U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES MAP MF–2370
SHEET 2 OF 3
Version 1.0
Pamphlet accompanies map

INTERPRETIVE GEOLOGIC CROSS SECTIONS FOR THE DEATH VALLEY REGIONAL FLOW SYSTEM AND SURROUNDING AREAS, NEVADA AND CALIFORNIA

By
Donald S. Sweetkind1, Robert P. Dickerson2, Richard J. Blakely3, and Paul D. Denning1
2001

1U.S. Geological Survey, Denver, Colo.
2Pacific Western Technologies, Inc., Denver, Colo.
3U.S. Geological Survey, Menlo Park, Calif.

Cross sections H-1 to H-5, H-13 to H-16, and H-23 to H-28 at scale of 1:250,000.

Details of cross sections H-2 to H-5 and H-24 to H-28 at scale of 1:100,000.

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Undifferentiated Quaternary deposits
Undifferentiated Quaternary and Tertiary deposits (Holocene to Pliocene, but may locally include Miocene and Oligocene deposits)

BEDROCK UNITS

VOLCANIC ROCKS

Basaltic lava flows, undivided (Pleistocene to Miocene)

Volcanic rocks of the Death Valley vicinity

Volcanic rocks (Pliocene and Miocene)—Volcanic rocks associated with the central Death Valley volcanic field and other volcanic rocks of the Death Valley area. Includes the 6.0- to 5.4-Ma Greenwater Volcanics (Pliocene) of the Death Valley area and the 12- to 9-Ma dacitic rocks in Death Valley and the Grapevine Mountains

Volcanic rocks of the Nevada Test Site and vicinity

Stonewall Flat Tuff (Miocene), Thirsty Canyon Group (Miocene), and younger volcanic rocks, undivided—Includes Fortymile Canyon assemblage and rocks that fill moat of the Timber Mountain caldera
Timber Mountain Group (Miocene)
Intracaldera and caldera margin megabreccia, undivided (Miocene)
Paintbrush Group (Miocene)
Calico Hills Formation (Miocene)
Wahmonie and Salyer Formations, undivided (Miocene)
Crater Flat Group (Miocene)
Belted Range Group (Miocene)
Older ash-flow tuffs and lava sequences (Miocene)—Includes Lithic Ridge Tuff, Tunnel Formation, Tub Spring Tuff, tuff of Yucca Flat, and other volcanic units older than the Belted Range Group
Volcanic rocks, undivided (Pliocene to Oligocene)—Includes all volcanic rocks associated with the southwestern Nevada volcanic field and also older volcanic rocks not associated with southwestern Nevada volcanic field, including Kane Wash Tuff, Hiko Tuff, and Fraction Tuff (Miocene) and Shingle Pass Tuff and Monotony Tuff (Oligocene). Where subsurface information is available, unit is subdivided into younger and older units
Younger volcanic rocks, undivided (Pliocene to Miocene)—Includes Crater Flat Group and younger rocks; use is restricted to sections H-6, H-16, and H-22 where these sections cross northwestern part of Amargosa Desert
Older volcanic rocks, undivided (Miocene to Oligocene)—Use is restricted to north end of section H-19; unit is used for Miocene and Oligocene volcanic rocks not associated with southwestern Nevada volcanic field, including Kane Wash Tuff, Hiko Tuff, and Fraction Tuff (Miocene) and Shingle Pass Tuff and Monotony Tuff (Oligocene)

INTRUSIVE AND METAMORPHIC ROCKS (MIOCENE TO CRETACEOUS)

Intrusive rocks (Miocene and Oligocene)—Intrusive rocks of Tertiary age. Includes granitic and mafic intrusive rocks in the Black Mountains (for example, Willow Spring Diorite and granite at Smith Mountain) and Panamint Mountains, hypabyssal intrusive rocks in the Greenwater Range (for example, Brown Peak intrusive center), and intrusive rocks at the Nevada Test Site [associated with the Timber Mountain Group, Calico Hills Formation and Wahmonie Formation (Miocene)]. Locally includes minor associated extrusive rocks
Intrusive rocks (Oligocene to Cretaceous)—Intrusions and dikes of Cretaceous age or those intrusions whose age is poorly constrained. Includes plutons in the Panamint Range and plutons north of Yucca Flat at the Nevada Test Site

CONTINENTAL SEDIMENTARY ROCKS (PLIOCENE TO OLIGOCENE)

Unit 4 (Pleistocene? to Miocene)—Late synextensional to post-extensional sedimentary rocks, predominantly post 6 Ma. Includes the Funeral Formation (Pleistocene? and Pliocene) of the Furnace Creek basin
Unit 3 (predominantly Miocene)—Miocene synextensional and (or) synvolcanic sedimentary rocks, predominantly between 14 and 10 Ma. Includes the Artist

Drive (Pliocene to Oligocene?) and Furnace Creek Formations (Pliocene? and Miocene) within the Furnace Creek basin
Older Tertiary sedimentary rocks, undivided (Miocene to Eocene)
Tertiary sedimentary rocks, undivided (Pleistocene? to Eocene)

SEDIMENTARY AND METASEDIMENTARY ROCKS (MESOZOIC TO PROTEROZOIC)

Aztec Sandstone (Lower Jurassic)—Exposed in the eastern and southern Spring Mountains
Chinle Formation (Upper Triassic) and Moenkopi Formation (Middle? and Lower Triassic), undivided—Exposed in the eastern Spring Mountains
Kaibab and Toroweap Formations, undivided (Lower Permian)—Includes Permian redbeds that underlie the Toroweap Formation. Exposed in the Spring Mountains
Tectonically disrupted Paleozoic and Late Proterozoic sedimentary rocks, undivided—Pahrump Group (Late Proterozoic) and younger sedimentary rocks that are tectonically thinned and (or) pervasively brecciated in the upper plates of extensional detachment faults. Use is restricted to the Death Valley area
Permian and Pennsylvanian rocks, undivided—Predominantly carbonate rocks. Includes the Keeler Canyon Formation (Lower Permian to Middle Pennsylvanian), exposed in the Last Chance Range and Cottonwood Mountains; the Bird Spring Formation (Lower Permian to Pennsylvanian), exposed in the Spring Mountains, Las Vegas Range, Sheep Range, and Nopah Range; and the Tippipah Limestone (Lower Permian and Pennsylvanian), exposed at the Nevada Test Site
Mississippian rocks, undivided—Mostly carbonate rocks. Includes the Monte Cristo Limestone (Upper and Lower Mississippian), exposed in the Montgomery Mountains, Spring Mountains, and nearby ranges; the Joana Limestone (Lower Mississippian), exposed in the Pahranagat Range; various Mississippian carbonate units in the Spotted Range; and carbonate rocks of the Perdido Formation and Tin Mountain Limestone (Lower Mississippian) in the Cottonwood Mountains and Last Chance Range. In Keystone thrust plate (eastern Spring Mountains), includes the Sultan Limestone (Lower Mississippian to Middle Devonian)
Chainman Shale (Mississippian)—Exposed in the Pahranagat Range, and the eastern Nevada Test Site (Syncline Ridge, CP Hills, and Calico Hills). Includes the Scotty Wash Quartzite
Eleana Formation (Mississippian and Upper Devonian)—Exposed in the Nevada Test Site area. Shown on cross sections within footwall duplex of Belted Range thrust
Devonian and Silurian rocks, undivided (Devonian and Silurian)—Includes the Simonson Dolomite (Middle and Lower Devonian), Sevy Dolomite (Lower Devonian), and Laketown Dolomite (Silurian)
Ordovician rocks, undivided—Includes the Ely Springs Dolomite (Upper Ordovician), Eureka Quartzite (Upper and Middle Ordovician), and Pogonip Group (Middle and Lower Ordovician)
Nopah (Upper Cambrian), Bonanza King (Upper and Middle Cambrian), and Carrara (Middle and Lower Cambrian) Formations, undivided

Zabriskie Quartzite (Lower Cambrian) and Wood Canyon Formation (Lower Cambrian to Late Proterozoic), undivided
Stirling Quartzite (Late Proterozoic)
Johnnie Formation (Late Proterozoic)
Stirling Quartzite and Johnnie Formation, undivided (Late Proterozoic)—Use is restricted to the vicinity of the Spring Mountains in footwall of Keystone thrust and to thrust duplexes that are inferred at depth
Stirling Quartzite and Johnnie Formation (Late Proterozoic) and Pahrump Group (Middle to Late Proterozoic), undivided—Use is restricted to those areas where these rocks are metamorphosed to medium grades; includes minor younger igneous rocks. Occurs at Bare Mountain, the Funeral Mountains, and the Bullfrog Hills
Metamorphic and igneous rocks, undifferentiated (Late Proterozoic to Early? Proterozoic)—Includes all Proterozoic rocks; use is restricted to section H-22
Noonday Dolomite (Late Proterozoic) and Pahrump Group (Middle and Late Proterozoic), undivided
Metamorphic and igneous rocks, undifferentiated (Early? Proterozoic)

HYDROGEOLOGIC UNITS (PALEOZOIC TO PROTEROZOIC)

[Use is restricted to those sections or parts of sections where abundant Quaternary cover (for example, section H-22 and northeastern end of section H-29) or lack of detailed map data (for example, sections H-44 and H-45) prevent more detailed stratigraphic subdivision]

Lower carbonate-rock aquifer (Devonian to Cambrian)—Includes Paleozoic carbonate rocks of Devonian to Cambrian age, as used by Laczniak and others (1996)
Lower clastic confining unit (Late Proterozoic to Lower Cambrian)—Predominantly clastic rocks; equivalent to the quartzite confining unit of Laczniak and others (1996)

EXPLANATION OF SYMBOLS USED ON CROSS SECTIONS

[These sections use no direct subsurface data, such as borehole data, below about 2 km; all contacts and faults below this depth are interpreted. Confidence in the geologic interpretation naturally decreases with depth; however, for legibility, all contacts and faults are shown as solid lines]

Contact between lithologic or hydrogeologic units
Normal fault or thrust fault—Opposed barbs indicate direction of relative vertical movement. D and U indicate relative down and up motion, respectively, for normal faults that are subparallel to the line of section. Dashed where projected above land surface
Strike-slip fault—A and T indicate direction of relative movement away from and toward observer, respectively
Profile representing the inferred base of the Cenozoic section, based upon inversion of regional gravity data—After Blakely and others (1999)

Tie point with intersecting cross section—Some intersects not apparent to viewer at scale (1:750,000) of accompanying index maps. All coordinates of individual cross section tie points are reported in metadata that supports the associated digital files

Tie point with boundary of Nevada Test Site

Tie point with U.S. Highway 95

Tie point with county boundary

Bend in cross section—All bends in cross section are shown. Some subtle bends are not discernible to viewer at scale (1:750,000) of accompanying index maps. Location of all vertices (section bends) are reported in metadata that supports the associated digital files

Any use of trade names in this publication is for
descriptive purposes only and does not imply
endorsement by the U.S. Geological Survey
For sale by U.S. Geological Survey Information Services
Box 25286, Federal Center, Denver, CO 80225
1-888-ASK-USGS
A PDF for this map is available at http://geology.cr.usgs.gov/greenwood-pubs.html