

NHC's understanding of coastal environment processes, and how anthropogenic interventions affect these processes, combined with our extensive experience, assists clients in planning and designing projects that meet their technical, economic, and environmental objectives.

## Services

Our services focus on understanding, analyzing, and designing for estuarine and coastal processes. These processes include tidal hydrodynamics, wave transformation, wave agitation in harbors, littoral currents, longterm and short-term beach stability, tidal marsh dynamics, and dispersion of sediment and thermal plumes. NHC provides planning and design services, construction administration and supervision, and documentation for tidal marsh restoration, bio-engineered and other shoreline protection, and floating and fixed breakwater structures.

- Coastal hydraulic, geomorphologic, and sediment transport analyses.
- Field surveys of bathymetry, waves, currents, salinity, and sediment characteristics.
- Wave generation, refraction, diffraction, run-up, and dissipation.
- Wind/wave circulation and transport modeling using SWAN, Delft 3D, MIKE 21, MIKE 3, LITPACK, WHAFIS 4.0, Telemac, Bouss-2D, ADCIRC.
- Assessment of coastal/estuary flooding, wave run-up, storm surge, and sea level rise, to determine flood construction levels.
- Conceptual and detailed design of foreshore erosion protection, including beach nourishment, groins, revetments, and seawalls.
- Conceptual design of marinas, small harbors, and floating/fixed breakwaters.
- Estuary hydrodynamics (density currents, morphodynamic modeling).



- Environmental studies: outfalls, dredging, plume dispersion/mixing, habitat, project monitoring

## Approach and Capabilities

Solutions to coastal and estuarine issues require a keen understanding of the interrelated processes of wave climate, hydrodynamics, climate and sea level change, wind and wave interactions, and sedimentation processes on tidal marsh and coastal shoreline conditions. NHC has the experience, expertise, and capability to apply this understanding to determine project alternatives, assess potential impacts, and provide coastal project and mitigation designs. NHC's experience and capability to collect field data supports our coastal analysis and engineering designs.

## Our Expertise

### **Tidal Marsh Geomorphology and Restoration**

**Design:** Geomorphologic modeling of tidal channel formation, marsh vegetation interactions, and sedimentation for developing tidal marsh restoration and mitigation designs. Analysis of sea level rise, sediment accretion, and bioaccretion to quantify marsh habitat evolution over various time horizons.

**Support for Infrastructure Design:** Providing data and analysis to design engineers from numerical and physical modeling to assess harbor agitation, wave refraction coefficients, scour, and erosion/sedimentation. Through modeling and analysis, NHC's specialists also provide conceptual design parameters and layout optimization.

**Shoreline Erosion Protection:** Reconstruction and protection of shoreline and intertidal foreshores including mitigating contaminated sediments and incorporating aquatic habitat features. Application of bio-engineering to protect against wave erosion. Detailed design, construction supervision, and repairs for riprap protection structures.

**Coastal Geomorphology:** Assessment of coastal and estuarine geomorphic, tidal, and wave effects on infrastructure development (e.g., ports) using historical data, site observations, detailed field measurements including ADCP and LISST samples, and numerical modeling of tidal currents, waves, salinity, and sediment transport.

**Coastal Flood Hazard Analysis and Mapping:** Development of 2D numerical models to assess flood hazards from the combined effects of tides, storm surge, wave run-up, and interactions with river flows. Flood hazard mapping using GIS and dynamic visualizations. Identification of flood vulnerability and assets at risk. Simulation of potential effects of sea level rise on coastal flooding. Planning of mitigation measures.

## Contact Us Today

For more details on our services and office locations, please visit: [www.nhcwater.com](http://www.nhcwater.com)

