# GEOLOGIC MAP OF THE BURNS KNOLL QUADRANGLE BEAVER AND IRON COUNTIES, UTAH

by

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## DESCRIPTION OF MAP UNITS

Qal **Alluvial deposits of intermittent stream channels and floodplains (Holocene)--** Unconsolidated, poorly sorted sand, gravel, and boulder deposits whose clast composition reflects local geologic units upstream. Thickness up to 30 feet.

$Qaf_1$ **Alluvial fan deposits of the latest generation (Holocene)**--Unconsolidated mud, sand, gravel, and boulder deposits; 80 percent sand and grit size, 20 percent larger clasts up to a foot. Mostly developed where stream channel gradients flatten as they enter the Escalante Desert lowland. These fans cut the late Quaternary fault scarps.

$Qaf_2$ **Alluvial fan deposits of intermediate age (Holocene to Pleistocene)**--Unconsolidated mud, sand, gravel and boulder deposits along the west side of the Escalante Desert along the east flank of Blue Mountain. The Lake Bonneville shoreline is so indistinct south of Moonshine Well that the age of $Qaf_2$ relative to the 15,000-year-old Bonneville Shoreline was not determined. Surface of these fans is cut by small rills.

$Qaf_3$ **Older alluvial fan deposits (Pleistocene?)**--Poorly consolidated deposits of silt, sand, gravel, and boulders that form the steep upper part of the alluvial apron along the east side of Blue Mountain.

Qap **Alluvial deposits on pediment (Quaternary)**--Silt- to boulder-size deposits on southward sloping pediment surface that covers the northern two-thirds of this quadrangle. Islands of Tertiary volcanic rock remain above the pediment surface in its upper reaches. The pediment is cut by shallow drainage courses. Pediment deposits are interlaced with eolian sand and silt which was deposited concurrently with alluvial materials on the pediment surface.

Qe **Eolian deposits, undivided (Quaternary)**--Mostly silt to fine sand deposits that have been blown across the Escalante Desert floor in a northeasterly direction. Mostly formed into low, poorly organized longitudinal dunes. Eolian material constitutes a fair portion of all deposits in the Escalante Desert having accumulated concurrently with alluvial and lacustrine deposits throughout late Quaternary time, activated by persistent winds blowing out of the Mojave Desert in California and Nevada.

Qea **Eolian and alluvial deposits (Quaternary)**--Eolian sand and silt with a significant component of admixed alluvial fan material.

Qeb **Blowouts (Quaternary)**--Small eolian deflation depressions in the floor of the Escalante Desert intimately associated with adjacent dune deposits.

Qlu **Undifferentiated lacustrine deposits (Quaternary)**--This unit is mapped only below the elevation of 5090 feet, the likely highstand of Lake Bonneville in the Lund area (Currey, 1982) between 16,000-14,500 years ago. They are mostly reddish-orange clayey silt with an admixture of eolian sand. Lake Bonneville deposits are poorly known in this quadrangle because they are partially covered by later eolian and playa deposits.

Qla **Lacustrine and alluvial deposits (Quaternary)**--Deposits of mixed origins: Lake Bonneville bottom sediments, playa-lake floor deposits, eolian sand and silt, and fine-grained alluvial materials at the toe of fans and pediments. Mostly fine-grained sandy silt.

QTa **Alluvium (Quaternary-Pliocene?)**--Alluvial pea-gravel, sand, and silt on the Escalante Desert floor. This material may have come from the west or north within the quadrangle, but a large part of it may also have come from the High Plateaus east of Cedar City and been brought across the desert by Pleistocene streams that are no longer so active. Some may also have been brought from the southwest from Pleistocene drainages off the Bull Valley Mountains near Enterprise. QTa is now largely covered with Holocene eolian deposits. Its thickness is unknown, but may be hundreds of feet.

Tbm **Blawn Formation, mafic lava flow member (Miocene)**--Brown to gray porphyritic trachyandesite lava flows that weather reddish-brown with liesegang bands. Contains plagioclase and pyroxene phenocrysts. Best et al. (1987) showed that Blawn rocks are 23-18 m.y. old. Less than 100 feet thick where exposed along the north edge of the map, but more extensively exposed and thicker in the Frisco quadrangle to the north (Best, Lemmon, and Morris, 1989).

Ti **Isom Formation (Oligocene)**--Marginally rhyolite to trachyte, densely welded, reddish-brown to purplish-gray ash-flow tuff. Contains less than 12 percent phenocrysts of plagioclase, and minor pyroxene and magnetite. Age, adjusted to new decay constants, is 26 m.y. Exposed only along southwest edge of map.

Tsh **Andesite of Shauntie Hills (Oligocene)**--Heterogeneous reddish-brown lava flows containing phenocrysts of plagioclase and combinations of biotite, hornblende, and pyroxene in an aphanitic matrix. Exposed along north edge of this quadrangle but more extensively exposed in the adjacent Frisco quadrangle where it attains a thickness of nearly 2000 feet (Best, Lemmon, and Morris, 1989).

Jt **Temple Cap Formation (Jurassic)**--Interbedded red siltstone and sandstone in basal 200 feet; silty red sandstone and fine grained tan flaggy sandstone in the middle 500 feet; upper 575 feet is medium-grained, cliff-forming, tan sandstone with small-scale, water-laid crossbeds. The top of the formation is truncated by the Blue Mountain thrust.

Jn **Navajo Sandstone (Lower Jurassic)**--Red to light brownish gray, fine-grained eolian sandstone that forms cliffs and ledges. Tertiary silicification has converted most of the Navajo on Blue Mountain into quartzite. Thickness about 1900 feet.

Trc **Chinle Formation (Upper Triassic)**--The Chinle Formation consists of the basal Shinarump Conglomerate Member, mapped as Trcs, and the upper member mapped as Trc. The upper member includes variegated mudstone, siltstone and sandstone, and locally contains limestone nodules. In the Beaver Dam Mountains sixty miles south of Blue Mountain this unit has been assigned to the Petrified Forest Member of the Chinle Formation (Hintze, 1986). Alteration to hornfels has changed the appearance of these strata on Blue Mountain, but the alteration effects are not as great in the upper Chinle as in the Moenkopi Formation. Some shales in the upper member of the Chinle are phyllitic, and locally the unit is mottled; but it is less indurated than the Moenkopi. The upper Chinle member is about 280 feet thick.

Trcs **Shinarump Member of Chinle Formation (Upper Triassic)**--This member forms ledges and cliffs of light colored sandstone, making it a conspicuous and easily recognizable unit. At the base a quartzite pebble conglomerate ranges from zero to 10 feet in thickness; the remainder of the member consists of medium coarse, greenish gray to light brownish gray sandstone, with channel cross bedding prominent in the upper part of the unit. Locally, the unit contains petrified wood. The Shinarump Member is about 120 feet thick.

Trm **Moenkopi Formation (Lower Triassic)**--Hornfels, indurated siliceous siltstone and mudstone, yellowish green, brown, and greenish black. Base of unit not exposed; thickness about 300 feet.

Cs **Swasey Limestone (Middle Cambrian)**--Medium gray, massive crystalline dolomitized limestone that characteristically forms cliffs and ledges. Thickness on Blue Mountain is 670 feet (Weaver, 1980, p. 129-130).

## STRUCTURE

**Blue Mountain thrust fault**--In the adjacent Blue Mountain quadrangle to the west the Mesozoic Blue Mountain thrust soles on the Chisholm Formation, except at the easternmost side where it ramps up into the Swasey Limestone as shown on this map. The steep eastward dip of the thrust surface on this map is a result of post-thrust folding.

This folding is dome-like beneath Blue Mountain and probably was caused by an unroofed Tertiary laccolithic intrusion beneath Blue Mountain. Presence of an igneous body beneath Blue Mountain is suggested by a 200 gamma aeromagnetic high centered on the Blue Mountain topographic high.

**High-angle faults that cut Mesozoic rocks**--North-trending faults are probably related to the major basin-range fault concealed by valley-fill on the east side of Blue Mountain. They show small displacement, generally down to the east. Faults that trend northeastward or southeastward may be tear faults related to Mesozioc movement on the Blue Mountain thrust.

Concealed basin-range fault east of Blue Mountain--No geophysical data are available to help estimate the total displacement on this range-bounding fault but it likely has several thousand feet of Late Miocene to Holocene vertical offset, by analogy with similar known basin-range faults.

Normal fault that cuts Quaternary deposits--In the southwest corner of the quadrangle a fault shown by hachured line cuts Qac deposits. This fault indicates Quaternary movement on the concealed basin-range fault described above. Offset of the Quaternary deposits is about 20 feet. The scarp is so much modified by post-faulting erosion that the faulting probably occurred several thousand years ago. This quadrangle lies on the west edge of the Intermountain Seismic Belt and has shown almost no historic earthquake activity (Stover et al. (1986).

## ECONOMIC GEOLOGY

No commercial mineral production has been reported for this quadrangle. Weaver (1980, p. 128) reported that he had collected limonite and hematite pseudomorphs after pyrite from the Shinarump Member of the Chinle Formation on the east side of Blue Mountain. This same area shows some prospector's trails and shallow excavations. No systematic geochemical surveys of the area have been reported.

Sand and gravel could be obtained from alluvial fans on the west side of the quadrangle, but the materials are poorly sorted and better deposits of construction materials are available in adjacent areas to the south.

## GEOLOGIC HAZARDS

Because there are no permanent human inhabitants in this quadrangle, nor any works of man other than the gravel roads and railroad, the potential for significant damage is very limited. The chief hazard is flooding which occurs most often after late summer cloudbursts. Damages to the county-maintained gravel roads is not likely to be serious and can be quickly and inexpensively repaired. Railroad maintenance is done by railroad crews stationed at Lund, 12 miles to the southwest.

Earthquakes are a possible but extremely infrequent hazard. The basin-range fault on the west side of Escalante Valley could possibly generate a magnitude 7 earthquake, and there could possibly be surface rupture at the west base of Blue Mountain. But because of the remoteness of the area and the lack of human inhabitants or structures not much loss would likely occur within the quadrangle even in a severe earthquake.

Wind is perennial in the Escalante Desert area. On hot days in the Mojave Desert of California and Nevada the air expands northeastward generating stiff afternoon winds across the Escalante Desert flats. Silt and fine sand blows northeastward across the desert floor and is occasionally a nuisance to transportation.

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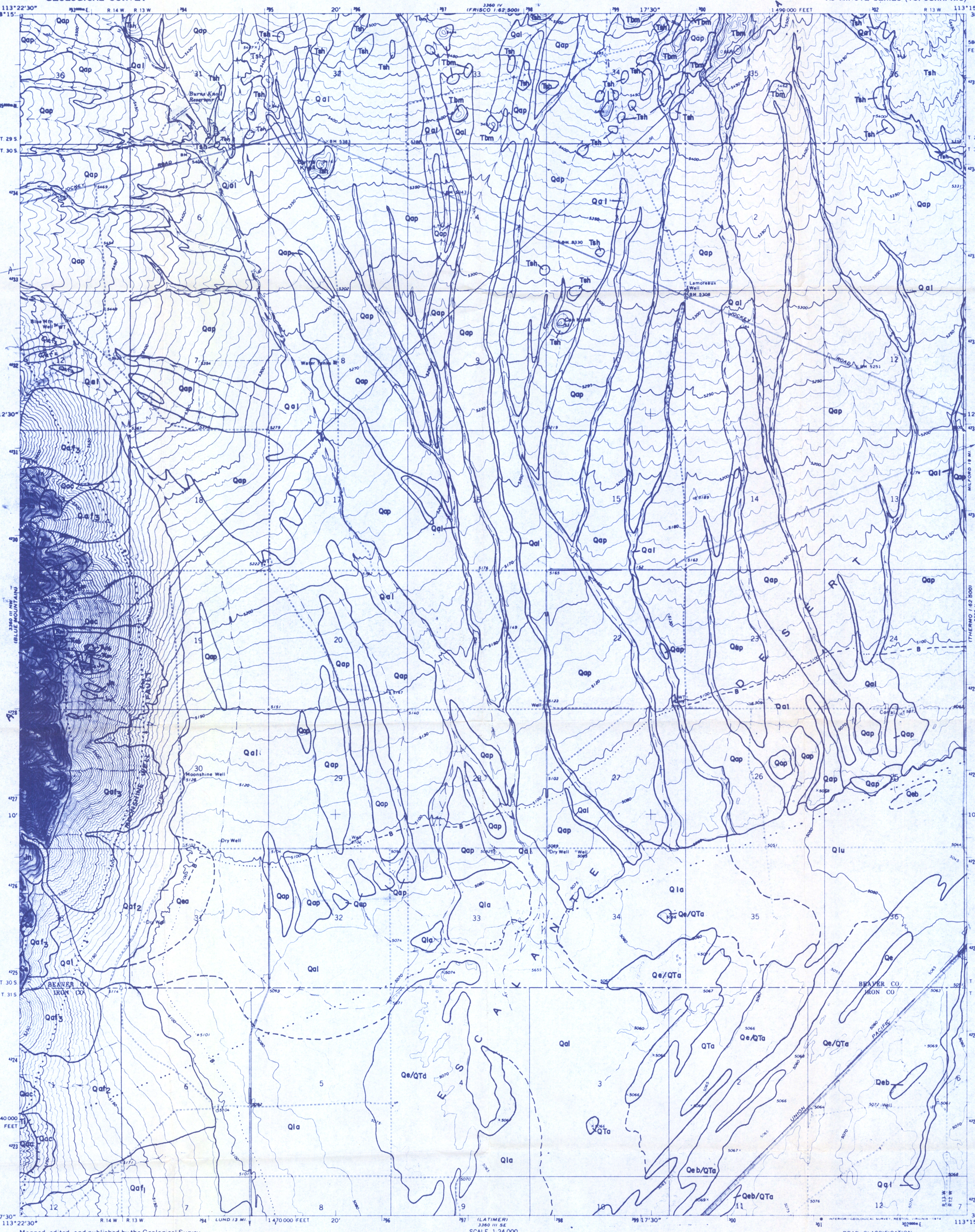
Quaternary mapping by Hintze, igneous rocks identified by Best, older bedrock mapping by Weaver (1980*)
*Brigham Young University Geology Studies, volume 27, part 3.

BURNS KNOLL QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)



## Map units

| | |
|---|---|
| Qal | Alluvium |
| $Qaf_1$ | Young fan deposits |
| $Qaf_2$ | Middle fan deposits |
| $Qaf_3$ | Old fan deposits |
| Qap | Pediment alluvium |
| Qla | Lacustrine and alluvial deposits |
| Qlu | Lacustrine deposits |
| Qeb | Eolian blowout |
| Qea | Eolian and alluvial deposits |
| Qe | Eolian deposits |
| QTa | Old alluvium |

UNCONFORMITY

| | |
|---|---|
| Tbm | Blawn mafics |
| Ti | Isom Formation |
| Tsh | Andesite of Shauntie Hills |

UNCONFORMITY

| | |
|---|---|
| Jt | Temple Cap Fm |
| Jn | Navajo Ss (quartzite) |
| ₹c | Chinle Fm (hornfels) |
| ₹s | Shinarump Cg |
| ₹m | Moenkopi Fm (hornfels) |

THRUST

| | |
|---|---|
| €s | Swasey Limestone |

--B··· Bonneville shoreline

Qe/QTa indicates thin cover of Qe over QTa

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1971

Projection and 10,000-foot grid ticks: Utah coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue. 1927 North American datum

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

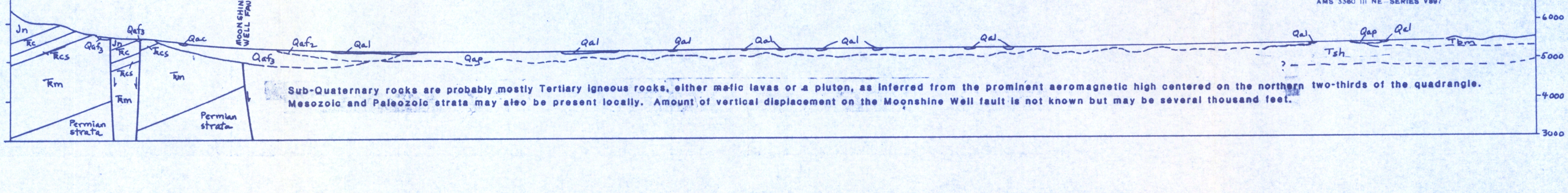
ROAD CLASSIFICATION
Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route — U.S. Route — State Route

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

BURNS KNOLL, UTAH
N3807.5—W11315/7.5
1971
AMS 3360 III NE—SERIES V897

Hintze + Best 1989
Burns Knoll quadrangle
1:24000



Sub-Quaternary rocks are probably mostly Tertiary igneous rocks, either mafic lavas or a pluton, as inferred from the prominent aeromagnetic high centered on the northern two-thirds of the quadrangle. Mesozoic and Paleozoic strata may also be present locally. Amount of vertical displacement on the Moonshine Well fault is not known but may be several thousand feet.

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| Qea | Eolian and alluvial deposits |
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| QTa | Old alluvium ~~colluvium~~ alluvium |
| Tbm | Blawn mafics |
| Tsh | Shauntie Hills Andesite (oldest volcanic unit) |
| Ti | Isom Formation |
| Jt | Temple Cap Fm |
| Jn | Navajo Ss (quartzite) |
| ₮c | Chinle Fm (hornfels) |
| ₮s | Shinarump Cg |
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