



**Rincon Consultants, Inc.**

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January 2, 2024  
Project No: 20-10008

Bryan Bondy, PG, CHG  
Executive Director  
Upper Ventura River Groundwater Agency  
202 West El Roblar Drive  
Ojai, California 93023  
Via email: [bbondy@uvrgroundwater.org](mailto:bbondy@uvrgroundwater.org)

**Subject: Camino Cielo Stream Flow Monitoring Annual Data Transmittal for Water Year 2023  
Upper Ventura River Groundwater Agency, Ventura County, California**

Dear Mr. Bondy:

Rincon Consultants, Inc. (Rincon) has prepared the following Annual Data Transmittal for the 2023 Water Year (October 1, 2022, through September 30, 2023) for stream flow monitoring activities performed at Camino Cielo located in the most northern portion of the Upper Ventura River Groundwater Basin in Ventura County, California (Figure 1). This memorandum was prepared for Upper Ventura River Groundwater Agency (UVRGA) in accordance with UVRGA's Monitoring and Data Collection Protocols and Data Quality Control Review Procedures.

In July 2023, Rincon installed a stream gage equipped with a Solinst Levellogger automated pressure transducer at the County-owned crossing at Camino Ceilo. Cross section (Figure 2) and channel slope (Figure 3) surveys were completed to support the development of a stage-discharge rating curve using HydroCalc Version 3.0c software (HydroCalc), which utilizes Manning's equation to model flow rates from observed depth of water and channel dimensions. Manning's roughness coefficients were selected based on substrate type and slope was back calculated using a normal depth calculator provided by the National Weather Service.<sup>1</sup>

High water flows caused by the above average precipitation in the winter and spring of 2023 prevented equipment deployment during the first half of the water year. Continuous level data collection commenced by July 18, 2023, and instantaneous discharge measurements (Figure 4) were collected through the monitoring period to support rating curve development and calibration. These measurements occurred for a limited range of flow conditions during the 2023 Water Year monitoring period, which prevents the development of a robust empirical rating curve spanning water depth ranges outside of those measured by the continuous pressure transducer. Calibration of the rating curve involved utilizing field-derived flow measurements, and a best-fit curve was applied to the HydroCalc outputs to establish an equation for calculating discharge rates based on stream depths at the thalweg (Figure 5). While Manning's equation-derived rating curves may exhibit inaccuracies beyond the calibration data range, the pressure transducer-derived depths consistently fell within the established calibration range, resulting in reliable calculated flow rates throughout the monitoring period (Figure 6).

Attachment 1 provides a Microsoft Excel file with sheets presenting instantaneous discharge measurements, rating curve, hydrograph, and channel cross section and slope.

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<sup>1</sup> <https://www.weather.gov/aprfc/NormalDepthCalc>



We appreciate Rincon's opportunity to support this project. Please do not hesitate to contact us if you have any questions.

Sincerely,  
**Rincon Consultants, Inc.**

A handwritten signature in black ink, appearing to read "Thomas Sanford".

Thomas Sanford  
Watershed Scientist

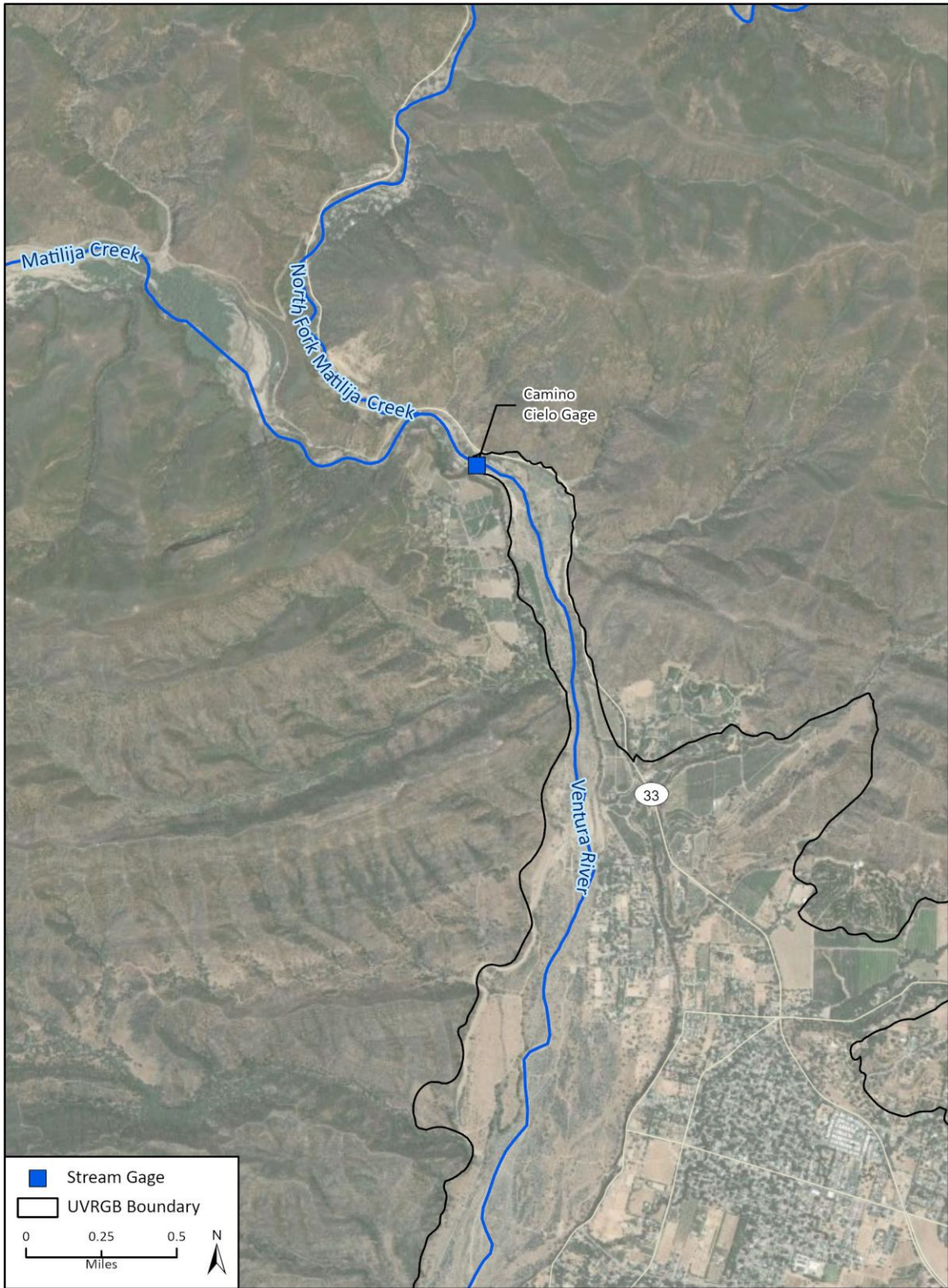
A handwritten signature in black ink, appearing to read "Kiernan Brtalik".

Kiernan Brtalik  
Director Watershed Sciences

**Attachments**

Attachment 1 Camino Cielo Flow Data (Microsoft Excel File provided electronically)

**Figure 1 Camino Cielo Stream Gage Location**

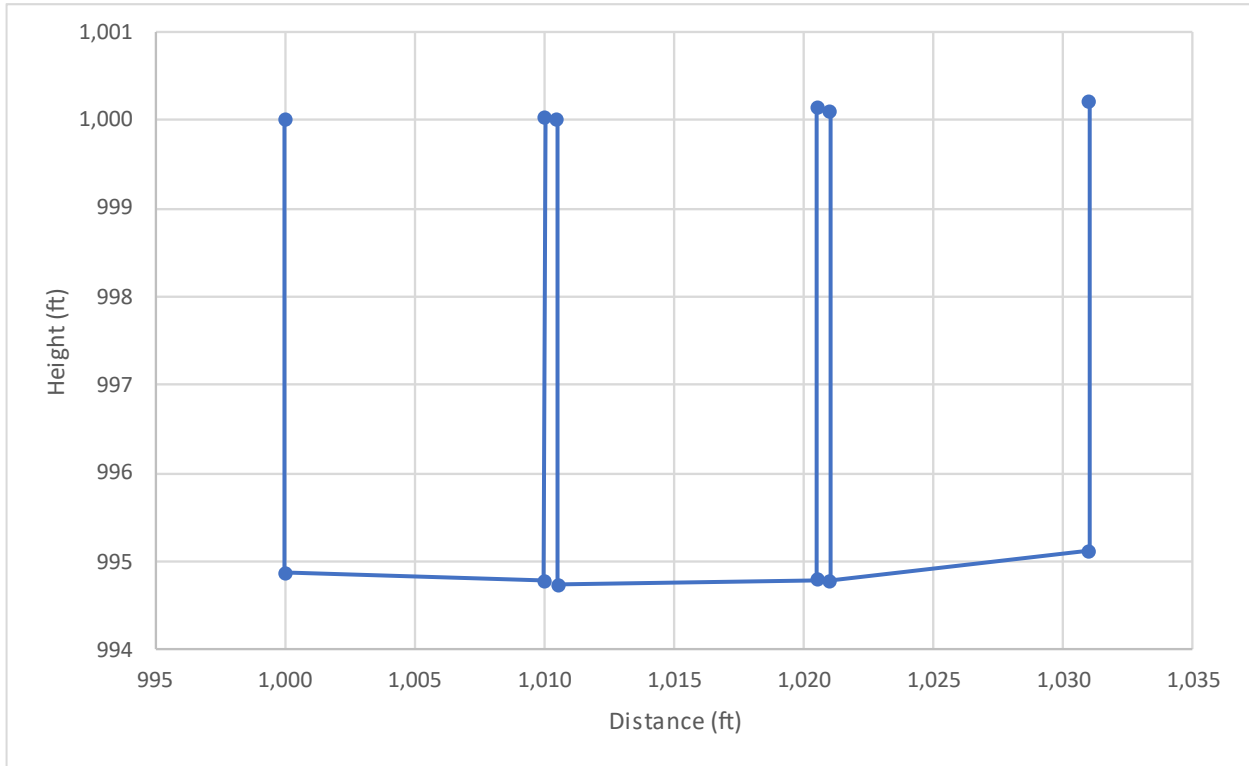


Imagery provided by Esri and its licensors © 2023.

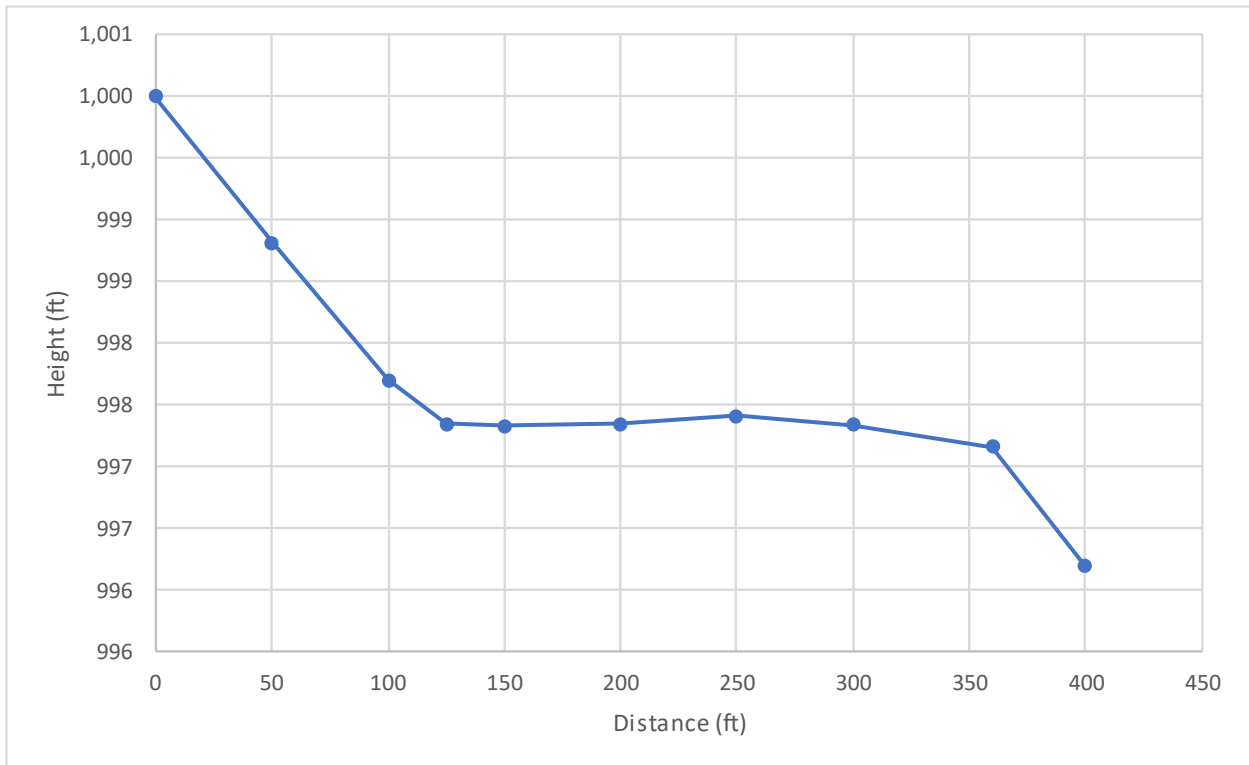
Camino Cielo Stream Gage Location  
Aquatic GDE Assessment Figures



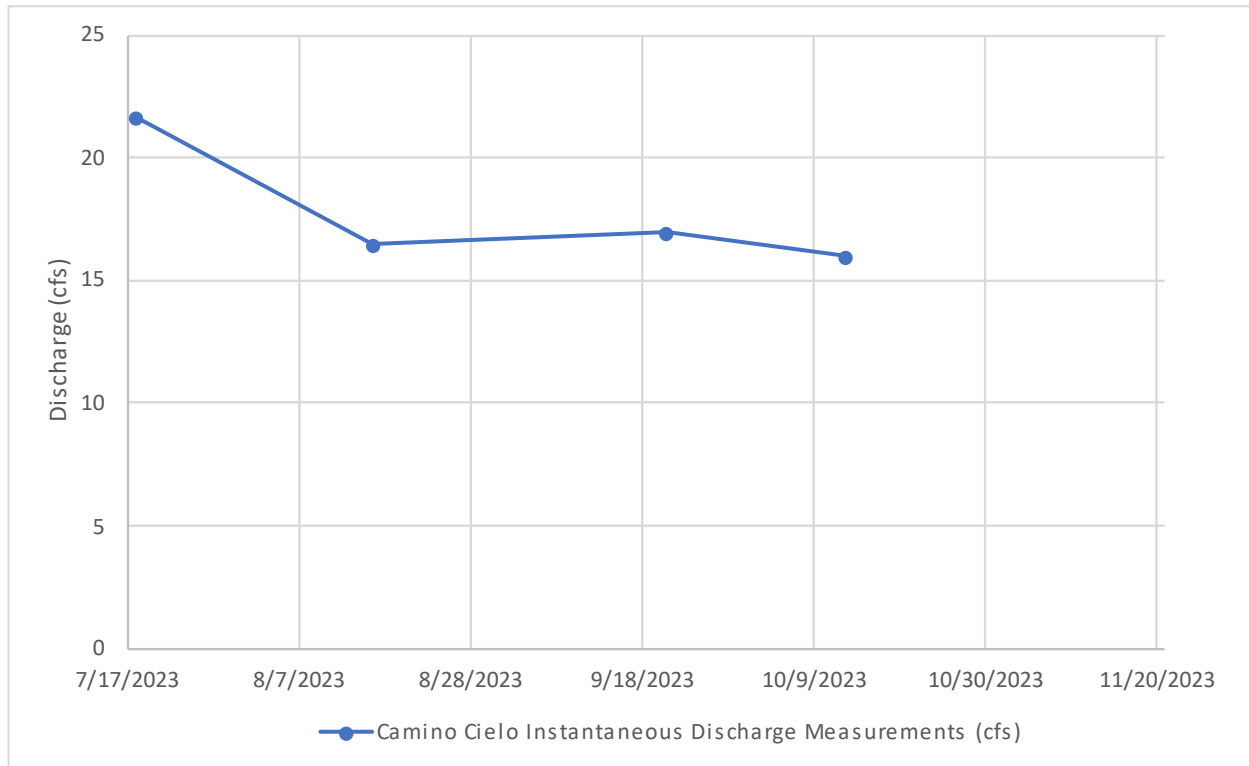
**Figure 2 Camino Cielo Cross Section**



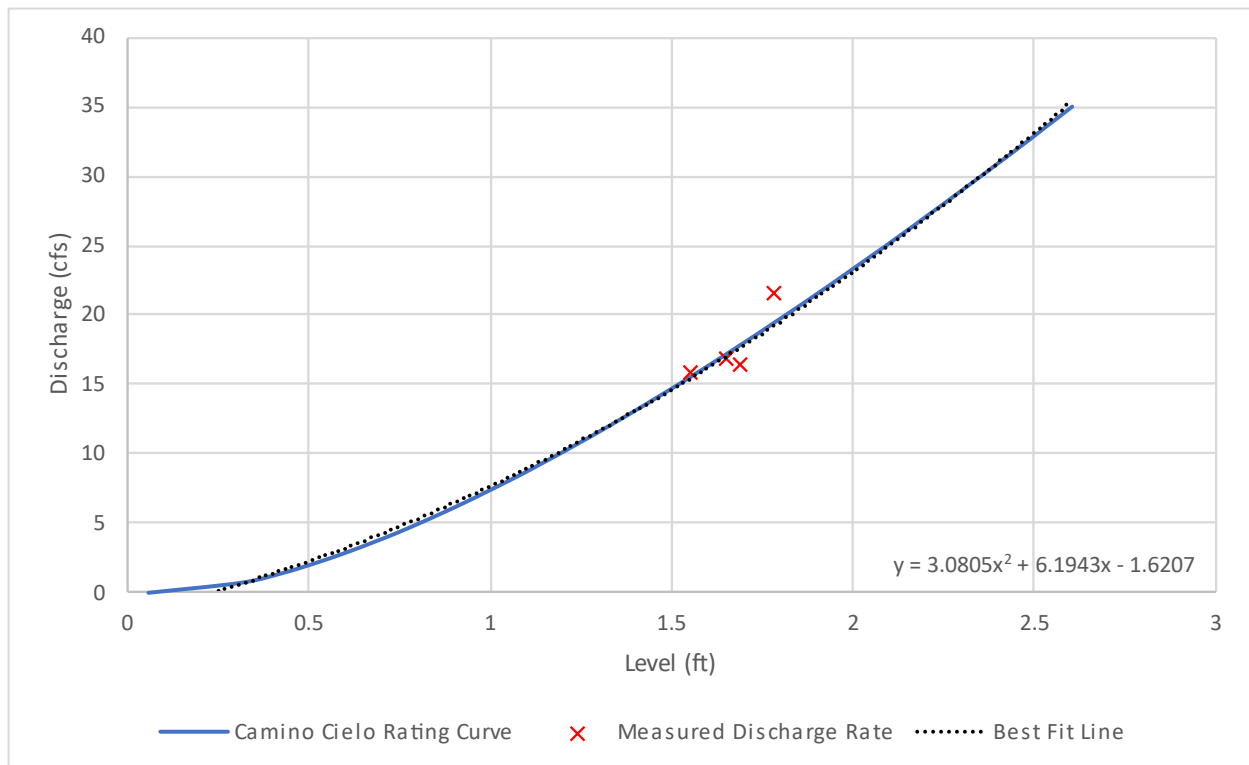
**Figure 3 Camino Cielo Channel Slope**



**Figure 4 Camino Cielo Instantaneous Discharge Measurements**



**Figure 5 Camino Cielo Rating Curve**



**Figure 6 Camino Cielo Hydrograph**

