

## EXECUTIVE SUMMARY

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### Introduction and Purpose

For nearly 100 years, the Los Angeles County Flood Control District (Flood Control District) has fulfilled its mission by providing flood risk management and water conservation for much of the County of Los Angeles. The Flood Control District manages a system of reservoirs, debris basins, and other drainage infrastructure, which reduces the risk of floods and debris flows for downstream communities. In addition, the reservoirs and spreading facilities managed by the Flood Control District enable the storage of flood and storm waters and replenishment of local groundwater resources to supply approximately one third of the region's water supply. In order to maintain the proper functionality of these facilities, the sediment that erodes from the region's mountains and that reaches the reservoirs and debris basins needs to be managed.

In recent years, the Flood Control District has identified new challenges in managing sediment. In particular, recent wildfires have led to an increased inflow of sediment and debris within Flood Control District facilities. This has put pressure on the remaining capacity of existing sediment placement sites, where the Flood Control District has traditionally placed sediment. As a result, the Flood Control District has developed this Sediment Management Strategic Plan (Strategic Plan) and is pursuing new alternatives that can reduce the environmental and social impacts of sediment management.

The Strategic Plan provides an overview of sediment management issues, evaluates various alternatives to help identify optimal solutions for sediment management, and identifies general steps that should be pursued to meet the Flood Control District's mission. The Strategic Plan is guided by the following key objectives:

- Maintaining flood risk management and water conservation;
- Recognizing opportunities for increased environmental stewardship;
- Reducing social impacts related to sediment management;
- Identifying ways to use sediment as a resource; and
- Ensuring the Flood Control District is fiscally responsible in decision-making.

The Strategic Plan balances these objectives with alternatives that address the sediment management needed in order for the facilities managed by the Flood Control District to be able to provide for flood risk management and water conservation and also take into consideration the environment, communities, and the Flood Control District's budget. This Strategic Plan considers input received from numerous stakeholders in the region during the development of this plan and is part of a continuing dialogue about sediment management between the Flood Control District and stakeholders. The Flood Control District understands that some stakeholders desire a more "natural" system and approach to sediment management. However, sediment accumulation in the existing system still needs to be addressed. And so, this Strategic Plan focuses on sediment management with respect to the existing system.

The Strategic Plan contains an overview of sediment management issues and different sediment management alternatives. This Strategic Plan does not specify a selected alternative for specific facilities. Projects such as the Pacoima Reservoir Sediment Removal Project being considered (as of 2012) for implementation in the near future will be developed based on a more detailed and comprehensive analysis as well a public engagement process specific to that project. This Strategic Plan is intended to be an advisory document. The Strategic Plan will guide development of specific sediment management projects for the Flood Control District's numerous facilities. Development of those specific sediment management projects will provide opportunities for additional public input, including that from the local communities affected by each cleanout. Specific sediment management projects that will result in significant environmental impacts will also be subject to environmental review under the

California Environmental Quality Act, which will provide additional opportunities for public involvement during project evaluation. The Strategic Plan is a living document that is open to other alternatives and may be revised in the future as conditions change.

### **Meeting the Challenges of Sediment Management**

Proper planning and maintenance of the flood management and water conservation system is important for protecting public safety and the quality of life in local communities. Many factors must be accounted for to ensure the system remains operational well into the future and is able to provide its flood control and water conservation purposes. The Strategic Plan provides a balanced approach by proactively addressing key issues affecting sediment management. The following paragraphs discuss key issues and challenges addressed in the Strategic Plan:

#### Maintaining Public Safety and Water Conservation Benefits

The reservoirs and debris basins operated by the Flood Control District address public safety by reducing flood risk. In addition, the reservoirs and groundwater recharge facilities operated by the Flood Control District are critical for water conservation and replenishment of local water resources. This Strategic Plan considers innovative solutions for sediment management while holding both public safety and water conservation as top priorities.

#### A Project on a Massive Scale

The Flood Control District operates 14 reservoirs and 162 debris basins and anticipates the need to manage 67.5 million cubic yards of sediment between 2012 and 2032. To put that into perspective, the Rose Bowl Stadium in Pasadena could hold approximately 400,000 cubic yards. Figure ES-1 shows the location and expected quantity of sediment for each reservoir and group of debris basins along with available capacity at existing Flood Control District sediment placement sites, which as of 2011 were estimated to have a total remaining capacity of approximately 48 million cubic yards. It is clear that sediment management alternatives must be identified to address the great amount of sediment that naturally erodes from the region's mountains and affects flood risk and water conservation for the region. This Strategic Plan identifies opportunities beyond traditional placement at sediment placement sites, including beneficial use of the sediment in the construction industry, at landfills, and at pits.

#### Limited Funding

While the Flood Control District's funding has been sufficient for previous sediment management projects, other operational needs must be taken into account when considering the cost and approach of the sediment management alternatives. Planning level costs are identified within the Strategic Plan and will be considered alongside the other benefits and impacts of the sediment management alternatives. Funding availability will need to be reevaluated as specific sediment management projects are developed.

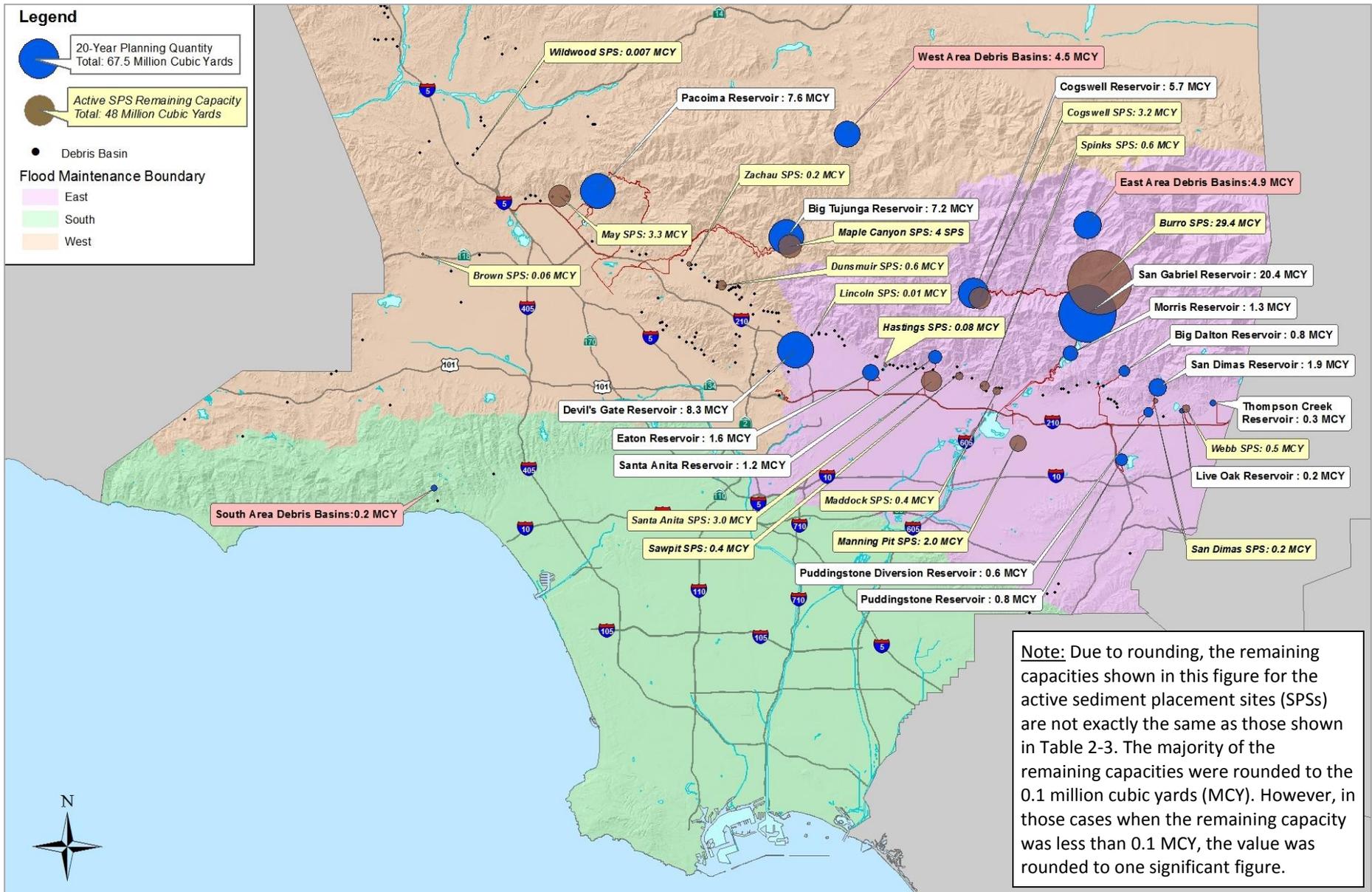
#### Coordination with Other Agencies

The reservoirs and debris basins operated by the Flood Control District are part of a regional system that includes various facilities, including several flood control basins or dams, operated by the U.S. Army Corps of Engineers (Army Corps of Engineers). The agencies' facilities are connected and sediment management operations at the Flood Control District facilities can affect the Army Corps of Engineers facilities. Therefore, for certain sediment management operations the Flood Control District needs to coordinate with the Army Corps of Engineers.

Furthermore, sediment management operations require environmental regulatory permits from various agencies. As a result, the Flood Control District works with other agencies to obtain those permits.

*(Continued on page ES-4)*

Figure ES- 1 20-Year Planning Quantities and Remaining Capacity at Sediment Placement Sites



### Project Partnerships

Some nontraditional alternatives considered in this Strategic Plan would require partnerships. One such example is the processing, transportation, and placement of sediment accumulated in the reservoirs and debris basins on County of Los Angeles beaches (More information about this can be found in Section 6.5.1). Another endeavor that will require project partners, especially the Army Corps of Engineers, will be the pursuit of the Long-Term Vision discussed at the end of this Executive Summary, under Next Steps.

### **Outreach Strategy**

To ensure the Strategic Plan accurately reflects the input of the numerous stakeholders in the Los Angeles region, the Flood Control District engaged agency, industry, and public stakeholders to help shape the various sediment management alternatives under consideration. The tenets of the public outreach program included:

- Stakeholder Task Force: Large task force created to gather input from external stakeholders during the development and review of potential sediment management alternatives to be incorporated into the Strategic Plan. Regulatory agencies, cities, landfill owners and operators, water agencies, sand and gravel companies, environmental groups, and others were invited to participate in the Stakeholder Task Force. All Stakeholder Task Force meetings were open to the public.
- Advisory Working Group: Small group created to gather additional input and a broad perspective from external stakeholders based on the members' diverse experiences and key roles in the stakeholder community. Participation included representatives from local jurisdictions, environmental groups, and the media.
- Public Open Houses: Conducted to provide an open forum for public input during the Strategic Plan review period. Two open houses were held in the general vicinity of major facilities to allow neighboring community members to provide feedback on the alternatives identified in the Strategic Plan.
- Website: Developed a website ([www.LASedimentManagement.com](http://www.LASedimentManagement.com)) dedicated to sediment management to provide ongoing information to the public on the development of the Strategic Plan and the planning of upcoming sediment management projects.

Based on valuable input from agencies, organizations, industry, and the public through the Stakeholder Task Force, Advisory Working Group, and public open houses, the Flood Control District evaluated numerous sediment management alternatives. This input was used to develop the combined alternatives presented in this plan.

### **Evaluating the Alternatives**

While considering input from stakeholders, the Flood Control District identified and analyzed various alternatives for removal, transport, beneficial use, and placement of the sediment. The alternatives were analyzed based on five main factors - environmental impacts, social impacts, implementability, performance, and approximate 20-year cost. A number of specific concerns were considered within each factor, as shown in Table ES-1.

**Table ES-1 Evaluation Factors Considered for Each Sediment Management Alternative**

Evaluation Factor	Description
Environmental Impacts	<ul style="list-style-type: none"> <li>• Habitat</li> <li>• Water quality</li> </ul>
Social Impacts	<ul style="list-style-type: none"> <li>• Traffic</li> <li>• Scenic and visual impacts</li> </ul>
Implementability	<ul style="list-style-type: none"> <li>• Construction issues</li> </ul>
Performance	<ul style="list-style-type: none"> <li>• Previous experience</li> <li>• Cleanout capacity</li> </ul>
Cost	<ul style="list-style-type: none"> <li>• Estimated total cost over 20 years</li> </ul>

Using the five factors, the Flood Control District analyzed each alternative to identify the feasibility for large reservoirs, small reservoirs, and debris basins. The alternatives identified as feasible for each facility type are included in Table ES-2. Subsequently, those alternatives were put together as feasible for each reservoir and the debris basins to create combined sediment management alternatives.

**Table ES-2 Feasible Sediment Management Alternatives**

Alternative	Feasibility		
	Large Reservoirs	Small Reservoirs	Debris Basins
<b>Removal</b>			
Excavation	✓	✓	✓
Dredging	✓		
Sediment Flushing (previously referred to as Flow Assisted Sediment Transport (FAST))	✓	✓	
Sluicing	✓		
<b>Transportation</b>			
Sluicing	✓		
Trucks (including Low Emission Trucks)	✓	✓	✓
Conveyor Belts	✓	✓	
Slurry Pipes	✓		
<b>Beneficial Uses and Placement</b>			
Aggregate and Other Materials	✓	✓	✓
Daily Cover at Solid Waste Landfills	✓	✓	✓
Fill at Pits	✓	✓	✓
Sediment Placement Sites	✓	✓	✓

As detailed in Section 6.5.1, the use of the sediment for replenishing the beaches in the County of Los Angeles would involve removing the sediment from the reservoirs and debris basins, transporting it to a processing site, processing the sediment for sand and managing the unusable byproducts, transporting the sand to the beaches, and placing the sand there. In order to perform all these tasks, the Flood Control District would need to find cost-sharing and project management partnerships. The Flood Control District understands that as long as better sources of sand are available to those agencies, there may be no interest for those agencies to incur additional expenses to extract sand from the reservoir and debris basin deposits. However, the Flood Control District will continue to analyze this alternative further.

During the analysis of alternatives, additional alternatives were considered, but eliminated based on feasibility. Table ES-3 details the alternatives identified as infeasible during the analysis and the reason(s) for elimination.

**Table ES-3 Sediment Management Alternatives Considered, But Eliminated**

Alternative	Reasons for Elimination
<b>Transportation</b>	
Trucking in Channels	Channels would need to be reconstructed since channels are not structurally designed to carry truck traffic. Bridge overcrossings would also need to be modified.
Rail	Travel distance is too short for rail to be cost-effective. Trucks would still be required from the reservoir/debris basin to the rail cars.
Two-way Saltwater Pipeline	Implementation and operations costs are very high. There would also be high environmental impact at coastal intake and discharge locations.
Cable-Bucket System	Permanent structures would have high visual impacts. Conveyor belts serve similar purpose, but have lower costs.
<b>Placement &amp; Beneficial Uses</b>	
Offshore	Existing regulations do not allow if onshore alternatives are feasible.

### Recommendations

Developing recommended sediment management alternatives for the 14 reservoirs and 162 debris basins the Flood Control District operates is a complex task. Each facility’s unique geographic location provides both challenges and opportunities for sediment management and each alternative carries a series of tradeoffs.

For the small reservoirs and debris basins, fewer combined alternatives were feasible. For the larger facilities with a number of combined alternatives, more detailed analysis is warranted before making a determination on the future course of action. Therefore, it is recommended that multiple combined alternatives be considered for future sediment removal projects.

The complete analysis and recommendations for each reservoir and the debris basins are provided in the Strategic Plan in the following order:

- San Gabriel Canyon Reservoirs (Morris, San Gabriel, and Cogswell Reservoirs) – Section 7.
- Other Large Reservoirs (Big Tujunga, Devil’s Gate, Pacoima, Puddingstone, San Dimas, and Santa Anita Reservoirs) – Section 8.
- Small Reservoirs (Big Dalton, Live Oak, Puddingstone Diversion, and Thompson Creek Reservoirs) – Section 9.
- Debris Basins – Section 10.

Section 11 provides a summary of the sediment management alternatives and recommendations for all the reservoirs and debris basins along with the general steps that should be pursued in order to implement a sediment management approach based on the alternatives recommended by this Strategic Plan.

### Next Steps

This Strategic Plan represents the first step in continued analysis and dialogue with our stakeholders to manage sediment at Flood Control District facilities in ways that consider the needs of all stakeholders. Several next steps have come out of the analysis included in this Strategic Plan.

- **Continue Analysis** – As a planning-level document, the Strategic Plan has identified feasible alternatives, but more analysis is needed prior to choosing a specific alternative for the larger, more complicated reservoirs. Specific analysis will clarify impacts and constraints, but may also identify new opportunities. One such alternative is sediment flushing (previously referred to as Flow Assisted Sediment Transport), which shows promise as a methodology to move sediment downstream in a manner that mimics natural processes. As this analysis continues, the Flood Control District will work cooperatively with stakeholders.

- **Beneficial Uses** – Some of the sediment that reaches the reservoirs and debris basins maintained by the Flood Control District could potentially be used as a resource of aggregate and other materials, daily cover at landfills, and fill at pits. The Flood Control District will continue to explore beneficial use of the sediment. Furthermore, the Flood Control District will remain open to cost sharing and project management partnerships to remove, transport, and process sediment for beach nourishment purposes.
- **Partner with Pit Operators/Acquire Pit(s)** – As mentioned above, sediment from the reservoirs and debris basins could potentially be used as a resource of construction and other materials and as fill for pits. These could potentially be possible through a service agreement with the owners of the sand and gravel processing plants and pits. Placement of sediment at pits could also be accomplished by acquisition of a pit. If not completely filled, the Flood Control District could also use the pits to provide additional groundwater recharge. The Flood Control District will continue efforts to establish the service agreements and to acquire pits in Sun Valley and the Irwindale area.
- **Long-Term Vision** – The flood management and water conservation system in the County of Los Angeles contains some facilities operated by the Flood Control District and others by the Army Corps of Engineers. The Flood Control District will continue to work with the Army Corps of Engineers and local stakeholders to develop a regionwide plan to address sediment as a part of a comprehensive study of how to improve facilities' operations and restore the natural functions of the watersheds while retaining the benefits provided by the current flood management and water conservation system.

The Flood Control District has provided flood risk management and water conservation for almost 100 years. However, new challenges associated with sediment management have emerged. The Flood Control District is always open to hearing and discussing new ideas, so find out how to be involved at [www.LASedimentManagement.com](http://www.LASedimentManagement.com) and share your ideas.