OFR 92-143

UNITED STATES DEPARTMENT OF THE INTERIOR

Mission of the U.S. Geological Survey Water Resources Division

The mission of the U.S. Geological Survey is to provide geologic, topographic, and hydrologic information that promotes the health, safety, and well-being of the people through the wise management of the Nation's natural resources. The Water Resources Division provides the hydrologic information and understanding needed for the best use and management of the Nation's water resources. To accomplish its mission, the Water Resources Division, in cooperation with State and local governments and other Federal agencies:

- Systematically collects and analyzes data on the quantity and quality of surface water and ground water, on water use, and on the quality of precipitation.
- Assesses water resources and develops an understanding of the impact of human activities and natural phenomena on hydrologic systems.
- Conducts supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science and engineering.
- Disseminates water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public releases.

U.S. Geological Survey
Water Resources Division
Massachusetts-Rhode Island District
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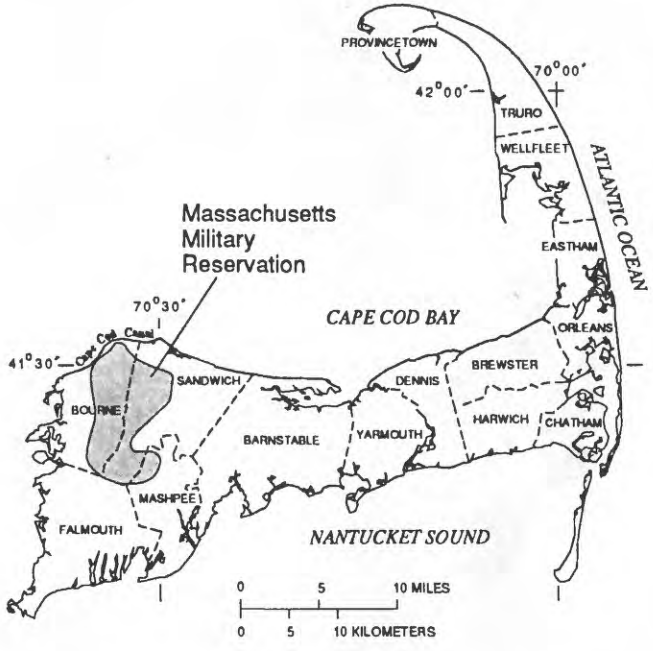
A Study of Ground-Water Flow Beneath the Massachusetts Military Reservation, Cape Cod, Massachusetts

Project Description
August 1992

U.S. Geological Survey
in cooperation with the
National Guard Bureau



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A Study of Ground-Water Flow Beneath the Massachusetts Military Reservation, Cape Cod, Massachusetts

Project duration: October 1991 through September 1994

Background

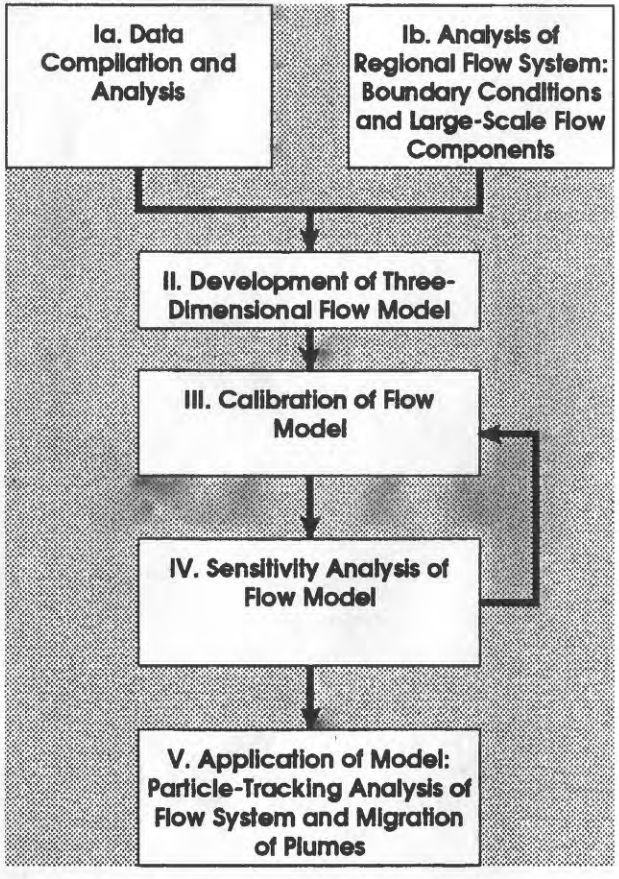
Several interrelated questions concerning ground-water flow, ground-water supply, and paths of contaminant plumes moving beneath the Massachusetts Military Reservation are being addressed by the National Guard Bureau. These questions include: What is the source of water to the many existing and proposed public-supply and remediation wells within and near the Reservation? What are existing paths and migration velocities of the plumes and how do surface-water bodies such as Ashumet Pond and the Coonamessett River affect these paths? How will changes in ground-water withdrawals affect future paths of the plumes? Answers to these questions require an understanding of the relation among the several factors that affect ground-water flow beneath and near the Reservation. These factors include the geologic framework and hydraulic properties of the aquifer, recharge to and pumping from the aquifer, and hydrologic features within the aquifer such as streams and ponds.

Objective

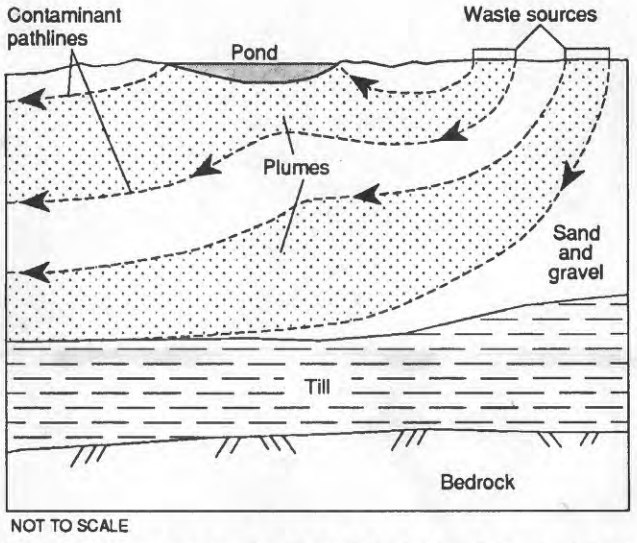
The objective of this investigation is to improve the understanding of the ground-water-flow system and migration of contamination plumes associated with the Massachusetts Military Reservation.

Approach

Improved understanding of ground-water flow and migration paths of contaminants dissolved in the ground water will be gained through the development of a three-dimensional computer model of the ground-water-flow system. The model will simulate the bulk motion of ground water within the aquifer, including the average velocity of contaminants dissolved in the ground water. The model will be used to track water and contaminant pathlines (known as particle tracking) through the aquifer. Hydrogeologic data collected by the Installation Restoration Program of the National Guard Bureau, the U.S. Geological Survey, and local communities will be used to construct the model. The model of the Reservation and surrounding areas will be integrated with larger-scale ground-water-flow models of Cape Cod, which have been developed in cooperation with State and local agencies.



Major steps in the investigation.



Schematic geologic section illustrating the migration of contaminant plumes in a sand and gravel aquifer similar to that underlying the Reservation.

Benefits

This investigation will increase the understanding of how ground-water flow and contaminant plumes beneath the Reservation are affected by the geologic structure of the aquifer, pumping from wells, and ground-water flow to and from ponds and streams. The model will integrate Reservation-wide hydrogeologic data, providing a comprehensive, quantitative analysis of ground-water flow and plume migration throughout the Reservation and adjoining areas. The investigation also will demonstrate how understanding of plume migration can be limited by uncertainties about the hydrogeology of the aquifer and simplifications of the actual flow system that are inherent in the computer-modeling approach. The investigation will give insight into how future pumping for public supply and remediation might affect the paths of plumes, and will help guide future hydrogeologic investigations of the Reservation.

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P.M. Barlow and D.R. LeBlanc, 1992