Everglades Geological Society
BULLETIN

Volume 12, Number 3 January 2006

January 18, 2006 (Wednesday)
6:00 P.M. at the Quality Hotel – Tropical Sun Room (New Meeting Place!)
2431 Cleveland Avenue
(social hour starts at approximately 5:00)

Speaker: Michael Stephen, Ph.D., P.G.

Topic: Geologic Considerations in Beach Management and Restoration

Meeting Sponsored by: DIVERSIFIED DRILLING CORPORATION

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Everglades Geological Society
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The Everglades Geological Society is an organization which seeks to promote interest in and understanding of Geology and the related Earth Sciences, and to provide a common organization for those individuals interested in geology and the related earth sciences. The Bulletin is a publication of the Everglades Geological Society, Inc.

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(please see map on page 6)

Members and Prospective Members Come Join Us!!

PRESIDENT'S MESSAGE
January 2006
by Mike Weinberg

Two months have passed since the last newsletter and winter of sorts has finally arrived in southwest Florida. Hopefully, everyone is doing well. In the last issue I made the claim that water and oil are the two major issues facing our profession today, and went on to pose a question or two about the new water management plan for Lake Okeechobee.

The subject of this message is oil. Not just any oil, but the extraterrestrial variety. A year ago November I was in Colorado for a short course. The newspapers there were filled with stories about dark stains on the surface of Titan, one of the moons of the planet Saturn, seen on recent images sent to earth by the Cassini space mission. Science reporters for major news organizations told us that the stains were probably caused by oil, as if there was nothing particularly unusual about that conclusion.

Oil? Our conventional theories say that once living organisms are required to generate it. So what is oil doing on Titan and why were these influential writers accepting such an account without questioning its logic? Arguments have been raised since that time for a non-organic origin of the oil. Others believe that different processes cause the stains. The point I wish to raise is not about the source of oil, but instead how we view the information we receive. My message last month had the same basic goal.

We are constantly exposed to new ideas that deal with geology, water resource management, environmental issues and other aspects of our profession. Some of them are no doubt on the right track, many others are probably not. Is it our role as scientists to accept new concepts as fact, or should we first consider and question the credibility of the arguments? My position is that we need to do a better job in asking the right questions. But, then again, I am a product of the 60's!

Join Everglades Geological Society

Application forms are available at meetings, by mail, and on-line.

http://www.evergladesgeologicalsociety.org

This Month's Speaker and Topic:

Geologic Considerations in Beach Management

Michael Stephen, Ph.D., P.G.

The geological sciences play an ever increasing role in coastal zone management and coastal restoration project design. It clearly lies within the purview of geological services to address the natural forces and processes which cause physical change to the coastline and investigate the sediments of coastal areas to enable appropriate design approach and selection of suitable materials for restoration construction.

Definition of the geologic setting provides initial input to the understanding of the relative role of wave and tidal energy in creating the resultant morphologic form of the coastline. Documentation of regional morphodynamics, the evolution of shoreline geometry resulting from the ratio of wave energy and tidal energy, provides a starting point to understanding shoreline change and evaluation of alternative solutions to erosion problems at a large scale.

After definition of a project area and relevant coastal processes, a regional and local sediment budget is an important next step in project planning. Reliant upon accurate geologic mapping of beach and offshore profiles the change in position of the shoreline and definition of volumetric change allows identification of erosion trends and rates. A regional and project area sediment budget is derived and serves as a design criteria and basis for evaluation of projected energy management or nourishment fill alternatives.

Coincident with and part of a sediment budget analysis is the definition of tidal inlet morphology and hydraulics. Inlets play a major role in shoreline behavior. They serve as sediment traps or storage reservoirs of sediment, provide a corridor for wave driven sediment bypassing to downdrift beaches and exert influence on incoming waves by causing refraction and local modification of sediment transport direction.

Application of the above analysis can lead to identification and utilization of creative techniques for beach stabilization or restoration of eroding beaches by guiding design of structural alternatives. However the most successful approach in Florida is to use beach nourishment with compatible sediment for the restoration of the shoreline to provide storm protection and recreational benefits.

The most important part of a beach restoration project is the identification of a suitable sediment source.
The appropriate geologic survey includes review of offshore bathymetric features, geophysical surveys, geotechnical sampling, sediment compatibility analysis and design of the borrow area.

Two case studies are presented, Marco Island, Florida and Bay Joe Wise Headland, Louisiana. The Marco Island project was constructed in 1990-91 at a total project cost of $5,300,000. The total construction volume of sand placed was 1,800,000 cubic yards. Structural components included terminal groins and offshore breakwaters.

Presented in more detail, the Bay Joe Wise Headland is located 50 miles southeast of New Orleans, LA, in Plaquemine's Parish, Barataria Basin. The Project extends from Pass Chaland to Grand Bayou Pass. The barrier island fronts the Gulf of Mexico and protects the shallow interior bay system and adjacent wetlands and marsh. The Project proposes to restore the marsh, beach and dune habitats along the Headland to protect and preserve the structural integrity of the barrier shoreline. During the Preliminary Design Phase, an extensive modeling plan was

conducted to evaluate the alternative designs in terms of project performance, constructability and environmental impacts and enhancements.

A geophysical and geotechnical survey consisting of seismic subbottom profiling, side scan sonar mapping, magnetometer profiling, vibracore sampling and sediment analysis was conducted for the Project. The purpose of the survey was to locate potential sources of borrow material, evaluate the potential sources, and determine the quantity and compatibility of suitable sediments. The Project as planned would dredge sediment to construct a marsh platform with a beach and dune component. It is estimated that over 3.3 million cubic yards of material are needed to meet the project goals.

Over forty (40) line miles of survey were conducted and thirty three (33) vibracores were collected based upon field interpretation of the geophysical surveys. One significant subbottom feature, a buried channel with a depth of over 30 feet below the sea floor (-50 feet NAVD), was found offshore of Quatre Bayou Pass located approximately 10 miles to the west of the Headland. The most prominent feature identified in the seismic data was a series of relatively steeply dipping reflectors. Such features are generally indicative of sediment deposition in an active current regime. Features such as the approximate channel shape, dipping sedimentary strata, and clay overburden were also discernable.

The data analysis revealed three primary sedimentologic units throughout the borrow area. The upper unit is a flat-lying loose clay overburden. The middle unit is a group of interbedded irregular clay, silt, and sand layers that are exemplified by dipping beds in the seismic records. The lower unit is typically fine sand with silt or clay pockets. This geologic sequence suggests a selective dredging process, wherein the upper two units are considered for use to construct the marsh fill and the lower unit is considered for use to construct the beach or dune fill component.

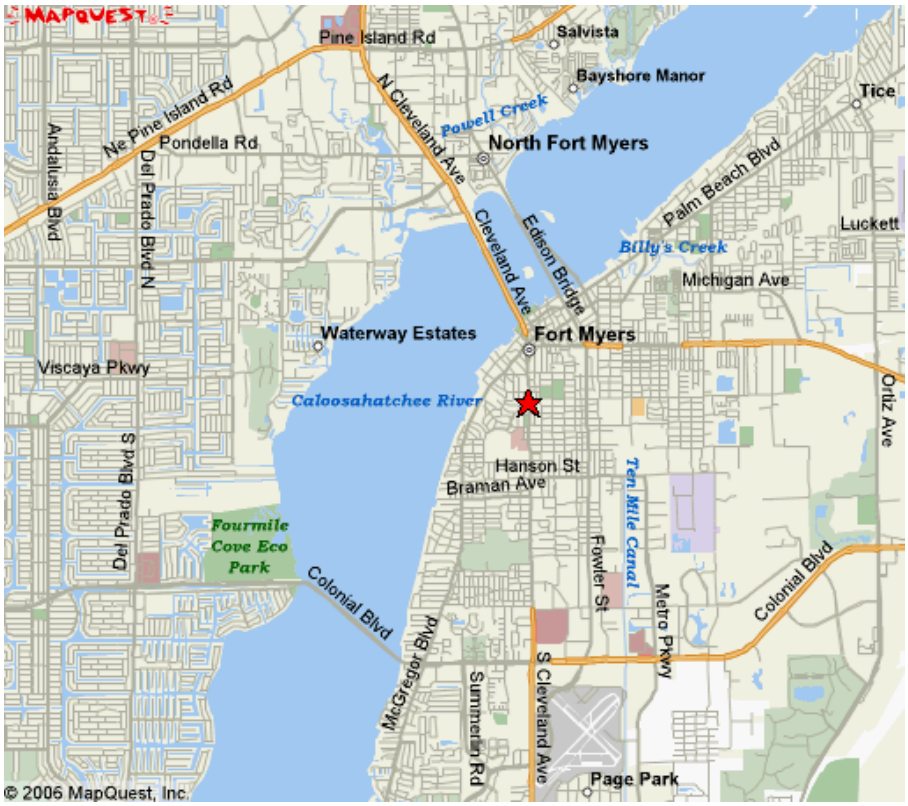
Native marsh, beach, dune, and nearshore samples from representative locations in the proposed fill template were obtained for comparison to borrow area sediments to evaluate compatibility. The borrow area “marsh-cut” sediments are coarser overall than the native marsh, with the range of borrow material distribution providing a functional match to the native marsh. The borrow area “beach/dune-cut” sediments are on average finer than the native sediments with a composite overfill ratio of 1.16. The total estimated volume is approximately 4.2 million cubic yards. Based on the surveys, sediment testing, and compatibility analysis, the proposed borrow area contains sufficient volumes of suitable sediments for marsh, beach, and dune restoration, and is deemed suitable to construct the project.

Biography

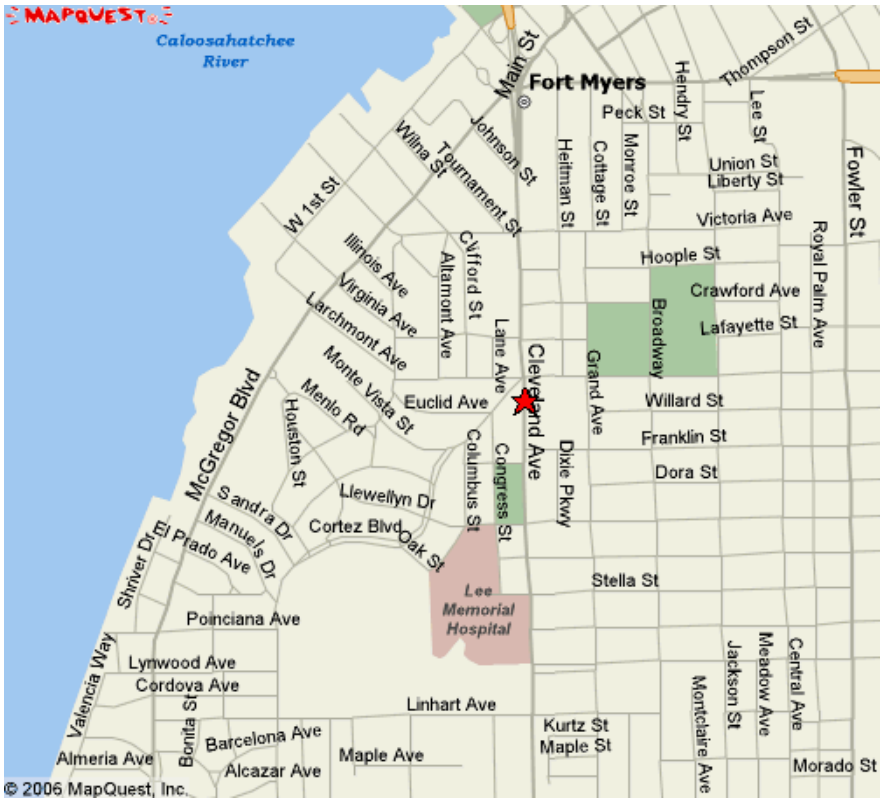
Michael Stephen, Ph.D., P.G.

As President and a founding partner of Coastal Engineering Consultants, Inc., Dr. Stephen has been responsible as Principal and Senior Project Manager for the comprehensive planning, permitting, funding coordination, design and construction administration of major beach restoration, inlet navigation, environmental remediation, shoreline stabilization, erosion control and other marine related projects.

With over 30 years of professional experience, Dr. Stephen has conducted marine and oceanographic surveys, marina design and permitting, water quality, and marine sediment sampling and analysis. He is an expert in the study of natural coastal processes, beach erosion control, beach nourishment, coastal protection and stabilization. His experience includes barrier island baseline surveys, profile and sediment sampling on the entire Florida Gulf Coast barrier island system from Pensacola to Marco Island.



EGS MEETING CALENDAR
2005-2006
November 15
January 18
March 21
May 16



Everglades Geological Society

Meets on the third Tuesday every other month. Social hour starts at 5:00 PM (the January meeting is on Wednesday due to room availability). The meeting begins at 6:00 PM. No meetings are held in June, July or August.

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