COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

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May 24, 2017

TO: Each Supervisor

FROM: Mark Pestrella
Director of Public Works

BOARD MOTION OF APRIL 5, 2016, AGENDA ITEM NO. 14
WATER RESILIENCE PLAN RAPID ASSESSMENT

On April 5, 2016, the Board instructed the Department of Public Works to prepare a Water Resilience Plan. As part of the plan, Public Works committed to the preparation of a Rapid Assessment on funding needs and strategies with significant impact on the region's water. Attached is the Rapid Assessment.

If you have any questions, please contact me or your staff may contact Angela George at (626) 458-4012 or ageorge@dpw.lacounty.gov.

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Attach.

cc: Chief Executive Office (Rochelle Goff)
Executive Office

WATER RESILIENCE PLAN: RAPID ASSESSMENT

Preliminary identification of needs and strategies with significant impact on the region's water

May 2017

Building Water Resilience in Los Angeles County: Rapid Assessment

Contents

Introduction

This document represents one of the items set forth in the Water Resilience Work Plan presented to the Board of Supervisors in June 2016. The Rapid Assessment presents some of the early findings of the research to identify the most promising approaches and related financial need. As a piece of the larger Water Resilience Plan, a first draft of which Public Works plans to present to the Board in summer 2017, the Rapid Assessment provides a targeted snapshot of the research outcomes and underscores the greatest perceived needs relevant to building regional water resilience.

The context of climate change and unpredictable rainfall in Southern California has greatly diminished the reliability of imported water supplies and our ability to replenish groundwater in recent years. This new reality calls for practical, effective strategies to access significant amounts of locally available water to supplement and build resilience in the region's water supply. Currently, the County of Los Angeles manages to capture and store enough stormwater to meet the demand of one and a half million residents each year. Research has shown that implementation of a portfolio of regional stormwater capture projects could increase this amount between two- and three-fold by ensuring the region can capitalize on less regular, more intense rain events.

While other sustainable sources of water should be considered and integrated into a comprehensive water management strategy for the region, stormwater represents an accessible, abundant resource with limited funding opportunities. Potable and recycled water are underwritten by ratepayer revenue that also supports improvement and expansion of related infrastructure. Available funding for existing stormwater capture supports current County operations and maintenance, but is insufficient for any significant expansion. Desalination has limited dedicated funding, but relies on costly treatment options that have unclear environmental impacts for the region. Significant investment in regional stormwater capture projects would have substantial impact on local water supply while contributing to improvements in overall watershed health. Stormwater capture strategies, in particular, provide unparalleled opportunities to improve water quality and enhance communities through the integration of multi-benefit approaches. New funding opportunities will be necessary to facilitate the design, implementation, and operations of centralized projects with regional benefits.

Understanding Stormwater

The term 'stormwater' refers to a broad category of water that requires multiple, integrated management strategies. First, stormwater refers to precipitation in the form of rain that falls and flows into streams and natural waterways, is collected in reservoirs and replenishes the region's groundwater. Second, stormwater represents the accumulations of water that flow into storm drains and channelized waterways and can pose flooding threats if not adequately managed. Third, stormwater comprises the urban runoff that flows across paved streets and hardscape surfaces, carrying with it trash and pollutants common to urban environments. Managing all aspects of stormwater requires a multifaceted approach that effectively captures it for future use, mitigates related flood risk, and protects watershed health.

For decades, the Los Angeles region has operated and maintained one of the largest flood protection systems in the nation, safeguarding the lives and property of millions of residents. However, the same infrastructure that protects the region from largescale flooding pours out into the ocean roughly one-third of the region's total annual water demand (LACDPW 2016). Increased urban development has reduced the amount of open, unpaved space, thus greatly diminishing the region's natural ability to replenish its groundwater. Water that would otherwise be absorbed by the ground and contribute to the regional water table flows instead into storm drains and flood channels, eventually making its way out to sea. Moreover, this urban runoff carries with it water-borne pollutants that ultimately pollute local water bodies and coastal waters, negatively impacting watershed health and the cleanliness and safety of the region's beaches.

Each aspect of stormwater and related management considerations are further described in the three sections below.

Water Supply: Capture, Storage, and Reuse

In 1915, The State Legislature adopted the Los Angeles County Flood Control Act after a series of disastrous regional floods took a heavy toll on lives and property. The Act established the Los Angeles County Flood Control District and empowered it to provide the region's flood protection and water conservation. Over the several decades that followed, the Flood Control District and the United States Army Corps of Engineers designed and constructed the vast majority of major dams, concrete-lined channels, storm drains and spreading grounds that comprise the regional flood protection and water conservation system today.

The joint mission of the Flood Control District to mitigate flood risk and capture stormwater for groundwater replenishment highlights an early understanding of the simultaneous threat and opportunity this resource presented. Looming just as large as the threat of flood was the loss of

millions of gallons of water in a semi-arid region whose continued development depended on a reliable, sufficient water supply. The 1915 Flood Control Act mandated the District to capture and store stormwater, causing it to become the focal point for efforts to save stormwater and augment the region's dwindling groundwater supply. A series of subsequent bonds that followed and funded further development of the infrastructure also focused on water conservation features.

Dams and spreading grounds have served as the principal methods of water conservation performed by the Flood Control District for the last century. Dams allow for the capture and storage of large volumes of stormwater in above-ground reservoirs, while spreading grounds permit percolation of water into the ground to recharge groundwater basins that may later be accessed through pumping. In an average year of rainfall, these regional Flood Control District facilities contribute 200,000 acre-feet of water to the underground stores that provide one-third of the region's annual water demand. At a smaller scale, underground infiltration galleries collect stormwater and allow it to recharge groundwater basins, while providing above-ground recreational facilities for community enjoyment. Individualized efforts like underground cisterns and rain barrels for local reuse further help to lessen demand for water at the local level. Significant stormwater capture, however, that contributes to the water supply benefits most from centralized, regional scale projects in large open areas with coordinated operations and management. Smaller, more distributed projects have reduced footprints with fewer coordination requirements, but also far lesser impact on water supply.

Flood Protection: Channeling and Discharging

The 1915 Flood Control Act established the authority and means by which to fund, develop, and operate extensive infrastructure dedicated to flood risk mitigation. History had shown that heavy rainfall can turn dry riverbeds into torrents of fast-moving water and quickly flood large portions of the region. The establishment of the Flood Control District provided for the development of drainage infrastructure to carry water away from inland flood-prone areas and out into coastal waters. So effective is the system that an estimated 500,000 acre-feet (160 billion gallons) of stormwater, approximately one-third of the region's total water demand, flow out to sea every year. This large volume of water released to the ocean underscores the missed opportunity to capture stormwater for later reuse before it is discharged into coastal waters.

Today, the Flood Control District extends over more than 2,700 square miles, including 85 cities and over one hundred unincorporated areas that are home to almost 10 million residents. The District encompasses 14 dams, 4 additional dams managed and operated by the U.S. Army Corps of Engineers, 27 spreading facilities for groundwater replenishment, a network of seawater barriers that protect the quality of the water table, and over 172 debris basins to protect communities from debris and mud flows. It also includes the vast majority of the "backbone" drainage infrastructure within nearly all of the region's principal watersheds, including 500 miles of open flood channels, 2,800 miles of underground storm drains, and an estimated 120,000 catch basins.

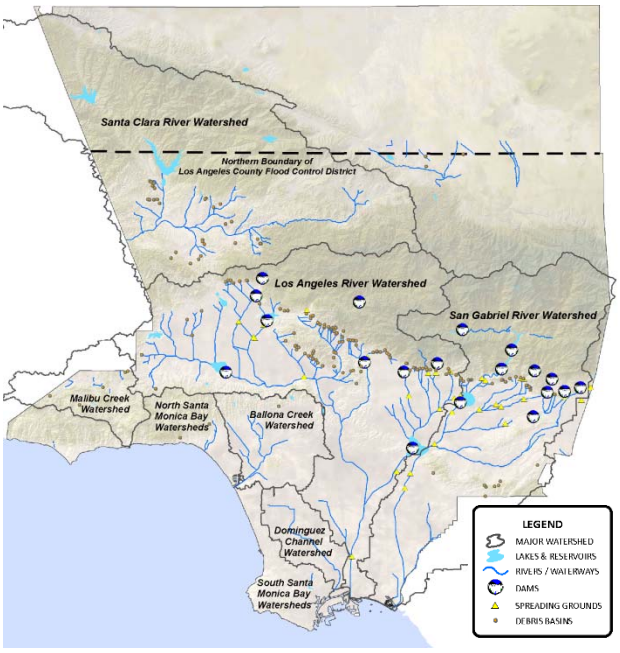

Figure 1. Map of Flood Control District

Looking to the future of the region and its flood mitigation program requires collaboration and coordination through multi-agency partnerships to develop, fund and implement projects and policies. Local communities also expect greater involvement in project planning and more targeted responses to their needs and concerns than in the past. As a result, planning efforts today aim to engage communities and develop projects that address known functional needs while providing additional benefits to the neighborhoods they occupy. Such benefits include aesthetic enhancement, habitat restoration, creation of recreational opportunities, and improving water quality.

Water Quality: Capture, Treatment and/or Infiltration

Stormwater that has washed over the landscape in the form of runoff is likely to carry pollutants and trash from the ground, particularly in urban areas where there is more hardscaping in the form of paved roads and sidewalks and higher population density. Water quality programs work to protect watershed health by ensuring that water-borne pollutants and trash are intercepted and captured before they can reach receiving water bodies. Where geologically feasible, percolation into the ground serves to filter out pollutants and may contribute to the water table, increasing the regional water supply.

In the early to mid-1900's, discharges to waterways were primarily from natural undeveloped areas and not viewed or perceived as pollution. Continued industrial and urban growth, along with lack of regulations protecting water quality, led to pollution of the country's rivers,

streams and lakes, resulting in contamination of water and food supplies, decimation of fish and wildlife populations and diminishing other benefits provided by natural resources. A series of Federal and State acts beginning in 1948 attempted to mitigate worsening water quality by requiring regulation and oversight of discharges into regional water bodies.

Water quality in Los Angeles County is directly regulated and enforced by the Los Angeles Water Board, which regulates discharges from medium and large municipal separate storm sewer systems (MS4s) through the Los Angeles County MS4 Permit issued under the National Pollutant Discharge Elimination System (NPDES) Program. At the central core of the current permit for the Los Angeles region is the requirement to meet the targets and schedules for 33 Total Maximum Daily Loads (TMDLs) that establish maximum allowed numeric targets for a specific pollutant within a given water body. One of the options provided within the permit for compliance is the development and implementation of an Enhanced Watershed Management Program (EWMP) that sets forth strategies to meet water quality requirements, including modeling to prove the effectiveness of these strategies. In addition, EWMPs require implementation of distributed projects that result in additional benefits, such as flood protection, water conservation, and creation of recreational opportunities. Within Los Angeles County, the County, Flood Control District and the 84 permittees formed 19 watershed management program groups to develop projects that meet these requirements.

Options for Increased Stormwater Capture & Treatment

At present, Los Angeles County accounts for the largest amount of water demand of any urbanized county in California. Total annual water demand within the Los Angeles Basin exceeds 1.5 million acre-feet, almost 500 billion gallons (GLAC IRWMP 2014). Increasing population, climate change, and competing interests for available water supplies all present long-term risks to the reliability and sufficiency of the Los Angeles region's water supply. Today's challenges require an integrated water resources management approach that improves the ability to generate and use local water. Many of the region's water management agencies have studied and planned for increasing the use of local recycled and graywater supplies, establishing ocean and brackish water desalination, developing more groundwater, and implementing improved water conservation initiatives to extend existing supplies. However, there has been little concerted effort to implement a substantial increase in stormwater capture for the benefit of regional water supplies. Below is a review of a selection of planning documents that propose specific types of stormwater projects and related costs to supplement local water supply.

Approaches and Costs

A variety of local planning documents address the opportunity and need for additional stormwater capture to supplement local and regional water supplies. These documents provide conceptual projects, projected costs, and the potential stormwater capture that would result.

Los Angeles Basin Study

In order to investigate opportunities for enhancing stormwater capture within the Los Angeles Basin, the U.S. Department of the Interior Bureau of Reclamation (Reclamation) and the Los Angeles County Flood Control District collaborated in recent years to develop the Los Angeles Basin Study. The purpose of the Basin Study was to examine the region's water supply and demand, investigate potential impacts from projected population growth and climate change, and develop concepts for stormwater capture to enhance local supplies and help the region adapt to its growing water needs.

Based on the climate change analysis conducted for the LA Basin Study and a survey of other studies, it appears there will be no substantial change in the annual average rainfall for the Los Angeles Region (Berg 2015). However, data suggest that storm rainfall intensities are likely to increase and prolonged periods of drought become more common. This highlights the significant role of local stormwater in establishing a reliable regional water supply otherwise threatened by fluctuations in imported water, which currently represents nearly two-thirds of annual demand.

The LA Basin Study determined that the region could increase the LA Basin's total stormwater capture by as much as an additional 240,000 to 400,000 acre-feet per year, roughly 15-25% of current annual demand. The strategies considered would also provide additional benefits such as increased flood protection, improved water quality, additional habitat and recreational opportunities. Cost estimates for the various concepts include life-cycle projections for capital costs, operations and maintenance costs, and land acquisition costs. The concept costs varied greatly depending on the type of infrastructure proposed and the geographic area covered. Generally, parcel-sized project concepts implemented throughout the region were much more costly in terms of acre-foot of water generated when compared to larger, regional facilities. To reach the full range of additional stormwater capture, the combined cost for regional stormwater concepts was estimated at $11 billion, while the combination of decentralized or distributed concepts totaled $38 billion. Among the project types considered were:

- Centralized Concepts
    - New Spreading Grounds & Existing Spreading Ground Enhancements
    - Large-Scale Park Infiltration Galleries

    - Spillway and Capacity Enhancements to County and Army Corps Dams
    - Conservation Enhancements to Debris Basins
    - Stormwater Injection Wells and other Advanced Technologies
- Distributed Concepts
    - Full Scale Complete/Green Street Programs
    - County-Wide Parcel Sized LID & BMPs
    - Increased Scale or Full Build-Out of the EWMP Program County-Wide

Los Angeles Stormwater Capture Master Plan

Similar to the County's LA Basin Study, in 2015 the City of Los Angeles released the Stormwater Capture Master Plan (SCMP). The plan sets specific targets for stormwater conservation within the city boundaries, and creates a blueprint for increasing potential stormwater capture by an additional 68,000 to 114,000 acre-feet per year on average (22 billion to 37 billion gallons) by the year 2035. With the City's goal to decrease imported water purchases by 50% by 2024, the strategies outlined in the SCMP will play a critical role in increasing the resilience of the City's local water supply.

The City of Los Angeles receives most of its water from four major sources: the Los Angeles Aqueducts, the State Water Project, the Colorado River Aqueduct, and local groundwater. Over the past few decades, several periods of drought -- including the most recent multi-year drought -- have reduced average supplies from the Los Angeles Aqueduct, leading to greater reliance on purchased imported water (LADWP 2015), a challenge that is only expected to worsen with climate change. A recent study on the Sierra Nevada Mountains, which helps to supply the Los Angeles Aqueduct, has projected that much of the snowpack from this region will be lost towards the end of the century. The study also noted that, "Dramatic projected snow cover loss strongly indicates that runoff would be exhausted much sooner", and "a snow cover retreat may also lead to enhanced evaporative water loss at snow margins, diminishing water that would reach reservoirs." (Walton 2017). In short, with more precipitation falling as liquid water vs snow, and with snow melting much sooner than normal, runoff from the Sierra Nevada Mountains will be much harder to capture in the future. The result would be an overall decrease in the total supply that can be brought to the City of Los Angeles. External factors such as increased demand on imported supplies outside of the Los Angeles Region will likely exacerbate the problem and lessen the dependability of imported water. This uncertainty highlights the need to invest heavily now in enhancing the local water supply.

The SCMP showcases a range of project types that can enhance the region's local stormwater supplies, categorized as centralized, distributed, and direct use projects. Cost estimates for the various projects accounted for a range of full life cycle costs and were also represented as costs

per acre-foot of stormwater captured or conserved. Total cost estimates by category are as follows:

- Centralized Projects - $2.0 billion
- Distributed Projects - $4.1 billion
- Direct Use Projects - $1.7 billion

Project types within each category included:

- Centralized Projects
    - Spreading Ground Enhancements
    - Debris Basin Retrofits
    - Large Park Retrofits
    - Stormwater capture at Gravel Pits
    - Largescale Wetland Projects
    - Reservoir Enhancements and Sediment Removal
- Distributed Projects (EWMP Style Projects)
    - On-Site Infiltration such as Rain Gardens/Grading, Bioswales
    - Green Streets
    - Impervious Replacement
    - Subregional Infiltration
- Direct Use Projects
    - On-Site Direct Use
    - Subregional Direct Use

Watershed Management Plans

Through the development of EWMPs and other watershed management plans, it was estimated that the cost of implementation efforts to comply with the MS4 permit is approximately $20 billion over the next 20 years. Permittees are actively working to secure funding for the implementation of best management practices (BMPs) in order to reach compliance with water quality objectives. It is anticipated that many of the permittees will have difficulties fully implementing these programs due to the lack of dedicated funding.

The projects proposed within the watershed management plans range from smaller, distributed projects and best management practices to larger, centralized projects that capture and treat typical volumes of stormwater generated by common rain events. Although the capacity of these projects is typically under 100 acre-feet per storm event, a large number of projects are planned across the County and will make a tangible contribution to total regional stormwater capture.

As permittees embark on tackling their MS4 responsibilities, there are numerous road blocks and challenges ahead, such as meeting aggressive TMDL timelines, facing enforcement actions by the Regional Board, and the potential for third party lawsuits if receiving water bodies continue to be impaired. However, the most immediate hurdle for jurisdictions will be obtaining the necessary funding to implement the programs and construct the costly projects spelled out in the watershed management plans. Unlike other utilities like water supply and sanitary sewer systems, most jurisdictions do not have fees and assessments in place that can provide reliable, long-term funding for stormwater infrastructure improvements. Typically, jurisdictions are required to request and obtain their annual budgets for stormwater projects and programs from their respective General Obligation Funds in which they compete with services such as police, fire, and education needs that are more commonly understood and prioritized by elected officials and local communities. Without a dedicated source of funding, the primary sources of funding will continue to be General Obligation Funds, revolving fund loan programs, and grants such as the State's Proposition 84 and Proposition 1 programs. Although helpful, it is presumed that grants and loans are insufficient long-term financing plans and will provide only a fraction of the $20 billion needed to meet the region's water quality requirements.

Established Need and Recommendations

Stormwater capture strategies represent a unique opportunity for the region to substantially supplement its local water supply and provide additional benefits for watershed health and communities. Although the Flood Control District manages and operates a number of significant centralized facilities already contributing to the local water supply, existing funding is insufficient to finance the development, construction, and operation of additional facilities needed to achieve a significant increase in the region's stormwater capture. Other types of water management infrastructure are supported by reliable sources of revenue that underwrite, at least in part, needed optimization and expansion. Stormwater infrastructure and facilities, on the other hand, have no reliable funding available for the development and implementation of new or expanded facilities to increase stormwater capture and effective management, the multiple benefits of which include improvements to water quality and creation of new recreational opportunities for local communities. As multiple agencies and jurisdictions throughout the region develop viable plans to capture and manage stormwater, the lack of sufficient funding has become apparent. A new regional stormwater fund could have a significant impact on the ability of multiple agencies and entities to develop and implement centralized programs that contribute to the local water supply, enhance watershed health, and contribute to community quality of life. A single funding source would also serve to improve collaboration and coordination amongst water management entities throughout the region,

improving overall planning and ensuring the sustainability and resilience of the County's water supply.

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