



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002RI2B

Title: Hydro-geologic Investigation of the Fresh Water lens in a Small Rock

Project Type: Research

Focus Categories: Groundwater, Methods, Water Quality

Keywords: groundwater, islands, fresh water lens, geophysical methods

Start Date: 03/01/2002

End Date: 02/28/2003

Federal Funds: \$32,127

Non-Federal Matching Funds: \$66,172

Congressional District: 2

Principal Investigator:

Daniel W. Urish

University of Rhode Island

Abstract

The understanding, appreciation and sustainable development of coastal and island groundwater resources is a continuing need in Rhode Island, the "Ocean State", as it is in much of coastal United States and the World. This is especially true of islands where the water resource is limited and highly susceptible to anthropogenic contamination, as well as salt water intrusion. The fresh water - salt water relationship in rock islands is particularly poorly understood and in need of focused research in applied science.

The primary purpose of this research project is to accomplish a comprehensive hydro-geologic groundwater investigation describing the characteristics of fresh water - salt water relationships in a small rock island in a salt water environment. This investigation will greatly aid applied scientists and water resource engineers in the more appropriate application of groundwater flow theory and models for other rock islands where water resource development may be contemplated. Additionally, there are two related objectives: 1) this study will be designed to serve as an educational study area and example of a unique marine-environmental ecosystem for students as well as the general public, and 2) The investigative methodology will employ state-of-the-art application of geophysical techniques in order to define most appropriate methodology which is both cost effective and non-destructive.

Rose Island, an 18 acre island in Narragansett Bay, Rhode Island, composed of metamorphosed sedimentary fractured rock covered by a thin veneer of glacial sediment, is an excellent research site. It has an effective diameter of about 800 feet, and a groundwater recharge estimated at about 12 inches per year, sufficient for the island to develop a small freshwater lens. The groundwater conditions can be evaluated in a natural state, since there is no existing groundwater exploitation. The island is a controlled environmentally protected location where good instrumentation for data collection can be safely installed and protected. The island is controlled by the Rose Island Lighthouse Foundation who have enthusiastically concurred with this project and will also provide transportation and on-island support as appropriate

Methodology will include the installation of data logging equipment for collection of long term hydro-geological data and the accomplishment of focused objective surveys. The long term data will include collection of climatological data (precipitation, temperature, evaporation, water level fluctuations, etc.) over the period of approximately 15 months, which will be correlated with other area full time climatological data stations such as Kingston, Warwick and Prudence Island. The focused surveys will include establishing topographic and water level elevation reference controls, geophysical surveys (electrical resistivity, electro-magnetics and possibly ground penetrating radar). The selection of appropriate geophysical methodology will depend on initial reconnaissance surveys to be accomplished at the onset of the project. Simple analytical models will be applied and tested against field findings and reports will be provided to the Rhode Island Water Resources Center, the University of Rhode Island Coastal Institute, and the island's owner and caretaker, the Rose Island Lighthouse Foundation.