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OIL SPILL RESPONSE ENGINEERING AND PLANNING

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Problem and research objectives

Tanker and barge traffic associated with the five petroleum product terminals along the NH side of the Piscataqua River represents a constant oil spill threat to the contiguous Great Bay System, NH, an estuarine reserve. Several serious accidents have in fact taken place in the 1970's and two small spills in 1990. A major factor is that the Piscataqua channel is subject to high velocity tidal currents. Should a spill occur, problems arise in knowing where the slick will move and how to control it using booms.

In this project, these problems were addressed by developing procedures for using diversion booms in high speed current environments and in revising and implementing a previously developed Oil Spill Trajectory Model. In the diversion boom concept, the boom is angled to the current in order to direct the slick to one side rather than attempt to contain the oil at an apex. Boom configuration (planform shape) must be designed before an emergency in order to prevent leakage when deployed. The Trajectory Model computer program makes use of surface current data to calculate the movement and spreading of spills in the Great Bay System.

Principal findings and significance

The boom configuration analysis models were completed in a format easy for the user to employ for design purposes. Model predictions agreed well with the experimental data from the boom shape experiments.

Boom configurations designed using the software package behaved as expected in demonstration experiments. The deployed boom was stable and could divert surface pollutants to shore-side skimming equipment.

Use of the bottom screw-in anchor was not successful, and portable anchor performance in the high currents of the Piscataqua was inconsistent depending on whether it set properly or not. Permanent moorings or systems secured to the berthed vessel are recommended. At the river and creek tributary locations where the currents are slower, an 85 lb. Danforth was found sufficient for holding protective booms in position.

The Trajectory Model was found to be a useful tool in planning a "Table-Top" exercise conducted by the DES. The spill response scenario involved the terminal operators, the U.S. Coast Guard, the U.S. Navy, as well as local fire and police departments. The upgraded oil spreading algorithm and enhanced graphics made the Trajectory Model especially effective.

Boom designs and methods of deployment developed in this project are now informally part of the area's contingency plans. The work will be incorporated formally in future documents mandated by recent government action.