Tuesday, December 16, 2008

Black Lab Pub, Churchill Room • 4100 Montrose Blvd.

Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 non-members & walk-ups

The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476 (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

Richard G. Howe,
Vice-President
Terrain Solutions, Inc.

A Pictorial Look at the Daisetta Sinkhole, Northeast Liberty County, Texas

Sinkholes are geological hazards associated with salt domes along the Texas and Louisiana Gulf Coast. These features are the surface expression of collapse structures that originate from solution cavities within the cap rock and/or the stock of salt domes. A sinkhole's manifestation may be entirely natural or can be exacerbated or induced by anthropogenic activity.

The photo presentation will provide a preview of the HGS/AEG Daisetta Sinkhole seminar and field trip which is scheduled for January 17, 2009. See page 40 for more information.

The Daisetta sinkhole, which collapsed on May 7, 2008, is located along the northwest flank of the Hull salt dome within a band of densely spaced petroleum wells that ring the dome. The presence of at least four other previously existing sinkholes within this band of active and abandoned wells suggests that their occurrence, like that of the Daisetta sinkhole, may be a result of oilfield operations begun in the early 1920s.

Initial collapse of the ground surface at the sinkhole was likely a vertical displacement of the substrate by an upwardly migrating cavity. Subsequent widening of the hole at ground level appears to be a result of mass wasting processes such as earth fall, topple, and slumping. Away from the edge of the hole are open cracks bounding slump blocks and minor cracks within the blocks. These features suggest lateral spreading of the adjacent sediment mass into the hole.

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The view of this low-oblique aerial photo is to the southeast with Daisetta High School visible at the upper right edge of the photo. State Highway 770 is visible next to the sinkhole and runs north and south. Hull swamp is below and left of the sinkhole.
The photo was taken on May 09, 2008 with a hi-resolution (10.3 megapixels), digital SLR.

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This photo is looking to the south-southeast across the crown, main scarp, and head of a slump block located along the southeast quadrant of the sinkhole. Dr. Carl Norman is sitting on the crown of the slump with his legs dangling across the block's main scarp and his feet hanging a few inches above the head of the slump.

With an average diameter of approximately 620 feet, the Daisetta sinkhole is among the largest sinkholes associated with Gulf Coast salt domes. Whereas the depth from the rim of the sinkhole to the bottom of the water standing in it is about 75 to 80 feet, the actual depth to the bottom of the collapse column is unknown but could be more than 1,000 feet.

Several groups have been investigating the sinkhole from different perspectives using a variety of field instrumentation and methods. The United States Geological Survey performed a horizontal LIDAR (Light Detection and Ranging) scan of the walls of the collapse last May in an attempt to provide a 3-D image of the sinkhole. Additionally, the USGS has placed a horizontal extensometer at the eastern edge of the sinkhole to measure rates of lateral spreading of the adjacent soil/sediment mass into the hole. The University of Texas at Dallas has performed two sets of horizontal LIDAR scans with an intervening time of several months that will be used to attempt to show changes in hole morphology through 3-D imagery. The Texas Spatial Reference Center at Texas A&M University at Corpus Christi has placed at least two benchmarks in Daisetta with one located near the eastern edge of the sinkhole. The purpose of the benchmarks being the detection of elevation changes across the dome. Robert Traylor with the Texas Commission on Environmental Quality has been studying subsurface information to determine the collapse mechanism and believes the sinkhole is a result of liquefaction at depth rather than ceiling collapse. The Center for GeoInformatics at Lousiana State University is monitoring ground movements at the nearby Hull-Daisetta High School using GPS technology. The Texas Bureau of Economic Geology has conducted a micro-gravity study to identify gravity anomalies across the Hull salt dome.

Dr. Carl Norman, Professor Emeritus of the University of Houston Department of Geosciences, and Richard G. Howe, of Terrain Solutions, Inc. have monitored elevation changes along Highway 770, approximately 100 feet east of the sinkhole, in an attempt to see if the sinkhole may be expanding in the subsurface and thus posing a threat to highway traffic and nearby buildings. Additionally, they have been mapping the sinkhole and surrounding ground deformation with a Total Station. During their numerous visits to the sinkhole since its appearance, Mr. Howe has made an extensive photographic survey of the sinkhole in an effort to document changes in the sinkhole and adjacent ground surface. The spectacular nature of the sinkhole and some of the changes that have occurred since its inception will be shown through aerial and ground photography. ■

Biographical Sketch

For more than 32 years, Richard G. Howe has practiced geology in various fields of application which include petroleum geology, engineering geology, environmental geology, and hydrogeology. Over the years, Mr. Howe has followed the water-related issues that impact the Houston Metropolitan Area and has been an advocate for sound water resource management. In the course of his professional work, he has conducted studies of many of the surface faults that cross the upper Gulf Coast which have occurred as a result of geologic process that can cause extensive damage to buildings and other structures.

He graduated from Lamar University in Beaumont, Texas with a BS in geology and received his MS in geoscience from Texas A&M University in College Station, Texas where much of his course

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View southeast across the southern portion of the Daisetta sinkhole.

work concerned engineering geology, hydrogeology, and environmental geology.

Mr. Howe is Vice-President of Terrain Solutions, Inc., an environmental and geological services firm. He is a Licensed Professional Geoscientist in Texas (No. 27) and is a Certified Professional Geologist with the American Institute of Professional Geologists (No. 5191). Mr. Howe is a Past-President of the Engineering, Science, and Technology Council of Houston (ECH) and is a Past-President of the Science Engineering Fair of Houston. Mr. Howe is a long-time member of the Houston Geological Society (HGS), He serves on the Board of Directors for the Society and is on the Society's Environmental and Engineering Geology Committee and Field Trip Committee. He represents HGS to ECH as one of its Councilors. Additionally, Mr. Howe is on the Advisory Committee for the Earth & Space Sciences Department at Lamar University and the Advisory Committee for the Geosciences program at the University of Houston Downtown. He is a member of the Texas Association of Professional Geologists, Association of Engineering and Environmental Geologists, the Environmental Division of the American Association of Petroleum Geologists Environmental Division, and the Society for Sedimentary Geology (SEPM). Mr. Howe serves as President of Charterwood Municipal Utility District where he has been a director on its board for more than 20 years.