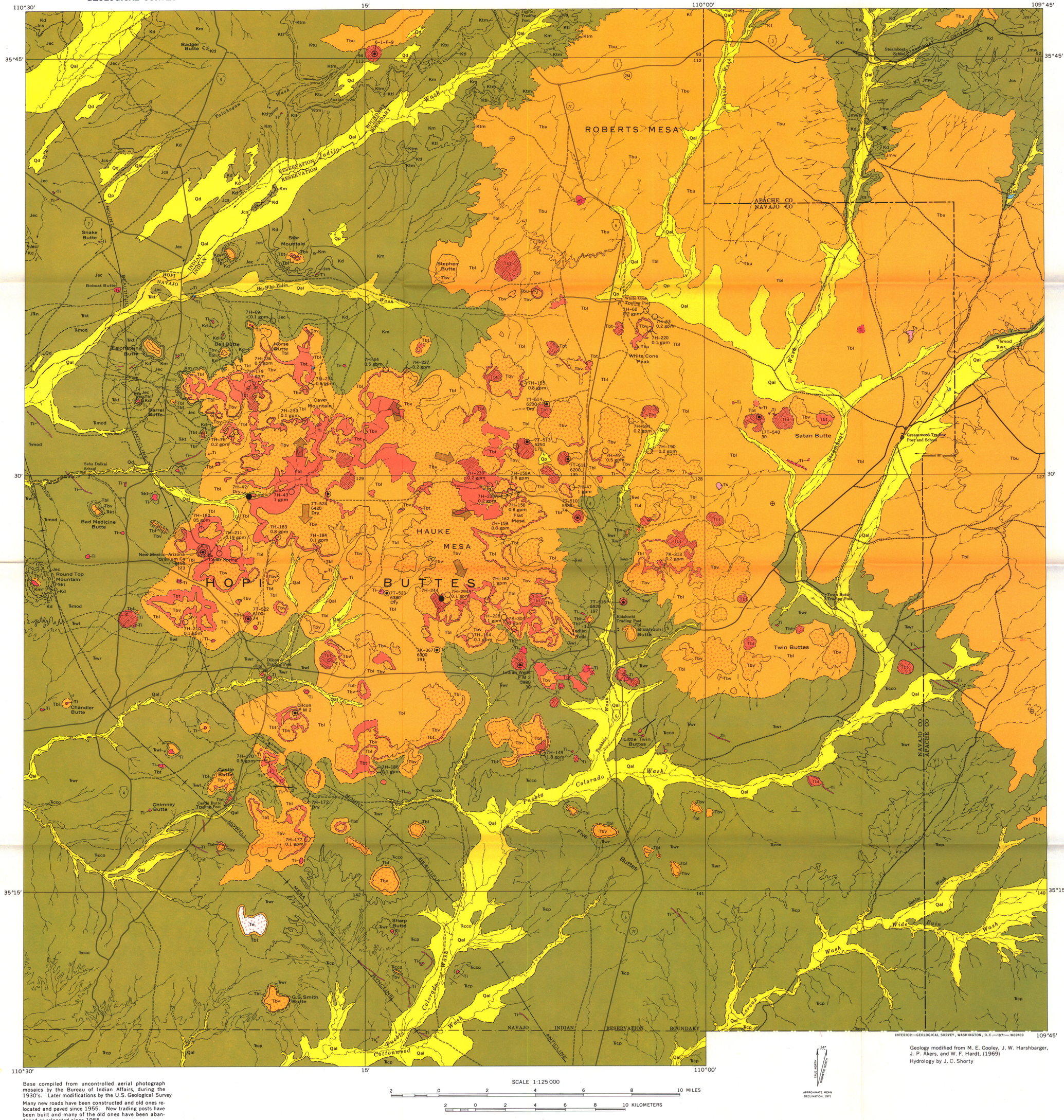
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
BUREAU OF INDIAN AFFAIRS AND THE NAVAJO TRIBE

PROFESSIONAL PAPER 521-D
PLATE 2



EXPLANATION

QUATERNARY

Qd — Dune deposits

Qal | Qp — Alluvium (Qal) and playa deposits (Qp)

TERTIARY

Bidahochi Formation

Tbu — Upper member

Tbv — Volcanic member

Tbl — Lower member

Ts | Tbt — Spring deposits (Ts) and tuff (Tbt)

Te | Ti — Extrusive (Te) and intrusive (Ti) igneous rocks

TRIASSIC, JURASSIC, AND CRETACEOUS

K,J,Tr — Sedimentary rocks undifferentiated

Kt, *Toreva Formation*
Ktu, *Toreva Formation, upper sandstone member*
Ktm, *Toreva Formation, middle carbonaceous mudstone member*
Ktl, *Toreva Formation, lower sandstone member*
Km, *Toreva Formation and Mancos Shale*
Kd, *Dakota Sandstone*
Jmw, *Westwater Canyon Member of Morrison Formation*
Jcs, *Cow Springs Sandstone*
Jec, *Entrada Sandstone and Carmel Formation*
JTrn, *Navajo Sandstone*
Tkt, *Kayenta Formation*
Trmod, *Moenave Formation, Dinosaur Canyon Sandstone Member*
Twl, *Wingate Sandstone, Lukachukai Member*
Twr, *Wingate Sandstone, Rock Point Member*
Tcco, *Chinle Formation, Church Rock and Owl Members*
Tcp, *Chinle Formation, Petrified Forest Member*

Diatremes that may yield water to drilled wells

Direction of ground-water movement in the volcanic rocks

Contact
Dashed where approximately located

Indefinite contact
Used for showing surficial deposits where contact is generalized in order to simplify detail

Gradational contact
Used to show approximate boundaries of units having gradational contacts

U/D — Fault
U, *upthrown side*; D, *downthrown side*

Strike and dip of beds

Horizontal beds

Anticline
Dashed where approximately located

Syncline, showing trace of axial surface and direction of plunge
Dashed where approximately located

127 — Quadrangle number

7H-516 / 5820 / 197 — Well number; Altitude of well, in feet above mean sea level; Depth to water, in feet below the land surface
Drilled well

7H-42
Dug well

7H-190 0.2 gpm — Spring number; Yield, in gallons per minute
Spring

Only wells and springs that were drilled in, or that receive water from, the volcanic rocks are shown

Indian Service road

Mine or quarry

Base compiled from uncontrolled aerial photograph mosaics by the Bureau of Indian Affairs, during the 1930's. Later modifications by the U.S. Geological Survey

Many new roads have been constructed and old ones relocated and paved since 1955. New trading posts have been built and many of the old ones have been abandoned or relocated since 1955

SCALE 1:125 000

2 0 2 4 6 8 10 MILES

2 0 2 4 6 8 10 KILOMETERS

APPROXIMATE MEAN DECLINATION, 1971

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971—W69169

Geology modified from M. E. Cooley, J. W. Harshbarger, J. P. Akers, and W. F. Hardt, (1969)
Hydrology by J. C. Shorty

GEOLOGIC MAP OF THE HOPI BUTTES VOLCANIC FIELD, SHOWING THE LOCATION OF WELLS AND SPRINGS, SOUTH-CENTRAL NAVAJO AND HOPI INDIAN RESERVATIONS, ARIZONA