comprehensive surveys throughout Galveston Bay and other coastal waters as well.

2.0 Study Objectives

The objectives of this study are to identify and map unpermitted point source discharges within selected shoreline segments of Galveston Bay and to develop a standard methodology and framework for possible future comprehensive shoreline surveys of the Galveston Bay system.

To accomplish these goals, the following activities were defined in the project scope of work:

1. Available discharge data on permitted discharges was obtained from:
   a. Railroad Commission (RRC) on pipeline permits and discharges of produced brines,
   b. Texas Water Commission (TWC) on permitted discharges,
   c. General Land Office (GLO) on pipeline permits,
   d. local governments (cities, counties, flood control districts) on stormwater discharges.
2. A plan to determine survey variability was implemented at the conclusion of all segment surveys. At least five randomly selected 1 mile transects within three survey segments were resampled as a check on survey variability and completeness.
3. Shallow draft boat surveys were conducted in bay and bayou segments to obtain a representative cross section of the various types of shoreline in the Galveston Bay system. The representative shoreline types selected for study are listed in Section 2.1.
4. A record was made of the location of all discharges, both permitted and unpermitted.
5. Responsible agencies were notified upon discovery of an unpermitted discharge. While storm sewers presently do not require permits, their presence and locations were recorded and catalogued separately.

2.1 Shoreline Types

The Galveston Bay system encompasses many types of shorelines. These shorelines and the areas in which they drain differ with respect to the nature and density of development as well as their accessibility

from the water and from land. Nine types of shoreline in the Galveston Bay system were surveyed for the presence of permitted and unpermitted discharges. These shoreline types represent a cross section of the types found throughout the bay system and are fairly inclusive of what may be found in any estuarine system. A total of 159 linear miles of shoreline/stream were designated for survey. The nine shoreline segments surveyed in this study are:

Cedar Bayou: Segment 0901, 19 river miles, industrialized/urban tributary.

Galveston Bay: Segment 2421, 22 shoreline miles, developed shoreline.

Double Bayou: Unclassified Segment in Chambers county, 22 river miles, agricultural/rural tributary with oil field activity.

East Bay: Segment 2423, 40 shoreline miles, marinas and agricultural/undeveloped open bay shoreline.

Chocolate Bayou: Tidal segment 1107, 14 river miles, moderately developed rural tributary.

Armand Bayou: Tidal segment 1113, 8 river miles, suburban tributary.

Dickinson Bayou: Tidal segment 1103, 15 river miles, moderately developed suburban/rural tributary.

Dickinson Bayou: Above tidal segment 1104, 7 river miles, rural non-tidal tributary.

Carancahua Lake and Bayou: Unclassified, 12 shoreline and river miles, rural secondary bay with oil field activity.

3.0 METHODOLOGY

3.1 Approach and Overview

By their very nature the locations of, or other data relative to, unpermitted discharges into coastal waters are not likely to be discernable from the records of regulatory governmental agencies. Identifying these unpermitted discharges in the Galveston Bay system is exacerbated by the number of permitted discharges whose physical locations are uncertain or unknown to the regulatory agencies, the large number of legally permitted discharges, and the wide variety and great length of shoreline types with limited accessibility. The limitations of the "water's edge perspective" and the lack of a definitive indicator of a discharge point other than the visual identification of a pipe, outfall, or discharge point with effluent also confound efforts to comprehensively survey an area in a single,