Attachment 8
Benefits and Cost Analysis

The Project provides improved flood protection, water conservation, and water quality. The drainage system will capture and convey storm water to the expanded Ely Basins. The system captures runoff from a watershed area of 956 acres and during average rainfall years, will deliver 722 acre-feet of storm water to the basins for recharge. The Project will eliminate 277 acres of flood inundation area of mixed residential, commercial, and industrial properties, as shown on Attachment 7-1.

The Project, when completed, will operate as a passive system. When precipitation occurs, water will conveyed through the Francis Street Storm Drain to the Ely Basins for recharge. The Project will provide immediate flood protection to the existing flood hazard area. There are no uncertainties related to the project benefits and the Project will not create any adverse effects.

The Project's economic costs related to flood control include expansion of 310 acre-feet to the Ely Basins, including water quality and water level monitoring systems, and 8,500 linear feet of storm drain conveyance facilities. As shown on Table 5, the drainage conveyance and basin improvements are estimated at $12.8 million. The Project's total costs are shown on Table 6 in Attachment 4.

The Project's flood damage reduction benefit analysis was calculated using the data presented in Attachment 7 and DWR's Flood Rapid Assessment Model (F-RAM). Expected annual damage without the Project is approximately $3.5 million, as shown on Table 11, due to the greater economic impacts to the commercial and industrial communities through flood damage and lost revenue. As shown on Table 12, the present value of expected annual damage is $55 million. F-RAM analysis is included as Attachment 8-1.

In addition to flood protection, the Ely Basins will be excavated to provide additional flood storage for greater aquifer recharge. The Project's recharge benefit analysis is presented Table 14 and described further below. The Project will provide a water supply benefit through avoided imported water supply costs. The total present value of the recharge benefit is $8.5 million.

Imported water supplies reliability will continue to be at risk. Reducing dependence on these supplies will benefit the entire State. For the cost analysis, MWD Tier 2 water rates are used since Tier 1 water is not available and is not anticipated to be available in the future. MWD's Tier 2 water rate for 2013 is $743 per acre-foot.

Approximately 722 acre-feet per year of storm water will be recharged at the basins reducing the City dependence on import water. Without the project, no new yield will be captured. Capture and recharge of the new yield will benefit all Chino Basin water producers serving an estimated population of 2.2 million.

The Project's non-monetized benefit is greenhouse gas (GHG) emissions reduction. As described in Attachment 7, GHG reductions will be reduced through reduced

dependence on imported water. GHG reduction of 1,100 tons CO_2 per year for the project will be achieved.

Project costs include initial construction and ongoing maintenance. It is estimated that every 5 years the basin will require removal of sediment build-up and scouring of the basin floor. At these 5 year intervals, over the Projects 50 year life, operation and maintenance costs will increase to account for the additional work. The total present value of discounted costs is $15.1 million, as shown on Table 16. All values for total present value Project costs (Table 16), flood damage reduction (Table 12), and monetized Project benefits (Table 14) are summarized on Table 17. The Project's benefit cost summary (Table 17) show that Project benefits outweigh Project cost by 4:1.

All included tables have been described, qualified, and/or supported here and in the comment section of each table.

Attachment 8-1
FRAM Analysis

DWR Levee Mitigation Prioritization Tool

To Read Instructions:	Read Instructions
To Enter Project Information:	Enter Project Information
To Enter Special Cases:	Enter Special Cases
View Cost-Benefit Analysis:	Cost-Benefit Analysis
View Stage Damage Graph:	Stage v Damage Curve
View AAD Graph (Actual):	Loss Probability Curve

Instructions

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Project information should be entered in the 'Inputs' tab only. Information is required in all cells highlighted green. Example:

Output information is provided in the 'BCA Summary' tab. Project calculations are performed in the sheets described in the Model Map.

Model Map

Sheet Name	Description
Menu:	Front page of model, with links to key sheets
Instructions:	Description of how this model should be used
Inputs:	Project information to be entered by user
BCA Summary:	Summary data resulting from Cost-Benefit Analysis
Assumptions:	Master page containing unit damage assumptions
Depth Damage Curves	Data describing stage damage relationships
Residential:	Direct residential building and contents costs
Commercial & Industrial:	Direct commercial and industrial building and contents costs
Agricultural:	Direct losses to agricultural production
Roads	Direct Losses to roads and infrastructure
Special Cases:	Table for entering information about special case buildings
Without Project EAD	Calculation of Estimated Annual Damages (EAD) without-project
Graph Data	Data used to develop graphical outputs
With Project EAD	Calculation of Estimated Annual Damages (EAD) with-project
Stage v Damage Curve	Graph of flood stage v flood damages
Loss Probability Curve	Graph of flood exceedance probability v flood damages

Inputs

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Project Name: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project

Cost of Project: $ 16,640,000

Description: The project will mitigat flooding for a tributary area of 956 acres and includes: storm drain improvements along Francis Street from Campus Avenue to the West Cucamonga Creek with a total pipeline length of approximately 8,500 linear feet and diameters ranging from 18" to 132", and expansion of the existing Ely Basins by approximately 310 acre-feet for additional aquifer recharge.

Number of Events Modeled: 3

		Without Project						With Project					
		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Average Return Interval (ARI)		10	25	100				10	25	100			
Annual Probability of Exceedance		0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!	0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!
Probability of Levee Failure		1.00	1.00	1.00				0.00	0.00	0.00			
Water Surface Elevation - channel (f)		875.90	876.13	876.50									
Flood Warning Time (hours)		0.5	0.5	0.5									
Flood Experience		Y	Y	Y				N	N	N			
Period of Inundation (days)		1	1	1									
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		100%	100%	100%									
Average Flood depth above ground level (f)		0.90	1.13	1.50									
Rural - Res: Homesteads													
Rural - Other: Barns, sheds													
Urban Res: Single story (no base)		82	102	136									
Urban Res: Single story (basement)													
Urban Res: Two plus story (no base)		224	281	374									
Urban Res: Two plus story (basement)													
Mobile home													
Commercial Properties													
Ratio Depreciated Value to Replacement Value		100%	100%	100%									
Average Flood depth above ground level (f)		0.90	1.13	1.50									
low value	building area inundated (sq.f.)	200,413	250,516	334,021									
medium value	building area inundated (sq.f.)	200,413	250,516	334,021									
high value	building area inundated (sq.f.)												
Industrial Properties													
Ratio Depreciated Value to Replacement Value		100%	100%	100%									
Average Flood depth above ground level (f)		0.90	1.13	1.50									
low value	building area inundated (sq.f.)	692,486	865,607	1,154,143									
medium value	building area inundated (sq.f.)	692,486	865,607	1,154,143									
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)		0.93	1.16	1.5									
length of major roads inundated (miles)		1.78	2.23	3.0									
length of minor roads inundated (miles)		0.69	0.87	1.2									
length of unsealed roads inundated (miles)													

Extrapolate Y-intercept: N

Summary of Cost-Benefit Analysis

Return to Menu

Project Name: **Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project**

Description: The project will mitigat flooding for a tributary area of 956 acres and includes: storm drain improvements along Francis Street from Campus Avenue to the West Cucamonga Creek with a total pipeline length of approximately 8,500 linear feet and diameters ranging from 18" to 132", and expansion of the existing Ely Basins by approximately 310 acre-feet for additional aquifer recharge.

Proposed project capital cost:	$ 16,640,000	[Note: construction costs which are assumed to occur in one year.]
Change in annual O&M costs:	$ -	[Note: the change in annual O&M costs compared to without project conditions.]
PV of future O&M costs:	$ -	(at 6% discount rate over 50 years)
PV of future costs	$ 16,640,000	[Note: the sum of capital costs plus the PV of O&M costs.]

Benefits

	Actual	Potential	
EAD without project	$ 10,404,463	$ 11,917,910	[Note: for stormwater projects use "Potential" damage which ignores storm warning effects.]
EAD with project	$ -	$ -	
Annual Benefit:	$ 10,404,463	$ 11,917,910	
PV of Future Benefits:	$ 163,993,691	$ 187,848,435	(at 6% discount rate over 50 years)

Cost-Benefit Analysis

	Actual	Potential	
Net Present Value (NPV)	$ 147,353,691	$ 171,208,435	(at 6% discount rate over 50 years)
Benefit:Cost Ratio	9.855	11.289	

NPV Sensitivity to Discount Rate:

	Actual	Potential
4%	$ 206,870,589	$ 239,382,741
5%	$ 173,303,096	$ 200,932,475
6%	$ 147,353,691	$ 171,208,435
7%	$ 126,949,350	$ 147,836,051
8%	$ 110,642,835	$ 129,157,568

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 Franci

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 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Warning Time:	hours	0.5	0.5	0.5	0	0	0	0	0	0	0	0	0
Recent Flood Expe	Y / N	Y	Y	Y	0	0	0	N	N	N	0	0	0
Actual : Potential Ratio		0.8	0.8	0.8	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							
COMMERCI	COM	Commercial Buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25							
COMMERCI	COM		S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49							
COMMERCI	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 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI:	10	25	100	0	0	0	10	25	100	0	0	0
Probability of Levee Failure	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flood depth above ground level (ft)	0.90	1.13	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buildings Inundated (no.)												
Rural - Res: Homesteads	0	0	0	0	0	0	0	0	0	0	0	0
Rural - Other: Barns, sheds	0	0	0	0	0	0	0	0	0	0	0	0
Urban Res: Single story (no base)	82	102	136	0	0	0	0	0	0	0	0	0
Urban Res: Two plus story (no base)	224	281	374	0	0	0	0	0	0	0	0	0
Mobile home	0	0	0	0	0	0	0	0	0	0	0	0
Structural Damages												
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 616,284	$ 4,129,103	$ 5,505,470	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ 2,295,612	$ 8,895,497	$ 11,860,662	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Structual Damages HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ 2,911,896	$ 13,024,599	$ 17,366,132	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Content Damages												
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 591,633	$ 2,495,950	$ 3,327,934	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ 765,204	$ 4,782,525	$ 6,376,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damage HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Actual:Potential Ratio	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ 1,085,469	$ 5,822,780	$ 7,763,707	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Contents Damages: Potential	$ 1,356,837	$ 7,278,475	$ 9,704,634	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-Up/ Other Costs												
External	$ 1,530,000	$ 1,912,500	$ 2,550,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cleanup	$ 1,224,000	$ 1,530,000	$ 2,040,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other Costs HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Other Costs: Potential	$ 2,754,000	$ 3,442,500	$ 4,590,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ 6,751,365**	**$ 22,289,879**	**$ 29,719,839**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Sum Potential Damages	**$ 7,022,733**	**$ 23,745,575**	**$ 31,660,766**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Actual Damage with levee failure ($):	**$ 6,751,365**	**$ 22,289,879**	**$ 29,719,839**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Potential Damage with levee failure ($):	**$ 7,022,733**	**$ 23,745,575**	**$ 31,660,766**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Indirect Actual Damage	$ 1,687,841	$ 5,572,470	$ 7,429,960	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Indirect Potential Damage	$ 1,755,683	$ 5,936,394	$ 7,915,192	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Commercial & Industrial Buildings

	Without Project						With Project					
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI:	10	25	100	0	0	0	10	25	100	0	0	0
Probability of Levee Failure	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commercial												
'Flood depth above ground level (ft)	0.90	1.13	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
low building size	200413	250516	334021	0	0	0	0	0	0	0	0	0
medium building size	200413	250516	334021	0	0	0	0	0	0	0	0	0
high building size	0	0	0	0	0	0	0	0	0	0	0	0
Industrial												
'Flood depth above ground level (ft)	0.90	1.13	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
low building size	692486	865607	1154143	0	0	0	0	0	0	0	0	0
medium building size	692486	865607	1154143	0	0	0	0	0	0	0	0	0
high building size	0	0	0	0	0	0	0	0	0	0	0	0
Structural Damages												
Commercial												
low	$ -	$ 1,202,476	$ 1,603,302	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ 1,422,930	$ 1,897,240	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Commercial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial												
low	$ 3,323,931	$ 4,154,913	$ 12,464,740	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ 3,933,318	$ 4,916,647	$ 14,749,942	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ 7,257,249	$ 11,696,967	$ 30,715,224	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damages												
Commercial												
low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Commercial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial												
low	$ -	$ -	$ 99,717,918	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ 117,999,537	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Actual:Potential Ratio	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ -	$ -	$ 174,173,964	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Contents Damages: Potential	$ -	$ -	$ 217,717,455	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-up/ Other Costs	$ 2,177,175	$ 3,509,090	$ 9,214,567	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-Up/ Other Costs: HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ 9,434,423**	**$ 15,206,057**	**$ 214,103,756**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Sum Potential Damages	**$ 9,434,423**	**$ 15,206,057**	**$ 257,647,247**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Damage with levee failure ($):	**$ 9,434,423**	**$ 15,206,057**	**$ 214,103,756**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Damage with levee failure ($):	**$ 9,434,423**	**$ 15,206,057**	**$ 257,647,247**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Indirect Actual Damages	$ 2,358,606	$ 3,801,514	$ 53,525,939	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Indirect Potentail Damages	$ 2,358,606	$ 3,801,514	$ 64,411,812	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Agricultural Damages

		Without Project						With Project					
		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI:		10	25	100	0	0	0	10	25	100	0	0	0
Probability of Levee Failure		1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Length of Inundation <5d Y/N		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Agricultural Land Inundated													
Corn	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Rice	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Walnuts	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Almonds	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Cotton	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Tomatoes	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Alfalfa	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Pasture	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Safflower	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Beets	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Beans	ac.	0	0	0	0	0	0	0	0	0	0	0	0
Other	ac.	0	0	0	0	0	0	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 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI	10	25	100	0	0	0	10	25	100	0	0	0
Probability of Levee failure	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roads Inundated												
length of arterial roads inundated (miles)	0.93	1.16	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
length of major roads inundated (miles)	1.78	2.23	2.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
length of minor roads inundated (miles)	0.69	0.87	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
length of unsealed roads inundated (miles)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potential Damages												
length of arterial roads inundated (miles)	$ 231,847	$ 289,808	$ 386,411	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
length of major roads inundated (miles)	$ 178,045	$ 222,557	$ 296,742	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
length of minor roads inundated (miles)	$ 20,775	$ 25,969	$ 34,625	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
length of unsealed roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Damages:	*$ 430,667*	*$ 538,334*	*$ 717,778*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Damage with levee failure ($):	$ 430,667	$ 538,334	$ 717,778	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Special Cases - Dollar Damages Incurred

Return to Menu

	Without Project						With Project					
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI	10	25	100	0	0	0	10	25	100	0	0	0
Probability of Levee failure	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Description / Site ID												
Total Damages:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Damage with levee failure ($):	0	0	0	0	0	0	0	0	0	0	0	0

Calculation of Without Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Y Intercept
Average Recurrence Interval (ARI)	10	25	100	0	0	0	
AEP	0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!	0
Actual Damage to Residential Buildings ($)	$ 6,751,365	$ 22,289,879	$ 29,719,839	$ -	$ -	$ -	
Potential Damage to Residential Buildings ($)	$ 7,022,733	$ 23,745,575	$ 31,660,766	$ -	$ -	$ -	
Actual Damage to Commercial/Industrial Buildings ($)	$ 9,434,423	$ 15,206,057	$ 214,103,756	$ -	$ -	$ -	
Potential Damage to Commercial/Industrial Buildings ($)	$ 9,434,423	$ 15,206,057	$ 257,647,247	$ -	$ -	$ -	
Damage to Agriculture ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Damage to Roads ($)	$ 430,667	$ 538,334	$ 717,778	$ -	$ -	$ -	
Actual Indirect Costs	$ 4,154,114	$ 9,508,568	$ 61,135,343	$ -	$ -	$ -	
Potential Indirect Costs	$ 4,221,956	$ 9,872,491	$ 72,506,448	$ -	$ -	$ -	
Special Cases	$ -	$ -	$ -	$ -	$ -	$ -	
Total Actual Damages	$ 20,770,569	$ 47,542,838	$ 305,676,717	$ -	$ -	$ -	$ 305,676,717
Total Potential Damages	$ 21,109,778	$ 49,362,457	$ 362,532,239	$ -	$ -	$ -	$ 362,532,239
EAD (Actual)	$ 10,404,463						
EAD (Potential)	$ 11,917,910						

Potential Damages

	Without Project							With Project						
Water Surface Elevation - channel (f)	875.9	876.125	876.5	876.5	876.5	876.5		0	0	0	0	0	0	
ARI	10	25	100	0	0	0		10	25	100	0	0	0	
Probability of Exceedence (AEP)	0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!		0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!	
Damages incurred	$ 21,109,778	$ 49,362,457	$ 362,532,239	$ -	$ -	$ -	$ 362,532,239	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Actual Damages

	Without Project							With Project						
Water Surface Elevation - channel (f)	875.9	876.125	876.5	0	0	0		0	0	0	0	0	0	
ARI	10	25	100	0	0	0		10	25	100	0	0	0	
Probability of Exceedence (AEP)	0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!		0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!	
Damages incurred	$ 20,770,569	$ 47,542,838	$ 305,676,717	$ -	$ -	$ -	$ 305,676,717	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Without Project

Water Surface Elevation - channel (f)	10	25	100	0	0	0
Probability of Exceedence (AEP)	0.100	0.040	0.010	0.010	0.010	0.010
Potential	$ 21,109,778	$ 49,362,457	$ 362,532,239	$ 362,532,239	$ 362,532,239	$ 362,532,239
Actual	$ 20,770,569	$ 47,542,838	$ 305,676,717	$ 305,676,717	$ 305,676,717	$ 305,676,717

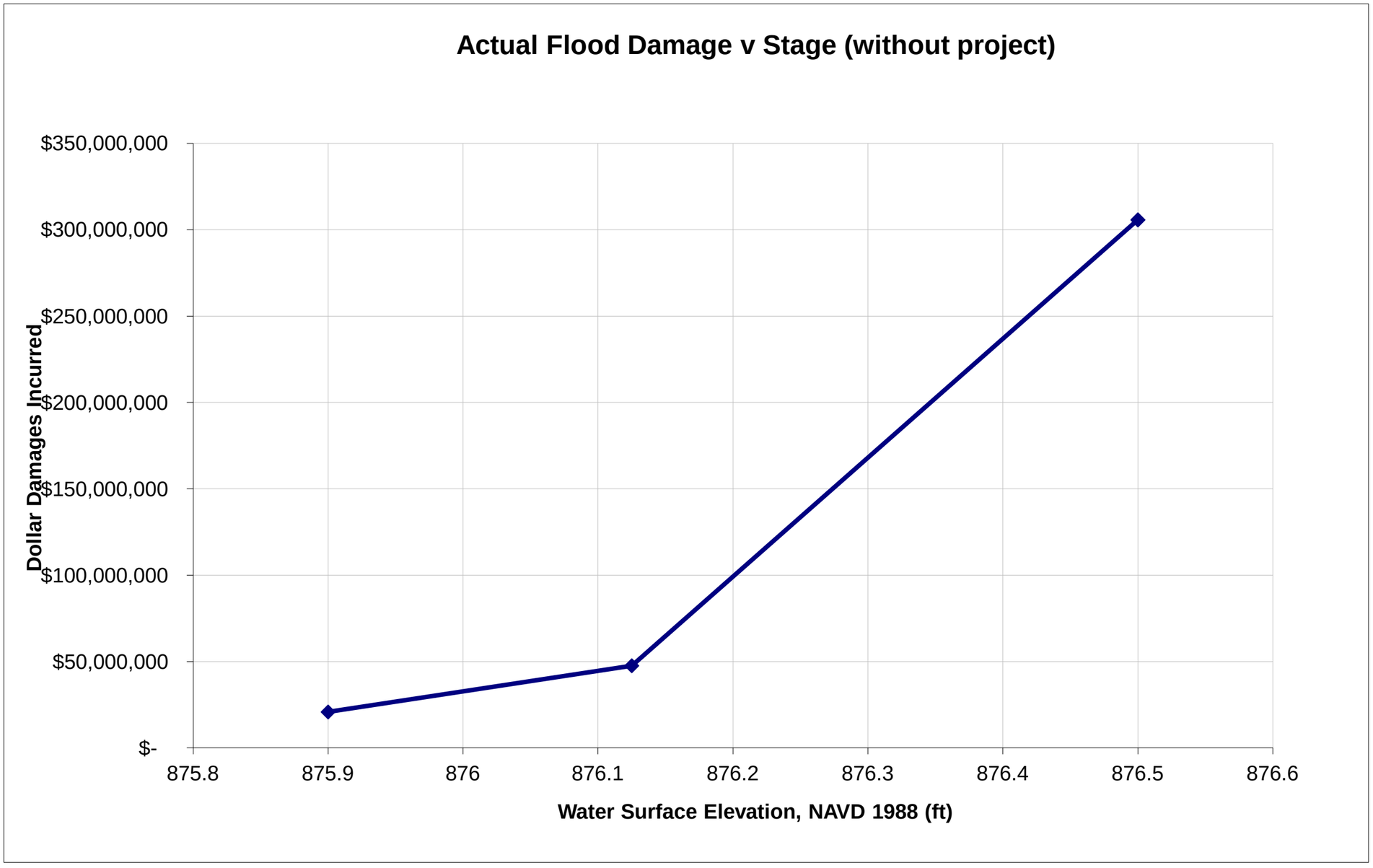
With Project

Water Surface Elevation - channel (f)	10	25	100	0	0	0
Probability of Exceedence (AEP)	0.100	0.040	0.010	0.010	0.010	0.010
Potential	$ -	$ -	$ -	$ -	$ -	$ -
Actual	$ -	$ -	$ -	$ -	$ -	$ -

Calculation of With Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
Average Recurrence Interval (ARI)	10	25	100	0	0	0	
AEP	0.100	0.040	0.010	#DIV/0!	#DIV/0!	#DIV/0!	0
Actual Damage to Residential Buildings ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Potential Damage to Residential Buildings ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Actual Damage to Commercial/Industrial Buildings ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Potential Damage to Commercial/Industrial Buildings ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Damage to Agriculture ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Damage to Roads ($)	$ -	$ -	$ -	$ -	$ -	$ -	
Actual Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Potential Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Special Cases	$ -	$ -	$ -	$ -	$ -	$ -	
Total Actual Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Potential Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -

EAD (Actual)	$ -
EAD (Potential)	$ -


Actual Flood Damage v Stage (without project)
$350,000,000
$300,000,000
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$-
Dollar Damages Incurred
875.8
875.9
876
876.1
876.2
876.3
876.4
876.5
876.6
Water Surface Elevation, NAVD 1988 (ft)

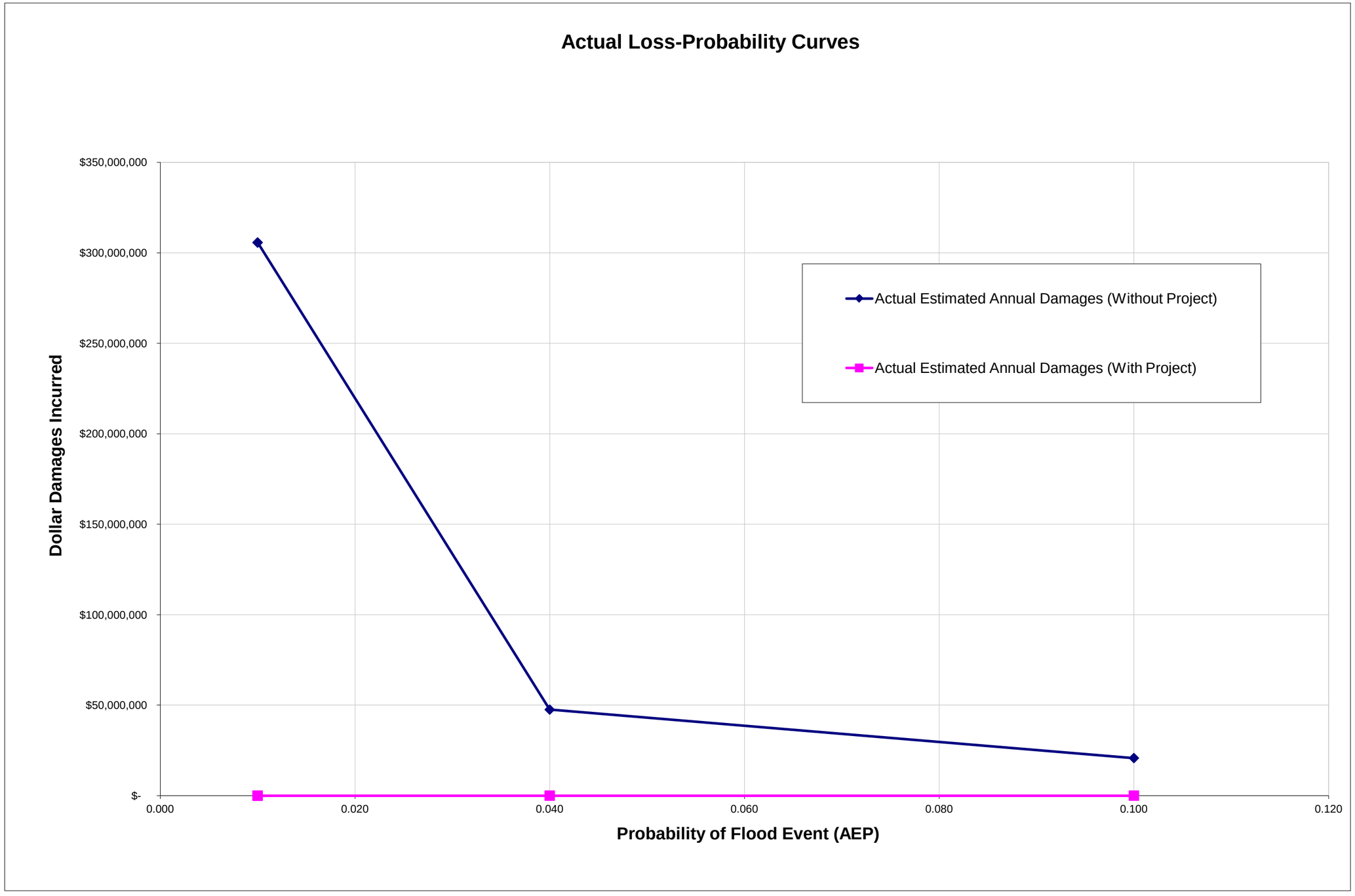

Actual Loss-Probability Curves
$350,000,000
$300,000,000
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$-
Dollar Damages Incurred
0.000
0.020
0.040
0.060
0.080
0.100
0.120
Probability of Flood Event (AEP)
Actual Estimated Annual Damages (Without Project)
Actual Estimated Annual Damages (With Project)

Table 11 - Expected Annual Damage

Project: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project

Hydrologic Event	Event Probability	Damage if Flood Structures Fail	Probability Structural Failure		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
					(f)	(g)	(i)	(j)	(k)	(l)	(m)
(a)	(b)	(c)	(d)	(e)	(c)*(d)	(c)*(e)	from (b)	from (f)	from (g)	(i) x (j)	(i) x (k)
10-Year	0.100	$ 21,109,778	0.60	0.00	$ 12,665,867	$ -	0.050	$ 20,770,569	$ -	$ 1,038,528	$ -
25-Year	0.040	$ 49,362,457	0.75	0.00	$ 37,021,843	$ -	0.020	$ 47,542,838	$ -	$ 950,857	$ -
100-Year	0.010	$ 362,532,239	1.00	0.00	$ 362,532,239	$ -	0.005	$ 305,676,717	$ -	$ 1,528,384	$ -
Expected Annual Damages, Without and With Project										**$ 3,517,769**	**$ -**

Notes:

1.) Expected annual damage determined using DWR's Flood Rapid Assessment Model (FRAM). Detailed FRAM analysis is included as part of this attachment.

Table 12 - Present Value of Expected Annual Damage

Project: Francis Street Storm Drain and Ely Basin
Flood Control and Aquifer Recharge Project

(a)	Expected Annual Damage Without Project[1.)]		$ 3,517,769
(b)	Expected Annual Damage With Project[1.)]		$ -
(c)	Expected Annual Benefit	(a)-(b)	$ 3,517,769
(d)	Present Value Coefficient[2.)]		15.76
(e)	**Present Value of Future Benefits Transfer to Table 17, Column (d).**	**(c)*(d)**	**$ 55,440,036**

Notes:

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 life cycle of project).

Table 14 - Annual Benefit
(All Costs should be in 2012 Dollars)

Project: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge 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)*(g)	Discount Factor[1.)]	Discounted Benefits[1.)] (h)*(i)
2012	Stormwater Capture and Storage	Acre-Feet	0	0	0	$ 743	$ -	1.000	$ -
2013	Stormwater Capture and Storage	Acre-Feet	0	0	0	$ 743	$ -	0.943	$ -
2014	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.890	$ 510,500
2015	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.840	$ 481,821
2016	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.792	$ 454,288
2017	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.747	$ 428,476
2018	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.705	$ 404,385
2019	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.665	$ 381,441
2020	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.627	$ 359,645
2021	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.592	$ 339,569
2022	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.558	$ 320,067
2023	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.527	$ 302,285
2024	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.497	$ 285,077
2025	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.469	$ 269,017
2026	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.442	$ 253,529
2027	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.417	$ 239,190
2028	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.394	$ 225,997
2029	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.371	$ 212,804
2030	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.350	$ 200,759
2031	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.331	$ 189,860
2032	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.312	$ 178,962
2033	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.294	$ 168,637
2034	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.278	$ 159,460
2035	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.262	$ 150,282
2036	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.247	$ 141,678
2037	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.233	$ 133,648
2038	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.220	$ 126,191
2039	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.207	$ 118,734
2040	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.196	$ 112,425
2041	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.185	$ 106,115
2042	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.174	$ 99,806
2043	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.164	$ 94,070
2044	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.155	$ 88,907
2045	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.146	$ 83,745

Table 14 - Annual Benefit
(All Costs should be in 2012 Dollars)

Project: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge 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)*(g)**	**Discount Factor[1.)]**	**Discounted Benefits[1.)] (h)*(i)**
2046	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.138	$ 79,156
2047	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.130	$ 74,567
2048	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.123	$ 70,552
2049	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.116	$ 66,537
2050	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.109	$ 62,522
2051	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.103	$ 59,080
2052	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.097	$ 55,639
2053	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.092	$ 52,771
2054	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.087	$ 49,903
2055	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.082	$ 47,035
2056	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.077	$ 44,167
2057	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.073	$ 41,873
2058	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.069	$ 39,578
2059	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.065	$ 37,284
2060	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.061	$ 34,989
2061	Stormwater Capture and Storage	Acre-Feet	0	772	772	$ 743	$ 573,596	0.058	$ 33,269
							Total Present Value of Discounted Benefits Based on Unit Value (Sum of Column (j) for all Benefits shown in Table)		**$ 8,470,292**

Notes:
1.) Complete these columns if dollar value is being claimed for the benefit.
2.) Refer to Attachment 7 and Table 7 for benefit details.

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

Project: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project

	Initial Costs Grand Total Cost from Table 6 (row (i), coulmn (d))	Adjusted Grant Total Cost[1.)]	Annual Costs[2.)]						Discounting Calculations	
			Admin	Operation	Maintainance	Replacement	Other	Total Costs (a)+...+(g)	Discount Factor	Discounted Costs (h)*(i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	1.000	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	0.943	$ -
2014	$ 16,640,000	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 16,651,000	0.890	$ 14,819,390
2015	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.840	$ 9,240
2016	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.792	$ 8,712
2017	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.747	$ 8,217
2018	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.705	$ 7,755
2019	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.665	$ 51,974
2020	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.627	$ 6,897
2021	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.592	$ 6,512
2022	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.558	$ 6,138
2023	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.527	$ 5,797
2024	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.497	$ 38,843
2025	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.469	$ 5,159
2026	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.442	$ 4,862
2027	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.417	$ 4,587
2028	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.394	$ 4,334
2029	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.371	$ 28,996
2030	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.350	$ 3,850
2031	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.331	$ 3,641
2032	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.312	$ 3,432
2033	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.294	$ 3,234
2034	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.278	$ 21,727
2035	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.262	$ 2,882
2036	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.247	$ 2,717
2037	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.233	$ 2,563
2038	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.220	$ 2,420
2039	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.207	$ 16,178
2040	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.196	$ 2,156
2041	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.185	$ 2,035
2042	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.174	$ 1,914
2043	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.164	$ 1,804
2044	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.155	$ 12,114
2045	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.146	$ 1,606
2046	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.138	$ 1,518
2047	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.130	$ 1,430
2048	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.123	$ 1,353
2049	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.116	$ 9,066
2050	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.109	$ 1,199
2051	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.103	$ 1,133
2052	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.097	$ 1,067
2053	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.092	$ 1,012
2054	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.087	$ 6,800
2055	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.082	$ 902
2056	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.077	$ 847
2057	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.073	$ 803
2058	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.069	$ 759
2059	$ -	$ -	$ 2,000	$ 9,000	$ 9,000	$ 58,156	$ -	$ 78,156	0.065	$ 5,080
2060	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.061	$ 671
2061	$ -	$ -	$ 2,000	$ 4,500	$ 4,500	$ -	$ -	$ 11,000	0.058	$ 638
								Total Present Value of Discounted Costs (Sum of Column (j))	**$**	**15,135,964**
								Transfer to Table 17, column (c), Proposal Benefits and Costs Summaries		

Notes:
1.) If any, based on opportunity costs, sunk costs and associated costs.
2.) The incremental change in O&M costs attributable to the project.

Comments:
(a) Capital and Other Initial Costs are take from and further described in Tables 5 and 6.
(b) Not Applicable.
(c) Administrative costs are estimated to include two weeks of work per year at a rate of $25 per hour.
(d) Operation costs are estimated to include one and a half weeks of work per year at a rate of $75 per hour. Additionally, pipe repair, sediment build-up removal, and scouring of the basin floor, will require extra costs every five years estimated at three weeks of work at a rate of $75 per hour.
(e) Maintenance costs are estimated to include one and a half weeks of work per year at a rate of $75 per hour. Additionally, pipe repair, sediment build-up removal, and scouring of the basin floor, will require extra costs every five years estimated at three weeks of work at a rate of $75 per hour.
(f) Replacement costs include sediment build-up removal (19,300 cubic-yards) and scouring of the basin floor at a rate of $3 per cubic-yard, to be done every 5 years.
(g) Other costs were not applicable.
(h) Total Costs are the summation of columns (a) through (f).
(i) Discount Factors are based on a 6% discount rate and a 50 year analysis period, as provided in the application.
(j) Discounted Costs are Total Costs multiplied by the Discount Factor.

Table 17 - Proposal Benefits and Costs Summary

Proposal: Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project
Agency: City of Ontario

Project	Project Proponent	Total Present Value Project Costs[1.)]	Total Present Value Project Benefits			From Section D2 – Briefly describe the main Non-monetized benefits[4.)]
			From Section D1 – Flood Damage Reduction[2.)]	From Section D3 – Monetized[3.)]	Total	
(a)	(b)	(c)	(d)	(e)	(f)=(d)+(e)	(g)
Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project	City of Ontario	$ 15,135,964	$ 55,440,036	$ 8,470,292	$ 63,910,328	As presented in Table 7, the project will reduce Green House Gases by approximately 900 tons per year.

Notes:
1.) Refer to Table 16.
2.) Refer to Table 12.
3.) Refer to Table 14.
4.) Refer to Attachment 7 for details.