ATTACHMENT 8

BENEFITS AND COST ANALYSIS

Attachment 8
Benefits and Cost Analysis

This attachment provides an overview of the benefit and cost analysis of the Amethyst Basin Project.

Reduced Local Flooding

The San Bernardino County Flood Control District (District) currently operates and maintains 119 basins in the County flood control system. The District's mission is to provide flood control protection from stormwater runoff from large storm events at a regional level. The Project's intent is exactly that. Amethyst basin, located along the Oro Grande Wash watershed, is a vital component of the watershed management network discussed in the Victorville Master Plan of Drainage. Oro Grande Wash, conveying 10,500 cubic feet per second prior to the confluence with the Mojave River is a major contributor to the Upper Mojave Regional Watershed which conveys well over 29,000 cubic feet per second during a 100-year storm event.

District flood event design standard for basin construction is based upon a minimum level of protection for a 100-year storm event (considered to be a 1 percent chance of occurring) with the spillway crest designed for the 1000-year storm event. For the purpose of this report a 10-, 25- and 100-year storm event floodplain maps has been generated utilizing HEC-RAS software and is provided in Attachment 7 for technical justification. The flood plain area for this study encompasses approximately 134 parcels within the City of Victorville. The inundation zones shown in Attachment 7 Exhibits 1-6 include 104 single-family residences, 30 commercial properties and local roads impacted by the 100 year flood event. The approximate replacement value for these existing buildings and their contents is $32.1 million dollars based on FRAM analysis. Additional infrastructure within the floodplain area, which would be damaged, includes utilities and California State Highway 15.

This Project will construct a basin that will reduce flood control stormwater damage and provide water conservation benefits. The project will help to achieve District's objectives to manage and control stormwater runoff, while increasing safety levels to downstream communities resulting from a large storm event.

Project Benefits Timeline Description

The full Project benefits would be realized beginning in 2015. (once the construction is complete)

Uncertainty of Benefits

Without the Project, a 25-year storm event or greater could result in significant flood damage to the communities located downstream of the Project. Analyses of both with and without the Amethyst basin project are discussed below. The Potential Project flood damage reduction benefits are on the FRAM model. These benefits have been determined to be $25.9 million resulting in a BCA 2.4 (included at the end of this Attachment).

In addition, there is an uncertainty in the total flood damage reduction benefits since we

did not monetize the Project benefits of reduced impacts to non-building infrastructure, commerce, or quality of life. Because these qualitative benefits were not included, the Flood Damage reduction benefits reported are lower than the actual benefits achieved by the Project.

Description of any adverse effects

Any potential adverse effects from this Project would occur during construction and will be mitigated in accordance with the environmental documents and permits.

The "Without Project" Baseline

As discussed above, without the Project, a 25-year storm event would result in significant flood damages to the communities located below the Project. Attachment 7 contains hydrologic runs of 10-, 25-, and 100-year frequency storms.

During a large storm event, inflow to the proposed basin area would enter through the site and impound immediately adjacent to Bear Valley Road. The local infrastructure and conveyance system downstream of the site is not equipped to handle major storm events without the proposed project. A 25- year storm event or larger would overtop Bear Valley Road causing flood hazards to this major emergency thorough way. For the "Without Project" condition, the basin would not exist therefore during more intense storms, the inflow to the roadway culverts and conveyance system will exceed capacity, resulting in overtopping of the roadway. However, for the purpose of this report clean flows are assumed, the culvert crossings could easily be blocked or buried with sediment from the uncontrolled watershed, resulting in the conveyance system water levels rising even faster. As the water surface rises, flow will begin overtopping the existing channels. The total capacity of local-main and lateral systems are designed to accommodate storm events of 25 years or less. If the storm event exceeds a 25 year storm event the channel walls will be breached and overtopping will occur in an uncontrolled manner, which will in turn erode the adjacent side slopes and undermine local infrastructure. In addition, California State Highway infrastructure downstream has adequate capacity for the runoff resulting from a 25-year frequency storm. During a greater than 25-year frequency storm the crossing is expected to fail. The area impacted by the resulting flood, shown graphically in Attachment 7 Exhibits 1-6, and the projected flood damage is discussed above.

Without the Project, high volumes of sediment, would likely bury the roadway crossings and downstream channels. Sediment removal projects by the District require years to complete, including obtaining necessary environmental documents and permits.

The "With Project" Analysis

To address the large storm event scenario, the Project proposes to eliminate potential flood damage resulting from a 100-storm event by constructing a new basin, with adequate capacity to safely attenuate the 100-year storm event and capture sediment deposits upstream of local state and city infrastructure. Spillway crest, outlet works and monitoring measures constructed by the Project will significantly reduce downstream erosion and flooding due to overtopping of channel walls. The Project will provide sufficient attenuation of flood waters to allow for downstream facilities to accommodate the reduced flood waters and provide a controlled method to gather sediment and debri

deposited during storm events that may cause severe damages.

With this Project, a 100-year storm event would be required to raise the water surface to the spillway level. Because of the outflow rate of the outlet structure, the basin would provide additional protection a reduction of flood water velocities than Without the Project scenario.

The likelihood of the District to remediate the damage prior to a 100-year storm event occurring is much higher than it would be to complete it prior to a 25-year storm event as required under the "Without Project" condition.
At the Basin, the Project will result in a controlled release of stormwater during a 100 year storm event and therefore resulting in significantly less flood damage.

Methods used to Estimate With- and Without-Project Conditions

Flood Damaged estimated With- and Without-Project conditions is based upon the building and content value in the floodplain area that would be impacted if the basin did not exist during a substantial storm event. After the Project, the basin would still be susceptible to overtopping with a 100 year storm event or greater however, as discussed above, the likelihood of 25 year storm events causing damages downstream is significantly less for the Project condition. This reduction in frequency is not included in the analysis, instead to ensure the model is extremely conservative, only the reduction in damage for no basin option compared to the Basin option for the Without Project are included.
For the purpose of this analysis, the District also assumed the typical 50% replacement value to buildings within the floodplain area. Nearly all of the buildings would suffer damage if the basin were to not exist. The damage to buildings is estimated to be $9.4 million (in 2007 Dollars).
For the purpose of this proposal, the District assumed the 90% content replacement default value resulting in damages to be $15.5 million. With the 50% amount of building replacement value noted above, and indirect cost computed in the FRAM model brings the total potential cost to $34 million (in 2007 Dollars).

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Project Name: Amethyst Basin Stormwater Reduction

Cost of Project: $ 10,508,959

Description:

Number of Events Modeled: 3

	Without Project			With Project		
	Event 1	**Event 2**	**Event 3**	**Event 1**	**Event 2**	**Event 3**
Average Return Interval (ARI)	10	25	100	10	25	100
Annual Probability of Exceedance	0.100	0.040	0.010	0.100	0.040	0.010
Probability of Levee Failure	1.00	1.00	1.00	0.00	0.60	1.00
Water Surface Elevation - channel (f)	3103.10	3103.60	3104.30	3100.70	3101.10	3101.60
Flood Warning Time (hours)	0	0	0	0	0	0
Flood Experience	N	N	N	N	N	N
Period of Inundation (days)						
HEC-FIA DATA INPUTS	N					
Residential Structural Damages ($)						
Residential Contents Damages ($)						
Residential Debris & Cleanup ($)						
Commercial Structural Damages ($)						
Commercial Contents Damages ($)						
Commercial Debris & Cleanup ($)						
Industrial Structural Damages ($)						
Industrial Contents Damages ($)						
Industrial Debris & Cleanup ($)						
Agricultural Structural Damages ($)						
Agricultural Contents Damages ($)						
Agricultural Debris & Cleanup ($)						
Residential Properties						
Ratio Depreciated Value to Replacement Value	50%	50%	50%	50%	50%	50%
Average Flood depth above ground level (f)	3.09	3.78	4.56	0.86	1.23	1.75
Rural - Res: Homesteads						
Rural - Other: Barns, sheds						
Urban Res: Single story (no base)	25	29	32	5	8	9
Urban Res: Single story (basement)						
Urban Res: Two plus story (no base)	36	41	72	4	13	14
Urban Res: Two plus story (basement)						
Mobile home						
Commercial Properties						
Ratio Depreciated Value to Replacement Value	50%	50%	50%	50%	50%	50%
Average Flood depth above ground level (f)	3.09	3.78	4.56	0.86	1.23	1.75
low value — building area inundated (sq.f.)						
medium value — building area inundated (sq.f.)						
high value — building area inundated (sq.f.)	22633	158431	226331	0	95058	158431
Industrial Properties						
Ratio Depreciated Value to Replacement Value						
Average Flood depth above ground level (f)						
low value — building area inundated (sq.f.)						
medium value — building area inundated (sq.f.)						
high value — building area inundated (sq.f.)						
Agricultural Production						
Corn — ac.						
Rice — ac.						
Walnuts — ac.						
Almonds — ac.						
Cotton — ac.						
Tomatoes — ac.						
Wine Grapes — ac.						
Alfalfa — ac.						
Pasture — ac.						
Safflower — ac.						
Sugar Beets — ac.						
Beans — ac.						
Other — ac.						
Roads						
length of arterial roads inundated (miles)						
length of major roads inundated (miles)						
length of minor roads inundated (miles)						
length of unsealed roads inundated (miles)	0.330	0.342	0.363	0.304	0.315	0.336

Extrapolate Y-intercept: N

Summary of Cost-Benefit Analysis

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Project Name: **Amethyst Basin Stormwater Reduction**

Description: 0

Proposed project capital cost:	$ 10,508,959	[Note: construction costs which are assumed to occur in one year.]
Change in annual O&M costs:	$ 30,465	[Note: the change in annual O&M costs compared to without project cond
PV of future O&M costs:	$ 480,185	(at 6% discount rate over 50 years)
PV of future costs	$ 10,989,144	[Note: the sum of capital costs plus the PV of O&M costs.]

Benefits

	Actual	Potential	
EAD without project	$ 1,648,245	$ 1,740,444	[Note: for stormwater projects use "Potential" damage which ignores s
EAD with project	$ 94,817	$ 96,238	
Annual Benefit:	$ 1,553,428	$ 1,644,206	
PV of Future Benefits:	$ 24,484,917	$ 25,915,746	(at 6% discount rate over 50 years)

Cost-Benefit Analysis

	Actual	Potential	
Net Present Value (NPV)	$ 13,495,773	$ 14,926,602	(at 6% discount rate over 50 years)
Benefit:Cost Ratio	2.228	2.358	

NPV Sensitivity to Discount Rate:

	Actual	Potential
4%	$ 22,862,070	$ 24,812,179
5%	$ 17,850,308	$ 19,507,544
6%	$ 13,975,958	$ 15,406,787
7%	$ 10,929,508	$ 12,182,311
8%	$ 8,494,879	$ 9,605,410

Model Assumptions

Residential

Foundation heights

Structure Category	Foundation Height (ft)
Rural - Res: Homesteads	1.5
Rural - Other: Barns, sheds	0
Urban Res: Single story (no base)	1.1
Urban Res: Two plus story (no base)	1.1
Mobile home	2.0
Commercial: Low	1
Commercial: Medium	1
Commercial: High	1
Industrial: Low	0.5
Industrial: Medium	0.5
Industrial: High	0.5

Estimate Replacement Value (assumed proxy for depreciated value)

Structure Category	Unit Cost $/ft^2 (2)	Average Size ft^2 (1)	Construction Cost
Rural - Res: Homesteads	159	1900	302100
Rural - Other: Barns, sheds	98	4000	392000
Urban Res: Single story (no base)	159	1900	302100
Urban Res: Two plus story (no base)	155	2200	341000
Mobile home (3)	98	1180	115640
Commercial: Low	120		0
Commercial: Medium	142		0
Commercial: High	207		0
Industrial: Low	120		0
Industrial: Medium	142		0
Industrial: High	207		0

1. Residential Square Footage Source: Sacramento County Tax Assessor Unit Cost and Commercial/Industrial/Public Square Footage Assumptions Source: Saylor Publications, Inc, 2007 Current Construction Costs

2. Replacement unit cost per square foot reflects average costs in the San Franc

3. According to FEMA guidance, replacement costs per square foot for mobile homes and barns and outbuildings are similar.

Other

External damages garden/outdoor areas $/building	$	5,000
Cleanup $/building	$	4,000
Number of residents per residential property		2.6

Commercial / Industrial Buildings

Clean-up costs as a percentage of direct structural damages	30%

Calculation of Other Direct Damages

Percentage of residential direct damages applied as indirect:	25%
Percentage of comm/ind. direct damages applied as indirect:	25%
HEC-FIA only: Percentage all building direct damages applied as indirect	25%
Percentage of roads direct damages applied as indirect:	25%

NPV Calculation

Discount Rate	6%
Time Horizon	50 years

Roads

Cost per mile of highway road inundated	$	250,000
Cost per mile of major road inundated	$	100,000
Cost per mile of minor road inundated	$	30,000
Cost per mile of unsealed road inundated	$	10,000

Agricultural Damages

	Weighted, Average Annual Damages ($/acre)	Establishment Costs ($/acre)	Land Cleanup & rehabilitation ($/acre)	Total <5 d) ($/acre)	Total (>=5 d) ($/acre)
Corn	$48	$0	$246	$293	$293
Rice	$227	$0	$243	$471	$471
Walnuts	$585	$5,284	$243	$828	$6,112
Almonds	$1,618	$3,514	$243	$1,862	$5,376
Cotton	$301	$0	$246	$547	$547
Tomatoes	$1,015	$0	$235	$1,250	$1,250
Wine Grapes	$3,241	$3,240	$235	$3,476	$6,716
Alfalfa	$250	$246	$243	$493	$739
Pasture	($15)	$82	$272	$257	$339
Safflower	$164	$0	$241	$405	$405
Sugar Beets	$313	$0	$262	$575	$575
Beans	$111	$0	$246	$356	$356
Other	$0	0	$246	$246	$246

Source: Comp Study

Establishment Costs are 50% costs of total establishment costs

Calculation of Actual to Potential Damages Ratio

		Without Project						With Project					
		Event 1	Event 2	Event 3	Event 4	Event	Event 6	Event	Event 2	Event 3	Event 4	Event 5	Event 6
Warning Time:	hours	0	0	0	0	0	0	0	0	0	0	0	0
Recent Flood Expe	Y / N	N	N	N	N	N	0	N	N	N	N	N	0
Actual : Potential Ratio		0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Warning Time	Experienced Community	Inexperienced Community
< 2 hours	0.8	0.9
2-12 hours	Linear reduction from 0.8 at 2 hours to 0.4 at 12 hours	0.8
>12 hours	0.4	0.7

Occ_Name	Cat_Name	Occ_Description	Parameter	Depth (ft) above First Finished Floor (FFE)																		
1ST-NB	RES	one story, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1ST-NB	RES		S	0	2.5	13.4	23.3	32.1	40.1	47.1	53.2	58.6	63.2	67.2	70.5	73.2	75.4	77.2	78.5	79.5	80.2	80.7
1ST-NB	RES		C	0	2.4	8.1	13.3	17.9	22	25.7	28.8	31.5	33.8	35.7	37.2	38.4	39.2	39.7	40	40	40	40
2ST-NB	RES	two or more stories, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2ST-NB	RES		S	0	3	9.3	15.2	20.9	26.3	31.4	36.2	40.7	44.9	48.8	52.4	55.7	58.7	61.4	63.8	65.9	67.7	69.2
2ST-NB	RES		C	0	1	5	8.7	12.2	15.5	18.5	21.3	23.9	26.3	28.4	30.3	32	33.4	34.7	35.6	36.4	36.9	37.2
FARM	FAR	Farm Homesteads	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
FARM	FAR		S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
FARM	FAR		C	0	0	0	0	0	6	30	54	69	75	78	80	80	80	100	100	100	100	100
MOBILE	MOB	Mobile homes	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
MOBILE	MOB		S	0	0	0	0	8	44	63	73	78	80	81	82	82	82	82	82	82	82	82
MOBILE	MOB		C	0	0	0	0	0	27	49	64	70	76	78	79	81	83	83	83	83	83	83
PUBLIC	PUB	Public buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
PUBLIC	PUB		S	0	0	0	0	8	22	30	35	39	41	44	46	48	49	49	49	49	49	49
PUBLIC	PUB		C	0	0	0	0	0	17.5	25	30	34	37	39	40.5	41.5	42	42	42	42	42	42
INDUSTRY	IND	Industrial Buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
INDUSTRY	IND		S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
INDUSTRY	IND		C	0	0	0	0	0	72	75	76.5	78	81	84	87	90	96	102	108	114	120	120
COMMERC	COM	Commercial Buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
COMMERC	COM		S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
COMMERC	COM		C	0	0	0	0	0	11	30	54	69	75	78	80	80	80	100	100	100	100	100

NOT USED

SL-NB	RES	split level, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
SL-NB	RES		S	0	6.4	7.2	9.4	12.9	17.4	22.8	28.9	35.5	42.3	49.2	56.1	62.6	68.6	73.9	78.4	81.7	83.8	84.4							
SL-NB	RES		SN	0	2.9	2.1	1.9	1.9	2	2.2	2.4	2.7	3.2	3.8	4.5	5.3	6	6.7	7.4	7.9	8.3	8.7							
SL-NB	RES		C	0	2.2	2.9	4.7	7.5	11.1	15.3	20.1	25.2	30.5	35.7	40.9	45.8	50.2	54.1	57.2	59.4	60.5	60.5							
SL-NB	RES		CN	0	2.2	1.5	1.2	1.3	1.4	1.5	1.6	1.8	2.1	2.5	3	3.5	4.1	4.6	5	5.4	5.7	6							
SL-NB	RES		Struct	N		0.8																							
1ST-B	RES	one story, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1ST-B	RES		S	0	0	0.7	0.8	2.4	5.2	9	13.8	19.4	25.5	32	38.7	45.5	52.2	58.6	64.5	69.8	74.2	77.7	80.1	81.1	81.1	81.1	81.1	81.1	81.1
1ST-B	RES		SN	0	0	1.34	1.06	0.94	0.91	0.88	0.85	0.83	0.85	0.96	1.14	1.37	1.63	1.89	2.14	2.35	2.52	2.66	2.77	2.88	2.88	2.88	2.88	2.88	2.88
1ST-B	RES		C	0	0.1	0.8	2.1	3.7	5.7	8	10.5	13.2	16	18.9	21.8	24.7	27.4	30	32.4	34.5	36.3	37.7	38.6	39.1	39.1	39.1	39.1	39.1	39.1
1ST-B	RES		CN	0	1.6	1.16	0.92	0.81	0.78	0.76	0.74	0.72	0.74	0.83	0.98	1.17	1.39	1.6	1.81	1.99	2.13	2.25	2.35	2.45	2.45	2.45	2.45	2.45	2.45
1ST-B	RES		Struct	N		0.8																							
2ST-B	RES	two or more stories, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2ST-B	RES		S	0	1.7	1.7	1.9	2.9	4.7	7.2	10.2	13.9	17.9	22.3	27	31.9	36.9	41.9	46.9	51.8	56.4	60.8	64.8	68.4	71.4	73.7	75.4	76.4	76.4
2ST-B	RES		SN	0	2.7	2.7	2.11	1.8	1.66	1.56	1.47	1.37	1.32	1.35	1.5	1.75	2.04	2.34	2.63	2.89	3.13	3.38	3.71	4.22	5.02	6.19	7.79	9.84	12.36
2ST-B	RES		C	0	0	1	2.3	3.7	5.2	6.8	8.4	10.1	11.9	13.8	15.7	17.7	19.8	22	24.3	26.7	29.1	31.7	34.4	37.2	40	43	46.1	49.3	52.6
2ST-B	RES		CN	0	0	2.27	1.76	1.49	1.37	1.29	1.21	1.13	1.09	1.11	1.23	1.43	1.67	1.92	2.15	2.36	2.56	2.76	3.04	3.46	4.12	5.08	6.39	8.08	10.15
2ST-B	RES		Struct	N		0.8																							
SL-B	RES	split level, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SL-B	RES		S	0	0	0	2.5	3.1	4.7	7.2	10.4	14.2	18.5	23.2	28.2	33.4	38.6	43.8	48.8	53.5	57.8	61.6	64.8	67.2	68.8	69.3	69.3	69.3	69.3
SL-B	RES		SN	0	0	0	1.8	1.6	1.5	1.6	1.6	1.6	1.6	1.7	1.9	2.1	2.4	2.6	2.9	3.2	3.4	3.6	3.9	4.2	4.8	5.7	5.7	5.7	5.7
SL-B	RES		C	0	0.6	0.7	1.4	2.4	3.8	5.4	7.3	9.4	11.6	13.8	16.1	18.2	20.2	22.1	23.6	24.9	25.8	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
SL-B	RES		CN	0	2.09	1.49	1.14	1.01	1	1.02	1.03	1.04	1.06	1.12	1.23	1.38	1.57	1.76	1.95	2.13	2.28	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44
SL-B	RES		Struct	N		0.8																							

Residential Buildings

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
ARI:	10	25	100	10	25	100
Probability of Levee Failure	1.00	1.00	1.00	0.00	0.60	1.00
Flood depth above ground level (ft)	3.09	3.78	4.56	0.86	1.23	1.75
Buildings Inundated (no.)						
Rural - Res: Homesteads	0	0	0	0	0	0
Rural - Other: Barns, sheds	0	0	0	0	0	0
Urban Res: Single story (no base)	25	29	32	5	8	9
Urban Res: Two plus story (no base)	36	41	72	4	13	14
Mobile home	0	0	0	0	0	0
Structural Damages						
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 879,866	$ 1,406,124	$ 1,938,274	$ 18,881	$ 161,926	$ 182,166
Urban Res: Two plus story (no base)	$ 932,976	$ 1,461,015	$ 3,228,588	$ 20,460	$ 206,135	$ 221,991
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -
Structual Damages HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ 1,812,842	$ 2,867,139	$ 5,166,862	$ 39,341	$ 368,060	$ 404,157

Residential Buildings

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
Content Damages						
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 502,241	$ 784,101	$ 1,063,392	$ 18,126	$ 97,880	$ 110,115
Urban Res: Two plus story (no base)	$ 534,006	$ 852,841	$ 1,902,780	$ 6,820	$ 110,825	$ 119,350
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damage HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Actual:Potential Ratio	0.9	0.9	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ 932,623	$ 1,473,247	$ 2,669,555	$ 22,451	$ 187,835	$ 206,519
Total Contents Damages: Potential	$ 1,036,247	$ 1,636,942	$ 2,966,172	$ 24,946	$ 208,705	$ 229,465
Clean-Up/ Other Costs						
External	$ 305,000	$ 350,000	$ 520,000	$ 45,000	$ 105,000	$ 115,000
Cleanup	$ 244,000	$ 280,000	$ 416,000	$ 36,000	$ 84,000	$ 92,000
Other Costs HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Total Other Costs: Potential	$ 549,000	$ 630,000	$ 936,000	$ 81,000	$ 189,000	$ 207,000
Sum Actual Damages	**$ 3,294,465**	**$ 4,970,386**	**$ 8,772,416**	**$ 142,793**	**$ 744,895**	**$ 817,676**
Sum Potential Damages	**$ 3,398,090**	**$ 5,134,081**	**$ 9,069,034**	**$ 145,287**	**$ 765,766**	**$ 840,623**
Total Actual Damage with levee failure ($):	**$ 3,294,465**	**$ 4,970,386**	**$ 8,772,416**	**$ -**	**$ 446,937**	**$ 817,676**
Total Potential Damage with levee failure ($):	**$ 3,398,090**	**$ 5,134,081**	**$ 9,069,034**	**$ -**	**$ 459,459**	**$ 840,623**
Indirect Actual Damage	$ 823,616	$ 1,242,597	$ 2,193,104	$ -	$ 111,734	$ 204,419
Indirect Potential Damage	$ 849,522	$ 1,283,520	$ 2,267,258	$ -	$ 114,865	$ 210,156

Commercial & Industrial Buildings

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
ARI:	10	25	100	10	25	100
Probability of Levee Failure	1.00	1.00	1.00	0.00	0.60	1.00
Commercial						
'Flood depth above ground level (ft)	3.09	3.78	4.56	0.86	1.23	1.75
low building size	0	0	0	0	0	0
medium building size	0	0	0	0	0	0
high building size	22633	158431	226331	0	95058	158431
Industrial						
'Flood depth above ground level (ft)	0.00	0.00	0.00	0.00	0.00	0.00
low building size	0	0	0	0	0	0
medium building size	0	0	0	0	0	0
high building size	0	0	0	0	0	0
Structural Damages						
Commercial						
low	$ -	$ -	$ -	$ -	$ -	$ -
medium						
high	$ 304,527	$ 2,131,689	$ 4,216,547	$ -	$ 393,540	$ 655,904
Commercial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Industrial						
low	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -
Industrial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ 304,527	$ 2,131,689	$ 4,216,547	$ -	$ 393,540	$ 655,904

Commercial & Industrial Buildings

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
Contents Damages						
Commercial						
low	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -
high	$ 702,755	$ 4,919,283	$ 12,649,640	$ -	$ -	$ -
Commercial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Industrial						
low	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -
Industrial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Actual:Potential Ratio	0.9	0.9	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ 632,479	$ 4,427,354	$ 11,384,676	$ -	$ -	$ -
Total Contents Damages: Potential	$ 702,755	$ 4,919,283	$ 12,649,640	$ -	$ -	$ -
Clean-up/ Other Costs	$ 91,358	$ 639,507	$ 1,264,964	$ -	$ 118,062	$ 196,771
Clean-Up/ Other Costs: HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ 1,028,364**	**$ 7,198,550**	**$ 16,866,186**	**$ -**	**$ 511,602**	**$ 852,676**
Sum Potential Damages	**$ 1,098,640**	**$ 7,690,478**	**$ 18,131,150**	**$ -**	**$ 511,602**	**$ 852,676**
Total Damage with levee failure ($):	**$ 1,028,364**	**$ 7,198,550**	**$ 16,866,186**	**$ -**	**$ 306,961**	**$ 852,676**
Total Damage with levee failure ($):	**$ 1,098,640**	**$ 7,690,478**	**$ 18,131,150**	**$ -**	**$ 306,961**	**$ 852,676**
Indirect Actual Damages	$ 257,091	$ 1,799,638	$ 4,216,547	$ -	$ 76,740	$ 213,169
Indirect Potentail Damages	$ 274,660	$ 1,922,620	$ 4,532,788	$ -	$ 76,740	$ 213,169

Agricultural Damages

		Without Project			With Project		
		Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
ARI:		10	25	100	10	25	100
Probability of Levee Failure		1.00	1.00	1.00	0.00	0.60	1.00
Length of Inundation <5d Y/N		Y	Y	Y	Y	Y	Y
Agricultural Land Inundated							
Corn	ac.	0	0	0	0	0	0
Rice	ac.	0	0	0	0	0	0
Walnuts	ac.	0	0	0	0	0	0
Almonds	ac.	0	0	0	0	0	0
Cotton	ac.	0	0	0	0	0	0
Tomatoes	ac.	0	0	0	0	0	0
Wine Grape	ac.	0	0	0	0	0	0
Alfalfa	ac.	0	0	0	0	0	0
Pasture	ac.	0	0	0	0	0	0
Safflower	ac.	0	0	0	0	0	0
Sugar Beets	ac.	0	0	0	0	0	0
Beans	ac.	0	0	0	0	0	0
Other	ac.	0	0	0	0	0	0

Potential Damages						
Corn	$ -	$ -	$ -	$ -	$ -	$ -
Rice	$ -	$ -	$ -	$ -	$ -	$ -
Walnuts	$ -	$ -	$ -	$ -	$ -	$ -
Almonds	$ -	$ -	$ -	$ -	$ -	$ -
Cotton	$ -	$ -	$ -	$ -	$ -	$ -
Tomatoes	$ -	$ -	$ -	$ -	$ -	$ -
Wine Grapes	$ -	$ -	$ -	$ -	$ -	$ -
Alfalfa	$ -	$ -	$ -	$ -	$ -	$ -
Pasture	$ -	$ -	$ -	$ -	$ -	$ -
Safflower	$ -	$ -	$ -	$ -	$ -	$ -
Sugar Beets	$ -	$ -	$ -	$ -	$ -	$ -
Beans	$ -	$ -	$ -	$ -	$ -	$ -
Other	$ -	$ -	$ -	$ -	$ -	$ -
Total Potential Damages	$ -	$ -	$ -	$ -	$ -	$ -
Total Damage with levee failure ($):	$ -	$ -	$ -	$ -	$ -	$ -

Roads

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
ARI	10	25	100	10	25	100
Probability of Levee failure	1.00	1.00	1.00	0.00	0.60	1.00
Roads Inundated						
length of arterial roads inundated (miles)	0.00	0.00	0.00	0.00	0.00	0.00
length of major roads inundated (miles)	0.00	0.00	0.00	0.00	0.00	0.00
length of minor roads inundated (miles)	0.00	0.00	0.00	0.00	0.00	0.00
length of unsealed roads inundated (miles)	0.33	0.34	0.36	0.30	0.32	0.34
Potential Damages						
length of arterial roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -
length of major roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -
length of minor roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -
length of unsealed roads inundated (miles)	$ 3,300	$ 3,420	$ 3,630	$ 3,040	$ 3,150	$ 3,360
Total Damages:	*$ 3,300*	*$ 3,420*	*$ 3,630*	*$ 3,040*	*$ 3,150*	*$ 3,360*
Total Damage with levee failure ($):	$ 3,300	$ 3,420	$ 3,630	$ -	$ 1,890	$ 3,360

Calculation of Without Project EAD

	Event 1	Event 2	Event 3	Y Intercept
Average Recurrence Interval (ARI)	10	25	100	
AEP	0.100	0.040	0.010	0
Actual Damage to Residential Buildings ($)	$ 3,294,465	$ 4,970,386	$ 8,772,416	
Potential Damage to Residential Buildings ($)	$ 3,398,090	$ 5,134,081	$ 9,069,034	
Actual Damage to Commercial/Industrial Buildings ($)	$ 1,028,364	$ 7,198,550	$ 16,866,186	
Potential Damage to Commercial/Industrial Buildings ($)	$ 1,098,640	$ 7,690,478	$ 18,131,150	
Damage to Agriculture ($)	$ -	$ -	$ -	
Damage to Roads ($)	$ 3,300	$ 3,420	$ 3,630	
Actual Indirect Costs	$ 1,081,532	$ 3,043,089	$ 6,410,558	
Potential Indirect Costs	$ 1,125,007	$ 3,206,995	$ 6,800,953	
Special Cases	$ -	$ -	$ -	
Total Actual Damages	$ 5,407,661	$ 15,215,446	$ 32,052,791	$ 32,052,791
Total Potential Damages	$ 5,625,037	$ 16,034,974	$ 34,004,767	$ 34,004,767
EAD (Actual)	$ 1,648,245			
EAD (Potential)	$ 1,740,444			

Actual Damages

Calculation of With Project EAD

	Event 1	Event 2	Event 3		
Average Recurrence Interval (ARI)	10	25	100		
AEP	0.100	0.040	0.010		0
Actual Damage to Residential Buildings ($)	$ -	$ 446,937	$ 817,676		
Potential Damage to Residential Buildings ($)	$ -	$ 459,459	$ 840,623		
Actual Damage to Commercial/Industrial Buildings ($)	$ -	$ 306,961	$ 852,676		
Potential Damage to Commercial/Industrial Buildings ($)	$ -	$ 306,961	$ 852,676		
Damage to Agriculture ($)	$ -	$ -	$ -		
Damage to Roads ($)	$ -	$ 1,890	$ 3,360		
Actual Indirect Costs	$ -	$ 188,947	$ 418,428		
Potential Indirect Costs	$ -	$ 192,078	$ 424,165		
Special Cases	$ -	$ -	$ -		
Total Actual Damages	$ -	$ 944,735	$ 2,092,140	$	2,092,140
Total Potential Damages	$ -	$ 960,388	$ 2,120,823	$	2,120,823

EAD (Actual)	$ 94,817
EAD (Potential)	$ 96,238

Actual Damages

Potential Damages

	Without Project				With Project			
Water Surface Elevation - channel (f)	3103.1	3103.6	3104.3		3100.7	3101.1	3101.6	
ARI	10	25	100		10	25	100	
Probability of Exceedence (AEP)	0.100	0.040	0.010		0.100	0.040	0.010	
Damages incurred	$ 5,625,037	$ 16,034,974	$ 34,004,767	$ 34,004,767	$ -	$ 960,388	$ 2,120,823	$ 2,120,823

Actual Damages

	Without Project				With Project			
Water Surface Elevation - channel (f)	3103.1	3103.6	3104.3		3100.7	3101.1	3101.6	
ARI	10	25	100		10	25	100	
Probability of Exceedence (AEP)	0.100	0.040	0.010		0.100	0.040	0.010	
Damages incurred	$ 5,407,661	$ 15,215,446	$ 32,052,791	$ 32,052,791	$ -	$ 944,735	$ 2,092,140	$ 2,092,140

Without Project

Water Surface Elevation - channel (f)	10	25	100
Probability of Exceedence (AEP)	0.100	0.040	0.010
Potential	$ 5,625,037	$ 16,034,974	$ 34,004,767
Actual	$ 5,407,661	$ 15,215,446	$ 32,052,791

With Project

Water Surface Elevation - channel (f)	10	25	100
Probability of Exceedence (AEP)	0.100	0.040	0.010
Potential	$ -	$ 960,388	$ 2,120,823
Actual	$ -	$ 944,735	$ 2,092,140

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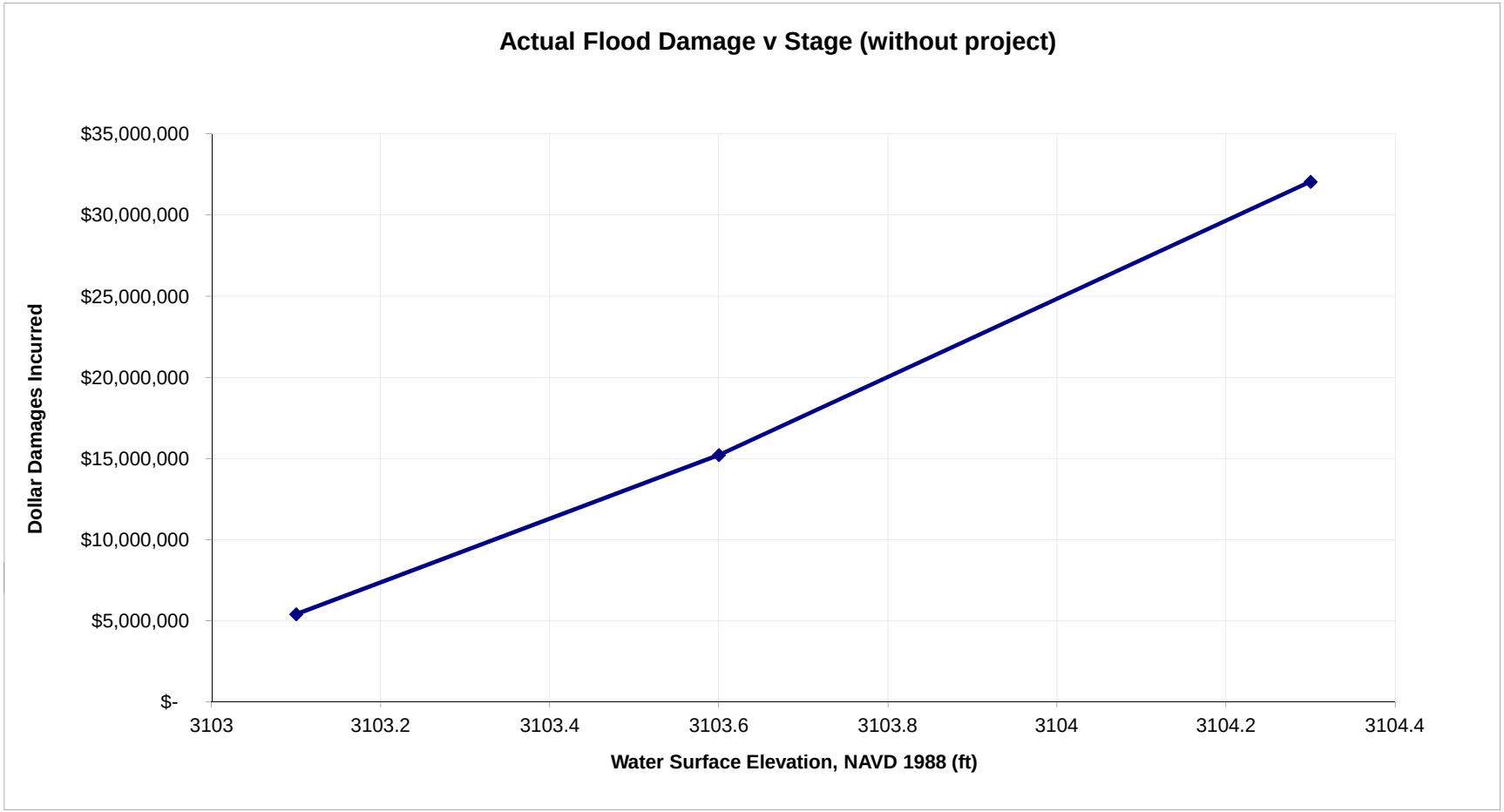

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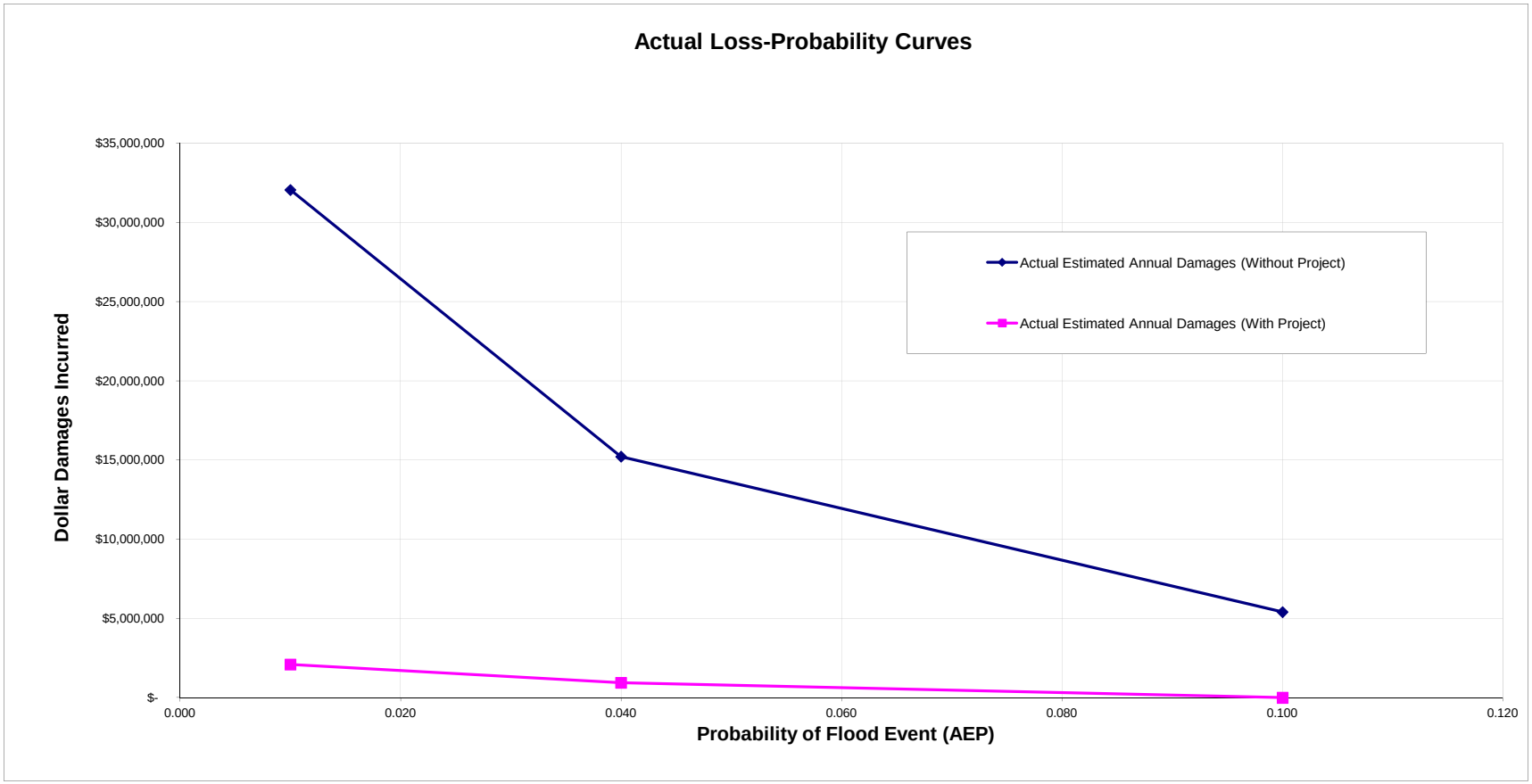

Table 11 – Example Calculation of Expected Annual Damage											
Hydrologic Event	Event Exceedance Probability	Event Damage if Flood Structures Fail	Probability Structural Failure		Expected Event Damage		Interval Probability	Average Damage in Interval		Average Damage in Interval times Interval Probability	
			Without Project	With Project	Without Project	With Project		Without Project	With Project	Without Project	With Project
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(i)	(j)	(k)	(l)	(m)
					(c) x (d)	(c) x (e)	from (b)	from (f)	from (g)	(i) x (j)	(i) x (k)
10-Year	0.1	$5,407,661	1	0	$5,407,661	$0					
25-Year	0.04	$15,215,446	1	0.6	$15,215,446	$9,129,268	0.06	$10,311,554	$4,564,634	$618,693.210	$273,878.028
100-Year	0.01	$32,052,791	1	1	$32,052,791	$32,052,791	0.03	$23,634,119	$20,591,029	$709,023.555	$617,730.879
Expected Annual Damages, Without and With Project										**$1,327,717**	**$891,609**

Table 12 – Present Value of Expected Annual Damage Benefits Project: Amethyst Basin Stormwater Flood Reduction Project			
(a)	Expected Annual Damage Without Project [1]		$1,327,717
(b)	Expected Annual Damage With Project [1]		$891,609
(c)	Expected Annual Benefit	(a) – (b)	$436,108
(d)	Present Value Coefficient [2]		**15.76**
(e)	**Present Value of Future Benefits** **Transfer to Table 17, column (d).**	**(c) x (d)**	**$6,873,062**

(1) This program assumes no land use changes in the floodplain. So, EAD will be constant over analysis period.

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

Table 13 – Non-monetized Benefits Checklist	
Question	Enter "Yes", "No" or "Neg"
Community/Social Benefits **Will the proposal**	
Provide education or technology benefits?	**No**
Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
Provide social recreation or access benefits?	**Yes**
• The Amethyst Basin will provide more access to open space. It covers approximately 30 acres , this acreage will never be developed due to the Project.	
Help avoid, reduce or resolve various public water resources conflicts?	**Yes**
The project will allow more recharge in the Alto Basin where a large amount of consumption is experienced. This will assist in reducing the tension and water rights issue resolved by the adjudication by placing new water in the ground in the area where it is needed and lessen the potential for the downstream recipients to question the use of water upstream.	
Promote social health and safety?	**Yes**
• The Project will reduce the flood hazard area from 100 acres without the basin to 65 acres with the basin • The Project will reduce the 100-year peak flow from 6,550 cfs without the basin to 5,230 cfs with the basin • With the basin construction, 81 residential and 6 commercial structures will be protected or removed from the 100-year flood area.	
Have other social benefits?	**No**
Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
Environmental Stewardship Benefits: **Will the proposal**	
Benefit wildlife or habitat in ways that were not quantified in Attachment 7?	**Yes**
The Project will be on 8 acres of potential Mojave Squirrel habitat. A ratio of 2 to 1 is being used for the mitigation which means an additional 16 acres of Mojave Squirrel habitat will be set aside off-site for this Project.	
Improve water quality in ways that were not quantified in Attachment 7?	**Yes**
• Water quality will improve from erosion reduction and slowing the flows to allow pollutants to drop out within the basin system. • Channelization of streams can eliminate the potential for assimilation and transformation of pollutants from plants and aquatic organisms.	
Reduce net emissions in ways that were not quantified in Attachment 7?	**No**
Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?	**No**
Sustainability Benefits: **Will the proposal**	
Improve the overall, long-term management of California groundwater resources?	**Yes**
The Project will increase the recharge capability Of the retention ponds at this location by up to 2,600 acre feet per year	
Reduce demand for net diversions for the regions from the Delta?	**No**
Provide a long-term solution in place of a short-term one?	**No**
Examples are not limited to, but may include: - Replace a temporary water supply with a more permanent supply? - Replace a temporary water quality solution with a more permanent solution? - Replace temporary flood control management with a more permanent solution? - Replace temporary habitat with a more permanent solution?	
Reduce water consumption on a permanent basis?	**No**
Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?	**No**
Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable land or water management practices with recognized sustainable practices?	
Improve water supply reliability in ways not quantified in Attachment 7?	**No**
Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
Other (If the above listed categories do not apply, provide non-monetized benefit description)?	**No**

Table 14 – Annual Benefit

(All benefits should be in 2012 dollars)

Project: Amethyst Basin Stormwater Flood Reduction Project

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value [1]	(h) Annual $ Value [1] (f) x (g)	(i) Discount Factor [1]	(j) Discounted Benefits [1] (h) x (i)
2012	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	1.000	$2,417,392
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	1.000	$4,357,308
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	1.000	$3,373,236
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	1.000	$270
2013	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.943	$2,279,601
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.943	$4,108,941
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.943	$3,180,962
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.943	$255
2014	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.890	$2,151,479
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.890	$3,878,004
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.890	$3,002,180
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.890	$240
2015	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.840	$2,030,609
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.840	$3,660,139
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.840	$2,833,518
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.840	$227
2016	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.792	$1,914,574
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.792	$3,450,988
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.792	$2,671,603
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.792	$214
2017	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.747	$1,805,792
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.747	$3,254,909
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.747	$2,519,807
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.747	$202
2018	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.705	$1,704,261
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.705	$3,071,902
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.705	$2,378,131
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.705	$190
2019	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.665	$1,607,566
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.665	$2,897,610
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.665	$2,243,202
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.665	$180
2020	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.627	$1,515,705
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.627	$2,732,032
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.627	$2,115,019
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.627	$169
2021	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.592	$1,431,096
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.592	$2,579,526
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.592	$1,996,956
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.592	$160
2022	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.558	$1,348,905
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.558	$2,431,378
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.558	$1,882,266
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.558	$151
2023	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.527	$1,273,966
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.527	$2,296,301
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.527	$1,777,695
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.527	$142
2024	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.497	$1,201,444
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.497	$2,165,582
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.497	$1,676,498
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.497	$134
2025	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.469	$1,133,757
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.469	$2,043,577
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.469	$1,582,048
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.469	$127
2026	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.442	$1,068,487
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.442	$1,925,930
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.442	$1,490,970
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.442	$119
2027	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.417	$1,008,052
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.417	$1,816,997
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.417	$1,406,639
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.417	$113
2028	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.394	$952,452
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.394	$1,716,779
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.394	$1,329,055
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.394	$106
2029	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.371	$896,852
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.371	$1,616,561
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.371	$1,251,471
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.371	$100
2030	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.350	$846,087
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.350	$1,525,058
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.350	$1,180,633
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.350	$94

Project: Amethyst Basin Stormwater Flood Reduction Project									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [1]	Annual $ Value [1] (f) x (g)	Discount Factor [1]	Discounted Benefits [1] (h) x (i)
2031	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.331	$800,157
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.331	$1,442,269
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.331	$1,116,541
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.331	$89
2032	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.312	$754,226
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.312	$1,359,480
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.312	$1,052,450
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.312	$84
2033	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.294	$710,713
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.294	$1,281,049
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.294	$991,731
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.294	$79
2034	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.278	$672,035
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.278	$1,211,332
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.278	$937,760
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.278	$75
2035	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.262	$633,357
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.262	$1,141,615
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.262	$883,788
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.262	$71
2036	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.247	$597,096
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.247	$1,076,255
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.247	$833,189
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.247	$67
2037	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.233	$563,252
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.233	$1,015,253
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.233	$785,964
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.233	$63
2038	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.220	$531,826
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.220	$958,608
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.220	$742,112
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.220	$59
2039	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.207	$500,400
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.207	$901,963
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.207	$698,260
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.207	$56
2040	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.196	$473,809
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.196	$854,032
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.196	$661,154
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.196	$53
2041	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.185	$447,218
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.185	$806,102
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.185	$624,049
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.185	$50
2042	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.174	$420,626
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.174	$758,172
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.174	$586,943
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.174	$47
2043	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.164	$396,452
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.164	$714,599
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.164	$553,211
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.164	$44
2044	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.155	$374,696
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.155	$675,383
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.155	$522,852
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.155	$42
2045	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.146	$352,939
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.146	$636,167
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.146	$492,492
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.146	$39
2046	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.138	$333,600
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.138	$601,309
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.138	$465,507
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.138	$37
2047	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.130	$314,261
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.130	$566,450
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.130	$438,521
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.130	$35
2048	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.123	$297,339
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.123	$535,949
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.123	$414,908
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.123	$33
2049	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.116	$280,417
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.116	$505,448
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.116	$391,295
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.116	$31

Project: Amethyst Basin Stormwater Flood Reduction Project

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
2050	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.109	$263,496
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.109	$474,947
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.109	$367,683
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.109	$29
2051	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.103	$248,991
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.103	$448,803
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.103	$347,443
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.103	$28
2052	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.097	$234,487
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.097	$422,659
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.097	$327,204
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.097	$26
2053	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.092	$222,400
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.092	$400,872
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.092	$310,338
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.092	$25
2054	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.087	$210,313
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.087	$379,086
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.087	$293,472
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.087	$23
2055	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.082	$198,226
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.082	$357,299
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.082	$276,605
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.082	$22
2056	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.077	$186,139
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.077	$335,513
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.077	$259,739
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.077	$21
2057	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.073	$176,470
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.073	$318,083
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.073	$246,246
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.073	$20
2058	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.069	$166,800
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.069	$300,654
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.069	$232,753
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.069	$19
2059	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.065	$157,130
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.065	$283,225
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.065	$219,260
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.065	$18
2060	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.061	$147,461
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.061	$265,796
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.061	$205,767
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.061	$16
2061	No. of 1-story Res. Structures flooded	each	32	9	23	$105,104	$2,417,392	0.058	$140,209
	No. of 2-story Res. Structures flooded	each	72	14	58	$75,126	$4,357,308	0.058	$252,724
	No. of Commercial Structures flooded	each	30	24	6	$562,206	$3,373,236	0.058	$195,648
	Length of Roads inundated	mile	0.363	0.336	0.027	$10,000	$270	0.058	$16
Last Year of Project Life									
								Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)	**$169,576,522**

Comments:

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 16 – Annual Costs of Project
(All costs should be in 2012 Dollars)

Project: Amethyst Basin Stormwater Flood Reduction Project

	Initial Costs Grand Total Cost from Table 6 (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2010									1.020	
2011									1.010	
2012									1.000	
2013	**$10,508,959**		$3,200	$9,600	$9,600	$8,065		$10,539,424	0.943	$9,942,853
2014			$3,200	$9,600	$9,600	$8,065		$30,465	0.890	$27,114
2015			$3,200	$9,600	$9,600	$8,065		$30,465	0.840	$25,579
2016			$3,200	$9,600	$9,600	$8,065		$30,465	0.792	$24,131
2017			$3,200	$9,600	$9,600	$8,065		$30,465	0.747	$22,765
2018			$3,200	$9,600	$9,600	$8,065		$30,465	0.705	$21,477
2019			$3,200	$9,600	$9,600	$8,065		$30,465	0.665	$20,261
2020			$3,200	$9,600	$9,600	$8,065		$30,465	0.627	$19,114
2021			$3,200	$9,600	$9,600	$8,065		$30,465	0.592	$18,032
2022			$3,200	$9,600	$9,600	$8,065		$30,465	0.558	$17,011
2023			$3,200	$9,600	$9,600	$8,065		$30,465	0.527	$16,049
2024			$3,200	$9,600	$9,600	$8,065		$30,465	0.497	$15,140
2025			$3,200	$9,600	$9,600	$8,065		$30,465	0.469	$14,283
2026			$3,200	$9,600	$9,600	$8,065		$30,465	0.442	$13,475
2027			$3,200	$9,600	$9,600	$8,065		$30,465	0.417	$12,712
2028			$3,200	$9,600	$9,600	$8,065		$30,465	0.394	$11,992
2029			$3,200	$9,600	$9,600	$8,065		$30,465	0.371	$11,314
2030			$3,200	$9,600	$9,600	$8,065		$30,465	0.350	$10,673
2031			$3,200	$9,600	$9,600	$8,065		$30,465	0.331	$10,069
2032			$3,200	$9,600	$9,600	$8,065		$30,465	0.312	$9,499
2033			$3,200	$9,600	$9,600	$8,065		$30,465	0.294	$8,961
2034			$3,200	$9,600	$9,600	$8,065		$30,465	0.278	$8,454
2035			$3,200	$9,600	$9,600	$8,065		$30,465	0.262	$7,976
2036			$3,200	$9,600	$9,600	$8,065		$30,465	0.247	$7,524
2037			$3,200	$9,600	$9,600	$8,065		$30,465	0.233	$7,098
2038			$3,200	$9,600	$9,600	$8,065		$30,465	0.220	$6,697
2039			$3,200	$9,600	$9,600	$8,065		$30,465	0.207	$6,317
2040			$3,200	$9,600	$9,600	$8,065		$30,465	0.196	$5,960
2041			$3,200	$9,600	$9,600	$8,065		$30,465	0.185	$5,623
2042			$3,200	$9,600	$9,600	$8,065		$30,465	0.174	$5,304
2043			$3,200	$9,600	$9,600	$8,065		$30,465	0.164	$5,004
2044			$3,200	$9,600	$9,600	$8,065		$30,465	0.155	$4,721
2045			$3,200	$9,600	$9,600	$8,065		$30,465	0.146	$4,454
2046			$3,200	$9,600	$9,600	$8,065		$30,465	0.138	$4,201
2047			$3,200	$9,600	$9,600	$8,065		$30,465	0.130	$3,964
2048			$3,200	$9,600	$9,600	$8,065		$30,465	0.123	$3,739
2049			$3,200	$9,600	$9,600	$8,065		$30,465	0.116	$3,528
2050			$3,200	$9,600	$9,600	$8,065		$30,465	0.109	$3,328
2051			$3,200	$9,600	$9,600	$8,065		$30,465	0.103	$3,140
2052			$3,200	$9,600	$9,600	$8,065		$30,465	0.097	$2,962
2053			$3,200	$9,600	$9,600	$8,065		$30,465	0.092	$2,794
2054			$3,200	$9,600	$9,600	$8,065		$30,465	0.087	$2,636
2055			$3,200	$9,600	$9,600	$8,065		$30,465	0.082	$2,487
2056			$3,200	$9,600	$9,600	$8,065		$30,465	0.077	$2,346
2057			$3,200	$9,600	$9,600	$8,065		$30,465	0.073	$2,213
2058			$3,200	$9,600	$9,600	$8,065		$30,465	0.069	$2,088
2059			$3,200	$9,600	$9,600	$8,065		$30,465	0.065	$1,970
2060			$3,200	$9,600	$9,600	$8,065		$30,465	0.061	$1,858
2061			$3,200	$9,600	$9,600	$8,065		$30,465	0.058	$1,753
...									...	
Last Year of Project Life									...	
									Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 17, column (c), Proposal Benefits and Costs Summaries	**$10,392,643**

Comments:

(1) Grand total costs are taken from Table 6 - Project Budget

(2) Administration costs are estimated to be (2) weeks of work per year at the rate of $40 per hour. (2 x 40 x 40 = $3,200)

(3) Operation costs are estimated to be (2) weeks of work per year at the rate of $120 per hour. (2 x 40 x 120 = $9,600)

(4) Maintenance costs are estimated to be (2) weeks of work per year at the rate of $120 per hour. (2x 40 x120 = $9,600)

(5) Replacement costs are estimated to include sediment built-up removal (48,400 Cubic Yards every 6 years) and scouring of the basin at the rate of $1 per Cubic Yard .
This cost is $48,400 to be divided by 6 years, the annual cost is $8,066.70 to do the work as needed

(6) Discount factors are based on 6% discount rate and 50 year analysis period.

Table 17 – Proposal Benefits and Costs Summary Proposal: Amethyst Basin Stormwater Flood Reduction Project Agency: County of San Bernardino Flood Control District						
Project	Project Proponent	Total Present Value Project Costs (1)	Total Present Value Project Benefits			From Section D2 – Briefly describe the main Non-monetized benefits
			From Section D2 – Flood Damage Reduction (2)	From Section D2 – Monetized (3)	Total	
(a)	(b)	(c)	(d)	(e)	(f) = (d) + (e)	(g)
Amethyst Basin		$10,392,643	$6,873,062	$0	$6,873,062	

(1) From Table 16 or RWMG method
(2) From Table 12 or RWMG method
(3) From Table 14 or RWMG method