Geotechnical and Design Challenges in Rebuilding New Orleans' Levees

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Agenda

- Safety Moment
- Scope of USACE's New Orleans Levee Work
- FFEB's Efforts
- Changes in Analytical Programs
- GIS
- Lessons Learned
- Summary

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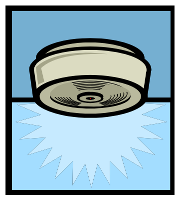
Safety Moment

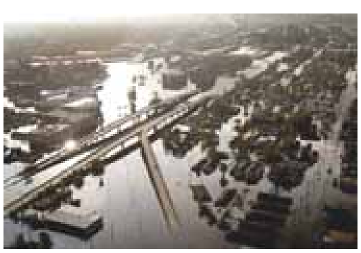
• It's that time of year to check your smoke and CO2 detectors and change the batteries.

• Maintenance of these detectors is covered in EM 385-1-1, section 09.H for those of you who work for USACE or other agencies using their safety manual.



Scope of USACE's New Orleans Work

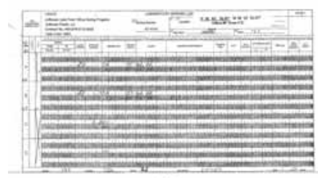
- 350 mile levee system
- 100-year level of protection by 2011 hurricane season
- Multiple sponsors and levee districts
- Repair and reconstruction work occurring simultaneously



Geotechnical Process Flow Diagram

Field Sampling	Sample Transport and Extrusion	Laboratory Analysis	Final Logs	Engineering Analysis

Safety and Quality Control



FFEB Efforts

- Joint venture of Fugro, Stantec, Eustis Engineering, and Burns Cooley Dennis
- $100 million, 3-year IDIQ contract
- 3,000+ borings for over 230,000 VLF
- 1,700+ cone penetrometer tests for over 150,000 VLF
- Laboratory testing
  - > 22,000 3-point UUs
  - > 17,000 UCTs
  - > 43,000 Atterberg Limits
  - > 3,600 Incremental Consolidation tests

Changes to Traditional Approaches

- Analytical Programs
  - Traditional wedge-type slope stability models are being supplemented
  - Programs using Spencer's Method have gained ground over other methods
- Borings vs. Cone Penetrometer Tests
  - Speed
  - Transferability of data
  - Reliability
  - Replicability

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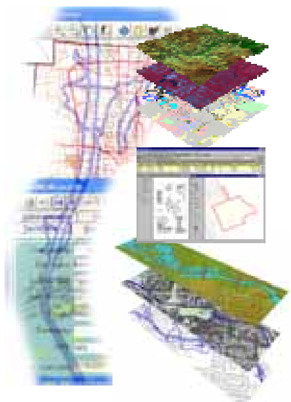
Geographic Information Systems

- Because of the large number of borings, samples, etc., a flexible, geo-referenced management tool was needed.
- Used GIS for information storage, data sharing, data depiction and management, and communications.
  - Provided multiple routes to access data (i.e., maps, boring files, task orders, etc.)
  - The latest data were always available to both USACE and joint venture team members and their designers.



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Lessons Learned

- Safety
- Communications
- Logistics
- Information Sharing and Collaboration
- Systems Approach
- Verification
- Risk Management

Lessons Learned
Safety

- There have been no lost time accidents over the last 200,000 hours of work.
- Safety was constantly stressed – every job started with a safety plan, tailgate meetings occurred regularly, and lessons learned were fed back to other teams.
- Constant threat of hurricane weather during prime drilling season required exceptional planning.

Lessons Learned

Communications

- Client and partnering
- Field teams
- Lab teams
- Design teams

Lessons Learned

Logistics

- An army may travel on its stomach, but drill crews travel on tubes.
- Over two dozen drill crews were working simultaneously at times making tube supply and pick-up a critical link in the supply chain.
- Keeping other supplies in the field also required constant attention.

Lessons Learned
Information Sharing and Collaboration

- USACE and FFEB were dedicated to continuous improvement
- Success required sharing of information and learning – traditional contract management model would not work.
- Information Sharing Methods
  - Formal partnering meetings
  - Informal meetings and phone calls
  - Sharing research efforts
  - Sharing process documentation

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Lessons Learned
Systems Approach

- From drilling plan through sampling, testing, and beyond, a systems approach was used.
- Goal of the testing program was to put solid geotechnical information in the hands of designers and decision makers as quickly as possible.
- A conventional approach of trying to optimize each step in the process could have yielded a suboptimal solution. Instead, we treated each part of the process as part of an overall whole so that we could enhance throughput while assuring quality.
- We looked for potential bottlenecks in the system and tried to address them before they became a problem

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Lessons Learned
Verification

- Because of a variety of factors including hurricane damage, subsidence, potential sea level rise, and other items, we learned that we could not take much for granted.
  - Many benchmarks had settled significantly over time.
  - Features that showed up on as-built drawings simple weren't there.

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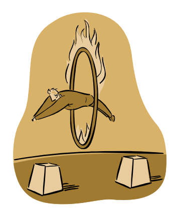
Lessons Learned
Risk Management



- Risks were identified early and discussed often
- Risk management is interwoven with many other aspects of successful project execution including safety, communications, logistics, etc.
- Examples include
  - Evaluation of weather conditions and predicted storm paths
  - Estimating field and lab productivity and the impact on tube delivery, extrusion, etc.
  - Anticipating subsurface conditions
  - Accounting for sea-level rise and subsidence in designs

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Summary

- The scope of the New Orleans levee repair and upgrade program is enormous.
- Safety can't be stressed too much or too often.
- Open communication, internal and external, is vital to the success of this type of effort.
- Productivity is a system-wide issue, not just a component concern. Systems engineering principles are applicable to this civil/geotechnical effort.
- Nothing can be taken for granted – must verify conditions that you would normally accept (e.g., benchmarks).

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Acknowledgement

This presentation is based on a paper by R. L. Mullins Jr., and Blake E. Cotton entitled, *Geotechnical Engineering in New Orleans*, published in the July-August 2009 issue of *The Military Engineer*.

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For Further Information

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