

**PROPOSITION 1E STORMWATER FLOOD MANAGEMENT GRANT APPLICATION
CITY OF PALM SPRINGS
TAHQUITZ CREEK LEVEE RECONSTRUCTION
EXHIBIT C
ECONOMIC ANALYSIS: FLOOD DAMAGE REDUCTION COSTS AND BENEFITS**

Description

The Goals and Objectives of this Proposal is to allow for the repair and reconstruction of an existing flood control levee along the Tahquitz Creek within Palm Springs, CA, from its confluence with the Palm Canyon Wash extending upstream approximately 0.75 miles adjacent to the City’s Wastewater Treatment Plant (WWTP). The repair and reconstruction of the levee would ensure the levee satisfies federal requirements for levee construction established in 44 CFR 65.10, and that the levee would withstand the effects of a 100-year storm in Tahquitz Creek and provide flood control protection to the adjacent WWTP.

This Proposal includes one project – Tahquitz Creek Levee Reconstruction. As a single project, the Proposal has independent utility and provides a complete synergy and linkage of the Purpose and Need and Goals and Objectives of the Proposal. There are no complications associated with coordinating implementation or operation of various projects, and the City is the only implementing agency associated with this project.

Cost Details

The overall estimated cost of this project is \$1,200,000. The estimated costs are identified on Table 6 included with Exhibit A – Work Plan, of this proposal. Generally, the costs are identified as follows:

Direct Project Administration Costs	\$50,000
Planning/Design/Engineering/ Environmental Documentation	\$400,000
Construction/Implementation	\$500,000
Environmental Compliance/ Mitigation/Enhancement	\$50,000
Construction Administration	\$100,000
Construction/Implementation Contingency	\$100,000
Total	\$1,200,000

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Table 10 is included herein below:

Table 10- Annual Cost of Flood Damage Reduction Project (All costs should be in 2009 Dollars) Project: Tahquitz Creek Levee Reconstruction									
	Initial Costs	Operations and Maintenance Costs ⁽¹⁾					Discounting Calculations		
YEAR	(a) Grand Total Cost From Table 6 (row (i), column(d))	(b) Admin	(c) Operation	(d) Maintenance	(e) Replacement	(f) Other	(g) Total Costs (a) +...+ (f)	(h) Discount Factor	(i) Discounted Costs(g) x (h)
2009	\$1,200,000	\$2,500	\$0	\$10,000	\$0	\$0	\$1,212,500	1.000	\$1,212,500
2010	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.943	\$11,788
2011	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.890	\$11,125
2012	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.840	\$10,500
2013	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.792	\$9,900
2014	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.747	\$9,338
2015	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.705	\$8,813
2016	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.665	\$8,313
2017	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.627	\$7,838
2018	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.592	\$7,400
2019	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.558	\$6,975
2020	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.527	\$6,588
2021	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.497	\$6,213
2022	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.469	\$5,863
2023	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.442	\$5,525
2024	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.417	\$5,213
2025	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.394	\$4,925
2026	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.371	\$4,638
2027	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.350	\$4,375
2028	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.330	\$4,125
2029	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.312	\$3,900
2030	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.294	\$3,675
2031	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.278	\$3,475
2032	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.262	\$3,275
2033	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.247	\$3,088
2034	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.233	\$2,913
2035	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.220	\$2,750
2036	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.207	\$2,588
2037	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.196	\$2,450
2038	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.185	\$2,313
2039	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.174	\$2,175
2040	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.164	\$2,050
2041	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.155	\$1,938
2042	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.146	\$1,825
2043	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.138	\$1,725
2044	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.130	\$1,625
2045	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.123	\$1,538
2046	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.116	\$1,450
2047	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.109	\$1,363
2048	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.103	\$1,288
2049	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.097	\$1,213
2050	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.092	\$1,150
2051	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.087	\$1,088
2052	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.082	\$1,025
2053	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.077	\$963
2054	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.073	\$913
2055	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.069	\$863
2056	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.065	\$813
2057	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.060	\$750
2058	\$0	\$2,500	\$0	\$10,000	\$0	\$0	\$12,500	0.058	\$725
Total Present Value of Discounted Costs (Sum of Column (i))									\$1,408,850
Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									
Comments:									

(1) The incremental change in O&M costs attributable to the project.

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Flood Damage Reduction Benefits

Historical Flood Damage Data

Historical records identify two major flood events that have occurred on Tahquitz Creek in Palm Springs, CA:

November 22 – 25, 1965: Heavy storms drawing tropical moisture in the mountains and desert regions of southern California dropped over 20” of rainfall on portions of Mt. San Geronio, 16” at Mt. San Jacinto, and generally over 4” of rainfall in the Palm Springs area. The significant rainfall in the mountains generated stormwater runoff in the various valley channels, including Tahquitz Creek, resulting in record flood levels.

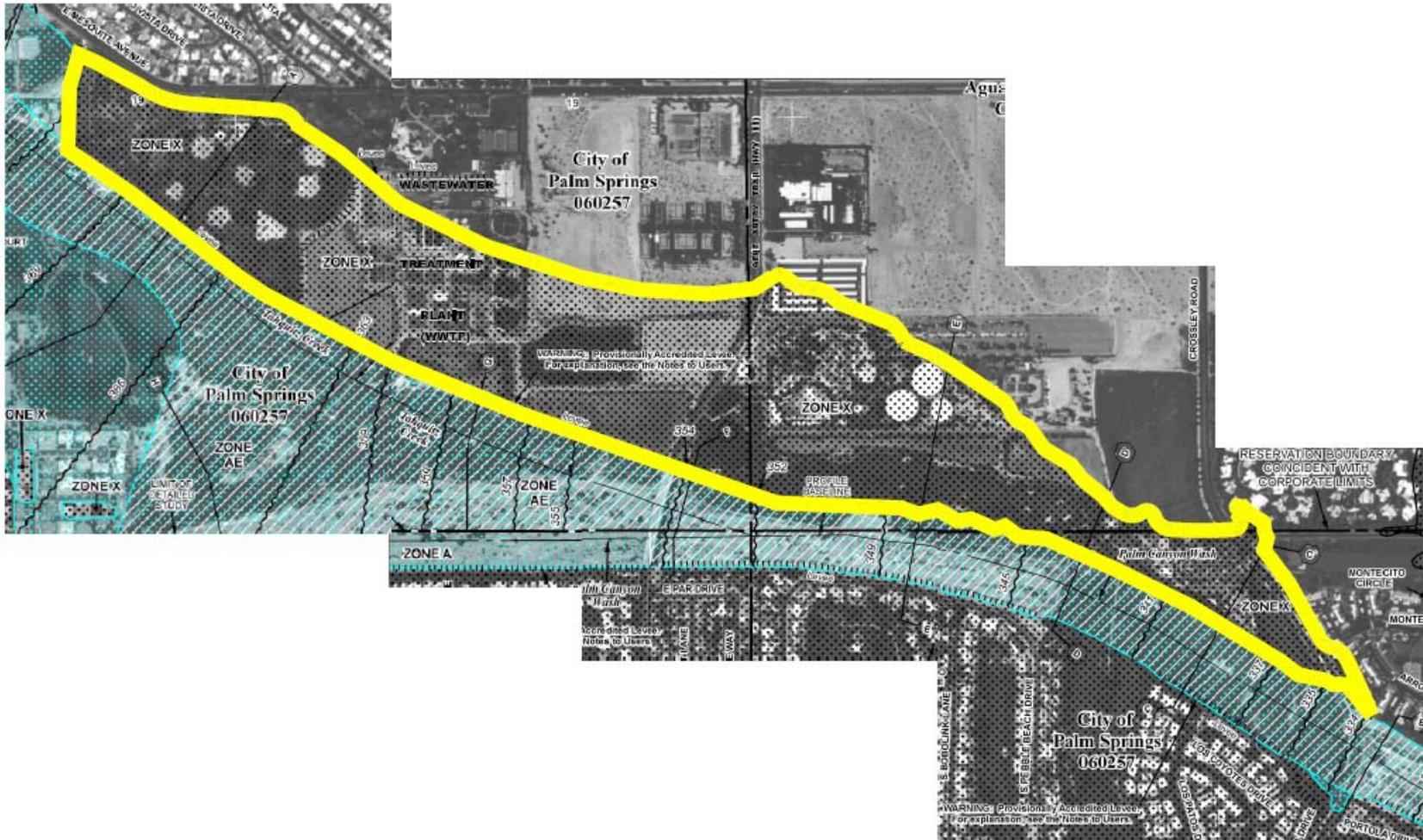
September 7, 1981: A late summer thunderstorm produced locally significant rainfall in the Mt. San Jacinto area, resulting in records flood levels in Tahquitz Creek.

The 1981 flood inundated the City’s WWTP, and prompted the City to design and construct a concrete lined levee adjacent to the WWTP to prevent damage from future floods. Estimates of the damage are unavailable from City records.

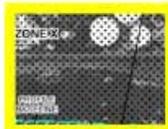
“Without Project” Conditions

An exhibit showing the area behind the levee provided with flood control protection by the Tahquitz Creek levee is shown on the following page, and is the area that would be subject to flooding in the event the levee failed during a 100-year storm.

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CITY CERTIFIED LEVEE SOUTH OF WWTP



**AREA TO BE PROTECTED FROM 100-YEAR FLOOD
PENDING CERTIFICATION OF TAHQUITZ CREEK LEVEE**

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The area is approximately 160 acres in size and contains the City's largest park and recreation area "Demuth Park", the City's WWTP, portions of the City's public golf course, a water park "Knott's Soak City", some commercial businesses, and a water reclamation plant owned and operated by Desert Water Agency (DWA).

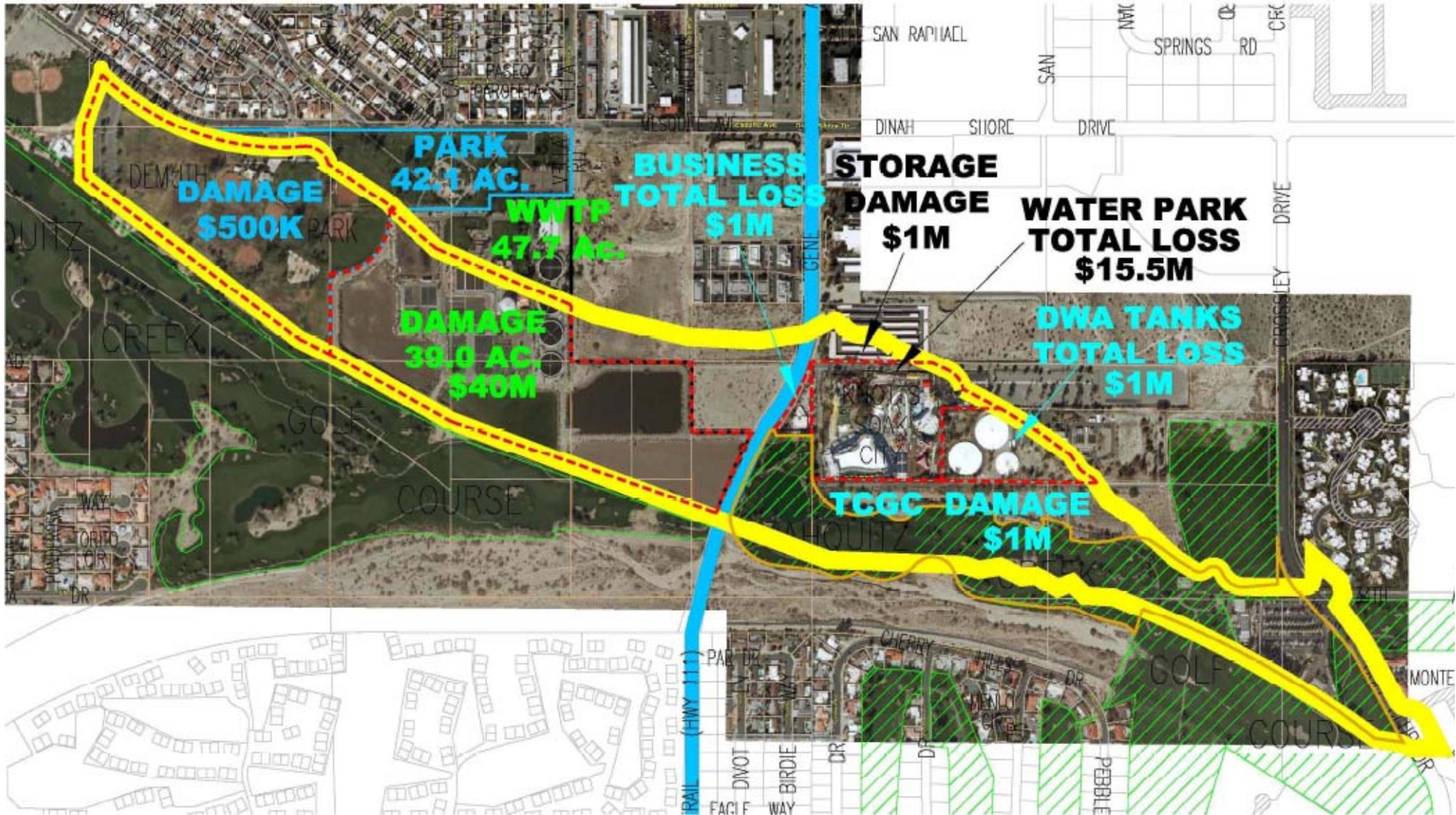
The "Without Project" condition can be characterized as follows:

FEMA completed digital Flood Insurance Rate Maps (DFIRM's) for Riverside County, which were adopted August 28, 2008. As part of this process, FEMA required that communities provide evidence to demonstrate that levees meet the minimum requirements established in Title 44, Chapter 1 of the Code of Federal Regulations, Section 65.10. The Tahquitz Creek Levee has been identified as a "Provisionally Accredited Levee" ("PAL"), Levee ID 16, as the City has been unable to demonstrate that this levee meets all of the requirements set forth in 44 CFR 65.10. The levee does not meet freeboard and other requirements, and must be repaired and reconstructed in order to satisfy FEMA's requirements and ensure the levee continues to provide flood control protection to properties behind it, including the City's WWTP. The failure of the Tahquitz Creek levee during a 100-year storm represents a risk of releasing millions of gallons of untreated wastewater into the Tahquitz Creek, resulting in significant pollution of stormwater runoff and groundwater within Tahquitz Creek.

Additionally, properties located in the area identified on the prior page are potentially at risk of flooding in the event the Tahquitz Creek levee fails during a 100-year storm. Flooding of these properties would result in significant damage to public and private property, as well as loss of life.

The flood inundation area protected by the existing levee due to 100-Year flood limits, as shown by FEMA Digital Flood Insurance Rate Map (DFIRM) Number 06065C1567G (Rev. 8/28/2008), is included on the next page.

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Flood damage to Demuth Park would be extensive, with replacement of park improvements, playground equipment, repair of public bathrooms, reseeding of play fields, and repair and/or replacement of parking lots required at a cost of approximately \$500,000. Damage to the City’s WWTP may approach \$40 Million, the estimated cost to replace treatment facilities. Additional costs would be incurred for environmental cleanup.

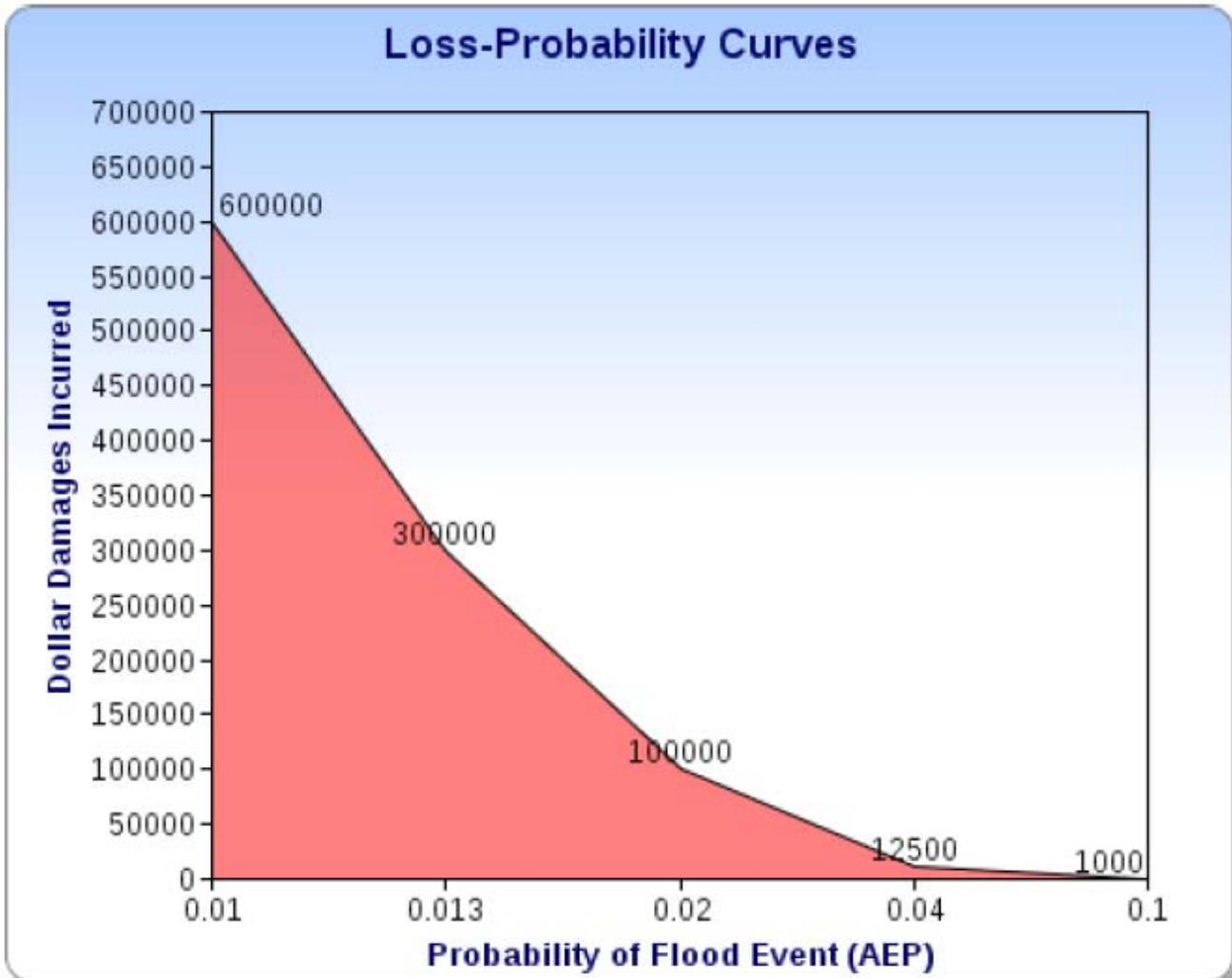
DWA’s reclamation plant would be damaged along with pumping equipment with an estimated repair cost of \$1 Mllion. The Tahquitz Creek Golf Course would sustain some damage to the the clubhouse and maintenance facilities estimated at \$1 Million. Another \$17.5M would be estimated for the total losses to private businesses in the area, including Knott’s Soak City Water Park. This brings the total to \$60M for damage to public facilities, public utilities, and private businesses during a 100-Year flood event.

Table 11 quantifies the estimates costs as a result of complete loss of public and private property due to failure of the Tahquitz Creek levee during a 100-year flood:

Table 11 - Event Damage							
Hydrologic Event	Event Probability	Damage if Flood Structures Fail	Probability Structural Failure		Event Damage		Event Benefit (Million \$)
			Without Project	With Project	Without Project	With Project	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
					(c) x (d)	(c) x (e)	(f) – (g)
10-Year	0.1	\$1,000,000	0.001	0	\$1,000	\$0	\$1,000
25-Year	0.04	\$5,000,000	0.0025	0	\$12,500	\$0	\$12,500
50-Year	0.02	\$20,000,000	0.005	0	\$100,000	\$0	\$100,000
75-Year	0.013	\$40,000,000	0.0075	0	\$300,000	\$0	\$300,000
100-Year	0.01	\$60,000,000	0.01	0	\$600,000	\$0	\$600,000

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The Loss-Probability Curve for the estimated flood damages is shown below:



Total Present Value of Expected Annual Damage Benefits

Table 12 identifies the calculated total present value of EAD over the life cycle of the project. The EAD without the project was calculated at \$4,280. Table 12 follows on the next page.

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Table 12:

Table 12 - Present Value of Expected Annual Damage Benefits			
Project: <u>Tahquitz Creek Levee Reconstruction</u>			
(a)	Expected Annual Damage Without Project (1)		\$4,280
(b)	Expected Annual Damage With Project (1)		\$0
(c)	Expected Annual Damage Benefit	(a) – (b)	\$4,280
(d)	Present Value Coefficient (2)		15.76
Present Value of Future Benefits			
(e)	Transfer to column (e) Table 20: Proposal Costs and Benefits Summaries.	(c) x (d)	\$67,453

(1) This program assumes no population growth thus EAD will be constant over analysis period.

(2) 6% discount rate; 50-year analysis period (could vary depending upon life cycle of project).