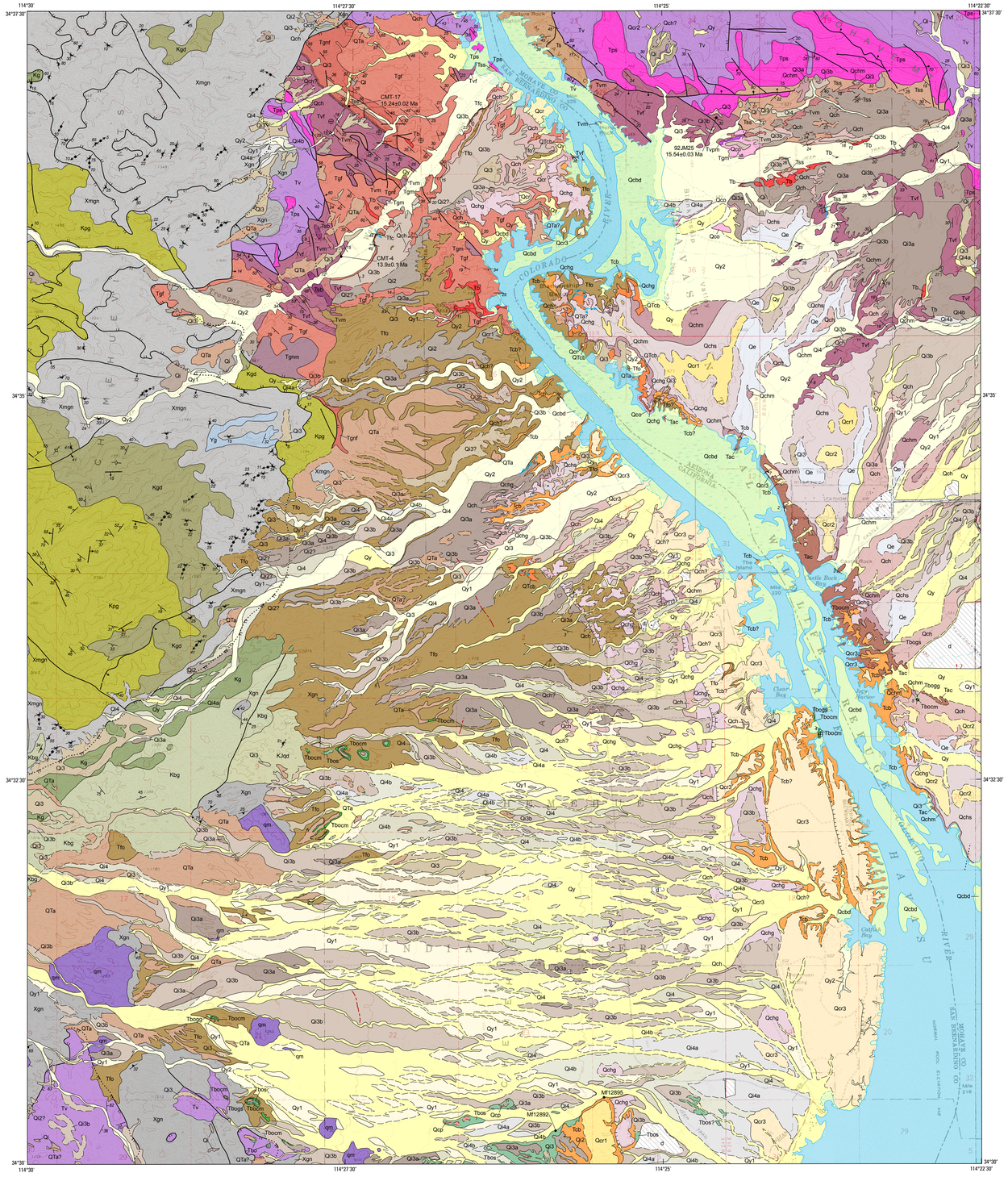
U.S. Department of the Interior
U.S. Geological Survey

Scientific Investigations Map 3411
Pamphlet accompanies map



Base from U.S. Geological Survey Castle Rock and Lake Havasu City North Digital Raster Graphics (DRGs)
Coordinate System: NAD 1983 UTM Zone 11N
Projection: Transverse Mercator
Datum: North American 1983

11°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2018

SCALE 1:24,000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS

MAP LOCATION

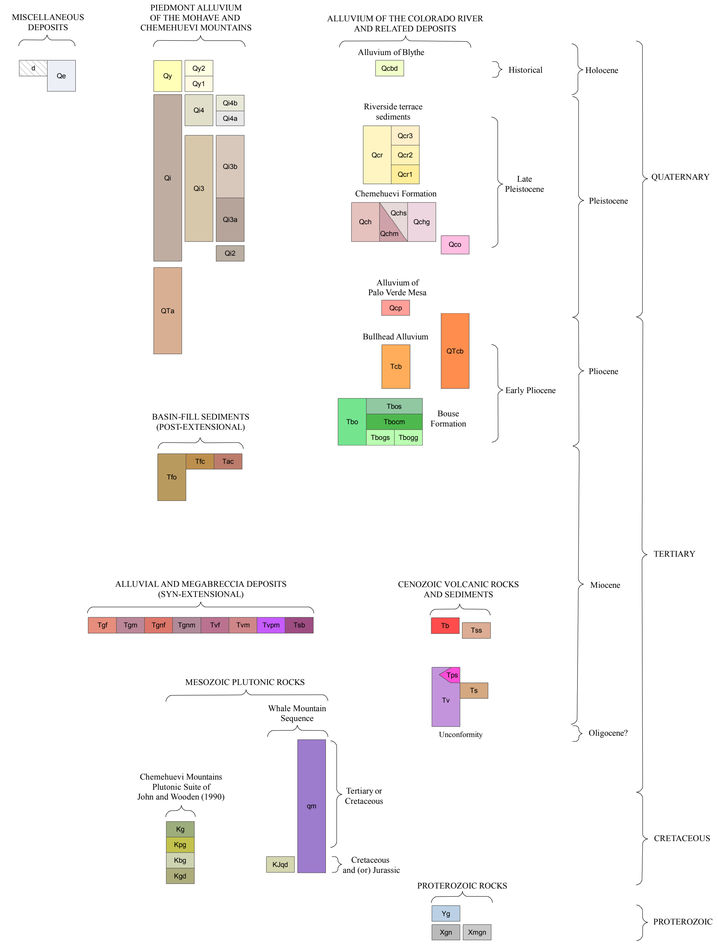
Bedrock geology compiled and modified from John (1987) and Miller and John (1999) by L.S. Beard and D. Block. Surficial geology mapped by P.K. House and D.V. Malmon between 2008 and 2017

GIS support provided by E. Mennow

Edited by J.L.Zigler

Manuscript approved for publication June 18, 2018

CORRELATION OF MAP UNITS



EXPLANATION OF MAP SYMBOLS

Contact—Solid where location is accurate; long dash where location is approximate; short dash where location is inferred; dotted where location is concealed; queried where identity or existence is uncertain

Gradational contact

Fault—Showing dip value and direction; solid where location is accurate; long dash where location is approximate; dotted where location is concealed

Detachment fault—Hachures on upper plate; solid where location is accurate; dotted where location is concealed

Normal fault—Bar and ball on downthrown block; solid where location is accurate; dotted where location is concealed

Lineament

Fluvial terrace scarp—Solid where location is accurate; dashed where location is approximate; queried where identity or existence is uncertain

Shoreline—Contact around open water or partially submerged units such as sandbars and marshes; solid where location is accurate; dashed where location is approximate

Horizontal bedding

Inclined bedding—Showing strike and dip

Inclined metamorphic foliation— Showing strike and dip

Inclined mylonitic foliation— Showing strike and dip

Inclined aligned-mineral lineation —Showing bearing and plunge. May be combined with other symbols

Inclined flow banding, lamination, layering, or foliation in igneous rock—Showing strike and dip

Vertical flow banding, lamination, layering, or foliation in igneous rock—Showing strike

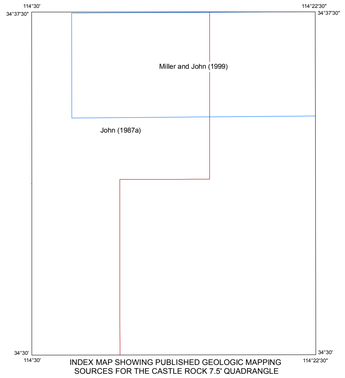
Fluvial transport direction

Sediment transport direction determined from imbrication

Sediment transport direction determined from flute casts

MT12892 **Microfossil sample locality**—Showing sample number

CMT-17 15.24±0.02 Ma **Geochronology sample locality**—Showing sample number and age



INDEX MAP SHOWING PUBLISHED GEOLOGIC MAPPING SOURCES FOR THE CASTLE ROCK 7.5' QUADRANGLE

LIST OF MAP UNITS

[See Description of Map Units (in pamphlet) for complete unit descriptions. Some unit exposures on the printed or plotted map are too small to distinguish the color for unit identification. These units are labeled where possible, and unlabeled units are attributed in the database]

MISCELLANEOUS DEPOSITS

- d — **Disturbed ground (recent)**
- Qe — **Eolian sand deposits (Holocene to upper(?) Pleistocene)**

PIEDMONT ALLUVIUM OF THE MOHAVE AND CHEMEHUEVI MOUNTAINS

- Qy — **Young piedmont alluvium, undivided (recent to upper Pleistocene)**
- Qy2 — **Active piedmont alluvium (upper to middle Holocene)**
- Qy1 — **Inactive piedmont alluvium (middle Holocene to upper Pleistocene)**
- Qi — **Intermediate-age piedmont alluvium, undivided (lower Holocene(?) to middle(?) Pleistocene)**
- Qi4 — **Unit 4 (lower Holocene(?) to upper Pleistocene)**
- Qi4b — **Unit 4b (lower Holocene(?) to upper Pleistocene)**
- Qi4a — **Unit 4a (upper Pleistocene)**
- Qi3 — **Unit 3 (upper Pleistocene)**
- Qi3b — **Unit 3b (upper Pleistocene)**
- Qi3a — **Unit 3a (upper Pleistocene)**
- Qi2 — **Unit 2 (upper middle to middle(?) Pleistocene)**
- QTa — **Older piedmont alluvium (middle Pleistocene to upper Pliocene(?))**

ALLUVIUM OF THE COLORADO RIVER AND RELATED DEPOSITS

- Qcbd — **Alluvium of Blythe, Lake Havasu deltaic facies (1938 to present)**
- Qcr — **Riverside terrace sediments, undivided (upper Pleistocene)**
- Qcr3 — **Terrace 3**
- Qcr2 — **Terrace 2**
- Qcr1 — **Terrace 1**
- Qch — **Chemehuevi Formation, undivided (upper Pleistocene)**
- Qchs — **Sand-dominated facies**
- Qchm — **Mud-dominated facies**
- Qchg — **Gravel facies**
- Qco — **Older sand and mud deposits (upper Pleistocene)**
- Qcp — **Alluvium of Palo Verde Mesa (lower(?) Pleistocene)**
- QTcb — **Boulder conglomerate (lower(?) Pleistocene to Pliocene)**
- Tcb — **Bullhead Alluvium (lower Pliocene)**
- Tbo — **Bouse Formation, undivided (lower Pliocene)**
- Tbos — **Clay, silt, and sand**
- Tbocm — **Marl or limestone**
- Tbogs — **Golden sand facies**
- Tbogg — **Golden gravel facies**

BASIN-FILL SEDIMENTS (POST-EXTENSIONAL)

- Tfc — **Paleochannel-fill conglomerate (lower Pliocene to upper Miocene)**
- Tac — **Alluvium of Castle Rock (upper Miocene)**
- Tfo — **Older fanglomerate (upper Miocene)**

ALLUVIAL AND MEGABRECCIA DEPOSITS (SYN-EXTENSIONAL)

- Tgf — **Granite-clast fanglomerate (Miocene)**
- Tgm — **Granite megabreccia (Miocene)**
- Tgnf — **Gneiss-clast fanglomerate (Miocene)**
- Tgnm — **Gneiss-clast megabreccia (Miocene)**
- Tvf — **Volcanic-clast fanglomerate (Miocene)**
- Tvm — **Volcanic-clast megabreccia (Miocene)**
- Tvpm — **Peach Spring Tuff-clast megabreccia (Miocene)**
- Tsb — **Sedimentary breccia (Miocene)**

CENOZOIC VOLCANIC ROCKS AND SEDIMENTS

- Tb — **Basalt (Miocene)**
- Tss — **Sandstone (Miocene)**
- Tps — **Peach Spring Tuff (Miocene)**
- Ts — **Sandstone and conglomerate (Miocene)**
- Tv — **Volcanic flows and intrusions (Miocene and Oligocene(?))**

MESOZOIC PLUTONIC ROCKS

Chemehuevi Mountains Plutonic Suite of John and Wooden (1990)

- Kg — **Two-mica granodiorite and monzogranite (Cretaceous)**
- Kpg — **Chemehuevi Peak granodiorite (Cretaceous)**
- Kbg — **Biotite granodiorite (Cretaceous)**
- Kgd — **Porphyritic hornblende-biotite granodiorite (Cretaceous)**

Whale Mountain Sequence

- KJqd — **Hornblende-biotite quartz diorite and quartz monzodiorite (Cretaceous or Jurassic)**
- qm — **Biotite monzogranite to syenogranite (Cenozoic or Mesozoic)**

PROTEROZOIC ROCKS

- Yg — **Porphyritic monzogranite (Mesoproterozoic)**
- Xgn — **Gneiss and migmatite (Paleoproterozoic)**
- Xmgn — **Mylonitized gneiss and migmatite (Paleoproterozoic)**

Geologic Map of the Castle Rock 7.5' Quadrangle, Arizona and California

By
P. Kyle House, Barbara E. John, Daniel V. Malmon, Debra Block, L. Sue Beard, Tracey J. Felger, Ryan S. Crow, Jonathan E. Schwing, and Colleen E. Cassidy

2018

ISSN 2329-132X (online)
https://doi.org/10.3133/sim3411

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Digital files available at https://doi.org/10.3133/sim3411

Suggested Citation: House, P.K., John, B.E., Malmon, D.V., Block, D., Beard, L.S., Felger, T.J., Crow, R.S., Schwing, J.E., and Cassidy, C.E, 2018, Geologic map of the Castle Rock 7.5' quadrangle, Arizona and California: Scientific Investigations Map 3411, pamphlet 19 p., scale 1:24,000, https://doi.org/10.3133/sim3411.