



Mike Fritschi
Director of Operations
Rancho Murieta Community Services District
July 5, 2022

RE: Calero Lake Bathymetric Survey and Stage-Storage Curve

To Mike Fritschi,

A bathymetric/topographic survey was completed for Calero Lake, and the immediate vicinity as requested per the agreement of services dated April 19, 2022. To complete the bathymetric portion of the survey a Seafloor Hydrone pontoon drone with a HydroLite sonar system and a Trimble R2 GPS unit were used to collect single beam sonar depths through a 15'x30' grid across Calero Lake. The topographic portion of the survey utilized a Trimble R10 GPS unit to establish a control network surrounding the lake and collect topographic data of the immediate ground, features, and structures. All GPS functionalities utilized the California Real-Time Network (CRTN) and were based on California State Plane Zone 2 projection, and the NAVD (North American Vertical Datum) 1988 vertical datum.

Also requested with the survey were a topographic contour map and a stage-storage curve to be processed from the data that was collected during field work. To create the topographic contour map, a surface of the lake bottom and the surrounding area was created in AutoCAD Civil 3D 2021 utilizing the data that was collected. The stage-storage curve for the lake was produced by creating a comparison surface to calculate the total volume at one-foot elevation intervals. The elevations that resulted from these calculations were based on the NAVD 1988 vertical datum.

After analyzing the data and comparing to the record stage-storage curve used by the district and what was calculated, a discrepancy was discovered. It was determined that this discrepancy is likely due to the difference in datums used to collect the data by Adkins and the data found on the stage-storage curve historically used by the district. If the stage-storage curve used by the district utilized NGVD (National Geodetic Vertical Datum) 1929 datum there would be a difference in the data vertically of a few feet. To test this theory the data that was collected was shifted vertically to fit to the NGVD 1929 datum; this shift equated to be 2.52 feet vertically down from the NAVD 1988 datum in this geographic area. A new stage-storage curve was created from the shifted data and was compared to the curve historically used by the district and the curve produced from the data collected on the NAVD 1988 datum. The results showed a curve that more closely resembled the curve that has been used by the district, but did not match it exactly (see Figure 1). There are other factors that may explain the difference in the data, such as: the age of the curve that is being used by the district, the greater accuracy of the equipment used today compared to the equipment used at the time of the field work to create the original curve, build-up of sedimentation on the lake bed, and the difference in methods for

calculating the volume between using a AutoCAD Civil 3D and hand calculations such as the average end area method. Also, after reviewing the original design plans from 1979 some additional factors became apparent. The existing peninsula near the southwest corner of the lake is not on the design plans, which may be the cause for the divergence between the curves as the elevation gets higher. The design plans list the method for gathering the data for the topography as aerial photography, which has a lower degree of accuracy compared to the methods implemented during our field work. The listed U.S.G.S benchmark, BB7, that was used as the vertical control for the design plans most likely had an elevation published in NGVD 1929, but this could not be verified because the datasheet for said monument could not be located.

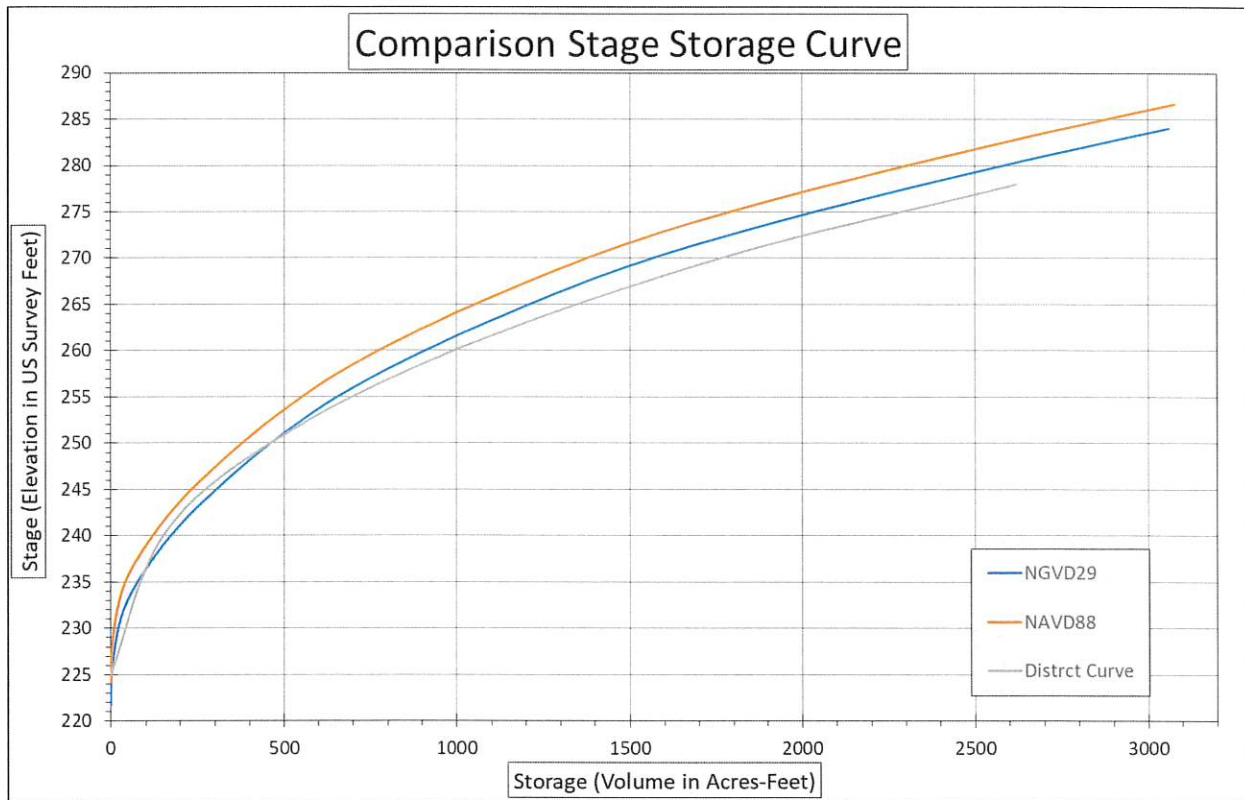


Figure 1

If you have any questions or comments, please feel free to contact me.

Sincerely,

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 Partner and Engineering Project Manager
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