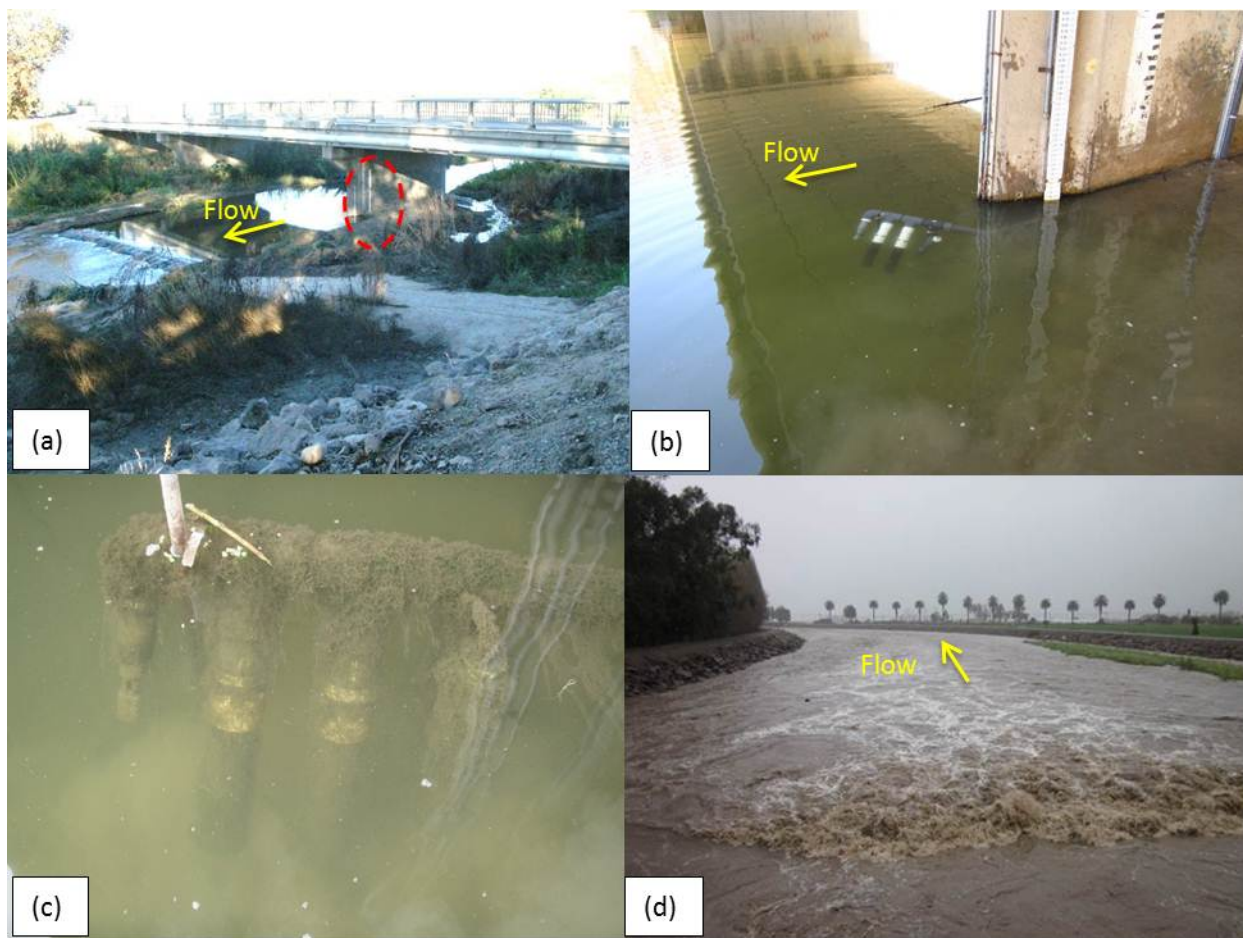


## Appendix C: Sensor Installation Details

### 03\_UNIV

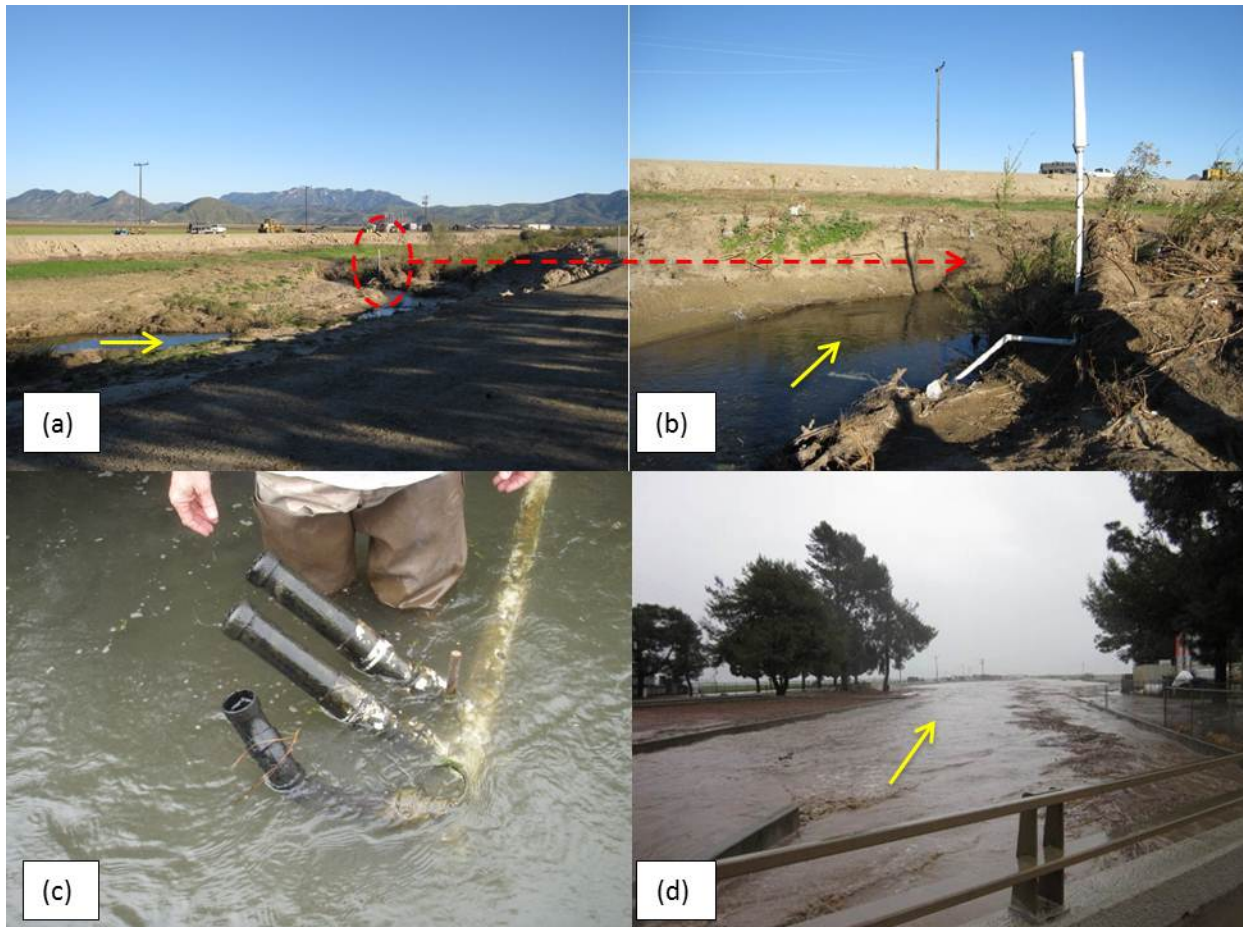
The 03\_UNIV station is co-located with USGS and Ventura County Watershed Protection District (VCWPD) equipment on Calleguas Creek under the University Drive Bridge. The electronics housing is bolted securely to a relatively protected side of a bridge pier. Two inch SCH 80 PVC conduit drops six feet vertically to below water level and then extends horizontally to position the salts sensors in the creek. While this creek section is shallow with significant moving sand, the bridge pier creates a relatively protected and stable 1.5 foot deep pool just downstream of the pier, providing an ideal location for the salts sensors. For salts, the station is equipped with two EC sensors (standard, non-contact), and four chloride ion selective electrode sensors. For flow, a depth sensor is securely anchored next to the bridge pier at the bottom of the vertical PVC section; the horizontal PVC section creates a stilling well. A concrete drop structure seen in Fig A1(a) just downstream provides some improved channel stability for flow ratings.



**Figure 1. Sensor system at 03\_UNIV: (a) Sensor unit attached to bridge pier, downstream drop structure; (b) Salts sensors suspended in pool downstream of pier; (c) Submerged sensors with two weeks of fouling; (d) March 20, 2011 storm flow looking downstream.**

## 04\_WOOD

The 04\_WOOD site is located on Revlon Slough 200 yards downstream of Wood Road where the channel transitions from concrete-lined to natural. 4\_WOOD is the most challenging site for deployment of continuous sensors, and initial attempts to monitor in the concrete channel during a pilot study in 2009 were unsuccessful due to rapid deposition of silt and lack of salts uniformity across the transect. The present location was selected because the creek is narrow and deep with a hard pan bottom, indicating that the swift water tends to scour rather than deposit silt. The system is staked in root balls in the middle of the channel where it is at some risk but survived the March 20, 2011 storm intact, reducing urgency to find a safer location. The sensors are positioned in the middle of the creek using 2-inch PVC conduit secured by metal stakes driven into the substrate. The creek is typically 1.5 feet deep at the sensor location. For salts, the station is equipped with one EC sensor and four chloride ion selective electrode sensors. For flow, a depth sensor is located closer to the electronics unit and the conduit is secured to prevent movement by clamping between pairs of 4 foot metal stakes driven into the creek bed.



**Figure 2. Sensor system at 04\_WOOD: (a) Revlon Slough natural channel, looking downstream just below Wood Road; (b) Sensor unit is staked in roots and dirt in middle of channel; (c) Sensors rotated up for maintenance; (d) March 20, 2011 storm flow looking downstream from Wood road.**

## 9A\_HOWAR

The 9A\_HOWAR site is located on Conejo Creek 50 yards upstream of Howard Road (downstream of the Camarillo WRP). The electronics housing was originally attached to a tree, but was moved to metal stakes after the tree became unstable following the March 20 storm. Two inch PVC conduit secured by metal stakes positions sensors in the middle of the creek. The creek is typically one foot deep at the sensor location, although the bottom is sandy and depth alters some with storms. For salts, the station is equipped with one EC sensor and two chloride ion selective electrode sensors. For flow, a depth sensor is located close to the river bank, and the conduit is secured to prevent movement by clamping between pairs of 4 foot metal stakes driven into the creek bed.



**Figure 3. Sensor system at 9A\_HOWAR: (a) Conejo Creek looking upstream near Howard Road toward Camarillo WRP; (b) March 20, 2011 storm flow looking upstream from similar location; (c) Sensors staked and supported in channel in PVC conduit; (d) Electronics housing staked on river bank.**

## 9B\_BARON

The 9B\_BARON site is located on Conejo Creek at the VCWPD gaging station behind Baron Brother's Nursery. The electronics housing is secured to a preexisting steel support 15 feet above water level. One-inch diameter flexible conduit drops down to creek level, where two-inch SCH 80 conduit bolted to concrete positions sensors in the creek. The creek is typically a few feet deep at the sensor location, although the bottom is sandy and depth alters significantly with storms. For salts, the station is equipped with two EC sensors (standard, non-contact), and two chloride ion selective electrode sensors. For flow, a depth sensor is securely anchored in the vertical pipe that drops into the water and is configured with horizontal pipe to create a stilling well.

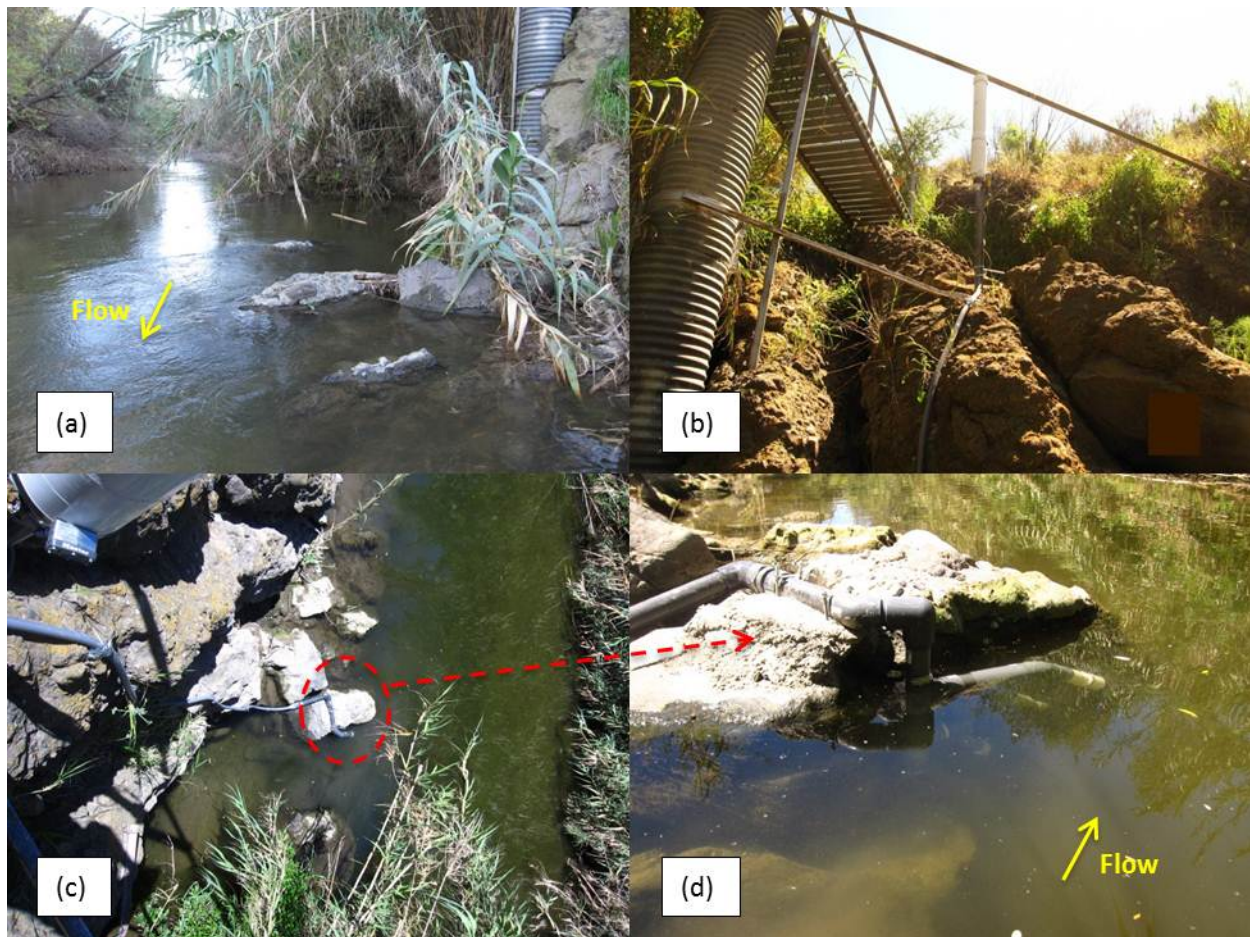


Figure 4. Sensor system at 9B\_BARON: (a) Conejo Creek at county gage station, looking upstream; (b) Electronics housing attached to gage station structure; (c) View looking down from electronics housing location to sensor location in creek; (d) Sensors positioned against upstream side of rock in deep protected pool.

## 07\_HITCH-S

07\_HITCH-S is located on Arroyo Las Posas one mile upstream of Hitch Blvd. At the site, the channel is constricted by the concrete and steel ruins of what may be an old drop structure. This creates a narrower, deeper and more stable channel in what is otherwise a shallow, sandy, and meandering creek. The electronics housing is secured to a steel I-beam that runs up the bank of the channel. One-inch diameter flexible conduit runs 40 feet along the I-beam down to water level, where two inch SCH 80 PVC conduit bolted to concrete positions sensors in the creek. The creek is typically 1.5 feet deep with swift moving water at the sensor location, although the bottom is sandy and depth alters with storms. For salts, the station is equipped with two EC sensors (standard, non-contact), and two chloride ion selective electrode sensors. For flow, a depth sensor is securely anchored in the vertical pipe that drops into the water and is configured with a horizontal pipe to create a stilling well.

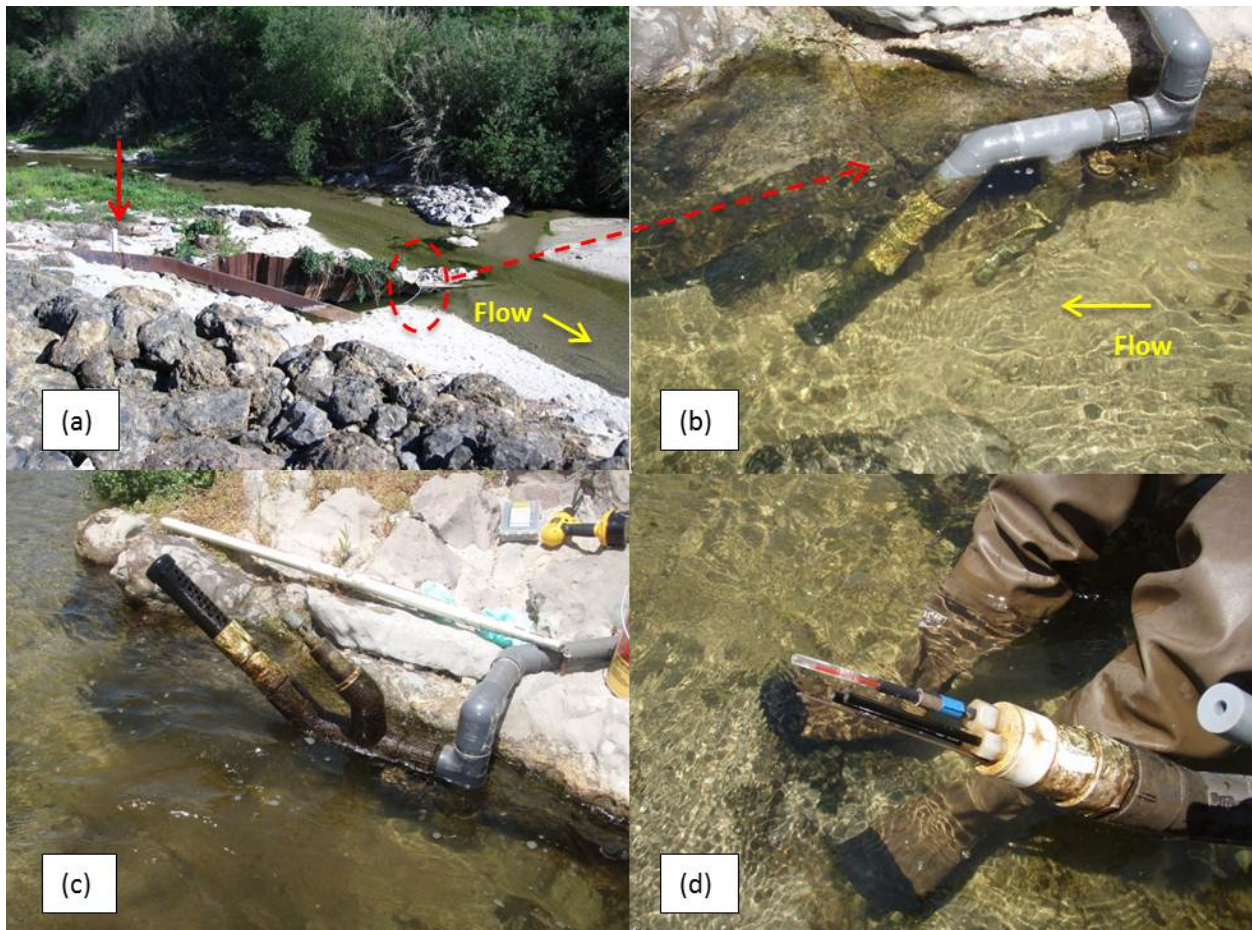


Figure 5. Sensor System at 07\_HITCH-S: (a) Arroyo Las Posas constricted by concrete and steel structure, electronics housing attached to I-beam on left is indicated by red arrow, flexible conduit runs to sensor location on concrete jutting into channel (red dashed circle); (b) Sensors anchored to near-vertical side of a boulder on upstream side of constriction; (c) Sensors rotated up out of water for maintenance; (d) Chloride sensor unit with shield removed to show sensing electrodes.