



Proposition 1E Stormwater Flood Management Grant Proposal Lake Wohlford Dam Replacement Project

Attachment 9: Economic Analysis – Water Quality and Other Expected Benefits

Attachment 9 consists of the following items:

- ✓ **Water Quality Background.** This attachment provides an overview of water quality issues in the region and within the City of Escondido.
- ✓ **Water Quality and Other Expected Benefits.** The body of this attachment provides a description of the water quality and other benefits associated with implementation of the proposed project.

This attachment contains estimations of the water quality and other benefits, as well as the total costs associated with the *Lake Wohlford Dam Replacement Project*. Section 1 provides a summary of local and regional water quality issues with respect to the San Diego IRWM Region, as well as with respect to the Project Area. Section 2 contains a narrative description of the expected costs that would be incurred to implement and operate the project over the project's lifetime (through 2060). Section 3 contains a narrative description of the expected water quality and other benefits of the *Lake Wohlford Dam Replacement Project*, which are equivalent to the water quality and other benefits associated with this grant proposal. Where possible, each benefit was quantified and presented in physical or economic terms. In cases where quantitative analyses were not feasible, this attachment provides complimentary qualitative analyses. In addition, this attachment provides a description of economic factors that may affect or qualify the amount of economic benefits to be realized. This attachment also includes a discussion regarding uncertainties about the future that might affect the level of benefit received.

Water Quality Background

The San Diego IRWM region lies entirely within the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB), which regulates water quality and discharges to surface waters. Municipal stormwater runoff within the region is regulated through a single National Pollutant Elimination System (NPDES) Municipal Separate Storm Sewer System Permit (MS4 Permit), which is issued by the San Diego RWQCB to 21 Copermittees (Order No. R9-2007-0001, NPDES CAS0108758) with the County of San Diego (see Attachment 8 for more detail about the MS4 Permit and Copermittees).

The San Diego RWQCB has identified over 40 inland surface water bodies, located in ten of the region's eleven hydrologic units, as not attaining applicable water quality objectives. Primary water quality constituents of concern for the region's surface waters include coliform bacteria, sediment, nutrients, salinity, metals, and toxic organic compounds. The RWQCB has completed Total Daily Maximum Loads (TMDLs) for several of these non-complying waters, and has initiated TMDLs for a number of additional impaired waters.

Escondido Creek and Lake Wohlford are located within the Carlsbad Hydrologic Unit, which drains in a westerly direction from Lake Wohlford to the Pacific Ocean through the San Elijo Lagoon (SDRWQCB 1994). Therefore, releases from Lake Wohlford are ultimately discharged into the Pacific Ocean via Escondido Creek and the San Elijo Lagoon. The San Diego RWQCB lists portions of Escondido Creek on the TMDL-required 303(d) list for dichlorodiphenyltrichloroethane (DDT), enterococci bacteria, fecal coliform, selenium, sulfates, total nitrogen, and toxicity. The San Elijo Lagoon is also listed on the 303(d) list for eutrophication, indicator bacteria, and sedimentation/siltation (SDRWQCB 2008). Lake Wohlford is not currently identified by the San Diego RWQCB as having water quality issues, although water entering the lake from the Escondido Canal has been found to have elevated levels of total coliform bacteria (SDRWQCB 2008 and ICF Jones and Stokes 2008).

Beneficial uses designated for Lake Wohlford, Escondido Creek, and San Elijo Lagoon all include the following: Municipal, Agricultural, Recreation 1&2, Warm, Cold, and Wild. Lake Wohlford is designated for recreational uses with the caveat that it is only available for fishing from shore or a permitted boat, as this lake is a domestic drinking water reservoir and therefore has a no water contact policy. In addition, the easternmost and westernmost portions of the lake are closed to the public.

Lake Wohlford has thirteen designated boat docks and fishing areas, and is open seven days a week for fishing purposes from mid-December through September. This lake is known for fishing of bass, trout, catfish, crappie, and bluegill. Outside of fishing, Lake Wohlford also provides facilities for campers, hikers, and picnickers.

Water Quality and Other Expected Benefits

The following sections provide information about the water quality and other benefits associated with this grant proposal. The summary of total project costs is based on Table 6 in DWR’s Stormwater Flood Management Grant Proposal Solicitation Package.

The water quality and other benefits that are anticipated to result from implementation of the proposal are summarized below in Table 9-1, and the cost-benefit overview is summarized in Table 9-2. This project would generate quantitative water quality and other benefits.

Table 9-1: Benefits Summary

Type of Benefit	Assessment Level	Beneficiaries
Water Quality and Other Benefits		
Avoided Sediment and Water Quality Degradation	Quantitative	Local and Regional
Recreational Benefits	Quantitative	Local and Regional
Increased Local Habitat	Quantitative	Local and Regional

Table 9-2: Benefit-Cost Analysis Overview

	Present Value (\$2009)
Costs – Total Capital and O&M	\$23,491,081
Monetizable Benefits	
Not applicable	--
Quantitative Benefits	<u>Quantitative Indicator*</u>
Avoided Sediment and Water Quality Degradation	+
Recreational Benefits	+
Increased Local Habitat	+

* Magnitude of effect on net benefits:
+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative); -- (significant negative)

The “Without Project” Baseline

Without this project, the City of Escondido would continue to maintain Lake Wohlford at approximately 43% of its original design capacity of 6,500 AF. In order to maintain this water level, the City would continue to transfer or divert water from Lake Wohlford when water reaches the designated safety level of 2,800 AF, as determined by the Federal Energy Regulatory Commission (FERC). In extreme wet weather events, the City would continue to discharge excess water through the base of the dam and into Escondido Creek. These discharges would potentially increase creek velocities and therefore produce erosion, sedimentation, and corresponding water quality issues within downstream water bodies such as Escondido Creek and San Elijo Lagoon.

In addition, as described in detail within Attachment 7, seismic-related safety issues pertaining to the existing Lake Wohlford Dam could result in dam failure. If this were to occur, flooding from Lake Wohlford would be substantial and would impact all downstream tributaries (refer to Figure 7-1). Dam failure would be expected to generate high volumes of rapid flows, which would cause scour, erosion, and excessive

downstream sedimentation. Therefore, without implementation of the *Lake Wohlford Dam Replacement Project*, the existing Lake Wohlford Dam would continue to pose a substantial threat to water quality of all tributaries downstream of Lake Wohlford.

Lastly, reduced capacity of Lake Wohlford Dam would maintain the recreational capacity (surface area, volume, and depth) of Lake Wohlford at its current state. Similarly, the aquatic habitat associated with Lake Wohlford would remain at its current size without implementation of the *Lake Wohlford Dam Replacement Project*.

Benefits Analysis

This project would provide several water quality and other expected benefits. These benefits are described in detail below and are summarized in Table 9-1 and 9-2 above.

Avoided Sediment and Water Quality Degradation

Water bodies downstream of Lake Wohlford, including Escondido Creek and San Elijo Lagoon, face substantial water quality issues. Portions of these water bodies are listed on the San Diego RWQCB's listing of impaired water bodies (303(d) list) for sediment-related water quality issues such as bacteria, total nitrogen, eutrophication, and sedimentation/siltation (SDRWQCB 2008).

Releases from Lake Wohlford Dam due to seismic-related safety issues could potentially exacerbate downstream erosion, sedimentation, and water quality issues. The City of Escondido conducted an inundation study in 1990, which demonstrated that failure of the Lake Wohlford Dam would generate a maximum outflow of 74,410 cubic feet per second (cfs) of water in approximately 68 minutes following dam failure. This analysis also determined that the reservoir would be completely empty in approximately 136 minutes after the breach begins (JMM 1990). Flows of this volume and release rate would be substantial, and would cause extreme scour, erosion, and sedimentation throughout the entire flood inundation area (refer to Figure 7-1 in Attachment 7), which includes downstream water bodies such as Escondido Creek and San Elijo Lagoon that are already listed for sedimentation/siltation issues.

The *Lake Wohlford Dam Replacement Project* would eliminate the potential for a seismic-induced failure to occur at the Lake Wohlford Dam, which would substantially reduce downstream scour, erosion, and sedimentation risks. This action would therefore remove a major potential source of pollutants from entering Escondido Creek and San Elijo Lagoon, which otherwise could substantially degrade the water quality of these water bodies. In turn, this could reduce future treatment and/or restoration costs that would be required to repair the water quality of Escondido Creek and San Elijo Lagoon if these water bodies were to be impacted by flooding from failure of Lake Wohlford Dam. These benefits were not monetized.

Recreational Benefits

The proposed improvements that would be implemented as part of the *Lake Wohlford Dam Replacement Project* would provide increased water surface areas and depths at Lake Wohlford, which could provide benefits associated with recreational uses such as fishing. The table below indicates the current and proposed physical attributes of Lake Wohlford with and without implementation of the *Lake Wohlford Dam Replacement Project*.

Table 9-4: Lake Wohlford Parameters, With and Without Project Conditions

Parameter	Without Project	With Project	Difference (With Project Increase)
Capacity (AF)	2,800	6,500	3,700
Depth (feet)	1,460	1,480	20
Surface Area (ft ²)	334,158.9	765,243.2	431,084
Volume (ft ³)	121,968,000	283,140,000	161,172,000

Lake Wohlford was designed to have a maximum depth of 1,480 feet; however, current seismic-related safety restrictions require that the City of Escondido retain depths to at least 20 feet below the maximum depth (ICF Jones and Stokes 2008). For purposes of this analysis, it was assumed that depths would be at their maximum allowable capacities, which would be 1,460 feet without the project and 1,480 feet with

the project. Using volume calculations and depth assumptions, this analysis then calculated respective maximum surface areas with and without the project. In sum, this analysis demonstrates that with implementation of the *Lake Wohlford Dam Replacement Project*, the surface area and volume of Lake Wohlford would substantially increase with respect to existing conditions.

Lake Wohlford is designated for recreational uses with the caveat that it is only available for fishing from shore or a permitted boat, as this lake is a domestic drinking water reservoir and therefore has a no water contact policy. In addition, the easternmost and westernmost portions of the lake are closed to the public. Lake Wohlford has thirteen designated boat docks and fishing areas, and is open seven days a week for fishing purposes from mid-December through September. This lake is known for fishing of bass, trout, catfish, crappie, and bluegill. Increased surface area and volumes for Lake Wohlford as a result of the *Lake Wohlford Dam Replacement Project* would substantially increase the amount of recreational space on Lake Wohlford for fishing activities. These benefits were not monetized.

Increased Local Habitat

As noted above, implementation of the *Lake Wohlford Dam Replacement Project* would substantially increase the volume and surface of Lake Wohlford with respect to existing conditions (refer to Table 9-4). The analysis above also indicates that Lake Wohlford contains bass, trout, catfish, crappie, and bluegill fish. In addition, the Basin Plan for the San Diego RWQCB notes that Lake Wohlford provides beneficial uses associated with warm, cold, and wild habitat uses. According to the Basin Plan, Lake Wohlford includes uses of water that support terrestrial and aquatic ecosystems (SDRWQCB 1994).

Table 9-4 above demonstrates that the *Lake Wohlford Dam Replacement Project* would increase the surface area of Lake Wohlford by 431,084 square feet. This increase would provide additional habitat for terrestrial species, including plants, which may rely on Lake Wohlford for a water supply source. In addition, the *Lake Wohlford Dam Replacement Project* would increase the volume of Lake Wohlford by 161,172,000 cubic feet. Increasing the amount of water available within Lake Wohlford would increase the amount of habitat (water) available for fish and other aquatic species within the lake.

Due to importance and value of local habitat for both terrestrial and aquatic species, the *Lake Wohlford Dam Replacement Project* would provide substantial benefits by increasing the amount of habitat available for both terrestrial and aquatic local species. This is particularly important because of the importance of ‘edge’ habitat in providing nesting and foraging grounds for native wildlife. These benefits were not monetized.

Distribution of Project Benefits and Identification of Beneficiaries

Table 9-5 summarizes beneficiaries of the *Lake Wohlford Dam Replacement Project*, which include local and regional beneficiaries. Local and regional beneficiaries would include local and regional residents. Local residents would benefit from increased water quality, recreational opportunities, and habitat associated with implementation of the *Lake Wohlford Dam Replacement Project*.

Table 9-5: Project Beneficiaries Summary

Local	Regional	Statewide
Local residents	Regional residents	Not applicable

Project Benefits Timeline Description

This project would provide water quality and other benefits following project construction in 2015 and through the project’s lifetime (until 2060).

Potential Adverse Effects from the Project

Any potential short-term impacts associated with project construction will be mitigated through the environmental documentation, compliance/mitigation, and permitting processes. No long-term adverse effects are expected as a result of the proposed project.

Uncertainty of Benefits

Uncertainties relating to the water supply benefits of this project are summarized below in Table 9-6. Uncertainties regarding the benefits associated with water quality and other benefits are generally related to the difficulty of monetizing such benefits.

Table 9-6: Omissions, Biases, and Uncertainties and their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided Sediment and Water Quality Degradation	+	These benefits were not monetized, so their exact benefits are not certain. It is highly likely that they would contribute positively to the benefits of this proposal.
Recreational Benefits	+	These benefits were not monetized, so their exact benefits are not certain. It is highly likely that they would contribute positively to the benefits of this proposal.
Increased Local Habitat	+	These benefits were not monetized, so their exact benefits are not certain. It is highly likely that they would contribute positively to the benefits of this proposal.

* Magnitude of effect on net benefits
+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative); -- (significant negative)

References

ICF Jones and Stokes. 2008. *Lake Wohlford Dam Environmental Opinion*. Prepared for the City of Escondido. December 2008.

James M. Montgomery, Consulting Engineers Inc. (JMM). 1990. *Inundation Study for Wohlford Dam, Escondido, California*. Prepared for the City of Escondido. August 1990.

San Diego Regional Water Quality Control Board (SDRWQCB). 1994. *Water Quality Control Plan for the San Diego Basin (Basin Plan)*.

San Diego Regional Water Quality Control Board (SDRWQCB). 2008. *2008 Clean Water Act Sections 305(b) and 303(d) Integrated Report on Evaluation of Surface Water Quality and Listing of Impaired Water Body Segments for the San Diego Region*. Available: http://www.swrcb.ca.gov/rwqcb9/water_issues/programs/303d_list/docs/updates_020910/App_B_All_Decisions.pdf. Accessed: March 14, 2011.

