# Water Balance Development, Hydrogeologic Characterization, and Selenium Flux Assessment for Upper Newport Bay Watershed Nitrogen and Selenium Management Program

## Orange County, California

### Client

**Orange County Department of Public Works**

### Highlights

♦ Developed comprehensive water balance of former swamp area

♦ Characterized selenium occurrence and speciation

♦ Evaluated potential sources of selenium

♦ Identify data gaps in water balance and selenium characterization

♦ Engaged project stakeholders throughout project

As the representative of the regional Nitrogen and Selenium Management Program (NSMP), the Orange County Department of Public Works, Watersheds Section (OC Watersheds) contracted DBS&A to develop a hydrogeologic characterization, water balance, and selenium transport evaluation in an area known as the former "Swamp of the Frogs," in the cities of Tustin, Irvine, and Santa Ana. The NSMP's goal is to better understand and ultimately control selenium and nitrogen occurrence and transport within the watershed so it can be reduced to meet U.S. EPA's Total Maximum Daily Load (TMDL) requirements for local surface water.



Peters Canyon Wash is located in the former Swamp of the Frogs area in present-day Tustin, California. DBS&A has led a project demonstrating that selenium-rich groundwater discharge into the surface water channels is driven by regional groundwater recharge in upgradient areas of the watershed.

The former swamp area was historically a depositional environment receiving regional stream flow and surface water runoff. A network of surface water channels was established to lower the water table and capture storm flow. These surface water channels are now located below the regional groundwater table and receive high-selenium groundwater throughout much of the former swamp area.

DBS&A worked with OC Watersheds, RWQCB, and stakeholders within the NSMP. To accomplish the goals of the study, DBS&A:

♦ Developed a comprehensive water balance of the former swamp area, including use of a rigorous watershed-scale model for estimation of deep percolation from precipitation and irrigation

♦ Characterized selenium salt occurrence and speciation in groundwater, surface water, and passive groundwater seeps to surface water channels

♦ Evaluated potential sources of selenium salt and loading to groundwater and surface water channels

♦ Identified data gaps in the water balance and selenium salt characterization, and outlined further studies to fill data gaps and move forward with TMDL compliance

*Daniel B. Stephens & Associates, Inc.*