

**FINAL REPORT**  
**CHARACTERIZATION OF NON-POINT SOURCES AND**  
**LOADINGS TO GALVESTON BAY**

**1.0 INTRODUCTION**

The Galveston Bay National Estuary Program (GBNEP) is a multi-agency environmental management planning program established for the protection and improvement of water quality and living resources within the Galveston Bay Estuary. In general terms, the project was designed to address one directive of the Clean Water Act: to develop the relationship between in-place loads and point and non-point loadings of pollutants to the estuarine zone and the potential uses of the zone, water quality, and natural resources. To meet these goals, the GBNEP has embarked on a three phase plan as mandated by the National Estuary Program: First, the problems in the estuary are prioritized; second, the estuary is scientifically characterized to better define the problems and link them with causes; and third, a series of action plans are created to solve these problems. The problem prioritization phase, conducted in 1989, identified non-point source pollutants entering Galveston Bay to be an important problem requiring further assessment.

This study, initiated in November 1990, and completed by Groundwater Services, Inc. (GSI), and their subcontractor Rice University (RU), was aimed at characterizing non-point sources and loads into Galveston Bay. Non-point sources include a wide array of diffuse pollutant types and sources, from major storm water outfalls, land drainage, and human activity. Pollutants include toxics, fecal coliform bacteria, oxygen demand, nutrients and sediments. Source activities include urban development and agricultural activities, septic tanks, and runoff from industrial and residential developments.

The present project was designed to be a "washoff" study; that is, a study of non-point source loads originating from different types of land use. Land use has been recognized as one of the major variables in non-point sources of pollution, and has been the focus of most of the non-point source studies performed in the U.S. to date. A unique and original land use/land cover database for Galveston Bay was developed in this case from interpreted satellite imagery that provided a high resolution snapshot of the basin land use as it existed in 1990.

In addition, the project utilized a relatively new technology, Geographical Information Systems (GIS), to achieve the objectives set forth in the work plan. The GIS was used to map the geographic characteristics of the study area, analyze the land use data, complete the NPS calculations, and finally

graphically present the project results. The resulting GIS database can be used as a very effective management tool for Galveston Bay.

This report presents the results from the GSI/RU NPS project. Section 2.0 lists the objectives and the approach adopted in the work. Sections 3 and 4 provide a brief overview of the study area and the nationwide and local non-point source studies that have been performed to date. A detailed description of the project methodology is included in Sections 5.0 and 6.0. The project results are discussed in Section 7.0, while conclusions are summarized in Section 8.0. The Figures referenced in this report are located in Volume II while the Appendices are located in Volume III.