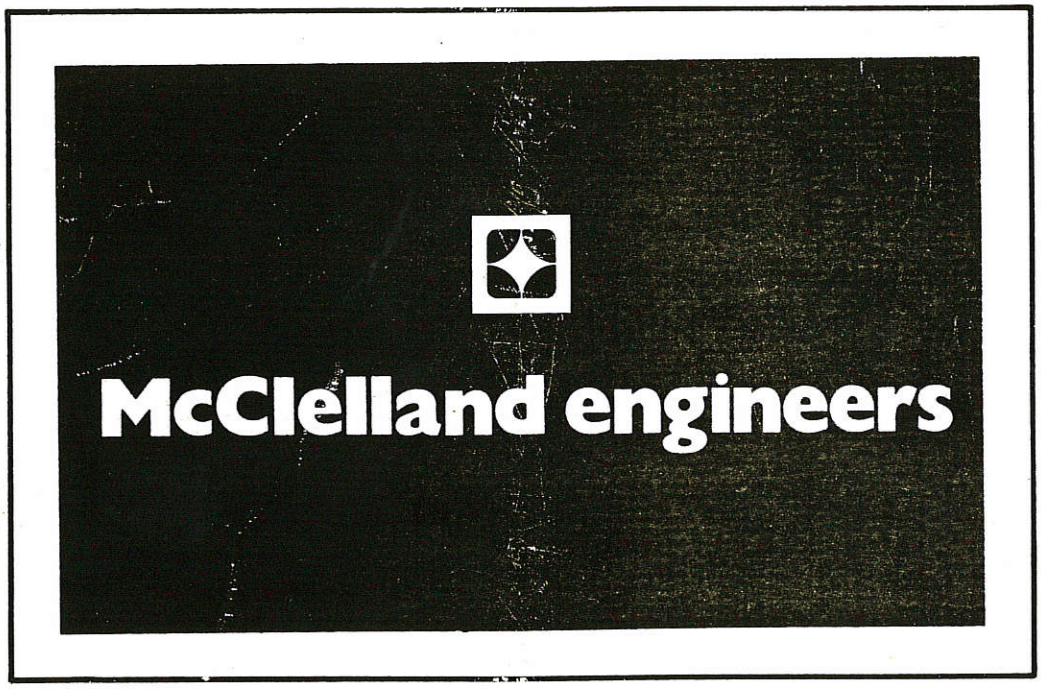
VOLUME II

GEOTECHNICAL DATA REPORT
OVERVIEW OF BORROW AREA STUDY
ISLES DERNIERES STABILIZATION PROJECT
STATE PROJECT NO. 750-55-01
TERREBONNE PARISH, LOUISIANA

REPORT TO

J. WAYNE PLAISANCE, INC./T. BAKER SMITH & SON, INC.
HOUMA, LOUISIANA



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R e p o r t

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J. WAYNE PLAISANCE, INC./T. BAKER SMITH & SON, INC.

Houma, Louisiana

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M c C L E L L A N D E N G I N E E R S, I N C.
Geoscience Consultants
Westlake, Louisiana

December 1987

McClelland engineers

Report No. 1087-1328
Volume II
December 23, 1987

J. WAYNE PLAISANCE, INC./T. BAKER SMITH & SON, INC.
550 South Van
Houma, Louisiana 70361

Attention: Mr. Marc Rogers, P.E., Project Manager

Geotechnical Data Report
Overview of Borrow Area Study
Isles Dernieres Stabilization Project
State Project No. 750-55-01
Terrebonne Parish, Louisiana

Mr. Rogers, we are pleased to submit Volume II, of a three-volume report, for the geotechnical services performed for the proposed Isles Dernieres Beach Stabilization Project. This work was authorized in writing by Mr. Rogers on April 7, 1987, and our services were performed in general accordance with the signed agreement dated February 16, 1987. During the project, minor changes to the scope of work and method of data presentation were made in order to address the concerns of the design professionals involved with this project and as a result of the encountered soil conditions.

Volume II describes the laboratory testing procedures and explains our method of data presentation for the proposed borrow areas. Volume I, submitted under separate cover, describes field and laboratory testing procedures and explains our method of data presentation for the three island segments. Volume III is our Geotechnical Interpretive Report and it presents the results of our geotechnical engineering studies for the proposed stabilization program. This document will also be submitted as a separate document. At various times during this project, we provided preliminary findings to the design team members. The information in the above referenced reports supersedes and replaces all previous data.

Mr. Rogers, we appreciate the opportunity to be of service to you and the design team on this initial phase of this very important study. We look forward to working with you on later phases of the study. After you receive this report, we will call you to answer your questions.

Sincerely,
McCLELLAND ENGINEERS, INC.

Andrew L. Shafer
Project Engineer

David E. Lourie, P.E.
Division Manager

ALS/DEL/me(R14.31)
Copies Submitted: (6)

CONTENTS

EXECUTIVE SUMMARY

A reconnaissance study was conducted as part of a comprehensive study for the proposed beach stabilization project for Isles Dernieres. McClelland Engineers performed field and laboratory studies on the three-island segments. A field investigation program was performed by Ocean Surveys, Inc., in the proposed borrow source areas north of Isles Dernieres. They used vibracoring methods to explore seafloor conditions to about 20-ft penetration. The samples obtained from the vibracoring were submitted to McClelland for laboratory testing.

The results of our involvement in this study are presented in three volumes. Volume II, Overview of Borrow Area Study, is presented here. This volume contains a complete description of our laboratory procedures and method of data presentation. It also includes an overall plan of the proposed borrow areas showing the vibracore locations. Volumes IIa through IIc contain the vibracore logs and laboratory test results from the borrow area soils, and these volumes are submitted under separate cover. Volume I contains information from the islands. Volume III, the Geotechnical Interpretive Report, also presented under separate cover, provides geotechnical recommendations for preliminary design of the beach restoration program.

The purpose of this study was to develop site-specific preliminary geotechnical information in the proposed borrow areas north of the islands and on the island segments. It should be recognized that while significant portions of the design concepts can be finalized using the information presented here, optimization of design alternatives requires additional study. To accomplish the purpose of this study, 256 vibracores were obtained and delivered to a dock in Cocodrie, Louisiana. They were then transported in the cores to our laboratory. Each core was logged in on arrival using the sample designation assigned to it by Ocean Surveys, Inc., and it was stored in a temperature controlled environment. At the time of extrusion, each core was measured and then it was split longitudinally and the soil materials were visually classified. Classifications included color, soil type, and consistency. Furthermore, we noted the presence and location of inclusions such as shells, wood, etc. Jar samples of representative material types were obtained from each core. At various times during the project, unused portions of the cores were packaged and given to the Louisiana Geological Survey and Louisiana State University.

Laboratory testing was performed on selected samples to evaluate pertinent engineering properties. Soil testing consisted of mechanical grain size analysis, hydrometer analysis, liquid and plastic limit tests, water contents, remolded miniature vane tests, standard Proctor density tests, and maximum-minimum density determinations.

This report describes our laboratory test procedures and method of data presentation.

INTRODUCTION

Background

The Isles Dernieres is a low profile barrier island chain located along the Gulf Coast of Louisiana in Terrebonne Parish. The islands are about 4 to 6.5 mi south of the mainland and are separated from the mainland by lakes and bays. Currently, the island chain is relatively undeveloped and consists of three island segments: East Island, Middle Island, and West Island. These three island segments contain about 16 mi of coastline along the Gulf side, and the width of the islands varies between about 200 and 5000 ft. The islands are separated from each other by breaches and passes. Plan views of the islands are shown in the Illustrations section of this report.

Reportedly, the entire island system is both migrating landward and eroding. Historical records indicate that in the mid-1800s the islands were separated from the mainland by only a quarter of a mile. The islands were also less fragmented and had a greater area. Currently, the island area is less than about one third of the area believed to present in the late 1800s. Since about 1850, Lake Pelto has increased significantly in size due to a number of factors including relative sea level rise and subsidence. It is estimated that the islands have migrated landward by about 0.6 mi since the mid-1800s. Furthermore, Isles Dernieres is estimated to be retreating at a rate of 30 to 90 ft per year. Although erosion is occurring due to a number of factors, erosion of the islands is caused primarily by hurricanes. The information presented here concerning the background of Isles Dernieres was provided by The Traverse Group during this study.

Project Description

In response to concerns about the loss of Isles Dernieres, a comprehensive study has been undertaken for a proposed beach stabilization project. The proposed beach stabilization project conceptually consists of nourishing the islands using dredged materials obtained from north of the islands. Other aspects of the project may include the construction of coastal structures.

During the course of this project, we have communicated with various members of the project team through meetings, phone conversations, and

written correspondence. This interaction has been with representatives from T. Baker Smith & Son, Inc.; The Traverse Group, Inc.; and Ocean Surveys, Inc. We have also discussed key aspects of our field and laboratory programs with the Louisiana Department of Transportation and Development. Furthermore, we have supplied unused portions of the vibracore samples to the Louisiana Geological Survey and Louisiana State University.

Purposes and Scope of Services

In order to identify and select appropriate beach stabilization alternatives within the framework of the concepts planned for Isles Dernieres, it was necessary to investigate subsurface conditions on the islands and in the proposed borrow areas. The purposes of our involvement in the proposed borrow areas were to:

- Visually classify the soils obtained through vibracoring operations performed by Ocean Surveys, Inc. (OSI),
- Determine geotechnical engineering properties of the borrow area soils, and
- Summarize our laboratory test results.

To accomplish these purposes, the components of the borrow area study included the following:

- Transporting the vibracore samples from the dock in Cocodrie, Louisiana to our laboratory,
- Developing and maintaining an inventory of the vibracores using the sample designations assigned by OSI,
- Storing the vibracores in a temperature controlled environment,
- Splitting the vibracores longitudinally, recording visual classifications of the soils and inclusions, and selecting representative samples for laboratory testing,
- Performing laboratory tests to verify visual classification, and to determine water content, remolded shear strength, moisture-density-shear strength relationships, and maximum-minimum densities, and
- Summarizing the laboratory data developed during the study and preparing Geotechnical Data Reports presenting the results of the laboratory testing program.

Relevant McClelland Reports

The data and recommendations developed during this reconnaissance study

are presented in three volumes for the islands and the borrow areas and are reported as follows:

- O Volume I consists of Volumes I, Ia, Ib, and Ic. These volumes discuss our involvement and present data from our field and laboratory investigations on the three islands.
- o Volume II consists of Volumes II, IIa, IIb, and IIc. Volume II is presented here and provides an overview of our methods and procedures for the laboratory investigation of the proposed borrow area soils. Volumes IIa through IIc contain the vibracore boring logs, mechanical grain size results, hydrometer analysis data, and other laboratory test results.
- o Volume III is the Geotechnical Interpretive Report and it contains the results of our engineering analyses.

Report Format

The laboratory testing program is described within the text of this report. Since we were not involved with the vibracore sampling operations in the field, we will not discuss the field aspects of this phase of the project. We assume OSI will describe their methods in their report. Illustrations showing the vibracore locations follow the text and complete Volume II.

LABORATORY TESTING

General

Laboratory tests were performed on representative soil samples from the vibracores. For our purposes, we considered representative samples to be those samples that were typical of the primary soil type within an individual core. We also obtained samples of other soil types that were present in thicknesses greater than about 6 in. within each core. In our laboratory testing program, we were concerned with evaluating classification properties, remolded shear strength, and soil density relationships.

Classification Testing

Test Methods. Our laboratory testing program designed for this project consisted of water content, liquid and plastic limits (Atterberg limits), mechanical sieve analysis, and hydrometer tests. These tests were performed in general accordance with the following current ASTM standards.

Test	ASTM Designation
Water content	D 2216
Liquid limit	D 4318, Method C
Plastic limit	D 4318, Method C
Particle size analysis (mechanical grain size and hydrometer)	D 422

In most cases, samples were dried in a standard oven having a temperature of 110 $\pm$ 5°C. Those samples visually observed to have a significant amount of organic material were dried in an oven with a temperature of 60 $\pm$ 5°C.

Shear Strength Measurement

Test Method. The remolded (disturbed) shear strength of cohesive soils was determined by performing remolded miniature vane tests. In this test, a small, four-bladed vane is inserted into a remolded cohesive soil specimen. Torque is applied through a calibrated spring until soil shear failure occurs. The shear strength is determined by multiplying the rotation, in degrees, by the spring constant. For each test specimen, the water content is also determined.

Soil Density Determination

Test Methods. Standard Proctor compaction tests were performed to determine the relationship between the moisture content and unit weight of cohesive soils from the borrow areas. Testing was conducted on composited samples of clay soils from the borrow areas. After mixing, the tests were performed in general accordance with ASTM D 698. Shear strength measurements were made on the Proctor samples using a calibrated hand penetrometer or a miniature vane.

For the granular soils, we performed tests to determine the minimum and maximum dry densities of composited samples from the vibracores. To determine the minimum density of an individual sample, the soil was lowered gently into a standard Proctor mold, the surface was leveled, and the mold and sample was weighed. The lowest value of three similar determinations was taken as the minimum density. Maximum densities were determined by placing the soil in the standard Proctor mold in three equal layers with the soil allowed to fall from a height of about 6 in. After the placement of each layer, a surcharge was applied to the top of the layer and the sides

were tapped with a rubber mallet to maximize the density. When the third layer had been placed and densified, the surface was leveled and the specimen was weighed. The highest value of three similar tests was considered to be the maximum density.

Data Presentation

Data from the above referenced tests are presented in Volumes IIa through IIc. Water contents, liquid and plastic limits, remolded shear strengths, and percent passing the No. 200 sieve (from the grain size tests) are tabulated on the vibracore logs presented in Volume IIa. In Volume IIb, mechanical grain size results are presented in tabular form and include key coastal and geotechnical grain size parameters, both in phi units and in millimeters. This format for data presentation was discussed with the design team members and was selected because it facilitated the use of the data. Although we have presented several important parameters regarding grain size characteristics, statistical evaluation of these parameters is beyond our scope of work and we understand this aspect of the data interpretation is being performed by The Traverse Group.

Volume IIc contains the hydrometer, Proctor, and minimum-maximum density test results. Hydrometer analysis results are presented in tabular form. Plots of unit weight and water content together with shear strength and water content are presented on Compaction Test Results Forms. The results of the minimum and maximum densities are plotted and reported on Relative Density Calculation Charts.

ILLUSTRATIONS

	STATE PROJECT	PARISH	SHT. NO.
	750-55-01	Terrebonne	4 OF 4

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CORE LOCATION NOTES

CORE LOCATIONS ARE NUMBERED FROM 1 TO 258. THE LAST EIGHT CORE LOCATIONS ARE ALTERNATE CORING SITES. THE CORE LOCATION NUMBERING INCREASES PROGRESSIVELY FROM WEST TO EAST. SEVERAL CORES HAVE BEEN MOVED FROM THEIR ORIGINAL POSITIONS AND THEREFORE, DO NOT APPEAR IN CONSISTENT GEOGRAPHICAL SEQUENCE. THE FOLLOWING LIST DETAILS THESE RELOCATIONS.

CORE 2 BETWEEN CORES 7 AND 13
CORES 11 AND 12 ARE AT THE SAME LOCATION
CORE 43 BETWEEN CORES 28 AND 35
CORE 44 ABOVE CORE 39
CORE 52 BETWEEN CORES 42 AND 46
CORE 53 BETWEEN CORES 30 AND 31
CORE 54 BETWEEN CORES 67 AND 71
CORE 55 BETWEEN CORES 68 AND 72
CORE 56 ABOVE CORE 62 AND NEXT TO 60
CORE 57 BETWEEN CORES 25 AND 44
CORE 69 ABOVE CORE 78 AND BELOW CORE 77
CORE 74 ABOVE CORE 86 AND BELOW CORE 85
CORE 76 BETWEEN CORES 96 AND 103
CORES 87 AND 88 ARE AT THE SAME LOCATION
CORE 146 ABOVE CORE 152 AND NEXT TO 149
CORES 177 AND 178 ARE AT THE SAME LOCATION
CORE 190 ABOVE 173
CORE 195 ABOVE 181
CORE 207 BETWEEN CORES 213 AND 216
CORES 231 AND 232 ARE AT THE SAME LOCATION

ALTERNATE CORES

CORE 251 NEXT TO CORE 131
CORE 252 BETWEEN CORES 133 AND 136
CORE 253 ABOVE CORE 46 AND NEXT TO CORE 45
CORE 254 ALSO ABOVE CORE 46 AND NEXT TO CORE 45
CORE 255 BETWEEN CORES 179 AND 187
CORE 256 ABOVE CORE 185
CORE 257 ABOVE CORES 211 AND 212
CORE 258 BELOW CORE 17

SCALE: 1" = 2000'

2000 0 2000 4000 6000

CHECK GRAPHIC SCALE BEFORE USING

NOTES

1. GRID SYSTEM IS IN FEET AND IS THE LOUISIANA STATE COORDINATE SYSTEM.
2. MARINE PIPELINES AND OYSTER LEASE BLOCK AREAS HAVE BEEN PLOTTED BASED UPON DRAWINGS AND COORDINATE DATA PROVIDED BY T. BAKER SMITH.
3. THE SELECTED CORE LOCATIONS PRESENTED ON THIS CHART ARE BASED UPON THE PRELIMINARY INTERPRETATION RESULTS OF A SURVEY PERFORMED BY OCEAN SURVEYS, INC. FROM 21 MAY 1987 - 16 JUNE 1987 AND CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THAT TIME.

LEGEND

- ⊕ - CORE LOCATION
- ✱ - REPLICATE CORE LOCATION
- ✪ - ALTERNATIVE CORE LOCATION
- ◇ - OYSTER LEASES
- — - PIPELINES
- △ - HORIZONTAL CONTROL STATION

DATE	DESCRIPTION	BY
	REVISIONS	

OCEAN SURVEYS, INC. OSI

OLD SAYBROOK, CONNECTICUT

PROPOSED VIBRATORY CORE LOCATIONS
ISLE DERNIERS STABILIZATION PROJECT

ISLE DERNIERS, LOUISIANA

DATE 2 OCT 1987

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

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