

**RESULTS OF THE FEBRUARY 16, 2006  
UTAH LIQUEFACTION ADVISORY GROUP MEETING**

Steve Bartlett, Facilitator  
Barry Solomon, UGS liaison and recorder

Members present:

Steve Bartlett  
Jim Bay  
Clifton Farnsworth  
Travis Gerber  
Grant Gummow  
Dave Simon  
Barry Solomon  
Bill Turner  
Les Youd

Guests:

Gary Christenson  
Griffen Erickson  
Bart Leeflang  
Bill Lund  
Mark Petersen  
Barry Welliver  
Shawn Steiner

**ACTION ITEMS**

1. Steve Bartlett/Grant Gummow – Determine UDOT permitting requirements for additional subsurface exploration in downtown UDOT rights-of-way.
2. Steve Bartlett/Travis Gerber – Develop UDOT research proposal for CPT investigations in Utah County.
3. Steve Bartlett/Travis Gerber/Barry Solomon – Develop NEHRP 2007 proposal.

**PRIORITIES FOR 2007 STUDIES**

1. Travis Gerber, Steve Bartlett, Barry Solomon – Collection and preliminary geologic analysis of subsurface data to identify data gaps and data-collection requirements for future hazard mapping in Utah Valley.
2. Steve Bartlett – Completion of probabilistic lateral spread map and deterministic lateral spread map for a scenario earthquake for southern Salt Lake County.
3. Steve Bartlett, Travis Gerber – Development of liquefaction-induced settlement map for Salt Lake County.

**MEETING SUMMARY**

**PRESENTATIONS AND SPEAKERS:**

- 1) Status of data collection and CPT correlations for south Salt Lake Valley; Griffen Erickson, U of U

- 2) M7.0 lateral spread map of north Salt Lake Valley; Steve Bartlett, U of U
- 3) Influence of surficial and subsurface geologic units on liquefaction hazard, north Salt Lake Valley; Barry Solomon, UGS
- 4) FY 2006 NEHRP liquefaction mapping efforts, Salt Lake Valley; Steve Bartlett, U of U

## **DISCUSSION ITEMS:**

Appropriate ground-shaking attenuation relationships and amplification factors for use in liquefaction mapping

- Revised NEHRP amplification factors should be available in a couple of years. The recently completed lateral spread maps for a scenario M7.0 earthquake used strong motion estimates from attenuation relationships and site amplification factors developed by Wong and others for mapping scenario ground shaking in Salt Lake Valley. These estimates and relations differ from the proposed NEHRP estimates and relationships. In addition, the probabilistic liquefaction triggering maps will use USGS rock estimates and modify the motion using site amplification factors developed by Ray Seed and others. ULAG considered whether or not the past mapping should be revised to be consistent with NEHRP relationships, when available, and should the future mapping be postponed until the new NEHRP amplification factors are available? The consensus was to proceed with the M7.0 scenario earthquake strong motion estimates by Wong and others, which were developed for Salt Lake Valley, and to apply amplification factors to the subdivisions of NEHRP soil classes developed by Seed and others for the probabilistic liquefaction triggering analysis.

Description of map units most useful to planners

- The lateral spread displacement map of north Salt Lake Valley includes five map classes qualitatively described in terms of relative hazard (minimal, low, moderate, high, and very high), based on nonexceedance of a displacement threshold. The number of classes may be too many to be of use to planners, who often request simplicity. Also, description of the classes should include requirements for special studies and/or mitigation. Typically, special studies would be required for sites mapped moderate to very high hazard, but structural mitigation may be cheaper than site-specific studies for buildings mapped with a moderate hazard. The final assignment of the hazard categories was tabled pending completion of the probabilistic lateral spread maps.

Corrections for soil aging

- Liquefaction susceptibility is affected by the age of soils. Age relationships were developed by Youd and Perkins for California, which are likely different than those appropriate for Utah, which have not been developed. Because the liquefaction maps currently being developed are not corrected for aging, they represent a conservative estimate of liquefaction triggering, which is appropriate for planning purposes.

#### Development of liquefaction-induced settlement maps

- Currently there are no probabilistic methods to predict liquefaction-induced settlement. The committee agreed that the settlement maps might have to be a best estimate of ground settlement using scenario earthquakes that are probability-based.

#### Other possible funding sources

- NEESR – NEESR may assist in a NEHRP grant to cover use of their equipment if a case is made that the work can only be done with the NEES shakers. Liquefaction studies may be proposed as part of a multi-year project to NEESR to also include 1) intermediate and deep shear-wave-velocity profiles, 2) in-situ non-linear dynamic soil testing using NEES shakers, and 3) CVM model testing.
- UDOT – The UTRAC program is extremely competitive (about 10% of projects funded), so it is not a likely source, but liquefaction should be discussed at the next UTRAC meeting on March 21; UTRAC funding may be available for collection of CPT data if the cost is less than \$20,000. Some funding may be available through specific UDOT projects rather than through UTRAC.
- ConeTec – ConeTec may collect CPT data as a participant in future liquefaction projects.