

DRAFT

Enhanced Watershed Management Program (EWMP) for the Upper Los Angeles River Watershed

Prepared for

Upper Los Angeles River Watershed Management Group



Preparation Leads



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Executive Summary

The Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175 (Permit) for Los Angeles County provides an innovative approach to Permit compliance through development of Enhanced Watershed Management Programs (EWMP). Through a collaborative approach, an EWMP for the Upper Los Angeles River (ULAR) Watershed Management Area (EWMP area) was developed by the ULAR EWMP Group. The ULAR EWMP Group is comprised of the cities of Los Angeles (lead coordinating agency), Alhambra, Burbank, Calabasas, Glendale, Hidden Hills, La Cañada Flintridge, Montebello, Monterey Park, Pasadena, Rosemead, San Fernando, San Marino, South El Monte, South Pasadena, and Temple City and the County of Los Angeles (Unincorporated County) and the Los Angeles County Flood Control District (LACFCD). By electing to comply with the optional compliance pathway in the MS4 Permit, the ULAR EWMP Group has leveraged this ULAR EWMP to facilitate a robust, comprehensive approach to stormwater management for the Los Angeles River watershed to address the priority water quality conditions in the EWMP area.

The planning area for the ULAR EWMP is the largest of all the EWMPs being developed in the Los Angeles (LA) region, representing 485 square miles of watershed and over 50 miles of mainstem LA River from its headwaters to just above the estuary. The LA River watershed has been subject to numerous water quality planning and compliance efforts, and the EWMP leveraged those efforts and identified additional projects to address water quality issues in the Upper LA River.

The vision for development of the EWMP was to utilize a multi-pollutant approach that maximizes the retention and use of urban runoff as a resource for groundwater recharge and irrigation, while also creating additional benefits for the communities in the ULAR watershed. This EWMP presents a toolbox of distributed and regional watershed control measures to address applicable stormwater quality regulations. Controlling pollutants in stormwater is a major challenge, and the EWMP Group members have been working towards improving stormwater quality for many years by implementing numerous stormwater capture projects across the watershed. State and federal regulations establish compliance timelines to address water quality issues, and this EWMP lays the path forward for implementation of additional water quality improvement projects.

For example, the Los Angeles River watershed is subject to a Total Maximum Daily Load (TMDL) for metals that requires compliance by 2028 and a bacteria TMDL that requires compliance by 2037. High levels of metals can negatively impact aquatic life (e.g., fish) in the rivers, creek and estuary; elevated bacteria concentrations can pose a potential health risk to people that recreate in the watershed. This EWMP plan has been prepared to address water quality issues and comply with the Permit requirement and timelines in a quantitative manner.



ES.1 Elements of the EWMP

The objective of the EWMP Plan is to determine the network of control measures (often referred to as best management practices [BMPs]) that will achieve required pollutant reductions while also providing

multiple benefits to the community and leveraging sustainable green infrastructure practices. This EWMP includes the following elements:

ES.1.1 Water Quality Priorities

The identification of Water Quality Priorities (Section 3 of the EWMP) was an important first step in the EWMP Plan development process. The Water Quality Priorities highlight the pollutants and waterbodies that are potentially not attaining water quality standards. The Water Quality Priorities are a driver of the control measures in the EWMP. For example, if a water quality objective is not being attained, additional pollutant reduction is required and thus more or larger control measures are needed to achieve those reductions. Over 170,000 data records of water quality monitoring data were compiled and analyzed to determine three categories of Water Quality Priorities based on whether TMDLs have been developed for waterbody-pollutants, whether water quality exceedances have occurred in the last 10 years, and whether the stormwater system is a likely source of these pollutants. The water quality prioritization process of the Permit determines the water body-pollutant combinations (WBPCs) that will be addressed by the EWMP. The Permit defines three categories of Water Quality Priorities:

- **Category 1** are pollutants subject to an established TMDL.
- **Category 2** are pollutants on the State Water Resources Control Board 2010 Clean Water Act Section 303(d) List of Impaired Water Bodies or those constituents that have sufficient exceedances to be listed.
- **Category 3** for pollutants with observed exceedances that are too infrequent to be listed, and parameters that are not considered typical pollutants.

The applicable TMDLs are the highest priority for stormwater quality compliance, and thus scheduling for addressing Water Quality Priorities was developed based on TMDL milestones (i.e., interim and final numeric limits) and other representative Regional Board-adopted TMDLs. The scheduling of EWMP implementation is based on the milestones of the applicable metals, toxics and bacteria TMDLs, as follows:

- Achieve a 31 percent milestone for the Los Angeles River Metals TMDL by 2017;
- Achieve a 50 percent milestone for the Los Angeles River Metals TMDL by 2024;
- Achieve final compliance (100 percent milestone) for the Los Angeles River Metals TMDL by 2028;
- Achieve final compliance for the Los Angeles / Long Beach Harbors Toxics TMDL by 2032; and
- Achieve final compliance for the Los Angeles River Bacteria TMDL by 2037.

ES.1.2 Watershed Control Measures

The Permit requires the identification of Watershed Control Measures, which are strategies and BMPs that will be implemented through the EWMP, individually or collectively, at watershed-scale to address the Water Quality Priorities. Section 4 of the EWMP describes the regional projects and Section 5 of the EWMP describes the distributed BMPs. The total network of Low Impact Development (LID), green streets and regional BMPs is referred to as the EWMP Implementation Strategy. The BMP capacity to be implemented by 2037 has the equivalent capacity of 20 Rose Bowl stadiums. For EWMP development it was important to establish nomenclature / definitions of the various control measures. Distributed and regional control measures make up the EWMP Implementation Strategy (see figure below for an illustration of distributed versus regional approaches).

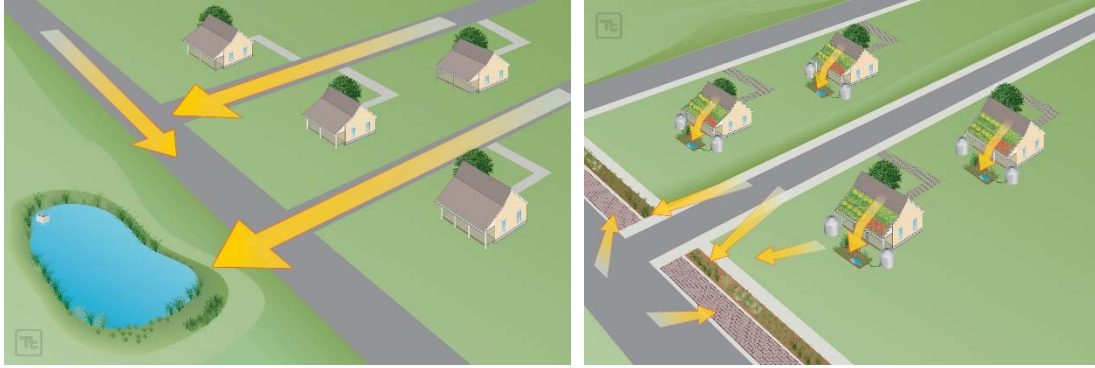


Illustration of Regional (left) and Distributed (right) BMP Approaches

The three main categories of structural BMPs include low-impact development, green streets, and regional projects, as defined below:

- Low-Impact Development:** distributed structural practices that capture, infiltrate, and/or treat runoff at the parcel, normally less than 10 tributary acres (see LID illustration on next page). Common LID practices (discussed in Section 5) include bioretention, permeable pavement, and other infiltration BMPs that prevent runoff from leaving a parcel. Rainfall harvest practices such as cisterns can also be used to capture rainwater - that would otherwise run off a parcel - and use it to offset potable water demands. The types of LID incorporated into the EWMP are the LID ordinance, residential LID, and LID retrofits of public parcels. Since the vast majority (nearly 70 percent) of runoff from the developed portion of the watershed is generated from impervious areas on parcels, LID is a natural choice as a key EWMP strategy to treat runoff from parcel-based impervious areas. LID can be viewed as the “first line of defense” due to the fact that the water is treated on-site before it runs off from the parcel and travels downstream.

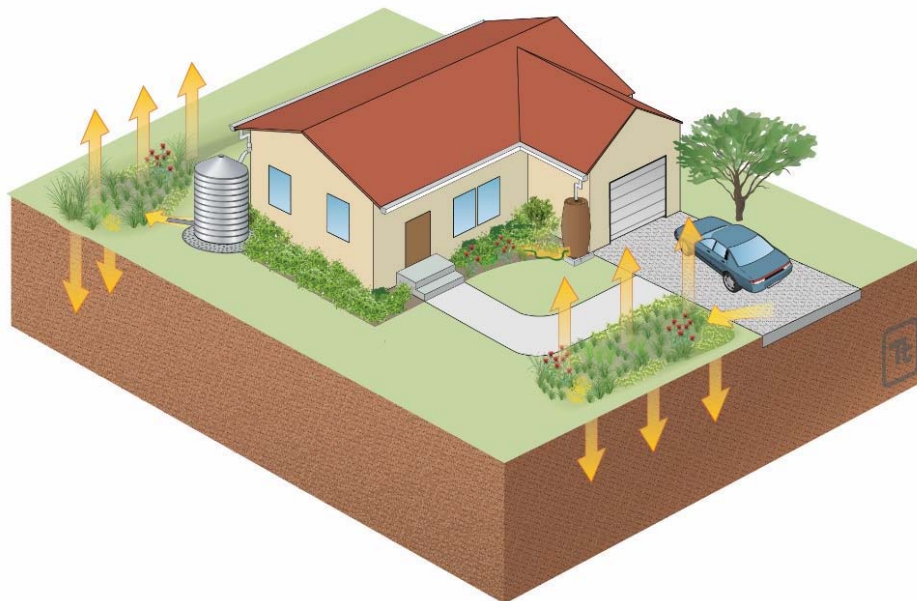
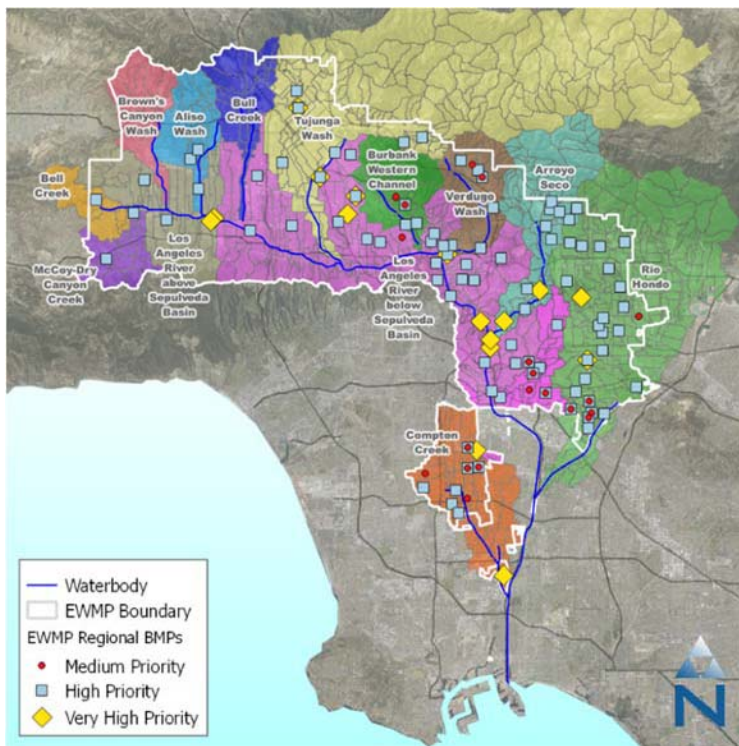
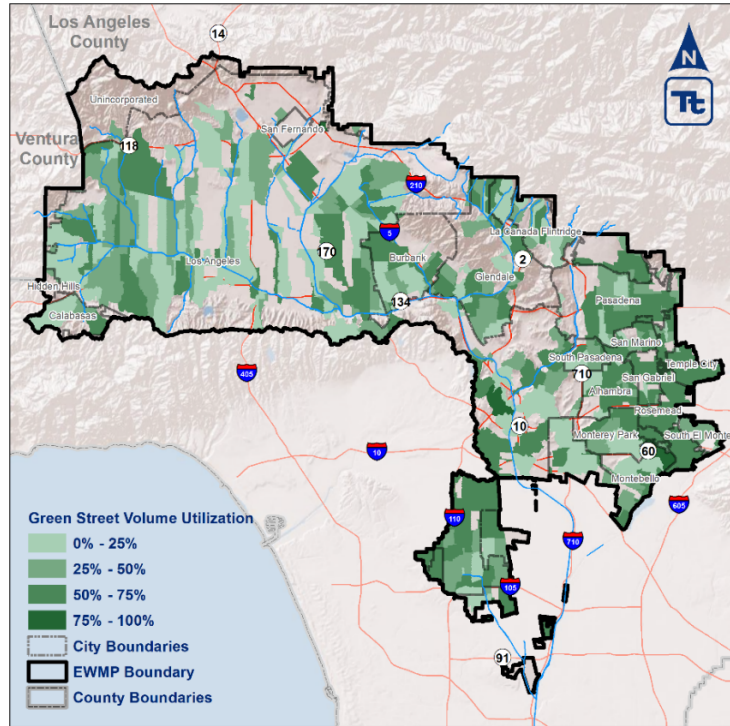


Illustration of LID implemented on a parcel (arrows indicate water pathways)

Green Streets: distributed structural practices that are typically implemented as linear bioretention/ biofiltration installed parallel to roadways (see illustration of a green street on the next page). These systems receive runoff from the gutter via curb cuts or curb extensions (sometimes called bump outs) and infiltrate it through native or engineered soil media. Permeable pavement can also be implemented in tandem or as a standalone practice, such as in parking lanes of roads. As shown in the figure to the right, a high percentage of streets are planned for green street retrofits for the EMWP Implementation Strategy. Green streets have been demonstrated to provide “complete streets” benefits in addition to stormwater management, including pedestrian safety and traffic calming, street tree canopy and heat island effect mitigation, increased property values, and even reduced crime rates.



Regional projects: Regional projects are centralized facilities located near the downstream ends of large drainage areas (typically treating 10s to 100s of acres; see illustration on the next page). Regional projects receive large volumes of runoff from extensive upstream areas and can provide a cost-effective mechanism for infiltration and pollutant reduction. . Runoff is typically diverted to regional projects after it has already entered storm drains.. Routing offsite runoff to public parcels (versus treating surface runoff near its source, as with green streets and LID) often allows regional BMPs to be placed in cost-effective locations. The ULAR EMWP includes over 120 regional BMPs (see figure to left), including multi-benefit regional projects that retain the storm water volume from the 85th percentile, 24-hour storm. The EMWP also includes regional projects on private land to assure pollutant reductions are achieved.

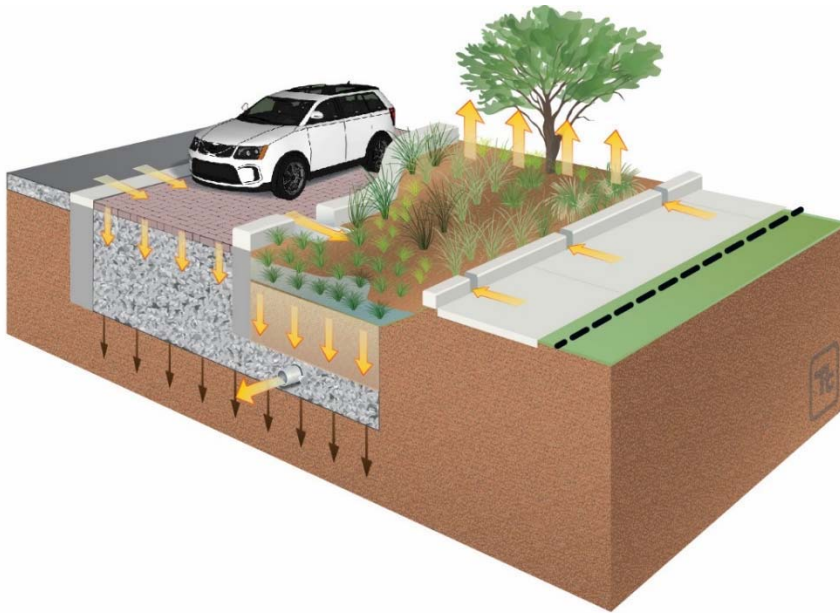


Illustration of a green street (arrows indicate water pathways)

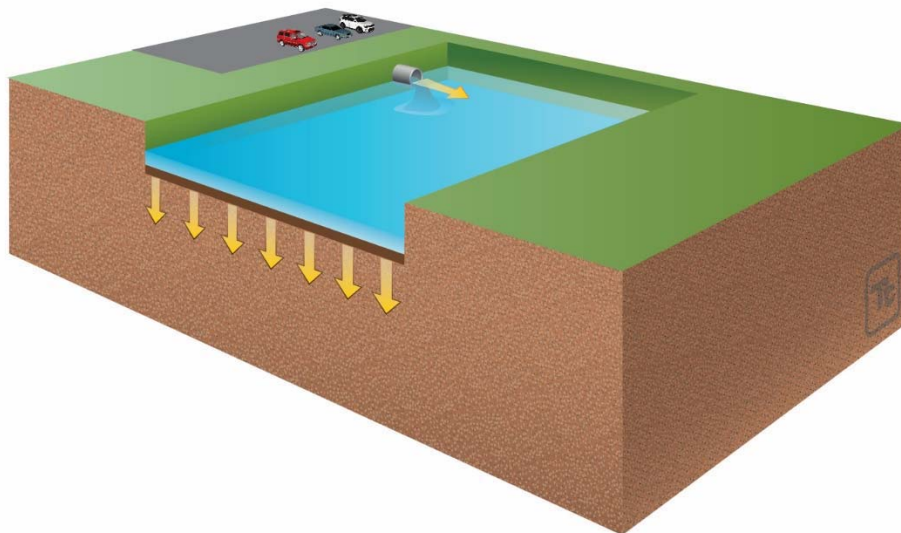


Illustration of a regional project (arrows indicate water pathways)

ES.1.3 Reasonable Assurance Analysis

A key element of each EWMP is the Reasonable Assurance Analysis (RAA) (presented in Section 6), which was used to quantitatively demonstrate that the EWMP Implementation Strategy will address the Water Quality Priorities. While the Permit prescribes the RAA as a quantitative demonstration that control measures will be effective, the RAA also uses a modeling process to identify and select potential control measures to be implemented by the EWMP. The Watershed Management Modeling System

(WMMS) is the basis for the modeling system used to conduct the RAA for the ULAR EWMP. WMMS is specified in the 2012 MS4 Permit as an approved tool to conduct the RAA. The LACFCD, through a joint effort with U.S. Environmental Protection Agency (USEPA), developed WMMS specifically to support informed decisions for managing stormwater.

The RAA demonstrates the calibrated modeling system is able to accurately predict flows and pollutant concentration in the LA River watershed. The RAA was developed based on complying with the applicable criteria for “limiting pollutants” during 90th percentile storm conditions. Limiting pollutants are the pollutants that drive BMP capacity (i.e., control measures that address the limiting pollutant will also address other pollutants). The limiting pollutants for ULAR are as follows:

- **Wet weather** – zinc and *E. coli*: according to the modeling analysis and review of monitoring data, control of zinc and *E. coli* requires BMP capacities that are the largest among the Water Quality Priority (WQP) pollutants, and thus control of zinc and *E. coli* has assurance of addressing the other ULAR wet weather Water Quality Priorities. The RAA for ULAR first identifies the control measures to attain zinc limits (during the zinc critical condition) and then identifies additional capacity, if any, needed to achieve *E. coli* limits.
- **Dry weather** – *E. coli*: among all the pollutants monitored during dry weather at mass emission stations in LA County, *E. coli* most frequently exceeds receiving water limitation (RWLs). During monitoring “snapshots” of over 100 outfalls along the LA River, over 85 percent of samples exceeded limits for *E. coli* during dry weather through the Bacteria Source Identification Study along the Los Angeles River (CREST, 2008). Among the dry weather WQP pollutants, achievement of dry weather RWLs for *E. coli* will be the most challenging.

The RAA was used to select the BMPs in the EWMP Implementation Strategy based on three primary elements:

- **Opportunity** – Where can these BMPs be located and how many can be accommodated?
- **System Configuration** – How is the runoff routed to and through the BMP and what is the maximum BMP size?
- **Cost Functions** – What is the relationship between BMP volume/footprint/design elements and costs?

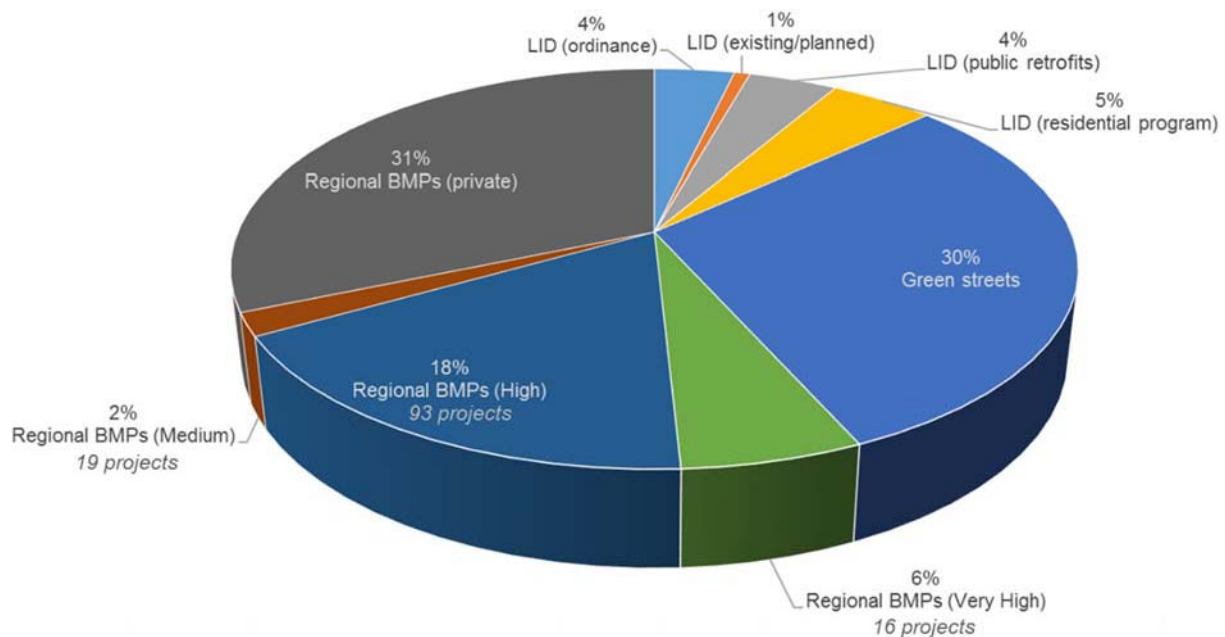
The WMMS considered millions of BMP scenarios and the EWMP Implementation Strategy was selected based on the most cost-effective scenarios, while incorporating the input from the EWMP Group related to the needs and opportunities within the communities.

ES.1.4 Detailed EWMP Implementation Strategy and Compliance Schedule

The EWMP Implementation Strategy (presented in Section 7) is the “recipe for compliance” of each jurisdiction to address Water Quality Priorities and comply with the provisions of the MS4 Permit. The EWMP Implementation Strategy includes individual recipes for each of the 18 jurisdictions and each watershed/assessment area – Los Angeles River above Sepulveda Basin, Los Angeles River below Sepulveda Basin, Compton Creek, Rio Hondo, Verdugo Wash, Arroyo Seco, Burbank Western Channel, Tujunga Wash, Bull Creek, Aliso Wash, Bell Creek, McCoy-Dry Canyon, and Browns Canyon Wash. Implementation of the EWMP Implementation Strategy will provide a BMP-based compliance pathway for each jurisdiction under the MS4 Permit.

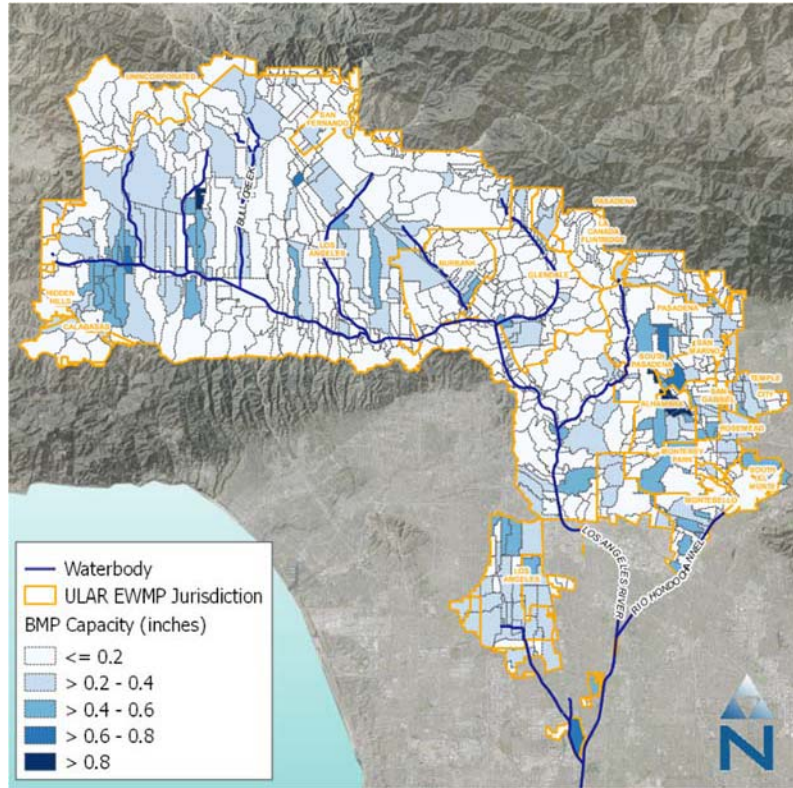
The EWMP Implementation Strategy is expressed in terms of [1] the volumes of stormwater and non-stormwater to be managed by each jurisdiction to address Water Quality Priorities, and [2] the control measures that will be implemented to achieve those volume reductions, as follows:

- Compliance Targets:** for MS4 compliance determination purposes, the primary metric for EWMP implementation is the volume of stormwater managed by implemented control measures. The stormwater volume to be managed is considered the BMP performance goal for the EWMP.
- EWMP Implementation Strategy:** the network of LID, green streets and regional BMPs that has reasonable assurance of achieving the Compliance Targets is referred to as the EWMP Implementation Strategy. The RAA modeling framework has been used to quantitatively demonstrate that the EWMP Implementation Strategy will address the Water Quality Priorities. The EWMP Implementation Strategy identifies the location and type of control measures to be implemented by each jurisdiction for final compliance by 2037, which includes addressing all Water Quality Priorities including the limiting pollutants zinc and *E. coli*. The LID, green street and regional projects that will address the Water Quality Priorities is a network of control measures with the equivalent capacity of approximately 20 Rose Bowl stadiums. As shown in the figure below, for the set of BMP to be implemented across the entire ULAR EWMP area by 2028, regional projects on public land make up 26 percent of the total control measure capacity. LID and green streets each make up 14 percent and 30 percent respectively. The EWMP Implementation Strategy will be validated and updated over time following review of water quality monitoring data through an adaptive management approach.

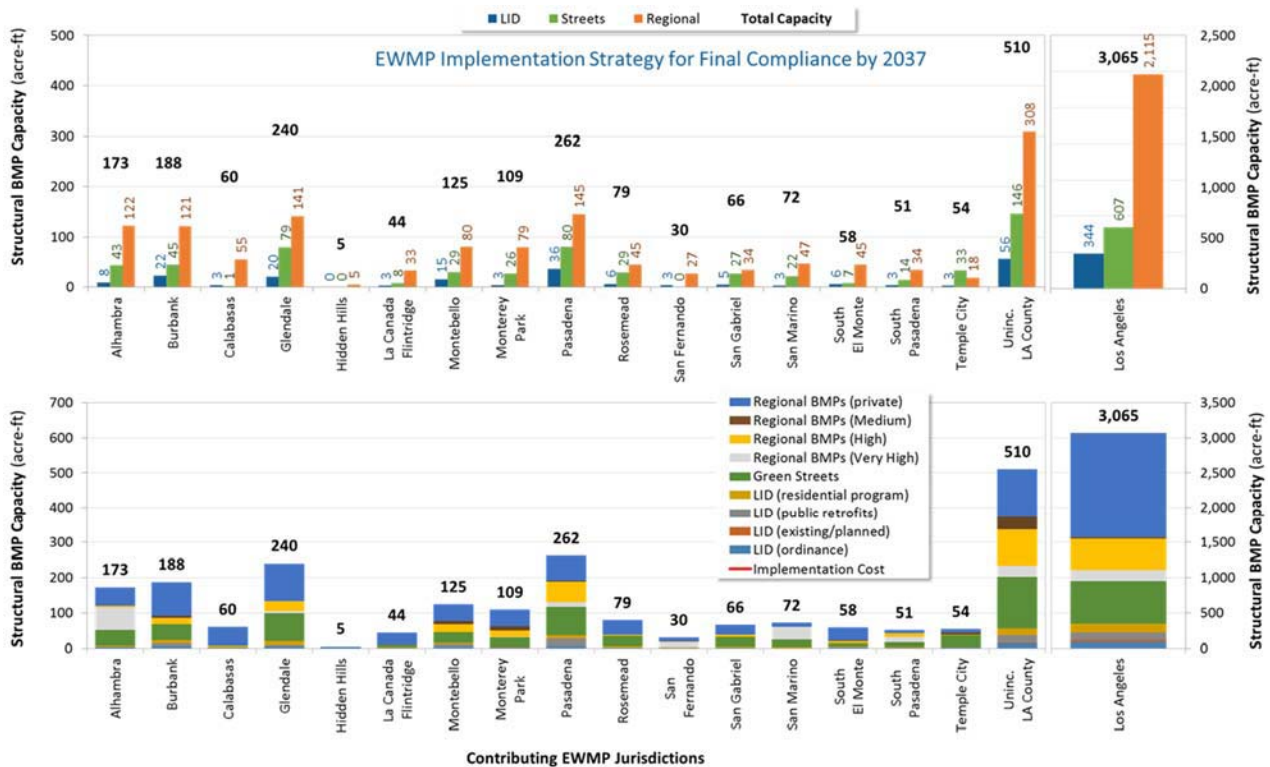


The EWMP Implementation Strategy is ultimately a recipe for compliance for each jurisdiction and subwatershed in the EWMP area. A total of 1,119 subwatersheds (see figure at top of next page) are provided a specific set of LID, green street and regional control measures. The BMP density is higher in some areas [dark blue] because either [1] relatively high load reductions are required, or [2] BMPs in those areas were relatively cost-effective (e.g., due to high soil infiltration rates). The EMWP includes tabular versions of the map to the right in detailed appendices for each jurisdiction.

The total capacity of LID, green streets and regional BMPs to be implemented by each jurisdiction by 2037 (the final compliance date for addressing *E. coli*) is shown in the bar chart at the bottom of this page. The strategy varies by jurisdiction depending on the pollutant reduction requirements and BMP preferences. The top panel groups the BMP types into LID, green streets and regional BMPs, while the bottom panel provides more resolution for the BMP sub-categories.



The pace of implementation for the EWMP Implementation Strategy is rapid due to the compliance dates specified in the LA River Metals TMDL (interim milestones in 2017 and 2024), Los Angeles Harbor Toxics TMDL (final compliance by 2032) and Los Angeles River Bacteria TMDL (final compliance by 2037). The scheduling of BMPs across all 18 jurisdictions to be implemented to achieve those milestones/compliance dates is shown in the figure on the next page).





ES.1.5 Adaptive Management Framework

One of the key components of the EWMP is the incorporation of an Adaptive Management Approach for evaluating monitoring data and “lessons learned” or experience gained during implementation to evaluate EWMP implementation progress. The Permit specifies that adaptive management process will be revisited every two years to evaluate the EWMP and update the program. The EWMP strategy will evolve based on monitoring results by identifying updates to the EWMP Implementation Plan to increase its effectiveness.

ES.1.6 EWMP Implementation Costs and Financial Strategy

The costs to implement the EWMP will require orders of magnitude increases in stormwater program funding. The capital costs to address Water Quality Priorities by 2037 is estimated at over \$5.7 billion, with total operations and maintenance costs exceeding \$210 million per year once fully implemented (see table below). Expenditures for the EWMP Implementation Strategy will be coordinated with other regional efforts to improve habitat, promote greenways and increase access to the LA River and its tributaries. In order to garner community support for financing the costs, the multi-benefits of the LID, green streets and regional projects will be quantified including improved aesthetics, increased recreational opportunity, water supply augmentation and climate change resiliency. The financial strategy presented in this EWMP outlines a set of multiple approaches that allows each jurisdiction to consider and select the strategies that best fit their specific preferences.

Present to 31% Metals TMDL Milestone (2017)		31% Metals TMDL Milestone (2017) to 50% Metals TMDL Milestone (2024)		50% Metals TMDL Milestone (2024) to Final Compliance with Metals TMDL (2028)		50% Metals TMDL Milestone (2024) to Final Compliance with Bacteria TMDL (2037)		Total at Final	
Capital	O&M/yr	Capital	O&M/yr	Capital	O&M/yr	Capital	O&M/yr	Capital	O&M/yr
168.78	17.01	458.65	55.27	2,889.50	176.91	2,580.94	210.84	6,097.87	210.84

Costs in units of \$ million