

COASTAL ENGINEERING
AND

OCEANOGRAPHIC STUDY

a proposal on

ENGINEERING WORK TO BE PERFORMED

for the

BEACH NOURISHMENT PROJECT

at the Galveston Seawall ^{TEXAS} Boulevard

submitted by
Dr. Y.H. Wang, P.E.
14 November 1992

TABLE OF CONTENTS

- I. Introduction
- II. Quantification of Borrow Material at the Big Reef
- III. Field Measurements — OCEANOGRAPHIC
- IV. Computer Simulation for Best Design Cross-section
- V. Prediction of Beach Response to Storms
- VI. Proposed Budget ITEMS & TIME PERFORMANCE
- VII. Biographic Sketch of the Proposer —

COASTAL
ENGINEERING WORK TO BE PERFORMED FOR THE
BEACH NOURISHMENT PROJECT AT THE GALVESTON SEAWALL

by Dr. Y.H. Wang, P.E.
November 14, 1992

TEXAS

COASTAL
I. INTRODUCTION

The engineering design works for the Galveston beach nourishment project will be performed using the highest standard ever employed for an actual beach fill project. After the design procedures are completed for the Galveston project, it is hoped that these procedures could set the standard for future beach nourishment project designs along the Texas coastline.

1 DON'T THINK THIS WAS DONE ON
BIG REEF - CHECK WITH SID TANNER
766-3050
COASTAL
In addition to the vibracore data of the borrow material at the Big Reef which will be supplied by the City of Galveston, the space technology of imagery analysis developed at the Johnson Space Center will be employed to quantify the borrow material so that questions of whether there is enough sand at the Big Reef for the nourishment project can be answered with better accuracy? It is understood that the Galveston City Engineering department is collecting the sediment data at the Big Reef but no qualified individual is available for the engineering analysis of the sediment data. The proposer is willing to take up the engineering analysis work.
FROM CORPS OF ENGINEERS
I WILL BE ASSIGNED TO PERFORM THIS

In order to maintain the highest standard of engineering design work, effort should and will be exerted to collect limited amount of nearshore data (wave, current and water level) to fill in the gaps left in the current data bank.

The best design cross-section will be selected through computer simulation and analysis. Once this computer model is calibrated with actual Galveston data, beach profile changes when exposed to northeasters and/or hurricanes will also be predicted.

ANALYSIS THAT WILL

In summary, the engineering works to be performed will include the following:

- * Quantification of borrow material at the Big Reef
- * Perform the engineering analysis of sediment data from the vibracore collections
- * Limited field measurements of nearshore wave, current and water level data
- * Computer simulation for selecting the best design beach fill cross-sections (or template) which can enduring storms while minimizing the quantity of beach fill.
- * Prediction of beach responses to northeasters and hurricanes after nourishment and estimation of re-nourishment periods.

II. QUANTIFICATION OF BORROW MATERIAL AT THE BIG REEF

FROM CORPS OF ENGINEERS

The engineering department, City of Galveston, is collecting the vibracore data at the Big Reef. The data provides valuable information regarding the depth and grain size of the sediment at the Big Reef. To quantify the source material, one needs to have a measure of the source area both above and below the water surface in shallow region. A space technology of imagery analysis developed at the Johnson Space Center will be adopted for more accurate estimation of the size of the borrow area. The area information together with the depth data from the vibracore collection should yield more reliable quantity information of the borrow material. Therefore, the question of whether is there enough sand for the intended project size can be better answered?

The vibracore data will yield information regarding the depth of sand deposition and the grain sizes and composition. With the sediment information in hand more engineering analyses will be performed by the proposer such as the sediment budget, interpretation of shoreline position; statistical analysis of the vibracore data for calculating overfill and re-nourishment factors, etc..

III. FIELD MEASUREMENTS - OCEANOGRAPHIC

It appears to be necessary to collect a limited amount of wave, current and water level data in the nearshore region to bridge up the gaps in the data bank since most data have been old and were collected in the offshore region. Qualified students from Texas A&M University at Galveston will be employed to do this work.

Sediment data collection on the borrow site (~~Big Reef~~) will be done and forward to the project by the City's engineering department. Sediment information on the project site is expected to be collected and supplied by the same.

check with
SID ZANNER
DID THEY DO?

IV. COMPUTER SIMULATION FOR BEST DESIGN CROSS-SECTION

Presently, geometry of the design profile cross-section is mostly derived by rule-of-thumb methods. To upgrade the beach fill design to a higher level of engineering performance, it is proposed to use the technique of mathematical modeling. Four different beach fill design templated geometries will be selected, namely, (1) U.S. Standard Design, (2) Storm Berm Design, (3) Profile Nourishment Design, and (4) Protective Dune Design. A beach profile change computer model developed by the Corps of Engineers, Waterway Experimental Station will be adopted for the evaluation of these four designs. The purpose of the evaluation is to determine which design provides the greatest level of sustaining power (or profile integrity) against wave induced storm erosion caused by elevated waves and water level to the nourished beach in front of the Galveston Seawall while minimizing the quantity of beach fill. Each beach fill is unique in terms of sand volume, grain diameter and composition, project dimensions, influence of nearby structures, varying wave, current, and water level conditions. These site specific parameters will be feeding into the computer for calculations and determination of the best beach fill profile for the Galveston Project.

V. PREDICTION OF BEACH RESPONSE TO STORMS

After the nourishment, changes in profile morphology will occur in response to the energy input to the coastal zone during storms. To estimate the storm-induced volumetric changes on beach profiles the computer model is first calibrated with measured wave and water level parameters. With this calibrated computer model the following predictions will be performed.

1. Prediction of beach profile change in volumetric terms for:
 - (i) A single northeaster
 - (ii) Two northeasters back-to-back
2. Prediction of beach profile change for a given strength of hurricane.
3. Prediction of re-nourishment periods

VI. PROPOSED BUDGET

The proposed budget is \$60,000.00. This includes:

Could this be done for LESS? TOTAL FEE MAY ONLY BE 100,000

TIME - Costs

<i>u</i>	<i>q</i>
<i>u</i>	<i>q</i>
<i>u</i>	<i>q</i>

- * Borrow Site: computer work on imagery analysis
- * Nearshore measurements: Instruments rental and student workers (beach profiles are not included).
- * Best beach fill template: Computer work
- * Prediction of Beach response to Storms: Computer simulations.

NEED TIME & AMOUNTS FOR EACH

VII. BIOGRAPHIC SKETCH OF THE PROPOSER

Dr. Y.H. Wang is a registered Professional Engineer (P.E. license number 50002). He holds an earned doctoral degree in engineering and has been promoted to the rank of full professor. Dr. Wang has taught the subject matter of coastal engineering for 9 years at the University of Florida in Gainesville, Florida, and 13 years at Texas A&M University at Galveston. Dr. Wang achieved the national and international status by publishing his work not only in the USA but also in England, Germany, Denmark, former USSR, China and Brazil. Dr. Wang is a frequent attendant at community meetings and public hearings and is a member of the Galveston County Beach and Shore Preservation Association; and was elected as one of the interim board member of the Texas Beach and Shore Preservation Association.

During his tenure serving as a faculty member at the Department of Coastal and Oceanographic Engineering, University of Florida from 1971 to 1979 Dr. Wang had initiated projects along the Atlantic shoreline as well as Gulf of Mexico coast. He had projects in Clearwater Beach, Jacksonville, and Pensacola. He was also supported by the US Corps of Engineers to study the littoral processes in Panama City Beach.

Dr. Wang joined Texas A&M University at Galveston in 1980 and was appointed as the Department Head to revitalize the engineering program. During his 5-year tenure as the Department Head, Dr. Wang successfully produced quality engineering graduates and earned high marks from both the graduates and their employers. For the past seven years, Dr. Wang has initiated the concept of nature-assisted duneline restoration, studied San Luis Pass, Rollover Bay and Pass, oil spill on Galveston Island, and satellite imagery application to coastal engineering.

Dr. Wang is an experienced principal investigator. His projects have been supported by the National Science Foundation, NASA, US Army Corps of Engineers, Sea Grant Offices in Florida and Texas, and private industry and foundations. Most recently, Dr. Wang has initiated

and organized a coastal erosion conference on the Galveston Campus of Texas A&M University for the Galveston County. The conventional as well as the new and emerging technologies for combating erosion in Galveston have been reviewed, studied and the results are published in form of a conference proceedings (see attachment).

A short version of Dr. Wang's resume may be found on the next page. A comprehensive resume of Dr. Wang will be supplied upon request.

BRIEF RESUME

PERSONAL: Yu-Hwa Wang, Ph.D., P.E., Professor
Department of Maritime Systems Engineering
Texas A&M University at Galveston, P.O. Box 1675
Galveston, Texas 77553-1675
Telephone: (409) 740-4507 FAX: (409) 740-4429

PROFESSIONAL SOCIETIES:
American Society of Civil Engineers
American Geophysical Union
Society of Naval Architects & Marine Engineers
International Association for Hydraulic Research

POSITIONS HELD:
Texas A&M University at Galveston, Galveston, Texas
Professor 1981 - present
Department Head 1980 - 1984
University of Florida, Gainesville, Florida
Doctoral & graduate Faculty
Associate Professor 1976 - 1979
Assistant Professor 1973 - 1976
Post-doctoral Fellow 1972 - 1973

LICENSE: Registered Professional Engineer in Texas, Lic.No. 50002

RESEARCH: Field projects in Tampa, Pensacola, Panama City Beach,
Clearwater City Beach, Florida; Galveston Island, Bolivar
Peninsula, Texas
Laboratory physical modeling and simulation of coastal
phenomena

GRANTS: Research projects funded by:
National Science Foundation (1975-1976, Grant GK-42124)
US Army Corps of Engineers, Mobil District (1976-1978)
Florida Sea Grant Office, NOAA (1976-1978)
Reynolds, Smith & Hill, Inc. (1977)
John L. Davenport Grant (1977-1979)
National Aeronautical & Space Administration (NASA)
(1975-1979, Grant NGS 7236)
Texas Sea Grant Office (1983-1985)
Dannenbaum Engineering Corporation (1990-1991)

PUBLICATIONS: Forty two (42) technical papers and reports

CONSULTANT TO THE FOLLOWING ORGANIZATIONS:

Department of Natural Resources, Florida (1973-1975)
Reynolds, Smith & Hill, Inc. (1978-1979)
Institute of Hydraulic Research, Nanjing, China (1984)
BME, Inc./Geotechnical & Material Consultant (1985)
China State Oceanic Administration (1987-)
Galveston County Beach Park Board of Trustees (1988-)



**US Army Corps
of Engineers**
Galveston District

INFORMATION ON SOILS IN BORROW AREAS

GALVESTON COUNTY SHORE EROSION STUDY

**FEASIBILITY REPORT
ON
BEACH EROSION CONTROL**

VOLUME 2

**GULF SHORELINE
STUDY SITE REPORT**

