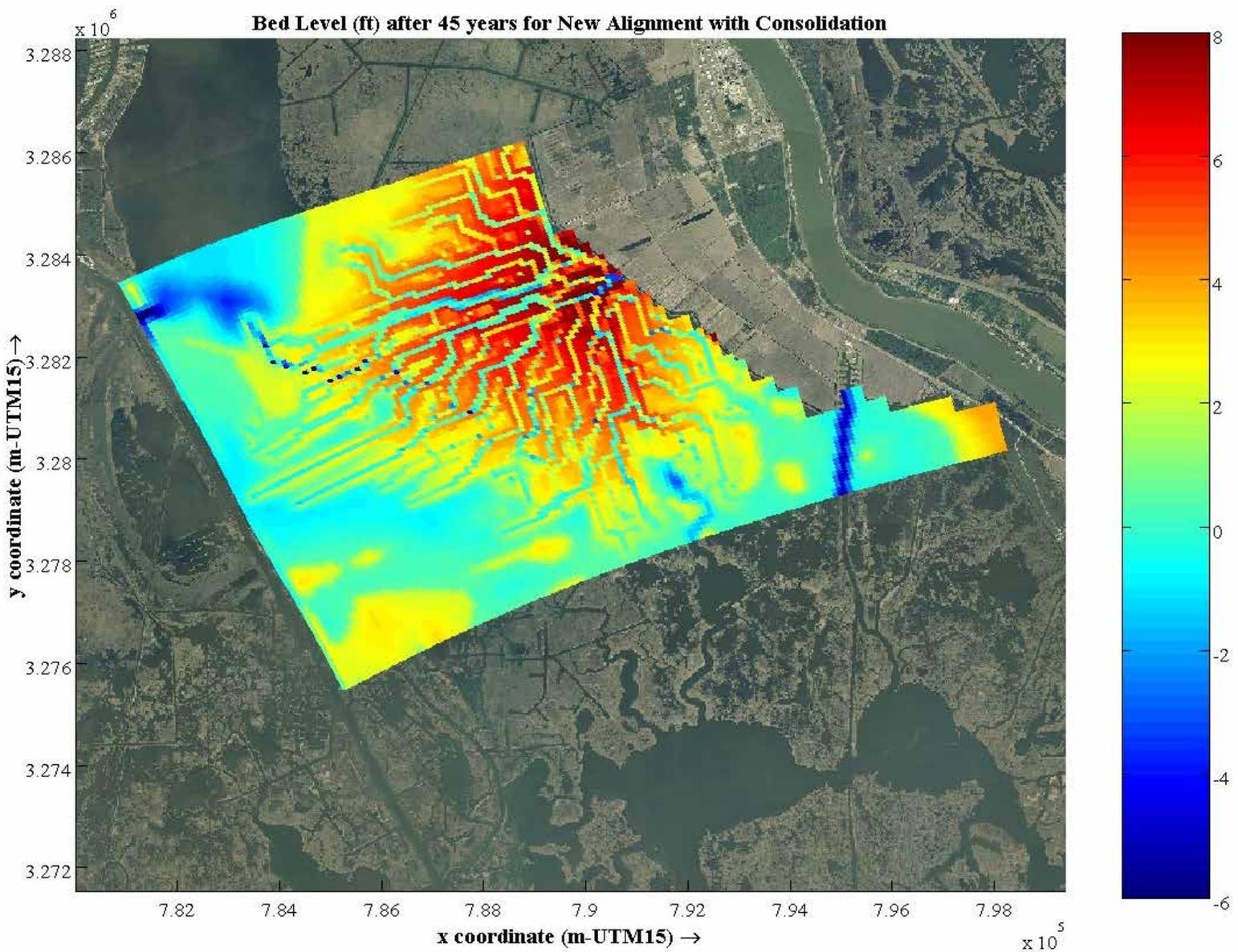
Batiquitos Lagoon Enhancement Project, Carlsbad, CA



Analysis and Redesign of Inlet, Little Lagoon Pass, AL

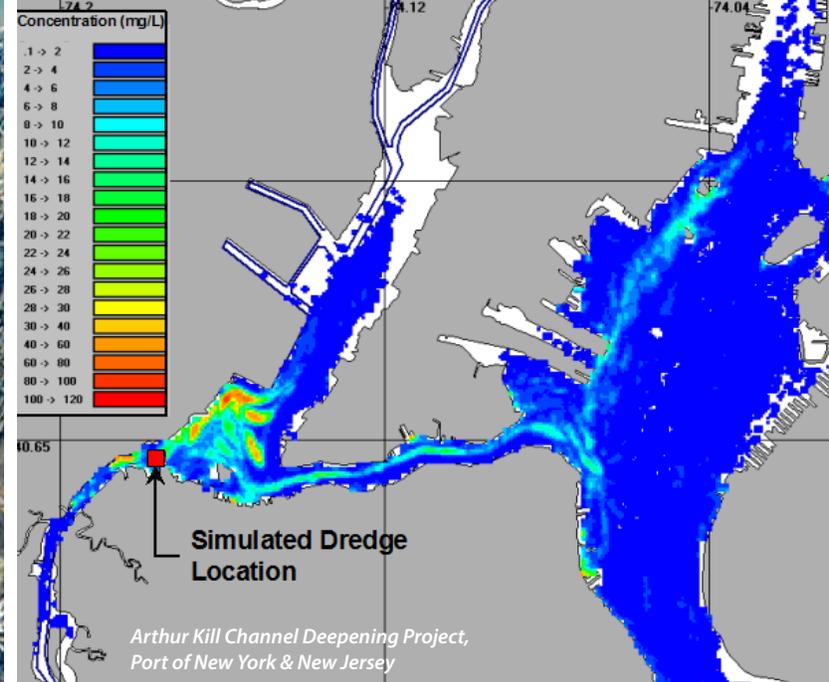


Bogue Inlet Management Plan, Emerald Isle, NC

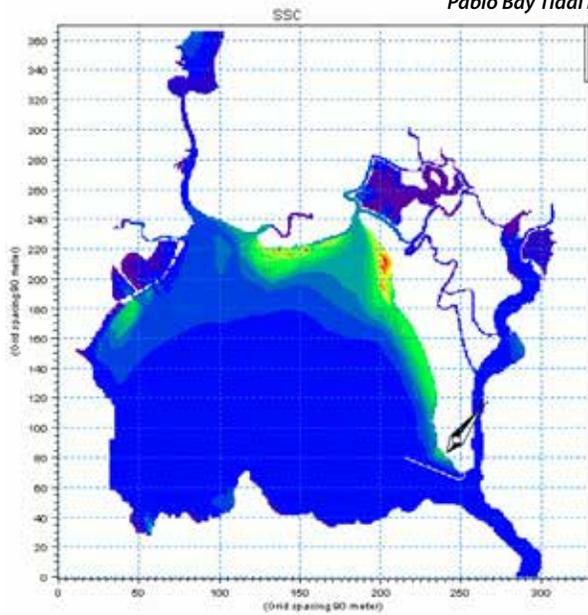


Sediment Transport

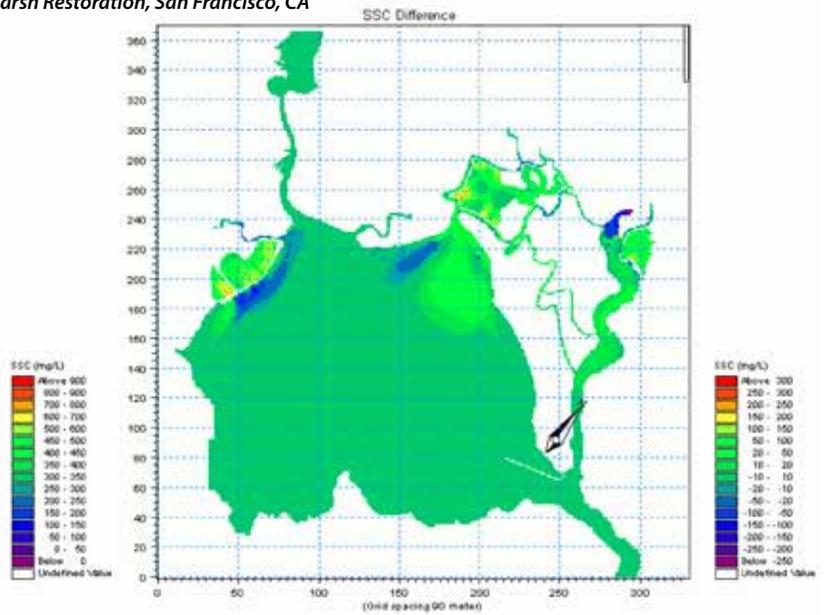
Dredged channels and harbor basins are often prone to sedimentation. Currents within the deepened channels are weaker than the currents that existed prior to dredging and thus are often incapable of preventing sedimentation. Mechanisms leading to shoaling in harbors include enhanced sediment influx due to density current and entrance eddy exchange, as well as sediment trapping inside the basin due to low ambient currents and sediment re-suspension resulting in adverse impacts. Moffatt & Nichol uses efficient and proven analytical methods developed in-house, as well as sophisticated commercial and publicly available numerical models, to estimate sedimentation and the need for future maintenance dredging and channel design. Moffatt & Nichol has applied these methods extensively throughout the world and on some of the largest channel deepening projects recently undertaken in the United States.



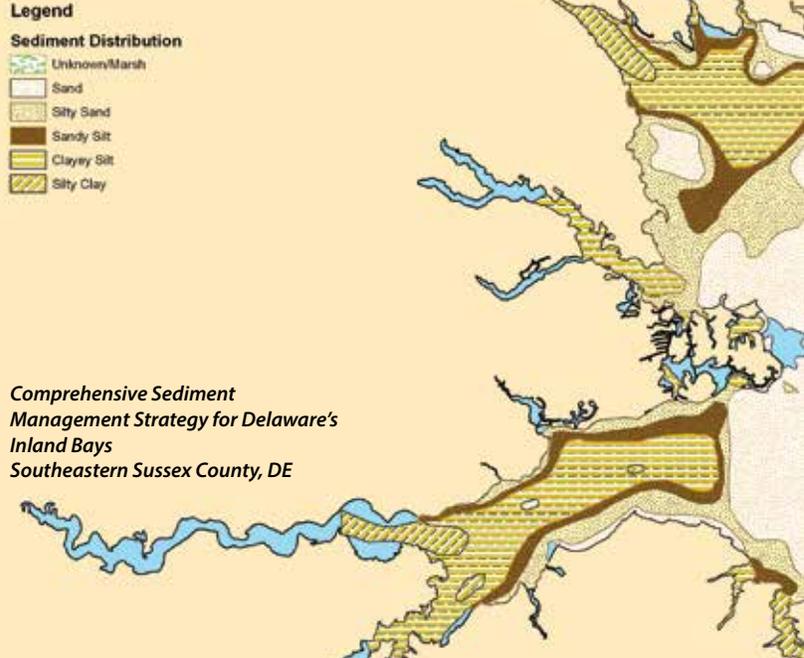
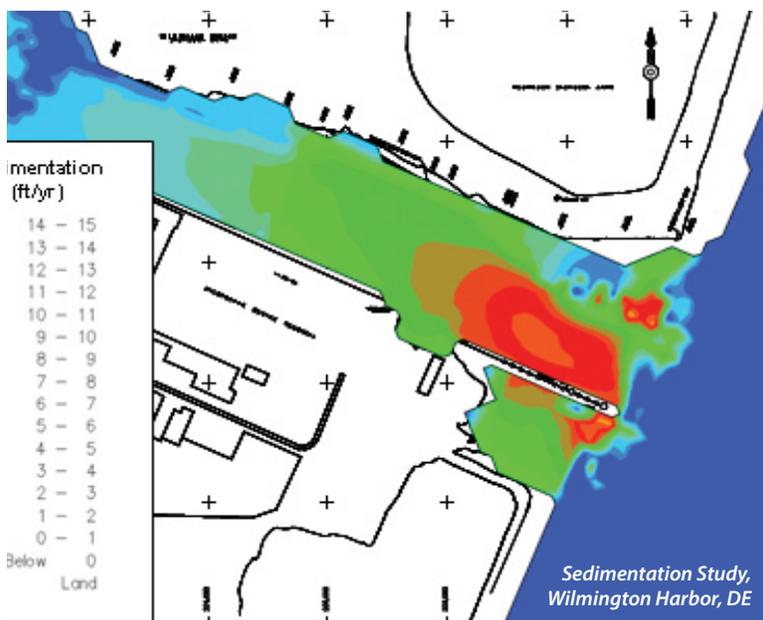
Pablo Bay Tidal Marsh Restoration, San Francisco, CA

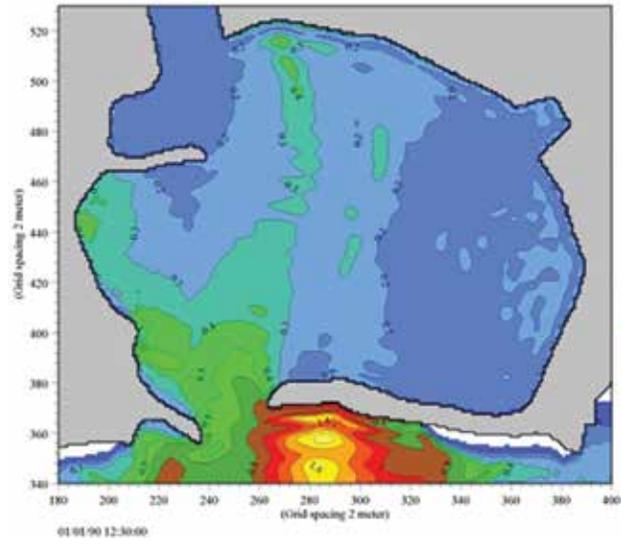


Simulated SSC (6-day average)
Moderate Flow Condition



Change From Existing Condition
Moderate Flow Condition

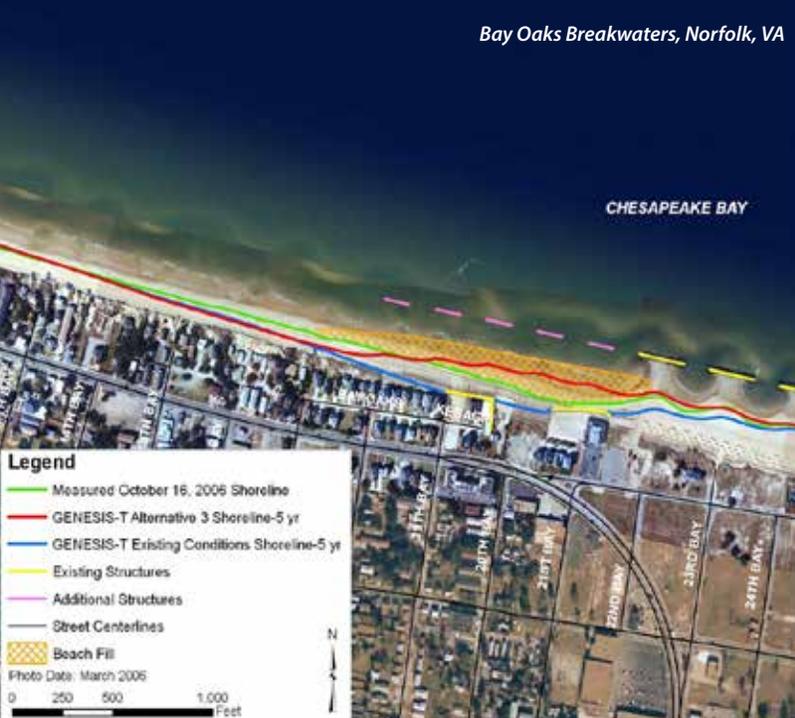




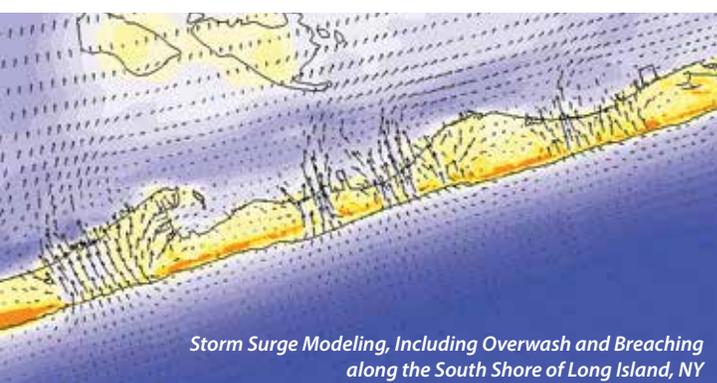
Wave Modeling (Physical & Numerical) Palmas Del Mar, Puerto Rico

Coastal Numerical Modeling

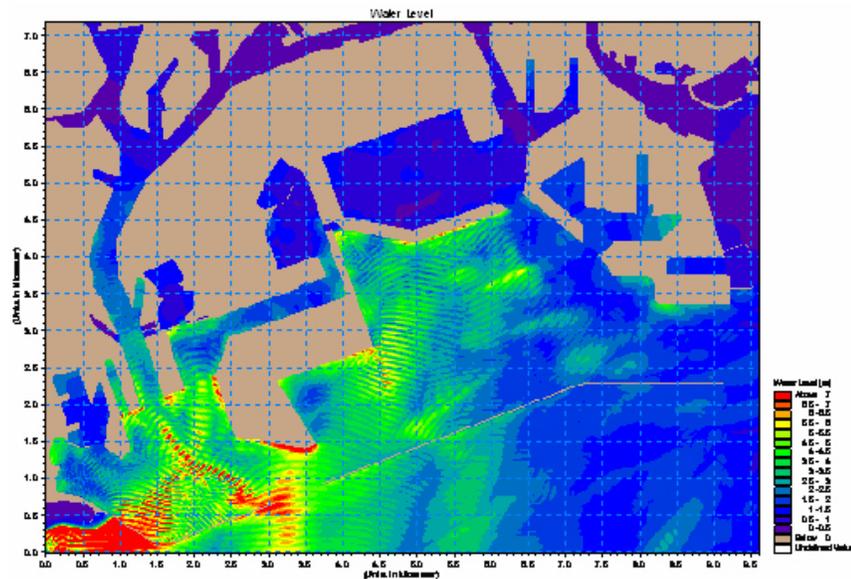
Development of infrastructure on the coast—from conceptual layouts, optimization, stability, and environmental impact assessment to detailed design—requires a thorough understanding of coastal processes including water levels, waves, currents, sediment transport, and morphological evolution. Moffatt & Nichol has extensive experience investigating these physical processes with the aid of state-of-the-art numerical tools to deliver valid, accurate, and useable solutions. This practical experience has been obtained through a focused effort over many years and projects and is one of the greatest advantages our firm offers. Purely theoretical, mathematical or academic understanding of the inner workings of numerical models cannot substitute for the hard-won, practical, design-oriented experience that we bring to our clients' projects.



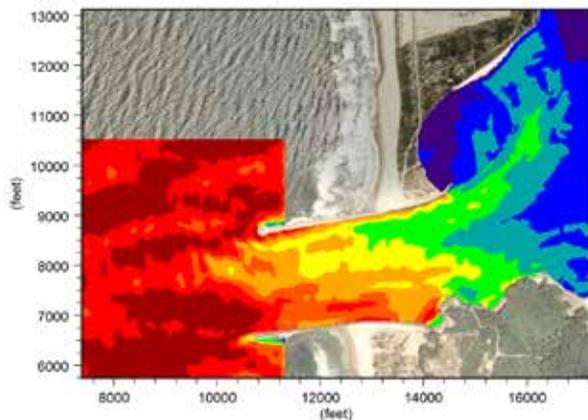
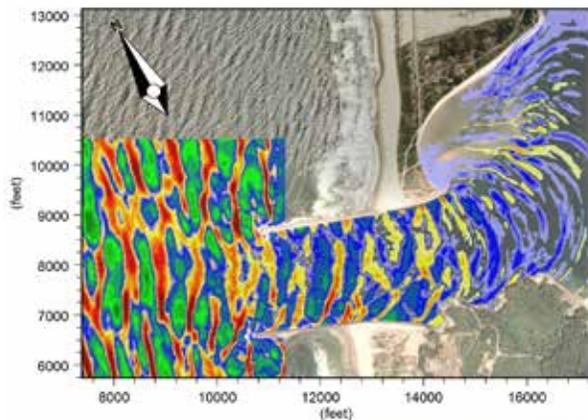
Shoreline Evolution Modeling at Coney Island - Sea Gate Reach, Brooklyn, NY



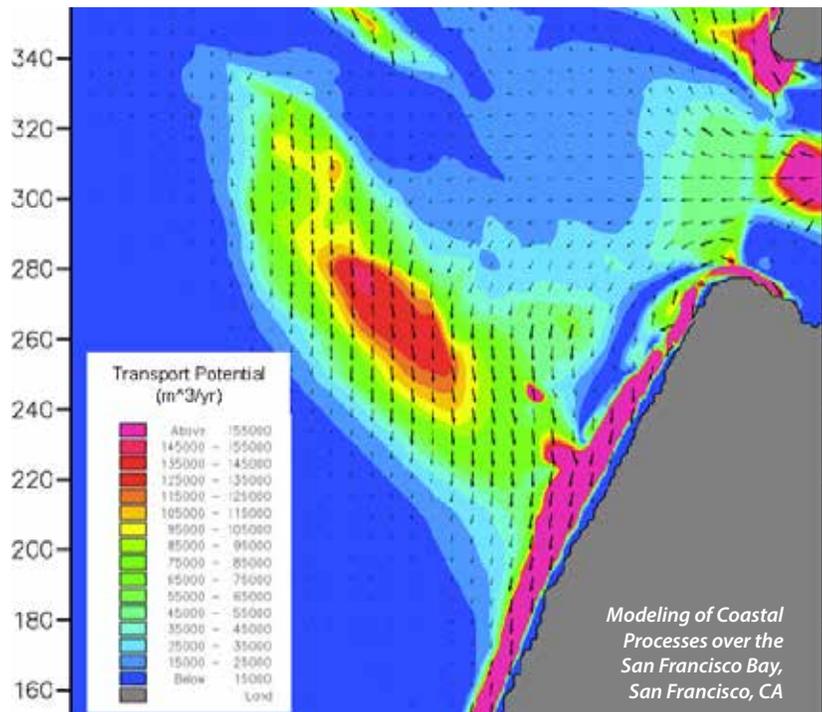
Storm Surge Modeling, Including Overwash and Breaching along the South Shore of Long Island, NY



Tsunami Propagation into the Port of Los Angeles, CA



Coos Bay Jetties Major Maintenance Report, Coos Bay, OR



Modeling of Coastal Processes over the San Francisco Bay, San Francisco, CA



Oyster Point Marina, South San Francisco, CA

Coastal Structures & Shoreline Protection

Coastal structures are important assets for the economic health of many coastal communities to protect harbors and inlets, provide beach and shoreline stability, stabilize navigation channels, and provide flood protection. Moffatt & Nichol provides the full range of coastal engineering services to properly plan, design, and build structures in the coastal environment. Specialties include numerical and physical modeling; hindcasting and statistical analyses to determine design storm surge, wave height and current magnitudes; coastal morphological analyses; and the determination of hydrodynamic loads on structures.

In addition to our coastal engineering capabilities, Moffatt & Nichol provides complete structural engineering design services (as well as civil, mechanical, and electrical engineering). Moffatt & Nichol is intimately familiar with the unique issues relevant to design and construction in the coastal zone including risk analysis, the proper selection of materials, the constructability of different possible structural systems, and the potential cost implications.

Rock Revetment, Yorktown, VA



Hurricane Protection Barrier, New Bedford, MA



East Ocean View Breakwaters, Norfolk, VA



Containment Dikes at Craney Island Dredged Material Management Area Eastward Expansion, Portsmouth, VA



Hyde County Living Shoreline, Ocracoke, NC



I-10 Bridge Replacement Study, Lake Pontchartrain, LA

Coastal Infrastructure Vulnerability

As history shows, our nation's coastal infrastructure network is increasingly vulnerable to coastal storm events. Moffatt & Nichol provides a full range of coastal engineering services critical to properly assessing potential vulnerabilities and providing appropriate design criteria. Specialties include hydrodynamic modeling, wave hindcasting, and statistical analyses to determine design storm surge, wave height, and current magnitudes; coastal morphological analyses; scour analyses; vessel collision analyses; and storm water management.



NC 12 Vulnerability Study, Ocracoke Island, NC



Great Highway Bluff Stabilization, San Francisco, CA



East Cliff Drive Bluff Stabilization, Santa Cruz, CA

Water Resources

Management of dwindling water supplies and our natural watershed systems is becoming a primary concern in developing a sustainable environment for ourselves and our children. As the population increases, it is becoming even more important to identify, protect, and/or restore these critical systems. Moffatt & Nichol has successfully completed water resource studies and projects to protect and expand these important resources. The services that Moffatt & Nichol provides in support of such projects include watershed planning and restoration design, public outreach and permitting support, watershed modeling and analysis (including coupled surface water/groundwater modeling), water supply modeling, stream and wetland restoration design, preparation of construction documents, and construction observation.

*Reservoir Operating Water Level Optimization Study
and Preliminary Additional Spillway Design, Gatun Lake, Panama*

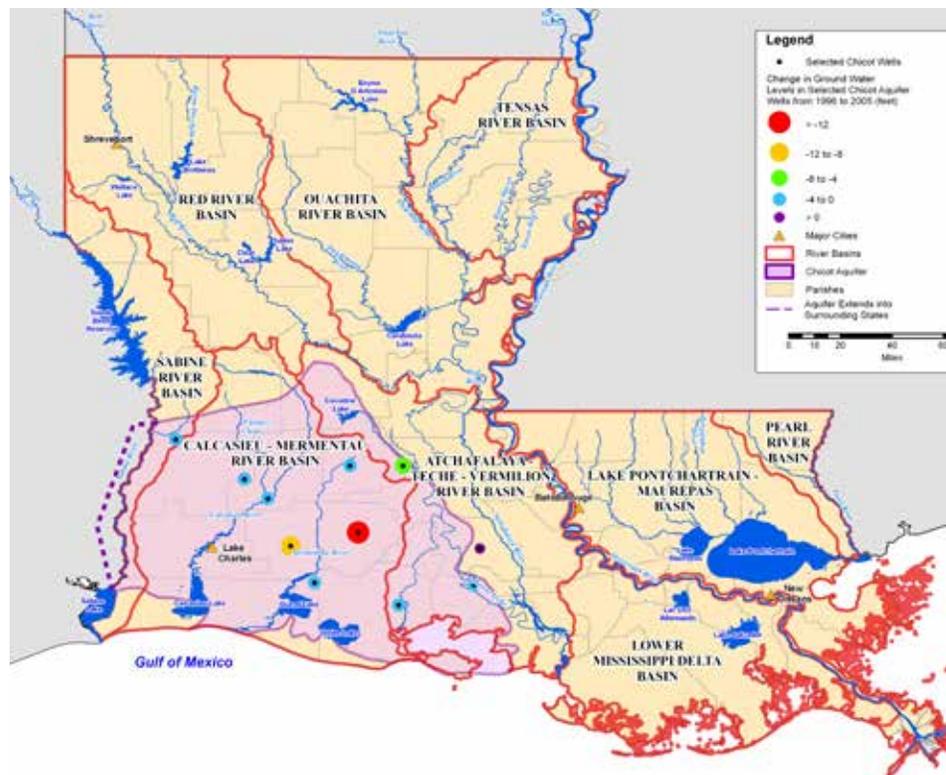




Cape Fear River Basin Water Supply Modeling, Jordan Lake, NC



Contra Costa Creeks Restoration, Contra Costa County, California CA



LADOTD Reservoir Water Supply Study, State of Louisiana, LA



Flooding Mitigation Project, Emerald Isle, NC

Stormwater Management

Management of stormwater quality, as well as quantity, is becoming more important in today's regulatory environment. The issues are especially complex in coastal regions where low topography and high groundwater tables limit the placement and performance of conventional Best Management Practices (BMPs). Moffatt & Nichol has successfully completed stormwater management studies and projects within these challenging environments as well as inland areas. The services that Moffatt & Nichol provides in support of such projects include planning and permitting support, watershed modeling and analysis (including coupled surface water/groundwater modeling), conventional and innovative BMP design, TMDL development and implementation, pump system design, public outreach, preparation of construction documents, and construction observation.



Inland Greens Stormwater Plan, Wilmington, NC



Bayfront Canal Flood Mitigation, Redwood City, CA



Manufactured Stormwater Collection & Treatment Devices at Norfolk International Terminals South Terminal, Norfolk, VA



Dundee Canal Drainage Improvements, Savannah, GA



Upper Guadalupe Flood Control Project, San Jose, CA

Flood Control & Drainage

Many flood control projects in urban and coastal areas involve complex design interactions between drainage, environmental, and aesthetic requirements to satisfy project design and site criteria. Moffatt & Nichol has extensive experience preparing hydrologic and hydraulic studies to support project design. We excel in modeling systems affected by tidal action and storm surge.

Moffatt & Nichol also has significant experience verifying that our projects are compliant with the Federal Emergency Management Agency (FEMA). We have modeling experience in riverine, coastal and dam breach analyses and are well versed in FEMA certification procedures. We provide floodplain analysis, conditional letter of map revision (CLOMR), letter of map revision (LOMR), map amendment (LOMA), and floodplain management services.



Pipemakers Canal Flood Mitigation Study, Savannah, GA



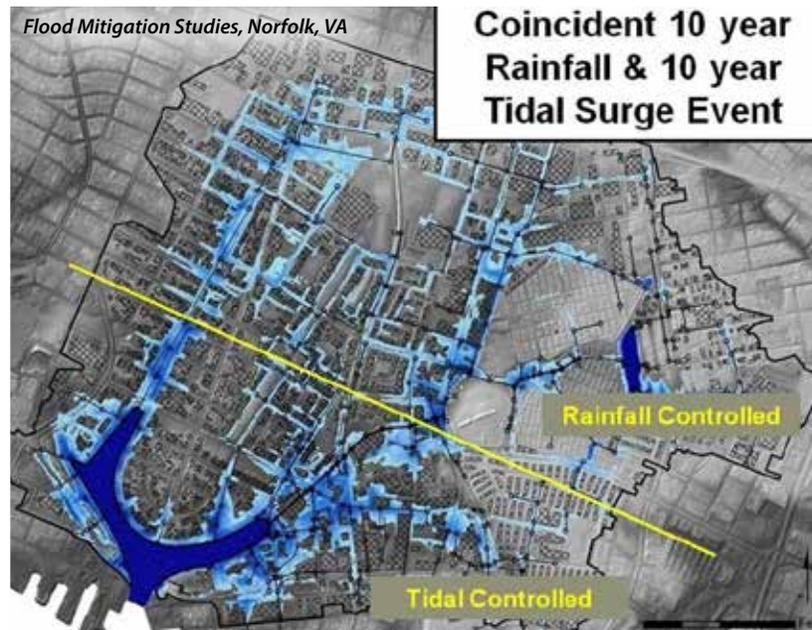
Flood Mitigation Study and Design, Belhaven, NC



Downtown Riverfront Park FEMA Compliance, Dayton, OH



Downtown Floodwall FEMA Certification, Norfolk, VA

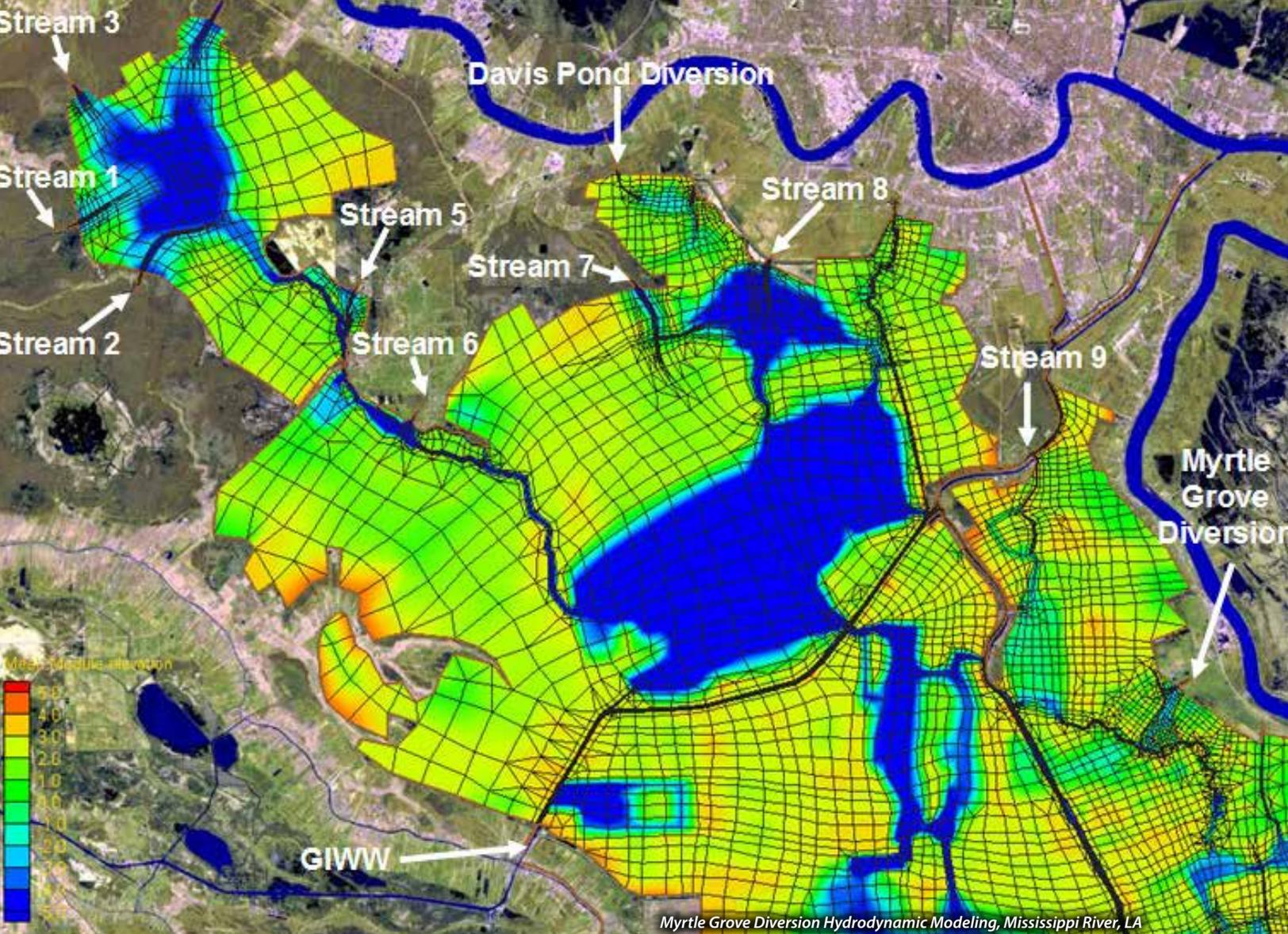


Flood Mitigation Studies, Norfolk, VA

**Coincident 10 year
Rainfall & 10 year
Tidal Surge Event**

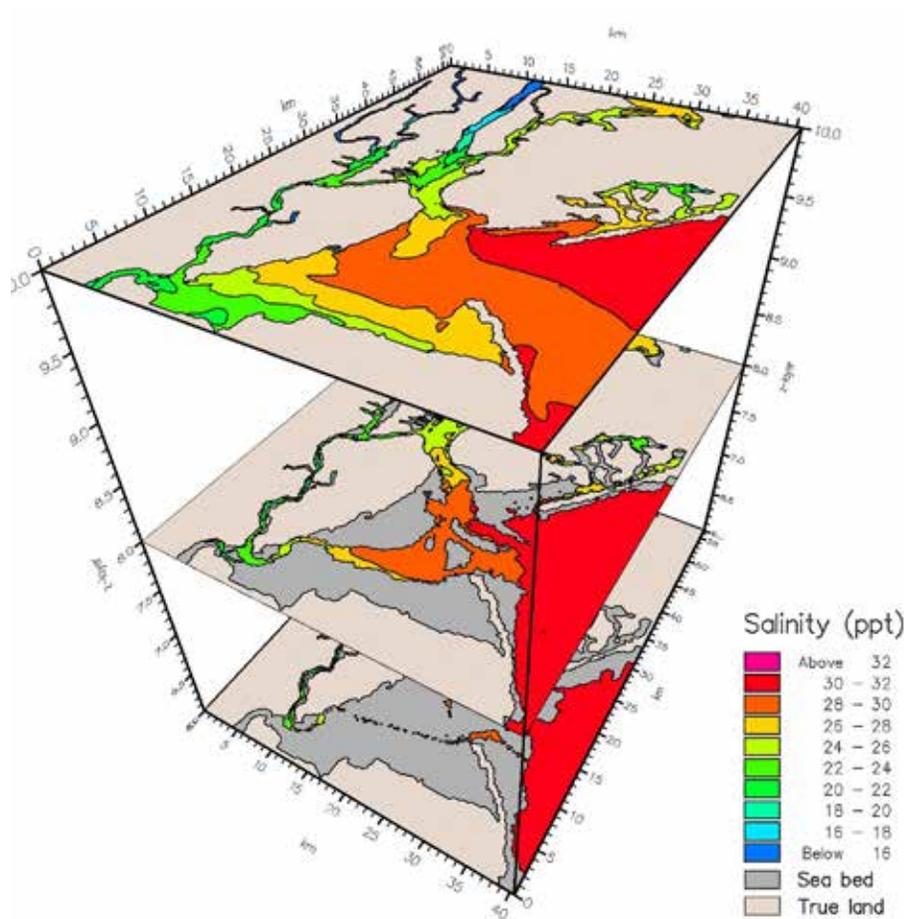
Rainfall Controlled

Tidal Controlled

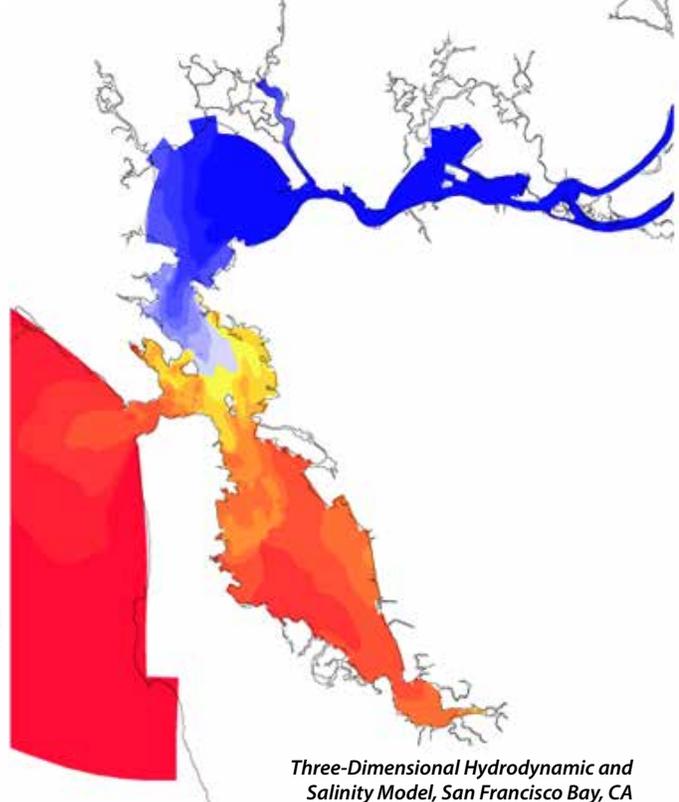


Estuarine & Riverine Numerical Modeling

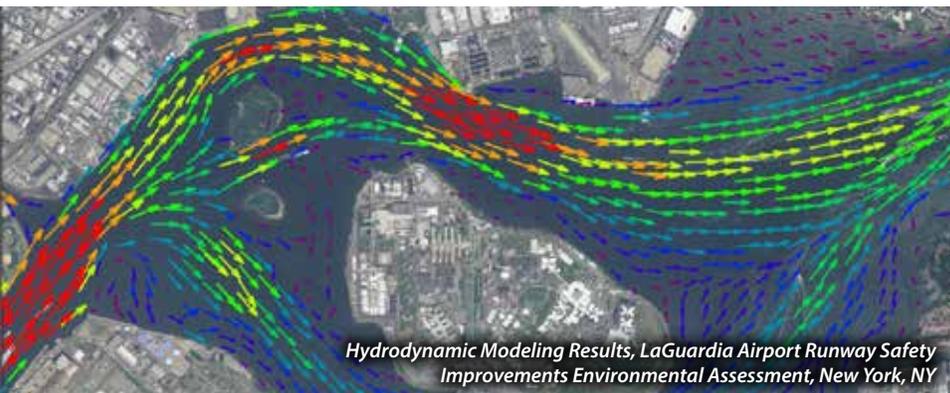
One of the most critical aspects of any project in an estuarine or riverine environment is the assessment of impacts on hydrodynamics, sediment transport, water quality, and sediment quality. Also important are the effects the system will have on the project itself, such as current and wave loads, flooding, and shoaling in navigation channels. These complex interactions are typically investigated using sophisticated numerical models. Moffatt & Nichol has completed hundreds of modeling studies, using multiple commercial and public domain modeling platforms, throughout the United States and abroad, including most of the major estuaries and coastal bays along the East, Gulf, and West Coasts of the United States. Many of these successful modeling investigations were subjected to rigorous review by project stakeholders, including the environmental and regulatory community, as part of an extensive environmental review process.



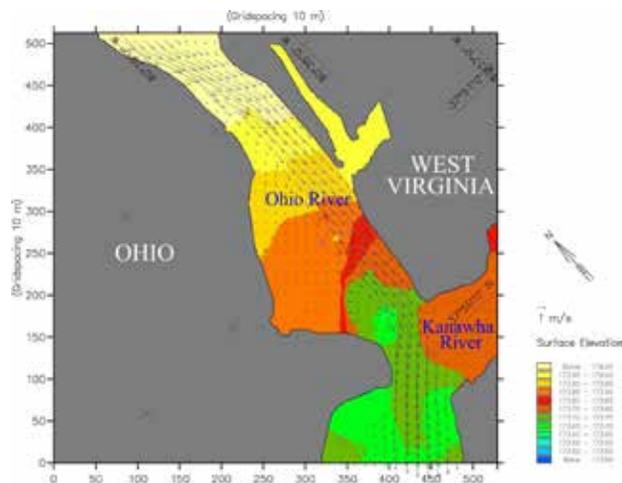
Salinity & Water Quality, NY/NJ Harbor Deepening Study, NY



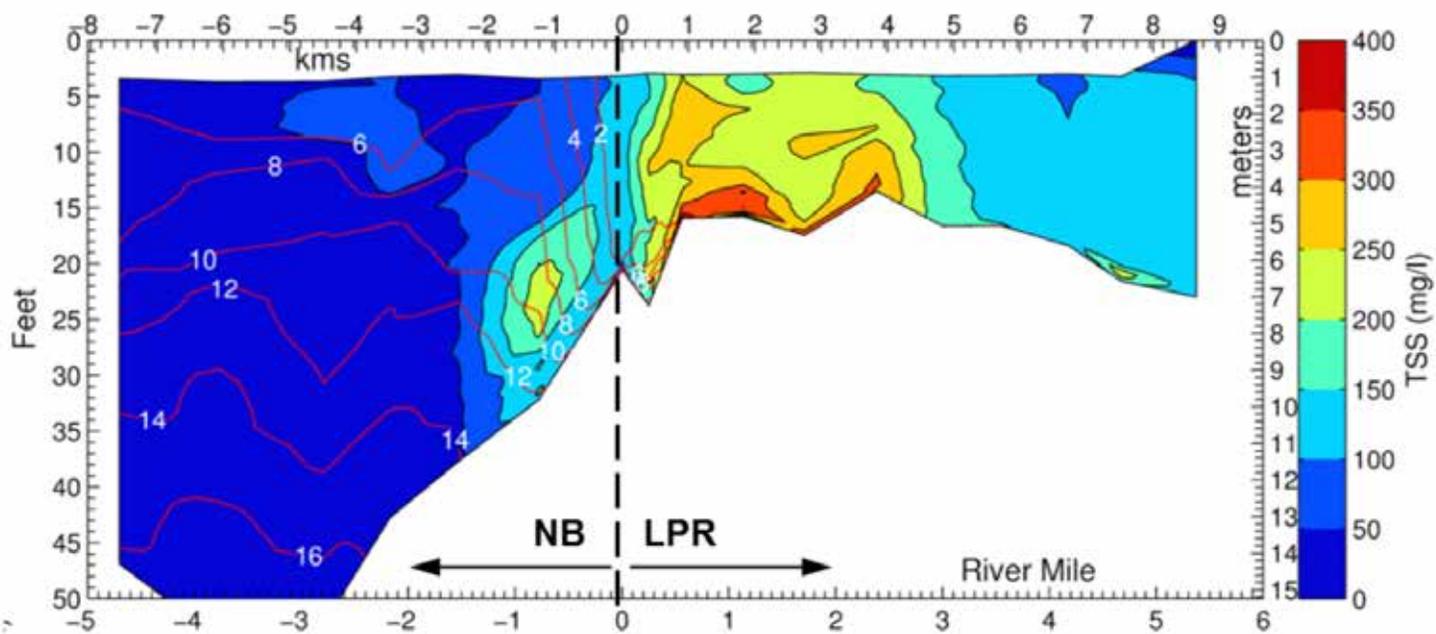
Three-Dimensional Hydrodynamic and Salinity Model, San Francisco Bay, CA



Hydrodynamic Modeling Results, LaGuardia Airport Runway Safety Improvements Environmental Assessment, New York, NY



Riverfront Park Development, Point Pleasant, WV



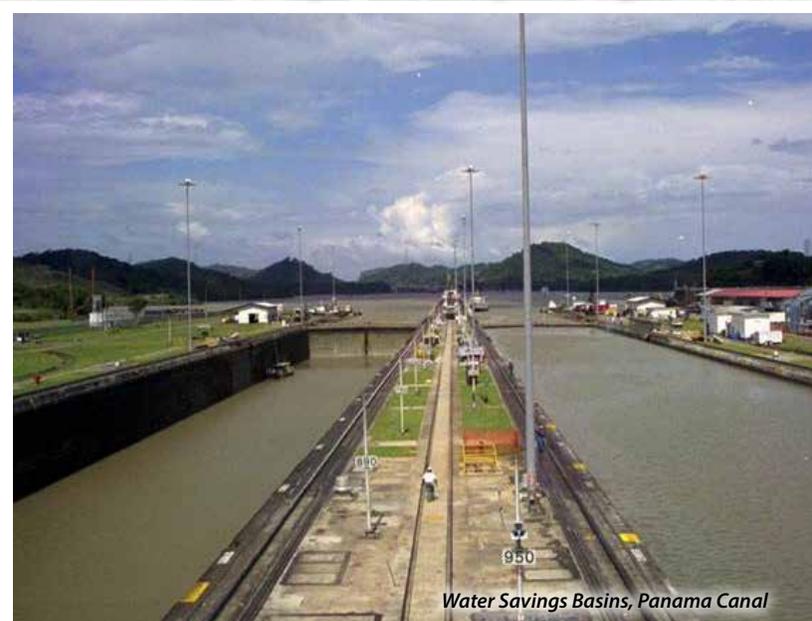
Lower Passaic River and Newark Bay Remedial Investigation/Feasibility Study (RI/FS)



Bolsa Chica Wetlands - Tide Control Structure, Huntington Beach, CA

Hydraulic Structures

Since the beginning of time, humans have attempted to control streams and rivers for water supply, navigation, and flood control. Natural disasters underscore the need for proper planning and design when implementing these challenging projects. Moffatt & Nichol has successfully completed numerous projects to protect life and property, while still balancing environmental concerns. The services that Moffatt & Nichol provides in support of such projects include the planning and design of locks, levees, hydraulic training structures, flow diversions, inverted siphons, reservoir outlet structures and appurtenances; tide gates; watershed planning and restoration design; public outreach and permitting support; hydraulic modeling and analysis of these structures; preparation of construction documents; and construction observation.





San Francisco Bay Hydrodynamic Modeling, SF-Oakland Bay Bridge East Span, CA

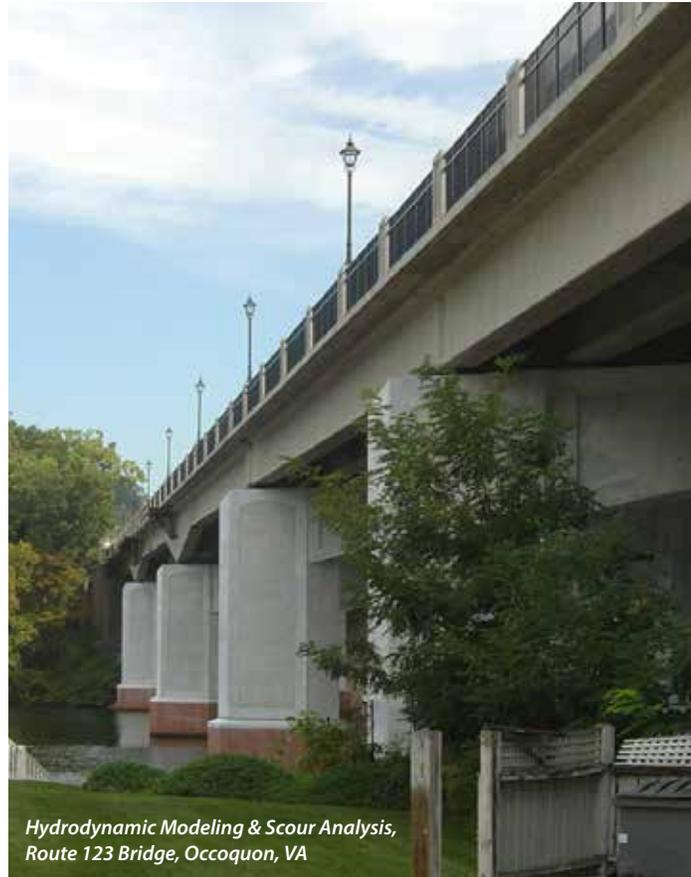
Bridge Hydraulics

The most common cause of bridge failures over waterways is flood waters scouring bed material from around bridge foundations, compromising the integrity of the structure. Moffatt & Nichol has performed hydraulic analysis for hundreds of structures throughout North America—for both new bridge construction and the safety inspection of existing bridges. We are well versed in the analysis procedures for both the hydrology and hydraulic portions of the problem as well as the design and implementation of measures to reduce scour.

*Hydrodynamic Modeling & Scour Analysis,
Virginia Dare Bridge over Croatan Sound, NC*



*Physical Model Scour Analyses, SF-Oakland Bay Bridge,
East Span, CA*



*Hydrodynamic Modeling & Scour Analysis,
Route 123 Bridge, Occoquan, VA*



13th Street Bridge over Santa Ynez River, Vandenberg AFB, Santa Barbara County, CA

Navigation & Vessel Moorings

As the demands increase on the world's waterways from both recreational and commercial vessels, Moffatt & Nichol is at the forefront of supporting both private and government clients in addressing issues that arise. The firm excels in extensive numerical modeling and analyses to determine potential impacts of deepening and widening navigation channels, as well as engineering design of channels that account for navigational risk, traffic congestion, tugboat operations and procedures, and vessel motions including resonance roll. Ship maneuvering studies are performed using both numerical models and full bridge mission simulators along with statistical and flow modeling of ship traffic.

Moffatt & Nichol employs the latest technology and industry experience to solve complex ship mooring and berthing problems and produce state-of-the-art designs. This technology includes an array of computer programs for static and time-domain dynamic analyses of vessels moored to piers and offshore moorings.

*Masonville Vessel Berth Mooring Design,
Baltimore, MD*

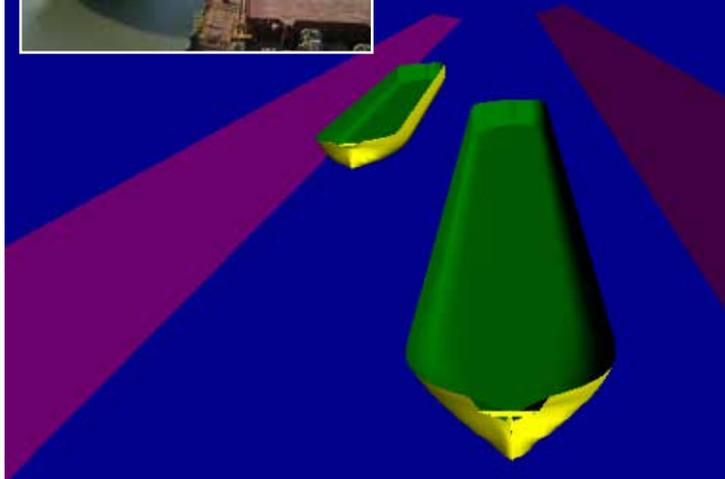




Study of Bermuda's Navigation Channels, Bermuda



Passing Vessel Simulations and Analysis, Welland Canal, Ontario



Moffatt & Nichol's Real Time Transas Vessel Simulator



One Week of Vessel Calls from Moffatt & Nichol AIS Database, Baltimore, MD



Fort McHenry Wetlands Restoration, Baltimore, MD

Ecosystem Restoration

Ecosystem Restoration is the practice of renewing and restoring ecological systems and habitats that have been degraded, damaged, or destroyed as the direct or indirect result of human activities. Moffatt & Nichol has used unique techniques and tools for planning and design of ecosystem restoration projects which include conservation, enhancement and restoration (both large and small). Strategies include the introduction of ocean tides through new or redesigned inlets; the introduction of river water, mineral sediments and nutrients through diversions; the management/regulation of flows to reduce saltwater intrusion; marsh restoration and vegetation plantings; beneficial use of dredged material; and shoreline protection. These ecosystem projects have required significant public, non-governmental organization and governmental agency coordination due to their high visibility and critical environmental importance. Moffatt & Nichol's ability to offer full planning, environmental documentation, permitting, numerical modeling, engineering design, and construction services for such projects has been instrumental in their success.



Masonville Cove Mitigation and Environmental Restoration, Baltimore, MD



Bolsa Chica Wetlands Restoration, Huntington Beach, CA



Planting and Seeding as Part of the Poplar Island Restoration Project, Baltimore, MD



Back Barrier Marsh Creation, Whiskey Island, LA



Bair Island Restoration, Redwood City, CA



Batiquitos Lagoon, CA

Watershed Restoration

Adverse impacts to water quality and aquatic habitat in the world's rivers, streams, lakes, estuaries, and wetlands have occurred over time from multiple effects. Watershed restoration seeks to return desired ecosystem services to their more naturally functioning conditions. This requires the comprehensive implementation of a variety of solutions or projects for which Moffatt & Nichol can provide the full range of planning, environmental documentation, permitting, numerical modeling, engineering design, and construction services required for such projects to be successful.



Hydrologic Restoration/ Phosphorus Reduction, Lake Okeechobee, FL



Clear Run Watershed Restoration, Wilmington, NC

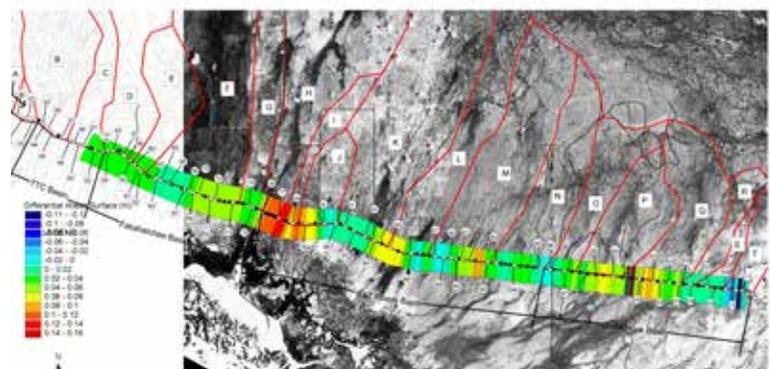


Watershed Restoration, Redwood Creek, CA



Watershed Restoration, Solstice Creek, CA

Watershed Hydrologic Restoration, Tamiami Trail, FL



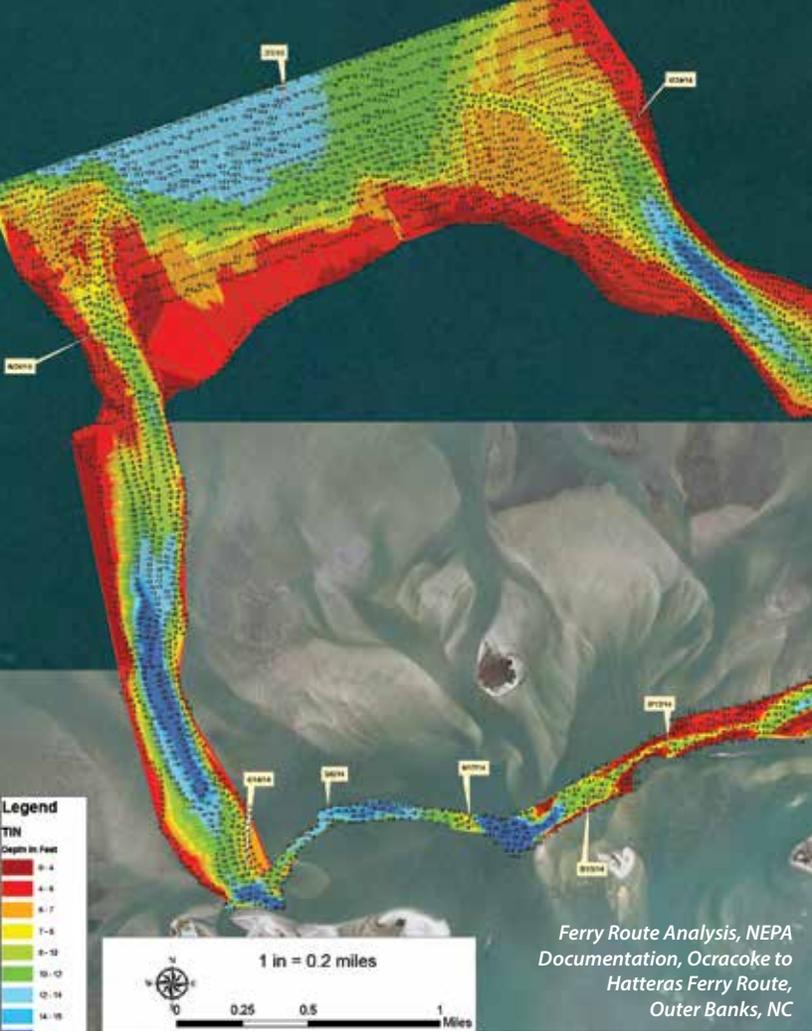


*Shoreline Restoration Environmental Analysis,
FONSI, and Permitting, Ocracoke, NC*

Environmental Review & Regulatory Compliance

Proper environmental and regulatory compliance is key to the success of any project. Moffatt & Nichol offers clients a complete range of environmental services with a unique engineering perspective. We provide in-depth environmental review expertise, which includes compliance with the National Environmental Policy Act (NEPA) and separate state review processes. We integrate engineering with environmental science to fully explore and identify project objectives and potential impacts at the beginning of the environmental review process. Our team assists clients to strategically plan projects and coordinate with regulators and other interested stakeholders to accomplish project goals while also avoiding, minimizing, and mitigating potential environmental and other community impacts.

Moffatt & Nichol's integrated environmental and engineering staff has successfully led and completed NEPA and state environmental review and our regulatory knowledge enables us to identify the environmental permits, certifications, and approvals required prior to project construction. We then work with the client to effectively and efficiently obtain and comply with all regulatory requirements prior to, during, and post- project construction (i.e. monitoring). We have expertise with a broad range of federal, state, and local environmental regulations and codes applicable to endangered and protected species, and the environment, and can complete many of the necessary assessments and reports with which coastal projects must comply.



Dredging and material disposal permitting, and environmental documentation



Treasure Island Coastal Flooding Protection, San Francisco, CA

Sea Level Rise & Climate Change

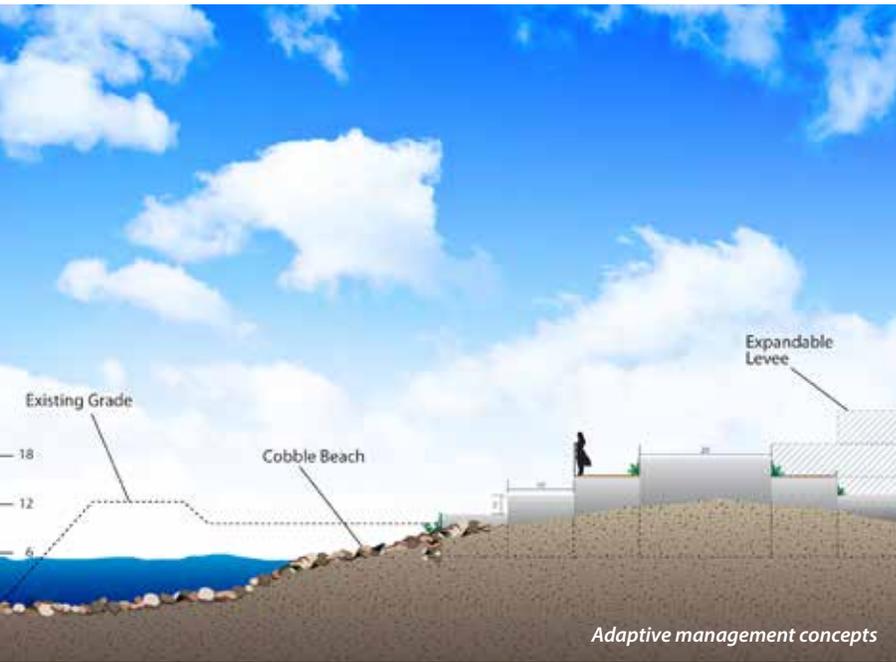
Sea Level Rise (SLR) and Climate Change are increasingly significant topics, as local governments, ports, and municipalities deal with a shrinking waterfront in the face of rising water levels and a changing climate, and as communities in general are becoming more environmentally conscious and aware. Addressing SLR is not as simple as “building it higher” because of the significant infrastructure already in place such as airport runways, container yards, homes, and businesses, and the connections at the inland edges, which limit the ability to just elevate the waterfront areas. Over the years, Moffatt & Nichol’s coastal engineers have routinely evaluated local and global sea levels as part of designing coastal flood protection projects, and they are very familiar with risk-based, probabilistic methods used in project life-cycle analysis and risk assessments. We are particularly qualified to assess the vulnerability to SLR and to develop adaptation/mitigation strategies in a manner that is easily understood by planners, architects, and local communities.



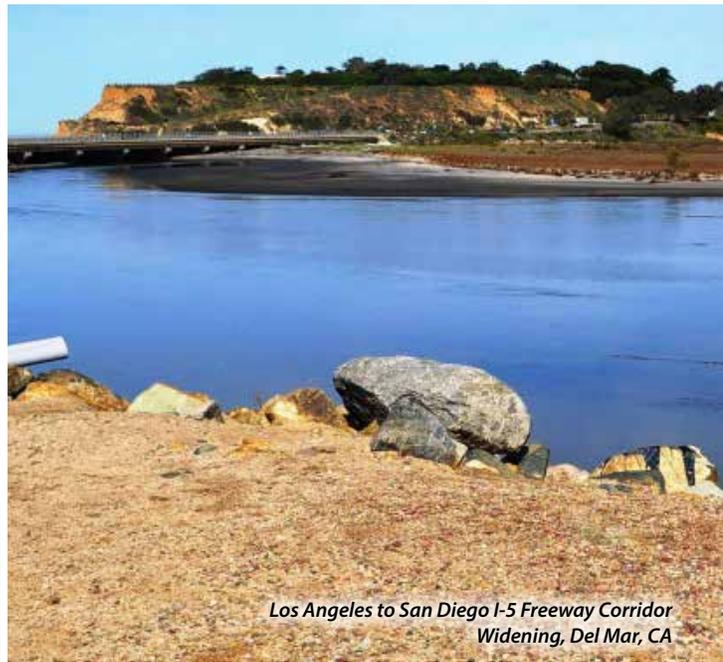
Bair Island Restoration, Redwood City, CA



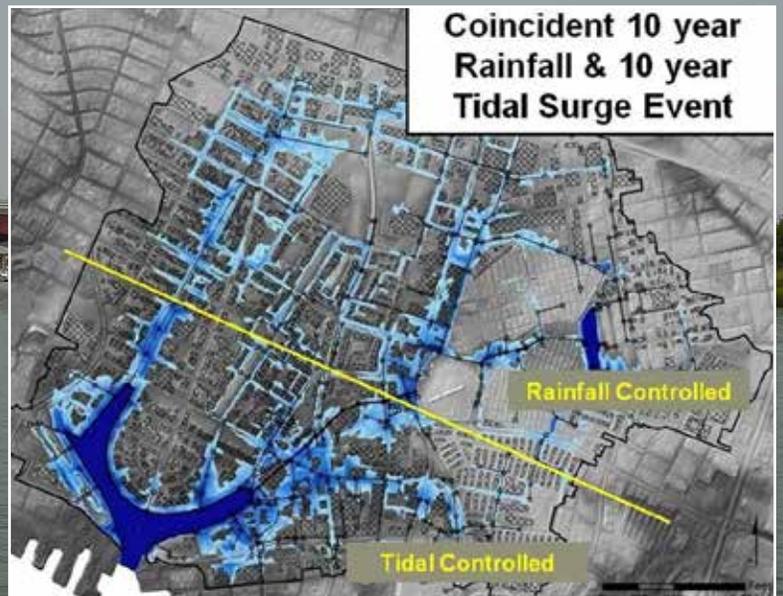
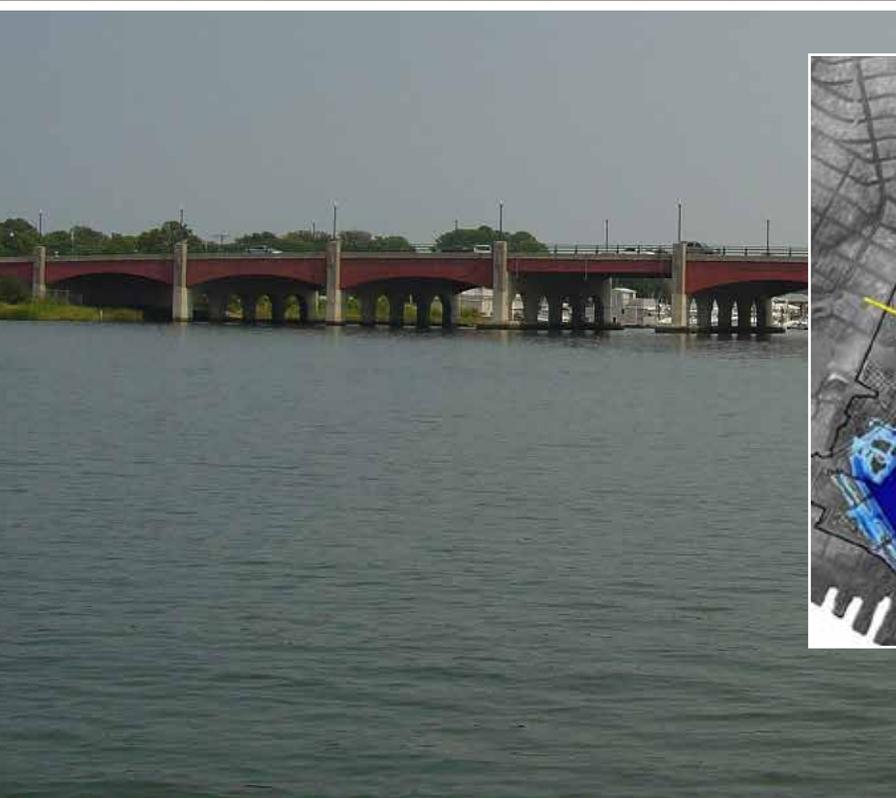
Downtown Flood Mitigation Project, Belhaven, NC



Adaptive management concepts



Los Angeles to San Diego I-5 Freeway Corridor Widening, Del Mar, CA





Hamilton Wetlands Restoration, Novato, CA

Beneficial Use & Dredged Material Management Plans

In the past, dredged material was viewed as “spoil” to discard, whereas today it is considered a resource for wetland creation and beach nourishment projects. Moffatt & Nichol has successfully completed many beneficial use projects and dredged material management plans around the world. The services that Moffatt & Nichol provides in support of such projects include planning and community outreach; sediment compatibility analysis; geotechnical design; contaminated sediment remediation; revetment/sill design; wetland creation design; 1-, 2-, and 3-D sedimentation modeling, leaching studies and analyses; storm damage and cost benefit analysis; evaluation of sand source alternatives and dredging alternatives; permitting; engineering design; preparation of construction documents; and construction observation.



Mississippi River Long Distance Sediment Pipeline, Plaquemines Parish, LA



Texas City Channel Deepening Design-Build, Texas City, TX



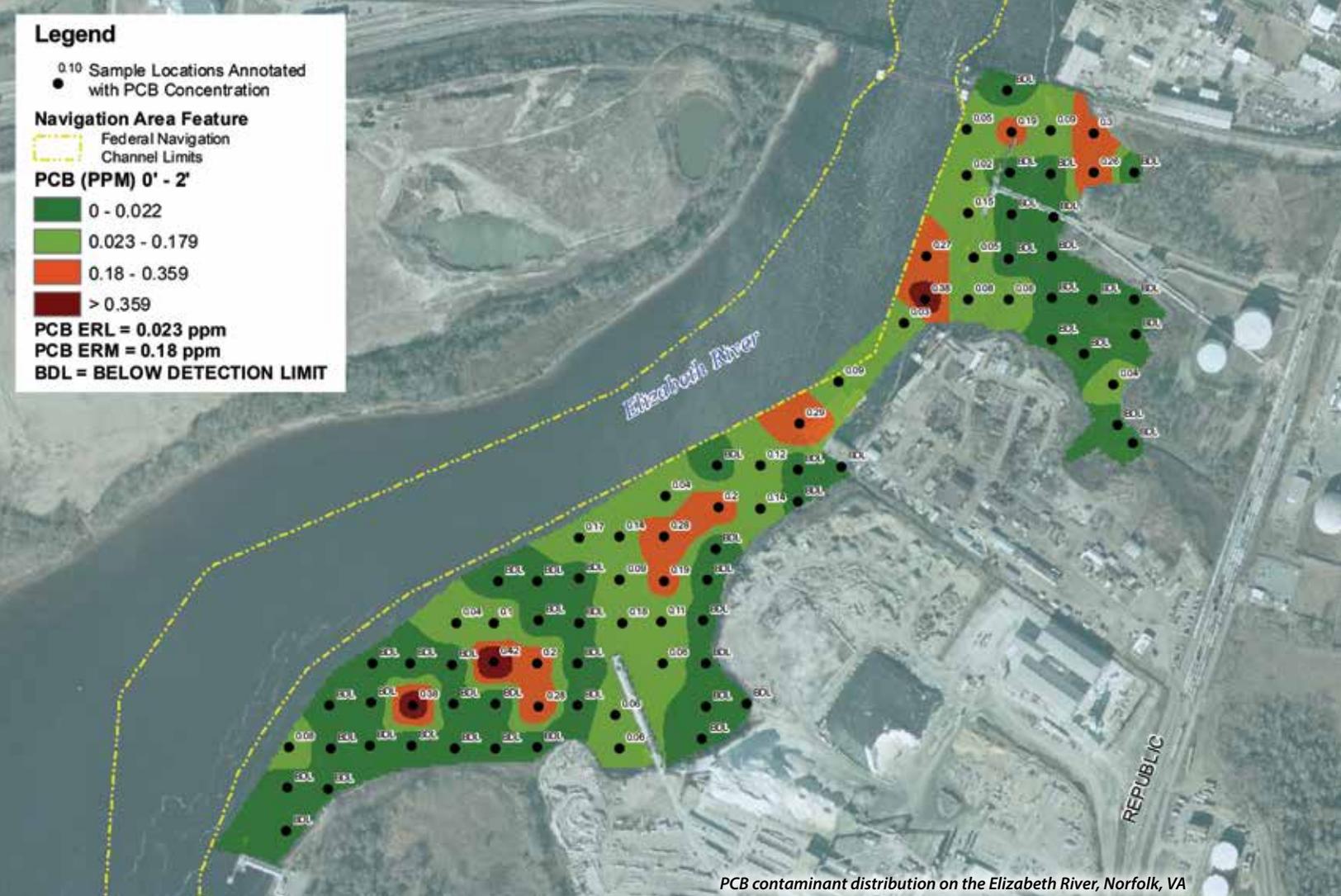
Shallow Draft Dredging Study, NC



Hart-Miller Island DCMF North Cell, Baltimore County, MD

Legend

- 0.10 Sample Locations Annotated with PCB Concentration
- Navigation Area Feature
 - Federal Navigation Channel Limits
- PCB (PPM) 0' - 2'
 - 0 - 0.022
 - 0.023 - 0.179
 - 0.18 - 0.359
 - > 0.359
- PCB ERL = 0.023 ppm
- PCB ERM = 0.18 ppm
- BDL = BELOW DETECTION LIMIT



PCB contaminant distribution on the Elizabeth River, Norfolk, VA

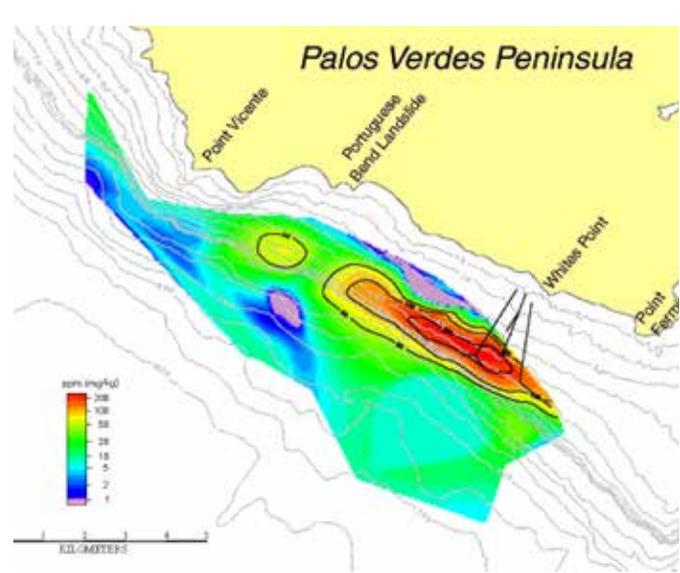
Contaminated Sediments

Highly contaminated aquatic sediments in ports and waterways are a combination of legacy contamination and current and recent point and non-point source discharges. When sediment contamination is so severe that it presents an unacceptable risk to human or ecological health, mitigative actions are required pursuant to Superfund rules. Moffatt & Nichol is at the forefront of specialized remediation and restoration engineering and construction management services for in-water construction projects in the open ocean, harbors, coastal wetlands, inlets, and inland waterways. The firm has a unique understanding of our clients' needs, coupled with an understanding of the dredging industry, as well as the environmental and regulatory issues and logistics that impact highly complex sediment remediation projects.

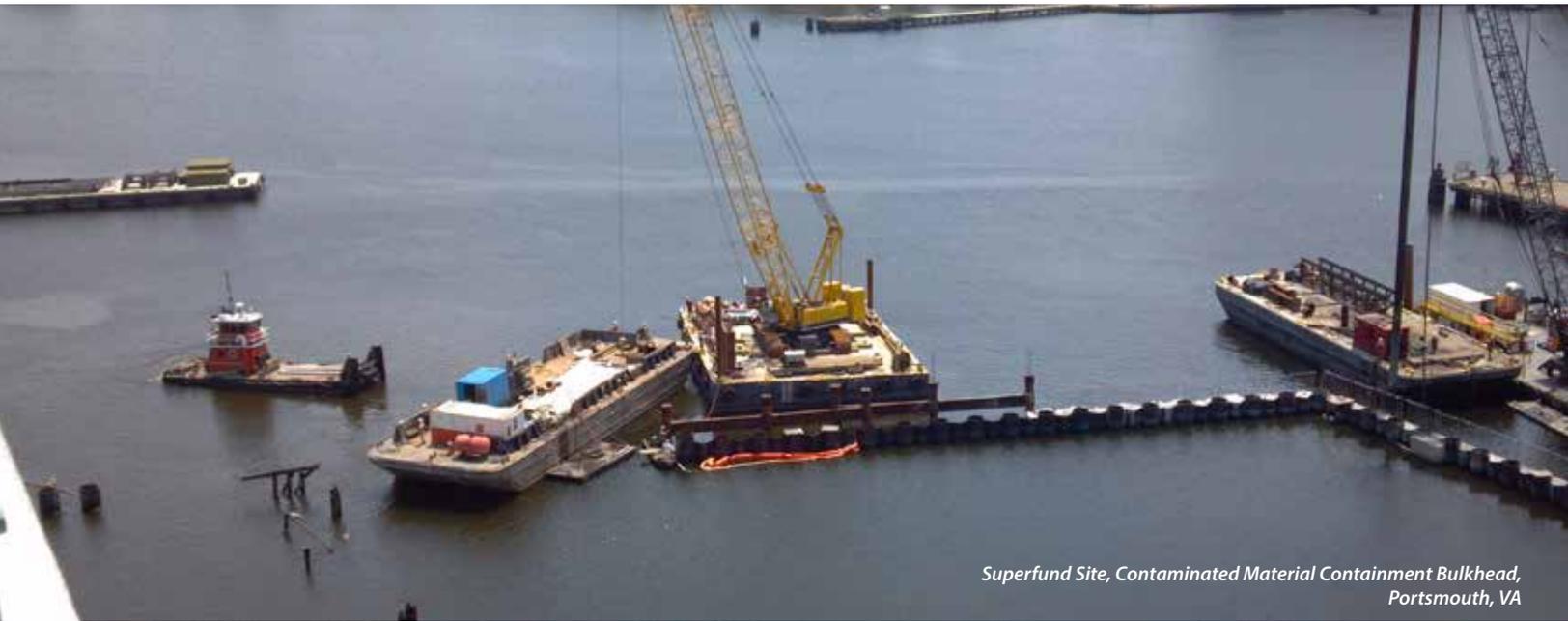
Furthermore, the analysis of contaminant fate and transport is important to the management of environmental resources and the development of effective remediation and restoration solutions. Oftentimes, numerical models offer the only option to studying the feasibility and effectiveness of proposed engineering solutions for a given contaminated sediment site. Moffatt & Nichol has extensive experience in the development and application of numerical models for hydrodynamics, sediment transport, and contaminant fate and transport in a variety of environments, including coastlines, estuaries, rivers, and bays.



Sediment remediation and cleanup projects



DDT contamination at the Palos Verde Shelf, Los Angeles, CA



Superfund Site, Contaminated Material Containment Bulkhead, Portsmouth, VA



Maintenance Dredging, Passaic River, Newark, NJ

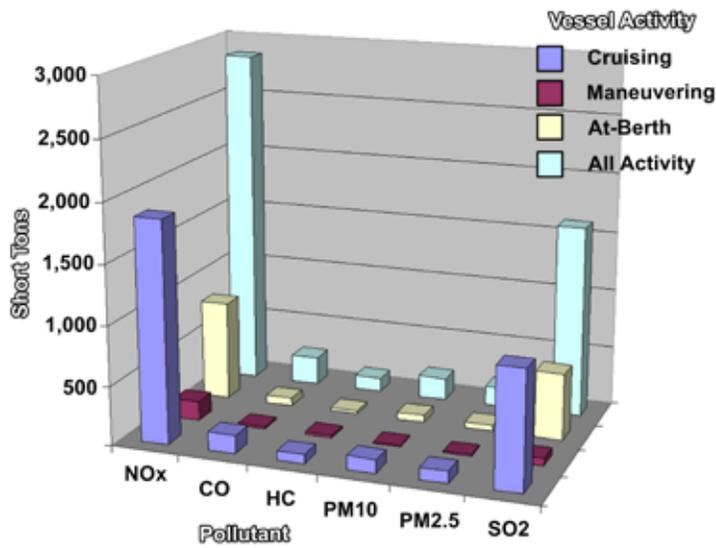


Plum Point Environmental Restoration and Water Quality Improving Wetlands, Norfolk, VA

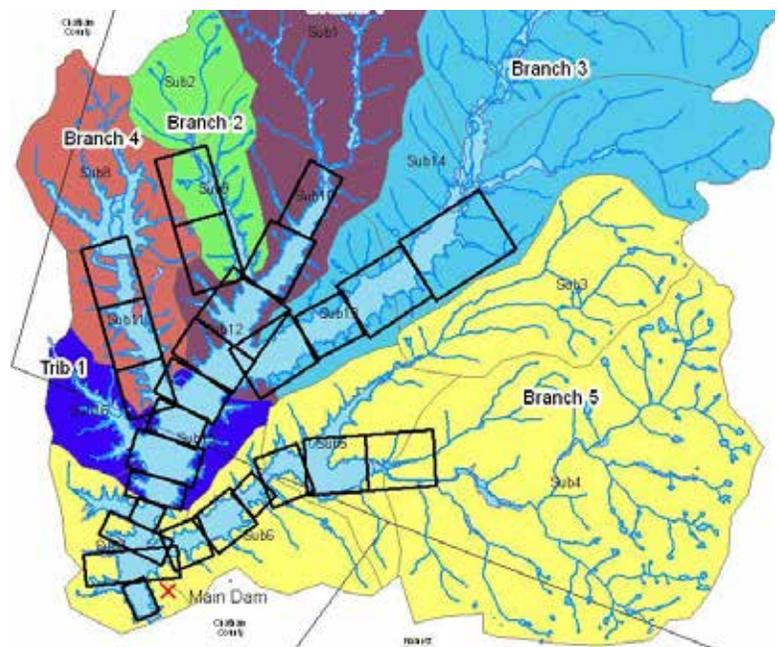
Air & Water Quality

As human activities have the potential to increase air and water pollution, it is important to have a thorough understanding of existing emissions and discharges, accurate forecasts of future ones, and strategies for mitigating or eliminating them. In support of our clients' efforts, Moffatt & Nichol has developed such tools as a cutting-edge, activity-based computational model that quantifies air emissions and integrates accepted Environmental Protection Agency (EPA) air emission factors with operational planning models developed by Moffatt & Nichol. The firm also has performed state-of-the-art, water quality numerical modeling of numerous lacustrine, riverine, and estuarine complexes. These efforts involved modeling constituents of concern from point, non-point, and air deposition sources including nutrients, sediment, pathogens, toxins (PCBs, PAHs, dioxin), and heavy metals (lead and mercury).

**Virginia Port Authority Ship Emissions
2005 Baseline Inventory**



Virginia Port Authority Emissions Inventory, Hampton Roads, VA



Harris Lake Water Quality Monitoring, New Hill, NC



Bonnet Carré Spillway Water Quality Impact Analysis, St. Charles Parish, LA



Inventing and forecasting air emissions from port operations helps clients understand and implement mitigation strategies



Award-winning Bio-retention Design at Baltimore Polytechnic Institute High School, Baltimore, MD

Notes



moffatt & nichol

www.moffattnichol.com