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THE FUTURE OF GEOTECHNICAL ENGINEERING

by

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Preface

Future events can be divided into three categories:

1. All those things that you know will happen. For example: the sun will come up tomorrow, the other line always moves faster, and late flights will get later. Your life experiences tell you how to deal with these.

2. All those future events that you can influence in some way – you know, or think you know, where you want to go, or what you want to achieve.

3. All those things that are totally unpredictable. For example, you never know when you will be in the right place at the right time, or the wrong place at the wrong time. The best you can do in these situations is to be ready to take advantage of opportunities in the case of the former and to be sure your affairs are in order in the case of the latter.

This report has been prepared to address the future of geotechnical engineering. A review of the growth and development of many areas within this important discipline and an assessment of its present status provide a strong foundation for dealing confidently with Category 1 events. New understanding, technology developments of many types, and many important societal and environmental challenges should provide opportunities for geotechnical engineers to make important contributions to success in dealing with events in the second category. By being alert, perceptive, innovative, and proactive there will be opportunities make major contributions in dealing with geotechnical aspects of issues that arise from the first type of unknown events in Category 3, and to mitigate potential adverse effects from the second type.

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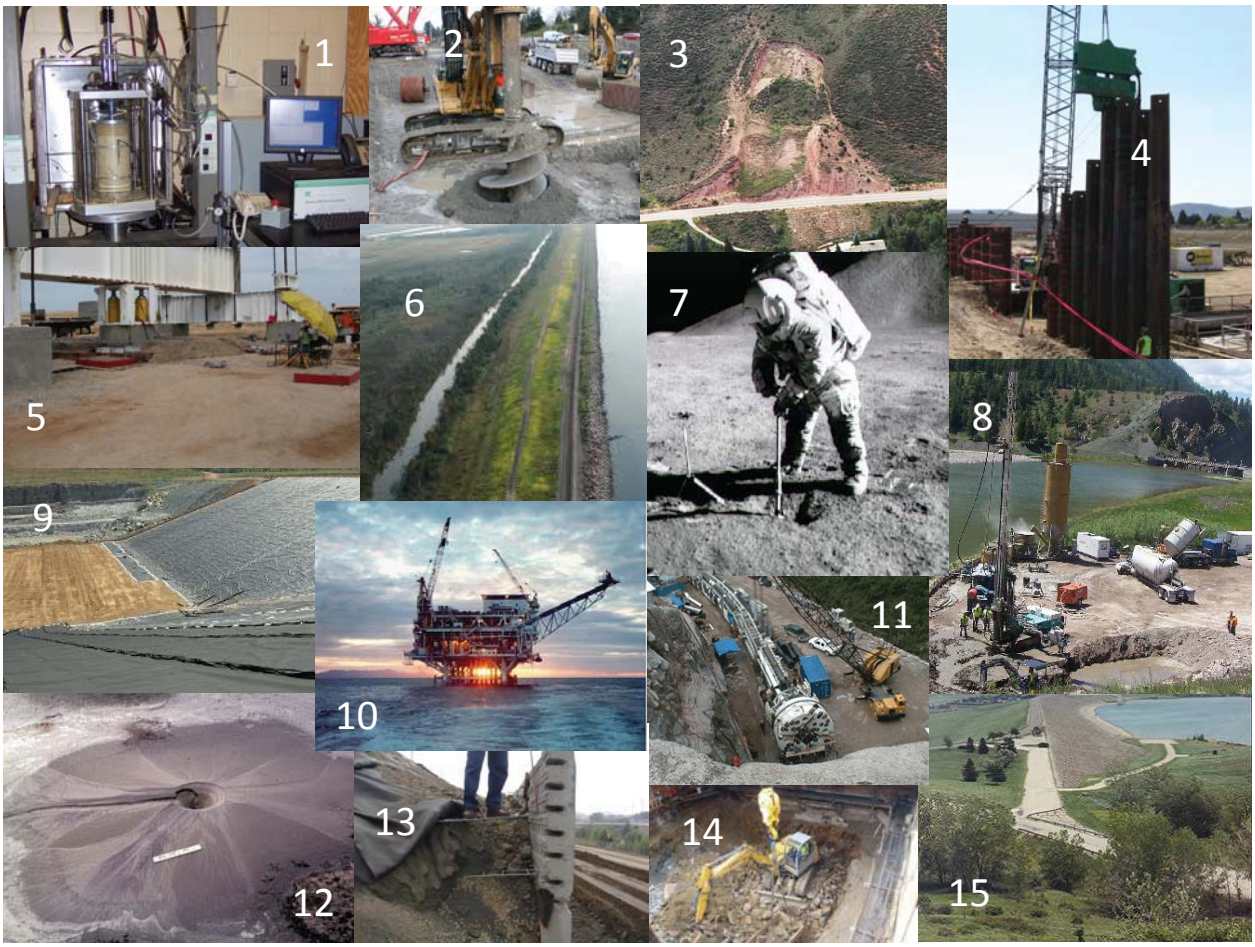
SOME OF THE SCOPE OF GEOTECHNICAL ENGINEERING AND CONSTRUCTION



1. Laboratory testing - Minnesota Department of Transportation experimental testing apparatus for the resilient modulus of unbound pavement materials. From MN DOT (2012), From "What is Resilient Modulus?", dot.state.mn.us/materials/mr/images/resilient-modulus.jpg, accessed November 10, 2012.

2. Deep foundations – Drilling of the shafts supporting one of the bridges over the Nalley Valley in Tacoma, Washington State. From WSDOT (2009), "Drilling first shafts, April 14, 2009", flickr.com/photos/wsdot/3442856260/, accessed November 10, 2012.

3. Slope stability – Landslide in Colorado. From Colorado Geological Survey (2012), "Landslides in Colorado", geosurvey.state.co.us/hazards/Landslides/PublishingImages/landslide.jpg, updated November 1, 2012.

4. Dewatering and ground water control – Installation of sheet piles prior to excavation for a new influent pump station the City of Lompoc's wastewater treatment plant (CA). From City of Lompoc (2008) "Wastewater Plant Upgrade Groundbreaking", cityoflompoc.com/departments/utilities/wastewater/2008-05_13.jpg, published February 6, 2012.

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5. Deep foundations - Pile load test during construction of interchanges on SR 149/SR 99 and SR 149/SR 70 near Oroville, Ca. From Caltrans (2006), “Highway 149 Pile Testing”, dot.ca.gov/hq/esc/ttsb/instrumentation/images/subtemplate/oroville_pile_beam.JPG, accessed November 10, 2012.

6. Levee – USACE Levee in New Orleans From New Orleans Environmental (2012) nolaenvironmental.gov/nola_public_data/projects/usace_levee/docs/AerialPhoto/original/DSC_2605.jpg, accessed November 10, 2012.

7. Geotechnic Frontiers – Apollo 15’s Jim Irwin samples the lunar surface to help define its characteristics. From NASA (2012), “Soil Mechanics Experiment” nssdc.gsfc.nasa.gov/image/spacecraft/alsep_soil_mech.jpg, updated May 14.

8. Soil and site improvement – Jet grouting to stabilize I-90 near the superfund site Milltown Reservoir in Montana as a bypass channel is constructed during EPA remediation efforts. FromUSEPA (2008) “Milltown Reservoir OU Photos - I-90 bridge stabilization drilling”, epa.gov/region8/images/I-90%20stablization_jet-grouting2%2006-12-07.jpg, updated June 8, 2012.

9. Environmental Geotechnics – Landfill liner. From Missouri Department of Natural Resources, (2012) “Missouri Solid Waste Management Law, 1972 to 2012”, dnr.mo.gov/env/swmp/images/landfilllinera.JPG, accessed November 10, 2012.

10. Geotechnic Frontiers – Offshore drilling rig. FromCongressman Forbes (2012), “Expanding Offshore Drilling to Create Jobs and Enhance Energy Independence” forbes.house.gov/uploadedfiles/offshore_drilling_1.jpg, accessed November 10, 2012.

11. Tunneling – Tunnel portal and tunnel boring machine. From FHWA (2011), “Technical Manual for Design and Construction of Road Tunnels - Civil Elements”, fhwa.dot.gov/bridge/tunnel/pubs/nhi09010/images/fig_14_02.gif, updated April 5.

12. Geotechnical earthquake analysis – Sand boil resulting from the liquefaction of sand in the Marina District of San Francisco during the Loma Prieta Earthquake of 1989. From USGS (1999), “Progress Toward a Safer Future Since the 1989 Loma Prieta Earthquake”, http:\\pubs.usgs.gov/fs/1999/fs151-99/images/sandboil.jpg, published November 3.

13. Mechanically Stabilized Earth Structures - MSE Wall on Guadalupe Parkway, Route 87, by San Jose Airport. From Caltrans (2002), “MSE Wall on Guadalupe Parkway”, dot.ca.gov/hq/esc/geotech/photos/west/p1010005.jpg, published July 25.

14. Earthwork and Excavation – An active, open excavation. From Arlington Virginia (2012), “Land Disturbance Activities and LDA Permit”, arlingtonva.us/departments/EnvironmentalServices/dot/images/image81108.jpg, updated October 31.

15. Seepage and earthen structures – Kansas’ Wilson Lake Dam, a USACE project constructed in the late sixties. From USACE (2012), “Wilson Lake Dam (KS)”, byways.org/explore/byways/12859/places/38500, accessed November 10.