APPLIED COASTAL

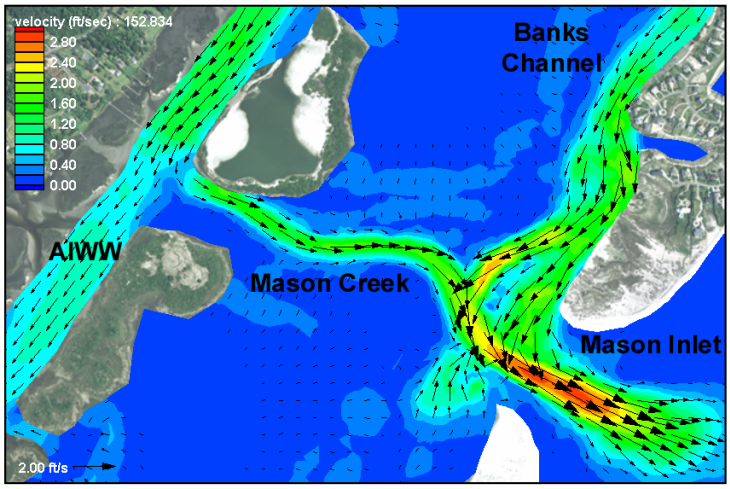
RESEARCH AND ENGINEERING, INC.

766 Falmouth Road, Suite A-1
Mashpee, MA 02649
http://www.appliedcoastal.com

Project: Mason Inlet and Middle Sound System
New Hanover County, North Carolina

Hydrodynamic and Sediment Transport Analyses of Present Conditions and Dredging Alternatives

Contact: Gahagan & Bryant Associates
7127 Ogden Business Lane, Unit 113
Wilmington, NC 28411
Mr. Chris Gibson; (910) 686-5884



The Mason Inlet system is a tidal estuary located northeast of Wrightsville Beach, NC, in New Hanover County. Due to southerly migration of the inlet channel on erosion impacts to adjacent properties, a plan was developed to relocate the inlet approximately 3,000 feet northeast of its 2001 location, and to re-open a connection between the inlet and the Atlantic Intracoastal Waterway (AIWW), known as Mason Creek. Following the Mason Inlet relocation, completed in March 2002, rapid infilling of the impoundment basin and shoaling within the AIWW at the junction with Mason Creek have generated concerns regarding performance of the modified inlet system. Specifically, future management of sediments within the inlet complex needed to be addressed to ensure that dredging efforts do not exacerbate shoaling in navigation channels. The entire Mason Creek study area covers approximately 2,150 acres, of which 1,300 acres are marsh

A two-dimensional (depth-averaged) hydrodynamic and sediment transport modeling analysis was performed by Applied Coastal for the Mason Inlet system, for present conditions and three proposed dredging alternatives. The Mason Creek system, as modeled, has three main channels: 1) the AIWW; 2) Mason Creek, the new channel between the inlet and the AIWW; and 3) the Banks Channel, which was previously the main channel between the Inlet and AIWW before the relocation of the inlet.

The results of the hydrodynamics analysis for existing conditions illustrate the mechanisms likely responsible for the observed shoaling at the AIWW junction with Mason Creek, as well as in the lower portion of the Banks Channel, near the Inlet. At both the AIWW junction with Mason Creek and in the seaward portion of the Banks Channel, tidal dynamics favor sediment deposition. An analysis of velocity residuals indicates that the AIWW is strongly ebb dominant, and therefore directs sediment to the confluence of the AIWW and Mason Creek. In addition, Mason Creek is presently moderately flood dominant, and hence favors sediment transport toward the AIWW junction. Prior to re-opening Mason Creek to the AIWW, no physical mechanism existed to cause this confluence of tidal current residuals.

Based on model results of the three different dredging options, Applied Coastal offered possible suggestions to improve the shoaling conditions within the Mason Inlet system including: 1) dredging a sedimentation basin in the north AIWW channel a the junction with Mason Creek, and 2) following a dredging plan which leaves the Inlet and flood shoal in tact. The first suggestion addresses the shoaling problem at the AIWW junction by providing a deep basin for the settlement of sediment. This junction area is a natural sediment trap, mostly due to the tidal characteristics of both the AIWW and Creek. The second suggestion is based on the performance of three modeled dredging options. Two of the options both greatly increase the tidal flow though the system due to dredging the inlet channel and the flood shoal, and in turn increase velocities and sediment fluxes. The third option, with less dredging volume, is seen as the most favorable for system stability and navigation interests in the Banks Channel.