Cave Buttes Dam
FCD Gage ID# 4904

Station Description

LOCATION – The dam is located near what would be the intersection of Happy Valley Road and 16th Street. The gage is located on the east side of the main dam structure across Cave Creek Wash. Latitude 33° 43' 15" N, Longitude 112° 02' 43" W. Located in the NW1/4 SW1/4 SW1/4 S03 T4N R3E in the Union Hills 7.5-minute quadrangle.

ESTABLISHMENT – The gage was established on January 25, 1984.

DRAINAGE AREA – 191 mi^2

GAGE – The gage is a bubbler type orifice located near the outlet works in the dam pool. The orifice is at elevation 1.90 feet gage height, or 1,563.90 feet NAVD 1988, levels of January 19, 1992.

There are 24 staff gages located from the bottom of the pool area to the top of the dam. All staff gages read in mean sea level datum. Previous surveys indicate that the staff gages read approximately five feet high.

There are no crest gages at this location.

ZERO GAGE HEIGHT - Zero gage height is defined as the invert of the outlet culvert. Elevation 1,562.00 feet NAVD 1988.

HISTORY – No history at this location prior to gage installation. Gaging was established at this location on January 25, 1984. The gage was a float and manometer type instrument. First rating was applied on January 1, 1990. The float type gage was replaced with a pressure transducer on November 1, 1993. Pressure transducer replaced on December 4, 1996. Pressure transducer moved out of CMP can on May 7, 1997 to its present location. A bubbler/non-submersible pressure transducer system was installed on February 12, 1998. Instrumentation replaced on April 1, 1998. A bubbler / gas purge system installed on February 17, 2000. Pool gage ID changed from 4904 to 4899. Pool gage ID changed to 4904 on February 21, 2008. The orifice line was relocated to the stilling well in June 2011. Elevation of orifice remains 1.90 feet gage height.

REFERENCE MARKS –

RM1 is a brass tablet on top of dam marked USCE SM-19. Elevation 119.08 feet gage height, or 1,679.10 feet M.S.L., levels of January 19, 1992.

RM2 is a brass tablet on top of dam marked USCE SM-16. Elevation 118.94 feet gage height, or 1,678.96 feet M.S.L., levels of January 19, 1992.

RM3 is a brass tablet on top of dam marked USCE SM-15. Elevation 118.96 feet gage height, or 1,678.98 feet M.S.L., levels of January 19, 1992.

RM4 is a brass tablet on top of dam marked USCE RM-6. Elevation 118.89 feet gage height, or 1,678.91 feet M.S.L., levels of January 19, 1992.

RM5 is a brass tablet on top of dam marked USCE OB-4. Elevation 118.92 feet gage height, or 1,678.94 feet M.S.L., levels of January 19, 1992.

RM6 is a brass tablet on top of dam marked USCE RM-2. Elevation 119.03 feet gage height, or 1,679.05 feet M.S.L., levels of January 19, 1992.

RM7 is a brass tablet on top of dam marked USCE SM-14. Elevation 119.33 feet gage height, or 1,679.35 feet M.S.L., levels of January 19, 1992.

RP1 is a white paint spot on top of inlet headwall near rail post. Elevation 12.50 feet gage height, or 1,572.52 feet M.S.L., levels of January 19, 1992.

RP2 is the top bolt on downstream side of CMP housing near orifice. Elevation 6.16 feet gage height, or 1,566.18 feet M.S.L., levels of January 19, 1992.

CHANNEL AND CONTROL – The primary outlet from the dam is a 45-inch diameter concrete culvert 548 feet in length. The auxiliary spillway for the dam is located to the west of the main dam.

PRINCIPAL OUTLET / EMERGENCY SPILLWAY –

The principal outlet is a 45-inch diameter concrete culvert. The invert of the inlet is at 0.00 feet gage height, or 1,562.00 feet NAVD88. The invert of the outlet is at –2.15 feet gage height, or 1,559.85 feet NAVD88. The culvert length is 548 feet. Flow begins through the culvert at 0.00 feet gage height.

The emergency spillway is located to the west of the gage and main dam. The spillway is blasted into the mountain and spills into the valley below. The bottom width of the spillway is 510 feet. The spillway crest is at 97.1 feet gage height, or 1,659.10 feet NAVD88.

The top of the dam elevation is approximately 119.1 feet gage height, or 1,681.1 feet NAVD88.

RATINGS – The current discharge rating is Rating #7 (applied 10/01/2015) which is a revision of Rating #6, adjusting the spillway flows using a weir coefficient of 2.8 rather than 2.9. Rating #6 is a revision of Rating #5 to account for movement of the pressure transducer out of the orifice. Rating #3 is the basis for all ratings following it. Ratings 4 (applied 10/1/94) and 5 (applied 10/1/96) are revisions of Rating #3 to account for discrepancies from the discharge at the gage at the outlet channel. R. W. Cruff developed rating #3 (applied 3/2/92) in March 1992 using the HY-8 culvert analysis for the primary outlet and the weir equation for the auxiliary spillway. Rating #2 (applied 1/1/90) was taken from the structure data book. Rating #1 (applied 1/25/84) was from the original COE design.

The capacity rating was modified to account for the new mapping for stages above the emergency spillway, and is based on the same topo used in the 2011 study. Previously, the volumes were only determined up to the spillway elevation. Volumes above the spillway elevation were estimated from extending the plot of the given values. The rating will be current for Water Year 2011. The previous capacity rating is Rating #4 (applied 5/7/97). Rating #4 is merely Rating #3 accounting for movement of the level sensor. Rating #3 (applied 10/1/96) is a revision of Rating #2 to account for more surface area. Rating #2 (applied 10/1/95) is a refinement of the design COE gross capacity curve. Rating #1 (applied 1/25/84) is the COE design capacity rating.

DISCHARGE MEASUREMENTS – Discharge measurements are made at the outlet channel to refine the rating for that gage. No other discharge measurements at the primary outlet would be possible.

POINT OF ZERO FLOW – Flow begins through the principal outlet at 0.00 feet gage height. Flow begins through the emergency spillway at approximately 97.1 feet gage height.

FLOODS / SIGNIFICANT IMPOUNDMENTS –

The largest impoundment occurred on January 8, 1993 at 75.89 feet gage height, and 17,592 acre-feet and 38.2 percent full. The second largest event occurred on January 23, 2010 at 67.20 feet, 8,696 acre-feet, and 18.6 percent full.

REGULATION – Cave Creek dam approximately 1/2 mile upstream regulates flows into Cave Buttes Dam. Both dams regulate natural flows on Cave Creek Wash.

DIVERSIONS – None known

ACCURACY – Fair

JUSTIFICATION – Monitor water levels behind Cave Buttes Dam for public safety.

UPDATE – July 7, 2016
DE Gardner