UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF THE PARAGONAH QUADRANGLE, IRON COUNTY, UTAH

By

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DESCRIPTION OF MAP UNITS

[Phenocryst contents are averages]

Qt **Talus deposits (Holocene)**--Deposits of unsorted, unstratified angular rock fragments as large as 3 m in diameter that have moved down steep bedrock slopes and collected at the base. Rock fragments are generally in contact and the interstices are commonly filled with a matrix of sand, silt, and clay. Forms slopes of about 30°. Thickness less than 5 m

Qae **Windblown sand and silt (Holocene)**--Yellowish-brown to reddish-brown, moderately well-sorted, locally cross bedded sand and silt blown primarily northward and eastward from Little Salt Lake playa. Forms poorly developed small dunes or thin sheets covered with vegetation. Generally more saline than the underlying alluvium. Salinity allows greasewood to flourish at the expense of sagebrush. Thickness less than 2 m

Ql **Little Salt Lake playa deposits (Holocene and Pleistocene)**--Calcareous, saline, and gypsiferous gray clay, silt, and sand deposited on the flat playa floor of intermittent Little Salt Lake. Includes some dunes of windblown silt (Qae). Playa formed behind a structural dam created by Quaternary uplift of the Red Hills (Threet, 1952; Anderson and Christenson, 1989). Depth of playa basin is controlled by a dam created by small, active alluvial fans that extend across Parowan Gap canyon near its eastern end about 6 km west of the quadrangle boundary (Neilson, 1983). Thickness at least 5 m

Qlm **Playa-margin deposits (Holocene)**--Calcareous, saline, and gypsiferous gray clay, silt, sand, and pebbles of volcanic rocks and quartzite deposited on gentle slopes around the margin of Little Salt Lake playa. Subject to periodic flooding during high lake stands. Includes slope wash alluvium, stream alluvium, small alluvial fans, and windblown sand and silt. Forms slopes of less than 1°. Thickness less than 4 m

Qsf **Stream floodplain alluvium (Holocene)**--Channel fill gravel, sand, and silt overlain by overbank and slope wash deposits of laminated fine sand and silt. Young soils with a thin mollic epipedon (surface horizon darkened by organic matter from grassy vegetation) developed on depositional surface. Surface covered with a loosely packed pavement of pebbles with fine sediment between clasts. Locally includes small channel deposits. Depositional surface as high as 2 m above stream channel bottoms. Forms slopes of less than 1°. Maximum observed thickness 3 m

Alluviual fan deposits undivided (Holocene and Pleistocene)--Poorly sorted, very poorly bedded pebbles, cobbles, and sparse boulders supported by a silty sand matrix. West of Little Salt Lake and Fremont Wash, subangular clasts of Tertiary volcanic rocks as large as 1 m, eroded from the northern Red Hills in the northwest corner of the quadrangle and the Black Mountains north of the quadrangle, are predominant. Elsewhere rounded cobbles as much as 10 cm in diameter, derived from the conglomerates of the Claron Formation (Tc) and the sedimentary and volcaniclastic rocks of Red Hills (Trs), are included. Clast size decreases toward the center of the basin

Qfa **Active fan alluvium (Holocene)**--Generally makes up active alluvial fans that are little incised and postdate most faults, although they are locally offset less than 1 m by the most recent fault movement. Locally deposited on the downthrown side of fault scarps after faulting. Locally includes deposits of small stream channels and floodplains. Very little soil development, although the surface is covered with a loosely packed pavement of pebbles with fine sediment between clasts. Forms slopes of less than 10°. Maximum observed thickness 20 m

Qf **Fan alluvium (late Pleistocene)**--Unit occurs as remnants of alluvial fans that no longer receive sediment because of incision resulting from late Pleistocene faulting or uplift. Unit locally includes thin alluvium that covers pediments cut on older alluvium. Soil weakly cemented by calcium carbonate between 35 and 75 cm depth (Crandell, Gorden, U.S. Soil Conservation Service, Cedar City, Utah, 1989, written commun.). Thin carbonate coatings occur on bottoms of clasts. Surface covered with a well developed pavement of closely packed pebbles and cobbles. Forms slopes of less than 15°. Maximum observed thickness 20 m

Qfo **Older fan alluvium (middle? Pleistocene)**--Unit occurs as abandoned remnants of alluvial fans preserved as terraces about 8 m above the general level of the uplifted Qf fan surface west of Little Salt Lake fault (Thomas and Taylor, 1946). Soil moderately cemented by calcium carbonate between 35 and 90 cm depth (Crandell, Gorden, 1989, written commum.). Carbonate deposited on the bottom of clasts forms rinds and pendants about 5 mm thick. Surface covered by well developed pavement of closely spaced pebbles. Forms slopes of less than 18°. Maximum observed thickness 10 m

Qp **Pediment alluvium (middle? Pleistocene)**--Poorly sorted, weakly bedded, subangular, pebbles, cobbles, and sparse boulders of Tertiary volcanic rocks supported by a silty sand matrix. Surface has moderately packed pavement of pebbles and cobbles overlying 4 cm of silt-rich, vesicular A soil horizon. Thin calcium carbonate coatings deposited on bottom of some surface clasts, but no strong carbonate horizon development. Soil formed at relatively high altitude in low carbonate sediment under conifers. Slight desert varnish on surface clasts. Unit deposited as a relatively thin veneer that covers a fan-shaped surface generally eroded on poorly consolidated layers of the sedimentary and volcaniclastic rocks and tuffs of Red Hills (Trs), Leach Canyon Formation (Tl), and Wah Wah Springs Formation (Tnw). Deposits are preserved on benches and interior valleys within the northern Red Hills in the northwestern corner of the quadrangle. Slopes about 16°. 1 to 4 m thick

Qbw **Basalt lava flows of Water Canyon (middle Pleistocene)**--Black to dark-gray olivine bearing flows, dense to vesiculated. Present near southeast corner of quadrangle. Vent is located approximately 5 km from southeast corner of the quadrangle on the Markagunt Plateau, in Water Canyon (Moore, 1982), where the flows fill a paleovalley that extends into the quadrangle. K-Ar age is 0.4± 0.04 Ma (Fleck and others, 1975). Thickness about 60 m

Qbb **Basaltic agglomerate and volcaniclastic rocks of Black Knob (Pleistocene?)**--Agglomerate composed of fragments of basalt, basaltic andesite and rare porphyritic andesite(?) in a pale-yellowish-brown, fine- to coarse-grained matrix. Occasional very light gray ash-beds intercalated with agglomerate. Present only in northwest part of quadrangle. Maximium exposed thickness about 60 m

Qdd **Diabase(?) dike (Pleistocene?)**--Pale-yellow brown, weathers to grayish orange pink; porphyritic, contains approximately 20 percent phenocrysts of plagioclase and pyroxene. Possible feeder dike for Qbb rocks. Found only at Black Knob

QTf **Alluvial sediments of Little Salt Lake fault (early Pleistocene and late Tertiary)** -- Primarily yellowish-brown, medium-grained, subangular, weakly indurated tuffaceous sandstone interbedded with light-brownish-gray, silty, tuffaceous, weakly indurated mudstone, and reddish-black, subangular, coarse-grained, weakly indurated, basaltic sandstone. Sandstone beds locally contain matrix-supported, subrounded, basalt clasts as large as 50 cm in diameter probably derived from eruption or erosion of basalts of Black Knob (Qbb). Mudstone locally contains white ash beds 1 cm thick. Exposed only in small areas beneath fan alluvium on the upthrown side of the Little Salt Lake fault (Fig. 1). Extensively sheared, faulted and tilted as much as 41°. Some fractures coated with calcium carbonate. Base not exposed. Exposed thickness 10 m

QTs **Basin-fill deposits of Slough Bench (early Pleistocene and late Tertiary)**--Eroded remnants of uplifted distal alluvial fan and basin-center slope wash deposits in Parowan Valley. Finest beds contain as much as 50 percent clay. Coarsest beds contain about 35 percent quartzite and volcanic rocks as large as 3 cm in diameter. Calcareous (less than 37 percent calcium carbonate), gypsiferous, and strongly saline (Gorden Crandell, 1989, written commun.). These deposits form low hills consisting of uplifted, structural blocks along the axis of the Parowan Valley. The deposits are poorly exposed and commonly veneered with windblown sand and silt from the Little Salt Lake playa. Soils are 1.5 m thick with natric and carbonate-enriched horizons (Crandell, Gorden, 1989, written commum.). Eroded to slopes of less than 5°. Thickness greater than 180 m (Bjorklund and others, 1977)

Tm **Megabreccia deposit (Miocene)**--Consist of a chaotic mixture of gravity-slide blocks composed of parts of two or more of the following units: Leach Canyon Formation (Tl), Bear Valley Formation (Tbv), Baldhills Tuff Member of Isom Formation (Tib), Wah Wah Springs Formation (Tnw), Cottonwood Wash Tuff (Tnc), and possibly sedimentary and volcaniclastic rocks and tuffs of Red Hills unit (Trs). Located near northwest corner of quadrangle. Larger blocks locally differentiated and labled with map unit symbols of individual parent rock units

Tl **Leach Canyon Formation of Quichapa Group (Oligocene)**--Moderately resistant to resistant, white to grayish-orange-pink rhyolitic partly to moderately welded ash-flow tuff. Contains about 15-25 percent phenocrysts of plagioclase (35-45 percent), quartz (25-30 percent), sanidine (20-30 percent), biotite (5 percent), hornblende (2 percent), Fe-Ti oxides (2 percent), and pyroxene (1 percent) (Anderson and Rowley, 1975). Characterized by high content (about 5 percent) of lithic fragments that are predominantly red. Thin vitrophyre, approximately 0.5 m thick, locally present at base. Typically erodes to hoodos. May include both Table Butte Tuff Member and underlying Narrows Tuff Member. Defined by Williams (1967). Average K-Ar age is 24.7 Ma (Armstrong, 1970). Maximum exposed thickness about 120 m

Tbv **Bear Valley Formation (Oligocene)**--Poorly resistant olive-gray, yellow-gray, and medium-green, commonly crossbedded tuffaceous sandstone that has been interpreted as eolian in origin (Anderson, 1971). Composed of subangular to well-rounded volcanic clasts, glass shards, and mineral grains mostly of feldspar, pyroxene, hornblende, biotite, magnetite, and quartz. Cemented by the zeolite clinoptilolite (Anderson, 1971). Locally includes thin conglomerate at base of the formation. Formation locally missing because of Tertiary erosion or tectonism. Resembles tuffaceous sandstone within the sedimentary and volcaniclastic rocks and tuffs of Red Hills unit (Trs). Defined by Anderson (1971). K-Ar age of about 25 Ma determined from interbedded tuff beds within the formation, that have been indentified in other areas (Fleck and others, 1975). Incomplete thickness about 0-60 m

Tib **Baldhills Tuff Member of Isom Formation (Oligocene)**--Moderately resistant to resistant, composed of many densely welded, trachytic ash-flow tuff cooling units that contain 5-20 percent phenocrysts, mostly of plagioclase and minor pyroxene and Fe-Ti oxides in a glassy to devitrified groundmass (Anderson and Rowley, 1975). In the Red Hills area, nine cooling units may be present and are in descending order: (1) yellowish-gray, relatively crystal-rich tuff, containing abundant spherical vesicles and locally overlain by a black vitrophyre that may represent remnant of a younger cooling unit; (2) cliff-forming pale-red to grayish-red, crystal-rich tuff, characterized by elongated vesicles and secondary flowage structures that are both flattened and folded and resemble flowage features in lava flows; (3) cliff-forming, pale-red to grayish-red, crystal-rich tuff containing common elongated vesicles; (4) slope-forming, yellowish-gray, relatively crystal-poor tuff, containing common spheroids; (5) slope-forming, light-brown, crystal- and lithic-rich tuff; (6) slope-forming, pale-reddish-brown, crystal-rich tuff; (7) slope-forming, yellowish-gray, crystal-poor tuff, containing abundant enlongated vesicles; (8) slope-forming, very dusky red, crystal-poor tuff; and (9) slope-forming, pale-reddish-purple, crystal-poor tuff. Uppermost part of member may locally include a thin tuff, too thin to map separately, of the Hole-in-the-Wall Member of the Isom Formation, (Anderson and Rowley, 1975). Defined by Mackin (1960). Caldera source of the Baldhills is probably at the northwest edge of the Escalante Desert (Best, Christiansen, and Blank, 1989). K-Ar age of 25.9±0.4 Ma determined by Fleck and others (1975). Maximum thickness about 245 m

Needles Range Group (Oligocene)--Defined as a formation by Mackin (1960) and later elevated to group status by Best and Grant (1987)

Tnw **Wah Wah Springs Formation**--Simple cooling unit of moderately resistant grayish-orange-pink, dacitic, moderately welded, ash-flow tuff. Contains approximately 35 percent phenocrysts of plagioclase (70 percent), hornblende (15 percent), biotite (5 percent), quartz (5 percent), Fe-Ti oxides (3 percent), sanidine (2 percent), and trace amounts of pyroxene, apatite, and zircon (Anderson and Rowley, 1975). Ferromagnesium mineral crystals are generally smaller than those in underlying Cottonwood Wash Tuff and matrix is generally lighter color. Long collapsed pumice common. Fractures commonly parallel to the plane of compaction foliation. Locally contains spheriodal masses of tuff as large as 0.3 m in diameter in the uppermost part of unit. At the base of the formation is a unit about 4 m thick composed predominantly of pale-greenish-yellow tuffaceous sandstone and subordinate pebbly conglomerate consisting of volcanic rock fragments. Source area of the formation is the Indian Peak caldera (Best and Grant, 1987, Best, Christiansen, and Blank, 1989, Best and others, 1989), along the central Utah-Nevada border. Defined by Mackin (1960) and later elevated to formational status (Best and Grant, 1987). Average K-Ar age is about 29.5 Ma (Armstrong, 1970). Maximium thickness about 60 m

Tnc **Cottonwood Wash Tuff**--Simple cooling unit of moderately resistant grayish-orange-pink to light-brownish-gray, dacitic, moderately welded, ash-flow tuff. Contains approximately 40 percent phenocrysts of plagioclase (65 percent), hornblende (15 percent), quartz (10 percent), biotite (5 percent), Fe-Ti oxides (3 percent), sanidine (2 percent), and trace amount of pyroxene, apatite, and zircon (Anderson and Rowley, 1975). Long collapsed pumice common. Fractures commonly parrallel to the plane of compaction foliation. Vitrophyre present locally at base. Source area is thought to be concealed by alluvium in a valley between the Fortification Range of eastern Nevada and the Mountain Home Range of southwestern Utah (Best and Grant, 1987). Defined by Mackin (1960) and later elevated to formational status (Best and Grant, 1987). Average K-Ar age is about 30.6 Ma (Armstrong, 1970). Maximum thickness about 120 m

Tn **Needles Range Group undivided**--Composed of the Wah Wah Springs Formation and Cottonwood Wash Tuff

Trs **Sedimentary and volcaniclastic rocks and tuffs of Red Hills (Oligocene)**--Mostly poorly resistant pebble- to boulder-size conglomerate, sandstone, minor limestone and limy shale beds, tuffaceous sandstone, and mudflow breccia. The mudflow breccia is locally mapped separately as unit Trsm. Upper part of the overall map unit consists of conglomerate beds containing boulder-size clasts predominantly of ash-flow tuff (some resemble tuffs of the Needles Range Group), lava flows of intermediate composition, and minor amounts of quartzite and limestone. The boulder conglomerate beds contain local interbedded thin pale-red sandstone, pebble conglomerate, and mudflow(?) breccia. The mudflow(?) breccia contains volcanic clasts and grains of quartz, feldspar, hornblende, pyroxene, and trace amounts of garnet. Pebble conglomerate and coarse-grained sandstone beds are more common below the boulder conglomerate beds. The pebble conglomerate beds contain predominately quartzite and limestone clasts. In general, volcanic clasts are more common near the top of the unit and quartzite and limestone clasts are more common near the base. Thin yellowish-gray and light-gray tuffaceous sandstone beds are interbedded throughout and are thicker in the lower half of unit. The sandstones are laminated and crossbedded; they contain abundant biotite that gives the sandstone a salt-and-pepper appearance. The sandstones resemble those in the Bear Valley Formation. The upper part is equvilent to "local volcanic and sedimentary strata", a unit mapped on the Markagunt Plateau (Anderson and others, 1987). The lower part is equivalent to the upper part of the "white" subunit (Doelling and others, 1989) of the Claron Formation and mapped separetely here from the Claron Formation because of different lithology. In adjacent Parowan Gap quadrangle, the unit contains thin tuffs. Based not exposed but unit is approximately 210 m in adjacent Parowan Gap quadrangle

Trsm **Mudflow breccia**--Mapped locally. Contains clasts of intermediate-composition lava flow and light-yellowish-green tuffaceous sandstone in a pale-red, dusky-brown, and grayish-orange-pink matrix. Matrix composed of plagioclase, hornblende, pyroxene, and opaque mineral. Resembles mudflow breccia in the Mount Dutton (exposed in adjacent Parowan Gap quadrangle) and in the Bear Valley Formations

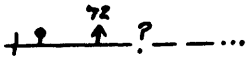
Tc **Claron Formation (Eocene)**--Slightly to moderately resistant fluvial and lacustrine deposits composed of intercalated sandstone, mudstone, limestone, and quartzite-limestone pebble conglomerate beds that contain well-rounded quartzite-limestone clasts. Conglomerate beds are more abundant in the map area than indicated for the same unit in other areas. Unit is mottled and varicolored, composed of pale-red, pale-reddish-brown, moderate-red, gray-yellow, moderate-reddish-orange, very pale orange, and gray-orange-pink beds. Fluvial and lacustrine deposits are intrepreted to have been altered by pedogenic processes (Mullett and others, 1988, Mullett, 1989). Claron Formation as mapped in this study is Eocene age, however, basal beds may be Paleocene or latest Cretaceous (Anderson and Rowley, 1975). Equivalent to the "pink" subunit (Doelling and others, 1989) of the Claron Formation. Incompletely exposed as fault slivers in the southeast corner of the quadrangle. Maximium exposed thickness about 45 m

Tpc **Conglomerate of Parowan Gap (Paleocene? and Upper Cretaceous?)**--Predominantly massive conglomerate beds locally interbedded with thin, coarse-grained sandstone. Well-rounded clasts predominantly quartzite and limestone and lesser amounts of sandstone and chert of pebble, cobble, and boulder size. In the Parowan Gap area, in adjacent Parowan Gap quadrangle, the conglomerate deposits are found locally as channel fill in paleotopography developed on erosional surface on underlying Iron Springs Formation that corresponds to an angular unconformity. Unit previously mapped as the lower part of the Claron Formation by Threet (1952), but mapped here separtely from the Claron Formation because of different lithology. Correlative with the Beehive unit of Hilton (1984) in the western part of the Markagunt Plateau. Incompletely exposed in the southeast corner of quadrangle. Maximum exposed thickness about 105 m

Kiu **Iron Springs Formation, upper part (Upper? Cretaceous)**--Moderately resistant, fluvial deposits composed predominately of yellowish-gray, grayish-yellow, moderate-yellow, and dark-yellowish-orange, fine- to medium-grained, thin-bedded to massive sandstone. Upper part contains several intercalated, light-gray siltstone beds, approximately 5 cm thick. Defined by Mackin (1947) for exposures in the Iron Springs mining district about 15 km southwest of the quadrangle, where the unit is about 1000 m thick. Correlative with Free Thought unit of Moore (1982) in adjacent Parowan quadrangle in the western part of the Markagunt Plateau. Incompletely exposed in the southeast corner of quadrangle. Maxium exposed thickness about 185 m

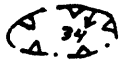
EXPLANATION OF SYMBOLS

Contact--Dip of contact shown. Contacts between bedrock and alluvial deposits approximately located

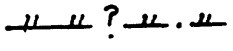


Fault--Dashed where approximately located; dotted where concealed; queried where uncertain; bar and ball on downthrown side. Arrow indicates direction and amount of dip; cross indicates vertical dip

Boundary of gravity-slide block of Quaternary age deposited below cliffs along slopes, showing parent bedrock unit symbol. Locally overlie Quaternary alluvium



Boundary of megabreccia deposit interpreted as gravity-slide blocks of Miocene age. Composition of deposit shown by parent bedrock unit symbol shown when individual blocks are mapped separately and Tm when blocks are to small to map separately. Arrow indicates direction and amount of dip. Dotted where concealed



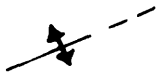
Shear zone--Not well exposed, approximately located, and dotted where concealed. The shear zone is low angle and has detached part of the Trs unit and overlying rocks from the underlying succession of rocks resulting in a detached sheet (Maldonado and others, 1990). It may also occur along the contact between the Trs unit and the base of the Tertiary volcanic rocks or in some areas within the upper part of the Trs unit. The shear zone is arbitrarily placed at the contact between the Trs unit and the base of the Tertiary volcanic rocks even though it may occur well below that contact. The shear zone may be characterizied by comminuted rock, folding, and discordence in attitudes and thinning or ommision of rocks overlying the shear zone. In some areas it may be difficult to differentiate remnants of the detached sheet from the megabreccia deposits of Tertiary age and the gravity-slide blocks deposited in basin fill deposits west of map area (unit QTh in adjacent Parowan Gap quadrangle). In geologic section, approximately located and queried where uncertain

Strike and dip of beds

Inclined

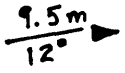
Horizontal

Strike and dip of foliation of pumice and lenticules in welded ash-flow tuff



Anticline--Showing axial trace of plane. Dashed where approximately located

Spring



Parameters for fault scarps formed in Quaternary deposits--Height in meters over maximum slope in degrees

REFERENCES CITED

Anderson, J.J., 1971, Geology of the southwestern High Plateaus of Utah--Bear Valley Formation, an Oligocene-Miocene volcanic arenite: Geological Society of America Bulletin, v. 82, p. 1179-1205.

Anderson, J.J., Iivari, T.A., and Rowley, P. D., 1987, Geologic map of the Little Creek Peak quadrangle, Garfield and Iron Counties, Utah: Utah Geological and Mineral Survey Map 104, 11 p., scale 1:24,000.

Anderson, J.J., and Rowley, P.D., 1975, Cenozoic stratigraphy of southwestern high plateaus of Utah, in Anderson, J.J, Rowley, P.D., Fleck, R.J., and Nairn, A.E.M., Cenozoic geology of southwestern high plateaus of Utah: Geological Society America Special Paper 160, p. 1-51.

Anderson, R.E., and Christenson, G.E., 1989, Quaternary faults, folds, and selected volcanic features in the Cedar City 1° x 2° quadrangle, Utah: Utah Geological and Minerral Survey Miscellaneous Pubulication 89-6, 29 p.

Armstrong, R.L., 1970, Geochronology of Tertiary igneous rocks, eastern Great Basin and Range Province, western Utah, eastern Nevada, and vicinity, U.S.A.: Geochimica et Cosmochimica Acta, v. 34, p. 203-232.

Best, M.G. and Grant, S.K., 1987, Stratigrapy of the volcanic Oligocene Needles Range Group in southwestern Utah and eastern Nevada, in Oligocene and Miocene volcanic rocks in the central Pioche-Marysvale igneous belt, western Utah and eastern Nevada: U.S. Geological Survey Professional Paper 1433-A, p. 1-28.

Bjorklund, L.J., Sumsion, C.T., and Sandberg, G.W., 1977, Selected hydrologic data, Parowan Valley and Cedar City Valley drainage basins, Iron County, Utah: U. S. Geological Survey, Utah Basic Data Release No. 28, 54 p.

Cook, E.F., 1965, Stratigraphy of Tertiary volcanic rocks in eastern Nevada: Nevada Bureau Mines Report 11, 61 p.

Fleck, R.J., Anderson, J.J., and Rowley, P.D., 1975, Chronology of mid-Tertiary volcanism in High Plateaus region of Utah, in Anderson, J.J., Rowley, P.D., Fleck, R.J., and Nairn, A.E.M., Cenozoic geology of southwestern high plateaus of Utah: Geological Society of America Special Paper 160, p. 53-61.

Hilton, D.A., 1984, The petrology, sedimentology, and stratigraphy of the Late Cretaceous(?) and early Tertiary sedimentary rocks of southwest Markagunt Plateau, Utah: Ohio, Kent State University, M.S. thesis, 79 p.

Mackin, J.H., 1960, Structural significance of Teritary volcanic rocks in southwestern Utah: America Journal of Science, v. 258, p. 81-131.

Maldonado, Florian, Sable, E.G., and Anderson, J.J., 1990, Shallow detachment of mid-Tertiary rocks, Red Hills (Basin and Range), with implications for a regional detachment zone in the adjacent Markagunt Plateau (Colorado Plateau), southwest Utah: Geological Society of America Abstracts with Progams, v. 22, no. 3, p. 94.

Moore, R.C., 1982, The geology of a portion of the west-central Markagunt Plateau, southwestern Utah: Ohio, Kent State University, M.S. thesis, 72 p.

Neilson, R.L., 1983, Pleistocene and Holocene evolution of Little Salt Lake playa (Lake Parowan), southwest Utah (abs): Geological Society of America Abstracts with Programs, v. 15, no.5, p. 300.

Rowley P.D., 1976, Geologic map of the Enoch NW quadrangle, Iron County, Utah: U.S. Geological Survey Geological Quadrangle Map GQ-130, scale 1:24,000.

Thomas, H.E., and Taylor, G.H., 1946, Geology and ground-water resources of Cedar City and Parowan valleys, Iron County, Utah: U.S. Geological Survey Water Supply Paper 993, 210 p.

Threet, R.L., 1952, Geology of the Red Hills area, Iron County, Utah: Seattle, University of Washington, Ph.D. dissertation, 107 p.

Williams, P.L., 1967, Stratigraphy and petrography of the Quichapa Group, southwestern Utah and southeastern Nevada: Seattle, University of Washington, Ph.D. dissertation, 182 p.

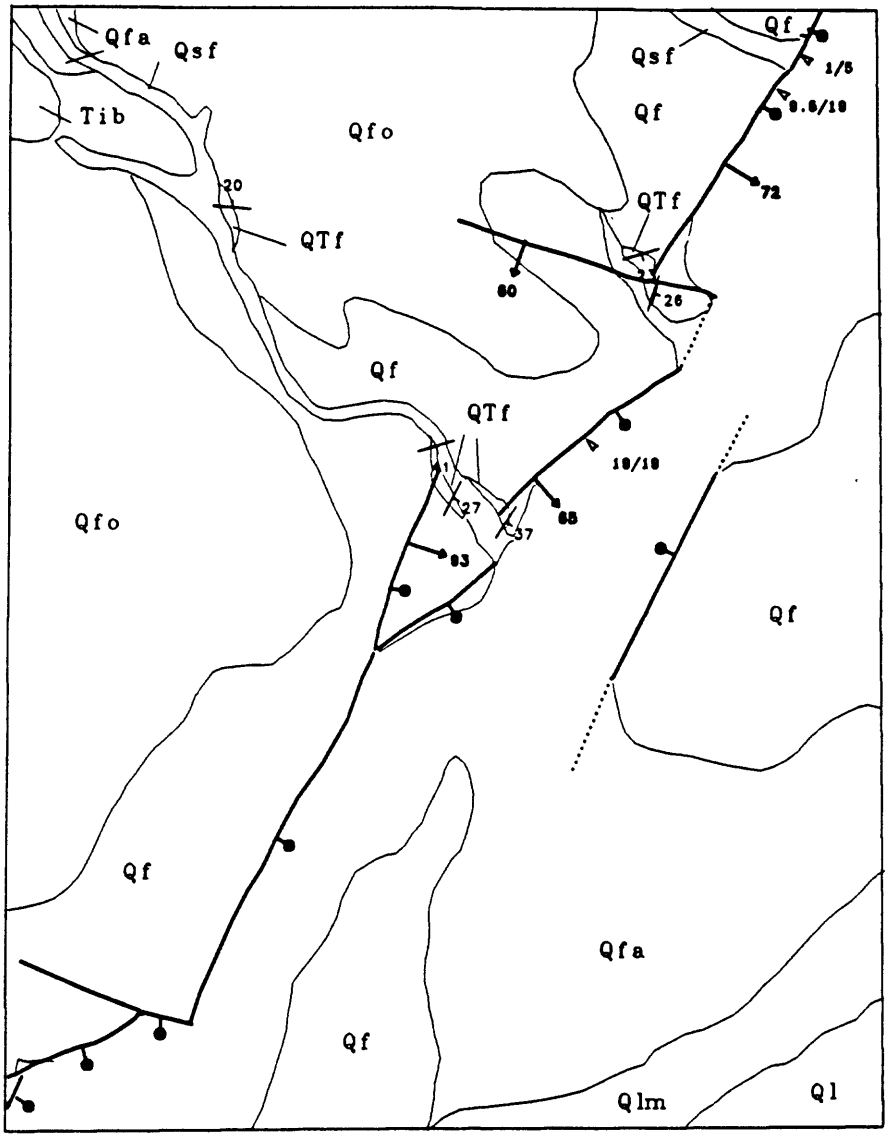
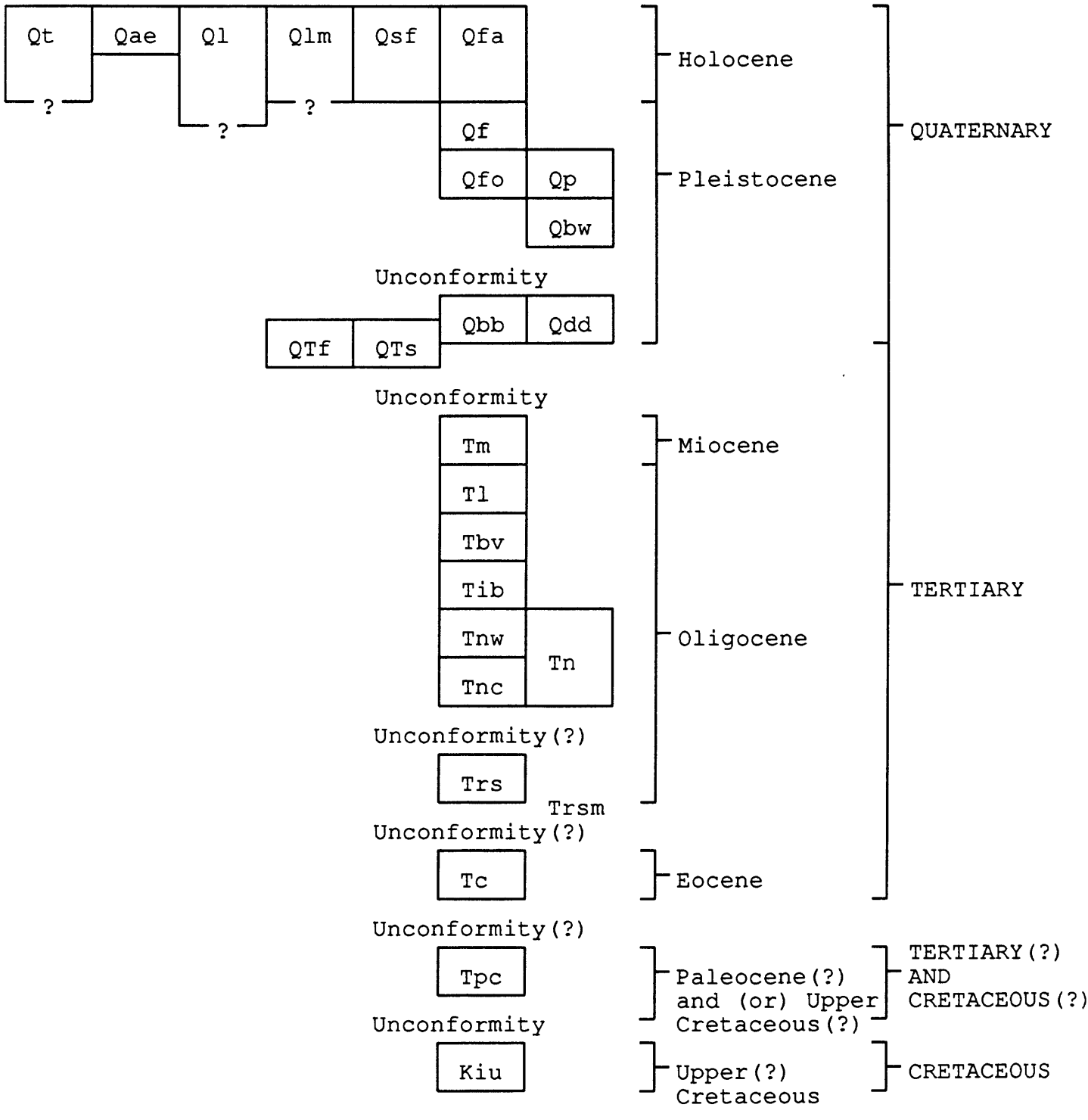
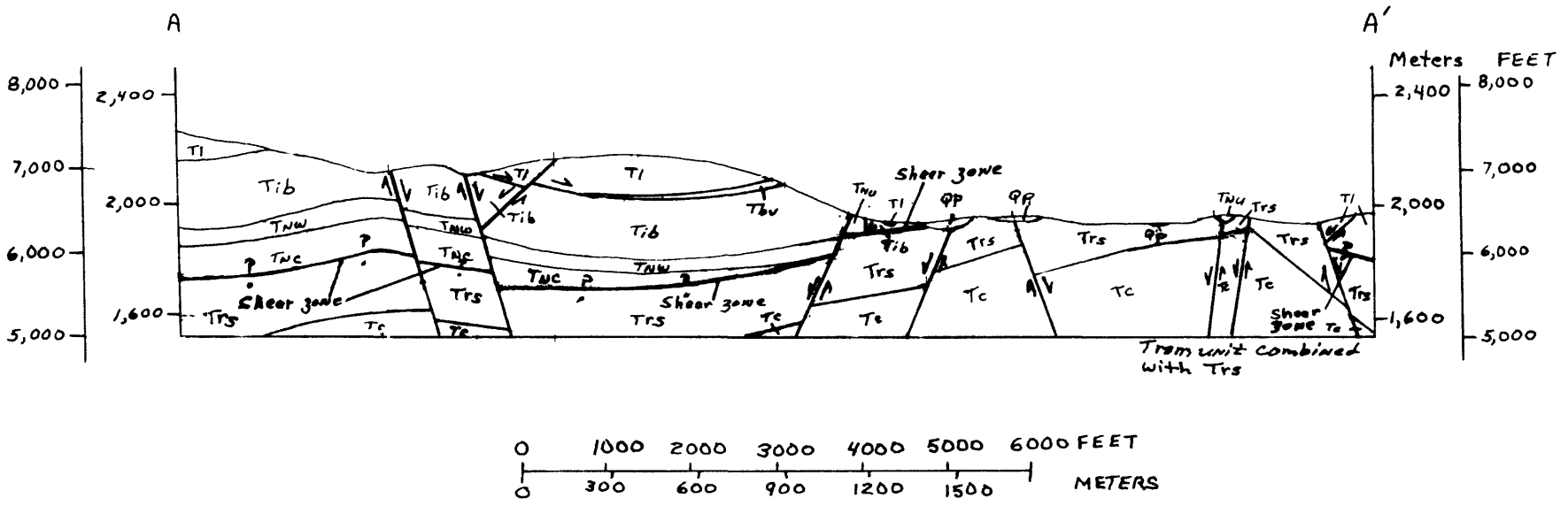


Figure 1. Enlargement of an area along Little Salt Lake fault showing details of faulting and bedding attitudes within alluvial sediments of Little Salt Lake fault (QTf).

CORRELATION OF MAP UNITS




A
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Meters
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Tbv
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QP
Shear zone
Trs unit combined with Trs
0 1000 2000 3000 4000 5000 6000 FEET
0 300 600 900 1200 1500 METERS