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INFORMATION AND SERVICE SINCE 1889

- geologic information
- geologic library and databases
- mapping and framework
- hazards and limitations
- mineral resources
- well cuttings and core repository
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New Waddell Dam Completed

Larry D. Fellows
Director and State Geologist

The New Waddell Dam on the Agua Fria River, just downstream from the old dam and Lake Pleasant northwest of Phoenix, was completed in October 1992. Construction began in 1986. It is a zoned earthfill dam 4,800 feet long and 1,200 feet wide at the base. Its crest elevation is 1,730 feet, 300 feet above the river bed. The reservoir completely submerges the old dam. Heavy rainfall (nearly 10.7 inches) in January and February 1993 caused the reservoir to fill much faster than expected, added about 292,000 acre feet of water, and saved the project \$12 million had Central Arizona Project (CAP) canal water been used. The reservoir is presently at 87 percent of its full elevation and is storing 64 percent of its 856,400 acre-foot capacity.

The primary purpose of the

project, constructed and managed by the U.S. Bureau of Reclamation, is to store CAP water, which will be pumped into the reservoir during winter months when water is readily available and out during summer months when demand is greatest. The reservoir can provide water for downstream users if the CAP canal is out of service for maintenance between the dam and the Colorado River. The new reservoir, much larger than the old one, will provide increased recreational opportunities. In addition, there will be incidental flood protection downstream.

Geologic conditions were investigated prior to construction to identify buried sand- and gravel-filled alluvial channels and to determine engineering characteristics. Geophysical techniques were used to determine thickness of the alluvial deposits. More than 300 holes were drilled, cores were taken, and borehole geophysical methods were used to identify alluvium-filled joints. Monitoring devices measure settlement, deflection, and pressure and monitoring wells adjacent to the reservoir measure changes in ground water during filling.



Figure 1. New Waddell Dam. Photograph by J. Madrigal, Jr., U.S. Bureau of Reclamation.

Mapping Season Begins

Digital Information

The *Digital Information (DI) publication series* has been established by the Arizona Geological Survey (AZGS) to address the growing use of computers in the geological professions. Database products and digital maps will be included. Initial releases will be oriented toward personal-computer-based applications because of current hardware and software limitations within the AZGS.

DI-1, Digital Geologic Map of Arizona, is a digitized version of AZGS Map 26. The U.S. Bureau of Land Management digitized the map. AZGS geologist Stephen M. Richard incorporated selected data that have become available since Map 26 was prepared in 1988 and made other modifications. The map is presented in Adobe Illustrator 1.1 format.

DI-1 costs \$30 plus \$1 for shipping and handling. It is available on 2 high-density floppy disks or by FTP on the Internet (no shipping charge). For additional information please contact Steve Richard at the AZGS (address on page 4 or by e-mail SRICHARD@ccit.Arizona.edu).

Geologic mapping for Fiscal Year 1993-94 began in October. The Arizona Geological Survey (AZGS) will spend approximately \$150,000 of its State budget on geologic mapping and related activities and the U.S. Geological Survey (USGS) will provide an additional \$80,161 as part of the National Geologic Mapping Program (NGMP). The NGMP funded thirty-seven mapping projects from 34 state geological surveys for a total of \$1,183,042.

Bedrock geologic mapping. Bedrock geologic mapping will be done in the Tank and Palomas Mountains in Yuma County and the east-central Gila Bend Mountains in Maricopa County. Additional mapping will probably be done in the Plomosa Mountains in La Paz County and the Artillery Mountains in Mohave County. Bedrock geologic mapping projects are planned and directed by AZGS geologist Jon E. Spencer, with assistance from Stephen M. Richard.

During 1992-93 AZGS geologists produced 7 new bedrock geologic maps, which were released as Open-File Reports (OFR) 93-5 to 93-10 and 93-12. Six of the maps cover parts of the Phoenix 1° x 2° quadrangle. Most of the mapping was done at

1:24,000 scale. The character of the rock formations was described and their sequence and distribution were determined. Relationships between mineral occurrences and deposits and the geologic framework were interpreted. The new mapping revealed, among other things, that (1) metallic mineralization was commonly controlled by northwest-trending shear zones, and (2) in many areas mineralization was associated with emplacement of felsic or mafic dikes into these shear zones.

Surficial geologic mapping. Surficial geologic mapping will be done in the Mesa 30' x 60' quadrangle, the Verde Valley, along the northwestern edge of the Phoenix metropolitan area, and around Table Top Mountain in western Pinal County. Surficial geologic mapping is planned and directed by Philip A. Pearthree.

AZGS geologists produced 1:24,000-scale surficial geologic maps of all or parts of 26 quadrangles during 1992-93. Since 1988, surficial geologic mapping has been focused primarily on urban and urban-fringe areas, where basic geologic map information is used to assess geologic hazards and other potential land-manage-

ment problems.

During the past year, mapping was conducted on the southeastern fringe of the Phoenix metropolitan area (OFR 93-3 and 93-15), the northwestern fringe of the Tucson area (OFR 93-13 and 93-14), and the northern Verde Valley near Cottonwood (OFR 93-16). The maps depict alluvial deposits that range in age from modern to more than one million years old. Detailed surficial geologic maps provide information about the extent of flood-prone areas, areas that may be subject to landslides or debris flows, and general soil and sediment characteristics that might impact existing or future construction or land management.

1984-93. The AZGS spent approximately \$1.1 million from its State budget on geologic mapping and related activities from 1984-93, mostly in the Phoenix 1° x 2° quadrangle. The USGS provided an additional \$576,400. During this decade AZGS geologists completed 67 geologic maps and 42 investigations based on the mapping. In addition, they made 28 technical presentations, with published abstracts, to describe results of mapping and investigations.

Just Released

The Arizona Geological Survey (AZGS) released 6 new publications since September 1993. Please mail publication requests to AZGS Publications, 845 N. Park Ave., #100, Tucson, AZ 85719-4816. Orders are shipped by UPS; a street address is required for delivery. All orders must be prepaid by check or money order payable in U.S. dollars to the Arizona Geological Survey. Add these shipping charges to your total order:

Shipping & Handling CHARGES

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Surficial geologic maps of the northern Avra Valley - Desert Peak area, Pinal and Pima Counties, southern Arizona: J.J. Field and P.A. Pearthree, Open-File Report 93-13, 12 p., 9 sheets, scale 1:24,000. \$20.00

Alluvial deposits in this largely undeveloped area northwest of Tucson are subdivided on the basis of age and whether deposited by piedmont streams or major streams that flow through the basin flats. Generalized

bedrock units are also shown. Potential geologic hazards and conditions that could impact future development are summarized.

Detailed surficial geologic map of the southern piedmont of the Tortolita Mountains, Pima County, southern Arizona:

K.A. Demsey, P.K. House, and P.A. Pearthree, Open-File Report 93-14, 9 p., scale 1:24,000. \$4.50

Piedmont alluvial deposits in the study area, located on the northwestern edge of the Tucson metropolitan area, are subdivided into age categories that range from modern to approximately 500,000 years old. Implications of the distribution and character of surficial geologic units for potential flooding, soil problems, and debris-flow and rockfall hazards are discussed.

Surficial geology of the Superstition Mountain piedmont area, northern Pinal and eastern Maricopa Counties, Arizona:

Gary Huckleberry, Open-File Report 93-15, 34 p., 6 sheets, scale 1:24,000. \$13.75

The mapped area, located in the southeastern portion of the Phoenix basin, contains several landscape elements, including steep mountain slopes,

pediments, alluvial fans, and stream terraces.

Surficial deposits are subdivided into 5 age categories that range from modern to about 2 million years. Soil development increases dramatically with increasing age. Flood-prone areas are extensive on the middle and lower piedmonts. The Superstition Mountains are fringed with broad pediments (shallow bedrock areas).

Surficial geology of the northern Verde Valley, Yavapai County, Arizona:

P.K. House and P.A. Pearthree, Open-File Report 93-16, 20 p., 4 sheets, scale 1:24,000. \$9.00

Steep mountain slopes, alluvial fans, and river terraces are common within the mapped area. Surficial deposits, subdivided into 19 map units based on age and source lithology, range in age from modern to about 2 million years. They record the long-term downcutting of the Verde River and its tributaries and major climate changes. Generalized bedrock types are also shown.

Geologic map of the Phoenix North 30' x 60' quadrangle, central Arizona:

S.J. Reynolds and M.J. Grubensky, compilers, Open-File Report 93-17, 1 sheet, scale 1:100,000. \$5.00 and

Down to Earth

The *Down-to-Earth (DTE) publication series* was established by the AZGS in 1991 to provide *nontechnical* information about geologic topics of general interest. Three reports have been published:

DTE 1, Energy resources of Arizona. Coal, hydroelectric, uranium and nuclear, oil and gas, geothermal, solar, wind, and biomass are described. An energy resources map (1:1,000,000 scale) is included. Agencies with energy-management responsibilities are listed. \$6.50 plus shipping and handling.

DTE 2, Radon gas: a geologic hazard in Arizona. Populated areas that have potential for elevated indoor radon are listed. Health risks and methods to determine indoor-radon levels are described. \$2.50 plus shipping and handling.

DTE 3, Land subsidence and earth fissures in Arizona. Portions of southern Arizona have experienced subsidence and earth fissuring because ground water was pumped faster than natural recharge occurred. Causes and impacts are described. \$4.50 plus shipping and handling.

Earthquake Brochure

A new brochure, **Arizona Earthquakes: Are We at Risk?**, contains information about what happens during an earthquake, Arizona's earthquake risk, and potential effects of major California earthquakes on

Arizona. It also provides earthquake-safety tips and lists the names, addresses, and phone numbers of Arizona-earthquake "specialists."

The AZGS prepared the brochure in cooperation with the Earthquake Preparedness Program. Special assistance in writing and review was

provided by faculty members of Northern Arizona University's Earthquake Information Center, Arizona State University's Geology Department, and the University of Arizona's Southern Arizona Seismic Observatory.

The brochure is available in English or Spanish. Free copies may be obtained from the Arizona Division of Emergency Management, Earthquake Preparedness Program, 5636 East McDowell Road, Phoenix, AZ 85007. Phone: (602) 231-6394.

JUST RELEASED, from page 3

Geologic map of the Phoenix South 30' x 60' quadrangle, central Arizona: S.J. Reynolds and S.J. Skotnicki, compilers, Open-File Report 93-18, 1 sheet, scale 1:100,000. \$5.00

These maps were compiled largely from 1:24,000-scale geologic maps, many of which were previously released as open-file reports. Surficial deposits and bedrock units are shown. Sources of map data are listed.

McKelvey Forum

The U.S. Geological Survey (USGS) will hold its 9th **V.E. McKelvey Forum on Mineral and Energy Resources** in the Tucson Convention Center February 22-25, 1994.

The Forum will highlight USGS research on the geology and mineral resources of the southwestern United States and Latin America as well as recent developments in minerals-related environmental research. Pre- and post-meeting field trips will provide an overview of the regional geology. The Forum is co-sponsored by the Department of Geosciences at the University of Arizona, the Arizona Geological Survey (AZGS), and the Arizona Geological Society (AGS).

An open house will be held at the USGS Center for Inter-American Mineral Resource Investigations,

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Minerals Information Office, and Earth Science Information Center in the Corbett Building. Publications of the USGS, AZGS, and AGS will be available for purchase.

For more information contact the U.S. Geological Survey, Attn: McKelvey Forum, Federal Center, Mail Stop 905, P.O. Box 25046, Denver, CO 80225-0046. Phone: (303) 236-5568; FAX: (303) 236-5603.



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