PACE performed a watershed-wide analysis of the San Gabriel/Coyote Creek watersheds (and is currently preparing plans for the remaining watersheds located in Orange County) to illustrate how to implement new various control measure requirements to mitigate hydromodification on new developments. These measures include low impact development (LID), hydromodification control, and treatment control to address hydrologic conditions of concern (HCOC), and support long-term watershed masterplanning goals. The planning process involved a multi-step process of characterizing and analyzing the watershed and sub-surface conditions utilizing sophisticated GIS mapping tools.

The project effort resulted in a dynamic planning tool that is accessible by County staff and property owners and provides watershed-specific support for integrating water quality, hydromodification, water supply and habitat protection issues as part of selecting and designing BMPs to meet the requirements of the County’s Model Water Quality Management Plan (WQMP). Specifically, this planning tool provides information related to infiltration feasibility and hydromodification susceptibility at the watershed and sub-watershed scale that will help inform BMP selection and design for a proposed project. Infiltration feasibility and hydromodification susceptibility are fundamental factors in the selection and sizing of BMPs to meet the requirements of the MWQMP and TCD.

Specific features of the watershed management planning tool include:

- Regional watershed application of new MS4 criteria
- Watershed information mapping database characteristics and constraints to assist site specific user
- Identification of areas with Hydrologic Conditions of Concern (HCOC) for default basis
- Technical foundation for site assessment screening using infiltration LID
- Identification of areas with ability to participate in regional / subregional BMPs opportunities
- Subwatershed plans and strategies planning /process
- Technical guidance for demonstrating equivalent water quality benefits compared to onsite facilities
A GIS database will help to characterize the physical resources that provide the foundation for an understanding of watershed characteristics. This will assist in the planning process to support identification of project opportunities and constraints, while guiding effective watershed planning implementation.

**Watershed Inventory / Characterization**
- Technical foundation for site assessments
- Identification of opportunity / constraints
  - Hydrologic Characteristics
  - Drainage Facilities Inventory
  - Water Supply
  - Geologic Constraints

**Data Sources**
- Multiple Agencies

**Limitations**
- Funding Resources/Level of Accuracy/Availability
Hydromodification Susceptibility Mapping Tool

Watershed hydromodification mapping characterizes all major channels or reaches within a given watershed as “susceptible” or “not susceptible” to hydromodification and includes delineations of the tributary area to each susceptible channel reach. Hydromodification is defined as the physical response of stream channels to changes in catchment runoff and sediment yield caused by land use modifications. The maps are intended to be used as the default basis for determining whether a susceptible channel segment exists downstream of the project or a part of determining whether HCOCs exist.

**Channel Erodibility Data**
- Watershed mapping / subareas
- 100-year floodplains
- Hydrography
- Lakes / reservoirs / basins
- Storm drains
- Channel locations / types / materials
  - Verification with aerial photographs
  - Extent of digital channel data
- In-stream structures

**Watershed Erosion**
- Erosion potential

**Data Issues**
- Quality of data
- Conflicts / inconsistencies

**Limitations**
- Verification required in downstream
Infiltration feasibility maps are intended to provide a preliminary planning level assessment of those infeasibility criteria that can be mapped meaningfully at a watershed or sub-watershed scale. The maps identify areas where infiltration is clearly infeasible to avoid the need for small projects to conduct site-specific testing that is unlikely to be necessary.

**Infiltration Limitations / Constraints**
- Soil permeability
- Depth to shallow groundwater
- Groundwater protection / Contamination
- Landslides
- Sewer systems high I/I zones
- Liquefaction hazard zones

**Potential Landslide Areas**

**Low Permeability Soils**
A key role to watershed planning is to identify potential opportunities for regional and subregional stormwater management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed rather than relying on individual site-specific treatment. Future subwatershed analysis can tier off this regional facility planning effort to develop subwatershed control strategies in compliance with the MS4 Permit. Subwatershed BMP facilities identified as part of this initial screening process are intended to serve as the planning and implementation tool for developing a subwatershed control approach, demonstrating that stormwater requirements and watershed objectives are still met based on scientifically based and technically sound analysis.

**Process for Implementing Subregional / Regional Facility Strategies**

**Generalized Steps**
1. Select opportunity locations
2. Develop subwatershed plans and supporting analysis
3. Implement regional/subregional facilities and administer participation

Facility implementation and prioritization also depends on variety of factors including (1) maximizing water quality benefits, and (2) timing opportunities of projects (i.e. development forecasts).

**Site Factors**
- Physical characteristics
- Ownership considerations
- Receiving water conditions
- Watershed characteristics
- Development forecasts
- Stakeholder input

**Subwatershed Plan Minimum Elements**
1. Develop Subwatershed control strategy
2. Conceptual facility plans and design criteria
3. Estimate facility capacity and expected performance
4. Establish criteria for project participation
5. Describe implementation plan
   - Funding mechanism
   - Schedule
   - Monitoring / Operations /Maintenance
Implementation planning should also emphasize the strategic location of BMPs that have been chosen to maximize the pollutant reduction within a watershed. An approach using a GIS-based tool can provide guidance for the systematic prioritizing of BMP projects to optimize pollutant reduction in a cost effective manner. The tool employs different weighting factors to assess high pollutant loading based on pollutant generation and watershed impairments. The methodology will generate a numerical scoring system to determine the subwatershed priority index based on the annual commutative pollutant loading tributary to a specific facility and weighted based on watershed specific impairments for the different pollutants to provide a relative importance within the watershed.

**Methodology for Analysis of Determination of Regional BMP Prioritization**
- Analysis similar to Geosyntec SBPAT
- Smaller subwatershed parcels of 40 acres
- Computation of annualized area weighted pollutant load for different constituents landuse based
  - Runoff Coefficients
  - Pollutant EMCs
  - 85th percentile 24-hour depth
- Normalize between high to low value
An interactive GIS mapping tool was developed to assist general public located within the watershed to be able to utilize the information database about their specific site and readily provide information in a format that would (1) answer specific questions about their site related to MS4 permit requirements and applying the WQMP, (2) assist in providing the required design information for BMP facilities, and (3) identifying the regional BMP which could be utilized to mitigate their particular site.