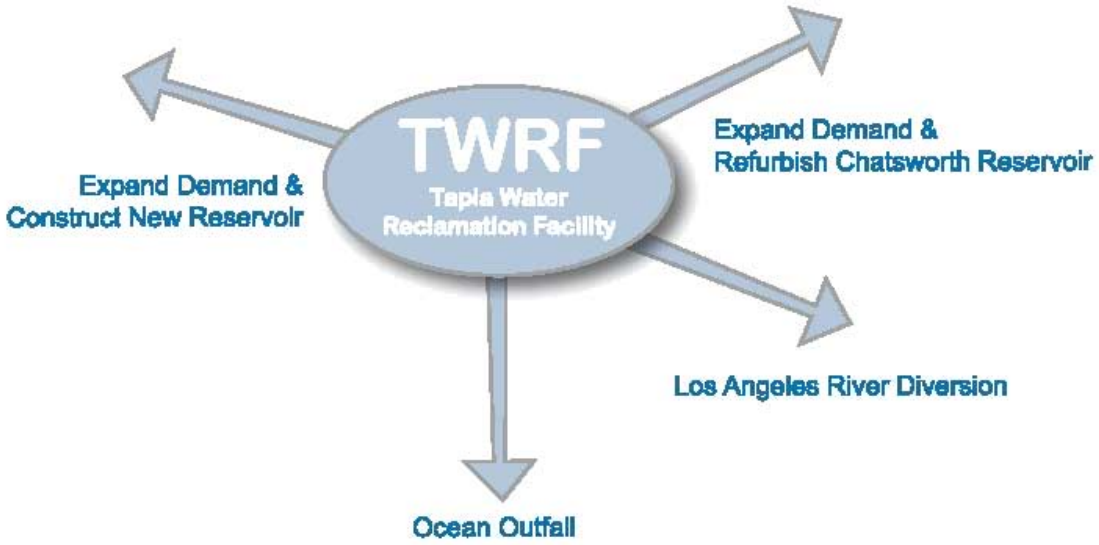
TAPIA EFFLUENT ALTERNATIVES STUDY
SUMMARY REPORT



INTRODUCTION

In 2005, the Joint Powers Authority of Las Virgenes Municipal Water District (LVMWD) and Triunfo Sanitation District (TSD) launched the Tapia Effluent Alternatives Study (TEA) to evaluate sustainable year-round alternatives to releasing surplus effluent from the Tapia Water Reclamation Facility (TWRF) into Malibu Creek.[1] The objective of the study was to investigate a range of projects that singly or in combination could provide long-term 12-month creek avoidance.

Sustainable 12-month creek avoidance requires accommodating from 33 to 44 million gallons of recycled water a day, which is the total volume processed through TWRF on a maximum-flow day. It must also accommodate a total annual volume of 13,500 acre feet a year (AF/y), which is TWRF's workable capacity of 12 million gallons per day (mgd) x 365 days. Any creek avoidance strategy that calls for expanding beneficial use of recycled water through irrigation must also include provision for at least 4,000 acre feet (AF) of storage.

The strategic challenges associated with long-term creek release avoidance are substantial and range from the unique natural characteristics of the Malibu Creek Watershed to limits on public financial resources and perceptions regarding wastewater management. Individual or combined options that may have functioned effectively elsewhere prove problematic in the districts' service areas. Each of the alternatives considered presents operational and environmental challenges, and each is expensive, ranging from estimates of $54.8 million for an ocean outfall to $191.7 million to expand the districts' recycled water infrastructure and construct seasonal storage.

This summary report presents an overview of the TEA Study's background, methodology, results and conclusions. A copy of the complete study is available through Las Virgenes Municipal Water District.

BACKGROUND

TWRF operates under a National Pollution Discharge Elimination System (NPDES) permit issued by the Los Angeles Regional Water Quality Control Board (LARWQCB) under the 1972 Federal Clean Water Act. In 1997, LARWQCB restricted TWRF from its previously permitted practice of releasing all surplus recycled water into Malibu Creek. The change in the permit prohibited TWRF from releasing effluent for six months of the year, from May 1 through October 31, except in the case of an operational emergency or storm event. In 1999 the board extended the creek release prohibition to seven months, prohibiting discharge from April 15 through November 15, and adding a third exemption that required dry season release as needed to maintain habitat for endangered species.

Release of surplus effluent from TWRF into Malibu Creek has continued to be an issue. Environmental organizations have proposed that the seven-month discharge prohibition be extended to year-round, and LARWQCB has suggested diverting all of TWRF's surplus to the Los Angeles River. LARWQCB has also announced its intention to develop Total Maximum Daily Loads (TMDLs) for nutrients for Malibu Creek and has indicated that these would be more restrictive than current standards developed by USEPA. In light of such considerations, the districts concluded it would be prudent to undertake an indepth study of the viability of year-round creek avoidance.

[1] The Joint Powers Authority of Las Virgenes Municipal Water District which is located in Los Angeles County and the Triunfo Sanitation District in Ventura County provides wastewater treatment, recycled water and biosolids composting for homes and businesses throughout the Malibu Creek Watershed.

METHODOLOGY

A consortium of experts in the fields of watershed ecology, habitat, geology and groundwater management, civil engineering, public affairs, government and land use planning was assembled to identify and evaluate a range of creek release alternatives.[2] From an initial list of 150 projects 13 were chosen for extensive review and subsequent evaluation according to five equally-weighted criteria: 1) economic costs and benefits, 2) operational flexibility, 3) environmental effects, 4) public considerations, and 5) sustainability (see Figure 1). Consideration was also given to the degree to which each project made effective use of the districts' existing facilities and ongoing operations and maintenance practices, the potential to which each might affect current interests and perspectives within the Malibu Creek Watershed and the role of LVMWD and TSD as government agencies. From this short list of 13 projects, four detailed alternatives were developed, subjected to rigorous scrutiny and rated on a scale of 0-5 using the above-described criteria (see Figure 2).

A Unique Region

The Malibu Creek Watershed and its surrounding region present challenges to construction and management of modern urban infrastructure. Residential and commercial development is spread out over 109 square miles in Agoura Hills, Calabasas, Hidden Hills, Oak Park, Thousand Oaks, Westlake Village and in outlying rural areas of unincorporated Los Angeles and Ventura counties. Development has expanded beyond the 101 freeway corridor to the foothills of the Santa Monica Mountains and into the mountains themselves.

Much of the area's underlying rock is soft and fractured and not conducive to water storage, which accounts for the fact that the region has no sizable groundwater aquifers, few year-round streams and almost no natural wetlands. Steep slopes of poorly cemented sedimentary rock can confound subsurface construction and maintenance. High intensity Pacific storms are known to leave behind mudslides and floods. That the area is by nature geologically active was demonstrated in 1994, when the Northridge Earthquake triggered 1,400 landslides in the Santa Monica Mountains.

Half of local lands are held in public ownership and are managed through cooperative agreements among 70 national, state and local agencies, including the National Park Service, the California Department of Parks and Recreation, Santa Monica Mountains Conservancy and various city and county agencies. Regulations aimed at protecting threatened and endangered species can affect how infrastructure is constructed and also influence business practices. Half of the districts' service area lies within the coastal zone where development and construction are regulated by the California Coastal Commission.

Existing Creek Avoidance

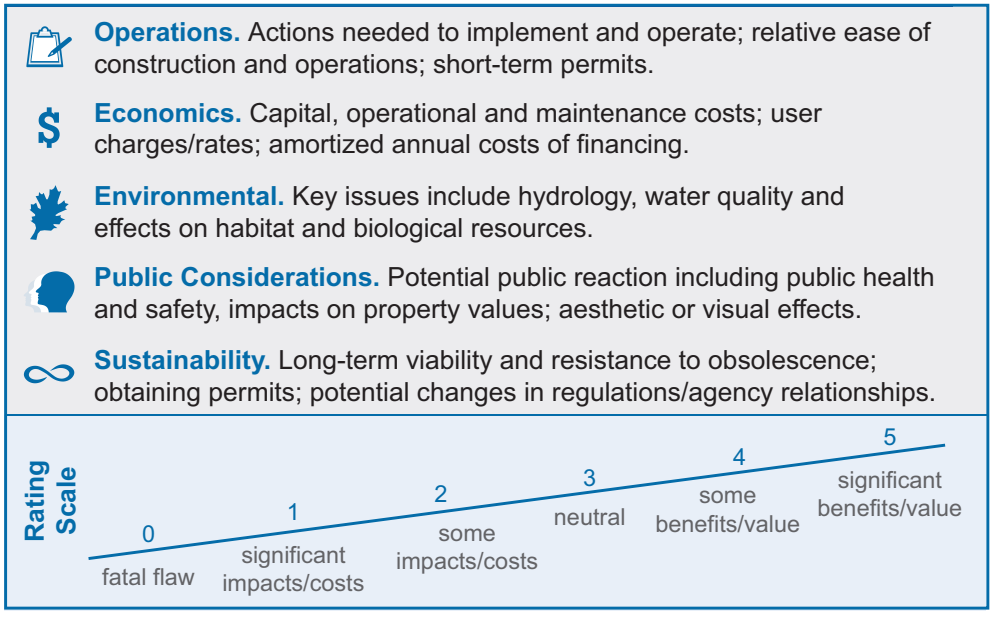
Among the creek avoidance projects considered, three have been implemented to some degree to comply with LARWQCB's seven-month release prohibition. These include:

- *Expanded Use of Recycled Water for Irrigation.* Since 1997 the districts have developed 74 new recycled water connections, increasing recycled water demand by 15 percent. Currently over 60 percent of TWRF's inflow is recycled.

- *Diversion of Raw Wastewater to the City of Los Angeles Sewer System.* The districts have negotiated a temporary agreement with the City of Los Angeles to allow diversion of a portion of raw wastewater from areas of Calabasas and Hidden Hills to the city's wastewater treatment facilities. Approximately $7 million in capital improvements to the districts' facilities and the City of Los Angeles wastewater system would be needed to permanently shift all the wastewater in this area, which is tributary to the Los Angeles River, to the city's facilities year-round. Purchase of capacity rights in the City of Los Angeles treatment system would also be required.

- *Discharging Recycled Water to the Los Angeles River.* In 1999 LARWQCB permitted discharge of recycled water to the L. A. River, requiring the river be

FIGURE 1: Evaluation criteria



[2] The study was coordinated and the final report prepared by Kennedy/Jenks Consultants, based in San Francisco, CA.

STUDY RESULTS

Figure 3 compares the composite ratings of the four alternatives the study considered in detail. Both Alternatives A and B require the construction of only a single facility. Alternative A, discharge of surplus effluent into the ocean near Malibu, would require a pipeline leading to an offshore outfall. Alternative B would require a pipeline and associated pumping facilities to divert surplus recycled water to the Los Angeles River. Both Alternatives A and B are able to accommodate TWRF's maximum daily effluent volume and total annual volume. In neither case is storage required. Both alternatives also allow the districts the flexibility to provide recycled water for irrigation during summer months and avoid creek release during winter and shoulder months.

Both Alternative C and Alternative D depend on maintaining a critical balance between storage and expanding beneficial use through irrigation. Alternative C would require the construction of a new reservoir in the Santa Monica Mountains. Alternative D would require refurbishment of the existing Chatsworth Reservoir. Significantly, neither alternative meets TWRF's required maximum daily diversion volume or annual volume without being supplemented with additional disposal strategies. (See Figure 4 for a numeric comparison of alternatives by cost and evaluation criteria.)

used only after all other creek release avoidance strategies were exhausted. This requirement was changed in 2005, allowing recycled water to be released to the river at any time. Meeting the existing nitrate TMDL of 8 mg/L has required approximately $1 million in upgrades at TWRF.

Alternative A: Ocean Outfall

Rating: 3.6 ■ Cost: $54.8 million

Disposing of unused recycled water through an ocean outfall would require construction of a pump station at TWRF, a force main and a gravity-flow pipeline through Malibu Canyon to a subsurface outfall off the Malibu coast. The outfall would allow the districts flexibility to draw recycled water to meet seasonal irrigation demand and dispose of what is not used.

An ocean outfall would require a new discharge permit from LARWQCB and an amendment to LARWQCB's Basin Plan. The outfall would also be subject to approval by the Coastal Commission and the State Lands Commission. The pump station, land pipeline and outfall would require diligent periodic inspection, repair and maintenance. There would be energy costs associated with pumping to the high point in Malibu Canyon before the water can gravity flow to the outfall.

The outfall would bypass Malibu Creek altogether. The volume of recycled water discharged into Santa Monica Bay would not increase. The overall ecological impacts of tertiary treated coastal discharges are extremely low, and adherence to existing water quality regulations would ensure effects remain less than significant. While subsurface ocean discharge has the potential to affect water chemistry in the immediate vicinity of an ocean outfall, physical mixing and dilution would limit any such effects to the immediate vicinity.

Construction would likely require extensive rock cutting in the Malibu Canyon Road right-of-way and possible suspension of the pipeline off the canyon walls. Portions would be visible until vegetation regenerates. During construction the public traveling on Malibu Canyon Road and at the beach at Malibu may be inconvenienced.

The pipeline would be located primarily within public rights-of-way. Encroachment permits would be required from Los Angeles County, CalTrans, the City of Malibu and perhaps the state of California. Other agencies with potential interest in the project include Los Angeles County's Department of Beaches and Harbors and Department of Regional Planning, Santa Monica Bay Restoration Commission, South Coast Air Quality Management District, Coastal Conservancy, California Department of Fish and Game, Santa Monica Mountains Conservancy, California Department of Parks and Recreation, U.S. Fish and Wildlife Service, National Marine Fisheries Service and Army Corps of Engineers.

Obtaining the necessary permits for construction would require substantial effort, although once the permits are issued, they would not likely be terminated. The traditional lifespan of this type of pipeline is 50 to 100 years, subject to location and construction conditions.

FIGURE 2:
Refined list of potential projects

1	Ocean Outfall
2	Pipeline to L.A. River
3	Divert Raw Wastewater to City of Los Angeles Facilities
4	Pipeline to Calabasas City Center
5	Pipeline to Agoura Gap
6	Decker Canyon pipeline to Malibu Golf Course
7	Pipeline to T.O. Blvd, Russell Park
8	Pipeline to Eastern Ventura County - A
	Pipeline to Eastern Ventura County - B
	Pipeline to Eastern Ventura County - C
9	Chatsworth Reservoir, Pump Station and Pipelines
10	Reservoir, Pump Station and Pipeline Improvements (Donnell)
11	Tank Farm Storage
12	Expanded Residential Reuse
13	Evaluation of Additional Reservoir Sites

Alternative B: Divert Surplus to Los Angeles River

Rating: 3.0 ■ Cost: $65.5 million

A 14-mile pipeline would be constructed to transport TWRF's surplus recycled water to a discharge point in the Los Angeles River upstream of the first fully concreted section of river near the intersection of Vanowen Street and Canoga Avenue. Any river discharge must be accomplished in accordance with Los Angeles River TMDLs. TWRF currently meets the river's existing nitrate TMDL of 8 mg/L for occasional release but would have to be retrofitted to meet that standard for sustained, long-term release. The effluent would also have to meet the metals TMDL for the Los Angeles River, which has been developed but not yet approved by the State Water Resources Control Board. Additionally, since unlined sections of the river are designated for groundwater recharge, limits on total dissolved solids are more stringent in the river than in Malibu Creek.

Construction and subsequent operation of Alternative B could result in environmental effects on the river's biological resources due to increased flow. These include displacement of areas of high avian feeding rates. Other potential effects include impacts on sheet-flow-related algal growth and the river's invertebrate populations, as well as impacts on the estuary at the river's mouth in Long Beach, which currently provides forage for large numbers of avian species.

Reaction among Los Angeles River interest groups such as the Friends of the Los Angeles River and River Project to transfer of effluent between watersheds is currently unknown but would need to be addressed. The Los Angeles County Department of Public Works has expressed concern about the effects of additional discharge on the hydraulic capacity of the river for flood protection. Other public agencies likely to comment on the project include the Los Angeles Department of Sanitation Watershed Protection Division, Los Angeles River Ad Hoc (City Council) Committee, the National Marine Fisheries Service and the California Department of Fish and Game.

Operationally, future regulatory changes for the Los Angeles River could require construction of additional advanced treatment facilities and technology at TWRF. This could leave the districts with the pipeline as a stranded asset. The projected lifetime of this type of pipeline is 50-100 years, depending on its location and environmental conditions. The pipeline and pumps would require periodic monitoring and maintenance.

Alternative C: Expand Recycled Water Use/Construct Reservoir at Donnell Ranch

Rating: 3.4 ■ Cost: $141.8 million

Alternative C depends on balancing increased demand for recycled water with storage. For storage to work, sufficient demand must be created to empty the reservoir each year in order to accommodate the next year's surplus.

Demand would be increased through such new uses as residential front yard irrigation, which would require new distribution pipelines and additional extensions and upgrades to the current recycled water infrastructure. Residential reuse would require development of construction and end-user protocols to protect against cross-connection between potable and recycled water lines. Storage would be provided by a new reservoir that would be constructed at Donnell Ranch in the Santa Monica Mountains.

In addition, Alternative C would reduce inflow into TWRF through a dry-weather transfer of approximately 2,500 AF/y of raw wastewater to the City of Los Angeles sewer system.

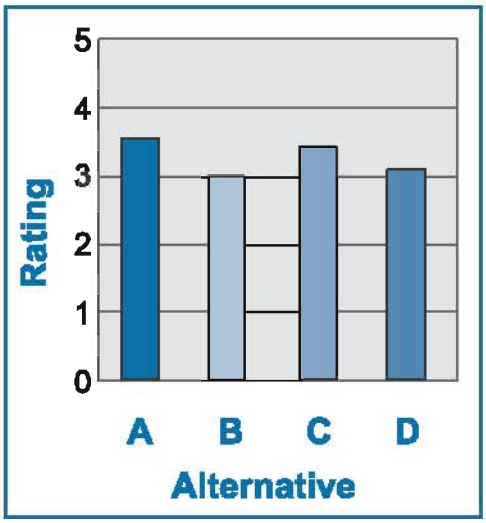
Construction of some pipeline extensions, such as Decker Canyon into the Santa Monica Mountains to serve the Malibu Golf Course and adjacent housing, is projected to be costly compared to the increased demand in recycled water these projects would generate. Recycled water extensions along the 101 freeway corridor would be more easily constructed but also would not increase demand substantially in relation to their cost.

Various regulatory agencies have concerns about nitrogen concentration from fertilizers in lakes and the creek downstream, and a similar concern might arise about the golf course's use of recycled water. However, because recycled water reduces the need for fertilizer and is more regulated than potable water irrigation, nitrogen runoff would likely be less with use of recycled water.

Construction of storage and a new pipeline would have potential effects on sensitive biological resources. The reservoir's dam would introduce a substantial visual element in a relatively natural setting. Local groups, associations or other entities that could be interested in these projects include homeowners and businesses impacted by pipeline construction as well as environmental and civic groups. Construction would require permits and permissions that are subject to public approval.

Once a market for recycled water is secured and infrastructure constructed, few problems are anticipated with sustaining the new reservoir. The infrastructure and reservoir have a projected sustainability of 50-100 years. Interagency agreements and contracts would be subject to periodic review that could lead to cancellation.

FIGURE 3:
Comparison of composite ratings for Alternatives A, B, C and D



Alternative D: Expand Recycled Water Use/Storage at Chatsworth Reservoir

Rating: 3.1 ■ Cost: $191.7 million

Like Alternative C, Alternative D depends on balancing storage with increasing demand for recycled water. In this case storage would be in Chatsworth Reservoir, which is currently owned by the Los Angeles Department of Water and Power. As with Alternative C, Alternative D includes a small diversion of raw sewage to City of Los Angeles treatment facilities. In addition it includes a small discharge of unused recycled water to the Los Angeles River.

Geological hazards in the vicinity of the Chatsworth Reservoir caused the City of Los Angeles to take the reservoir out of service after the 1991 Sylmar Earthquake, and soil liquefaction and earthquake-induced landslides could affect the safety of the two new dams that would have to be constructed. The dams would be subject to review by the state Department of Conservation and the Los Angeles County Flood Control District. Encroachment permits would be required from the City of Los Angeles, CalTrans, the cities of Calabasas and Hidden Hills and the Hidden Hills Property Owners Association.

The reservoir site includes oak woodlands, native grassland and freshwater marshland considered sensitive by state and federal resource agencies, as well as open water habitat that offers important wintering and breeding grounds for songbirds and waterfowl. The Simi Hills and the Santa Susana Mountains provide important wildlife linkages between the Santa Monica Mountains and San Gabriel Mountains. The Los Angeles City Council has named the entire site a natural preserve and designated it open space in the city's general plan.

Agencies and organizations that may have an interest in the disposition of the site include the San Fernando Chapter of the Audubon Society, California Wetlands Coalition, Mountains Restoration Trust, Santa Susana Park Association, Chatsworth Neighborhood Council and Santa Monica Mountains Conservancy. Because Alternative D involves importing recycled water from the Malibu Creek to the Los Angeles River Watershed, other interested groups would likely include the Friends of the Los Angeles River, River Project, Los Angeles and San Gabriel Rivers Watershed Council and City of Los Angeles Integrated Resource Plan (Public) Advisory Group.

Added to environmental factors associated with the site, the historic use of copper sulfate to reduce algae blooms at the reservoir may have resulted in elevated copper levels in soils that would have to be removed or encapsulated.

A lifetime of at least 50-100 years is projected for the reservoir and pipelines. Interagency agreements and contracts would be subject to periodic review and potential cancellation. Pumping water to the Chatsworth Reservoir would be costly.

FIGURE 4: Numeric comparison of Alternatives A, B, C and D by cost and evaluation criteria

Alternatives	Daily Capacity (MGD)	Annual Volume (AF/y)	Holding Volume (AF)	Cost (pre-Hurricane Katrina construction dollars)	Economics	Environmental	Operations	Public Cons.	Sustainability	Composite Ratings
Requirement for Total System	38	13,500	4,000							
Currently Available	12	7,000	200							
Alternative A										
Land & Ocean Outfall Pipeline	38	13,500	0	$54,800,000	5	2.5	4	2.5	4	3.8
Alternative B										
Disposal Pipeline to LA River	38	13,500	0	$85,500,000	4	3	3	3	2	3.0
Alternative C										
T.O. Blvd. & Russell Park Pipeline		251	0			3.5	3.5	3	3.5	
Decker Canyon to Malibu Golf Course		294	0			5	4	4	2.5	
Agoura Gap Pipeline		42	0			4	4	4	3.5	
Calabasas City Center Pipeline		24	0			4	3	3.5	4	
Raw Wastewater to L.A. City Facilities	2	1,600	0			3	4.5	4	3.5	
Pipeline to Eastern Ventura County		2,800	0			2.5	2	3	3	
Storage Reservoir, Pipe, PS (Ie, Donnell Res.)	12	0	4,000			2.5	4.5	3	4	
Upgrades to LVMWD Recycled Water Sys.	12	0	0			Further Evaluation Needed				
Residential Yard Use		650	0			Further Evaluation Needed				
Unidentified Disposal & Cat. 1 Projects		849	0			Further Evaluation Needed				
Total, Alternative C	26	6,511	4,000	$141,800,000	3	3.5	3.6	3.5	3.4	3.4
Alternative D										
T.O. Blvd. & Russell Park Pipeline		251	0			3.5	3.5	3.0	3.5	
Decker Canyon to Malibu Golf Course		294	0			5.0	4.0	4.0	2.5	
Agoura Gap Pipeline		42	0			4.0	4.0	4.0	3.5	
Calabasas City Center Pipeline		24	0			4.0	3.0	3.5	4.0	
Raw Wastewater to L.A. City Facilities	2	1,600	0			3.0	4.5	4.0	3.5	
Pipeline to Eastern Ventura County		2,800	0			2.5	2.0	3.0	3.0	
Chatsworth Reservoir, Pipe, PS	12	0	4,000			3.0	3.0	3.0	2.5	
Pierce College		1,000	0			Further Evaluation Needed				
Residential Yard Use		650	0			Further Evaluation Needed				
Disposal Pipeline to LA River	12	0	0			Further Evaluation Needed				
Total, Alternative D	26	6,662	4,000	$191,700,000	2	3.6	3.4	3.5	3.2	3.1

CONCLUSIONS

The TEA Study concludes that applying the five equally weighted criteria to Alternatives A through D does not result in a clearly differentiated course of action. Nor does it remove any of the alternatives from consideration.

Developing a year-round alternative for avoiding creek release is not a straightforward process. Primary challenges include the topography of the Malibu Creek Watershed, multiple overlapping regulatory jurisdictions, potentially conflicting special interests within watershed populations, and sometimes contrary positions among a variety of agencies and advocacy organizations.

Alternative A (ocean outfall) received the highest overall rating, thus suggesting it as the most suitable to achieve 12-month creek release avoidance. But closer examination reveals that while Alternative A received the highest marks for both operational ease and sustainability and would be the least expensive to construct and maintain, its environmental rating is low. This is in part because of construction impacts. Likewise Alternative A received a low score for public considerations.

Alternative D, a collection of projects based on balancing storage with increased demand for recycled water, would be the most expensive to construct and operate but was rated high environmentally. Conversely, environmental considerations caused Alternative B (L. A. River diversion), which is operationally simpler and much less expensive, to be rated lower overall than both of more costly Alternatives C and D. Although both storage alternatives ranked higher for public considerations than the ocean outfall or river diversion, neither storage alternative is able to meet the requirements of 38 mgd peak capacity and 13,500 AF/y effluent volume.

None of the four alternatives can be readily fitted into the districts' existing infrastructure. Alternatives B, C and D would require $4.9 million in upgrades at TWRF to achieve consistent 8 mg/L for nitrogen as well as $2.6 million in upgrades at Rancho Las Virgenes Composting Facility.

Also, Alternatives B, C and D would require increased pumping capacity to deliver recycled water from TWRF to LVMWD headquarters ($5.4 million) and increased pipeline capacity ($9.1 million) plus recycled water pump station upgrades at LVMWD headquarters ($6.7 million) and upgrades in the existing distribution system.

The complexities that resulted from comparison of the criteria ratings reflects the challenges of constructing and maintaining public service infrastructure in the Malibu Creek Watershed. Study results demonstrate that each 12-month alternative would pose environmental challenges. Each would be costly and would require creative solutions to generate the necessary capital. Not all the options are equally sustainable.

Based on these findings, the TEA Study concludes that any long-term sustainable alternative to the districts' currently permitted practice of releasing surplus recycled water into Malibu Creek will depend on collaboration and problem-solving among a wide variety of civic and nongovernmental agencies. Sustained creek avoidance strategies will also require thorough and sound analysis of economic costs and benefits in conjunction with operational flexibility. All of the above factors must be carefully balanced with a systematic evaluation of environmental effects. Selecting any alternative for potential implementation would require compromise.

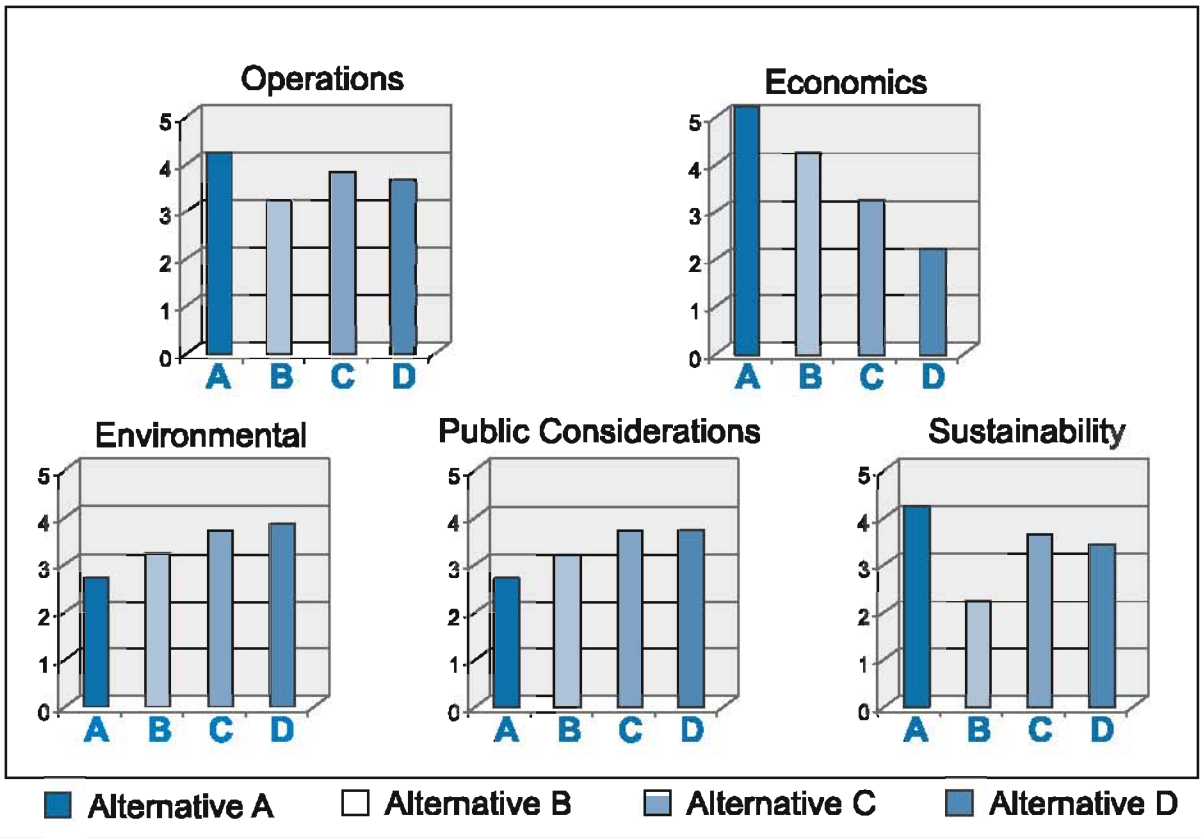


FIGURE 5: Comparison of alternatives by individual evaluation criteria