Under the U.S. Clean Water Act, the State of Hawaii Department of Transportation (HDOT) holds a National Pollutant Discharge Elimination System (NPDES) permit from the State of Hawaii Department of Health (HDOH) that controls water pollution from the storm runoff that is discharged from state highway facilities and adjacent areas by HDOTS’s Municipal Separate Storm Sewer System (MS4). This is the storm sewer network that carries rainwater from Oahu’s highways and adjacent areas, ultimately to the ocean. The effluent water quality requirements specified in the NPDES permit issued to HDOT were determined mainly based on a 2002 HDOH decision on the Total Maximum Daily Load (TMDL) for Ala Wai Canal (HDOH, 2002). A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant. Under the federal Clean Water Act, TMDLs must be determined for all water quality impaired water bodies. The Ala Wai Canal has been deemed a water quality impaired water body by the HDOH since 1998. However, principal findings of the Ala Wai Canal TMDL decision rationale were derived based on simple mass balance analysis (Freeman, 1993) and used a low estimate the Canal’s waste assimilative capacity. Also, the HDOH decision does not differentiate between runoff and waste loads generated by HDOT’s MS4 and by the City and County of Honolulu (CCH) MS4.

Dr. Clark Liu and Philip Moravcik of the Water Resources Research Center contracted with the HDOT to study stormwater coming from the HDOT system. The principal objective of the study was to derive a better characterization of the amounts of storm runoff and pollutant loads coming from HDOT’s MS4 and other sources, and their impacts on receiving water quality. Towards this end water quality monitoring networks were designed and installed to measure storm runoff and pollutant loads generated in the Ala Wai drainage basin and the Halawa drainage system (Figure 1). Water samples were collected from strategically placed automated equipment, triggered by high flow conditions in streams and sewers in the study watersheds. The samples were analyzed for total nitrogen and total suspended solids. The data collected were used for the calibration of watershed models of both Ala Wai and Halawa drainage systems.

The watershed modeling was conducted by using the USEPA’s Better Assessment Science Integrating point and Non-point Sources (BASINS) framework. BASINS is made up of
several GIS-based computer tools and databases for watershed analysis. These GIS tools and databases are integrated with several built-in analytical models for watershed simulation. The calibrated watershed models were used to evaluate the HDOT MS4’s contributions to pollutant loads during major storm events, relative to other sources of pollution. A receiving water quality model was also developed for the Ala Wai Canal to predict water quality in the canal under varying inputs of storm runoff and pollutant loads.

Results of WRRC’s survey and modeling analysis indicate that HDOT MS4 facilities contribute a small portion of the storm runoff and pollutant loads entering Ala Wai Canal. Although this project did not calculate the CCH contributions, the combined HDOT and CCH contribution of storm runoff and pollutant loads is expected to be much smaller than that suggested by the existing Ala Wai TMDL analysis (HDOH, 2001). Major portions of storm runoff and pollutant loads most likely result from upland areas. Due to steep topography and high rainfall, upland areas are more susceptible to the soil erosion. BASINS/HSPF modeling indicates that HDOT MS-4 facilities generated less than 4% of total runoff and pollutant loads during the December 2009 rainstorm.

US. Environmental Protection Agency and State of Hawaii Department of Health (2002). Revisions to Total Maximum Daily Loads for the Ala Wai Canal, Island of Oahu, Hawaii, HDOH, Honolulu, HI.
