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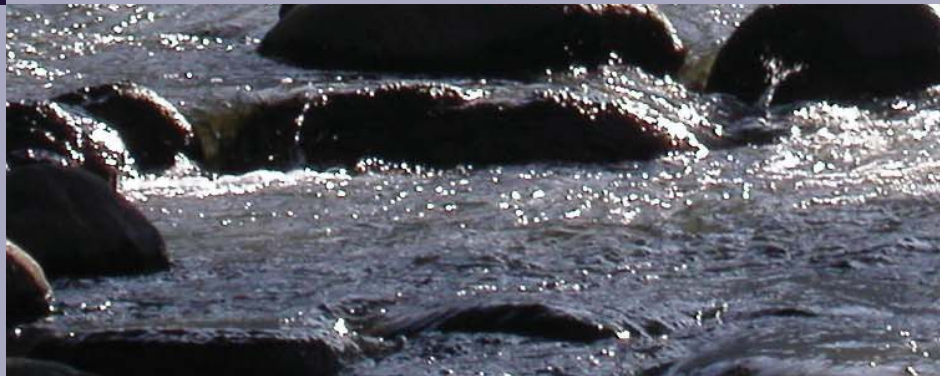
Benefits and Costs Assessment

Technical Memorandum
August 18, 2006

Integrated Regional Water Management Plan For the Greater Los Angeles County Region



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Technical Memorandum for the Integrated Regional Water Management Plan for the Greater Los Angeles County Region prepared in partnership with:

BROWN AND CALDWELL

DMA
David Miller & Associates, Inc.

DUVIVIER architects
Architecture, Planning and Sustainable Design

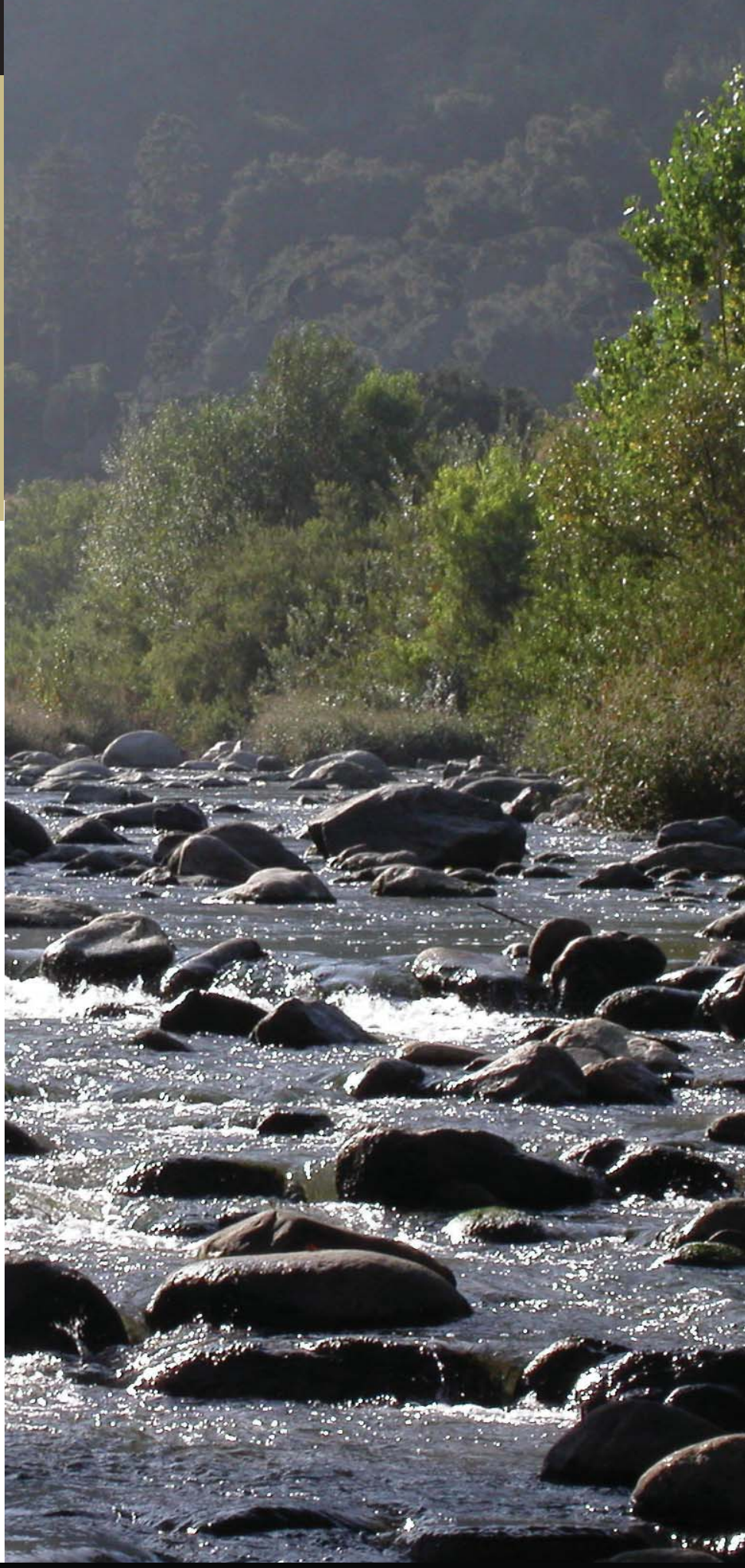
EIP
ASSOCIATES

HARGREAVES
ASSOCIATES

MALCOLM PIRNIE
INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS AND CONSULTANTS

RMC
Water and Environment

TREEPEOPLE



11111 Santa Monica Blvd.
Suite 750
Los Angeles, CA 90025

Tel: (310) 893-2700
Fax: (310) 893-2750

www.brownandcaldwell.com

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August 18, 2006

Mr. Don Wolfe
Chair
IRWMP Leadership Committee
Los Angeles County Flood Control District
900 South Fremont Avenue, 12th Floor
Alhambra, CA 91803

Subject: Greater Los Angeles Integrated Regional Water Management Plan - Project Integration Technical Memoranda and the Benefits and Costs Assessment Technical Memoranda

Dear Mr. Wolfe:

We have uploaded today for your review and distribution the Project Integration Technical Memoranda and the Benefits and Costs Assessment Technical Memoranda (TM) to our FTP site in a folder titled: "LAIRWMP". You have access to the FTP site through the following link: ftp://bc:bcftp@ftp.brwncald.com, Username: bc, and Password: bcftp. Thank you very much for the opportunity to provide these documents, as a part of our ongoing scope of work for the LA IRWMP project. These documents are two important steps in our Region's efforts to develop our IRWMP.

The Project Integration TM:

1. Documents our current progress towards developing regional quantitative targets for water supply, water quality, and open space,
2. Provides a comprehensive summary assessment of the projects that stakeholders have identified in their Subregions, and the Region, to make progress towards these targets as of June 1, 2006; and
3. Provides regional planning tools to assist the Subregions with beginning to define a vision for filling the gap to achieve the quantitative targets.

This document will serve as a very useful tool at the Subregional and Regional levels as they continue to identify appropriate projects for various funding sources, including the upcoming Prop 50, Round 2 funding opportunity.

The Benefits and Costs Assessment TM:

1. Presents a summary of the benefits and costs provided by stakeholders for projects submitted in the Step 2 Application as of June 2006, and
2. Presents a summary of the benefits and order-of-magnitude cost estimates of three distinct approaches for accomplishing the regional quantitative targets established by the Leadership Committee for water supply, water quality and open space.

This document will also assist the Subregions with beginning to define a vision for filling the gap to achieve the quantitative targets.

These documents are intended to be "snapshots" in time which document the progress being made by members of the Leadership Committee, Steering Committees, and stakeholders to develop a comprehensive IRWMP which will be technically, economically, and politically sound. The documents are intended to stimulate discussion and feedback, and all comments will be used to help improve the final draft IRWMP that will be circulated at the end of September. We encourage review and feedback from the Steering Committees over the next several weeks, and it is our understanding that several of them may be scheduling conference calls in the next week to begin to discuss the documents before their regularly scheduled meeting in September. Please contact me if you have any questions.

Very truly yours,

BROWN AND CALDWELL

Michael Drennan
Vice President

BENEFITS AND COSTS ASSESSMENT TECHNICAL MEMORANDUM

Prepared for
Leadership Committee of Greater Los Angeles
County Integrated Regional Water Management Plan
August 2006

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ACRONYM LIST

AFY	Acre-feet/Year
BMP	Best Management Practice
DAC	Disadvantaged Communities
ENR	Engineering News Record
IRWMP or Plan	Integrated Regional Water Management Plan
JWPCP	Joint Water Pollution Control Plant
MG	million gallons
MGD	million gallons per day
O&M	operations and maintenance
Region	Greater Los Angeles County Region
RWQCB	Regional Water Quality Control Board
SFH	Single Family Home
TM	Technical Memorandum
WEF	Water Environment Federation

1. INTRODUCTION

1.1 Purpose

The purpose of this Benefits and Costs Assessment Technical Memorandum (TM) is to: 1) present a summary of the benefits and costs provided by stakeholders for projects submitted in the Step 2 Application in June 2006, and 2) to present a summary of the benefits and order-of-magnitude cost estimates of three distinct approaches for accomplishing the regional quantitative targets established by the Leadership Committee for water supply, water quality and open space.

1.2 Background

The Greater Los Angeles County Region (Region) faces many complex water resources management challenges. These challenges include development of additional water supplies required to meet the needs of a growing population, addressing and managing the water quality of our streams and rivers, and the preservation of the Region's water-based habitats. Regional, short and long-term targets for the development of additional water supplies, improved water quality, and additional open space and habitat acreage have been identified (see, for example, the Integrated Water Management Strategy TM, submitted May 31, 2006). In order to assess the best approach to meeting the Region's water resources needs, an Integrated Regional Water Management Plan (IRWMP or Plan) is being developed through a collaboration of multiple stakeholder groups, public input, and the technical consultant team.

One important aspect of the IRWMP is to address the Region's water resource needs and objectives through cost-effective, often multi-purpose water resources management solutions. The IRWMP integrates strategies and projects with a focus on synergy among project types in order to increase the Region's water supply while concurrently improving water quality and providing open space. This integrated and synergistic planning approach is expected to increase project effectiveness, reduce cost per unit of output, increase project benefits and/or provide a broader distribution of benefits, and facilitate a broader distribution of project costs among local, state, and federal cost-sharing partners.

The IRWMP includes stakeholder projects, some of which have been submitted for Prop 50 funding, and integrates new Regional and Subregional project planning and development concepts through a stakeholder-driven process. Although plan formulation will result in a single consolidated IRWMP, aspects of the analysis are also conducted at the Subregional level. For planning purposes, the region has been divided into five Subregions, which are:

- North Santa Monica Bay Watersheds;
- Upper Los Angeles River Watershed;
- Upper San Gabriel River and Rio Hondo Watersheds;
- Lower San Gabriel and Los Angeles Watersheds; and
- South Bay Watersheds.

Analysis at the Subregional level provides perspective on opportunities to implement regional project concepts. In addition, analysis at the Subregional level provides insight into issues that are more difficult to identify at the Regional level, such as identification of opportunities within disadvantaged communities.

Figure 1. The Greater Los Angeles County Region and the Five Associated Subregions

1.3 Regional Planning Approaches or "Tools"

An assessment of three distinct approaches to achieving the quantitative targets described in the Project Integration TM is a major component of IRWMP development. Projects identified through the Call for Projects process (also described in the Project Integration TM) may not provide the level of benefit needed to accomplish the Region's quantitative targets. Nor do they address the Region's goal of accomplishing these targets in an integrated fashion. There is still a benefit gap that needs to be met in order to reach these targets. The Region's desire to continue to explore new and existing integrated water management practices has led to the development of three distinct approaches to regional planning (hereinafter identified as "tools" or "planning tools"):

- Planning Tool 1: Site Scale
- Planning Tool 2: Neighborhood Scale
- Planning Tool 3: Regional Scale

These tools have been developed at the direction of the Leadership Committee, to assist stakeholders, and members of the Steering Committees and Leadership Committee by providing information on the benefits

and costs of three distinct approaches for achieving the quantitative targets described previously. It should be emphasized that none of these tools should be interpreted to be the answer for the Region, or any Subregion—the information is provided to help decision-makers develop more informed choices about appropriate solutions for their particular Subregion given their particular set of opportunities and constraints. It is likely that the final solution for each Subregion will be a hybrid of all three of solutions presented in the tools.

Each tool consists of a group of localized projects which would fill the expected future gaps in regional water supply, water quality, and open space targets. A more detailed discussion of the three Regional Planning Tools can be found in the Project Integration TM.

1.4 Costs and Benefits

The primary purpose of developing estimates of the costs and benefits of three distinct approaches is to assist decision-makers evaluate various methods for achieving the quantitative targets for water supply, water quality and open space. For the purposes of this TM, the question being addressed isn't: "Is it worth it?", but is instead: "How shall we go about it?" That being said, an economic benefit assessment framework and a set of excel spreadsheets have been developed that can be easily modified to incorporate additional benefits as additional references are identified. In addition, it is assumed that none of the approaches or Planning Tools should be interpreted to be the answer for the Region, or any Subregion—the information is provided to help decision-makers develop more informed choices about appropriate solutions for their particular Subregion given their particular set of opportunities and constraints.

Calculation of the costs and benefits of the three Regional Planning Tools has been conducted at the conceptual level, which is based on data gathered from similar projects that have already been constructed in the region, discussions with local agency personnel, or from costs and benefits identified in the appropriate literature (see the Costs and Benefits sections below and the references section at the end of this document). The costs and benefits of each Regional Planning Tool are estimated separately, using generic unit costs and benefits that may be applicable to each Regional Planning Tool.

It should be noted that the cost of a project or groups of project will vary depending on if and how the project is structured to render multiple benefits. For example, capturing and treating the water from a particular storm drain that currently drains into the Los Angeles River could be done so for water supply, water quality, habitat development or a combination of these purposes. If the project is done for only one of these purposes, then that project and improvements provided therein would mostly be substantially different than if the same project was developed to achieve two or three of these objectives. Likewise, the costs associated with the different project integration and development alternatives will also vary. To facilitate an assessment of the costs to benefit relationships of these different project integration and development alternatives, the costs and benefits of each Regional Planning Tool are estimated separately. The costs estimates were developed using generic unit costs and benefits applicable to each Regional Planning Tool.

Again, the cost estimates developed herein are appraisal-level estimates and are to be used only for comparison purposes. More detailed cost estimates that reflect local project conditions and other cost factors will need to be developed in subsequent planning stages of the selected projects. Similarly, more detailed benefit estimates are not necessary for development of the IRWMP because the purpose of the Plan is to identify the overall approach to regional water resources management and not to select among specific local projects. It is important to consider that the benefits identified in this IRWMP are not all encompassing. It is understood that some localized benefits exists for some projects that cannot be identified at this Regional Planning level. For this reason, calculation of a benefit/cost ratio for any of the three Regional Planning Tools would likely be misleading, given the under-representation of potential benefits.

The information contained within this analysis provides decision-makers with a venture level quantitative assessment of the incremental costs and benefits of integrated regional water resources management. The costs and benefits presented in this TM provide a perspective on the significant economic differences between the three Regional Planning Tools in terms of the magnitude of the costs and benefits. An assessment of the potential magnitude of Federal participation in financing regional water resources management is also provided. The costs and benefits analysis clearly shows the progressive increase in regional benefits that is gained from increased project integration and development of multi-purpose projects. The results of this analysis indicate that project integration and coordination with the management of exiting natural features (such as parks, rivers, wetlands, etc.) will lower the cost of developing the additional water supplies that are needed for the Region. It is worth re-emphasizing here that none of these tools should be interpreted to be the answer for the Region, or any Subregion—the information is provided to help decision-makers develop more informed choices about appropriate solutions for their particular Subregion given their particular set of opportunities and constraints. It is likely that the final solution for each Subregion will be a hybrid of all three of solutions presented in the tools.

2. STAKEHOLDER IDENTIFIED PROJECTS

The projects identified by the stakeholders (stakeholder projects) provide the foundation for the IRWMP and the Regional Planning Tools. The mix of projects provided by the stakeholders comprises projects that have been developed (or are being developed) by local and regional planning entities. These projects address a range of desired outcomes, such as contribute to the water supply, water quality, and open space targets developed for the IRWMP. The remaining gap between the resource benefits that can be derived from stakeholder projects and the overall IRWMP target form the objectives of the Regional Planning Tools.

2.1 Call for Projects

The stakeholder projects included in the IRWMP come largely from a "Call for Projects" that was made to the Stakeholders during Tasks 1 and 2 of the IRWMP process and that occurred up until June 1, 2006. The Call for Projects was an invitation to stakeholders to submit projects for inclusion in the IRWMP. The stakeholders were given the option of submitting their projects either on-line or via a project information form known as the "short form". These processes yielded some 1,085 projects from across the Region as of June 1, 2006. Some of these projects were also submitted for Proposition 50 funding in the Step 2 Application process, which occurred in June 2006.

The cost and benefit estimates for the stakeholder projects vary greatly in the level of planning and refinement based on how far along the project might be in the planning process. Projects that are at the advanced stage of planning or at the pre-design phase typically have far more refined cost and benefit estimates than projects that are in the conceptual stage. Table 1 presents a summary of benefits for those stakeholder projects which had quantified beneficial outcomes available.

Table 1. Summary of Projects in Benefit Categories

	Number of Projects by Benefit Category			
	Water Supply	Water Quality	Open Space(1)	Other benefits(2)
Number of Projects	204	26	77	166
Total Quantified Benefits	269,561 (acre-feet per year [AFY])	348 (million gallons per day [MGD])	3,832 (acres)	varies

(1) Includes public access, open space, habitat, and recreation benefit types.

(2) Flood control is included in this benefit type.

Estimated capital costs for the projects submitted by the stakeholders are summarized in Table 2. Projects presented in Table 2 are sorted into benefit combination groups to account for different costs associated with multi-purpose projects. In the "Call for Projects", Stakeholders were asked to select one of four fairly broad cost ranges for this stage of the planning process, and therefore the table presents the costs in this manner. Note that the total number of projects in Tables 1 and 2 are not equivalent because not all projects in Table 2 included quantified benefits.

Table 2. Project Capital Costs ($)						
Benefit Type	Number of Projects	< 100k	100K-1M	1M-10M	>10M	UDR
WS	149	15	32	55	26	21
WQ	6	0	0	4	2	0
OS	54	0	16	15	23	0
OB	106	31	25	21	10	19
WS/WQ	7	0	0	0	7	0
WS/OS	3	0	0	3	0	0
WS/OB	40	7	8	18	7	0
WQ/OS	6	0	1	5	0	0
WQ/OB	2	0	0	1	1	0
OS/OB	12	1	8	3	0	0
WS/WQ/OS	0	0	0	0	0	0
WS/WQ/OB	4	0	1	1	2	0
WS/OS/OB	1	0	0	1	0	0
WQ/OS/OB	1	0	1	0	0	0
WS/WQ/OS/OB	0	0	0	0	0	0
TOTAL	391	54	92	127	78	40

WS = water supply
WQ = water quality
OS = open space, public access, habitat, or recreation
OB = other benefit (such as flood management)
UDR = Updated Data Required

2.2 Step 2 Application Projects

The following is a brief discussion of the costs and benefits of the small group of stakeholder projects that were advanced for submittal for Prop 50 funding in the Step 2 Application process. Costs and benefits submitted in the Step 2 Application have been estimated at the local project level, which is more detailed than what was available for most of the projects identified in the "Call for Projects" and more refined than the venture level cost and benefit estimates used to assess the Regional Planning Tools.

Thirteen projects were submitted in the Step 2 Application, as a result of detailed process of selection at the Subregional Steering Committees and the Leadership Committee in early 2006. These projects largely focus on Water Supply and Water Quality improvements. Other benefits expected to result from these projects include improved or increased habitat, open space, recreation and educational opportunities, flood control, and beneficial impacts to disadvantaged communities. Some of the projects that were submitted in the Step 2 Application are components of larger Subregional projects, such as the Las Virgenes Creek Restoration Project (which includes the first few acres of what will ultimately be seven river miles of riparian habitat restoration). Other projects are related because the benefits affect the same water body, such as the Joint Water Pollution Control Plant (JWPCP) Marshland Enhancement Project and the Wilmington Drain Restoration Multi-use Project. The benefits of project integration, which are likely to be greater than the benefits of individually assessed projects, were not included in the Step 2 Application, but are being assessed for the IRWMP.

Table 3. Summary of Project Costs and Benefits for Step 2 Application Projects		
	Physical Benefit	Sum of Present Values(1)
Water Supply	30,785 (AFY)	$575,924,918
Water Quality	6,104 (AFY)	$43,699,166
Open Space		$30,867,612
Wetland Habitat	29 (acres)	
Riparian Habitat	63.5 (acres)	
Open Space	30.5 (acres)	
Total Benefits		$650,491,696
Total Costs		$150,467,888

(1) Discounted over 50 years at 6 percent.

3. REGIONAL PLANNING TOOLS COSTS

In total, the projects identified through the Call for Projects process, including the 13 projects submitted in the Step 2 Application, do not provide the level of physical benefit needed to achieve the Region's quantified targets. In order to evaluate possible alternative pathways to satisfying the IRWMP targets, three categorical approaches (Regional Planning Tools) have been developed that delineate distinct alternative paths to meeting the Region's water resource needs. The purpose of defining three distinct approaches is to allow for decision-makers to evaluate the benefits and costs of various approaches to accomplishing the same objectives or targets. It is not the intent of this exercise to define a preferred alternative, but to provide information to help support the process of defining individual solutions for each of the five Subregions as well as the region as a whole. The three categorical approaches are largely differentiated by the scale of individual projects which make up the tool, with Planning Tool 1 including projects at the site scale, Planning Tool 2 including projects at the neighborhood scale, and Planning Tool 3 including projects at the larger regional scale:

- Tool 1: Site scale;
- Tool 2: Neighborhood scale; and
- Tool 3: Regional scale.

Multiple benefits can be accomplished by projects at any scale, but in general, increased benefits occur as a result of increased scale, especially for water quality treatment and habitat creation. In general, larger multi-purpose projects are able to provide water supply, water quality, and habitat creation benefits at a lower cost than an accumulation of smaller single-purpose projects. The three Regional Planning Tools have been designed to accent different scales and therefore should not be considered as alternative comprehensive plans. The actual plans, which will be implemented in the near and long term future, will include combinations of all scales presented in this analysis. The benefit of conducting comparative cost and benefit assessments of the three Tools is that the comparison illustrates the relative costs and benefits of increasing (or decreasing) scale among local projects.

All three Tools are designed to treat the runoff from a "design storm" of 0.75 inch precipitation in 24 hours. The volume of storm water runoff associated with the design storm was estimated to help define future needs for capture and treatment facilities (capacity and cost). Storm water runoff volume was calculated using a weighted Simple Method equation, as applied in the Los Angeles County 1994-2005 Integrated Receiving Water Impacts Report. In the Region, the 85th percentile 24-hour runoff storm event translates to approximately 0.75 inch of precipitation over a 24-hour period (Los Angeles Regional Water Quality Control Board [RWQCB], 2002). The Los Angeles design storm event has been calculated based on methods and recommendations set forth by the ASCE and Water Environment Federation (WEF) in their design manual (ASCE/WEF: Urban Runoff Quality Management, 1998). For detailed design, storm intensity and rate of runoff would also need to be considered in addition to volume of runoff.

Only urban storm water runoff must be captured and treated to meet water quality requirements, therefore only developed areas were considered. Upstream, more pristine areas were not considered. The percent impervious area for each land use type was estimated based on guidelines for Los Angeles County published in the Department of Public Works Hydrology Manual (Los Angeles County, 1991). The total volume of storm water runoff associated with the 85th percentile (0.75 inch) storm event is approximately 25,800 acre-feet/design storm event over the entire 1,151 square miles of developed area in the Los Angeles Region.

Water quality targets and volumes achieved by the three Regional Planning Tools are presented in terms of acre-feet per year instead of the more typical million gallon per day (MGD) metric for ease of comparison with water supply targets and volumes. Tools 2 and 3 develop dry weather and storm water flow for local water supply. Because water supply is typically measured in acre-feet per year, it was assumed that the dry weather and storm water flow contributions to water supply would be more readily understood if they were presented in the common water supply metric. In order to capture and treat the "design" storm event, treatment facilities capable of 8,400 MGD are required. Each Regional Planning Tool provides 8,400 MGD capacity, although the volume of water supply developed from captured runoff varies among the three tools.

Table 4 presents the present value sum of costs for the three Regional Planning Tools. Present values are used to calculate the total costs and benefits of the tools, over the useful life of the Tools, in this case 50 years. Present values are discounted (6 percent per year) so that all costs and benefits are referenced back to the current year, 2006. The farther into the future a cost or benefit is incurred, the greater it is discounted. For example, using the discounted method applied in this analysis (6 percent), $100 today is valued at $79.37 in 2010, $44.25 in 2020, and $5.43 in the 50th year of the analysis (2056).

Table 4. Summary of Regional Planning Tool Costs(1) ($ Millions)

	Regional Planning Tool		
	Tool 1	Tool 2	Tool 3
Water Supply Quantity (AFY)	800,000	800,000	800,000
Water Supply Costs (Tables 6 & 7)	$9,499	$8,487	$9,842,
Water Quality Quantity (AFY)	810,000	810,000	810,000
Water Quality Costs (Table 8)	$32,154	$45,580	$15,869
Open Space Quantity (acres)	8,000	8,000	8,000
Open Space Costs (Table 8)	$3,109	-	-
Total Costs	$44,762	$54,067	$25,711

(1) Costs are sum of present values discounted 50 years at 6 percent.

Note: Quantities are attained over 20 years.

Discounting is necessary for the comparison of costs and benefits and for the comparison of one tool to another because it accounts for differences in the timing of costs and benefits. Typically, costs are higher in the early stages of a project (construction, land acquisition, etc) and then level off at a much lower level (operations and maintenance [O&M] costs). Benefits, on the other hand, typically don't occur until after the construction is complete and may require a few years to build up to a sustainable level. Discounting provides a consistent systematic approach to comparing costs and benefits that occur at different times (some today, some tomorrow, and some 50 years from now). All the costs and benefits presented in this analysis are discounted at 6 percent and summed over 50 years, with the exception of the discussion of construction costs, which are presented in today's 2006 dollars. These construction costs are discounted when they are included in the total costs of there Regional Planning Tools.

The total present value water supply costs presented in Table 4 are the sum of a series of calculations for each of the 50 years of the project's useful life (a sample calculation is presented in Table 7 for the reader's review). For each year (2007 – 2056), the volume of water produced by each supply type has been estimated based on discussions with local water agency personnel. A total annual cost for each supply type is calculated by multiplying the annual volume by the unit cost for each water supply type (presented in Table 6). The total annual costs for each supply type are summed and discounted according to the year of the project. In the example calculation, the year is 2025, which is project-year 19. The discount factor for that year is 0.330. The

present value costs presented in Table 4 are the result of conducting these calculations over 50 years and summing them up to get a grand total present value cost of water supply for each tool. The same type of calculations (estimating quantities achieved, estimating costs incurred each year, discounting based on the year, summing to gat a grand total present value) are also conducted for water quality, as described in the next section.

Table 4 also presents the water supply, water quality, and open space quantities achieved by those Tools. There are no costs specifically identified for open space creation under Tools 2 and 3 because land purchases are assumed to be a requirement for construction of the water quality facilities. Under Tool 1, land in addition to land required for construction of the treatment facilities must be purchased for the sole purpose of creating the same number of open space acres as tools 2 and 3. Therefore, only Tool 1 has costs specifically identified for open space. Capital costs, including land purchases, for each tool are distributed evenly over a twenty year period and O&M costs are accrued cumulatively over the same 20 years. All costs are discounted at 6 percent and summed over a period of 50 years.

Table 4 indicates that the same quantities of water supply, water quality, and open space can be achieved at varying costs. The costs of implementing Tool 3, which has the greatest level of integration, are 57 percent of the costs of implementing Tool 1, which has the least level of integration, even though both tools produce the same water supply, water quality, and open space quantities during the same time.

3.1 Water Supply Costs

Table 5 presents the quantities of the various types of water supply that will provide a total of 800,000 AFY. Each type of water supply is assumed to achieve the full quantity presented in Table 5 by 2020, with the exception of conservation which will be fully achieved in 2025. After 2025, water supply quantities for each supply type are assumed to be constant at the fully achieved level. Water supply quantities under Tool 1 are based on projected increases in local water supply production, conservation, and MWD supplies. Under Tool 2, an additional 130,000 AFY of dry weather runoff is developed for water supply, which displaces an equal volume of demand for imported water. Under Tool 3, an additional 120,000 AFY of storm water runoff is developed for water supply, similarly displacing an equal amount of imported water.

Differences in water supply costs among the three Regional Planning Tools are directly related to the level of project integration and increased use of multi-purpose projects across the tools. Water supply unit costs, presented in Table 6 are based on MWD rate projections and discussions with local water agency personnel. Table 7 presents an example calculation of total annual water supply costs under each Regional Planning Tool. This table displays the change in costs across the planning tools as imported water is replaced by new supplies developed from urban dry weather and storm water runoff. The example calculations are conducted for the year 2025, using the water supply quantities presented in Table 5.

Table 5. Water Supply Development Quantities (AFY)			
	Regional Planning Tool		
Water Supply Type	Tool 1	Tool 2	Tool 3
Conservation/Demand Reduction	110,000	110,000	110,000
Expanded Local Groundwater Production	100,000	100,000	100,000
Desalination	55,000	55,000	55,000
Groundwater Recovery	35,000	35,000	35,000
Additional Recycled Water	130,000	130,000	130,000
Additional Imported Water	370,000	240,000	120,000
Dry Weather Urban Runoff	0	130,000	130,000
Storm Water Urban Runoff	0	0	120,000
Totals	800,000	800,000	800,000

Table 6. New Water Supply Development Unit Costs (2006 Dollars per acre foot)			
	Total New Supply Volume Increments		
Water Supply Type	First 25%	26% to 75%	Greater than 75%
Conservation	$600	$1,400	$2,000
Local Groundwater Production	$600	$1,100	$1,500
Local Surface Water	$250	$250	$250
Recycled Water	$775	$1,000	$1,450
Groundwater Recovery	$875	$1,125	$1,375
Ocean Desalination	$1,000	$1,000	$1,000
Dry Weather Runoff	$500	$1,000	$1,500
Urban Storm Water Runoff	$500	$1,000	$1,500

Source: Informal survey of local water agency personnel

Table 7. Total Annual Water Supply Cost Example: 2025				
		Regional Planning Tool		
Water Supply Type	$/Acre-foot	Tool 1	Tool 2	Tool 3
Imported Water	$842	$311,410,000	$66,665,000	$33,333,000
Conservation	$2,000	$220,000,000	$220,000,000	$220,000,000
Local Groundwater Production	$1,500	$150,000,000	$150,000,000	$150,000,000
Recycled Water	$1,450	$188,500,000	$188,500,000	$188,500,000
Groundwater Recovery	$1,375	$48,125,000	$48,125,000	$48,125,000
Ocean Desalination	$1,000	$55,000,000	$55,000,000	$55,000,000
Dry Weather Runoff	$1,5000	0	$195,000,000	$195,000,000
Urban Storm Water Runoff	$1,5000	0	0	$180,000,000
Total		$973,035,000	$923,290,000	$1,069,958,000
Discount Factor		.330	.330	.330
Present Value Total		$321,134,000	$304,716,000	$353,121,000

Note: Present Value discounted at 6 percent for 19 years (2025 to 2006).

3.2 Water Quality Costs

Differentiation among the three Regional Planning Tools is reflected in the costs of the alternative tools. Differences in water quality costs are due to differences in treatment facility design and function in each of the three tools. Tool 1, the least integrated of the three Regional Planning Tools, requires 1,030 treatment facilities (5 MGD each) and Best Management Practices (BMPs) that capture 100 percent of the runoff from residential properties in the region. Tool 2 uses 1,600 5.25 MGD facilities, but requires no residential BMPs. Tool 3, the most centralized and integrated tool, uses 84 treatment facilities, each rated at 100 MGD.

The differences in project integration and centralization among the three Regional Planning Tools also affect the quantity of open space created by each tool. Under Tool 1, 1,550 acres of open space is created at the detention and sand filtration areas of the treatment facilities, assuming that only 50 percent of the 3,100 acres used for treatment would quality as open space. An additional 6,450 acres is purchased under this tool for the purpose of achieving 8,000 total acres of open space. Under Tools 2 and 3, wetland filtration replaces sand filtration and the detention areas are larger than under Tool 1. Both Tools 2 and 3 create 8,000 acres of open space without the need for land purchases beyond those required for the treatment facilities. Table 8 presents the significant differentiating features of the three Regional Planning Tools and their construction costs.

Table 8. Summary of Regional Planning Tool Water Quality Features and Construction Costs (Millions of 2006 Dollars)

	Tool 1		Tool 2		Tool 3	
Feature	Description	Cost	Description	Cost	Description	Cost
Total Treatment Capacity[1]	3,260 MGD (BMPs) + 5,140 MGD (plant)	$49,600	8,400 MGD (plant)	$61,600[1]	8,400 MGD (plant)	$17,100
Capacity/Plant	5 MGD 1,030 plants		5.25 MGD 1,600 plants		100 MGD 84 plants	
BMPs	Residential	$5,860	None		None	
Level 1	Screening/det basin	$13,700	Screening/det basin	$21,900	Screening/det basin	$6,750
Level 2	Sand Filter/Disinfect	$6,560	Wetland Filter/Disinfect	$2,060	Wetland Filter/Disinfect	$1,330
Level 3	Reverse Osmosis	$23,400	Reverse Osmosis	$37,500	Reverse Osmosis	$9,060
Land Acquisition	6,450 acres open space + 3,100 acres treatment	$9,680	8,000 acres	$13,200	8,000 acres	$8,800
Collection Sys	Existing		Existing		Existing	
Distribution	None	-	(1 mi. 16" dia. pipe, 1 Pump Station)/Plant	$1,600	(5 mi. 72" dia. pipe, 1 Pump Station)/Plant	$878
Total WQ Construction Costs		$59,300		$76,400		$26,800
Annual O&M Cost		$135		$188		$51

Note: All costs in millions of 2006 dollars

1. Total Treatment Capacity Costs are the sum costs for BMPs and Treatment Levels 1, 2, and 3.

3.2.1 BMP Cost Assumptions

Residential BMPs can take many forms, including devices such as infiltration tree wells, cisterns, dry wells, berms, swales, permeable asphalts and concrete. Professor Bowman Cutter at UC Riverside is currently researching BMP costs based on implementation data for Santa Monica. He estimated a cost of $3,740 in 2006 dollars for a single family home BMP, assuming the varied use of cisterns, dry wells and berms. Several values of BMP costs are available in the literature, but Professor Cutter's values were chosen for the purpose of this analysis based on his familiarity with this region and his expertise in this area. The price of BMPs for Tool 1 can be estimated if the number of Single Family Homes (SFHs) are known in the study area. Therefore the total BMP costs are: ($3,740/BMP)(1 BMP/SFH)(1,565,886 SFHs/Study Area) =$5,860 Million/Study Area

Note: The number of SFHs in the study area lacks precision. The Study Area incorporates portions of Los Angeles, Ventura, Orange, and San Bernardino Counties, and no public agencies were able to give summed quantities of SFHs in their respective counties. The Los Angeles County Assessor's office provided a number for the combined total of SFHs, town homes and duplex's in their county. This number was divided by the total area in Los Angeles County zoned for SFHs and an average number of 0.21 acres per home was determined. This average acreage for SFHs is inflated by homes on large properties, and deflated by the inclusion of town homes and duplexes (373,189 Acres SFH in Los Angeles County)/(1,807,349 Homes Los Angeles County)= 0.21 Acres/Home Los Angeles County.

The area of single family homes in the study was estimated to be 51,513 square miles/328,836 acres. The developed area in the Region is known to be 1,151 square miles, of which 62 percent of the land is believed to be used for housing (Surface Water Quality TM, 2006), and 72 percent of that housing portion is used for SFHs (Ballona Creek, 2004).

3.2.2 Treatment Level Cost Assumptions

Level 1 treatment includes pumping, screening and primary sedimentation. Dry and wet weather runoff is designed to be held up to 72 hours to ameliorate peaks in runoff and allow for smaller Level 2 and Level 3 treatment facilities. Level 2 treatment for Tool 1 consists of sand filtration and disinfection. Level 2 treatment for Tools 2 and 3 consists of wetland treatment followed by disinfection. (Note therefore the cost estimation procedure is different than in Tool 1). Level 2 treatment takes place over a 72 hour period following a storm event. Level 3 for all tools consists of reverse osmosis taking place over 72 hours. For Tool 3, it is assumed that 1/3 of the treated water will not require treatment to Level 3, so the Level 3 treatment facility is downsized accordingly; calculations for Tool 3, Level 3, will reference a 67 million gallon (MG) plant instead of 100 MG plant.

The costing methodology advanced in Gordon (2002) was used to determine costs for all types of treatment except that of wetlands and the disinfection associated with wetlands treatment. All final calculated costs are increased by engineering, legal, and administrative costs, estimated by Gordon as 25 percent.

The cost equation $C=K \times Q^{0.6}$ was used for plants up to 100 million gallon in size, where

C = cost in $

K = 11,237,200.0

Q = treatment plant capacity in millions of gallons[1]

Costs were adjusted from Gordon's 2002 study to 2006 dollars using the Engineering News Record (ENR) costs indexes for Los Angeles.

3.2.3 Treatment Level 1 Cost Assumptions

Following is an explanation for how cost estimates were developed for Treatment Level 1 for Planning Tools 1, 2, and 3 using 2006 dollars:

First, the total Construction Costs for the plants were estimated by Gordon's Method and updated to 2006 dollars utilizing the ENR Construction Cost Index as follows:

Tool 1: ($11,237,200)(5MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $34M/plant

Tool 2: ($11,237,200)(5.25 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $35M/plant

Tool 3: ($11,237,200)(100 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $205M/plant

Costs for each level of treatment were apportioned using a percentage of the overall treatment cost established by Gordon (2002), with Level 1 treatment requiring 31.36 percent of the total, Level 2 requiring 14.98 percent and Level 3 requiring 53.66 percent. These percentages were applied when calculating the Level 1 treatment costs for the three Tools are as follows:

Tool 1 (5 MG Plant): ($34M/plant)(31.36%)(1,030 plants)(1.25) = $13,700M

Tool 2 (5.25 MG Plant): ($35M/plant)(31.36%)(1,600 plants)(1.25) = $21,900M

Tool 3 (100 MG Plant): ($205M/plant)(31.36%)(84 plants)(1.25) = $67,50M

3.2.4 Treatment Level 2 Cost Assumptions

Following is an explanation for how cost estimates were developed for Treatment Level 2. Again, Tools 2 and 3 substitute Gordon's Level 2 Sedimentation and Disinfection with wetlands treatment and disinfection using the alternative cost estimation described below.

Tool 1, Level 2 treatment is calculated in a method equivalent described above for Level 1.

First, estimate the total Plant Cost:

($11,237,200)(5 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $34M/plant

Next, multiply the Plant cost by the appropriate percentage:

Tool 1 (5 MG Plant): ($34M/plant)(14.98%)(1,030 plants)(1.25) = $6,560M

Tool 2 and 3, Level 2 treatment is calculated as follows:

Plant capacity is based on the design storm runoff volume, but that treatment takes place over a three-day period. Accordingly, treatment flow is Q Million Gallons/3 days = MGD.

[1] Pease note that while Q is typically a flow, such as MGD or acre-feet/day, in this usage it is a volume. This convention was adapted in the reference documents for these calculations and was continued here (Brown and Caldwell, 1998; Gordon, 2002)

Wetland acreage requirements were calculated using the equation As = (Q/3)*(t)3.07*(1/d)*(1/h) (Crites, 1998).

As = surface area in acres

Q/3 = flow in MGD

t = treatment time in days, assumed 1 day

3.07 = units conversion factor

d = depth in feet, assumed 3 feet

h = plant void ratio, assumed 0.7

Acreage requirements computed by this formula were increased by 9 percent to account for necessary berms, access roads, etc. (Plude, 2006). Again, Plant Capacity Q is divided by three to account for three days of drainage from the detention basin to the completion of treatment in the plant.

Tool 2, Level 2: (5.25 MG/3)(1 day)(3.07)(1/3)(1/0.7)(1.09) = 2.78 Acres

Tool 3, Level 2: (100 MG/3)(1 day)(3.07)(1/3)(1/0.7)(1.09) = 53.12 Acres

An average 2003 cost per acre of wetlands was assumed to be $186,455, San Diego Creek NTS Master Plan (2003). Using ENR CCI for 2003 and 2006, the cost was extrapolated to $215,320/acre (ENR CCI, 2003, 2006). Using this cost per acre, the Level 2 Wetland Treatment costs for Tools 2 and 3 are calculated as follows:

Tool 2 (5.25 MG Plant): ($215,320/Acre)(2.78 Acres)(1,600 Plants)(1.25) = $1,200M

Tool 3 (100 MG Plant): ($215,320/Acre)(53.12 Acres)(84 Plants)(1.25) = $1,200M

The two estimates are the same, because costs are based on the total treated volume, which is the same between the two Tools.

Costs for chlorination/dechlorination of wetland discharge were determined from work Brown and Caldwell has done in other parts of the country for disinfection of stormwater. Five minutes of contact time was assumed. $245,394/MGD and $38,562/MGD were assumed for 5.25 MG and 100 MG plants, respectively (Davis, 2006).

Tool 2 Disinfection

($245,394/MGD)(1.75 MGD/5.25 MG Plant)(1,600 5.25 MG Plants)(1.25) = $860M

Tool 3 Disinfection

($38,562/MGD)(33.33 MGD/100 MG Plant)(84 100 MG Plants)(1.25) = $135M

Level 2 treatment combines wetlands treatment and disinfection, for a total cost:

Tool 2 (Wetlands and Disinfection): (1,200)+(860)= $2060M

Tool 3 (Wetlands and Disinfection): (1,200)+(135)= $1330M

Treatment Level 3 Cost Assumptions

Level 3 Treatment Costs are calculated using the same method established for Level 1 above.

Tool 1: ($11,237,200)(5 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $34M/plant

Tool 2: ($11,237,200)(5.25 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $35M/plant

Tool 3: ($11,237,200)(67 MG)$^{0.6}$ (8546.72 ENR LA June 2006/7420.88 ENR LA July 2002) = $161M/plant

Costs for each level of treatment were apportioned using a percentage of the overall treatment cost:

Tool 1: (5 MG Plant): ($34M/plant)(53.66%)(1,030 plants)(1.25) = $23,400M

Tool 2: (5.25 MG Plant): ($35M/plant)(53.66%)(1,600 plants)(1.25) = $37,500M

Tool 3: (67 MG Plant): ($161M/plant)(53.66%)(84 plants)(1.25) = $9060M

3.2.5 Land Acquisition Cost Assumptions

Estimating real estate costs across a metropolitan area, while relatively straight-forward in some states, is very complex in California due to Proposition 13, which makes land assessment values an unreliable indicator of land costs. Proposition 13 freezes the assessed value of property at the point of sale and allows a maximum 2 percent annual increase between transfers. One approach used elsewhere is to average assessed values and apply a multiplier to increase them to market values. To calculate a multiplier in California it would likely be necessary to estimate an average time since last transfer of ownership for properties in the area and an average disparity between the rate of increase in market value versus the 2 percent annual increase allowed in assessed value. Such an approach would require substantial field study while producing estimates still subject to a wide range of uncertainty. In this analysis, land costs are based on professional judgment as described below.

An initial value of $1,000,000 per acre was assumed for land to be acquired along the Region's rivers and major tributaries. An official with public sector appraisal experience related to the Los Angeles County Drainage Area was queried and expressed the opinion that the amount was sufficient. This value, along with a ten percent contingency ($1,100,000 per acre) was used to calculate land costs for Regional Planning Tool 3. Therefore the land costs for Tool 3 = (8,000 acres)($1,100,000/acre) = $8,800M.

Land costs for Regional Planning Tool 2 were assumed to be the most expensive for two reasons. First, the neighborhood scale tool would require placement of facilities in or near developed residential areas. Second, the need to site facilities along storm drains before they emptied into local waterways would reduce somewhat the flexibility to avoid developed parcels. The base value from the regional scale was increased by 50 percent and the same contingency was applied resulting in a value of $1,650,000 per acre for use in cost analysis of Regional Planning Tool 2. Therefore the land costs for Tool 2 = (8,000 acres)($1,650,000/acre) = $13,200M.

Land costs for Regional Planning Tool 1 were assumed to be at a mid point between the costs used for the other tools presented above because it was assumed that some of the treatment facilities could be sited on cheaper land along the region's rivers and major tributaries. A total of 3,100 acres was estimated to be needed to site these facilities at an average cost of $1,375,000/acre (based on the average of $1,100,000 and $1,650,000/acre). (3,100 acres)($1,375,000/acre) = $4,260M. However, additional land acquisition for pure recreation was added to Tool 1 to make the three tools more comparable with respect to open space benefits. It was assumed that one half of the 3,100 acres could be designed to provide additional open space benefits. Therefore the additional land required was determined to be (8,000 acres) – (3,100 acres/2) = 6,450 acres. In estimating costs for land acquired specifically for recreation it was assumed that acquisition could be focused on vacant land and that, together with the lack of hydrologic constraints imposed when placing treatment facilities, would result in cheaper land costs. An estimate of $840,000 per acre was developed. (6,450 acres)(840,000) = $5,420M. Therefore the total land costs for Tool 1 are $4,260M + $5,420M = $9,680M.

This was compared to costs of $490,000 per acre for recent recreational development in the San Bernardino area. The ratio between these costs was found to be similar to the same ratio for the value of recent home sales in each area. Additional information was sought regarding recent purchases of undeveloped land for purposes of preservation or restoration. On August 1, 2006 it was reported in the Long Beach Press Telegram that 66 acres of the Los Cerritos Wetlands had been purchased for $14,000,000 or $212,000 per acre. This represents approximately one fourth of the cost estimated for open space acquisition in Regional Tool 1. However, the value of the wetlands for purposes of development is substantially lower than the value of the mostly upland acreage that would be acquired for Regional Tool 1. Because development of wetlands is stringently regulated the use of these 66 acres is highly restricted. This is due to the fact that development of the wetland, if permitted, would require expensive site preparation (e.g., placement of fill) and replacement of the destroyed wetland acres with mitigation acres would be required at a probable rate of two or more new acres for each acre filled.

3.2.6 Collection System Cost Assumptions

It is assumed that there will be no new costs for collection of storm water for treatment. Existing collection systems will be used to convey stormwater to new treatment facilities.

3.2.7 Annual O&M Cost Assumptions

Annual operations and maintenance (O&M) costs were calculated on a percentage basis with a different percentage for each level of treatment, using methodology advanced in Gordon (2002). The O&M cost equation is:

$C = M \div F$

where,

C = cost of operations and maintenance in million of dollars;

M = capital cost for each functional element of the plant (collection system, level I treatment, level II treatment, and level III treatment), in million of dollars; and

F = factor based on plant function, where

F collection = 1220.30,

F level I = 484.66,

F level II = 333.19, and

F level III = 269.56.

Following is a detailed explanation of O&M costs as shown in Table 8. Total plant construction costs, M in the equation, have been previously derived in the discussion of treatment costs.

Tool 1

Level 1: ($13,700M)/(484.66) = $28M

Level 2: ($6,560M)/(333.19) = $20M

Level 3: ($23,490M)/(269.56) = $87M

Sum: $135M

Tool 2

Level 1: ($21,900M)/(484.66) = $45M

Level 2: ($1200M)/(333.19) = $4M

Level 3: ($37,560M)/(269.56) = $139M

Sum: $188M

Tool 3

Level 1: ($6750M)/(484.66) = $14M

Level 2: ($1200M)/(333.19) = $4M

Level 3: ($9060M)/(269.56) = $33M

Sum: $51 M

3.2.8 Distribution Cost Assumptions

Tool 1 will not require a distribution system; this feature is unnecessary with a distributed system of BMPs on Single Family Homes. Tools 2 and 3 utilize large centralized treatment facilities that need pipelines to convey their products. Tool 2, featuring 5 MGD plants, is assumed to need a 16" diameter pipe with a conveyance of one mile. Too1 3, featuring 100 MGD plants, is assumed to need a 72" diameter pipe with a conveyance of five miles. Using the assumed cost of $20/inch diameter/foot conveyance, the price of piping is calculated at $1.7M/Plant and $38M/Plant for Tools 2 and 3, respectively. ($20/inch/feet)(16")(5,280ft.) = $1.7M. Pump stations for Tools 1 and 2 are priced at $1M/Plant and $10M/Plant, respectively, for a total of $1.6 billion and $840 M, respectively. The total distribution-related construction cost for Tools 2 and 3 sum to $1,600M and $878M, respectively. For example: ($1M/Tool 2 Plant)(1,600 Plants) = $1,600M (Everest, 2006).

4. REGIONAL PLANNING TOOL BENEFITS

4.1 Benefit Assessment Framework

A Benefits Assessment Framework has been developed to assess the benefits of the stakeholder identified projects submitted in the Step 2 Application and to assess the benefits of the Regional Planning Tools (see Attachment 10-A to the Step 2 Applications). The purpose of the benefits assessment framework is to quantify, in monetary terms, improvements to the "beneficial uses" of water as identified by the California State Water Resources Control Board and any other improvements that may result from projects and Regional Planning Tools contained within the IRWMP. The benefits assessment framework provides a tool which identifies benefits attributable to the integration of separate and often single purpose water resources projects into a regional water management plan. The benefit assessment framework is used in this analysis to compare the estimated benefits of alternative Regional Planning Tools, which differ in their reliance on multi-purpose projects, project integration, and degree of centralization. The goal of the benefit assessment framework is to identify opportunities to increase regional net benefits, through the integration of individual projects or project purposes into a more cost-effective program.

Project benefits can be most simply defined as the total gain in well being (value) provided by the project in question. Some component of this gain may be expressed in monetary terms, as will be described below. Other components of this gain cannot be expressed monetarily, or require extensive data gathering and analysis for their approximation and therefore are not included in the benefit estimate. Three general categories of economic benefits have been identified during the IRWMP planning process:

- Water Supply Benefits;
- Water Quality Benefits; and
- Other Economic Benefits.

The category "Other Economic Benefits" includes direct economic benefits resulting from improvements or increases in habitats, recreation opportunities, and flood control.

Benefit values used in this analysis are generally based on value estimates found in the natural resource and environmental economics literature. Readily available benefit and cost estimates have been used for the assessment of the three categorical alternative approaches (Regional Planning Tools) to water resource management in the Region. Project and location specific benefit and cost studies have not been conducted for this assessment. In general, the benefits calculated in this analysis may be considered conservative estimates because they are not inclusive of all potential benefit categories, such as multiple recreation opportunities, flood control improvements, or other benefit types which would require new field studies to quantify. Therefore, any comparison of costs and benefits should be conducted with the conservative aspect of benefit estimates in mind.

Water Supply Benefits are generated by increased local water supply production. Increases in local water supply production are assumed to reduce the amount of imported water purchased from Metropolitan Water District each year. Increases in local water supply production are also assumed to increase water supply reliability. Water Supply Benefits are calculated as the sum of:

- The cost of reduced purchases from Metropolitan Water District, and
- The expected cost of shortage surcharges levied by Metropolitan Water District during drought conditions.

Water Supply Benefits calculated in this manner should be considered a minimum estimate of benefits because they include only expected avoided payments and not consumer's willingness to pay for improved local water supply.

Water Quality Benefits are generated by the capture and treatment of dry-weather and storm-water runoff. Improvements to water quality are assumed to provide numerous beneficial water use, aesthetic, and health related impacts. Water Quality Benefit calculations are based on California resident's stated willingness-to-pay value for removing impairments to California water bodies (Larsen and Lew, 2002).

Other Economic Benefits, which would result from each of the three Regional Planning Tools assessed in this analysis, include the economic benefits of increases in

- open space;
- parkland; and
- wetland and riparian habitat.

4.2 Regional Planning Tool Benefits

The calculation of economic benefits resulting from increases in open space and parkland is based on increases in property values for adjacent and nearby residential properties (Crompton, 2001 and 2005). The calculation of wetland and riparian habitat benefits is based on improved recreational opportunities (bird watching: McConnell and Walls, 2005) and on California resident's stated willingness-to-pay value for wetland restoration (Pate and Loomis, 1997). The economic benefits of riparian habitat improvements are assumed to be equivalent to the economic benefits of wetland habitat improvements.

Table 9 presents a summary of benefits generated by each of the Regional Planning Tools. The benefits are based on the services provided by the facilities described in the Regional Concept Cost section of this document. Benefits, which result from capital expenditures distributed over twenty years, accumulate at the same rate as the capital is expended. All benefits are discounted at 6 percent and summed over a period of 50 years.

Table 9. Summary of Regional Planning Tool Benefits(1) ($ Millions)

	Regional Planning Tool		
	Tool 1	Tool 2	Tool 3
Water Supply Quantity (AFY)	800,000	800,000	800,000
Water Supply Benefits	$1,992	$2,550	$3,066
Water Quality Quantity (AFY)	810,000	810,000	810,000
Water Quality Benefits	$3,626	$3,626	$3,626
Open Space Quantity (acres)	8,000	8,000	8,000
Open Space Benefits (recreation based)	$1,884	$1,884	$3,768
Open Space Benefits (recreation and habitat based)	-	-	$1,949
Total Benefits	$7,502	$8,060	$12,408

(1) Benefits are sum of present values discounted 50 years at 6 percent.

Note: Quantities are attained over 20 years.

Water quality benefits are constant across the three Regional Planning Tools because the quantity and the unit value of water quality improvements are the same for each tool. Water supply benefits increase with increases in the scale of tools. Open space benefits are greater for Tool 3 than for the other two tools because their adjacency to existing water resources and the larger size of open space parcels increases their value for recreation and improves habitat conditions (thereby increasing habitat values). Overall, Table 7 shows that a broad range of benefits can result from achievement of the same target quantities of water supply, water quality, and open space. The benefits resulting from Tool 3, the regional scale, are 1.65 times larger than the benefits resulting from Tool 1, the site scale.

4.3 Benefits Requiring Additional Study

Many of the monetary benefits associated improvements in water quality and increases in open space cannot be quantified at the conceptual level of analysis presented in the IRWMP. For example, the dollar value of creating new recreational opportunities in neighborhood or regional parks can only be calculated when the specific location of the new facility is known so that it can be analyzed in relation to its proximity to existing facilities. Likewise, the full economic benefits of reaching the IRWMPs water quality goals cannot be enumerated without detailed studies of the costs that will be avoided upon attainment such as the elimination of the economic losses associated with beach closures or the health impacts of swimming in polluted ocean waters. In order to calculate the benefits arising from reduced beach closures it would be necessary to determine which beaches are closed, how often and for how long; the average daily number of beach goers at each beach at the time of year of each closure; and the nearest alternate beach available as a substitute. The acquisition and analysis of this data, while feasible, could not be completed within the scope and schedule constraints imposed by the States requirements for completion of the IRWMP. Another example of a benefit type that could arise but cannot be estimated at this time would be the economic and intangible benefits resulting from restoring steelhead fishery in the Region's rivers. Attaining TMDL compliance would be one requirement of such a restoration but the benefits would not accrue until substantial restoration of riparian habitat could be completed after reaching compliance. A fuller accounting of the benefit categories requiring detailed studies to estimate is presented the Benefit Assessment TM.

4.4 Subregional Considerations

The IRWMP planning region has been divided into five Subregions:

- North Santa Monica Bay Watersheds;
- Upper Los Angeles River Watershed;
- Upper San Gabriel River and Rio Hondo Watersheds;
- Lower San Gabriel and Los Angeles Watersheds; and
- South Bay Watersheds.

Each Subregion has been assessed to identify local characteristics, which may support opportunities or present constraints to implementation of IRWMP water quality/water supply infrastructure development and increases in open space. In addition, Subregions were reviewed for opportunities to support enhancement of disadvantaged communities through IRWMP implementation.

Subregional characteristics which may support opportunities or pose constraints to IRWMP implementation include physical characteristics of the Subregion (size, topography, etc.), population density, amount of permeable vs. impermeable surface, soil characteristics, and the amount of vacant/undeveloped/under-utilized land available. More detailed discussions concerning these Subregional characteristics are contained in the attached five Subregional TMs. Table 10 presents a rough estimate of potential Subregional opportunities for IRWMP implementation based on a preliminary analysis of the relevant characteristics

identified above. It is important to note that opportunities and constraints are largely based on physical characteristics and do not represent a distribution of costs and benefits among the Subregions.

Table 10. Summary of Subregional IRWMP Implementation Opportunities[1]

Subregion	Water Supply (AFY)	Dry-Weather (AFY)	Stormwater (AFY)	Wetlands (acres)	Riparian (miles)	Open Space (acres)
South Bay	227,583	76,684	117,423	392	28	8,400
North Santa Monica Bay	8,300	7,900	12,000	14	1	300
Upper San Gabriel and Rio Hondo	128,000	64,000	98,000	224	16	4,800
Upper Los Angeles River	184,000	80,000	122,500	322	23	6,900
Lower San Gabriel and Los Angeles	256,000	92,800	142,100	448	32	9,600
Totals	800,883	321,384	492,023	1,400	100	30,000

1. This table provides a preliminary allocation of possible contributions to Regional quantitative targets based on physical characteristics of the Subregions as mentioned above. It is intended to provide a preliminary basis for discussion and it is not intended to suggest Subregional quantitative targets at this time.

The South Bay Watersheds Subregion has one of the largest populations of the five Subregions in the Greater Los Angeles County Region. The Subregion is heavily urbanized and its percentage of total developed land is comparable to the Upper Los Angeles River and Lower San Gabriel and Los Angeles Subregions, which are also heavily urbanized. Based on this, the South Bay Subregions potential expected contributions to meeting region-wide targets are among the higher of the Subregions in terms of water supply, surface water quality, open space and habitat enhancement (considered functions of population and developed area). Potential anticipated contributions to open space and habitat enhancement will likely require acquisition and creation of new open space given the lack of existing open space.

The North Santa Monica Bay Subregion is the smallest of the five Subregions in the Greater Los Angeles County Region in terms of size, population and developed land. However, it has the second largest amount of vacant/open space, a great deal of which contains important and sensitive coastal and riparian habitat, including an Area of Special Biological Significance. Based on this, the North Santa Monica Bay Subregions potential expected contributions to meeting Region-wide targets are lower than other Subregions for water supply, surface water quality, open space and habitat enhancement (considered functions of population and developed area). Actual contributions to open space and habitat enhancement could be relatively greater due to the open space and vacant land available in the Subregion.

The Upper San Gabriel and Rio Hondo River Subregion contains a population of 1.6 million, which is approximately 16 percent of the population in the regional planning area. The presence of conjunctive use opportunities in the Upper San Gabriel and Rio Hondo River Subregion (recycled water, stormwater and dry weather flows) offers a substantial benefit to multi-use projects that leverage these assets. The potential availability of inactive gravel mining facilities, properties along the San Gabriel River corridor and inactive flood control facilities offer opportunities for dry-weather and stormwater flow retention and open space/habitat creation. The relative proximity of dense populations to the San Gabriel River offer potential for projects to provide open space and recreational values to the residents.

The Upper Los Angeles River Subregion is the largest in the region covering 372,224 acres, which is approximately 28 percent of the Greater Los Angeles County Region. In the Upper Los Angeles River Subregion developed land covers 177,531 acres, which is approximately 48 percent of the land available in the Subregion. The Subregion contains the second largest amount of vacant land and open space however; most

of this area is in the Angeles National Forest. Opportunities exist to promote/increase ecosystem restoration in Hansen dam, Sepulveda basin, Chatsworth reservoir, Glendale narrows, foothills and Arroyo Seco. In addition, habitat corridors may be created along Tujunga and Pacoima washes. Approximately 2.3 million People reside in the Upper Los Angeles River Subregion making it the third most populated Subregion, accounting for approximately 23 percent of the residents in the Greater Los Angeles County Region. Thus, the Upper Los Angeles River Subregion would provide a significant contribution to meeting region-wide targets for water supply and urban runoff, open space, and habitat enhancement.

The Lower San Gabriel and Los Angeles Subregion is the third largest in the region covering 229,776 acres, which is approximately 18 percent of the Greater Los Angeles County Region. In the Lower San Gabriel and Los Angeles Subregion developed land covers 206,560 acres, which is approximately 90 percent of the land available in the Subregion. Approximately 3.2 million people reside in the Lower San Gabriel and Los Angeles Subregion making it the third most populated Subregion, accounting for approximately 32 percent of the residents in the Greater Los Angeles County Region. The Lower San Gabriel and Los Angeles Subregion could provide significant contributions to meeting Region-wide targets for water supply, surface water quality, and open space and habitat enhancement. However, the Lower San Gabriel and Los Angeles River contribution to open space and habitat enhancement would require acquisition and creation of new open space given the lack of existing open space.

Under Proposition 50, Chapter 8, the State defines a disadvantaged community (DAC) as one in which the median income is less than 80 percent of the Statewide median income. In 2005, this was approximately $38,000. Approximately 43 percent (4.1 million) of the total IRWMP Region population lives within a DAC according to on median income data identified in Year 2000 census tracts. The following list identifies the proportion of population in each Subregion within a DAC.

- North Santa Monica Bay Watersheds, 0 percent;
- Upper Los Angeles River Watershed, 43 percent;
- Upper San Gabriel River and Rio Hondo Watersheds, 24 percent ;
- Lower San Gabriel and Los Angeles Watersheds 49 percent; and
- South Bay Watersheds, 50 percent.

Representatives from disadvantaged communities have been regularly contacted and invited to participate in Subregional workshops. The cities in the Subregions that contain substantial minority populations have been in attendance at the workshops and have submitted projects that benefit the local community. In general, DACs may receive benefits in some or all categories during IRWMP implementation. However, the specific blueprint for achieving this needs further development. Possible benefits to DACs would include: having a clean, reliable and affordable water supply; water quality improvements in the nearby creeks, rivers and beaches; improved access to parks and trails; and availability of educational and wildlife viewing opportunities. In addition, visitors from disadvantaged communities would enjoy the recreational opportunities provided by IRWMP implementation in areas outside of DACs, such as North Santa Monica Bay.

4.5 Beneficial Aspects of Project Integration

Project integration typically consists of concurrent development of multipurpose projects or coordination of single purpose projects in such a way that the benefits of the single purpose are enhanced (or costs reduced). More than 25 percent of the stakeholder identified projects are multi-purpose projects. The Regional Planning Tools have been designed to illustrate varied degrees of project scale, and potential integration.

Tool 1, which is at the site scale, perhaps offers the least opportunity for integration, and relies on typical single-purpose water supply projects, on-site BMPs to achieve water quality goals, and additional land

purchases to achieve open space goals. Tool 2 generates 130,000 AFY of water supply from capture of dry weather flow and conducts surface water treatment at neighborhood-scale facilities. Open space goals are achieved through creative use of retention facilities at the neighborhood level. Although overall costs are 19 percent higher for Tool 2 (Table 4), there is a 7 percent increase in quantified economic benefits (Table 7). In addition, development of water quality projects at the neighborhood scale may allow a preferential distribution of benefits by siting projects in disadvantaged communities.

Tool 3, which is the most regional tool, may offer the most opportunities for integrated solutions, as it also makes the most use of region's natural resources, such as rivers, creeks, and major tributary channels in order to create multi-purpose riparian corridors that connect the entire Region. Tool 3 generates 130,000 AFY of water supply from dry weather flow and 120,000 AFY from storm water flow. The heavy reliance on large scale projects adjacent to natural features greatly reduces the overall cost of this tool. The cost of Tool 3 is 56 percent of the cost of Tool 1 and 47 percent of the cost of Tool 2 (Table 4). Benefits are also increased, due to greater reductions in imported water purchases and the increased size of open space parcels, which enhances recreation and habitat benefits. The overall benefits of Tool 3 are 65 percent greater than the benefits of Tool 1 and 54 percent greater than the benefits of Tool 2 (Table 7). Tool 3 also provides opportunities to distribute benefits to disadvantaged communities through the placement of treatment facilities and accompanying open space and habitats along waterways in those communities. Maps displaying the locations of disadvantaged communities and major waterways are included in the attached Subregional TMs.

Additionally, the natural resource focus associated with Tool 3 increases the opportunity for Federal cost sharing in water resource habitat improvement through the U.S. Army Corps of Engineers ecosystem restoration program. The objective of the U.S. Army Corps of Engineers ecosystem restoration program is to invest in restoration projects or features that make a positive contribution to the Nation's environmental resources in a cost effective manner. Restoration of riparian and wetland habitat, including the restoration of natural functions such as storm water retention and filtration, is a substantial component of Tool 3. Construction of large scale ecosystem restoration projects are cost-shared 65 percent federal funds/35 percent non-federal funds. Although only a rough estimate of federal financial participation can be made with the venture level cost estimates used in this analysis, it would not be unreasonable to assume that as much as 20 percent to 25 percent of the total cost of Tool 3 may be available for federal participation under the U.S. Army Corps of Engineers ecosystem restoration program.

Other opportunities for increased Federal cost sharing through other programs may also exist. For example, the potential for Bureau of Reclamation participation in the construction of water supply elements of Tools 2 and 3 should be investigated.

5. CONCLUSION

Three Regional Planning Tools, each designed to achieve the same level of water supply, water quality, and open space output have been assessed in terms of venture level costs and benefits. The three categorical approaches are largely differentiated by the scale of individual projects which make up the tool, with Planning Tool 1 including projects at the site scale, Planning Tool 2 including projects at the neighborhood scale, and Planning Tool 3 including projects at the larger regional scale. The results of the assessment indicate that Tool 3, is the tool with the least cost and highest economic benefits. Multiple benefits can be accomplished by projects at any scale, but in general, increased benefits occur as a result of increased scale, especially for water quality treatment and habitat creation. In general, larger multi-purpose projects are able to provide water supply, water quality, and habitat creation benefits at a lower cost than an accumulation of smaller single-purpose projects. The three Regional Planning Tools have been designed to accent different scales and therefore should not be considered as alternative comprehensive plans. The actual plans, which will be implemented in the near and long term future, will include combinations of all scales presented in this analysis. The benefit of conducting comparative cost and benefit assessments of the three Tools is that the comparison illustrates the relative costs and benefits of increasing (or decreasing) scale among local projects.

The three Regional Planning Tools have been developed to illustrate the economic effects of varied levels of project scale, integration and centralization. None of the tools represent a comprehensive plan to meet the Region's water resource needs, but instead illustrate the benefits of project integration, reliance on multi-purpose projects, and centralization around existing natural features. The actual plans, which will be implemented over the course of the next twenty years and more, will likely be a mix of strategies adapted to local opportunities and constraints and would be unlikely to consistently achieve the high level of integration depicted in Tool 3. However, the results of this analysis clearly indicate that increasing project integration with centralization around natural features to whatever extent possible will increase the economic benefits of achieving the Region's future water resource needs.

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APPENDIX A

Benefit Assessment Analysis for North Santa Monica Bay Subregion

APPENDIX A: BENEFIT ASSESSMENT ANALYSIS FOR NORTH SANTA MONICA BAY SUBREGION

This technical memorandum (TM), prepared under Task 3 of the Greater Los Angeles County Integrated Regional Water Management Program (IRWMP), identifies the potential opportunities and constraints for the North Santa Monica Bay Subregion to realize the benefits targeted at the region-wide level.

Countywide water supply, water quality, open space and habitat, and infrastructure repair and replacement targets have been established for the Greater Los Angeles County Region IRWMP. These targets represent the quantitative benefits that will be achieved with successful implementation of the IRMWP. The relative contributions of the five IRWMP Subregions towards achieving these benefits will be based on many considerations which may include population, land use, presence of disadvantaged communities, and the sets of opportunities and constraints unique to each Subregion.

Benefits Assessment Scenarios

Three Regional Planning Tools have been chosen for a cost-benefit analysis as part of the Greater Los Angeles County IRWMP. The purpose of these three Tools is to illustrate two main points to stakeholders: the overall cost to meet water supply and water quality targets Region-wide and the cost and benefits of integrating three distinct scales of projects to achieve these targets. All three approaches have particular benefits, impacts and costs which are summarized in Table 1. All three approaches incorporate water supply planning targets consistent with the Metropolitan Water District of Southern California's Integrated Resources Plan. They also represent an aggressive commitment to recycled water.

Scenario 1: Site Scale. This approach reflects continuation of the current approach to water supply, water quality and open space, habitat and recreational projects. This approach is characterized by individual projects pursued by individual agencies and entities in the region and for projects located on individual sites.

Scenario 2: Neighborhood Scale. This scenario reflects a strategic shift to 130,000 acre-feet of the water supply through development of dry weather flow capture and treatment to meet both water quality requirements and water supply needs. This supply development would equally offset planned imported water development.

Scenario 3: Regional Scale. This scenario reflects a further expansion of water quality and water supply co-development through capture and treatment of 120,000 acre-feet of wet weather flows. This additional water supply development would equally further offset planned imported water development.

Benefits Assessment for the North Santa Monica Bay Subregion

This section identifies the potential opportunities and constraints for the North Santa Monica Bay Subregion to realize the benefits targeted at the County-wide level.

Land Use and Population Analysis

Table 2 provides a rough point of reference for how much the North Santa Monica Bay Subregion may be able to contribute toward achieving the region-wide targets based on land use and population information.

Table 1. Water Supply, Water Quality, Open Space, Habitat, and Recreation Elements of Scenarios 1 through 3

	Analytical Target	Alternative 1 Single Purpose	Alternative 2 Decentralized	Alternative 3 Centralized
Water Supply[1]	**800,000**	*Acre Feet/Year*		
Water Conservation / Demand Reduction		110,000	110,000	110,000
Expanded Local Water Production		100,000	100,000	100,000
Other Projects (desalination & groundwater recovery)		90,000	90,000	90,000
Additional Recycled Water		130,000	130,000	130,000
Additional Imported Water		370,000	240,000	120,000
Urban (Dry Weather) Runoff		0	130,000	130,000
Stormwater Runoff (from Urban Areas)		0	0	120,000
Total		**800,000**	**800,000**	**800,000**
Surface Water Quality				
Urban (Dry Weather) Runoff	**320,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		124,000	0	0
Treatment[3]				
Traditional (Mechanical/Chemical)		196,000		
Natural (Treatment Wetlands)			320,000	320,000
Use of Treated Water				
Non-Potable Reuse[4]		0	130,000	130,000
Discharge to Creeks and Rivers		196,000	190,000	190,000
Stormwater Runoff (from Urban Areas)	**490,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		189,875	0	0
Short-Term Detention		300,125	490,000	490,000
Treatment				
Traditional (Tertiary)		300,125	0	0
Natural (Treatment Wetlands)				
Secondary Treatment[5]				120,000
Tertiary Treatment			490,000	370,000
Use of Treated Water				
Recharge via Groundwater Basins		0	0	120,000
Discharge to Creeks and Rivers		300,125	490,000	370,000
Open Space & Habitat				
Native wetland restoration	**1,400 acres**			
Riparian habitat/buffer restoration	**100 miles**			
Parks and Open Space creation	**30,000 acres**			
Infrastructure Repair & Replacement				
Flood Management	**20%**			
Water Supply	**20%**			
Wastewater	**20%**			

Notes:
1: Estimated increase in water supply and/or demand reduction above current supplies/conservation
2: Equals approximately 39% of runoff, as that portion of urbanized area is single family homes
3: Assumes tertiary treatment, unless otherwise noted
4: Local distribution of treated urban runoff for irrigation and other uses (similar to reclaimed water)
5: Assumes secondary treatment for subsequent groundwater recharge via spreading basins

Water Supply Relationships
- Residential BMPs would reduce water demand (amount TBD)
- Non-potable reuse of treated Urban Runoff
- Recharge of treated stormwater runoff

Table 2. North Santa Monica Bay Estimated Potential Contribution Towards Achieving Region-Wide Targets	
Region-wide Target Category	North Santa Monica Bay Estimated Target Contribution
Water Supply	8,300 AFY [1]
Urban Dry Weather Runoff Capture	7,900 AFY [2]
Stormwater Capture	12,000 AFY [2]
Native Wetlands Restoration	14 acres [1]
Riparian Habitat/Buffer Restoration	1 miles [1]
Parks and Open Space Creation	300 acres [1]

1. Calculated based on North Santa Monica Bay percentage of total County-wide population (1 percent)

2. Calculated based on North Santa Monica Bay percentage of total developed area (2 percent)

The North Santa Monica Bay Subregion is the smallest of the five Subregions in the Greater Los Angeles County Region in terms of size, population and developed land. However, it has the second largest amount of vacant/open space, a great deal of which contains important and sensitive coastal and riparian habitat, including an Area of Special Biological Significance. Based on this, the North Santa Monica Bay Subregion expected contributions to meeting Region-wide targets are lower than other Subregions for water supply, surface water quality, and open space and habitat enhancement (considered functions of population and developed area); actual contributions to open space and habitat enhancement could be relatively greater due to the open space and vacant land available in the Subregion.

Opportunities and Constraints

Opportunities and constraints for the North Santa Monica Bay Subregion to realize the benefits targeted at the County-wide level are discussed below in the following context:

- Opportunities and constraints to realize the benefits targeted at the County-wide level are presented below. The discussion is based on the review of the Call for Projects list and major needs, opportunities and constraints in the Subregion as summarized in Table 3. These major needs, opportunities and constraints were identified during the course of the IRWMP based on various sources including direct input from stakeholders.
- The next step will be to develop a quantitative benefit of all the projects reported by stakeholders in the Call for Projects and to identify gaps between these known benefit opportunities and the additional quantity of benefits the Subregion could contribute in order to achieve their portion of the Region's targets (Table 2). The opportunities and constraints that exist in bridging the gap between the two would then be developed.

It is anticipated that the list of opportunities and constraints provided below by benefit category will be used as a starting point to help define integrated projects and programs in the North Santa Monica Bay Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

Water Supply

Opportunities to produce water supply benefits in the North Santa Monica Bay Subregion are mainly in expanding the use of recycled water and conservation. Opportunities to achieve additional supply benefits through reuse of treated urban runoff exist as proposed under Scenario 2. Opportunities for groundwater recharge and reuse of stormwater proposed under Scenario 3 are limited because of the lack of groundwater storage.

Table 3. Major Needs, Opportunities, and Constraints in North Santa Monica Bay

	Water Supply	Surface Water Quality	Open Space and Habitat	Infrastructure
Needs	• Reduce reliance on imported water • Provide more local water supply for firefighting	• Reduce bacterial concentrations at beaches • Reduce urban runoff • Reduce impact of septic systems	• Restore Steelhead Habitat and Access • Restore Malibu Lagoon habitat • Restore creek habitat and natural hydrologic function	• Not available at this time
Opportunities	• Surplus of recycled water available for reuse • Capture, treatment and reuse of stormwater runoff • Implementation of conservation devices	• Naturalization of streams and creeks • Installation of permeable surfaces • Conversion of septic systems • Gain involvement of private homeowners	• Removal of man-made barriers to steelhead migration • Wetlands creation • Creek Restoration • Exotic species removal • Utilize available open space	• Not available at this time
Constraints	• Poor quality groundwater • Limited space for additional reservoirs • Limited recycled water users • Cisterns for firefighting are difficult to maintain • Limited desalination opportunities • Las Virgenes MWD currently already recycle a significant fraction of reclaimed water • Lack of storage available in groundwater basins which limits the amount of groundwater recharge	• Widespread sources of bacteria requires that a wide array of solutions be implemented by multiple and agencies.	• Reliance on U.S. Army Corps of Engineers for Rindge Dam removal • Conflicting needs of wildlife • "Active" versus "passive" recreation conflicts • Urban use occurs upstream of beneficial uses	• Topography generally makes region-wide pipelines and infrastructure projects prohibitive

Sources:

1. *Fish Migration Barrier Severity and Steelhead Habitat Quality in the Malibu Creek Watershed (Heal the Bay, 2005)*
2. *Making Progress: Restoration of the Malibu Creek Watershed (Malibu Creek Watershed Executive Advisory Council, 2001)*
3. *North Santa Monica Bay IRWP Stakeholders Workshop No. 1 Meeting Minutes (February, 2006)*
4. *North Santa Monica Bay Watersheds White Paper (LA County Department of Public Works, 2002)*

Additional details about specific opportunities and constraints impacting water supply benefits are provided below.

Opportunities

- Tapia Water Reclamation Facility produces Title 22 water that is suitable for reuse.
- There are opportunities for treatment and reuse of urban runoff in conjunction with already planned runoff capture projects.
- Conversion of septic systems to sewered systems in specific locations with subsequent tertiary treatment can yield additional supply benefits for non-potable reuse.
- Fire suppression water needs can be assisted with non-potable supply created locally.
- Projects identified in the Call for Projects that would offer water supply benefits include 11 recycled water expansion projects, four water conservation projects, a filtration plant expansion project, and a public education project.
- Some recycled water expansion projects could be consistent with the multipurpose emphasis of Scenario 3 by creating accompanying habitat benefits through the use of recycled water to create riparian and wetland habitat.

Constraints

- Recycled water customers are limited and Las Virgenes MWD already recycles a high fraction of reclaimed water, presenting challenges for expansion.
- Limited groundwater storage and poor groundwater quality make conjunctive use and groundwater recharge water supply options less feasible.
- Subregional topography limits the use of surface water reservoirs and can make water supply infrastructure improvements such as pipelines prohibitive from a cost standpoint.
- Desalination opportunities are limited.

Surface Water Quality

Major opportunities for creating surface water quality benefits can be achieved through addressing bacterial loadings in the creeks and streams that contribute to poor water quality and the occurrence of frequent beach closures. Naturalization of creeks and streams would restore hydrologic function and provide improvements in water quality through sediment reduction. In addition to producing water supply benefits, water conservation projects also offer water quality benefits through reductions in urban runoff. There are opportunities for creation of natural treatment wetlands which could be combined with the treatment of urban runoff as proposed under Scenario 2. A major constraint for the region is the uncertainty of sources of bacteria.

Additional details about specific opportunities and constraints impacting water quality benefits are provided below.

Opportunities

- Bacteria TMDL implementation plans either have been completed or will be completed shortly that assist the Subregion with identifying potential BMPs and sites for implementation.
- There are opportunities for capture and treatment of urban runoff throughout the Subregion including the areas impacting Malibu Lagoon.
- A plan to restore portions of Las Virgenes, Mc Coy, and Dry Canyon Creeks has been developed which proposed projects that may improve water quality.

- Treatment processes at the Tapia Water Reclamation Facility can be upgraded to reduce nutrient loading although the cost to do so may be prohibitive.
- Sediment water quality issues can be combined with habitat restoration efforts that restore creek habitat and restore natural hydrologic function.
- Recycled water expansion can produce water quality benefits through reduction of nutrient loading into Malibu Creek.
- Septic systems can be converted to sewer systems in specific locations to help reduce bacteria and nutrient impacts to groundwater.
- Projects identified in the Call for Projects that would offer water quality benefits include four stormwater management projects, two advanced treatment projects, a wastewater diversion project, a sediment control project and a septic system conversion project.
- Many proposed projects offering water quality benefits have the potential to offer accompanying water supply benefits. The sediment control project offers accompanying habitat benefits, making all of the water quality projects consistent with the multipurpose emphasis of Scenario 3.

Constraints

- Bacterial sources are widespread and more analysis is needed to identify the most efficient approaches towards achieving optimal water quality improvements.
- In general, the expense needed to implement structural BMPs to comply with water quality regulations is greater than the resources currently available to the Subregions cities and agencies.

Open Space and Habitat

Significant opportunities for obtaining habitat benefits are linked to the fact that much of the North Santa Monica Bay Subregion is undeveloped and maintains large areas of ecological habitat. One of the more promising opportunities for habitat restoration lies in restoring steelhead migration to many of the creeks of the Subregion. Other opportunities for creating habitat benefits exist in restoring aquatic and native vegetation habitat in conjunction with efforts to improve water quality of creeks. Open Space benefits can be obtained through preservation and land acquisition efforts.

Additional details about specific opportunities and constraints impacting open space and habitat benefits are provided below.

Opportunities

- A comprehensive plan has been prepared for removal of man-made structures to provide improved steelhead access and will restore 19 miles of steelhead habitat.
- There are many occurrences of non-native vegetation through the Subregion. Removal of this vegetation can also be coordinated to produce water quality benefits through decreased sedimentation.
- Reclaimed water can be used to restore wetland and riparian areas on Gillette Ranch, creating habitat as well as supply benefits.
- Projects identified in the Call for Projects that provide Open Space and Habitat Benefits include six riparian restoration projects, two park projects and one constructed wetlands project have been identified.
- All of the projects listed above can offer accompanying water quality benefits, making them consistent with the multipurpose emphasis of Scenario 3.

Constraints

- Urban use occurs upstream of habitat making habitat restoration efforts dependent on upstream water quality improvements.
- In some areas, the topography and high cost of land is a constraint toward creating more active recreational opportunities (e.g., soccer and ball fields).

Infrastructure Repair and Replacement

Because infrastructure repair and replacement was added only recently as a goal for the IRWMP, limited information has been compiled and limited feedback from stakeholders has been obtained. However, based on this limited information, general opportunities and constraints are:

Opportunities

- Rehabilitation of trunk sewer lines is needed to reduce inflow and infiltration (I&I) which is estimated at up to 15 percent of treatment plant inflows based on the Call for Projects information.
- Treatment facility upgrades made to meet water quality requirements can be designed to also repair and replace existing infrastructure, extending their useful life.
- Projects identified in the Call for Projects that would offer water infrastructure and repair and replacement benefits include a trunk sewer rehabilitation project and a project to relocate the Sepulveda feeder to improve water supply reliability to the Malibu area.

Constraints

- The rugged topography of the North Santa Monica Bay Subregion in general creates high repair and replacement costs.

Disadvantaged Communities

Under Proposition 50, Chapter 8, the State defines a disadvantaged community as one in which the median income is less than 80 percent of the Statewide median income. In 2005, this was approximately $38,000. Based on this definition and an analysis of median income data by Year 2000 census tracts, there are no disadvantaged communities in North Santa Monica Bay. However, visitors from other Subregions, including those from disadvantaged communities, enjoy the recreational opportunities provided by North Santa Monica Bay. No data is readily available to quantify the number of visitors from disadvantaged communities. The Subregion should make an effort to quantify this number so that benefits to disadvantaged communities could be quantified later on.

Conclusions and Next Steps

The North Santa Monica Bay Subregion has less population and fewer developed areas than the other Subregions, which will reduce the amount of scaled contributions to County-wide water supply and water quality benefits. The presence of large areas of riparian and vegetative habitat in the undeveloped areas should allow the North Santa Monica Bay Subregion to offer greater contributions towards meeting the County-wide open space and habitat benefit target. A number of recycled water and conservation projects have already been identified through the Call for Projects to help meet North Santa Monica Bay's share of water supply benefits. Currently proposed stormwater and urban runoff management projects will also contribute towards meeting the County-wide water quality benefit target. An already planned steelhead restoration program will help to meet the County-wide riparian habitat target. Any remaining gaps in meeting the Subregional share of water quality and water supply benefits will need to be filled with future projects.

Many of the projects identified in the Call for Projects provide multiple benefits and should be considered as Scenario 3 (Multi-Purpose Emphasis) projects. These include:

- The use of water conservation (primary water supply benefit) to reduce urban runoff (accompanying water quality benefit)
- The modification of stormwater and urban runoff projects (primary water quality benefit) to include non-potable reuse elements (accompanying water supply benefit)
- The use of reclaimed water (primary water supply benefit) to create wetlands and riparian habitat (accompanying habitat benefit)
- Naturalization of creeks to address both water quality and steelhead habitat benefits simultaneously

The next steps will be to address how to further refine and implement integrated projects and programs in the North Santa Monica Bay Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

APPENDIX B

Benefit Assessment Analysis for Upper Los Angeles River Subregion

APPENDIX B: BENEFIT ASSESSMENT ANALYSIS FOR UPPER LOS ANGELES RIVER SUBREGION

This technical memorandum (TM), prepared under Task 3 of the Greater Los Angeles County Integrated Regional Water Management Program (IRWMP), identifies the potential opportunities and constraints for the Upper Los Angeles River Subregion to realize the benefits targeted at the region-wide level.

County-wide water supply, water quality, open space and habitat, and infrastructure repair and replacement targets have been established for the Greater Los Angeles County Region IRWMP. These targets represent the quantitative benefits that will be achieved with successful implementation of the IRMWP. The relative contributions of the five IRWMP Subregions towards achieving these benefits will be based on many considerations which may include population, land use, presence of disadvantaged communities, and the sets of opportunities and constraints unique to each Subregion.

Benefits Assessment Scenarios

Three scenarios have been chosen for a cost-benefit analysis as part of the Greater Los Angeles County IRWMP. The purpose of these three scenarios is to illustrate two main points to stakeholders: the overall cost to meet water supply and water quality targets Region-wide and the cost and benefits of integrating projects to achieve these targets. All three scenarios have particular benefits, impacts and costs which are summarized in Table 1. All three scenarios incorporate water supply planning targets consistent with the Metropolitan Water District of Southern California's Integrated Resources Plan. They also represent an aggressive commitment to recycled water.

Scenario 1: Site Scale. This approach reflects continuation of the current approach to water supply, water quality and open space, habitat and recreational projects. This approach is characterized by individual projects pursued by individual agencies and entities in the region and for projects located on individual sites.

Scenario 2: Neighborhood Scale. This scenario reflects a strategic shift to 130,000 acre-feet of the water supply through development of dry weather flow capture and treatment to meet both water quality requirements and water supply needs. This supply development would equally offset planned imported water development.

Scenario 3: Regional Scale. This scenario reflects a further expansion of water quality and water supply co-development through capture and treatment of 120,000 acre-feet of wet weather flows. This additional water supply development would equally further offset planned imported water development.

Benefits Assessment for the Upper Los Angeles River Subregion

This section identifies the potential opportunities and constraints for the Upper Los Angeles River Subregion to realize the benefits targeted at the County-wide level.

Land Use and Population Analysis

Table 2 provides an estimate of how much the Upper Los Angeles River Subregion may be able to contribute toward achieving the Region-wide planning targets based on land use and population information provided by Draft IRWMP.

Table 1. Water Supply, Water Quality, Open Space, Habitat, and Recreation Elements of Scenarios 1 through 3

	Analytical Target	Alternative 1 Single Purpose	Alternative 2 Decentralized	Alternative 3 Centralized
Water Supply[1]	**800,000**	*Acre Feet/Year*		
Water Conservation / Demand Reduction		110,000	110,000	110,000
Expanded Local Water Production		100,000	100,000	100,000
Other Projects (desalination & groundwater recovery)		90,000	90,000	90,000
Additional Recycled Water		130,000	130,000	130,000
Additional Imported Water		370,000	240,000	120,000
Urban (Dry Weather) Runoff		0	130,000	130,000
Stormwater Runoff (from Urban Areas)		0	0	120,000
Total		**800,000**	**800,000**	**800,000**
Surface Water Quality				
Urban (Dry Weather) Runoff	**320,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		124,000	0	0
Treatment[3]				
Traditional (Mechanical/Chemical)		196,000		
Natural (Treatment Wetlands)			320,000	320,000
Use of Treated Water				
Non-Potable Reuse[4]		0	130,000	130,000
Discharge to Creeks and Rivers		196,000	190,000	190,000
Stormwater Runoff (from Urban Areas)	**490,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		189,875	0	0
Short-Term Detention		300,125	490,000	490,000
Treatment				
Traditional (Tertiary)		300,125	0	0
Natural (Treatment Wetlands)				
Secondary Treatment[5]				120,000
Tertiary Treatment			490,000	370,000
Use of Treated Water				
Recharge via Groundwater Basins		0	0	120,000
Discharge to Creeks and Rivers		300,125	490,000	370,000
Open Space & Habitat				
Native wetland restoration	**1,400 acres**			
Riparian habitat/buffer restoration	**100 miles**			
Parks and Open Space creation	**30,000 acres**			
Infrastructure Repair & Replacement				
Flood Management	**20%**			
Water Supply	**20%**			
Wastewater	**20%**			

Notes:
1: Estimated increase in water supply and/or demand reduction above current supplies/conservation
2: Equals approximately 39% of runoff, as that portion of urbanized area is single family homes
3: Assumes tertiary treatment, unless otherwise noted
4: Local distribution of treated urban runoff for irrigation and other uses (similar to reclaimed water)
5: Assumes secondary treatment for subsequent groundwater recharge via spreading basins

Water Supply Relationships
- Residential BMPs would reduce water demand (amount TBD)
- Non-potable reuse of treated Urban Runoff
- Recharge of treated stormwater runoff

Table 2. Upper Los Angeles River Estimated Potential Contribution Towards Achieving Region-Wide Targets	
Region-wide Target Category	Upper Los Angeles River Estimated Target Contribution
Water Supply	184,000 AFY [1]
Urban Dry Weather Runoff Capture	80,000 AFY [2]
Stormwater Capture	122,500 AFY [2]
Native Wetlands Restoration	322 acres [1]
Riparian Habitat/Buffer Restoration	23 miles [1]
Parks and Open Space Creation	6,900 acres [1]

1. *Calculated based on Upper Los Angeles River percentage of total County-wide population (23 percent)*
2. *Calculated based on Upper Los Angeles River percentage of total developed area (25 percent)*

The Upper Los Angeles River Subregion is the largest in the region covering 372,224 acres, which is approximately 28 percent of the 1,306,258 acre Region. In the Upper Los Angeles River Subregion developed land covers 177,531 acres, which is approximately 48 percent of the land available in the Subregion. The Subregion contains the second largest amount of vacant land and open space however; most of this area is in the Angeles National Forest. Approximately 2.3 million people reside in the Upper Los Angeles River Subregion making it the third most populated Subregion, accounting for approximately 23 percent of the 10.2 million residents in the Region. Thus, the Upper Los Angeles River Subregion would provide a significant contribution to meeting Region-wide targets for water supply, urban run off, open space, and habitat enhancement.

Opportunities and Constraints

The context for the opportunities and constraints within the Upper Los Angeles River Subregion is as follows:

- Opportunities and constraints to realize the benefits targeted at the County-wide level are presented below. The discussion is based on the review of the Call for Projects list and major needs, opportunities and constraints in the Subregion as summarized in Table 3. These major needs, opportunities and constraints were identified during the course of the IRWMP based on various sources including direct input from stakeholders.
- The next step will be to develop a quantitative benefit of all the projects reported by stakeholders in the Call for Projects and to identify gaps between these known benefit opportunities and the additional quantity of benefits the Subregion could contribute in order to achieve their portion of the Region's targets (Table 2). The opportunities and constraints that exist in bridging the gap between the two would then be developed.

Table 3. Major Needs, Opportunities, and Constraints in Upper Los Angeles River				
	Water Supply	Surface Water Quality	Open Space and Habitat	Infrastructure
Needs	• Reduce reliance on imported water • Increase water reliability in drought years • Improve foothill municipal water district access to state project water	• Improve water quality • Meet TMDLs • Maintain 303(d) listed waterways • Improvement of runoff quantity and quality • Utilize numerous discharges into the Los Angeles River	• Plan to preserve upland habitat	• Not available at this time
Opportunities	• Capture, treatment and reuse of stormwater runoff • Reclaimed water surplus available • Conservation programs • Desalination • Water distribution system improvements • Projects for Safe Drinking Water Act Compliance • Increased reliability through system interconnections • Improve conjunctive use capacity in SF Basin - additional spreading capacity (gravel pits) • Groundwater treatment facilities (VOCs, nitrate, hexavalent chromium)	• Implementing TMDL, NPDES and AB 885 requirements • RWQCB Watershed Management Initiative chapters • Implement SWRCB's non-point source program plan • Promote better leverage of inter-agency and private entity resources for NPS Programs • Use ecosystem restoration to help revitalize neighborhoods • Create mixed-use areas integrate parks, housing, retail, jobs, schools, and greenways • Implement recommendations from floodplain management task force • Hold floodwaters and extend open space • Improve flood safety through restoration of forest, river, and creek • Develop and implement coordinated water quality monitoring • Capture, treat and use stormwater • Green visions • Public education	• Promote/increase ecosystem restoration in Hansen dam, Sepulveda basin, Chatsworth reservoir, Glendale narrows, foothills and Arroyo Seco • Increase channel naturalization • Widening river channel • Recover/restore landscape hydrologic connections • Create greenway and bikeway along creeks and rivers and transportation and utility corridors • Multi-purpose parks • Integrate recreation into wetlands and watershed projects. • Provide for maintenance of parks, open space, and trails • Create habitat corridors along washes (i.e., Tujunga and Pacoima) • Restore riparian habitat along historic tributaries where feasible • Watershed protection	• Not available at this time
Constraints	• Funding • Pervasive groundwater contamination in basins • Resistance to indirect potable reuse • Limited spreading capacity	• Majority of Los Angeles River watershed is impaired due to point and non-point sources	• How to Preserve Upland Habitat	• Integration with existing infrastructure systems

The list of opportunities and constraints are addressed below by benefit category. This is merely a starting point to define integrated projects and programs in the Upper Los Angeles River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

Water Supply

Opportunities to produce water supply benefits in the Upper Los Angeles River Subregion are mainly in expanding the use of recycled water, groundwater remediation, infrastructure improvements, and conservation.

Opportunities

- Planned and existing stormwater runoff capture facilities can integrate treatment and reuse of urban runoff.
- Additional supply benefits through reuse of treated urban runoff.
- Groundwater recharge and reuse of stormwater.
- Recycled water expansion projects.
- The use of recycled water to support riparian and wetland habitat.

Constraints

- Infrastructure improvements to expand potential recycled water customers in the basin.
- Poor groundwater quality at some locations make conjunctive use and groundwater recharge water supply options less feasible without corresponding remediation of groundwater quality.
- Extent of development limits options for downstream surface water storage and raises the importance of inter-departmental collaboration for water supply infrastructure improvements.
- Desalination opportunities are limited to the treatment and utilization of brackish waters.

Surface Water Quality

Opportunities to creating surface water quality benefits in the Upper Los Angeles River Subregion are mainly in addressing point and non point sources of contamination.

Opportunities

- Ecosystem restoration by creation of greenways, natural treatment wetlands and stormwater detention basins could be utilized for treatment of urban and storm runoff.
- Water conservation programs would also provide water quality benefits by reducing urban runoff, while producing benefits to the water supply.
- Naturalization of creeks and streams would restore hydrologic function and provide improvements in water quality through sediment reduction.
- Development and implementation of on-site residential BMPs would reduce runoff volume and assist in meeting TMDLs.
- Treatment processes at the Tillman Water Reclamation Facility can be utilized to reduce nutrient loading and maintain downstream habitat.
- Sediment water quality issues can be combined with habitat restoration efforts that restore creek habitat and restore natural hydrologic function.

Constraints

- Limited downstream open space for use in capture and treat solutions.
- Solutions for water quality must be able to address the issues of both point and non-point sources for a successful solution.

Open Space and Habitat

Approximately half of the Upper Los Angeles River Subregion contains vacant or open space, however a large portion of that open space is existing National Forest Land. The opportunities still exist for the utilization and preservation of urban open space in the Subregion. Expansion of the Sepulveda Basin and Hansen Dam natural areas would provide additional open space and habitat areas while also providing water quality and supple benefits. Other opportunities for creating habitat benefits exist in restoring aquatic and native vegetation habitat in conjunction with efforts to improve water quality of local waterways such as the Tujunga and Pacoima washes as well as Calabasas Creek.

Opportunities

- Reclaimed water can be used to support wetland and riparian areas along the Los Angeles River, creating habitat as well as supply benefits.
- Creation of greenways, recreation areas, treatment wetlands, stream naturalization and restoration of hydrologic connections.
- Restoration and creation of native habitats using native vegetation that can also serve to assist in the meeting of water quality goals.
- Removal of non-native vegetation can also produce water quality benefits through decreased consumptive use.
- Many of the open space projects can offer accompanying water quality benefits.
- Open space benefits can be met using a combination of preservation and land acquisition.
- Regional geology allows projects that provide open space and habitat benefits to also provide water quality and quantity benefits.
- Restoration and creation of native habitats and open space can enhance and restore wildlife corridors between Verdugo and San Gabriel Mountains.
- Increase open space, improve connectivity and access to and between Tujunga and Pacoima washes and the Angeles National forest using utility easements.

Constraints

- Open space improvements would require land acquisition.
- Lack of a comprehensive plan on how to preserve and restore upstream habitat and open space.
- Cost of land acquisition.
- Funding for operation, maintenance, and security of habitat, open space, and trails.
- Lack of coordination or communication between federal, state, regional entities with jurisdiction over the watershed.

Infrastructure Repair and Replacement

Because infrastructure repair and replacement was added only recently as a goal for the IRWMP, limited information has been compiled and limited feedback from stakeholders has been obtained. However, based on this limited information, general opportunities and constraints are:

Opportunities

- Rehabilitation of trunk sewer lines, pump stations and associated infrastructure is needed to reduce inflow and infiltration (I&I), this process has begun through programs like the City of Los Angeles' 60 Mile Program.
- Treatment facility upgrades made to meet water quality requirements can be designed to also repair and replace existing infrastructure, extending their useful life.

Constraints

- Coordination or planed infrastructure improvements with needs addressed in IRWMP.

Disadvantaged Communities

The cities in the Subregion that contain substantial minority populations have been in attendance at the workshops and have submitted projects that benefit the disadvantaged communities. The disadvantaged communities have been contacted and invited to participate in Subregional workshops. The disadvantaged communities in the Upper Los Angeles River Subregion will receive benefits from projects that provide additional water supply reliability, open space and recreational opportunities in their communities. See the project location maps in the Project Integration TM to identify these projects.

Conclusions and Next Steps

The Upper Los Angeles River Subregion is the largest of the Subregions, with the third largest population and second largest developed areas. Thus the Subregion could account for a quarter to a third of scaled contributions to County-wide water supply, water quality, and open space benefits. The results from this analysis suggest that substantial opportunities exist to enhance water supply, water quality, open space, habitat and recreation in the watershed. Over 150 projects in various stages have been submitted that will help provide these benefits. However, there are other opportunities for projects that have not yet been submitted, as these projects surface they will be added to the IRWMP list in subsequent iterations. Many of the projects produce multiple benefits for the Greater Los Angeles County planning area. Any remaining gaps in meeting the Subregional share of water quality and water supply benefits will need to be filled with future projects.

Many of the projects identified in the Call for Projects provide multiple benefits and can be integrated at the Regional scale. Therefore, they should be considered as Scenario 3 (Regional, Multi-Purpose Emphasis) projects.

The next steps will be to address how to implement integrated projects and programs in the Upper Los Angeles River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

APPENDIX C

Benefits Assessment Analysis for Upper San Gabriel and Rio Hondo River Subregion

APPENDIX C: BENEFITS TECHNICAL MEMORANDUM FOR UPPER SAN GABRIEL AND RIO HONDO RIVER SUBREGION

This technical memorandum, prepared under Task 3, identifies the potential opportunities and constraints for the Upper San Gabriel and Rio Hondo River Subregion to realize the benefits estimated at the County-wide level.

County-wide water supply, water quality, open space and habitat, and infrastructure repair and replacement targets have been established for the Greater Los Angeles County Region IRWMP. These targets represent the quantitative benefits that will be achieved with successful implementation of the IRMWP. The relative contributions of the five IRWMP Subregions towards achieving these benefits will be based on many considerations which may include population, land use, presence of disadvantaged communities, and the sets of opportunities and constraints unique to each Subregion.

Benefits Assessment Scenarios

Three scenarios have been chosen for a cost-benefit analysis as part of the IRWMP. The purpose of these three scenarios is to illustrate two main points to stakeholders: the overall cost to meet water supply and water quality targets Region-wide and the cost and benefits of integrating projects to achieve these targets. All three scenarios have particular benefits, impacts and costs which are summarized in Table 1. All three scenarios incorporate water supply planning targets consistent with the Metropolitan Water District of Southern California's Integrated Resources Plan. They also represent an aggressive commitment to recycled water.

Scenario 1: Site Scale. This approach reflects continuation of the current approach to water supply, water quality and open space, habitat and recreational projects. This approach is characterized by individual projects pursued by individual agencies and entities in the region and for projects located on individual sites.

Scenario 2: Neighborhood Scale. This scenario reflects a strategic shift to 130,000 acre-feet of the water supply through development of dry weather flow capture and treatment to meet both water quality requirements and water supply needs. This supply development would equally offset planned imported water development.

Scenario 3: Regional Scale. This scenario reflects a further expansion of water quality and water supply co-development through capture and treatment of 120,000 acre-feet of wet weather flows. This additional water supply development would equally further offset planned imported water development.

Benefits Assessment for the Upper San Gabriel and Rio Hondo River Subregion

This section identifies the potential opportunities and constraints for the Upper San Gabriel and Rio Hondo River Subregion to realize the benefits targeted at the County-wide level.

Land Use and Population Analysis

Table 2 provides an estimate of how much the Upper San Gabriel and Rio Hondo River Subregion may be able to contribute toward achieving the Region-wide planning targets based on land use and population information provided by Draft IRWMP Plan.

Table 1. Water Supply, Water Quality, Open Space, Habitat and Recreation Elements of Scenarios 1-3

	Analytical Target	Alternative 1 Single Purpose	Alternative 2 Decentralized	Alternative 3 Centralized
Water Supply[1]	**800,000**	*Acre Feet/Year*		
Water Conservation / Demand Reduction		110,000	110,000	110,000
Expanded Local Water Production		100,000	100,000	100,000
Other Projects (desalination & groundwater recovery)		90,000	90,000	90,000
Additional Recycled Water		130,000	130,000	130,000
Additional Imported Water		370,000	240,000	120,000
Urban (Dry Weather) Runoff		0	130,000	130,000
Stormwater Runoff (from Urban Areas)		0	0	120,000
Total		**800,000**	**800,000**	**800,000**
Surface Water Quality				
Urban (Dry Weather) Runoff	**320,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		124,000	0	0
Treatment[3]				
Traditional (Mechanical/Chemical)		196,000		
Natural (Treatment Wetlands)			320,000	320,000
Use of Treated Water				
Non-Potable Reuse[4]		0	130,000	130,000
Discharge to Creeks and Rivers		196,000	190,000	190,000
Stormwater Runoff (from Urban Areas)	**490,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		189,875	0	0
Short-Term Detention		300,125	490,000	490,000
Treatment				
Traditional (Tertiary)		300,125	0	0
Natural (Treatment Wetlands)				
Secondary Treatment[5]				120,000
Tertiary Treatment			490,000	370,000
Use of Treated Water				
Recharge via Groundwater Basins		0	0	120,000
Discharge to Creeks and Rivers		300,125	490,000	370,000
Open Space & Habitat				
Native wetland restoration	**1,400 acres**			
Riparian habitat/buffer restoration	**100 miles**			
Parks and Open Space creation	**30,000 acres**			
Infrastructure Repair & Replacement				
Flood Management	**20%**			
Water Supply	**20%**			
Wastewater	**20%**			

Notes:
1: Estimated increase in water supply and/or demand reduction above current supplies/conservation
2: Equals approximately 39% of runoff, as that portion of urbanized area is single family homes
3: Assumes tertiary treatment, unless otherwise noted
4: Local distribution of treated urban runoff for irrigation and other uses (similar to reclaimed water)
5: Assumes secondary treatment for subsequent groundwater recharge via spreading basins

Water Supply Relationships
- Residential BMPs would reduce water demand (amount TBD)
- Non-potable reuse of treated Urban Runoff
- Recharge of treated stormwater runoff

Table 2. Upper San Gabriel and Rio Hondo Estimated Potential Contribution Towards Achieving Region-Wide Targets	
Region-wide Target Category	Upper San Gabriel and Rio Hondo Estimated Target Contribution
Water Supply	128,000 AFY [1]
Urban Dry Weather Runoff Capture	64,000 AFY [2]
Stormwater Capture	98,000 AFY [2]
Native Wetlands Restoration	224 acres [1]
Riparian Habitat/Buffer Restoration	16 miles [1]
Parks and Open Space Creation	4,800 acres [1]

1. Calculated based on Upper San Gabriel and Rio Hondo percentage of total County-wide population (16 percent)

2. Calculated based on Upper San Gabriel and Rio Hondo percentage of total developed area (20 percent)

The Upper San Gabriel and Rio Hondo River Subregion contains a population of 1.6 million based upon 2006 population projections. This represents approximately 16 percent of the population in the regional planning area (that is home to approximately 10.2 million residents). The presence of conjunctive use opportunities in the Upper San Gabriel and Rio Hondo River Subregion (recycled water, stormwater and dry weather flows) offers a substantial benefit to multi-use projects that leverage these assets. The relative proximity of dense populations to the San Gabriel River offer potential for projects to provide open space and recreational values to the residents.

The benefits of capture of the 24 hr, 0.75 in storm include the generation of 5,187 acre-feet of water annually to augment water supply in the Upper San Gabriel and Rio Hondo River Subregion. Wet weather flows are substantially higher as significant Forest Service lands comprise approximately ½ the watershed. Large storm events present and opportunity to enhance existing flood control facilities and establish additional capture strategies to take advantage of these period high flows on the San Gabriel River and its tributaries.

Opportunities and Constraints

The context for the opportunities and constraints within the Upper San Gabriel and Rio Hondo River Subregion is as follows:

- Opportunities and constraints to realize the benefits targeted at the County-wide level are presented below. The discussion is based on the review of the Call for Projects list and major needs, opportunities and constraints in the Subregion as summarized in Table 3. These major needs, opportunities and constraints were identified during the course of the IRWMP based on various sources including direct input from stakeholders.
- The next step will be to develop a quantitative benefit of all the projects reported by stakeholders in the Call for Projects and to identify gaps between these known benefit opportunities and the additional quantity of benefits the Subregion could contribute in order to achieve their portion of the Region's targets (Table 2). The opportunities and constraints that exist in bridging the gap between the two would then be developed.

Table 3. Major Needs, Opportunities, and Constraints in Upper San Gabriel and Rio Hondo River				
	Water Supply	Surface Water Quality	Open Space and Habitat	Infrastructure
Needs	• Reliance on imported water • Water reliability in drought years • Optimize storage capacity	• Impaired water quality • TMDLs • 303(d) listed waterways • Runoff quantity and quality • Volume of stormwater and dry-weather flows • Wastewater effluent • Abandoned and active gravel pits	• Stream modification • Equestrian uses • Protection of uplands	• Not available at this time
Opportunities	• Capture, treatment and reuse of stormwater runoff • Reclaimed water surplus • Conservation • Desalination • Water distribution system improvements • Safe Drinking Water Act Compliance projects • System interconnections for increased reliability • Expanded conjunctive use • Groundwater treatment facilities • Increase replenishment capacity • Gravel pits for storage	• Implementing TMDL, NPDES and AB 885 requirements • Natural treatment systems • Open Space • Habitat • Enhanced flood management • U.S. Army Corps of Engineers participation	• Promote/increase ecosystem restoration in Santa Fe dam • Preserve pristine waters of upper San Gabriel • Equestrian use • Integrate recreation into wetlands and watershed projects. • Provide for maintenance of parks, open space, and trails • Creation of habitat linkages and corridors	• Not available at this time
Constraints	• Funding • Pervasive groundwater contamination (VOC, nitrate and perchlorate) • Limited spreading capacity • No opportunities for ocean desalination • Institutional hurdles to water transfers	• Lack of Funding • Pervasive nature of impairments • Lack and expense of undeveloped land • Public safety • Liability • Impediments to cross-jurisdictional efforts	• Stream Modification • Equestrian Uses • Lack of Data • Protection of Uplands	• Integration with existing infrastructure systems

The list of opportunities and constraints are addressed below by benefit category. This is merely a starting point to define integrated projects and programs in the Upper San Gabriel and Rio Hondo River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

Water Supply

Opportunities to produce water supply benefits in the Upper San Gabriel and Rio Hondo River Subregion are mainly in expanding the use of recycled water, groundwater remediation, infrastructure improvements, and conservation.

Opportunities

- Expansion of recycled water use, storm water and dry weather capture for groundwater recharge.
- Active and inactive gravel mining operations could be used to store recycled water and capture storm water and dry weather flows.
- Stormwater and/or dry weather runoff could offset some of the imported water demands
- Planned and existing stormwater runoff capture facilities can integrate treatment and reuse of urban runoff.
- Additional supply benefits through reuse of treated urban runoff.
- Recycled water expansion projects.
- Idle land next to the San Gabriel River could be used for retention and percolation of storm water.
- The use of recycled water to support riparian and wetland habitat.

Constraints

- Primary purpose of some facilities is flood control, as defined by federal regulations when the facilities were constructed, they cannot be used for other purposes.
- Currently a requirement to bring imported water into the Main San Gabriel basin to replenish water that is pumped in most years.
- Pervasive groundwater contamination has made areas of some of the groundwater basins underlying the Subregion unusable.
- Groundwater recharge will have to be carefully implemented to provide assurances that groundwater will not be contaminated and to avoid movement of current contaminant plumes and/or addition of other contaminants within the groundwater basins.
- Gravel pits are on private property and significant hurdles exist to their development.
- Infrastructure improvements to expand potential recycled water customers in the basin.
- Extent of development limits options for downstream surface water storage and raises the importance of inter-departmental collaboration for water supply infrastructure improvements.
- Desalination opportunities are limited to the treatment and utilization of brackish waters.

Surface Water Quality

Opportunities to creating surface water quality benefits in the Upper San Gabriel and Rio Hondo River Subregion are mainly in addressing point and non point sources of contamination.

Opportunities

- Active and inactive gravel mining operations could be used to store recycled water and capture storm water and dry weather flows.
- Ecosystem restoration by creation of greenways, natural treatment wetlands and stormwater detention basins could be utilized for treatment of urban and storm runoff.
- Water conservation programs would also provide water quality benefits by reducing urban runoff, while producing benefits to the water supply.
- Naturalization of creeks and streams would restore hydrologic function and provide improvements in water quality through sediment reduction.
- Development and implementation of on-site residential BMPs would reduce runoff volume and assist in meeting TMDLs.

- Sediment water quality issues can be combined with habitat restoration efforts that restore creek habitat and restore natural hydrologic function.

Constraints

- Primary purpose of some facilities is flood control, as defined by federal regulations when the facilities were constructed, they cannot be used for other purposes.
- Solutions for water quality must be able to address the issues of both point and non-point sources for a successful solution.
- Stormwater and urban runoff storage will have to be carefully implemented to provide assurances that groundwater will not be contaminated and to avoid movement of current contaminant plumes and/or addition of other contaminants within the groundwater basins.

Open Space and Habitat

Approximately half of the Upper San Gabriel and Rio Hondo River Subregion contains vacant or open space, however a large portion of that open space is existing National Forest Land. The opportunities still exist for the utilization and preservation of urban open space in the Subregion. Expansion of the Santa Fe recreation area and completion of integrated projects such as those within the emerald necklace provide opportunities for increases in habitat and open space while also providing water quality and water supply benefits.

Opportunities

- Reclaimed water can be used to support wetland and riparian areas along the San Gabriel and Rio Hondo Rivers, creating habitat as well as supply benefits.
- Creation of greenways, recreation areas, treatment wetlands, stream naturalization and restoration of hydrologic connections.
- Restoration and creation of native habitats using native vegetation that can also serve to assist in the meeting of water quality goals.
- Modification of un-used flood control facilities to provide open space, habitat and recreation benefits in addition to water supply and water quality.
- Utilization of utility easements and water spreading facilities as habitat and open space.
- Convert idle land next to the San Gabriel River to provide open space, habitat and recreation benefits in addition to water supply and water quality.
- Regional geology allows projects that provide open space and habitat benefits to also provide water quality and quantity benefits

Constraints

- Open space improvements would require land acquisition.
- Lack of a comprehensive plan on how to preserve and restore upstream habitat and open space.
- Cost of land acquisition
- Funding for operation, maintenance, and security of habitat, open space, and trails.
- Liability and safety concerns within water spreading facilities.

Infrastructure Repair and Replacement

Because infrastructure repair and replacement was added only recently as a goal for the IRWMP, limited information has been compiled and limited feedback from stakeholders has been obtained. However, based on this limited information, general opportunities and constraints are:

Opportunities

- Rehabilitation of trunk sewer lines, pump stations and associated infrastructure is needed to reduce inflow and infiltration (I&I).
- Treatment facility upgrades made to meet water quality requirements can be designed to also repair and replace existing infrastructure, extending their useful life.

Constraints

- Coordination or planed infrastructure improvements with needs addressed in IRWMP.

Disadvantage Community Benefits

The disadvantaged communities in the Upper San Gabriel and Rio Hondo River Subregion will receive benefits from projects that provide additional water supply reliability. Open space and recreational oriented projects will provide additional community benefits. The disadvantaged communities have been regularly contacted and invited to participate in Subregional workshops. The cities in the Subregion that contain substantial minority populations have been in attendance at the workshops and have submitted projects that benefit the Upper San Gabriel and Rio Hondo River Subregion will receive benefits from projects that provide additional water supply reliability, open space and recreational opportunities in their communities. See the project location maps in the Project Integration TM to identify these projects.

Conclusions and Next Steps

The results from this analysis suggest that substantial opportunities exist to enhance water supply, water quality, open space, habitat and recreation in the watershed. Over 386 projects are in various stages that will provide these benefits. There are clearly other projects underway that have not yet been surfaced. These projects will be added to the IRWMP list in subsequent iterations. Many projects produce multiple benefits for the Greater Los Angeles County planning area.

The next steps will be to address how to implement integrated projects and programs in the Upper San Gabriel and Rio Hondo River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

APPENDIX D

Benefit Assessment Analysis for Lower San Gabriel and Los Angeles Subregion

APPENDIX D: BENEFIT ASSESSMENT ANALYSIS FOR LOWER SAN GABRIEL AND LOS ANGELES SUBREGION

This technical memorandum (TM), prepared under Task 3 of the Greater Los Angeles County Integrated Regional Water Management Program (IRWMP), identifies the potential opportunities and constraints for the Lower San Gabriel and Los Angeles River Subregion to realize the benefits targeted at the Region-wide level.

County-wide water supply, water quality, open space and habitat, and infrastructure repair and replacement targets have been established for the Greater Los Angeles County Region IRWMP. These targets represent the quantitative benefits that will be achieved with successful implementation of the IRMWP. The relative contributions of the five IRWMP Subregions towards achieving these benefits will be based on many considerations which may include population, land use, presence of disadvantaged communities, and the sets of opportunities and constraints unique to each Subregion.

Benefits Assessment Scenarios

Three scenarios have been chosen for a cost-benefit analysis as part of the Los Angeles IRWMP. The purpose of these three scenarios is to illustrate two main points to stakeholders: the overall cost to meet water supply and water quality targets Region-wide and the cost and benefits of integrating projects to achieve these targets. All three scenarios have particular benefits, impacts and costs which are summarized in Table 1 below. All three scenarios incorporate water supply planning targets consistent with the Metropolitan Water District of Southern California's Integrated Resources Plan. They also represent an aggressive commitment to recycled water.

Scenario 1: Site Scale. This approach reflects continuation of the current approach to water supply, water quality and open space, habitat and recreational projects. This approach is characterized by individual projects pursued by individual agencies and entities in the region and for projects located on individual sites.

Scenario 2: Neighborhood Scale. This scenario reflects a strategic shift to 130,000 acre-feet of the water supply through development of dry weather flow capture and treatment to meet both water quality requirements and water supply needs. This supply development would equally offset planned imported water development.

Scenario 3: Regional Scale. This scenario reflects a further expansion of water quality and water supply co-development through capture and treatment of 120,000 acre-feet of wet weather flows. This additional water supply development would equally further offset planned imported water development.

Benefits Assessment for the Lower San Gabriel and Los Angeles River Subregion

This section identifies the potential opportunities and constraints for the Lower San Gabriel and Los Angeles River Subregion to realize the benefits targeted at the County-wide level.

Land Use and Population Analysis

Table 2 provides an estimate for how much the Lower San Gabriel and Los Angeles River Subregion may be able to contribute toward achieving the region-wide targets planning based on land use and population information provided by the Draft IRWMP.

Table 1. Water Supply, Water Quality, Open Space, Habitat, and Recreation Elements of Scenarios 1 through 3

	Analytical Target	Alternative 1 Single Purpose	Alternative 2 Decentralized	Alternative 3 Centralized
Water Supply[1]	**800,000**	*Acre Feet/Year*		
Water Conservation / Demand Reduction		110,000	110,000	110,000
Expanded Local Water Production		100,000	100,000	100,000
Other Projects (desalination & groundwater recovery)		90,000	90,000	90,000
Additional Recycled Water		130,000	130,000	130,000
Additional Imported Water		370,000	240,000	120,000
Urban (Dry Weather) Runoff		0	130,000	130,000
Stormwater Runoff (from Urban Areas)		0	0	120,000
Total		**800,000**	**800,000**	**800,000**
Surface Water Quality				
Urban (Dry Weather) Runoff	**320,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		124,000	0	0
Treatment [3]				
Traditional (Mechanical/Chemical)		196,000		
Natural (Treatment Wetlands)			320,000	320,000
Use of Treated Water				
Non-Potable Reuse[4]		0	130,000	130,000
Discharge to Creeks and Rivers		196,000	190,000	190,000
Stormwater Runoff (from Urban Areas)	**490,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		189,875	0	0
Short-Term Detention		300,125	490,000	490,000
Treatment				
Traditional (Tertiary)		300,125	0	0
Natural (Treatment Wetlands)				
Secondary Treatment[5]				120,000
Tertiary Treatment			490,000	370,000
Use of Treated Water				
Recharge via Groundwater Basins		0	0	120,000
Discharge to Creeks and Rivers		300,125	490,000	370,000
Open Space & Habitat				
Native wetland restoration	**1,400 acres**			
Riparian habitat/buffer restoration	**100 miles**			
Parks and Open Space creation	**30,000 acres**			
Infrastructure Repair & Replacement				
Flood Management	**20%**			
Water Supply	**20%**			
Wastewater	**20%**			

Notes:
1: Estimated increase in water supply and/or demand reduction above current supplies/conservation
2: Equals approximately 39% of runoff, as that portion of urbanized area is single family homes
3: Assumes tertiary treatment, unless otherwise noted
4: Local distribution of treated urban runoff for irrigation and other uses (similar to reclaimed water)
5: Assumes secondary treatment for subsequent groundwater recharge via spreading basins

Water Supply Relationships
- Residential BMPs would reduce water demand (amount TBD)
- Non-potable reuse of treated Urban Runoff
- Recharge of treated stormwater runoff

Table 2. Lower San Gabriel & Los Angeles River Estimated Potential Contribution Towards Achieving Region-Wide Targets	
Region-wide Target Category	Lower San Gabriel and Los Angeles River Estimated Target Contribution
Water Supply	256,000 AFY [1]
Urban Dry Weather Runoff Capture	92,800 AFY [2]
Stormwater Capture	142,100 AFY [2]
Native Wetlands Restoration	448 acres [1]
Riparian Habitat/Buffer Restoration	32 miles [1]
Parks and Open Space Creation	9,600 acres [1]

1. *Calculated based on Lower San Gabriel and Los Angeles River percentage of total County-wide population (32 percent)*
2. *Calculated based on Lower San Gabriel and Los Angeles River percentage of total developed area (29 percent)*

The Lower San Gabriel and Los Angeles River Subregion is the third largest in the region covering 229,776 acres, which is approximately 18 percent of the 1,306,258 acre Region. In the Lower San Gabriel and Los Angeles River Subregion developed land covers 206,560 acres, which is approximately 90 percent of the land available in the Subregion. Approximately 3.2 million people reside in the Lower San Gabriel and Los Angeles River Subregion making it the third most populated Subregion, accounting for approximately 32 percent of the 10.2 million residents in the Region. Thus, the Lower San Gabriel and Los Angeles River Subregion could provide significant contributions to meeting region-wide targets for water supply, surface water quality, and open space and habitat enhancement. However, the Lower San Gabriel and Los Angeles River contribution to open space and habitat enhancement would be require acquisition and creation of new open space given the lack of existing open space.

Opportunities and Constraints

The context for the opportunities and constraints within the Lower San Gabriel and Los Angeles River Subregion is as follows:

- Opportunities and constraints to realize the benefits targeted at the County-wide level are presented below. The discussion is based on the review of the Call for Projects list and major needs, opportunities and constraints in the Subregion as summarized in Table 3. These major needs, opportunities and constraints were identified during the course of the IRWMP based on various sources including direct input from stakeholders.
- The next step will be to develop a quantitative benefit of all the projects reported by stakeholders in the Call for Projects and to identify gaps between these known benefit opportunities and the additional quantity of benefits the Subregion could contribute in order to achieve their portion of the Region's targets (Table 2). The opportunities and constraints that exist in bridging the gap between the two would then be developed.

Table 3. Major Needs, Opportunities, and Constraints in Lower San Gabriel and Los Angeles River				
	Water Supply	Surface Water Quality	Open Space and Habitat	Infrastructure
Needs	• Reduce reliance on imported water • Improve water reliability in drought years	• Improve water quality • Meet TMDLs • Maintain 303(d) listed waterways • Utilize numerous discharges into rivers • Reduce trash in recreational areas • Restoration of stream habitat and hydrologic function to reduce • Sluicing and disposal of sediments • Reduce impact of septic systems • Improve equestrian uses • Improvement of water quality data and understanding • Reduce untreated storm water	• Restoration of stream habitat • Improve equestrian uses • Improvement of open space and habitat data • Maintenance of wildlife corridor in Puente-Chino Hills • Green waste removal from upstream restoration	• Not available at this time
Opportunities	• Capture, treatment and reuse of stormwater runoff • Reclaimed water surplus • Conservation • Desalination • Water distribution system improvements • Safe Drinking Water Act Compliance projects • System interconnections for increased reliability • Expanded conjunctive use • Water transfers	• Implementing TMDL, NPDES and AB 885 requirements • Implementation of BMPs • Preserve pristine waters of upper San Gabriel • Develop more water quality data • Implementation SWRCB's Non-Point Source Program Plan • Implementation sediment clean up and removal • Improve flood protection	• Promote/increase ecosystem restoration in: • Long Beach/Marina • Coyote Creek • Compton creek • Rio Hondo • La/SG rivers • Los Cerritos wetland complex • Increase channel naturalization • Widening the river channel • Recover/restore landscape hydrologic connections • Create greenway and bikeway along creeks and rivers and transportation and utility corridors • Dual use flood channel and naturalized stream	• Not available at this time
Constraints	• Funding • Pervasive groundwater contamination exist • Institutional hurdles to water transfers	• Wildlife corridor in Puente-Chino Hills under development threat • Degradation from urban runoff • Main San Gabriel Basin contaminated VOC plumes • Lack of expertise in maintaining constructed wetlands • Need capacity building funding for watershed management	• Space for stream modification • Maintaining equestrian Uses • Lack of Data • Wildlife Corridor in Puente-Chino Hills Under Development Threat • Cost of Removal of Green Waste From Upstream Restoration	• Integration with existing infrastructure systems

The list of opportunities and constraints are addressed below by benefit category. This is merely a starting point to define integrated projects and programs in the Lower San Gabriel and Los Angeles River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

Water Supply

Opportunities to produce water supply benefits in the Lower San Gabriel and Los Angeles River Subregion are mainly in expanding the use of desalination, recycled water, groundwater remediation, infrastructure improvements, and conservation.

Opportunities

- Achieve additional supply benefits through reuse of treated urban runoff exist as proposed under Scenario 2.
- Reuse of stormwater for groundwater recharge under Scenario 3.
- Geographic location neat the coast facilitates for seawater desalination under all Scenarios.
- Some recycled water expansion projects could be consistent with the multipurpose emphasis of Scenario 3 by creating accompanying habitat benefits through the use of recycled water to support riparian and wetland habitat.

Constraints

- Infrastructure improvements needed to expand potential recycled water customers in the basin.
- Poor groundwater quality makes conjunctive use and groundwater recharge water supply options less feasible.
- Extent of development limits the options for surface water reservoirs and raises the importance of inter-departmental collaboration for water supply infrastructure improvements.
- Basin currently has limited groundwater recharge capacity due to native soil conditions and lack of available open space.

Surface Water Quality

Opportunities to create surface water quality benefits in the Lower San Gabriel and Los Angeles River Subregion can be delivered by addressing point and non point sources of contamination.

Opportunities

- Ecosystem restoration by creation of greenways, natural treatment wetlands and stormwater detention basins could be utilized for treatment of urban and storm runoff.
- Water conservation programs could also provide water quality benefits by reducing urban runoff, while producing benefits to the water supply.
- Naturalization of creeks and streams would restore hydrologic function and provide improvements in water quality through sediment reduction.
- Development and implementation of on-site residential BMPs would reduce runoff volume and assist in meeting TMDLs.
- Efforts in the Upper Los Angeles River and Upper San Gabriel River can be utilized to assist in reducing nutrient loading and maintaining downstream habitat.
- Sediment water quality issues can be combined with habitat restoration efforts that restore creek habitat and restore natural hydrologic function.

- Many proposed projects offering water quality benefits have the potential to offer concurrent water supply benefits. The sediment control project offers accompanying habitat benefits, making all of the water quality projects consistent with the multipurpose emphasis of Scenario 3.

Constraints

- Limited open space for use in capture and treat, or natural treatment solutions.
- Solutions for water quality must be able to address the issues of both point and non-point sources for a successful solution.

Open Space and Habitat

Opportunities exist for obtaining habitat in the Lower San Gabriel and Los Angeles River Subregion including vacant or open space areas near and adjacent to the Los Angeles, San Gabriel and Rio Hondo Rivers, as well as Coyote and Compton Creeks, and along the costal areas of the Subregion. However, meeting these goals would likely require acquisition of land, or acquisition of rights to easements such as utility easements because currently less than 10 percent of the Subregion is open space and vacant land. Promising opportunities for habitat restoration include the continued acquisition, preservation, and restoration of coastal wetlands such as of the Los Cerritos Wetlands Complex and riverine wetlands such as those within and similar to the Long Beach RiverLink project. Other opportunities for creating habitat benefits exist in restoring aquatic and native vegetation habitat value of these projects, the will result in Open Space benefits equal to the amount of land preserved.

Opportunities

- Reclaimed water can be used to support wetland and riparian areas along the rivers, creating habitat as well as supply benefits.
- Creation of greenways, recreation areas, treatment wetlands, stream naturalization and restoration of hydrologic connections.
- Restoration and creation of native habitats using native vegetation that will also serve to assist in the meeting of water quality goals.
- Many of the open space projects can offer accompanying water quality benefits.
- Open space benefits can be met using a combination of preservation and land acquisition.
- Utility corridors along waterways could be used for open space purposes without incurring the cost of acquisition.
- Open space benefits can be realized through cost sharing partnerships with local, State and non-governmental organizations.

Constraints

- Open space expansion may require land acquisition.
- Need a plan on how to maximize return on investment for preservation and restoration.
- Discontinuous open space areas limit the value of habitat due to absence of corridors and linkage.
- Funding for operation, maintenance, and security of habitat, open space, and trails.

Infrastructure Repair and Replacement

Because infrastructure repair and replacement was added only recently as a goal for the IRWMP, limited information has been compiled and limited feedback from stakeholders has been obtained. However, based on this limited information, general opportunities and constraints are:

Opportunities

- Rehabilitation of trunk sewer lines, pump stations and associated infrastructure is needed to reduce inflow and infiltration (I&I), this process has begun through programs like the City of Los Angeles' 60 Mile Program
- Treatment facility upgrades made to meet water quality requirements can be designed to also repair and replace existing infrastructure, extending their useful life.

Constraints

- Coordination or planed infrastructure improvements with needs addressed in IRWMP.

Disadvantaged Communities

The cities in the Subregion that contain substantial minority populations have been in attendance at the workshops and have submitted projects that benefit the disadvantaged communities. The disadvantaged communities have been contacted and invited to participate in Subregional workshops. The disadvantaged communities in the Lower San Gabriel and Los Angeles River Subregion will receive benefits from projects that provide additional water supply reliability, open space and recreational opportunities in their communities. See the project location maps in the Project Integration TM to identify these projects.

Conclusions and Next Steps

The Lower San Gabriel and Los Angeles River Subregion has the largest population and developed area of the Subregions, with the third largest area. Thus the Subregion accounts for a approximately thirty percent of scaled contributions to County-wide water supply and water quality, while only accounting for three percent of open space benefits. The results from this analysis suggest that substantial opportunities exist to enhance water supply, water quality, open space, habitat and recreation in the watershed. Over 160 projects in various stages have been submitted that will help provide these benefits. However, there are other opportunities for projects that have not yet been submitted, as these projects surface they will be added to the IRWMP list in subsequent iterations. Many of the projects produce multiple benefits for the Greater Los Angeles County planning area. Any remaining gaps in meeting the Subregional share of water quality and water supply benefits will need to be filled with future projects.

Many of the projects identified in the Call for Projects provide multiple benefits and can be integrated at the Regional scale. Therefore, they should be considered as Scenario 3 (Regional, Multi-Purpose Emphasis) projects.

The next steps will be to address how to implement integrated projects and programs in the Lower San Gabriel and Los Angeles River Subregion that maximize the benefits to the Subregion while making progress toward meeting the regional objectives and targets.

APPENDIX E

Benefit Assessment Analysis for South Bay Subregion

APPENDIX E: BENEFIT ASSESSMENT ANALYSIS FOR SOUTH BAY SUBREGION

This technical memorandum (TM), prepared under Task 3 of the Greater Los Angeles County Integrated Regional Water Management Program (IRWMP), identifies the potential opportunities and constraints for the South Bay Subregion to realize the benefits targeted at the region-wide level.

County-wide water supply, water quality, open space and habitat, and infrastructure repair and replacement targets have been established for the IRWMP. These targets represent the quantitative benefits that will be achieved with successful implementation of the IRMWP. The relative contributions of the five IRWMP Subregions towards achieving these benefits will be based on many considerations which may include population, land use, presence of disadvantaged communities, and the sets of opportunities and constraints unique to each Subregion.

Benefits Assessment Scenarios

Three scenarios have been chosen for a cost-benefit analysis as part of the Los Angeles IRWMP. The purpose of these three scenarios is to illustrate two main points to stakeholders: the overall cost to meet water supply and water quality targets region-wide and the cost and benefits of integrating projects to achieve these targets. All three scenarios have particular benefits, impacts and costs which are summarized in Table 1. All three scenarios incorporate water supply planning targets consistent with the Metropolitan Water District of Southern California's Integrated Resources Plan. They also represent an aggressive commitment to recycled water.

Scenario 1: Site Scale. This approach reflects continuation of the current approach to water supply, water quality and open space, habitat and recreational projects. This approach is characterized by individual projects pursued by individual agencies and entities in the region and for projects located on individual sites.

Scenario 2: Neighborhood Scale. This scenario reflects a strategic shift to 130,000 acre-feet of the water supply through development of dry weather flow capture and treatment to meet both water quality requirements and water supply needs. This supply development would equally offset planned imported water development.

Scenario 3: Regional Scale. This scenario reflects a further expansion of water quality and water supply co-development through capture and treatment of 120,000 acre-feet of wet weather flows. This additional water supply development would equally further offset planned imported water development.

Benefits Assessment for the South Bay Subregion

This section identifies the potential opportunities and constraints for the South Bay Subregion to realize the benefits targeted at the County-wide level.

Land Use and Population Analysis

Table 2 provides a rough point of reference for how much the South Bay Subregion may be able to contribute toward achieving the County-wide targets based on land use and population information.

Table 1. Water Supply, Water Quality, Open Space, Habitat, and Recreation Elements of Scenarios 1 through 3

	Analytical Target	Alternative 1 Single Purpose	Alternative 2 Decentralized	Alternative 3 Centralized
Water Supply[1]	**800,000**	*Acre Feet/Year*		
Water Conservation / Demand Reduction		110,000	110,000	110,000
Expanded Local Water Production		100,000	100,000	100,000
Other Projects (desalination & groundwater recovery)		90,000	90,000	90,000
Additional Recycled Water		130,000	130,000	130,000
Additional Imported Water		370,000	240,000	120,000
Urban (Dry Weather) Runoff		0	130,000	130,000
Stormwater Runoff (from Urban Areas)		0	0	120,000
Total		**800,000**	**800,000**	**800,000**
Surface Water Quality				
Urban (Dry Weather) Runoff	**320,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		124,000	0	0
Treatment[3]				
Traditional (Mechanical/Chemical)		196,000		
Natural (Treatment Wetlands)			320,000	320,000
Use of Treated Water				
Non-Potable Reuse[4]		0	130,000	130,000
Discharge to Creeks and Rivers		196,000	190,000	190,000
Stormwater Runoff (from Urban Areas)	**490,000**			
Reduction of Runoff Volumes				
On-Site Residential BMPs[2]		189,875	0	0
Short-Term Detention		300,125	490,000	490,000
Treatment				
Traditional (Tertiary)		300,125	0	0
Natural (Treatment Wetlands)				
Secondary Treatment[5]				120,000
Tertiary Treatment			490,000	370,000
Use of Treated Water				
Recharge via Groundwater Basins		0	0	120,000
Discharge to Creeks and Rivers		300,125	490,000	370,000
Open Space & Habitat				
Native wetland restoration	**1,400 acres**			
Riparian habitat/buffer restoration	**100 miles**			
Parks and Open Space creation	**30,000 acres**			
Infrastructure Repair & Replacement				
Flood Management	**20%**			
Water Supply	**20%**			
Wastewater	**20%**			

Notes:
1: Estimated increase in water supply and/or demand reduction above current supplies/conservation
2: Equals approximately 39% of runoff, as that portion of urbanized area is single family homes
3: Assumes tertiary treatment, unless otherwise noted
4: Local distribution of treated urban runoff for irrigation and other uses (similar to reclaimed water)
5: Assumes secondary treatment for subsequent groundwater recharge via spreading basins

Water Supply Relationships
- Residential BMPs would reduce water demand (amount TBD)
- Non-potable reuse of treated Urban Runoff
- Recharge of treated stormwater runoff

Table 2. South Bay Estimated Potential Contribution Towards Achieving Region-Wide Targets	
Region-wide Target Category	South Bay Estimated Target Contribution
Water Supply	227,583 AFY [1]
Urban Dry Weather Runoff Capture	76,684 AFY [2]
Stormwater Capture	117,423 AFY [2]
Native Wetlands Restoration	392 acres [1]
Riparian Habitat/Buffer Restoration	28 miles [1]
Parks and Open Space Creation	8,400 acres [1]

1. Calculated based on South Bay percentage of total County-wide population (28 percent)

2. Calculated based on South Bay percentage of total County-wide developed area (24 percent)

The South Bay Subregion has one of the largest populations of the five Subregions in the Greater Los Angeles County Region. The Subregion is heavily urbanized and its percentage of total developed land is comparable to the Upper Los Angeles River and Lower San Gabriel and Los Angeles Subregions, which are also heavily urbanized. Based on this, the South Bay Subregion expected contributions to meeting region-wide targets are among the higher of the Subregions in terms of water supply, surface water quality, and open space and habitat enhancement (considered functions of population and developed area); while anticipated contributions to open space and habitat enhancement would be require acquisition and creation of new open space given the lack of existing open space.

Opportunities and Constraints

The context for the opportunities and constraints within the South Bay Subregion is as follows:

- Opportunities and constraints to realize the benefits targeted at the County-wide level are presented below. The discussion is based on the review of the Call for Projects list and major needs, opportunities and constraints in the Subregion as summarized in Table 3. These major needs, opportunities and constraints were identified during the course of the IRWMP based on various sources including direct input from stakeholders.
- The next step will be to develop a quantitative benefit of all the projects reported by stakeholders in the Call for Projects and to identify gaps between these known benefit opportunities and the additional quantity of benefits the Subregion could contribute in order to achieve their portion of the Region's targets (Table 2). The opportunities and constraints that exist in bridging the gap between the two would then be developed.

Water Supply

There are opportunities to produce water supply benefits in the South Bay Subregion including recycled water expansion, desalination, water conservation, and expansion of groundwater storage. There are also opportunities to achieve additional supply benefits through capture, treatment and reuse of treated urban runoff, as proposed under Scenario 2. However, this may be limited by the availability of non-potable supply customers. Although infiltration of stormwater to address water quality needs holds much potential for the region, the availability of this water supply benefits through recharge (as proposed in Scenario 3) is limited due to the soil geology, which hinders recharge to the groundwater basins that are used for supply.

Table 3. Major Needs, Opportunities, and Constraints in South Bay				
	Water Supply	Surface Water Quality	Open Space and Habitat	Infrastructure
Needs	• Reduce reliance on imported water • Improved reliability in drought years	• Volume of stormwater runoff • Volume of dry weather runoff • Industrial discharges • 303(d) listings for Ballona Creek, Dominguez Channel, Port of LA, and beaches	• Disadvantaged communities need more recreation opportunities /open space • Loss of natural function and habitat in channels • Extent of development	• Not available at this time
Opportunities	• Expanded use of recycled water available (seawater barriers, refineries, ports) • Expand groundwater storage and recovery • Implementation of conservation devices • Ocean desalination • Capture, treatment and reuse of stormwater runoff	• TMDL implementation • Ballona Creek restoration • Natural treatment systems • Participation from ports, Army Corps and private industry	• Wetlands restoration/creation (e.g., Ballona, JWPCP Marshland, Gardena) • Creek restoration/daylighting • Trail creation • Natural treatment systems • Multi-objective projects	• Not available at this time
Constraints	• Soils, geology inhibit groundwater recharge via infiltration • Pockets of groundwater contamination (VOCs, MTBE, TDS)	• Lack of funding • Pervasive nature of impairments • Lack of undeveloped land • Impediments to cross-jurisdictional efforts	• Lack of funding • Lack of undeveloped land • "Active" versus "passive" recreation conflicts	• Topography generally makes region-wide pipelines and infrastructure projects prohibitive

Sources:

1. *Ballona Creek Watershed Management Plan (Los Angeles County Department of Public Works, 2004)*
2. *Dominguez Watershed Master Plan (Los Angeles County Department of Public Works, 2004)*
3. *South Bay Stakeholders Workshops Minutes (RMC, 2006)*

Additional details about specific opportunities and constraints impacting water quality benefits are provided below.

Opportunities

- Recycled water can be extended to additional users throughout the region. There are also additional uses that can be considered such as expanded use of recycled water for seawater barriers and for delivery to refineries and ports.
- Desalination of seawater and groundwater is a feasible option, both in expansion of existing operations, as well as construction of new facilities. There are sites in the Subregion that have the existing infrastructure and location suitable for seawater desalination.
- Water conservation for large public landscaping presents opportunities for further demand reductions.
- Water conservation through irrigation controllers and use of native landscaping on residential properties may have potential.
- Projects identified in the Call for Projects that would offer water supply benefits include eight recycled water expansion projects, seven water conservation projects, four desalination projects (two groundwater

and two seawater) and projects for gravel quarry infiltration, aquifer protection, well development, feeder connection development, native plant recycled water usage study and a two public education projects.

- Five dry weather urban runoff projects offer water supply benefits through non-potable reuse through the use of cisterns, which is consistent with the Expanded Multi-Purpose emphasis of Scenario 2.

Constraints

- Hydrogeology of groundwater basins underlying the Subregion prevents substantial groundwater recharge from occurring.
- Groundwater contamination requires advanced treatment for use of groundwater as potable supply.
- The customer demand for non-potable water may be limited, particularly for captured and treated urban stormwater.

Surface Water Quality

A variety of opportunities exist for achieving water quality benefits in the South Bay Subregion. The highly urbanized environment generates significant sources of pollutants that are carried to creeks as runoff during dry weather and storms. Stormwater produces high peaks of pollutant loading due to the high proportion of impervious surfaces and the channelization of rivers and creeks. Surface water quality benefits can be achieved by capturing dry weather urban runoff and stormwater for treatment, detention, and/or infiltration. Water conservation projects also offer water quality benefits through reductions in urban runoff.

Additional details about specific opportunities and constraints impacting water quality benefits are provided below.

Opportunities

- Bacteria, trash, metals and nutrient TMDL implementation plans either have been completed or will be completed shortly that assist the Subregion with identifying potential BMPs and sites for implementation.
- Existing open space such as parks and schools can be utilized to implement stormwater detention and treatment BMPs.
- Projects identified in the Call for Projects that would offer water quality benefits include 24 stormwater management and urban dry weather runoff projects including storm drain retrofits, infiltration, biofiltration, disinfection, constructed wetlands and BMPs. Two projects for harbor and lake water quality improvement were also identified.
- Six water quality projects offer habitat and open space/recreation benefits by creating open spaces for wildlife habitat, making them consistent with the multi-purpose emphasis of Scenario 3.

Constraints

- The Subregion encompasses a number of different entities and effective water quality improvement implementation requires cross jurisdictional coordination and cooperation.
- The relative lack of undeveloped land makes finding sites suitable for stormwater capture more difficult.

Open Space and Habitat

Because the South Bay Subregion is highly developed and has experienced substantial loss of open space and riparian and wetland habitat, there is a need to create open space/recreation and habitat benefits that will improve the quality of life for the inhabitants of the Subregion.

Additional details about specific opportunities and constraints impacting open space/recreation and habitat benefits are provided below.

Opportunities

- There are multiple opportunities for park improvement, creation of trails and biking paths, land acquisition and restoration of riparian and wildlife habitat activities throughout the Subregion.
- Projects identified in the Call for Projects that provide open space and habitat benefits include 20 riparian habitat restoration projects, ten parks projects, eight constructed wetlands, and three public education and outreach projects.
- The constructed wetlands and riparian habitat projects offer accompanying water quality benefits, making them consistent with the multi-purpose emphasis of Scenario 3.

Constraints

- There is a potential conflict between developing open space/recreational benefits that address "active" (e.g., sports fields) versus "passive" (e.g., wildlife viewing) recreational needs.

Infrastructure Repair and Replacement

Because infrastructure repair and replacement was added only recently as a goal for the IRWMP, limited information has been compiled and limited feedback from stakeholders has been obtained. One opportunity that has been identified is to combine treatment facility upgrades made to meet water quality requirements with repair and replacement of existing infrastructure to extend its useful life.

Disadvantaged Communities

Under Proposition 50, Chapter 8, the State defines a disadvantaged community (DAC) as one in which the median income is less than 80 percent of the Statewide median income. In 2005, this was approximately $38,000. Based on this definition and an analysis of median income data by Year 2000 census tracts, approximately 50 percent of the total South Bay region population lies within a DAC. These DACs may receive benefits in some or all categories during IRWMP implementation in the Subregion. However, the specific blueprint for achieving this needs further development. Possible benefits to DACs would include: having a clean, reliable and affordable water supply; water quality improvements in the nearby creeks, rivers and beaches; improved access to parks and trails; and availability of educational and wildlife viewing opportunities. New projects need to be conceived that can provide these benefits to the South Bay Subregion DACs.

The stakeholder process will ensure that the benefits address community needs that are expressed through organizations such as the Los Angeles Neighborhood Initiative (LANI) which serves underserved neighborhoods in the City of Los Angeles, and the Department of Neighborhood Empowerment (DONE), which encompasses 97 neighborhood councils in the City of Los Angeles. Both organizations include DACs in the South Bay Subregion.

Conclusions and Next Steps

The South Bay Subregion is densely populated and highly urbanized which translates to high water demand and significant water pollution. Because of this, the amount of potential contribution to County-wide water supply and water quality benefits will be among the highest of the Subregions. The opportunities available through recycled water and desalination should allow the South Bay Subregion to contribute significantly to meeting the County-wide water supply goal. The capture of urban dry weather runoff and stormwater will provide a large amount of water quality benefits. Dry weather runoff capture and treatment projects include non-potable water supply benefits that are consistent with Scenario 2. However, a main challenge in realizing these benefits lies in finding enough non-potable supply users. Additional water supply benefits through recharge of stormwater (as proposed under Scenario 3) would be limited due to the closed nature of the

groundwater basin. There are many opportunities to address quality of life issues in the Subregion by creating open space/recreation and habitat benefits in conjunction with projects that also produce water quality benefits.

One hundred projects have already been identified through the Call for Projects that will go a long way towards meeting the South Bay's potential share of benefits in all categories. Many of the projects identified in the Call for Projects provide multiple benefits and should be considered as Scenario 3 (Multi-Purpose Emphasis) projects. These include:

- The use of water conservation (primary water supply benefit) to reduce urban runoff (accompanying water quality benefit)
- The use of urban runoff projects (primary water quality benefit) to provide water for non-potable reuse (accompanying water supply benefit)
- Implementation of stormwater management projects (primary water quality benefit) to create open space/recreation areas and riparian habitat (accompanying recreational/open space and habitat benefit)
- Native riparian habitat restoration (primary habitat benefit) that would improve downstream water quality (accompanying water quality benefit)

The next steps will be to address how to further refine and implement integrated projects and programs in the South Bay Subregion that maximize the benefits to the Subregion while making progress toward meeting the County-wide objectives and targets.