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

**ArcGIS File Geodatabase**

Thumbnail Not Available

**Tags**

Colorado River, Chemehuevi Mountains, Mohave Mountains, Topock Gorge, Lake Havasu, Havasu National Wildlife Refuge, Chemehuevi Indian Reservation, Clark County, Mohave County, San Bernardino County, Arizona, California, geologic map


## Summary

The Castle Rock quadrangle contains key structural and stratigraphic elements recording a complex history of Cretaceous plutonism and deformation, significant tectonic extension, volcanism, and sedimentation in the Miocene, and, ultimately, the evolution of the Colorado River from the latest Miocene to the present. The Castle Rock quadrangle is in the northeastern corner of Chemehuevi Valley, California and Arizona. It includes the Colorado River’s entrance to the valley at the mouth of Topock Gorge and the northern outskirts of Lake Havasu City, Arizona, and the Chemehuevi Indian Tribal community of Havasu Lake, California. The map includes large parts of the Chemehuevi Indian Reservation and the Havasu National Wildlife Refuge. Upon its exit through the mouth of Topock Gorge, the Colorado River enters Chemehuevi Valley where its floodplain (now submerged under Lake Havasu) is flanked by alluvial piedmonts of the Chemehuevi and Mohave Mountains to the west and east, respectively. This abrupt transition offers a useful perspective into the structural evolution of the Colorado River extensional corridor and of the Colorado River itself. Lake Havasu submerged the axis of Chemehuevi Valley following the completion of Parker Dam in 1938, and the Colorado River now feeds a verdant delta marsh that comprises part of the map. Important bedrock units include the Cretaceous Chemehuevi Mountain Plutonic Suite, the 18.78 Ma Peach Spring Tuff, and thick overlying sequences of interlayered Miocene megabreccia and fanglomerate. The exposure of these units is closely linked to extension along the Chemehuevi-Whipple Mountain detachment fault system. The complex bedrock geologic framework serves as the structural and topographic foundation for the key strata chronicling the evolution of the lower Colorado River. Important stratigraphic units that bear on its evolution to the present day include the Bouse Formation, the Bullhead Alluvium, the Chemehuevi Formation, and the modern delta. This database and the accompanying map and pamphlet are products of ongoing geologic mapping efforts in the lower Colorado River corridor (LOCO), led by the U.S. Geological Survey (USGS) and the Arizona Geological Survey (AZGS). The study is funded through the USGS National Cooperative Geologic Mapping Program, and is focused on the identification and characterization of Colorado River deposits in the area between Hoover and Imperial Dams, in Nevada, California, and Arizona.


## Description

This digital map database represents the general distribution of bedrock and surficial geologic units, and related data in the Castle Rock 7.5’ quadrangle, Arizona and California. The database delineates map units that are identified by general age and lithology following the stratigraphic nomenclature of the U.S. Geological Survey.This metadata report provides an overview of the data content of this ESRI ArcGIS 10.3 file geodatabase and associated files. Refer to the Supplemental Information section of this metadata report for more information about the contents of the geodatabase and associated files. Refer to the feature class-level metadata reports for detailed attribute information. Refer to the accompanying map and pamphlet for cartographic, descriptive, and interpretive presentations of the information.

## Credits


This digital database was prepared by Kyle House, Sue Beard, Debra Block, Colleen Cassidy, Ryan Crow, Tracey Felger, and Beth Mennow (all USGS). Technical reviews were provided by Keith Howard (USGS) and Phil Pearthree (AZGS). Digital review was provided by Stephanie Dudash (USGS).

### Use limitations

Not for use at scales larger than 1:24,000. Any derivative products utilizing these datasets shall clearly indicate their source. If users modify the data in any way, they are obligated to describe the types of modifications they have performed. User specifically agrees not to misrepresent these datasets, nor to imply that changes they made were approved by the USGS.

### Extent

**West** -114.669038 **East** -114.364747
**North** 34.725285 **South** 34.466865

### Scale Range

**Maximum (zoomed in)** 1:5,000
**Minimum (zoomed out)** 1:50,000

## ArcGIS Metadata ►

## Topics and Keywords ►

THEMES OR CATEGORIES OF THE RESOURCE geoscientificInformation

CONTENT TYPE Downloadable Data

PLACE KEYWORDS Colorado River, Chemehuevi Mountains, Mohave Mountains, Topock Gorge, Lake Havasu, Havasu National Wildlife Refuge, Chemehuevi Indian Reservation, Clark County, Mohave County, San Bernardino County, Arizona, California

THEME KEYWORDS geologic map

*Hide Topics and Keywords ▲*

## Citation ►

TITLE Geologic Map of the Castle Rock 7.5’ Quadrangle, Arizona and California
PUBLICATION DATE 2018-06-18 00:00:00

EDITION 1.0

PRESENTATION FORMATS digital map

SERIES
NAME U.S. Geological Survey Scientific Investigations Map
ISSUE 3411
PAGE https://doi.org/10.3133/sim3411

*Hide Citation ▲*

## Citation Contacts ►

RESPONSIBLE PARTY
INDIVIDUAL'S NAME 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.
CONTACT'S ROLE author

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CONTACT'S POSITION Geologist
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CONTACT'S ROLE publisher

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DELIVERY POINT Reston, Virginia

ONLINE RESOURCE
LOCATION https://doi.org/10.3133/sim3411

*Hide Contact information ▲*

*Hide Citation Contacts ▲*

## Resource Details ►

DATASET LANGUAGES English
DATASET CHARACTER SET utf8 - 8 bit UCS Transfer Format

STATUS completed
SPATIAL REPRESENTATION TYPE vector

SPATIAL RESOLUTION
DATASET'S SCALE
SCALE DENOMINATOR 24000

SUPPLEMENTAL INFORMATION

The schema for this geodatabase is derived, in part, from the NCGMP09--draft standard format for digital publication of geologic maps, version 1.1 (NCGMP09 v1.1), available at http://ngmdb.usgs.gov/Info/standards/NCGMP09/. Feature attributes and symbology follow the recommendations outlined in the FGDC Digital Cartographic Standard for Geologic Map Symbolization, available at https://pubs.usgs.gov/tm/2006/11A02/..

CastleRock24k_USGS_SIM-3411.gdb contains the following spatial and non-spatial data:

GeologicMap (feature dataset) - contains the following feature classes used to depict the geology:
CartographicLines - annotation leaders for MapUnitPointsAnno24k (domain CR24k_FGDC_CartoLines attached to Type field)
ContactsAndFaults - geologic contacts and faults (domain CR24k_FGDC_ContactsFaults attached to Type field)
DataSourcePolys - boundaries of published maps used in bedrock compilation
GenericSamples - microfossil and geochronology sample locations
GenericSamplesAnno - annotation for GenericSamples
GeomorphLines - lineaments (domain CR24k_FGDC_GeomorphLines attached to Type field)
MapUnitPoints - geologic map unit label points (domain CR24k_MapUnits attached to MapUnit field)
MapUnitPointsAnno24k - feature-linked annotation for MapUnitPoints via relationship class Anno_218_393
MapUnitPolys - geologic map unit polygons (domain CR24k_MapUnits attached to MapUnit field)
OrientationPoints - Orientation data for planar and linear geologic features (domain CR24k_FGDC_OrientationPts attached to Type field)
OrientationPointsAnno24k - feature-linked annotation for OrientationPoints via relationship class Anno_217_395

CorrelationOfMapUnits (feature dataset) - includes the following feature classes used to depict the Correlation of Map Units, List of Map Units, and Explanation of Map Symbols for the geologic map:
CMUAnno - geologic unit names, ages, and other descriptive text
CMULines - age brackets and line symbols in Explanation of Map Symbols (domain CR24k_CMULines attached to Type field)
CMUMapUnitPolys - boxes depicting List of Map Units and Correlation of Map Units (domain CR24k_MapUnits attached to MapUnit field)
CMUPoints - point symbols in Explanation of Map Symbols (domain CR24k_FGDC_OrientationPts attached to Type field)

DataSources (non-spatial table) - contains references to data sources used to the compile data in the CastleRock24k_USGS_SIM-3411 geodatabase.

DescriptionOfMapUnits (non-spatial table) - tabular representation of the content of the Description of Map Units (contained in the accompanying pamphlet), and the List of Map Units, and Correlation of Map Units (portrayed on the accompanying geologic map).

Resources (folder) - contains CastleRock24k_USGS_SIM-3411.style and associated fonts (used to symbolize line and point features by matching values in Type field to style, and to symbolize MapUnitPolys by matching values in MapUnit field to style); o34114e3.tif and o34114e4.tif (1:24,000-scale DRG topo bases, UTM11_NAD27), and other acillary data used to create the map graphic.

CREDITS

This digital database was prepared by Kyle House, Sue Beard, Debra Block, Colleen Cassidy, Ryan Crow, Tracey Felger, and Beth Mennow (all USGS). Technical reviews were provided by Keith Howard (USGS) and Phil Pearthree (AZGS). Digital review was provided by Stephanie Dudash (USGS).

ARCGIS ITEM PROPERTIES

*Hide Resource Details ▲*

## Extents ►

EXTENT

GEOGRAPHIC EXTENT

BOUNDING RECTANGLE

WEST LONGITUDE -114.903522

EAST LONGITUDE -114.02606

SOUTH LATITUDE 33.089819

NORTH LATITUDE 35.981392

EXTENT CONTAINS THE RESOURCE Yes

EXTENT

GEOGRAPHIC EXTENT

BOUNDING RECTANGLE

EXTENT TYPE Extent used for searching

WEST LONGITUDE -114.669038

EAST LONGITUDE -114.364747

NORTH LATITUDE 34.725285

SOUTH LATITUDE 34.466865

EXTENT CONTAINS THE RESOURCE Yes

*Hide Extents ▲*

## Resource Points of Contact ►

POINT OF CONTACT

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ORGANIZATION'S NAME U.S. Geological Survey

CONTACT'S POSITION Geologist

CONTACT'S ROLE originator

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*Hide Resource Points of Contact ▲*

## Resource Maintenance ►

RESOURCE MAINTENANCE
UPDATE FREQUENCY not planned

*Hide Resource Maintenance ▲*

## Resource Constraints ►

LEGAL CONSTRAINTS
LIMITATIONS OF USE

The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers at the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty. In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of delivery, installation, operation, or support by USGS.

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LIMITATIONS OF USE

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*Hide Resource Constraints ▲*

## Data Quality ►

SCOPE OF QUALITY INFORMATION ►
RESOURCE LEVEL dataset

*Hide Scope of quality information ▲*

DATA QUALITY REPORT - COMPLETENESS OMISSION ►
MEASURE DESCRIPTION

This geodatabase is considered complete for the time period of the content. The quadrangle is completely mapped, and all geologic features on the source maps were digitized and attributed, as was all new mapping.

EVALUATION TYPE indirect

*Hide Data quality report - Completeness omission ▲*

DATA QUALITY REPORT - CONCEPTUAL CONSISTENCY ▶

MEASURE DESCRIPTION

Geologic lines (ContactsAndFaults), and geologic units (MapUnitPolys) are topologically related entities. The following topology rules were employed to maintain the topological integrity of the data: geologic lines 1) must not self-overlap, 2) must not self-intersect, 3) must not have pseudonodes, 4) must not intersect or touch interior, 5) must be single part, and 6) must not have dangles [excepting faults]; geologic units 1) must not overlap, 2) must not have gaps, and 3) boundary must be covered by [geologic lines].

EVALUATION TYPE direct internal

EVALUATION METHOD

Topology was validated and errors were fixed or flagged as exceptions. Additionally, feature class MapUnitPolys was checked for sliver polygons by searching for anomalously small values in the Shape_Area field. Feature class ContactsAndFaults was checked to ensure the length and directionality of each line segment was appropriate for the geologic feature it depicts.

*Hide Data quality report - Conceptual consistency ▲*

DATA QUALITY REPORT - ABSOLUTE EXTERNAL POSITIONAL ACCURACY ▶

MEASURE DESCRIPTION

Bedrock geology for this database was digitized from georeferenced 1:24,000-scale source maps, and new mapping of surficial geology was compiled at scales from 1:12,000 to 1:24,000. Lines in feature class ContactsAndFaults with the modifier 'location accurate' in the Type field (e.g. Contact - Identity and existence certain, location accurate) are assumed (but not guaranteed) to be located within approximately +/- 15 meters of their actual position on the ground. Lines with modifiers 'approximate', inferred', and 'concealed' are assumed to be poorly located, and may have errors that greatly exceed +/- 15 meters. Points in feature class OrientationPoints that were digitized from georeferenced 1:24,000-scale source maps are assumed (but not guaranteed) to be located within approximately +/- 15 meters of their actual position on the ground, while points that were collected as part of this study were located using a handheld GPS, and are assumed to be located within approximately +/- 5 to 10 meters of their position on the ground. Points in feature classes MapUnitPoints are used in conjunction with the lines in ContactsAndFaults to create MapUnitPolys, and for cartographic annotation; the locations have only a very general geographic relevance. Similarly, all the feature classes in the

CorrelationOfMapUnits feature dataset are for cartographic purposes only; the locations have no geographic relevance.

EVALUATION TYPE indirect

*Hide Data quality report - Absolute external positional accuracy ▲*

DATA QUALITY REPORT - QUANTITATIVE ATTRIBUTE ACCURACY ►

MEASURE DESCRIPTION

Geologic features in the geodatabase were symbolized based on attributes, plotted at 1:24,000-scale and visually reviewed for accuracy by the authors.

EVALUATION TYPE indirect

*Hide Data quality report - Quantitative attribute accuracy ▲*

*Hide Data Quality ▲*

## Lineage ►

LINEAGE STATEMENT

This geologic map was compiled from published bedrock mapping of John (1987) and Miller and John (1999), and new surficial geologic mapping that was funded through the USGS National Cooperative Geologic Mapping Program. An unpublished surficial geologic map of the Castle Rock quadrangle was first produced by D. Malmon in 2010 as part of the USGS Federal Lands of the Southwest project. Malmon left the USGS before the map was finalized, and efforts to complete the map did not resume until 2014, when the USGS Geologic and Geomorphic Framework of Lower Colorado River project made the decision to update the surficial geology of Malmon to reflect advancements in the understanding of the Colorado River and its deposits, as well as incorporate published bedrock mapping. To that end, the 1:24,000-scale bedrock geologic map of the Chemehuevi Mountains of John (1987) was scanned, georeferenced, and completely digitized by S. Priest (USGS, now retired). This mapping was incorporated into the surficial mapping of Malmon, and adjusted to better fit topography and modern imagery by D. Block and S. Beard. A tectonic study of the Chemehuevi-Sacramento detachment fault by Miller and John (1999) included bedrock mapping for the area north of Blankenship Valley, as well as updated mapping for the Trampas Wash area (Miller and John, 1999; figure 7, scale ~1:37,000). This figure was georeferenced and the geology digitized and modified by S. Beard to supplement the mapping of John (1987) in the Trampas Wash area, and to fill in the bedrock north of Blankenship Valley. In conjunction with the compilation of the bedrock geology, the surficial mapping of Malmon required significant updates to reflect new data and interpretations concerning the Colorado River and its deposits. This work, which was performed primarily by House, employed a variety of techniques and tools to identify and map the surficial deposits. Field work was conducted to observe and describe sediments, soils, surfaces, and vertical exposures. Colorado River sediments were distinguished in the field by the presence of typical Colorado River facies, including: gravels containing abundant far-traveled, exotic quartzite and chert clasts, well-

bedded silt and clay sequences, and sand rich in rounded quartz grains. In contrast, “piedmont gravel deposits” are dominated by angular to subrounded clasts derived from local bedrock source rocks. Geologic units were characterized in the field based on lithology, elevation, landscape position, as well as indicators of exposure age, such as dissection, surface drainage, surficial clast weathering, soil and pavement development, and other descriptive parameters indicative of age. Relative ages of some piedmont surfaces are based on characteristics such as the degree of dissection, pavement and varnish development, and the degree of calcic soil formation. Stratigraphic relations between units are based on the tracing of unambiguous contacts observed in outcrop wherever possible. Field observations were supplemented in the office with multiple sets of black and white and color stereographic aerial photographs at different scales, as well as digital imagery, including NAIP, WorldView 2, and MASTER data. Contacts were digitized on a tablet monitor (Wacom brand) with a digitizing pen, drawn over a variety of digital imagery, at a screen resolution of about 1:5,000. Contacts were digitized and units were labeled while referring to field notes and maps, georeferenced ground photographs, field-annotated aerial photographs, and Google Earth imagery. In addition to the surficial deposits, the shoreline of Lake Havasu, and the contacts of the delta deposits that are visible at, or just below, the water surface were digitized by D. Block. These lines were compiled from WorldVIew 2 data and aerial photography flown in 1938, and were digitized at a screen resolution of about 1:5,000.

*Hide Lineage ▲*

## Geoprocessing history ►

PROCESS
DATE 2018-08-16 11:01:27
TOOL LOCATION c:\arcgis\desktop10.5\ArcToolbox\Toolboxes\Data Management Tools.tbx\Compact
COMMAND ISSUED
```
Compact
\\Igswzcwwgsrio\loco\Team\Felger\ActiveMaps\CastleRock24k_USGS\PubMaterials\
CastleRock24k_USGS_SIM-3411\CastleRock24k_USGS_SIM-3411.gdb
```
INCLUDE IN LINEAGE WHEN EXPORTING METADATA No

*Hide Geoprocessing history ▲*

## Distribution ►

DISTRIBUTOR ►
CONTACT INFORMATION
INDIVIDUAL'S NAME U.S. Geological Survey Information Services
ORGANIZATION'S NAME U.S. Geological Survey
CONTACT'S ROLE distributor

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VOICE 1-888-ASK-USGS

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CITY Denver

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ORDERING PROCESS
TERMS AND FEES None

*Hide Distributor ▲*

DISTRIBUTION FORMAT
NAME ArcGIS File Geodatabase
VERSION 10.3

TRANSFER OPTIONS
ONLINE SOURCE
LOCATION https://doi.org/10.3133/sim3411

*Hide Distribution ▲*

## Metadata Details ►

METADATA LANGUAGE English
METADATA CHARACTER SET utf8 - 8 bit UCS Transfer Format

SCOPE OF THE DATA DESCRIBED BY THE METADATA dataset
SCOPE NAME dataset

ARCGIS METADATA PROPERTIES
METADATA FORMAT ArcGIS 1.0
STANDARD OR PROFILE USED TO EDIT METADATA FGDC

LAST MODIFIED IN ARCGIS FOR THE ITEM 2018-08-16 10:53:20

*Hide Metadata Details ▲*

## Metadata Contacts ►

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*Hide Metadata Contacts ▲*

## Metadata Maintenance ►

MAINTENANCE
UPDATE FREQUENCY not planned

*Hide Metadata Maintenance ▲*