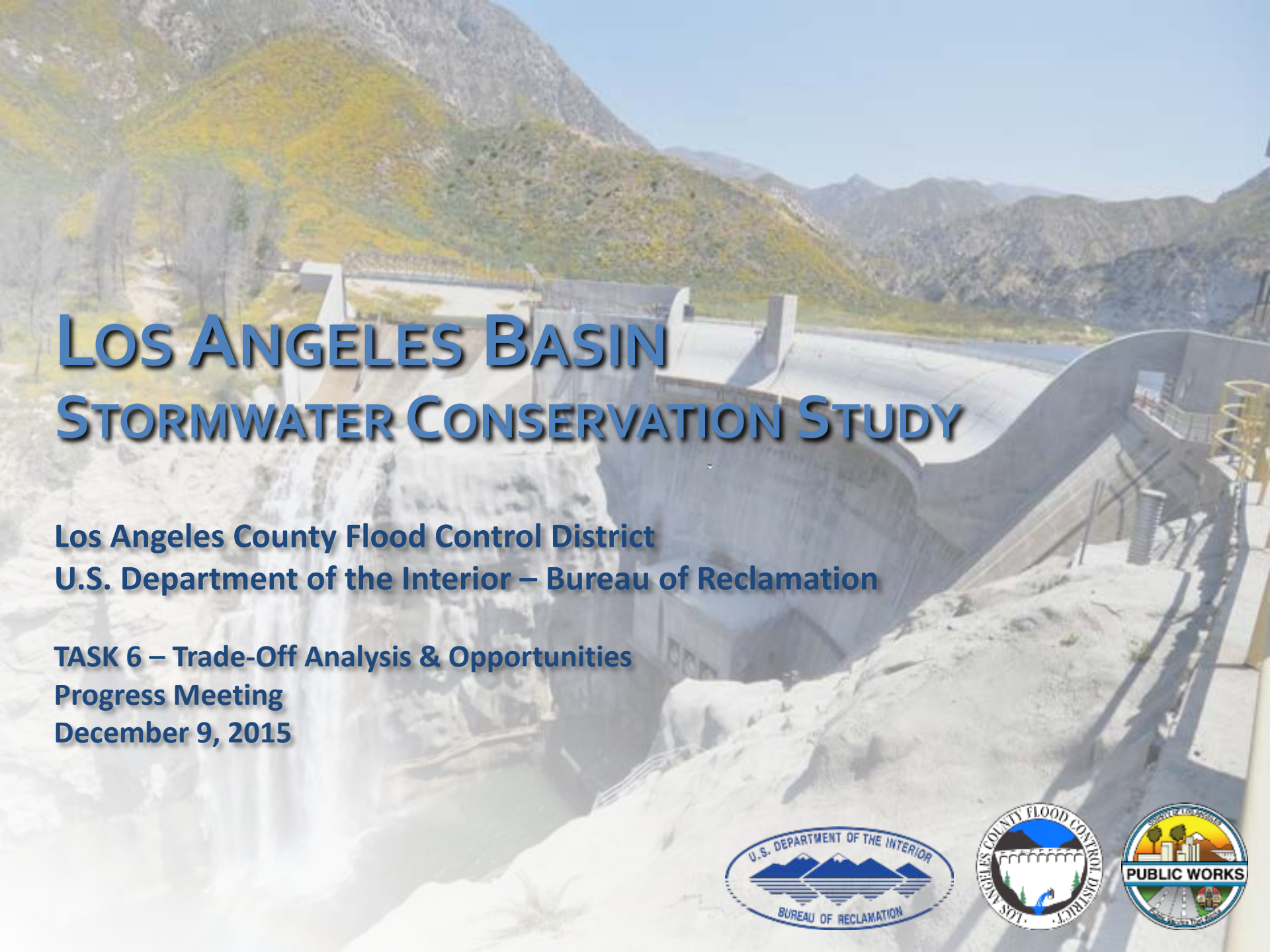


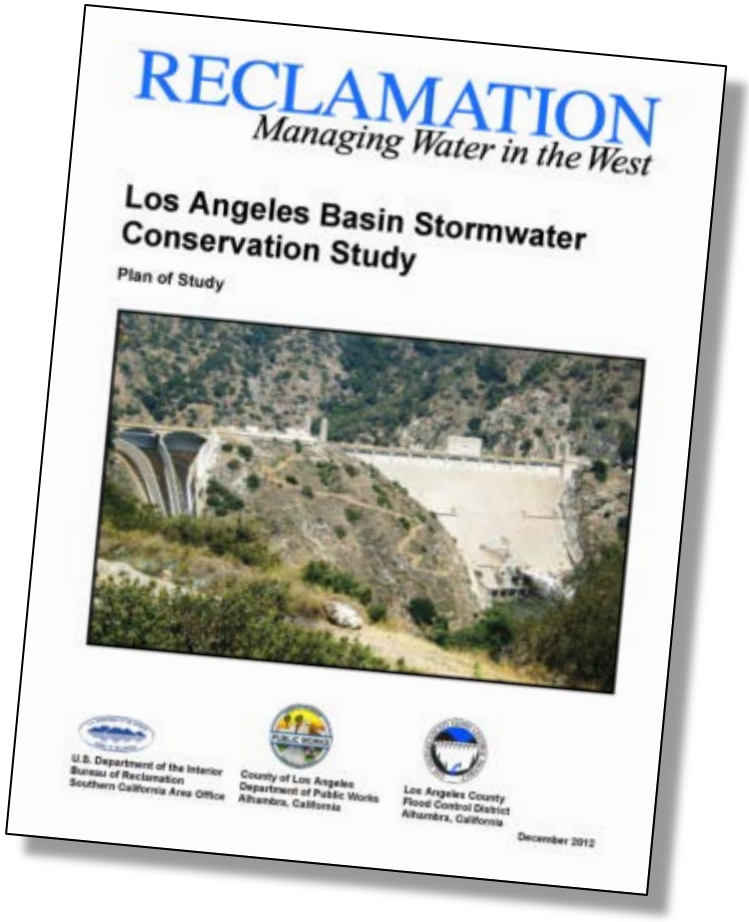
Los Angeles Basin
Stormwater Conservation Study

Los Angeles County Flood Control District
U.S. Department of the Interior – Bureau of Reclamation

TASK 6 – Trade-Off Analysis & Opportunities
Progress Meeting
December 9, 2015

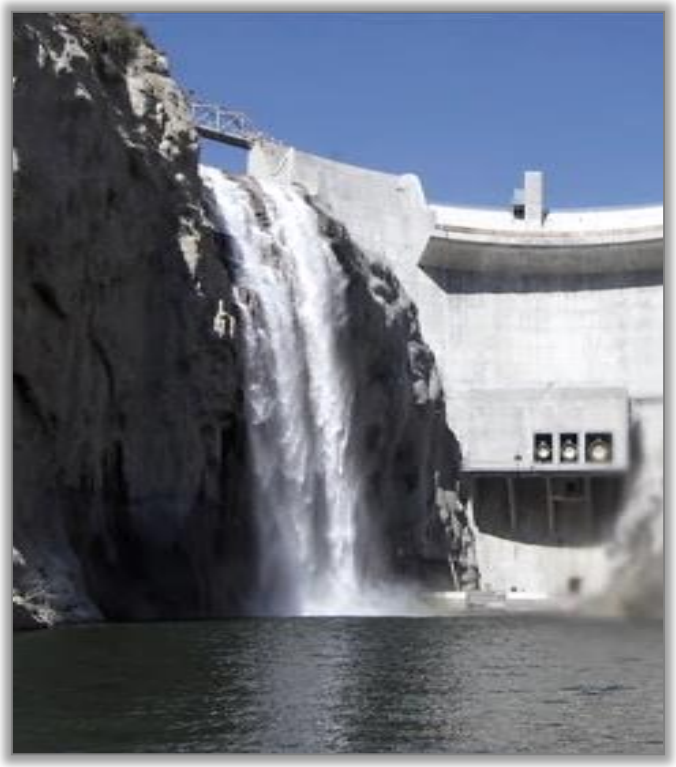
Overview

- LA Basin Study Update
- Economic Effects and Trade-Off Analysis
- Opportunities/ Conclusions
- Study Conclusion



Study Objectives

- Evaluate existing water conservation under future conditions
- Evaluate potential new facilities & operational changes for climate change



Study Elements

Downscaled Climate Change & Hydrologic Modeling

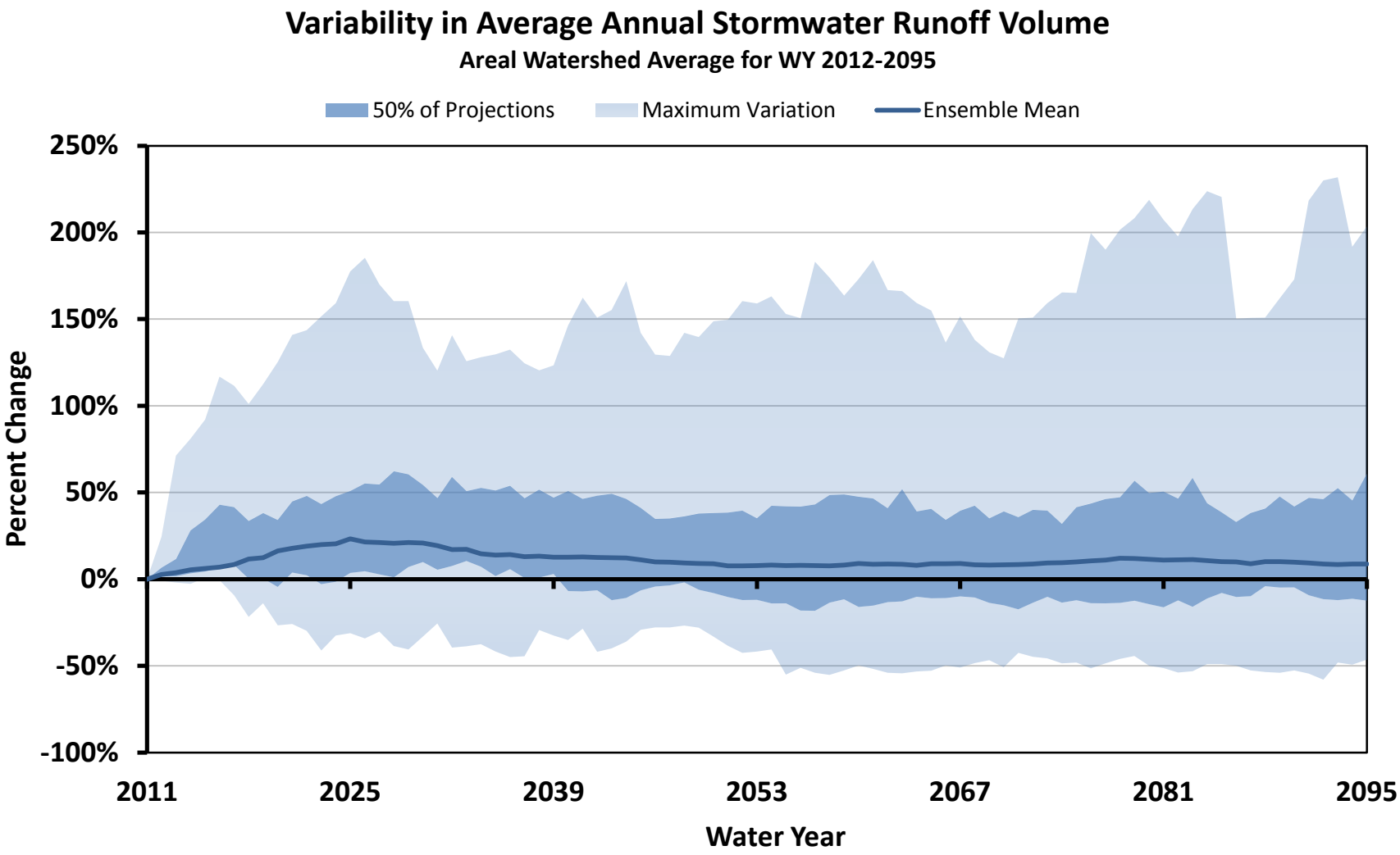
Water Supply & Demand Projections

Existing Infrastructure Response

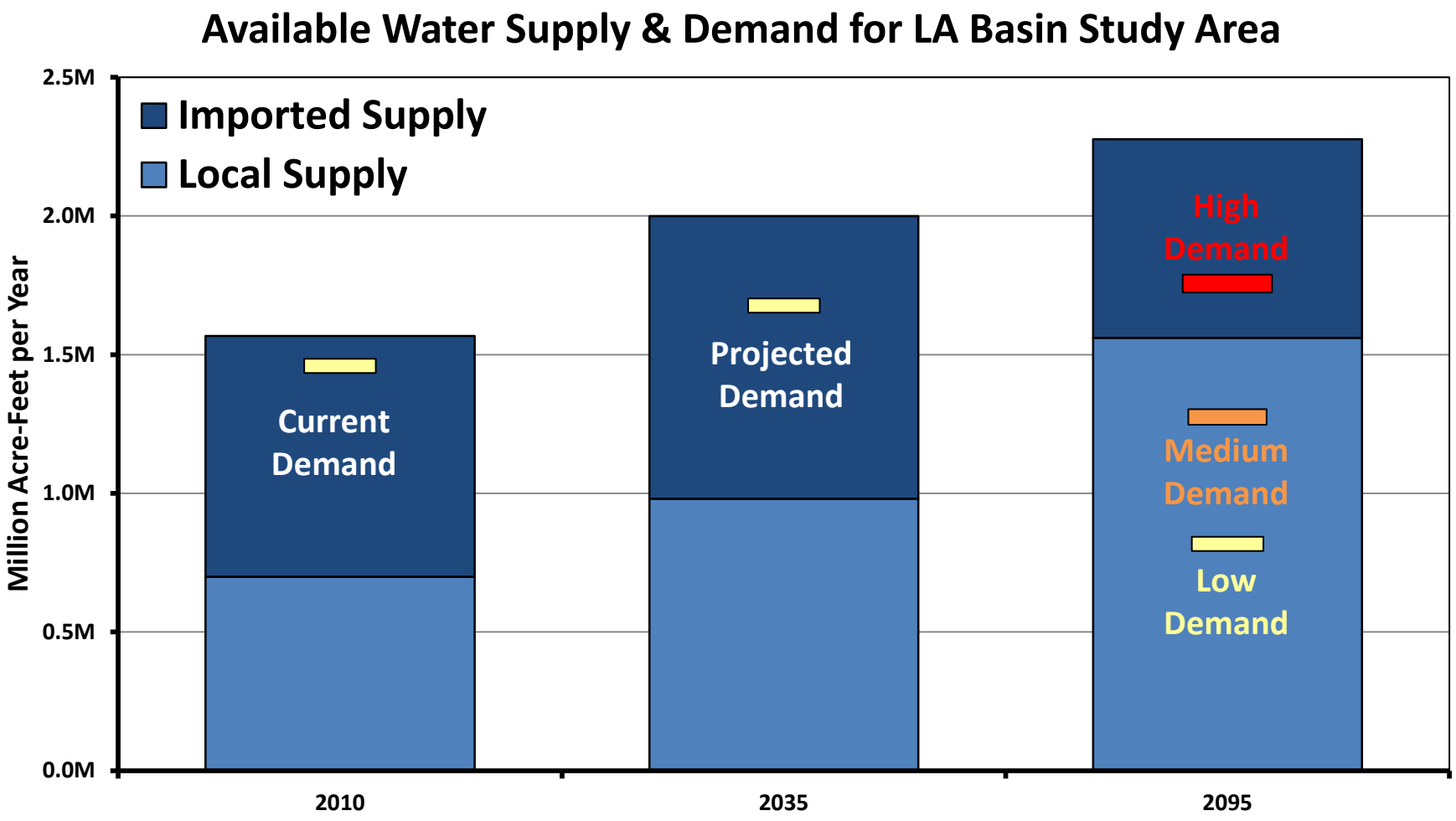
Develop Stormwater Conservation Concepts

Tradeoff Analysis & Opportunities

A Need for Climate Resiliency

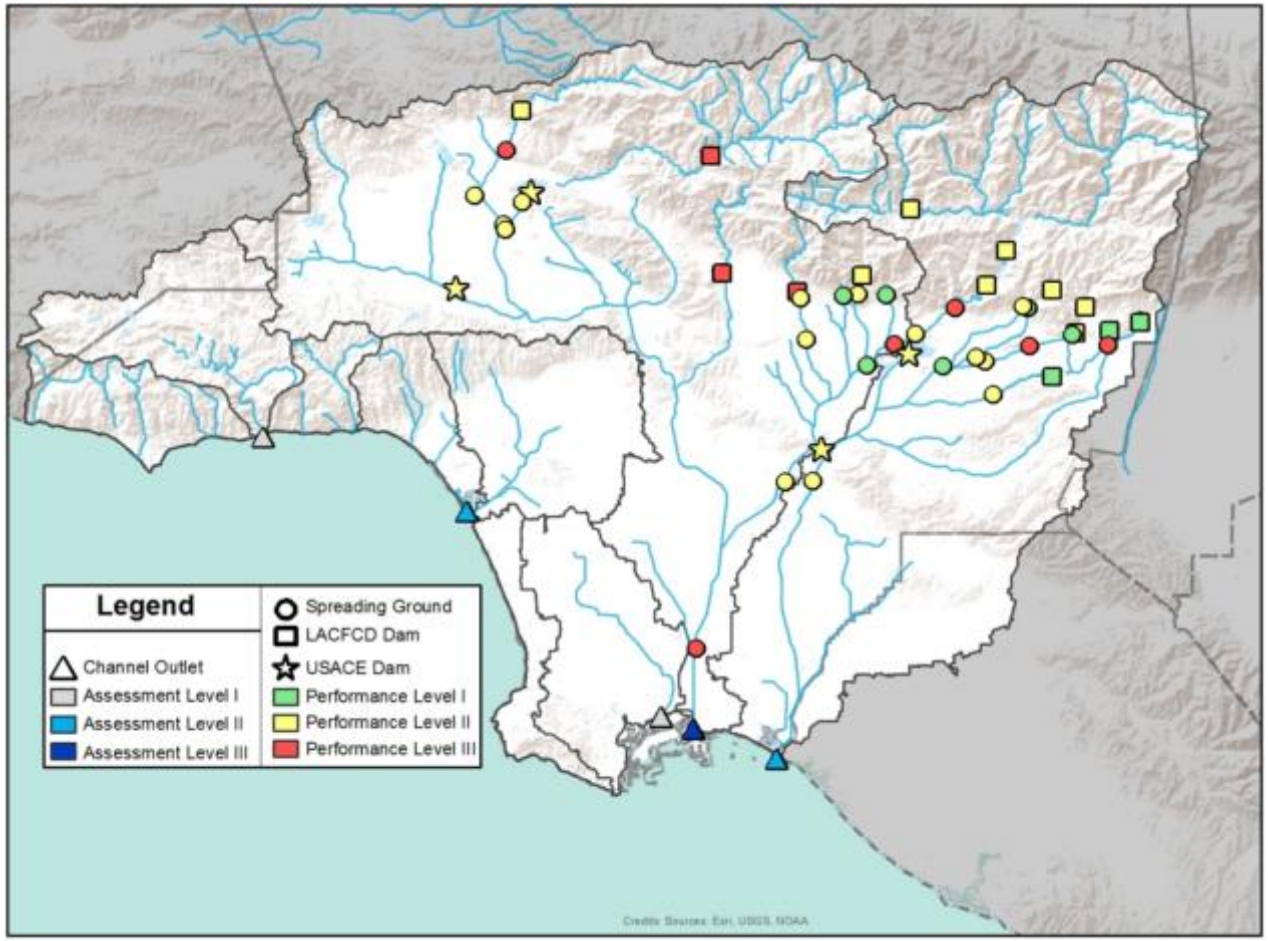


Future Water Supply & Demand



Evaluating the Infrastructure

- **18 Dams**
  - 14 LACFCD
  - 4 Army Corps
- **27 Spreading Grounds**
- **5 Major Channel Outlets**



Task 5 Concept Development

Charrettes Identified Nearly 500 Concepts

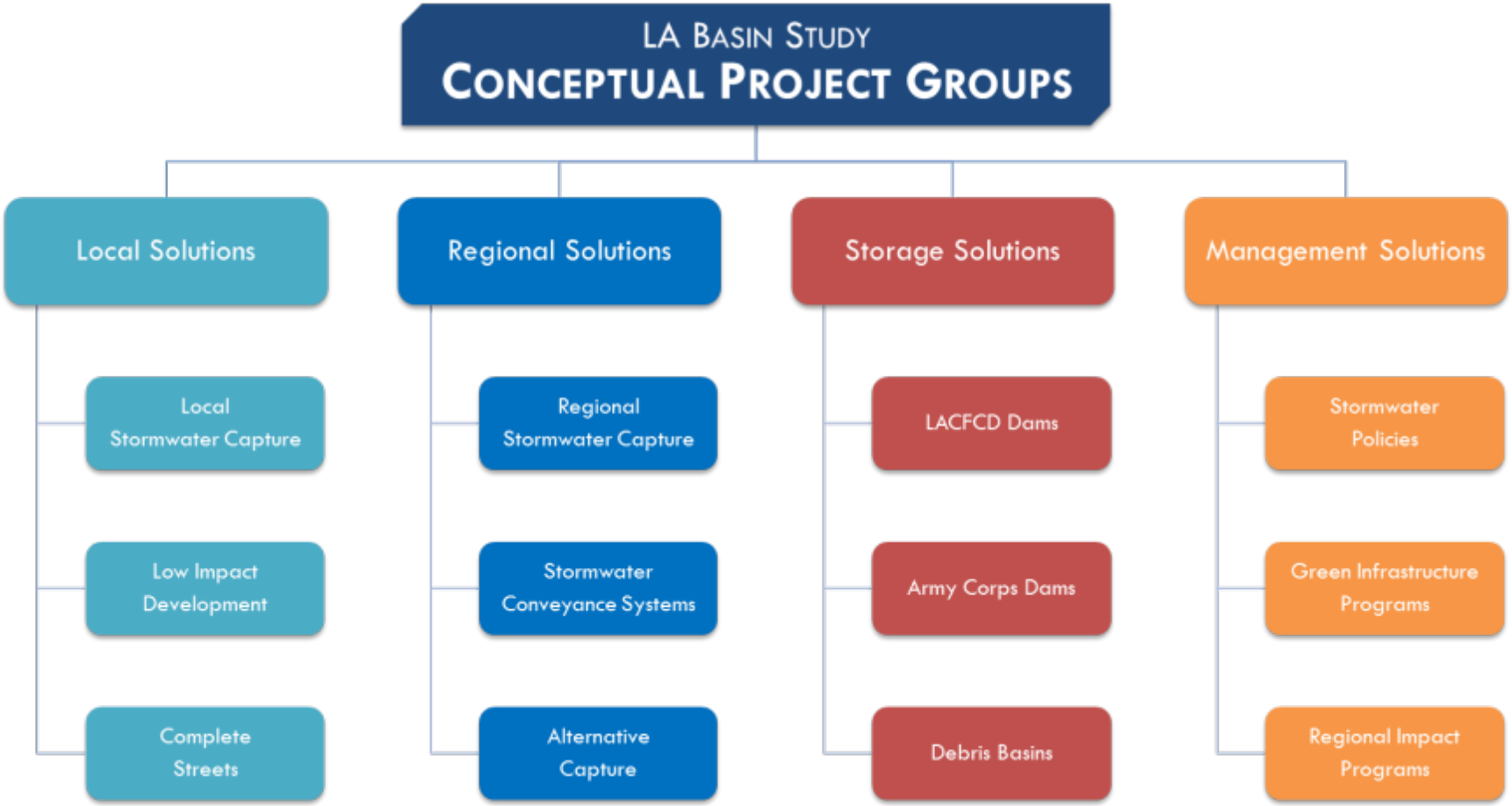
Concepts Reviewed for Focus on Stormwater Capture and Duplicates

Remaining Concepts Targeted for Further Evaluation

126 Stormwater Concepts Evaluated and Scored

Highest Scoring Concepts Placed into 12 Project Groups

Task 5 Project Groups



Task 5 Results & Findings

Summary of Project Group Benefits and Costs

Project Group	Stormwater Conserved/ Storage Capacity (AFY)	Recreation (miles of trail)	Habitat (acres)	ROW (acres)	Range of Costs ($/ac-ft)
Local Solutions					
Local Stormwater Capture[c]	23,900 to 39,200	204	266	2,655	$8,800 to $14,400
Low Impact Development[d]	76,300 to 111,300	0	0	0	$7,700 to $11,200
Complete Streets[d]	25,800 to 36,900	0	0	0	$13,500 to $19,400
Regional Solutions					
Regional Stormwater Capture[c]	26,100 to 59,900	12	42	682	$900 to $2,100
Stormwater Conveyance Systems[c]	8,000 to 10,000	3	8	31	$42,700 to $53,100
Alternative Capture[c]	3,800 to 6,900	2	2	34	$1,400 to $2,400
Storage Solutions					
LACFCD Dams[b]	57,400 to 264,100	0	0	0	$100 to $480
USACE Dams[a, b]	3,800 to 11,800	0	0	0	-
Debris Basins[c]	90 to 230	1	0	0	$13,100 to $35,900
Management Solutions					
Stormwater Policies[d]	153,000 to 225,800	0	0	0	$7,800 to $11,500
Green Infrastructure Programs[d]	99,700 to 145,300	0	0	0	$7,500 to $10,900
Regional Impact Programs[c]	245,300 to 521,000	555	240,200	162,600	$9,600 to $20,300

[a] Cost Information for USACE dams not determined for this study.

[b] Increased storage capacity or stormwater retention for potential reuse or recharge; costs exclude estimates for Santa Anita Dam

[c] Conservation through groundwater recharge

[d] Conservation through groundwater recharge or stormwater retention for potential reuse

Task 6 – Trade-Off Analysis & Opportunities

Objectives

- Evaluate the quantifiable benefits and costs of the stormwater concepts identified in Task 5
- Analyze the trade-offs between concepts

Trade-Off Elements Analyzed

- **ECONOMIC EFFECTS –** Benefits / costs of different types of goods and services, and impacts on the regional economy through changes in the amount and type of spending.

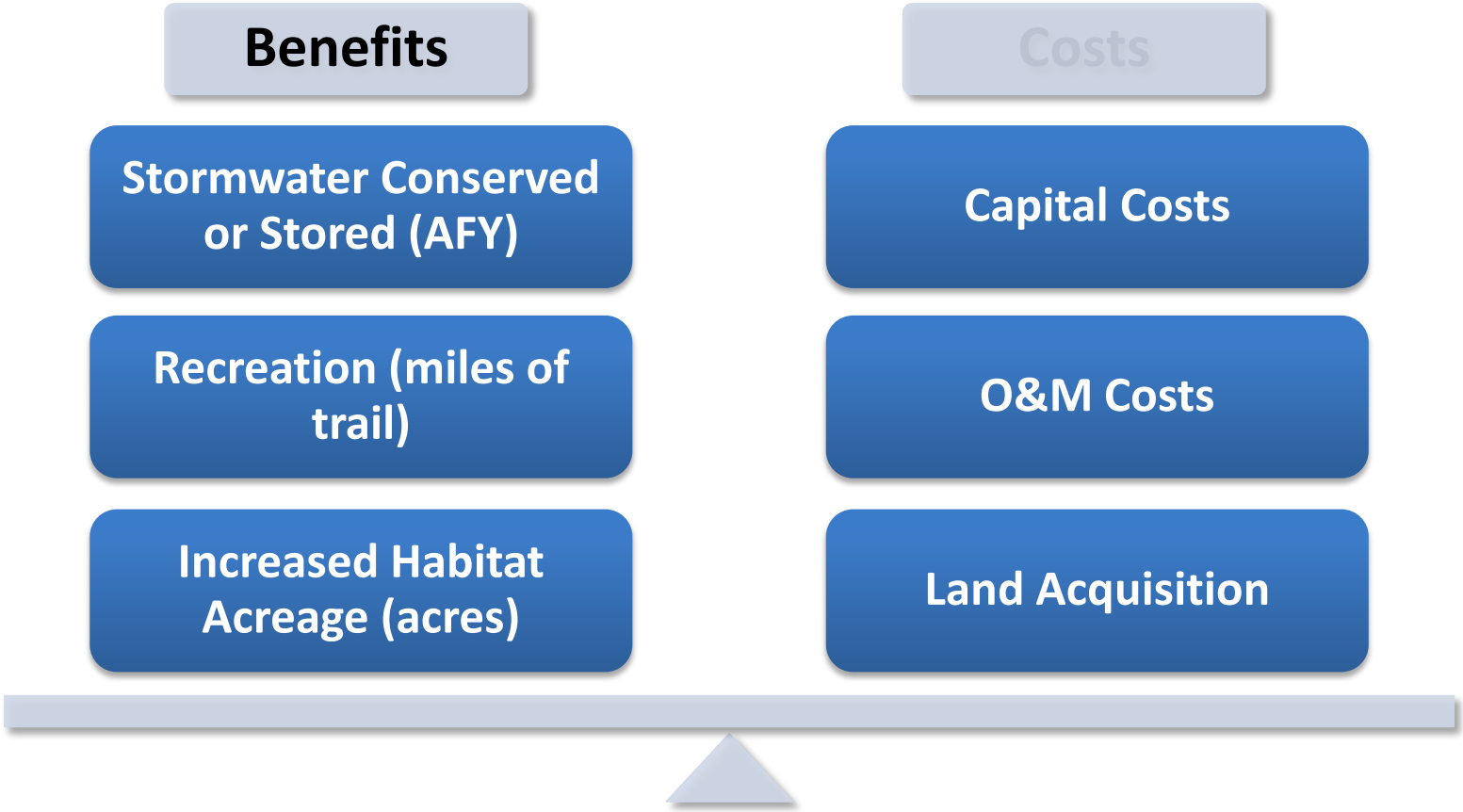
- **FINANCIAL EFFECTS –** Impacts of paying for a project, i.e., paying off capital debt and covering O&M expenses.

- **ENVIRONMENTAL EFFECTS –** Type and quality of environmental and natural resources that would be potentially influenced, i.e., water quality, energy consumption, impacts on habitat, and ecosystem function.

- **SOCIAL EFFECTS –** How the social characteristics of a community or region are altered, i.e., education, environmental justice, and quality of life.

Quantitative Benefits

Are only one part of the effects from the concepts and should not be used in isolation to make planning decisions.

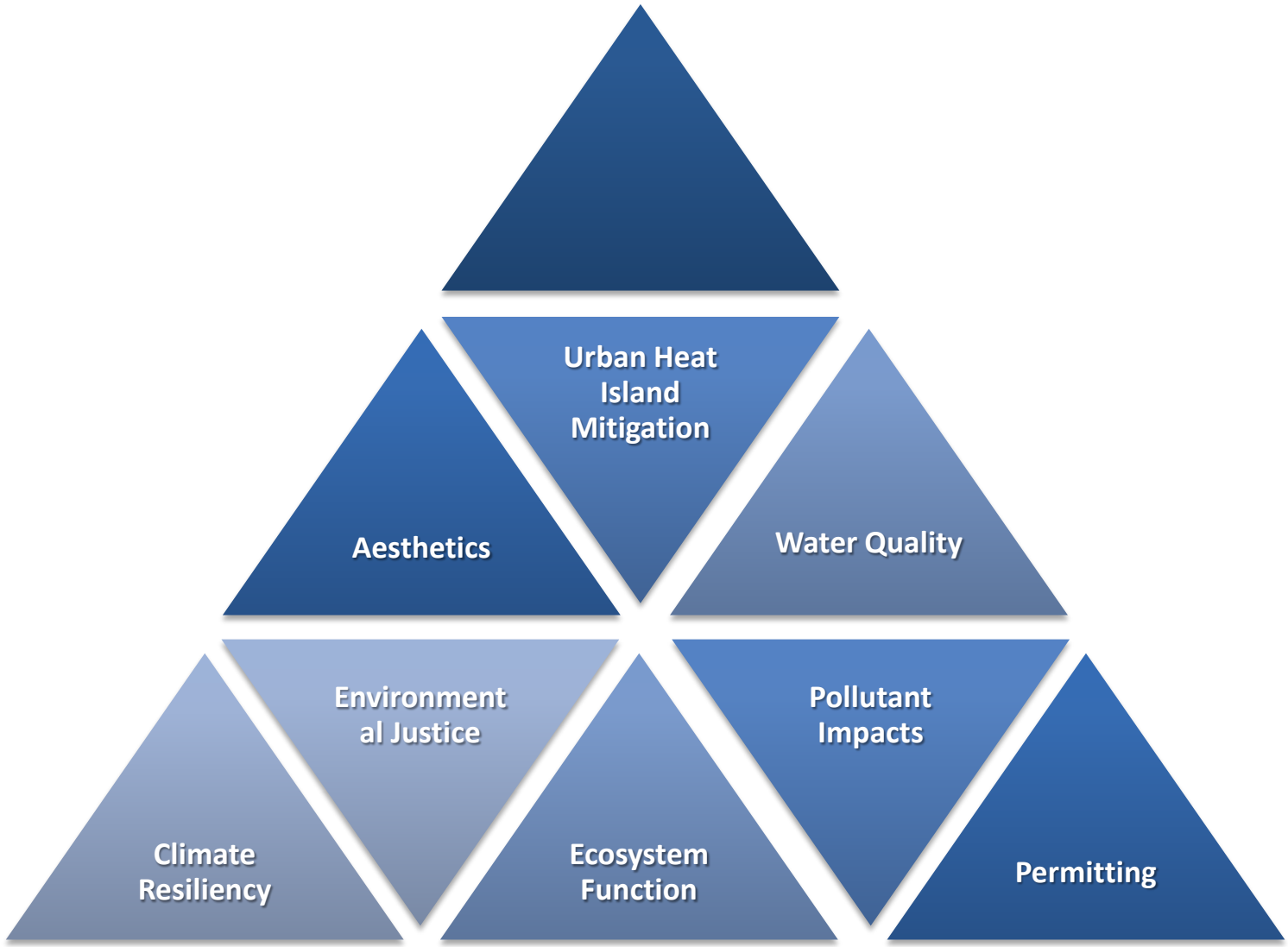


Benefits and Costs Analysis Results

Concept	Present Value of the Best or Mid-point Estimate of Quantified Benefits (Million $'s)	Present Value of Capital, Land, and Operation and Maintenance Costs (Million $'s)
Local Solutions		
Local Stormwater Capture	748	7,153
Low Impact Development	519	21,055
Complete Streets	172	12,253
Regional Solutions		
Regional Stormwater Capture	252	1,320
Stormwater Conveyance Systems	54	10,346
Alternative Capture	34	226
Storage Solutions		
LACFCD Dams	832	667
USACE Dams	40	N/A
Debris Basins	3	74
Management Solutions		
Stormwater Policies	946	227,362
Green Infrastructure Programs	677	26,681
Regional Impact Programs	896	116,661

*** All benefits and costs are present value over a 50-year planning period using the current Fiscal Year 2016 federal water project planning rate of 3.125%.**

Qualitative Benefits



STAC Members Survey

Conducted to determine the relative importance of each of the quantitative and qualitative effects:

Impact Measure	Final Weights Used in Trade-Off Analysis
Stormwater Conservation	10.0
Water Quality Impact	8.86
Climate Adaptation	7.99
Flood Risk Mitigation	7.98
Pollutant & Environmental Impact	7.66
Operations & Maintenance Cost	7.15
Ecosystem Function	6.93
Environmental Justice Impacts	6.82
Energy Impact	6.74
Capital Cost	6.67
Connectivity	6.52
Habitat	6.31
Environmental Compliance and Regulatory Permitting	5.90
Recreation	5.46
Financial Impact	5.20

Highest possible score possible is a 10.0 (reflects the impact measure that has the highest total number of points across all STAC survey respondents.)

Retained and Discarded Measures

Measure	Retain or Discard Measure?	Reason to Retain Or Discard
Stormwater Conservation	Retain	No correlation with other measures
Environmental Compliance and Permitting	Retain	No correlation with other measures
Water Quality	Retain	No correlation with other measures
Capital Cost	Retain	Correlated only with O&M Cost
Operation and Maintenance (O&M) Cost	Retain	Correlated only with Capital Cost
Climate Adaptation	Retain	Correlated only with Energy Impacts
Flood Risk Mitigation	Retain	Correlated only with Health & Well being
Financial Impact	Retain	Correlated and combined with Regional Impacts
Ecosystem Function	Retain	Retained as a measure of several impacts
Habitat	Retain	Retained as a measure of several impacts
Pollutant and Environmental Impact	Retain	Retained as a measure of several impacts
Environmental Justice Impacts	Retain	Retained as a measure of several impacts
Connectivity	Retain	Retained as a measure of several impacts
Recreation	Retain	Retained as a separate measure of a specific activity
Energy Impacts	Retain	Retained as a measure of several impacts
Endangered Species	Discard/Combine	Correlated with 5 variables
Regional Economic Impact	Discard/Combine	Correlated with Financial Impact & Recreation
Education	Discard/Combine	Correlated with 6 variables
Health and Well Being	Discard/Combine	Correlated with 6 variables

Water Supply Benefits

- **The results from previous water supply reliability studies have been obtained to place an economic value on water supplies.**

  - Barakat and Chamberlin (1994)
  - Orange County (2003)
  - Goddard and Fiske (2005)
  - Griffin and Mjelde (2000)
  - Koss and Khawaja (2001)

Water Supply Benefits

Concept	Households Potentially Supported by Stormwater Conserved at 138 gpcd		Households Potentially Supported by Stormwater Conserved at 100 gpcd		Annual Value of Stormwater Conserved at $51 per Household per Year, 138 gpcd, and Low Estimate of Stormwater Conserved	Annual Value of Stormwater Conserved at $166 per Household per Year, 100 gpcd, and High Estimate of Stormwater Conserved	Annual Value of Stormwater Conserved at $73 per Household per Year and Mid-point of Conservation and Water Use Range
	Low	High	Low	High	Low Estimate	High Estimate	Best Estimate
Local Solutions							
Local Stormwater Capture	38,471	62,971	53,091	86,902	$1,962,000	$14,425,800	$4,576,100
Low Impact Development	174,945	282,834	241,428	390,319	$8,922,200	$64,793,000	$20,632,100
Complete Streets	58,673	93,060	80,970	128,426	$2,992,300	$21,318,700	$6,829,100
Regional Solutions							
Regional Stormwater Capture	56,094	128,737	77,411	177,660	$2,860,800	$29,491,600	$8,532,000
Stormwater Conveyance Systems	17,194	21,492	23,728	29,660	$876,900	$4,923,500	$1,710,100
Alternative Capture	8,167	14,829	11,271	20,465	$416,500	$3,397,200	$1,045,100
Storage Solutions							
LACFCD Dams	123,364	567,603	170,246	783,308	$6,291,600	$130,029,100	$33,093,500
USACE Dams	8,167	25,361	11,271	34,998	$416,500	$5,809,700	$1,575,500
Debris Basins	193	494	267	682	$9,900	$113,200	$32,000
Management Solutions							
Stormwater Policies	333,770	505,061	460,612	696,998	$17,022,300	$115,701,700	$37,623,100
Green Infrastructure Programs	228,675	369,232	315,577	509,550	$11,662,400	$84,585,400	$26,945,200
Regional Impact Programs	46,853	79,305	64,658	109,444	$2,389,500	$18,167,600	$5,704,800

Recreation Benefits

- Recreation values that will be used to estimate recreation benefits were obtained from Recreation Use Values Database maintained by the Oregon State University College of Forestry http://recvaluation.forestry.oregonstate.edu/
- Estimated benefits associated with sightseeing and general recreation in California range from about $5 to $16 per recreation day (2010 $'s)
- Value depends on recreation activity and valuation method

Recreation Benefits

Concept	Feet of Trail	Miles of Trail	Annual Increase in Use at 22,480 Visits per Mile	Annual Total Value at $5.47 per Visit
Local Solutions				
Local Stormwater Capture	1,077,000	204.0	4,585,409	$25,082,200
Low Impact Development	0	0	0	$0
Complete Streets	0	0	0	$0
Regional Solutions				
Regional Stormwater Capture	63,000	11.9	268,227	$1,467,200
Stormwater Conveyance Systems	18,018	3.4	76,713	$419,600
Alternative Capture	11,907	2.3	50,696	$277,300
Storage Solutions				
LACFCD Dams	N/A	N/A	N/A	N/A
USACE Dams	N/A	N/A	N/A	N/A
Debris Basins	3,270	0.6	13,922	$76,200
Management Solutions				
Stormwater Policies	0	0	0	$0
Green Infrastructure Programs	0	0	0	$0
Regional Impact Programs	2,782,560	527	11,846,960	$64,802,900

Habitat and Ecosystem Benefits

Concept	Habitat Acres	Habitat Right-of-Way Acres	Combined Acreage	Combined Value at $141 per Acre	Combined Value at $719 per Acre
Local Solutions					
Local Stormwater Capture	266	0	266	$37,500	$191,300
Low Impact Development	0	0	0	$0	$0
Complete streets	0	0	0	$0	$0
Regional Solutions					
Regional Stormwater Capture	42	0	42	$5,900	$30,200
Stormwater Conveyance Systems	8	0	8	$1,100	$5,800
Alternative Capture	2	0	2	$300	$1,400
Storage Solutions					
LACFCD Dams	0	0	0	$0	$0
USACE Dams	0	0	0	$0	$0
Debris Basins	0	0	0	$0	$0
Management Solutions					
Stormwater Policies	0	0	0	$0	$0
Green Infrastructure Programs	0	0	0	$0	$0
Regional Impact Programs	5,200	2,470	7,670	$1,081,500	$5,514,700

Quantified Economic Benefits & Costs

Concept	Present Value of the Best or Mid-point Estimate of Quantified Benefits (millions)	Present Value of Capital, Land, and Operation & Maintenance Costs (millions)
Local Solutions		
Local Stormwater Capture	$748	$7,153
Low Impact Development	$519	$21,055
Complete Streets	$172	$12,253
Regional Solutions		
Regional Stormwater Capture	$252	$1,320
Stormwater Conveyance Systems	$54	$10,346
Alternative Capture	$34	$226
Storage Solutions		
LACFCD Dams	$832	$667
USACE Dams	$40	N/A
Debris Basins	$3	$74
Management Solutions		
Stormwater Policies	$946	$227,362
Green Infrastructure Programs	$677	$26,681
Regional Impact Programs	$896	$116,661

Trade-Off Analysis Results

Combines quantitative and qualitative impacts for each concept and the importance weights to calculate a final score for each project group.

Concept	Final Weighted Scores for Concepts	
	Average Score	Sum of Scores
Local Solutions		
Local Stormwater Capture	44	660
Low Impact Development	37	558
Complete Streets	36	543
Regional Solutions		
Regional Stormwater Capture	36	537
Stormwater Conveyance Systems	31	464
Alternative Capture	36	534
Storage Solutions		
LACFCD Dams	41	613
USACE Dams	22	326
Debris Basins	32	475
Management Solutions		
Stormwater Policies	34	504
Green Infrastructure Programs	38	568
Regional Impact Programs	41	607

Trade-Off Analysis Results

Benefits with the best value:

- LACFCD Dams
- Local Solutions
- Regional Impact Programs
- Green Infrastructure Programs

The results should be used as a baseline evaluation that can be adjusted to represent particular resources and impacts of interest.

Task Conclusions

The Trade-off Analysis should be used as a guide to:

- **Create a roadmap from the baseline evaluation process for:**
  - ✓ **LACFCD Dams Storage Solutions**
  - ✓ **Local Solutions**
  - ✓ **Regional Impact Programs**
  - ✓ **Green Infrastructure Programs**
- **Move forward from Appraisal-Level analysis to Feasibility-Level**
- **Maximize stormwater capture opportunities for the future**

Next Steps

- Review and submit comments on Task 6 Report
- Study process ends December 31, 2015
- A Study Summary Report will be published in the near-term (early 2016)
- Opportunities to build on outcomes from this Study
- *STAC Comments are due by Monday, Dec 14th

Contact Information

Los Angeles Basin Stormwater Conservation Study

http://www.usbr.gov/lc/socal/basinstudies/LABasin.html (LA BASIN STUDY WEBSITE)

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