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Utah Seismic Safety Commission Sets Priorities

by Janine Jarva
Utah Geological Survey

On August 10, 1994, the first meeting of the Utah Seismic Safety Commission (USSC) was held in the Utah State Capitol. Dr. T. Leslie Youd was unanimously elected chairperson of the USSC during its inaugural year. Dr. Youd is currently Chairman of the Department of Civil Engineering at Brigham Young University in Provo, Utah and represents the American Society of Civil Engineers on the USSC. Other members include: State Senator Craig A. Peterson; State Representative Clark Reber; James Bailey, Structural Engineers Association of Utah; Barry Smith, American Institute of Architects; Ken Bullock, Executive Director, Utah League of Cities and Towns; Suzanne Winters, State Science Advisor, Governor's Office of Planning and Budget; M. Lee Allison, Director, Utah Geological Survey; Walter J. Arabasz, Director, University of Utah Seismograph Stations; Lorayne Frank, Director, Utah Division of Comprehensive Emergency Management; James Golden, Assistant Chief Structural Engineer, Department of Transportation; Bill Juszack, Project Coordinator, Division of Facilities Construction and Management; and D. Douglas Bodrero, Commissioner, Department of Public Safety. Chairman Youd reviewed the mission, goals, and objectives of the USSC as detailed in its enabling legislation (see *Fault Line Forum* v. 10, no. 1, p. 1 2).

The majority of the first meeting was spent considering the draft document *A Strategic Plan for Earthquake Safety in Utah*, which had been submitted to the USSC by the Utah Earthquake Advisory Board before it disbanded on June 30, 1994. The USSC voted unanimously to adopt it as a working document and go forward to revise and complete it. As part of this process, the USSC decided to widely circulate the document for public comment. Also, for the document to be effective, the need to establish priorities, costs, and timelines for each strategy in the final version was emphasized. Chairman Youd urged USSC members to carefully consider the full range of strategies addressed in the document, and come to the next meeting prepared to select those strategies that are of critical importance to begin to accomplish the goal of improving seismic safety in Utah.

In September 1994, the USSC sent the draft of *A Strategic Plan for Earthquake Safety in Utah* to over 165 individuals and organizations for comment. Comments were solicited from state and federal government agencies, professional societies, the Utah League of Cities and Towns, the Utah Association of Counties, interested private individuals, and all groups listed as "responsible agencies" in the document. Many reviewers took considerable time to detail additions, improvements, and general suggestions, including the Federal Emergency Management Agency, the California Seismic Safety Commission, the Utah Office of Education, the Utah Department of Environmental Quality, private architects and geologists, and numerous members of the Structural Engineers Association of Utah.

On October 6, 1994, the USSC met to discuss the review comments and identify high-priority strategies. USSC members incorporated additions and changes into the document and revised and refined cost estimates and resource

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needs for each strategy. These revisions were compiled into a final draft which Chairman Youd presented to the State and Local Affairs Interim Committee of the Utah Legislature on October 19, 1994.

Also at the October 6 meeting, USSC members selected the highest priority strategies to present to the Utah Legislature. In choosing the highest priority strategies, the following criteria were applied:

- potential reduction in casualties
- potential value of property saved or property damage reduced
- breadth of impact or number of people reached
- cost, both short term and long term
- political feasibility.

Acknowledging that some strategies require further consensus and that others can only be achieved incrementally, the USSC identified critically important strategies in which it believed profoundly and for which it could argue persuasively to convince the people of Utah and their legislators of their vital significance. This generated a lively discussion that resulted in the following key strategies being selected by consensus for initial endorsement by the USSC to the State and Local Affairs Interim Committee:

- Inform citizens about earthquake hazards and risks.
- Enhance communication capabilities for emergency responders.
- Establish community emergency-response teams (CERT) statewide.
- Improve the seismic safety of older public-school buildings.
- Improve the post-earthquake operational status of essential services buildings.
- Develop incrementally a strong-motion program.
- Update estimates of direct losses expectable from earthquakes.

On November 28, 1994, the USSC met for a final review of the full document. Many national-level initiatives and programs are developing that will affect specific strategies over time. The USSC recognizes that its "long-term roadmap" will evolve as political realities change, new information becomes available, and a broader community of users becomes involved in achieving its goals. Utah has already taken many steps toward earthquake safety and preparedness. But the journey must continue. *A Strategic Plan for Earthquake Safety in Utah* identifies continuing needs and creates a framework to coordinate efforts and monitor progress along the way. Copies of the document will be made available to all interested parties upon presentation to the Utah Legislature in January, 1995. To be added to this mailing list, contact Janine Jarva, Utah Geological Survey, (801) 467-7970, fax (801) 467-4070.

Proceedings of the Fifth U.S. National Conference on Earthquake Engineering (5NCEE)

In July 1994, hundreds of international geoscientists, engineers, and other experts involved in understanding and mitigating the effects of earthquakes, gathered in Chicago, Illinois, for the Fifth U.S. National Conference on Earthquake Engineering (5NCEE).

Sponsored by the Earthquake Engineering Research Institute, the 5NCEE provided a forum for professionals from a broad range of disciplines committed to reducing the impact of earthquakes on the developed and natural environment. Participants represented geology, seismology, geophysics, geotechnical engineering, soils and foundation engineering, structural engineering, architecture, human response, regional planning, emergency-response planning, and regulation.

Over 400 papers were presented in 55 sessions during the 5NCEE. All contributed and invited papers are included in the Proceedings. The Proceedings consist of four volumes, each about 1000 pages in length, and can be ordered from the EERI office for $200, including shipping within the U.S. For delivery to foreign addresses, add $30. California residents, add 8.25% sales tax.

Volume I: Analysis of Building Structures; Bridge Structures; and Control Systems and Base Isolation. **Volume II:** Post-Earthquake Damage Assessment; Design of Building Structures and Structural Components; Dams and Reservoirs; Educational Issues; and Experimental Methods and Tests of Structures and Components. **Volume III:** Ground Motion and Seismicity; Learning from Earthquakes; Damage Assessment and Strengthening; Repair and Strengthening of Structures; and Socio-Economic Issues, Urban Design and Safety. **Volume IV:** Soil-Structure Interaction, Soil Stability and Foundations; Critical/Nuclear Facilities; Seismic Risk; Secondary Systems, Equipment and Non-Structural Hazards; and Lifelines, Utility and Transportation.

To order, contact the Earthquake Engineering Research Institute, 499 14th Street, Suite 320, Oakland, California 94612-1934, (510) 451-0905, fax (510) 451-5411.

Executive Summary of
A Strategic Plan for Earthquake Safety in Utah

As indicated in the last issue of the *Fault Line Forum* and the previous article, the Utah Seismic Safety Commission (USSC) is finalizing the draft document *A Strategic Plan for Earthquake Safety in Utah*. We are reproducing the *Executive Summary* below. The document is the culmination of a review and planning process, initially undertaken by the Utah Earthquake Advisory Board (UEAB), to promote seismic safety aimed at saving lives and property of the citizens of Utah. The UEAB disbanded on June 30, 1994, after passing the document on to its successor, the USSC.

A Strategic Plan for Earthquake Safety in Utah presents the main objectives and recommended strategies for improving earthquake safety in Utah along with planned outputs and desired outcomes that would result from the implementation of those strategies. Public comment was accepted through September 26, 1994. The USSC compiled and debated the input it received and incorporated it into this final draft of the document that was presented to the State and Local Affairs Interim Committee of the Utah Legislature on October 19, 1994. The document will now undergo final review by the USSC and will then be submitted to the 1995 Utah State Legislature as mandated by Utah House Bill 358, which created the USSC.

The earthquake threat in Utah is real. Compelling evidence indicates that Utah will experience life-threatening earthquakes. Utah citizens must be prepared. The USSC hopes that *A Strategic Plan for Earthquake Safety in Utah* will provide a sound basis for action to promote seismic safety in Utah.

> ***"Compelling evidence indicates that Utah will experience life-threatening earthquakes."***

> ***"We have been lucky so far to experience only moderate-sized earthquakes; we cannot expect this luck to last."***

Executive Summary

Introduction

The mission of the Utah Seismic Safety Commission (USSC), building on work of its predecessor, the Utah Earthquake Advisory Board (UEAB), is to develop a strategic plan for earthquake safety in order to save lives, prevent injuries, protect property, and reduce social and economic disruption from earthquakes. This document was developed through a review and planning process undertaken by the UEAB and contains a list of recommended "strategies" to reduce losses from earthquakes. The document has been completed and adopted by the Utah Seismic Safety Commission as a strategic plan to be presented to the 1995 Legislature.

The main points this document attempts to make are the following:

1. There is a real and serious danger of both life-threatening and damaging earthquakes in Utah in our lifetimes.
2. We as individuals and collectively can take significant actions to reduce the loss of life, property damage, and long-term economic impact.
3. Implementing an earthquake-safety plan for Utah is a long-term process.
4. Strategies to safeguard lives and property from earthquakes must be sensitive to financial and regulatory burdens. Many actions can be taken now without great expense that will make Utah safer tomorrow.

Government has a clearly defined mandate to protect the health, safety, and welfare of its citizens. With respect to earthquake safety, this involves five basic actions: (1) improving our geotechnical understanding of earthquakes and earthquake hazards, (2) improving development and construction practices, (3) educating the public, (4) disaster-response planning, and (5) post-earthquake recovery planning. These actions and the recommended strategies in this document are consistent with Governor Leavitt's Key Objectives and with the Utah Legislature's strategic plan, *Utah Tomorrow*. The individual strategies have been placed in a format consistent with state planning guidelines.

Efforts to promote public policy for earthquake safety in Utah began nearly two decades ago with the Utah Seismic Safety Advisory Council (1977-1981), followed by the Earthquake Task Force of the Utah Advisory Council on Intergovernmental Affairs (1989-1991) and later the UEAB (1991-1994). Responsibility has now passed to the USSC.

The Earthquake Threat in Utah

Utah has experienced damaging earthquakes in the past, and geologic evidence indicates that earthquakes larger than any experienced locally in historical time are likely in the future. Large earthquakes are possible anywhere in Utah, but they are most likely in a "seismic belt" about 100 miles wide extending north-south along the

Wasatch Front and through Richfield to Cedar City and St. George.

Earthquakes produce a variety of geologic hazards that threaten life and property. These hazards include ground shaking, surface fault rupture, regional subsidence, liquefaction and related ground failure, landslides, and various types of flooding. Earthquake hazards are greatest in the Wasatch Front area because of the greater earthquake probability and because of extensive areas where geologic conditions pose the potential for damaging, earthquake-induced effects. The probability of large earthquakes appears to be slightly lower in southwestern Utah, and geologic conditions there are not as prone to aggravate earthquake effects. In general, earthquake probabilities and hazards are lower in eastern and western Utah outside the main seismic belt.

We must prepare for earthquakes because: (1) Utah is a seismically active region, (2) our population is concentrated in the areas of greatest hazard, and (3) many of our older buildings and lifelines have low earthquake resistance. We have been lucky so far to experience only moderate-sized earthquakes; we cannot expect this luck to last.

Strategies for Earthquake Safety

The following pages list the main objectives and strategies for earthquake safety. The list of strategies, which is not in order of priority, is not intended to be exhaustive. Work will continue to develop consensus and to set priorities for action. Also listed in the following pages are the planned outputs (for example, products, plans, and assessments) and desired outcomes, in terms of increased earthquake safety, for each strategy.

Summary of Strategies

Objective 1: Increase earthquake awareness and education.

Strategy	Output	Outcome
1.1 Inform citizens about earthquake hazards and risks.	Provide information and training targeted to meet individual or collective needs.	All citizens are better able to prepare for and respond to an earthquake.
1.2 Incorporate earthquake education in school curricula.	A multi-level curriculum for earthquake education in all public schools.	All students are provided with earthquake science and safety training as a part of their regular education.
1.3 Disclose geologic hazards in real-estate transactions.	Homebuyers are made aware of geologic hazards at a property prior to purchase.	Homebuyers are more informed in their decisions.

Objective 2: Improve emergency response and recovery.

Strategy	Output	Outcome
2.1 Establish community emergency response teams (CERTs) statewide.	Trained volunteer community emergency response teams exist statewide.	Reduce life, property, and environmental loss by providing more immediate response in a disaster.
2.2 Develop effective exercise and training programs for hospitals.	All hospital staff are trained for earthquake emergency response including implementing a standardized triage system.	Hospitals are prepared for earthquake response.
2.3 Enhance communication capabilities for emergency responders.	Develop a communication system that will allow for the use of new technologies and provide the capability of expansion during peak disaster use.	Emergency response capability will be enhanced because the new communication system will allow for the interoperability of agencies to meet the requirements of multi-agency response.
2.4 Enhance the integrated emergency management system statewide.	Continue to promote an intergrated emergency management system at all levels of government the and private sector to protect life, health, property, and the environment.	All jurisdictions and agencies can more fully utilize their resources to respond to any type of a disaster including earthquakes.

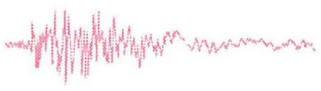
Objective 3: Improve the seismic safety of buildings and infrastrucure.		
Strategy	**Output**	**Outcome**
3.1 Improve lifeline survivability in the event of an earthquake.	Assess and mitigate earthquake hazards on all lifelines.	Functional or easily/rapidly repairable lifelines after a earthquake.
3.2 Mitigate nonstructural hazards in government-owned and leased buildings.	Assess hazards in government-owned buildings and upgrade as necessary.	A safe/operational working environment for government agencies following an earthquake.
3.3 Reduce structural hazards of government-owned buildings.	Government-owned buildings structurally modified to better withstand earthquakes.	A safer environment to conduct government business.
3.4 Improve earthquake performance of water and waste-water systems.	Establish appropriate and practical uniform safety and emergency-response plans for all water and waste-water systems.	Improved safety, performance, and reliability of water and waste-water systems.
3.5 Prevent loss of historic buildings.	Vulnerability assessments and mitigation completed on buildings on the National Historic Register.	The preservation of historic buildings and their associated heritage in the event of an earthquake.
3.6 Improve safety of older public school buildings.	Identify and reduce structural and non-structural seismic hazards in all pre-1976 public school facilities.	Safer facilities for students and teachers, as well as buildings usable in an emergency.
3.7 Improve the seismic safety of older homes.	Create and distribute maps of seismic-hazard areas and upgrade information packets, procedural manuals, standards, and requirements to all affected home owners, all real-estate agents, building contractors, and lending institutions. Establish funding sources and incentives to encourage seismic-safety retrofitting.	Improved safety and lower repair costs in the event of an earthquake.
3.8 Improve safety and operational ability of older hospital buildings.	Assess earthquake vulnerability of all hospitals and upgrade the structures to better survive an earthquake.	Safe structures that will provide a more secure environment for patients and staff and improved ability to survive an earthquake and provide disaster relief.
3.9 Improve safety of mobile homes.	Seismically brace all new mobile homes; retrofit inadequately braced existing mobile homes at time of resale. Create and implement incentive packages to encourage mobile home owners to retrofit existing installations.	Increased safety for occupants, reduced amounts of utility rupture and associated hazards and repair costs.
3.10 Improve safety of older high-occupancy buildings (250 persons or more) to be structurally competent to withstand moderate to large earthquakes.	Assessment of seismic vulnerability on all older high-occupancy structures and retrofit or disclose building condition upon resale.	Prevent collapse in the event of an earthquake, thus reducing life loss, property loss, potential secondary effects, and reconstruction costs.

3.11 Enforce the state amendment to the Uniform Building Code which requires building owners to install roof anchors and parapet bracing when reroofing their buildings.	Copies of the amendment are distributed to building officials, architects, and engineers through the media and professional societies, and education programs are conducted.	A gradual decrease in the seismic hazard posed by existing unreinforced masonry buildings.
3.12 Improve the post-earthquake operational status of essential service buildings.	All essential government services buildings need to be identified. Buildings constructed before 1976 are to be retrofitted or relocated as needed, to meet standards that will allow them to remain operational after an earthquake.	The ability to provide unimpeded disaster relief services.
3.13 Improve plan review procedures on new construction to insure that buildings are being designed in accordance with current seismic code requirements.	Competent plan reviews are completed for new construction.	Help ensure that new buildings are being designed safely by competent professionals to withstand seismic forces.

Objective 4: Improve essential geoscience information.		
Strategy	**Output**	**Outcome**
4.1 Determine appropriate seismic design coefficients for highway bridges.	Calculate and incorporate new seismic design coefficients in design work for new bridges associated with the widening of I-15.	(1) Ensure that the best available information is used for the safe and economical design of the new bridges. (2) Prevent the need for retrofit of the bridges in the near future. (3) Reduce bridge damage in an earthquake.
4.2 Reduce earthquake-induced liquefaction risk to highway structures.	Identify all hazardous bridges; generate a plan to reduce hazards.	Highway bridges are safer in the event of earthquake-induced liquefaction.
4.3 Determine appropriate seismic criteria and procedures for evaluating performance of existing dams.	Guidelines for seismic safety assessments of existing dams.	Uniform, state-of-the-art assessments of seismic safety of dams.
4.4 Make land use compatible, through local government ordinances, with known hazards.	Local governments are encouraged or required to adopt geologic-hazards ordinances as needed.	Land use is safer and consistent with identified geologic hazards.
4.5 Perform geologic-hazards investigations for critical public facilities.	Geologic-hazards investigations are performed for all new critical public facilities.	Critical facilities will not be sited in hazardous areas and, in the event of a natural disaster, facilities that are needed for emergency response will remain intact.
4.6 Reduce earthquake losses by mapping and identifying geologic hazards.	Hazard maps for all earthquake-prone urban areas.	Development and management are safer, more reasoned, more cost-effective.

4.7 Develop a statewide, real-time earthquake monitoring system.	(1) Increased number of seismically vulnerable counties and cities in Utah for which continuous and accurate instrumental earthquake data are available. (2) Rapid emergency alert, within minutes after the occurrence of an earthquake in the Utah region, to state-agency officials, emergency managers, and the general public.	Collect and distribute data needed: (1) for more cost-effective earthquake engineering, (2) for more rapid and effective emergency response, (3) to reliably quantify earthquake dangers, and (4) to improve scientific understanding of local earthquake behavior, in order to better mitigate effects.
4.8 Develop incrementally a strong-motion program.	Deploy at least 108 accelerographs in the seismic regions of the state to record strong ground shaking.	The hazard of strong ground shaking from local earthquakes is better quantified so it can be correctly incorporated into safe, cost-effective design of buildings and other structures. Key information can also be rapidly available for crisis management.
4.9 Monitor faults using Global Positioning System (GPS) measurements.	Regular monitoring of a network of GPS benchmarks.	Strain buildup and ground deformation associated with faults are understood on a very detailed level, allowing more accurate estimation of the likelihood of large earthquakes and accompanying hazards.

Objective 5: Assess earthquake risk.		
Strategy	**Output**	**Outcome**
5.1 Conduct lifeline collocation vulnerability studies.	All lifeline collocation sites in UBC seismic zone 3 are identified; a plan is developed for each one.	During an earthquake emergency, damaged lifelines in one area will not cripple each other.
5.2 Update estimates of direct losses expectable from earthquakes.	Comprehensive studies to estimate the potential loss of life, number of injuries, and damage to structures and lifelines from earthquakes of various magnitudes and locations.	Earthquakes are placed in a proper policy perspective based on credible projections of losses and societal impacts; emergency planning is improved; and long-term hazard-reduction activities are prioritized.
5.3 Evaluate the indirect losses associated with earthquakes.	A study assessing the indirect economic losses from earthquakes including: wage and job loss, rebuilding cost, impacts on insurance and financial institutions, and costs of business interruption and failure.	Identification of indirect economic impacts, resulting in increased preparedness, more rapid recovery, and wise resource allocation.



Earthquake Activity in the Utah Region

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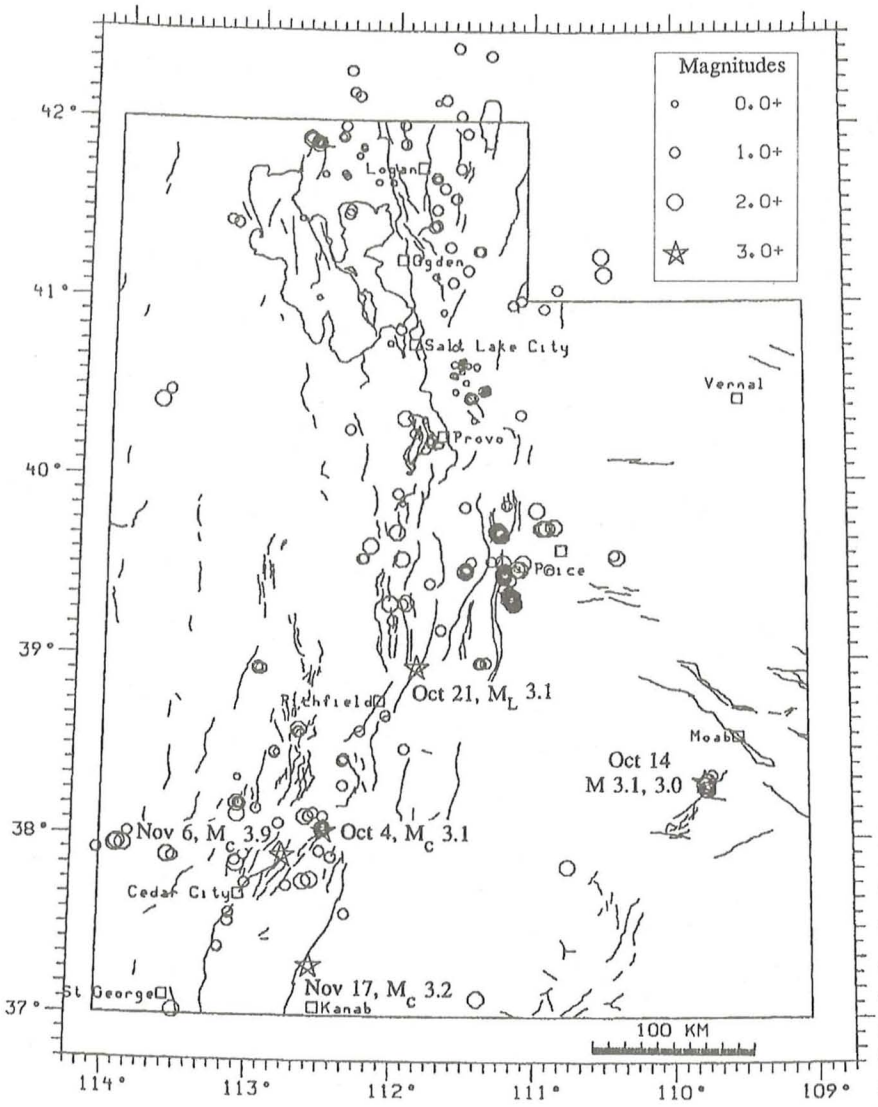

October 1 - December 31, 1993

During October 1 through December 31, 1993, the University of Utah Seismograph Stations located 389 earthquakes within the Utah region. The total includes six earthquakes in the magnitude 3 range and 163 in the magnitude 2 range. Earthquakes which have magnitudes of 3.0 or larger are plotted as stars and specifically labeled on the epicenter map. There was only one earthquake reported felt during the report period. Magnitude is either local magnitude, M_L, or coda magnitude, M_C. Mountain Daylight Time is used through October 30, Mountain Standard Time for the remainder.

• Eastern Wasatch Plateau-Book Cliffs area near Price (coal-mining related): Three clusters of seismic events (magnitude 0.9 to 3.3) make up 42% of the shocks that occurred in Utah during the report period. These clusters are located: (a) 25 miles WNW of Price, (b) 25 miles WSW of Price, (c) 30 miles SW of Price.

• Northern Utah: A cluster of 15 earthquakes occurred 25 miles W of Garland (40 miles WNW of Logan). Most of the earthquakes in this series occurred from December 6th through December 8th.

Throughout the report period, two clusters of earthquakes occurred in the Heber City area (30 miles SE of Salt Lake City). The clusters are located: (1) 4 miles SSE of Midway, and (2) 4 miles E of Heber City. The majority of the shocks were less than magnitude 1.0. Seismic activity is sporadic in this area.

• Central Utah: A series of 19 earthquakes occurred 1 mile NE of Spring City (40 miles WSW of Price). The shocks ranged in magnitude from 1.2 to 2.8. Significant earthquakes include:

M_L 3.1	October 21	4:07 p.m.	2 miles ESE of Salina, felt in Salina and Redmond.

• Southern Utah: A cluster of eight earthquakes occurred 22 miles SW of Moab, in a remote area located west of Canyonlands National Park. The shocks ranged in magnitude from 1.2 to 3.1.

A series of ten earthquakes occurred during October, 13 miles SW of Circleville (40 miles NE of Cedar City). Significant earthquakes include:

M_C 3.1	October 4	8:24 p.m.	14 miles NNW of Panguitch
M_C 3.0	October 14	9:57 a.m.	23 miles SSW of Moab
M_L 3.1	October 14	12:39 p.m.	22 miles SSW of Moab
M_L 3.5	November 6	12:30 a.m.	5 miles NE of Parowan
M_C 3.2	November 17	3:48 a.m.	4 miles E of Orderville

Geologic Hazards Now Included in the State Geologic Information Database

by David Vaughn
Utah Automated Geographic Reference Center

Geographic Information Systems (GIS) technology has become an indispensable tool for organizations using geographic information. Many local, state, and federal agencies in Utah already depend on GIS while others are in the early implementation phases of the technology. Some of the programs that benefit from this technology include planning, risk assessment, natural resource management, demographic analysis, facilities management, economic analysis, and environmental protection. The availability of geologic-hazard information adds another dimension to many of these applications. A number of new geologic and geologic-hazard coverages have recently been added to the State Geographic Information Database (SGID).

During the late 1980s and early 1990s the Utah Legislature took much natural-hazard legislation under consideration. They discovered that the information they needed in their deliberations was scattered among many federal, state, and local agencies and organizations. This included demographic data and geographic and related information about transportation corridors, communications facilities, water and utilities infrastructure, building stocks, schools, hospitals, and police and fire stations as well as the information about mapped natural hazards. Legislators considering earthquake and other natural-hazards legislation wanted to be able to obtain all relevant data from one source. Therefore, during the 1991 session they passed Utah Senate Bill 21, "The Geographic Information Systems Data Sharing and Conformity Bill." It formally established the SGID as the single source of GIS data for Utah and named a state agency, the Automated Geographic Reference Center (AGRC) in the Utah Division of Information Technology Services, as the SGID manager. The SGID serves as the clearinghouse and central repository for all digital geospatial data including contributed data, data developed through cooperative efforts between AGRC and other agencies, and data produced for AGRC project contracts. All Utah state agencies are required to participate in the SGID and comply with the standards and data formats it establishes. This common framework assists agencies in data acquisition efforts, ensures data-interchange capability and compatibility, and aids users in determining the appropriateness of the data to their needs and applications.

The SGID is rapidly developing into a distributed database. Each state agency is responsible for their data coverages and network node. The Department of Natural Resources is currently organizing their network node on the system. The Departments of Environmental Quality and Health are working towards the same goal. Three regional data-cooperative programs that have agreed to participate in SGID development include the Southwestern Utah Planning Authority Council covering southwestern Utah, the Canyon Country Partnership covering southeastern Utah, and the Uinta Data Cooperative covering northeastern Utah. All of these groups are composed of multiple state, federal, and local governmental agencies. One of the main objectives of the SGID is to facilitate data sharing among its users to support planners and decision makers.

The SGID may be accessed in a number of ways: via Internet, via the State of Utah's Wide Area Network, and with the proper emulation software via modem. There are plans to develop an AGRC Home Page on the Internet's World Wide Web system to promote access by browsing software such as the National Center for Supercomputing Application's MOSAIC. As part of the National Spatial Data Infrastructure (NSDI) Executive Order, the Federal Geographic Data Committee has developed a metadata standard. Metadata describes the content, quality, extent, and other characteristics of data. All federal agencies that create geospatial data must comply with this metadata standard. AGRC plans to adopt the standards for the SGID as well. There is an effort to make metadata available through the Internet WAIS interface. The ARC/INFO software needed to achieve this goal is in development at the USGS Water Resources office in Reston, Virginia.

The Utah SGID is based in and maintained on ARC/INFO software (version 6.2) developed by Environmental Systems Research Institute of Redlands, California. ARC/INFO is the official state GIS software standard. The SGID User's Guide serves as the data catalog. Thematic organization allows queries and searches by informational content. Geographic partitioning allows

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> *"The wide availability of these data . . . should encourage their use . . . [in] long-term planning and decision-making processes."*

queries and searches by specific area and scale of resolution (1:24,000 to 1:500,000). Participation in the SGID allows file transfers from AGRC's on-line data libraries to remote locations for use with ARC/INFO in-house systems. Indirect access is available to archived coverages maintained at other agency locations.

At the present time the SGID has over 200 different data subjects stored at various scales. New data are constantly developed and incorporated. The SGID is currently stored in ARC/INFO Librarian format. AGRC plans to update to the new ARCSTORM format this fall. Most state, local, and federal agencies have adopted ARC/INFO as their standard data format, but information can easily be converted for use with other database systems.

In cooperation with the Utah Geological Survey and the GIS Advisory Council (GISAC), AGRC has added data concerning potential geologic hazards to the SGID. Many layers cover the populous Wasatch Front area while others are statewide. Data layers available at this time include shallow ground water, landslides, Quaternary faults and folds, Quaternary volcanic vents and flows, surface fault rupture hazard, liquefaction potential, dam-failure inundation potential, and earthquake-induced landslide potential. Most are at scales of 1:500,000 to 1:1,000,000, although some contain data at larger scales. A seismicity coverage will soon be available when data from the University of Utah Seismograph Stations are incorporated.

A menu-driven interface allows on-line data to be viewed, queried, and analyzed. Using the statewide Quaternary faults and folds coverage, map and tabular data can soon be generated to answer such questions as: (1) where are all the faults with slip rates greater than 1 mm/year?, (2) display all the faults with recurrence intervals less than 5,000 years, and (3) which Holocene faults have rupture lengths greater than 30 km? (rupture length is an indirect means of estimating maximum earthquake magnitudes). A planner for a city or county jurisdiction might ask, "Where are all the faults in my jurisdiction and what do you know about them?" Performing an overlay analyis by combining these basic tectonic data with lifeline, critical facility, and other coverages makes it possible to determine areas at varying degrees of risk from geologic hazards. Potential conflicts in land use or design are identified. This process is helpful in developing plans for emergency preparedness and response to natural disasters as well as pre-disaster mitigation programs.

AGRC serves a broad audience of state, federal, local, and private organizations. The wide availability of these data in a standard format should encourage their use by organizations and individuals who might not otherwise have incorporated earthquake and other hazards considerations into their long-term planning and decision-making processes.

Twice a year, AGRC publishes the SGID User's Guide that details data availability, data standards, how to access the database, participation in the SGID, and new features of the SGID. This guide is available free-of-charge to government agencies in Utah. A lifetime subscription of $75 is available to private users and out-of-state government agencies. If you have further questions about the SGID, participating in the SGID, the User's Guide, or GIS services available from AGRC, call David Vaughn, SGID Manager at (801) 538-3165.

Natural Disasters in Utah: How Can We Better Prepare?

by Nancy Barr and Judy Watanabe
Utah Division of Comprehensive Emergency Management

The Utah Division of Comprehensive Emergency Management (CEM), Natural Hazards Section, conducted a half-day workshop entitled ***Natural Disasters in Utah: How Can We Better Prepare?*** This workshop was held at the Sevier County Courthouse in Richfield, Utah, on November 9, 1994. This workshop covered a wide range of emergency-management topics including: (1) the Utah earthquake threat - what's at risk?, (2) emergency planning for business, disaster assistance, and the recovery process, (3) lessons learned - how can we prepare for the next major earthquake?, and (4) flood-plain management and mitigation - lessening the impact of a natural disaster.

During the afternoon, two other workshops were held. The first one was tailored to school administrators, principals, teachers, and members of the PTA. This workshop focused on creating or updating the earthquake emphasis of the current school emergency-action plan. Topics addressed included hazard assessment, evacuation procedures, and response assignments. The second workshop was a lender/agent workshop conducted by the National Flood Insurance Program (NFIP). This workshop focused on updating and educating local lenders and agents on their responsibilities within the NFIP, which include rating insurance, identifying properties which would be protected by flood insurance, and understanding Federal requirements for flood insurance compliance.

For more information about these workshops, contact John Rokich, CEM Natural Hazards Section Manager, at (801) 538-3400.

Tremor Troops Workshop

by Bob Carey
Utah Division of Comprehensive Emergency Management

The EPICenter of the Utah Division of Comprehensive Emergency Management, in conjunction with the University of Utah Earthquake Education Office, hosted a workshop for elementary school teachers called "Tremor Troops" on October 21-22, 1994.

Earthquake education is relevant to everyone living in Utah. Utah schools currently hold earthquake drills but teachers do not have curriculum materials nor the Utah-specific earthquake risk information needed to develop their students' understanding of the causes and effects of earthquakes and appropriate safety measures that can be taken. This workshop is designed to provide these instructional materials for K-6 teachers with grade-level-specific group activities and discussions. In addition, teachers of 3rd and 5th grades will find the materials especially relevant to the new science core curriculum for their grade levels. The concepts taught at 4th and 6th grades are appropriate expansions of the science core materials.

For more information regarding this workshop or a schedule of coming workshops, contact Deedee O'Brien at 581-6201 or Bob Carey at 538-3400.

NASA and FEMA Join Forces to Improve Disaster Response

The National Aeronautics and Space Administration (NASA) and the Federal Emergency Management Agency (FEMA) are exploring a cooperative venture to test and implement a prototype remote-sensing system that will acquire, process, and distribute digital images of disaster-damaged areas to response and recovery officials as quickly as possible.

The new system will provide response personnel critical information about the location and magnitude of disasters within hours of occurrence. It will use a telemetry system to relay images to the ground and a mobile ground station to receive and construct aerial maps for use in the field. The technology will also be made available to commercial providers of aerial photographic services.

Under current technology, producing and distributing images of disaster sites requires three to ten days. Although time-consuming, the information is invaluable to recovery operations. NASA-provided information was used in recent disaster responses, including in south Florida following Hurricane Andrew, in the Midwest during the Mississippi River floods, and in southern California following the Northridge earthquake.

For more information on this project, contact *Myron Webb, Johnson C. Stennis Space Center, MS 39529-6000, (601) 688-3341.*

- Reprinted from Natural Hazards Observer, v. 18, no. 6, p. 12.

White House Appoints Interagency Task Force to Examine Natural Disasters

The White House has formed a federal interagency task force to review the proposed Natural Disaster Protection Act of 1993 (S. 1350 and H.R. 2873). The legislation currently has 20 cosponsors in the Senate and 145 cosponsors in the House. The task force is headed by Ellen Seidman, Special Assistant to the President for Economic Policy, and includes representatives from the Federal Emergency Management Agency, the Office of Management and Budget, and the Departments of Commerce, the Treasury, and Housing and Urban Development.

In February 1994, the task force began considering the ramifications and options of the bill's three components: mitigation, primary insurance, and reinsurance. Initially, the group is examining ways to reduce disaster losses and lessen their impacts with cost-effective mitigation procedures. Second, it is considering ways to reduce federal costs in disasters through appropriate sharing of risk among federal, state, and local governments and the private sector based on both exposure to losses and efforts to reduce those losses. Third, the task force is surveying ways to create incentives to reduce losses. Finally, it wants to establish an effective partnership among all levels of government and the private sector for dealing with natural hazards. The group hopes to determine whether insurance with mitigation incentives should be broadened beyond small residential structures to cover public facilities and, more fundamentally, whether insurance is a viable, affordable means to promote mitigation.

The task force has held discussions with insurance professionals, financial market experts, consumer representatives, Senate and House staff, experts in hazards and risk identification, staff from other federal agencies, and state insurance commissioners.

To obtain further information about the task force or to offer suggestions, contact *Ellen Seidman, Special Assistant to the President for Economic Policy, National Economic Council Staff, Executive Office Building, Washington, DC 20506*

- Reprinted from Natural Hazards Observer, v. 18, no. 6, p. 11.

Meetings and Conferences

• February 9-11, 1995, **Earthquake Engineering Research Institute Annual Meeting**, San Francisco, California. The meeting will include case studies from recent earthquakes, panel discussions, and individual presentations on designing and constructing new seismic-resistant structures; retrofitting old structures; building earthquake-resistant lifelines and infrastructure; and establishing effective codes, enforcement procedures, and public policy. For a conference brochure, contact EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1902, (510) 451-0905, fax (510) 451-5411.

• March 5-11, 1995, **American Concrete Institute spring convention**, Salt Lake City, Utah. American Concrete Institute (ACI) Committee 341, Earthquake Resistant Concrete Bridges, is sponsoring two technical sessions during the convention, one on developments in seismic design of concrete bridges since the Loma Prieta earthquake, and the other on seismic retrofit of bridge components. For more information, contact M. Saiidi Saiidi, Civil Engineering Department (258), University of Nevada, Reno, NV 89557, (702) 784-6937.

• April 2-7, 1995, **Third International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics**, St. Louis, Missouri. Researchers from Japan, Canada, Italy, Switzerland, Germany, Mexico, and the U.S. have been invited to make special presentations. Themes include liquefaction and ground failure, dynamic earth pressures and seismic design of earth retaining structures, soil structures interaction under dynamic loading, stability of slopes and earth dams under earthquakes, soil amplification during earthquakes and microzonation, predicting strong ground motion for design, wave propagation in soils, and geotechnical analysis of recent earthquakes. For more information, contact Shamsher Prakash, Department of Civil Engineering, University of Missouri-Rolla, Rolla, MO 65401, (314) 341-4489, fax (314) 341-4729, e-mail prakash@novell.civil.umr.edu.

• April 23-27, 1995, **Eighth Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems**, Orlando, Florida. For information contact Mark Cramer, EEGS, P.O. Box 4475, Englewood, CO 80155, (303) 771-6101.

• May 15-17, 1995, **Second International Conference on Seismology and Earthquake Engineering**, Tehran, Iran. The conference will be organized around seven technical divisions: seismicity and seismotectonics; earthquake engineering; geotechnical earthquake engineering; vulnerability and safety; risk mitigation and planning; earthquake education and public awareness; and IDNDR activities. For information, contact Dr. Fariborz Nateghi -A, SEE 2 Organizing Committee, P.O. Box 19395/3913, Tehran, I.R., Iran, phone 00-98-21-801-4038, fax 00-98-21-258-8732.

• May 18-19, 1995, **GSA Rocky Mountain Section Annual Meeting**, Bozeman, Montana. Submit completed abstracts to David R. Lageson (address below), (406) 994-6913, by January 20, 1995. For meeting information contact Stephan G. Custer, Department of Earth Sciences, Montana State University, Bozeman, MT 59717-0348, (406) 994-6906.

• May 24-26, 1995, **GSA Cordilleran Section Annual Meeting**, Fairbanks, Alaska. Submit abstracts to Catherine Hanks, Geophysical Institute, University of Alaska, Fairbanks, AK 99775-0800, (907) 474-5562, by January 30, 1995. For meeting information contact David B. Stone, Department of Geology and Geophysics, University of Alaska, Fairbanks, AK 99775-0760, (907) 474-7565.

• May 24-26, 1995, **Seventh International Conference on Soil Dynamics and Earthquake Engineering**, Crete, Greece. The conference will provide a forum for the presentation and discussion of new and advanced ideas in soil dynamics and earthquake engineering in theory and practice. Themes will include excitation and propagation of dynamic waves in the ground, the determination of dynamic properties of soils and rocks, and the behavior of structures under dynamic loading. For further information, contact the Conference Secretariat, SDEE 95, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO4 2AA, UK, phone 44-0-703-293223, fax 44-0-703 292853, international e-mail cmi@ib.rl.ac.uk.

• June 5-7, 1995, **Seventh Canadian Conference on Earthquake Engineering**, Montreal, Canada. Topics include seismicity and strong ground motion, seismic hazard and risk, lifelines, seismic analysis of structures, design of structures and components, experimental methods and testing, soil dynamics, liquefaction, slope stability, and foundations, observations of behavior during earthquakes, characteristics and impact of earthquakes in eastern North America, seismic code provisions, planning of emergency response, and repair and retrofitting of structures. For information, contact the Organizing Secretary, 7CCEE, Department of Civil Engineering, Ecole Polytechnique, University of Montreal Campus, P.O. Box 6079, Station "Cen-

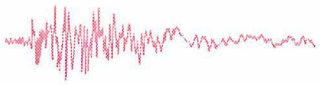
tre-Ville", Montreal, Quebec, Canada H3C 3A7, (514) 340-3713, fax (514) 340-5881, e-mail judd@music.polymtl.ca.

• July 2-14, 1995, **International Union of Geodesy and Geophysics XXI General Assembly**, Boulder, Colorado. Contributed papers on any topics related to geophysics are encouraged. The abstract deadline is February 1, 1995. For further information, contact IUGG XXI General Assembly, c/o American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

• August 10-12, 1995, **Fourth U.S. Conference on Lifeline Earthquake Engineering**, San Francisco, California. Sponsored by the Technical Council on Lifeline Earthquake Engineering, American Society of Civil Engineers, the conference will feature sessions, exhibits, and field trips on the design, construction, social, and emergency-response impacts of earthquakes on lifelines (water and sewer, electric power, communications, transportation, and gas and liquid fuels). For more information, contact Jerry Isenberg, Weidlinger Associates, 333 7th Avenue, 13th floor, New York, NY 10001, (212) 563-5200 or Anne Kiremidjian, Civil Engineering Department, Terman 238, Stanford University, Stanford, CA 94305, (415) 723-4164.

• October 17-19, 1995, **Fifth International Conference on Seismic Zonation**, Nice, France. The conference, sponsored jointly by the Earthquake Engineering Research Institute and the French Association of Earthquake Engineering, will provide a state-of-the-art assessment of the advances in seismic zonation, integrating earth sciences, engineering, planning, social sciences, and public policy. The program will include multidisciplinary discussions of how seismic zonation has been used as a tool in mitigation efforts in major seismic regions throughout the world. Recent destructive earthquakes re-emphasize the importance of using seismic zonation techniques to reduce earthquake damage and refine mitigation efforts related to the built environment, land use, and emergency preparedness. The conference will be taking place at the midpoint in the International Decade for Natural Disaster Reduction and will provide an international multidisciplinary forum for the asimilation and dissemination of recent advances pertinent to the reduction of losses from natural disasters worldwide. For further information, contact EERI at 499 14th Street, Suite 320, Oakland, CA 94612-1934, (510) 451-0905, fax (510) 451-5411.

• November 14-16, 1995, **First International Conference on Earthquake Geotechnical Engineering**, Tokyo, Japan. Sponsored by the Japanese Society of Soil Mechanics and Foundation Engineering and the Earthquake Geotechnical Engineering Committee of the International Society for Soil Mechanics and Foundation Engineering, themes include dynamic soil behavior, dynamic response of ground, liquefaction and associated phenomenon, seismic failure of embankments and slopes, and reports on recent earthquakes. For more information, contact Dr. Ilko Towhata, Department of Civil Engineering, University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, Japan, phone 81-3-3812-2111, ext. 6121, fax 81-3-3818-5692.



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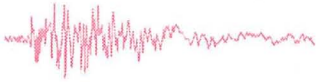

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