

**RESULTS OF THE FEBRUARY 14, 2006  
UTAH GROUND SHAKING WORKING GROUP MEETING**

Ivan Wong, Facilitator  
Gary Christenson, UGS liaison and recorder

Members present:

Kim Olsen  
Harold Magistrale  
Jim Pechmann  
Walter Arabasz  
Jim Bay  
Ken Stokoe  
Francis Ashland  
Wulung Chang  
Mark Petersen  
Kris Pankow  
Bob Smith  
Steve Bartlett  
Greg McDonald  
Relu Berlacu

Guests:

Bob Carey  
Bill Lund  
Dave Marble  
Barry Welliver  
David Simon  
Chris DuRoss  
Rob Williams  
Jeff Berry

**ACTION ITEMS**

Jim Bay/Rob Williams-Bill Stephenson – Resolve discrepancies in shear-wave-velocity profiles from SASW and seismic imaging at FTT ANSS site.

UGS/GSWG

- Establish sub-working group to develop a siting philosophy for collecting additional deep-basin-structure data and recommendations for sites for Stokoe deep SASW and USGS deep (5-km-long) P-wave seismic imaging. Involve structural geologists/geologic mappers working in Wasatch Front basins; consider updating gravity models and geologic interpretations of deep seismic-reflection lines in Great Salt Lake and northern Salt Lake County.
- Work with SDSU in geologic data interpretation and development of CVM.
- Coordinate cooperative use of Stokoe shear-wave source and USGS P-wave source for other geophysical studies by UU/USU.

**PRIORITIES FOR 2007 STUDIES**

- Continue laboratory dynamic soil testing – Initial testing indicates Bonneville clays are more linear than most empirical relations indicate.
- We may need more shallow Vs30 data for Weber/Davis/Utah Counties, pending analysis of last summer's data.

- Collect additional and/or re-analyze deep-basin-structure data (gravity, seismic, geologic).
- Perform additional verification studies of the CVM to assess sensitivity to basin parameters and determine whether velocity- and basin-structure data are adequate for use in developing urban hazards maps.
- Consider passive instrumental monitoring to model basin effects.

## **MEETING SUMMARY**

### **PRESENTATIONS AND SPEAKERS:**

- 1) Measurements of Shallow P- and S-Wave Velocities in Utah and Salt Lake Valleys; *Rob Williams, USGS*
- 2) Preliminary Results from Determining Sediment Thicknesses in the Salt Lake Valley, Utah, using ANSS Data; *Jim Pechmann, UUSS*
- 3) Shallow Shear Wave Velocity Measurements in Weber, Davis, and Utah Counties, and Dynamic Properties of Bonneville Clay; *James Bay, USU*
- 5) National Seismic Hazard Mapping Workshop on Attenuation Relations in the Western U.S.; *Mark Petersen, USGS*
- 6) Construction and Verification of a Wasatch Front Community Velocity Model; *Harold Magistrale, SDSU*
- 7) Determination of Intermediate (100 m) and Deep Shear Wave Velocity Profiles for the Community Velocity Model, Salt Lake Valley, Utah; *Ken Stokoe, UTA*

### **DISCUSSION ITEMS:**

#### **Siting of Stokoe SASW Profiles and USGS P-Wave Seismic Imaging Line**

- The principal goals are to determine the local shear-wave-velocity structure and configuration of basin edges.
- Multiple deep SASW profiles in a cross-valley array would be valuable. We may be more likely to find such sites in valleys outside Salt Lake Valley (SLV).
- For the USGS line, imaging the Wasatch (east side) fault is preferred, but a line between the Wasatch and West Valley faults in northern SLV defining the central SLV graben would also be valuable, but is probably not practical. Any imaging of the Wasatch fault zone (east side) may need to be done outside SLV, perhaps in Utah Valley, at a location where basin structure is anticipated to be analogous.
- In SLV, determining west-side or other basin-edge configurations other than the east side would also be useful.
- Profiles in areas where R1 and R2 may be encountered to determine the velocity contrast would be useful, as well as profiles where deep soft soils may exist.
- We need to determine the extent of high-velocity “tufa” layers, mostly in east bench locations.

- Deep SASW profiles should be done at ANSS sites whenever possible to improve site characterization for use in site-amplification and sediment-thickness studies. Also, USU has an eccentric shaker which could be used to directly evaluate resonance at ANSS sites.

### **Planning for Preparing Wasatch Front Urban Hazards Maps**

- Should we do a SLV pilot project or do the entire Wasatch Front area covered by the CVM? – We should attempt Salt Lake Valley first where data are best, then move to other Wasatch Front valleys where fewer data exist.
- Seismic source characterization – Which faults to include? – We should use the same faults used in the NSHMs. Review faults used in the NSHMs and add additional faults where slip-rate/recurrence data are sufficient. Consider whether to include lesser understood faults that may impact ground motions but have high uncertainties.
- Incorporation of uncertainties – Logic trees or shrubs? Yet to be determined.
- Attenuation relations – Which ones? Numerical region-specific or just empirical? We will await the outcome of the “Next Generation of Attenuation Models” (NGA) process to decide how to proceed. Yuehua Zeng and Paul Somerville are both working on attenuation relations specific to the Basin and Range.
- Modeling basin effects – How should this be done? We are probably still a year away from basin modeling, but we’ll perhaps have 2-3 teams model basin effects. CVM verification by Kim Olsen may also be used to look at sensitivity of ground motions to basin effects and different basin models. We need to involve structural and mapping geologists working on cross sections in Wasatch Front basins to help define basin structure.
- Site amplification factors – How should they be developed? We need to look at both low-strain and high-strain amplification; ANSS studies to date model low-strain effects. We may empanel 2-3 teams to model site amplification.
- Include directivity/other effects? Yes, we should be able to include directivity effects and time-dependent models.
- How can we use the results of the ANSS projects? ANSS projects (Pechmann and Pankow) will provide data on both site amplification and sediment thickness that can be used in modeling both.
- Schedule –
  - Magistrale hopes to have the first-draft CVM done by 5/06.
  - Verification by Olsen should be done by 12/06.
  - Completion of the CVM should be in mid- to late 2007.
  - Begin urban hazards map development in 2008.