REGIONAL & URBAN HAZARDS EVALUATION NEWSLETTER

VOLUME I, NUMBER I JUNE 1984

EDITORS PAGE

FROM WALT HAYS, COORDINATOR, REGIONAL AND URBAN HAZARDS EVALUATION PROGRAM

" At several recent meetings of the new 'Regional and Urban Hazards Evaluation Program - Wasatch Front, Utah', the need was expressed for a vehicle for timely dissemination of information regarding the program to participants and to interested persons affiliated with the program. It was decided that an informal newsletter, prepared from materials submitted by project personnel, could be that vehicle. The newsletter will be prepared for the benefit of all personnel and other associates who have a need to know the progress of the Wasatch Front program. It is intended that the newsletter contain information that ordinarily would not be published elsewhere or information that would be difficult to disseminate otherwise. The newsletter is NOT intended as a substitute for formal publication of results, but is very similar to the U.S.Geological Survey, Geologic Division's Cross Section publication. The newsletter will be published on a quarterly basis, March, June, September and December. It is our intention that the newsletter be prepared, if possible, from camera-ready copy, submitted to the Editor, with little or no formal editing by the respective participating agencies."

from....Walt Hays
Coordinator, Regional and Urban Hazards Evaluation Program
WASATCH FRONT, UTAH

THIS NEWSLETTER IS NOT TO BE QUOTED OR CITED AS A PUBLICATION BECAUSE MUCH OF THE MATERIAL CONSISTS OF REPORTS OF PROGRESS AND RESEARCH ACTIVITIES AND MAY CONTAIN PRELIMINARY OR INCOMPLETE DATA AND TENTATIVE CONCLUSIONS.

FROM THE EDITOR

I must begin this first issue with an apology and at the same time request your assistance. I realize that many important publications, meetings, workshops, comments, project reports etc., have not been included in this issue. We hope to remedy this, but can do so only with your cooperation and assistance. This newsletter is intended to be an exchange place for information. If you have information you feel should be shared, please send it to the Editor or any of the Associate Editors. If you are aware of a special meeting, symposium or workshop that would be of value to other participants, please let us know. Basically, the value of the newsletter lies in your collective hands! It will be of value only if there are continuing contributions from participants in the program. Comments are MOST welcome...even the negative ones, and constructive criticism is always appreciated

Wendy Hassibe, Editor

DEADLINES FOR UPCOMING ISSUES

Sept (1984)Issue....September 28
March (1985) Issue.....March 29
June (1985) Issue.....June 28

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BACKGROUND NOTES

In October 1983, the U.S.Geological Survey initiated a new program element of the National Earthquake Hazards Reduction Program (NEHRP). That element - Evaluation of Regional and Urban Hazards, is described below:

The Regional and Urban Hazards Evaluation program element was created to develop the basic information and the partnerships needed for evaluating earthquake hazards and risk in broad geographic regions containing important urban areas and to provide a basis for loss-reduction measures that can be implemented by local governments. The goal is to provide an integrated program having comprehensive research goals and producing generic information that can be used to reduce earthquake losses in urban areas. The scientific emphasis is on developing a fundamental physical understanding of the cause, frequency of occurrence, and the physical effects of earthquake ground shaking, surface faulting, ground failure, and tectonic deformation in various geographic regions.

THE REGIONAL AND URBAN EARTHQUAKE HAZARDS PROGRAM FOR THE WASATCH FRONT HAS FIVE INTERRELATED COMPONENTS:

1/ INFORMATION SYSTEMS - to produce quality data along with a comprehensive information system

2/ SYNTHESIS OF GEOLOGICAL AND GEOPHYSICAL DATA FOR EVALUATION OF EARTHQUAKE HAZARDS - to produce synthesis reports describing the state-of-knowledge about earthquake hazards in the region and to recommend future research

3/ GROUND MOTION MODELING - to produce deterministic and probabilistic ground-motion models and maps of the ground-shaking hazards with commentaries on use

4/ LOSS ESTIMATION MODELS - devise economical methods for acquiring inventories of structures and lifeline systems in urban areas, create a standard model and commentary for loss estimation, produce loss and casualty estimates for urban areas.

5/ IMPLEMENTATION - foster creation and implementation of hazard-reduction measures in urban areas

STRATEGIES FOR THE WASATCH FRONT STUDY

* Foster Partnerships
* Take Advantage of Past Research Studies and Other Activities
* Study Ten Counties Along the Wasatch Front
* Convene Annual Meetings to Review Progress and Recommend New Research
* Publish Annual Reports and Communicate Findings
* Take Advantage of Earthquakes

C A L E N D A R

- ☐AUG.1-4.....TOBACCO ROOT GEOLOGICAL SOCIETY, BOISE, IDAHO
- ☐AUG.13-17.....EARTH RESISTIVITY FOR ENGINEERING AND HYDROLOGY, DAYTON, OHIO
- ☐AUG.14-15.....WORKSHOP ON EVALUATION OF REGIONAL AND URBAN EARTHQUAKE HAZARDS AND RISK IN UTAH, SALT LAKE CITY,UTAH
- ☐AUG.20-24.....SEISMIC REFRACTION EXPLORATION SEMINAR, DAYTON, OHIO
- ☐AUG.26-29.....ROCKY MOUNTAIN SECTION, AAPG - SEPM, SALT LAKE CITY, UTAH
- ☐AUG.27-29.....GEOTHERMAL RESOURCES COUNCIL, RENO, NEVADA
- ☐SEPT.19-22.....UTAH GEOLOGICAL ASSOCIATION FIELD TRIP, NORTHWESTERN UTAH
- ☐SEPT.28-29.....TECTONIC GEOMORPHOLOGY,BINGHAMTON, NEW YORK
- ☐NOV.5-8.....GEOLOGICAL SOCIETY OF AMERICA, RENO, NEVADA

UTAH GEOLOGICAL AND MINERAL SURVEY WASATCH FRONT GEOLOGIC MAPS

The Utah Geological and Mineral Survey is publishing three 1:100,000 scale geologic maps of a band 25 to 33 miles wide along the Wasatch Front from Logan to Santaquin. These maps, UGMS Maps 53-A (northern), 54-A (central) and 55-A (southern) are on a special topographic base with 100 foot contour interval. They were compiled by Fitzhugh D. Davis from published sources and theses supplemented by reconnaissance mapping where existing data were inadequate. These maps are a good base for many proposed studies in the Wasatch Front earthquake program. In addition to the geologic maps (A), the series includes surface water resource maps (B), ground water resource maps (C) and mineral resource and petroleum potential maps (D). Maps 54-A and 55-A have been published and Map 53-A will be published in August 1984. The maps and special base material can be obtained from the UGMS.

ANNOUNCEMENTS

* WORKSHOP *

EVALUATION OF REGIONAL AND URBAN EARTHQUAKE HAZARDS AND RISK IN UTAH

On AUGUST 14-15, 1984, the first of three annual workshops on "Evaluation of Regional and Urban Earthquake Hazards and Risk in Utah", will be held in Salt Lake City, Utah. The State Capitol building will be the headquarters for the meeting which is being cosponsored by the U.S.Geological Survey, Federal Emergency Management Agency, Utah Geological and Mineral Survey, the University of Utah, and the Utah Division of Comprehensive Emergency Management.

The workshop will bring together researchers from many disciplines, engineers and architects, federal, state and local public officials, and emergency response planners to:

(#) Assess the present state-of-knowledge of earthquake hazards in Utah including scientific, engineering, and societal-preparedness components.

(#) Determine what additional scientific, engineering, and societal-response information is needed to implement an earthquake-loss-reduction program in Utah.

(#) Create action plans to implement an earthquake-loss-reduction program.

The program is organized to achieve an effective exchange of information through the use of individual speakers, panels, and small discussion groups. Time will be provided for interactive discussions. All speakers and panelists will focus on issues and recommendations in their oral presentations. Technical presentations giving details on current research are scheduled for evening sessions at the Hotel Utah.

Following the workshop, the proceedings will be published as an USGS Open-File Report. Each speaker's expanded abstract or technical paper will be included in the proceedings as well as summaries of the workshop discussions.

FOR MORE INFORMATION ABOUT THE WORKSHOP, CONTACT:

WALT HAYS or PAULA GORI
730-860-6471 or FTS 928-6471
or write to them at
USGS, 905 NATIONAL CENTER, RESTON, VIRGINIA 22092

ADDITIONAL MEETINGS.....

ROCKY MOUNTAIN SECTION MEETING
AAPG - SEPM
ENERGY MINERALS DIVISION

AUGUST 26-29 are the dates set for the 1984 meeting of the Rocky Mountain Section AAPG-SEPM and the National Meeting of EMD. The meetings will be held at the Hotel Utah in Salt Lake City. Some of the Technical Sessions are:

- STRUCTURE OF THE BASIN AND RANGE PROVINCE AND ITS MARGIN
- STRATIGRAPHY OF PALEOZOIC ROCKS
- URANIUM AND TAR SANDS
- STRUCTURE OF THE ROCKY MOUNTAIN THRUST BELT
- SOURCE ROCK SYMPOSIUM
- STRATIGRAPHY OF MESOZOIC-CENOZOIC ROCKS
- FORELAND BASINS AND STRUCTURES
- SEDIMENTATION AND DEPOSITIONAL ENVIRONMENTS MARINE-MARGINAL MARINE

* FIELD TRIPS *

(A) Thrust Belt and Wasatch-Uinta Intersect area, August 25-26

(B) Geothermal Resources, Southwest Utah, August 25-26

(C) Coal Resources, Kemmerer, Wyoming area, August 29-30

(D) Energy Overview of the Uinta Basin, August 29-31

FOR INFORMATION, CONTACT AAPG, BOX 979, TULSA, OKLAHOMA 74101

UTAH GEOLOGICAL ASSOCIATION
1984 FIELD TRIP

The 1984 UGA Field Trip is scheduled for September 19-22 and will begin in the Albion Range in Idaho, proceeding to the Raft River Range, City of Rocks, through the Grouse Creek Mountains and into Nevada to Wendover and Gold Hill. From Gold Hill, the trip will proceed to the Mercur Gold Mine, with additional stops between Gold Hill and Mercur. This will be an individual vehicle(sedans not recommended, but 4-wheel drive not required) three-night campout with catered meals. Some space in other vehicles will be available to participants who will not be driving. The basic cost is $60.00 for the Field Trip per participant, $35.00 for the Guidebook if purchased prior to the Field Trip, $40.00 if purchased later. Registration must be complete by September 5th. For additional itinerary and registration information, contact Wendy Hassibe (801) 524-5652 or write UGA , Box 11334, SLC, Utah 84147.

PUBLICATIONS

(The following list is obviously not comprehensive and includes primarily U.S.G.S. publications and articles by U.S.G.S. authors. The Editor would appreciate receiving information about all publications that relate to the program.)

USGS OPEN FILE REPORTS

83-843 A Workshop on "The 1886 Charleston, South Carolina Earthquake and its implications for today", Hays and Gori, Editors, 1983

83-845 A Workshop on "Site-specific effects of soil and rock on ground motion and the implications for earthquake design", Hays editor, 1983

83-884 A description of colored isostatic gravity maps and a topographic map of the conterminous US, Simpson and others 1983

84-95 A description of colored gravity and terrain maps of the southwestern Cordillera, Saltus, 1984

84-106 Preliminary slip-rate table and map of Late-Quaternary Faults of California, Clark and others, 1984

84-115 Surficial geologic map ofthe Oak City area, Utah, Varnes and Van Horn, 1984

84-166 Intensity survey of the Borah Peak earthquake of October 28, 1983, Reagor and Baldwin, 1984

84-256 Statistical relations among earthquake magnitude, surface rupture length and surface fault displacement, Bonilla and others, 1984

OTHER USGS PUBLICATIONS

Cir.817 Scientific and technical, spatial and bibliographic data bases and systems of the USGS, including other federal agencies

Cir.896A Earthquakes in the US, Jan-March 1982

Cir.896B Earthquakes in the US, April-June 1982

Cir.896C Earthquakes in the US, July-Sept.1982

Cir.898 Summary of workshops concerning regional seismic source zones of parts of the conterminous US

Cir.914 Strong Motion Program Report, Jan-Dec.1981

Cir.918 National Earthquake Hazards Reduction Program:Overview, Report to the U.S. Congress

Cir.919 National Earthquake Hazards Reduction Program: Fiscal Year 1983 activities

MF-1643 Geologic map of the North Hansel Mountains, Idaho and Utah. Allmendinger, 1983

PP 946 Geologic principles for prudent land use: a decisionmaker's guide for the San Francisco Bay Region, Brown and Kockelman, 1983

WRI83-4272 Reconnaissance of the shallow-unconfined aquifer in the Salt Lake Valley, Seiler and Waddell, 1984.

ARTICLES BY USGS AUTHORS IN OUTSIDE PUBLICATIONS

Buland, R. The computation of seismic travel times. Bulletin of the Seismological Society of America, Vol. 73, No.5, October 1983, p.1271

O'Neill, J.M. Recurrent movement along and other characteristics of north-east trending faults in part of east-central Idaho and west-central Montana (abstr.) Abstracts with Programs, Geological Society of America, Vol.14, No.5, March 1982, p. 345

Borcherdt, R. Reflection-Refraction of general and type I-S waves in elastic and anelastic solids. The Geophysical Journal of the Royal Astronomical Society, Vol. 70, No.3, pages 621-638.

Shroba, R. Soil B-Horizon properties as age indicators for Late Quaternary deposits along the Wasatch Front, North-Central Utah (abstr.). Abstracts with programs, Geological Society of America, Vol.14, No.4, March 1982, p.233

Thatcher, W. Geodetic measurements and the earthquake cycle (abstr.) EOS Transactions, American Geophysical Union, Vol. 64, No.18, May 3, 1983, p.207.

ADDITIONAL ARTICLES.....

Keefer, D.K. Landslides caused by earthquakes, Bulletin of the Geological Society of America, Vol.95, No.4, April 1984, p.407

Hart, W.K. and others Areal distribution and age of low-K, high-alumina olivine tholeiite magmatism in the northwestern Great Basin. Bulletin of the Geological Society of America, Vol.95, No.2, February 1984, p. 186.

(for information on obtaining publications, contact the Editor)

UTAH EARTHQUAKE ACTIVITY OCTOBER 1983 TO MARCH 1984

William D. Richins
University of Utah Seismograph Stations
Department of Geology and Geophysics

The University of Utah Seismograph Stations records an 85-station seismic network designed for local earthquake monitoring within Utah, southeast Idaho, and western Wyoming. During October 1,1983 to March 31,1984, 290 earthquakes were located within the Utah region (see Figures 1 and 2).

The largest event during this time period occurred on October 8, 1983 at 5:57am, 6 km southwest of the Salt Lake City International Airport. This magnitude 4.3 earthquake was widely felt throughout the Salt Lake Valley, as well as to the south in northern Utah county and to the north in the Ogden area. Several small aftershocks were instrumentally recorded. A magnitude 5.2 earthquake occurred in this same area in 1962 causing moderate damage. Other significant aspects of earthquake activity shown in Figures 1 and 2 include (from north to south):

1. a magnitude 3.0 earthquake on December 11, 1983 south of Soda Springs, Idaho;

2. a magnitude 4.0 earthquake on November 18, 1983, located near and felt at Snowville on the Idaho-Utah border;

3. on-going microseismicity with magnitudes less than 2.1 north of Great Salt Lake along the Idaho-Utah border;

4. a cluster of activity 15km south of Logan during December 22-26, 1983, with magnitudes less than 2.0;

5. two magnitude 2.2 earthquakes felt 30km east of Ogden on March 23, 1984;

6. clustered small-earthquake activity in the vicinity of active coal mining southwest of Price in central Utah;

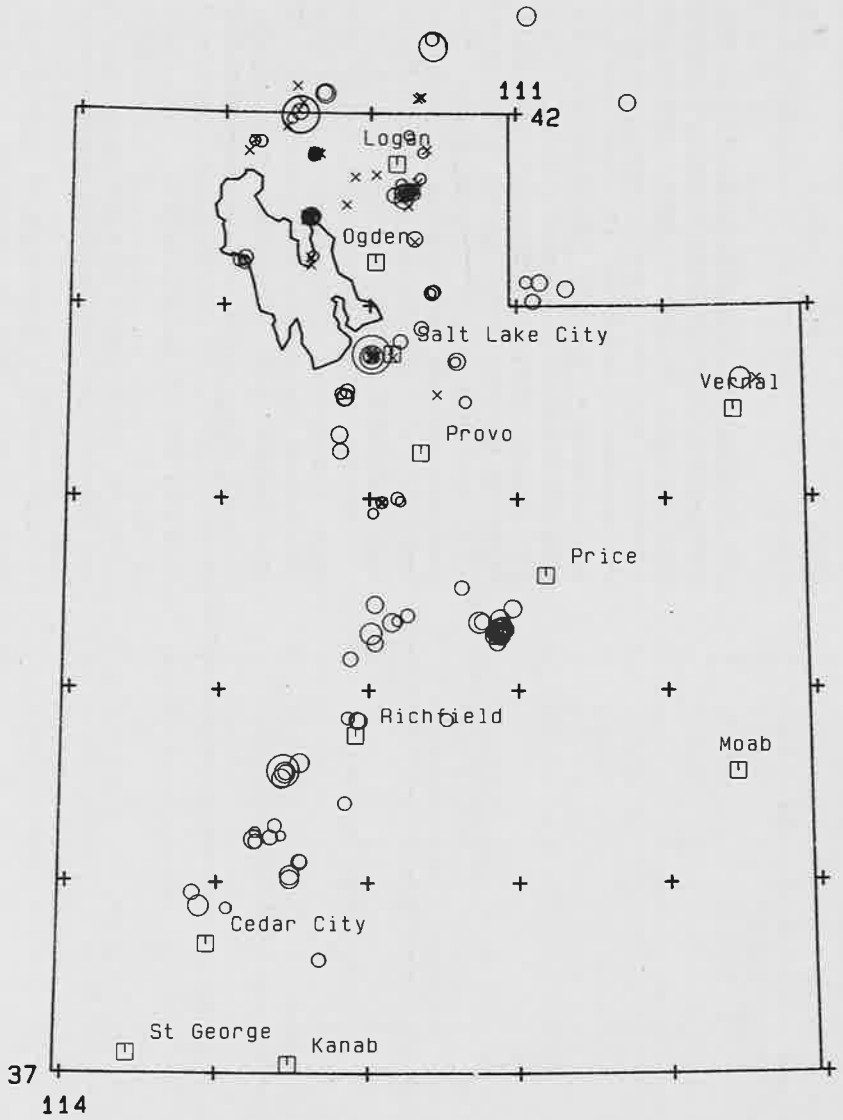
7. a magnitude 3.6 earthquake near Cove Fort southwest of Richfield on December 9, 1983; and

8. on-going small earthquake activity scattered throughout a northeast-southwest-trending belt between Richfield and Cedar City in southwest Utah.

On October 28, 1983, a magnitude 7.3 earthquake struck central Idaho between Challis and Mackay. This earthquake (labeled as the Borah Peak, Idaho earthquake) resulted in two deaths, approximately 34km of surface rupture with vertical displacements up to 2.7 m, and $12.5 million damage. Intensive research on the seismological aspects of this earthquake and implications for possible future earthquakes in Utah are underway at the University of Utah Seismograph Stations.

During late January 1984, the on-line computer facility used for earthquake detection and recording at the University of Utah Seismograph Stations was extensively upgraded to allow a doubling of recording capacity from 64 to 128 data channels. As part of this effort, an additional 24 seismic stations were added to the network in the Yellowstone and central/southeastern Idaho area.

Additional information on earthquake data within Utah and relating to the Borah Peak,Idaho sequence is available by contacting the University of Utah Seismograph Stations, Salt Lake City, Utah, 84112 (telephone: 801 581-6274)



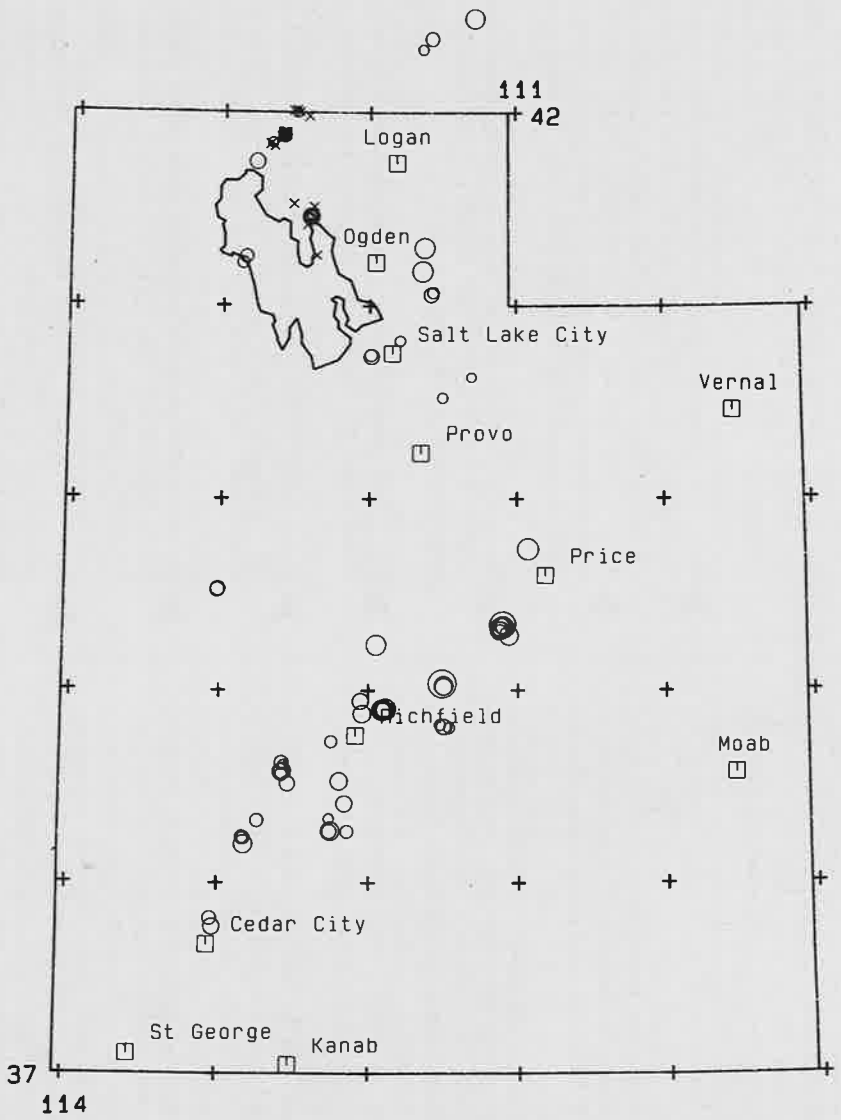
Utah Earthquakes: Oct 1 - Dec 31, 1983

0 50 100 km

magnitude scale (ml):

6 4 2 1 <1.0

Figure 1



Utah Earthquakes: Jan 1 - Mar 31, 1984

0 50 100 km

magnitude scale (ml):

6 4 2 1 <1.0

Figure 2

PROGRESS REPORTS AND NEW PROJECTS

Activities of the U.S.Geological Survey and its Contractors in Utah

William M. Brown III

The continuing and proposed programs of the U.S.Geological Survey in Utah involve more than 20 projects on geologic and hydrologic hazards. Much new work in the region was begun recently as a result of the 1983 Borah Peak, Idaho earthquake and the debris flows, landslides, and floods of 1983-84. Several additional projects are pending approval for startup in the upcoming fiscal year beginning October, 1984. This article concentrates on projects related to earthquakes and landslide hazards in Utah and selected projects that might be of interest to researchers here. Projects on hydrologic hazards and other matters brought to my attention (such as notable omissions here) will be discussed in the September newsletter. Please send all inquiries, corrections, and comments to me at the address or phone number given below.

The following briefs are condensed from U.S.G.S. Open-File Report 83-918 (cited below):

○EARTHQUAKE HAZARD AND PREDICTION RESEARCH IN THE WASATCH FRONT/SOUTHERN INTERMOUNTAIN SEISMIC BELT (contract with Smith, R.B., Arabasz, W.J., Pechmann,J.C., and Richins, W.D., Department of Geology and Geophysics, University of Utah: April 1 to September 30,1983)

TOPICS INCLUDE subsurface geometry and kinematics of normal fault zones, subsurface geometry of active faulting, strain release across the Wasatch Front, earthquake source characteristics and University of Utah seismic network operations.

○TECTONIC-TILT MEASUREMENTS USING LAKE LEVELS (Wood, S.H., and Vincent, K., Branch of Engineering Geology and Tectonics, U.S.G.S., Boise State University, Boise, Idaho: continuing)

TOPICS INCLUDE analysis of past leveling data along the Wasatch Fault for evidence of vertical tectonic movement, releveling across the Wasatch Fault in Weber Canyon (near Ogden), and establishment of new lake-level measurement sites on the Great Salt Lake.

○REGIONAL AND LOCAL HAZARDS MAPPING IN THE EASTERN GREAT BASIN (Anderson, R.E., Branch of Engineering Geology and Tectonics, U.S.G.S., Denver, Colorado:continuing)

TOPICS INCLUDE collection, processing, and interpretation of high-resolution seismic reflection profiles across selected faults in the eastern Great Basin, study of fault scarps in the Sevier Desert basin, and study of paleostress in central Utah.

○ESTIMATION OF SEISMIC GROUND MOTION IN NORTHERN UTAH (contract with McGuire, R.K., Dames and Moore, Golden, Colorado: July 1, 1981 to September 30, 1983).

TOPICS INCLUDE using Modified Mercalli (MM) intensity data in the Rocky Mountain region to estimate strong motion in northern Utah, and the use of California strong motion data to provide correlations between peak parameters (ground acceleration, ground velocity, and spectral velocity), MM intensity, and distance.

○DEVELOPMENT OF LIQUEFACTION POTENTIAL MAPS FOR SALT LAKE AND UTAH COUNTIES, UTAH (contract with Anderson, L.R., Department of Civil Engineering, Utah State University, Logan, Utah and Keaton, J.R., Dames and Moore, Salt Lake City, Utah:Salt Lake County -- July 9, 1981 to April 18, 1983; Utah County -- begun May 6, 1983 and continuing).

MAPS DEVELOPED for Salt Lake County include (1) Soil Data and Ground Water Map, (2) Critical Acceleration and Ground Slope Map, (3) Geologic Ground Failure Map, and (4) Liquefaction Potential Map. The Liquefaction Potential Map shows that liquefaction induced ground failure is a significant seismic hazard in Salt Lake County. Similar maps are being developed for Utah County.

○GROUND RESPONSE ALONG THE WASATCH FRONT (King, K.W., Branch of Engineering Geology and Tectonics, U.S.G.S., Denver, Colorado : continuing).

OBJECTIVE is to improve fundamental knowledge about how the ground response along the Wasatch Front correlates with local and regional geology. Work includes data collection for Salt Lake City, Ogden, Provo, Logan, and Cedar City urban areas; documentation of road construction-induced seismic energy effects on adobe structures; studying of differences between surface and subsurface ground motions in a waste repository site; and a field experiment to explain an area of anomalously low ground responses in the Ogden area.

THE FOLLOWING BRIEFS, ALSO EXCERPTED FROM U.S.G.S. OPEN-FILE REPORT 83-918, DISCUSS REGIONAL AND TOPICAL STUDIES OF POSSIBLE INTEREST:

○ REANALYSIS OF INSTRUMENTALLY-RECORDED U.S. EARTHQUAKES (Dewey, J.W.,Branch of Global Seismology and Geomagnetism, U.S.G.S., Denver, Colorado : continuing).

TOPICS INCLUDE relocation of historical United States earthquakes using refined methods, and evaluating the implications of revised hypocenters on regional tectonics and seismic risk.

○ REGIONAL AND NATIONAL SEISMIC HAZARD AND RISK ASSESSMENT (Algermissen, S.T., Branch of Engineering Geology and Tectonics, U.S.G.S., Denver, Colorado : continuing).

TOPICS INCLUDE investigations of the magnitude and distance dependence of the standard deviation of ground motion attenuation statistical variability; development of a graphical technique for showing the relative contribution of various magnitudes to the exceedances of a given ground motion value in probablistic seismic hazard analysis; assessment of sensitivity of regional probablistic ground motion values to changes in the input parameters of finite fault rupture model, ground motion attenuation function, and magnitude-frequency relationship; development of a pattern-recognition algorithm for discriminating areas having high potential for large earthquakes from areas having low potential for large earthquakes; development of a series of computer programs for digitizing and plotting seismicity data; investigation of efficient data processing for collecting and analyzing earthquake damage data; and development of a computer program (with U.S.G.S., Water Resources Division) for use in seismic hazard evaluation of dam sites.

○ SOIL DATING TECHNIQUES, WESTERN REGION (Machette, M.N., Branch of Western Regional Geology, U.S.G.S., Menlo Park, California : continuing). PURPOSE is to establish a data base for soil chronosequences as correlation and dating tools for Quaternary surficial deposits in the Western United States. Studies use soil stratigraphy and scarp morphology to determine the amount of Quaternary displacement and paleoseismicity of faults.

○ ESTIMATING STRONG GROUND MOTION FOR ENGINEERING DESIGN AND SEISMIC ZONATION (Joyner, W.B., and Boore, D.M., Branch of Engineering Seismology and Geology, U.S.G.S., Menlo Park, California : continuing).

INVESTIGATIONS INCLUDE analysis of strong-motion data leading to the development of predictive equations for strong-motion parameters and development of methodology for making predictive maps of strong ground motion, cooperation with professional groups in development of code provisions for earthquake resistance, and study of the scaling of earthquake spectra.

○ SEISMIC SLOPE STABILITY (Keefer, D.K., Branch of Engineering Geology and Tectonics, Menlo Park, California:continuing).

INVESTIGATIONS INCLUDE development of quantitative methods of predicting earthquake-induced landslides on a regional scale.

○ A COMPUTERIZED METHOD FOR PREDICTING EARTHQUAKE LOSSES IN URBAN AREAS (contract with Kustu, O., Miller, D.D., and Scholl, R.E., URS/John A. Blume & Associates, Engineers, San Francisco, California:Phase II,July 1, 1982 to August 27, 1983)

PROJECT INVOLVED development of a comprehensive and practical method for predicting earthquake-caused losses in urban areas, compiling the data necessary for its application, and demonstrating its practicability.

○ SEISMIC DATA LIBRARY (Lee, W.H.K., Branch of Seismology, U.S.G.S., Menlo Park, California : continuing).

NON-RESEARCH PROJECT with the objective of providing access to seismic data for the research community. Over the past 10 years, the project has built up one of the world's largest collections of seismograms and related materials.

○ NATIONAL EARTHQUAKE INFORMATION SERVICE (Person, W.J., Branch of Global Seismology and Geomagnetism, U.S.G.S., Denver, Colorado : continuing).

INFORMATION INCLUDES a weekly publication, Preliminary Determination of Epicenters; Monthly Listings of Earthquakes (MLE); Earthquake Data Reports (EDR); Fault Plane Solutions determined when possible and published in MLE and EDR for any earthquake having a MB magnitude greater than or equal to 5.8. Centroid Moment Tensor Solutions and Moment Tensor Solutions published in MLE and EDR. Digital Waveform plots published in MLE. Maintains the Early Earthquake Alerting Service that provides services on recent earthquakes on a 24-hour basis to scientists, news media and the general public.

○ UNITED STATES EARTHQUAKES (Stover, C.W., Branch of Global Seismology and Geomagnetism, U.S.G.S., Denver, Colorado : continuing).

PROJECT INCLUDES canvassing by mail questionnaires for felt and damage data : for example, 75 earthquakes in 18 states were canvassed during April 1 - September 30, 1983. Project determines hypocenters, magnitudes, and maximum intensities for publication in Preliminary Determination of Magnitudes weekly discussed above ,compiles earthquake data for United States earthquakes, and publishes regional seismicity maps

REFERENCE

Jacobson, M.L., 1983, Summaries of Technical Reports, Volume XVIII Prepared by Participants in National Earthquake Hazards Program December 1983: U.S. Geological Survey Open-File Report 83-918, Menlo Park, California 543 p.

THE FOLLOWING BRIEFS CONCERN RECENT STUDIES ON LANDSLIDES AND DEBRIS FLOWS IN UTAH :

○ DEBRIS-FLOW RUNOUT STUDIES (Wieczorek, G.F., Branch of Engineering Geology and Tectonics, Menlo Park, California : continuing).

TOPICS INCLUDE detailed investigations of debris-flow deposits in central Utah, collection of data on sources, tracks, and lobes of deposits from events of 1983-84, and dating of earlier and prehistoric deposits. Objectives include prediction of debris-flow runout distances and volumes based on source area characteristics and channel geometry.

○ FEDERAL DISASTER RESPONSE IN UTAH, 1983-84 (Brown, W.M.,III, Branch of Engineering Geology and Tectonics, Menlo Park, California : continuing).

TOPICS INCLUDE evaluation of response of scientific community to landslide, debris-flow, and flood disasters in Utah; comparisons with responses to similar, recent disasters in the Western United States and recommendations for future preparedness.

○ MECHANICS OF DEBRIS FLOWS (Harp, E.L., Branch of Engineering Geology and Tectonics, U.S.G.S. Menlo Park, California and Wells, W.G.,II, U.S. Forest Service, Glendora, California : continuing).

INVESTIGATION of ground moisture conditions needed to initiate debris-flow movement at sites along Wasatch Front, Utah.

○ DETERMINATION OF LANDSLIDE AGES AND RECURRENCE INTERVALS (Madole, R.F., Branch of Engineering Geology and Tectonics, U.S.G.S., Denver,Colorado : continuing).

AGE DATING of landslide deposits on Wasatch Plateau and determination of recurrence intervals of landslide movement.

○ LANDSLIDE PROCESSES (Fleming, R.W., Branch of Engineering Geology and Tectonics, U.S.G.S., Denver, Colorado : continuing).

INVESTIGATIONS of landslides and debris flows in Utah, including source and deposit characteristics, development of slide planes, velocity of movement, differential movement within landslide mass, velocity of movement, history of movement, activity as related to long-term climatic variability, reactivation of older landslides, and other topics.

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PROGRESS REPORTS NARRATIVE

(Furnished by Art Tarr, USGS, Denver, Co.)

The following summaries are from USGS semi-annual technical reports submitted for the first half of FY 1984.

Al Rogers has been studying the effects of site geology on ground motion recorded in the Wasatch Front area. He finds that the ground response, as characterized by the mean spectral ratio (references to hard rock) at three different frequency bands, varies with the age and lithology of the underlying surficial deposits. At urban sites along the Wasatch Front, the observed ground response appears to increase with decreasing age and with decreasing coarseness of the deposit (Table 1).

Ken King reports that six strong-motion accelographs were installed in the Salt Lake City urban area. The Salt Lake City strong-motion network is now composed of six new instruments and three existing systems operated by the Branch of Engineering Seismology in Menlo Park, California. Sites (Table 2) were selected jointly by U.S.Geological Survey and Utah Geological and Mineral Survey geologists on the basis of type and thickness of surficial sediments as well as geographical coverage (Figure 1). Future earthquakes large enough to trigger the strong-motion instruments are expected to give records which will show a wide range of ground amplification.

Measurement of contemporary crustal deformation is an important technique for understanding the physical process of strain accumulation and is a potentially useful tool for earthquake prediction. Direct determination of ground deformation is, however, notoriously difficult because the changes in elevation, horizontal distance, and tilt are so very small from measurement to measurement. Careful and consistent measurement techniques are essential and elaborate corrections to the raw data are necessary to reduce effects such as temperature and humidity on atmospheric refraction. Spence Wood has been using recorrected level-line and lake-level data to estimate vertical tectonic deformation across the Wasatch Front near Ogden and Salt Lake City. He reports evidence of pronounced down-tilting of the hanging-wall side of the Wasatch Fault near Weber Canyon amounting to about 10cm (9 microradians) along a 12km segment and over a period of 25 years; the apparent strain is what one expects if the block west of the fault is moving down relative to the block east of the fault. He also notes that although the current tilt rate averages about 0.75 microradians/year, the tilt rate was very small during the period 1974.8 through 1979.4, implying that vertical deformation since 1958 was episodic. The average trend of the major normal faults bounding the eastern Great Basin is generally north-south. Large Pliocene and Pleistocene displacements on these faults indicate a nearly east-west orientation (azimuth of 100 degrees) of the least principal compressive stress (sigma3) axis. Ernie Anderson's paleostress studies in central Utah indicate that in the Transition Zone between the Great Basin and Colorado Plateau, the sigma3 azimuth is rotated, in a clockwise sense, from the Pliocene sigma3 direction. The rotation is 20 to 25 degrees, measured from strikes of Pliocene dikes, and 90 degrees deduced from slips on a localized groupd of faults. Both sets of features (dikes and the group of faults) are located on the adjacent Colorado Plateau.

TABLE I....MEAN SPECTRAL RATIOS

AGE	0.2-0.7 (s)	0.7-1.0 (s)	NUMBER OF SAMPLES
Post-Bonneville Lake	6.4	9.1	12
Late-Bonneville Lake	5.0	6.4	25
Early Bonneville Lake	4.2	3.7	5
SOIL	**0.2-0.7 (s)**	**0.7-1.0 (s)**	**NUMBER OF SAMPLES**
Silt and clay	6.9	8.1	20
Sand and gravel	4.2	6.4	7
Rubble	3.3	3.6	5

FIGURE I

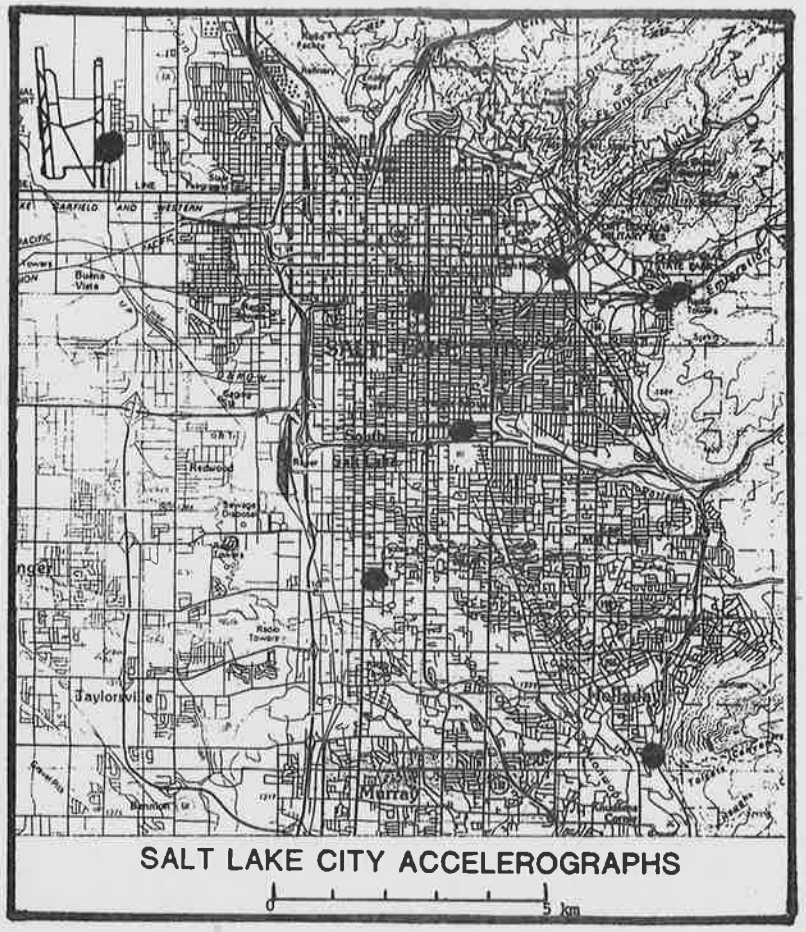

TABLE II....SALT LAKE CITY ACCELEROGRAPHS

No.	Name	Latitude (°N)	Longitude (°W)	Natural Frequency	Damping % Critical	Surficial geology	Thickness of Quaternary
1	Salt Lake Junct.	40.7500	111.8080	L 26.3 V 26.3 T 27.8	59 62 61	bedrock (Twin Creek Limestone)	0'
2	Sunnyside Trng.Center	40.7435	111.8135	L 25.0 V no cal. T 25.6	57 67	lake clay over alluvial fan	50'
3	Fairmont City Park	40.7223	111.8597	L 25.6 V 24.4 T 25.0	62 61 57	alluvial fan over lake clay and deltaic	300'
4	Liberty City Park	40.7468	111.8715	L 25.0 V 25.6 T 26.3	59 61 57	marsh sediments over lake clay	450'
5	Roosevelt Elementary School	40.7012	111.8657	L 25.0 V 25.6 T 25.6	63 63 57	Holocene sand over lake clay	550'
6	East Airport	40.7838	111.9633	L 26.3 V 25.6 T 26.3	55 61 63	alternating lake clay and deltaic	1,200'

M - stations operated by Engineering Seismology, Menlo Park

(All instruments are Kinemetrics SMA-1 with 1g accelerometers and vertical 0.1g triggers)