Attachment 8: Flood Damage Reduction Costs and Benefits

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Introduction

Tables 16, 11, and 12 are included in this attachment and the narrative below describes the flood damage reduction costs and benefits. Non-monetized benefits and a short summary of each are included in Table 13.

Narrative Description of the Project's Economic Costs

Project costs reflected in Attachment 4 (Budget) Table 6, row (i) are reflected in column (a) of Table 10. These amounts have been disaggregated by year expended, based on the information contained in Attachment 5 (Schedule).

In its present condition, even storm events of low statistical significance can trigger the need for maintenance along Pine Avenue to prevent the undermining of the road and appurtenant utilities. It is expected that after the Project is completed, the total annual maintenance costs will be reduced.

Annual administration costs borne by the City in conjunction with fulfilling the annual reporting requirements are assumed to be $10,000 per year.

Cost details for the Project

Budget categories (a) through (h) are included in the cost details as described in Table 6.

Narrative Description of the Project's Expected Flood Damage Reduction Benefits

Estimates of Historical Flood Damage Data

The December 2010 flood event resulted in the undermining of the road itself and IEUA's Treatment Plant 1 reclaimed water outfall line, resulting in the need for emergency repairs to prevent more serious impacts. A 0.6 mile section of the road was closed for approximately one week, causing traffic delays and business losses and limiting access to residences and critical utilities. The work logs from the cleanup and repair effort have been attached as Exhibit F.

Estimates of Existing without-Project Conditions

Presently, the area surrounding the Project lies within a FEMA 100-year floodplain (see Exhibit A) and is under significant threat of flood damage from stormwater runoff. Even minor storm events may cause flooding and/or the undermining of the road and appurtenant utilities. All flood events, ranging from 2-year to 200-year, will result in medium-term road closure, causing traffic delays for automobile passengers and freight, business losses to local shops and dairies, emergency access problems for local residents and the nearby California Institution for Women, and limited emergency access to Southern California Edison facilities.

Estimates of with-Project Conditions

After the Project is implemented, stormwater will flow under Pine Avenue through a culvert capable of handling 100-year storm flows and directed downstream to the Prado Reservoir. All damages incurred in the without-Project scenario will be significantly reduced.

Description of Methods Used to Estimate Without- and With-Project Conditions

Local business revenue losses were based on interviews with local business owners. In the interviews conducted the property owners provided loss estimates that only accounted for the losses incurred as a result of inaccessibility, and made an their best effort to exclude losses from closure of business at the time of the storm event. Exhibit B shows the estimates of the revenue lost by business owners in the area of $71,250 which represents revenue losses resulting from a 2-year storm event and 1 week of road closures. For 5-year through 200-year storm events, road closures are expected to last as long as 2 weeks. As a result, business losses are expected to significantly increase.

The cost of passenger traffic delays were estimated to be the lost wages by residents and employees resulting from traffic delays that in turn result from road closures. The estimated cost is the product of (1) total delay experienced by all vehicles as a result of having to travel alternate routes (See Exhibit D), (2) the amount of passenger traffic (See Exhibit C), (3) the average number of persons per vehicle, and (4) the median wage of workers in Chino. Additionally, the cost of freight delays was estimated as the product of (1) total delay experienced by all vehicles as a result of having to travel alternate routes, (2) the estimated amount of freight traffic (See Exhibit C), and (3) the freight cost per hour of delay.

The cost of road repair and replacement was estimated using the Flood Rapid Assessment Model (FRAM), included as Exhibit A.

The cost of utility line damage for the 2-Year flood event was estimated by taking the net present value of 30 years of annual maintenance, provided by the Santa Ana Watershed Project Authority (SAWPA), and the cost of utility line damage all over flood events was estimated as the sum of the net present value of maintenance and the cost of replacement construction and bypass pumping, again provided by SAWPA.

The cost of the burrowing owl habitat loss mitigation was estimated as the product of (1) the average cost of acquiring appropriate land, (2) the necessary number of acres to be acquired per burrow affected by flooding, and (3) the number of burrows affected by flooding.

Distribution of Local, Regional, and Statewide Benefits

The mitigation of flood impacts described above will primarily benefit local residents and businesses. However, the improvements will prevent possible damage to water utilities that serve the California Institute for Women, the TP1 outfall line which serves the entire Chino Basin, and the Santa Ana Regional Interceptor (SARI) line, which serves a variety of public, business, and residential users within the SARI tributary area. Also, effects resulting from the elimination of traffic delays experienced by

passengers and freight along Pine Avenue will benefit businesses and residents within the nearby cities of Ontario, Eastvale, and Corona.

Identification of Beneficiaries

Residents and businesses within the City of Chino and surrounding communities.

When the Benefits will be Received

Benefits will be received as of the completion date of the Project.

Certainty of the Benefits

The benefits were calculated based on statistical data to estimate the occurrence of 2-, 5-, 25-, 100- and 200-year storm events. The benefits will be realized for any flood event that exceeds the capacity under current conditions.

Description of Adverse Effects

There will be no adverse effects other than the one-time impacts of short term local traffic inconvenience and noise during the construction period. These issues were addressed in the CEQA documents.

Description, Qualification and Support of Values Used

For purposes of this analysis, Pine Avenue was assumed to be closed for one week in the 2-Year flood event and two weeks for all other flood events. Local business owners estimated losses totaling $71,250 for one week resulting from road closures; thus, revenue losses totaled $71,250 for the 2-Year flood event and $142,500 for all other events. The total time of delay for all vehicles traveling alternate routes was 1,217.09 hours per day of closure. Using the formula described above, passenger delays totaled $131,866 for the 2-Year flood event and $263,733 for all other events; freight delays totaled $21,168 for the 2-Year flood event and $42,336 for all other events. The cost of road repair and maintenance due to each flood event in the without-project condition was estimated to be $100,000 per lane mile per the Flood Rapid Assessment Model (FRAM). The net present value of utility line maintenance was $275,297 for the 2-Year flood event, and the net present value of utility line maintenance plus the cost of replacement for all other flood events was $475,297. Based on "West Riverside County, Multiple Species Habitat Conservation Plan, 2003" the cost of burrowing owl habitat loss mitigation (in this case, after a flood event) is $13,100 per acre. Furthermore, the California Burrowing Owl Consortium estimates that approximately 13 acres would be required per burrow. Finally, based on the proximity of wildlife area and the existing bird population, it is estimated that there are between two (2) and five (5) burrows located in the project area. For purposes of this analysis it has been conservatively assumed that two (2) burrows are located in the project area.

Estimates of Economic Flood Damage Reduction Benefits

With a useful life of 30 years for the flood control facilities described in this application and a discount rate of 6%, the present value of estimated flood control benefits equal to approximately $8,712,880 (see Table 12)

Documentation to Support Information Presented

See Exhibit A, Flood Reduction Analysis Model (FRAM); Exhibit B, Local Business Revenue Losses; Exhibit C, Daily Traffic Volume without Pine Avenue Closure; Exhibit D, Routes, Daily Volumes, and Daily Delays with Pine Avenue Closure; Exhibit E, Burrowing Owl Survey Protocol and Mitigation Guidelines; Exhibit F, logs prepared by staff detailing time spent on cleanup and repair efforts after the 2010 storm.

Other Flood Damage Reduction Benefits (Qualitative Discussion)

The Project would also reduce storm flows in and around a Southern California Edison easement that surrounds two transmission towers. These facilities are critical to the transmission of electricity throughout Southern California. If an equipment failure took place on these facilities during a large storm event, SCE would not have access until the stormwater receded.

Resources

Linscott Law & Greenspan, Traffic Impact Analysis South of Pine Avenue, 2007
Flood Rapid Assessment Model (FRAM)
West Riverside County, Multiple Species Habitat Conservation Plan, 2003 (http://www.rctlma.org/mshcp/)
California Burrowing Owl Consortium, Burrowing Owl Survey Protocol and Mitigation Guidelines, 1993)
Santa Ana Watershed Project Authority (conservation notes)

Table 16 – Annual Costs of Project

(All costs should be in 2012 Dollars)

Project: The City of Chino Arterial Flood and Stormwater Management Project

	Initial Costs Grand Total Cost from Table 5 (row (i), column (d))	Adjusted Grand Total Cost(1)	Annual Costs (2)		Discounting Calculations	
			Admin	Total Costs (a) +…+ (c)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(h)	(i)	(j)
2012	$0	$0	$0	$0	1.000	$0
2013	$2,011,192	$2,011,192	$0	$4,022,384	0.943	$3,794,702
2014	$0	$0	$10,000	$10,000	0.890	$8,900
2015	$0	$0	$10,000	$10,000	0.840	$8,396
2016	$0	$0	$10,000	$10,000	0.792	$7,921
2017	$0	$0	$10,000	$10,000	0.747	$7,473
2018	$0	$0	$10,000	$10,000	0.705	$7,050
2019	$0	$0	$10,000	$10,000	0.665	$6,651
2020	$0	$0	$10,000	$10,000	0.627	$6,274
2021	$0	$0	$10,000	$10,000	0.592	$5,919
2022	$0	$0	$10,000	$10,000	0.558	$5,584
2023	$0	$0	$10,000	$10,000	0.527	$5,268
2024	$0	$0	$10,000	$10,000	0.497	$4,970
2025	$0	$0	$10,000	$10,000	0.469	$4,688
2026	$0	$0	$10,000	$10,000	0.442	$4,423
2027	$0	$0	$10,000	$10,000	0.417	$4,173
2028	$0	$0	$10,000	$10,000	0.394	$3,936
2029	$0	$0	$10,000	$10,000	0.371	$3,714
2030	$0	$0	$10,000	$10,000	0.350	$3,503
2031	$0	$0	$10,000	$10,000	0.331	$3,305
2032	$0	$0	$10,000	$10,000	0.312	$3,118
2033	$0	$0	$10,000	$10,000	0.294	$2,942
2034	$0	$0	$10,000	$10,000	0.278	$2,775
2035	$0	$0	$10,000	$10,000	0.262	$2,618
2036	$0	$0	$10,000	$10,000	0.247	$2,470
2037	$0	$0	$10,000	$10,000	0.233	$2,330
2038	$0	$0	$10,000	$10,000	0.220	$2,198
2039	$0	$0	$10,000	$10,000	0.207	$2,074
2040	$0	$0	$10,000	$10,000	0.196	$1,956
2041	$0	$0	$10,000	$10,000	0.185	$1,846
2042	$0	$0	$10,000	$10,000	0.174	$1,741
2043	$0	$0	$10,000	$10,000	0.164	$1,643
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 17, column (c), Proposal Benefits and Costs Summaries						**$3,924,559**
Comments:						

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

Table 11(a) – Summary of Expected Cost of Flood Event

Hydrologic Event	Local Business Revenue Losses (1,4)		Cost of Passenger Traffic Delays (2,4)		Cost of Freight Traffic Delays (3,4)		Cost of Road Repair and Replacement (5)		Cost of Utility Line Damage (6)		Cost of Burrowing Owl Habitat Loss Mitigation (7)		**Expected Event Damage**	
	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	**Without Project**	**With Project**
2-Year	$71,250	$0	$131,866	$0	$21,168	$0	$150,000	$0	$275,297	$0	$340,600	$0	**$990,181**	**$0**
5-Year	$142,500	$0	$263,733	$0	$42,336	$0	$150,000	$0	$475,297	$0	$340,600	$0	**$1,414,465**	**$0**
25-Year	$142,500	$0	$263,733	$0	$42,336	$0	$150,000	$0	$475,297	$0	$340,600	$0	**$1,414,465**	**$0**
100-Year	$142,500	$0	$263,733	$0	$42,336	$0	$150,000	$0	$475,297	$0	$340,600	$0	**$1,414,465**	**$0**
200-Year	$142,500	$142,500	$263,733	$263,733	$42,336	$42,336	$150,000	$150,000	$475,297	$475,297	$340,600	$340,600	**$1,414,465**	**$1,414,465**

(1) "Without Project" figures based on interviews with local business owners regarding estimated revenue losses from flood-related closure of Pine Avenue (See Exhibit B).
(2) "Without Project" figures based on estimated average delay cost of $14.84 per person-hour (Source: U.S. Census Bureau, 2009), times 1.15 persons per vehicle (Source: California Department of Transportation, 2009), times 91% passenger traffic (See Exhibit C, Source: Linscott Law & Greenspan, Traffic Impact Analysis South of Pine Avenue, 2007), times daily delay in hours for all vehicles (See Exhibit D), times estimated closure time.
(3) "Without Project" figures based on estimated average delay cost of $26.70 per freight-hour (Source: U.S. Department of Transportation, 2011), times 9% freight traffic (See Exhibit C, Source: Linscott Law & Greenspan, Traffic Impact Analysis South of Pine Avenue, 2007), times daily delay in hours for all vehicles (See Exhibit D), times estimated closure time.
(4) For purposes of this analysis, estimated closure times are as follows: one week for 2-Year Event, two weeks for 5-, 25-, 100-Year and 200-Year Events.
(5) Based on Flood Rapid Assessment Model (FRAM), included as Exhibit A.
(6) "Without Project" figures for 2-Year Event based on $20,000 annual cost of maintaining utility line. "Without Project" figures for 5-Year, 25-Year and 100-Year Events based on $200,000 for replacement construction and bypass pumping, plus $20,000 annual cost of maintaining utility line (Source: Santa Ana Watershed Project Authority).
(7) "Without Project" figures based on average local land acquisition costs per acre (Source: West Riverside County, Multiple Species Habitat Conservation Plan, 2003) times 13.0 acres per affected burrow (Source: California Burrowing Owl Consortium, Burrowing Owl Survey Protocol and Mitigation Guidelines, 1993). For purposes of this analysis, the number of affected burrows was conservatively estimated to be two (2).

Table 11(b) – 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)
2-Year	0.5	$0	1	0	$990,181	$0		$0	$0	$0	$0
5-Year	0.2	$0	1	0	$1,414,465	$0	0.3	$1,202,323	$0	$360,697	$0
25-Year	0.04	$0	1	0	$1,414,465	$0	0.16	$1,414,465	$0	$226,314	$0
100-Year	0.01	$0	1	0	$1,414,465	$0	0.03	$1,414,465	$0	$42,434	$0
200-Year	0.005	$0	1	1	$1,414,465	$1,414,465	0.005	$1,414,465	$707,232	$7,072	$3,536
Expected Annual Damages, Without and With Project										**$636,517**	**$3,536**

Table 12 – Present Value of Expected Annual Damage Benefits

Project: The City of Chino Arterial Flood and Stormwater Management Project

(a)	Expected Annual Damage Without Project (1)		**$636,517**
(b)	Expected Annual Damage With Project (1)		**$3,536**
(c)	Expected Annual Benefit	(a) – (b)	**$632,981**
(d)	Present Value Coefficient (2)		**$13.76**
(e)	**Present Value of Future Benefits Transfer to Table 17, column (d).**	**(c) x (d)**	**$8,712,880**

(1) This program assumes no land use changes in the floodplain. So, EAD will be constant over analysis period.
(2) 6% discount rate; 30-year analysis period (could vary depending upon lifecycle of project).

Table 13 – Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	No
2	**Provide social recreation or access benefits?**	No
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
4	**Promote social health and safety?**	**Yes**
	The Project reduces risk to life resulting from underground utility failure, include high pressure gas lines. A road failure has the potential to cause a rupture in the natural gas line running under the roadway. A rupture to this line has a significant impact both locally and regionally. A rupture locally, coupled with a detonation of the high pressure gas main, will likely have an impact area of a quarter mile from the rupture impacting over 250 local residences, the SCE transmission lines, and all circulation in the immediate area. Regionally, the impact would disrupt the service in several counties in Southern California including parts of San Bernardino, Riverside, Orange, and San Diego Counties. The gas transmission line is the southern California natural gas source for a significant number of residential, commercial, and industrial uses within the four county area. The Project improves publics afety through improved emergency response by reducing the number of days a major arterial is closed due to damaging flood waters. The nearest major east/west arterial to the south is 5 miles away, and the nearest major east/west arterial to the north is 3 miles away. In its current state, Pine Avenue floods to an unusable and damage inducing state in a 2-year storm event, causing potential emergency service delays to area residents, particularly in the ultimate build out condition. There are additional east/west routes that may be taken; however, they are indirect and often include minimally marked roads through former or current farming properties.	
5	**Have other social benefits?**	No
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	**Yes**
	The Project provides water quality improvement for the Prado Basin, which contains some of the best and largest riparian habitat in Southern California, through a reduction in erosion, pollution release and sediment transport	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	No
	The Project provides water quality improvement for the Prado Basin, which contains some of the best and largest riparian - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	The Project provides water quality improvement for the Prado Basin, which is the primary source of groundwater recharge for downstream water users.	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	**Yes**
	This Project is the result of City planning efforts to design a long-term sustainable system that will have a minimum life span of 50 years, addressing current impacts and planning for the long term urbanization of the area. Through culvert and roadway improvements that have been modeled, designed and constructed for the ultimate build-out of the area, the roadways will require less short term as well as long term maintenance and result in a reduction in the frequency of potential road washout.	
13	**Reduce water consumption on a permanent basis?**	No
14	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No
15	**Improve water supply reliability in ways not quantified in Attachment 7?**	**Yes**
	The domestic water line running under Pine Avenue to the California Institution for Women, a female-only state prison located within the City of Chino, is the only source of water for the prison. Damage to this underlying water line would interrupt all water supplies to the prison. Water service disruption would have a significant impact to the Institution and would cause a relocation of prisoners to another facility.	
16	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	N/A

Exhibit A – Flood Reduction Analysis Model (FRAM)

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

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Instructions

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

Project Name: City of Chino Flood Control Project

Cost of Project (2012 $): $ 3,794,702

Description:

Number of Events Modeled: 5

	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)	2	5	25	100	200		2	5	25	100	200	
Annual Probability of Exceedance	0.500	0.200	0.040	0.010	0.005		0.500	0.200	0.040	0.010	0.005	
Probability of Levee Failure	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Water Surface Elevation - channel (f)												
Flood Warning Time (hours)												
Flood Experience	N	N	N	N	N		N	N	N	N	N	
Period of Inundation (days)												
HEC-FIA DATA INPUTS	Y											
Residential Structural Damages ($)	0	0	0	0	0		0	0	0	0	0	
Residential Contents Damages ($)												
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												
Average Flood depth above ground level (f)												
Rural - Res: Homesteads												
Rural - Other: Barns, sheds												
Urban Res: Single story (no base)												
Urban Res: Single story (basement)												
Urban Res: Two plus story (no base)												
Urban Res: Two plus story (basement)												
Mobile home												
Commercial 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.)												
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)	0.6	0.6	0.6	0.6	0.6		0	0.0	0.0	0.0	0.6	
length of major roads inundated (miles)												
length of minor roads inundated (miles)												
length of unsealed roads inundated (miles)												

Extrapolate Y-intercept: N

Summary of Cost-Benefit Analysis

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Project Name: **City of Chino Flood Control Project**

Description: 0

Proposed project cost (2012 $):	$ 3,794,702		
Change in annual O&M costs:	$ 10,000		
(Commencing in 2014)			
PV of future O&M costs:	$ 129,857	(at 6% discount rate over	30 years)
(Excluding maintenance for 2012 and 2013)			
PV of Future Costs	$ 3,924,559		

Benefits

	Actual	Potential		
EAD without project	$ 643,590	$ 643,590		
EAD with project	$ 10,608	$ 10,608		
Annual Benefit:	$ 632,981	$ 632,981		
PV of Future Benefits:	$ 8,712,880	$ 8,712,880	(at 6% discount rate over	30 years)

Cost-Benefit Analysis

	Actual	Potential		
Net Present Value (NPV)	$ 4,788,321	$ 4,788,321	(at 6% discount rate over	30 years)
Benefit:Cost Ratio	2.220	2.220		

NPV Sensitivity to Discount Rate:

	Actual	Potential
4%	$ 7,150,831	$ 7,150,831
5%	$ 5,935,771	$ 5,935,771
6%	$ 4,918,178	$ 4,918,178
7%	$ 4,059,988	$ 4,059,988
8%	$ 3,331,264	$ 3,331,264

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:	0%
Percentage of comm/ind. direct damages applied as indirect:	0%
HEC-FIA only: Percentage all building direct damages applied as indirect	0%
Percentage of roads direct damages applied as indirect:	0%

NPV Calculation

Discount Rate	6%
Time Horizon	30 years

Roads

Cost per mile of highway road inundate	$	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

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:	2	5	25	100	200	0	2	5	25	100	200	0
Probability of Levee Failure	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Flood depth above ground level (ft)	0.00	0.00	0.00	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)	0	0	0	0	0	0	0	0	0	0	0	0
Urban Res: Two plus story (no base)	0	0	0	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)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Structual Damages HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Content Damages													
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damage HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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	0.9
Total Contents Damages: Actual	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Contents Damages: Potential	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-Up/ Other Costs													
External	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cleanup	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other Costs HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Other Costs: Potential	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Sum Potential Damages	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Actual Damage with levee failure ($):	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Potential Damage with levee failure ($):	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Indirect Actual Damage	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Indirect Potential Damage	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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:	2	5	25	100	200	0	2	5	25	100	200	0
Probability of Levee Failure	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Commercial												
'Flood depth above ground level (ft)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
low building size	0	0	0	0	0	0	0	0	0	0	0	0
medium building size	0	0	0	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)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
low building size	0	0	0	0	0	0	0	0	0	0	0	0
medium building size	0	0	0	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	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Commercial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial												
low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Industrial HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damages												
Commercial												
low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
medium	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
high	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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	0.9	0.9	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Contents Damages: Potential	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-up/ Other Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Clean-Up/ Other Costs: HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Sum Potential Damages	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Damage with levee failure ($):	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Damage with levee failure ($):	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Indirect Actual Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Indirect Potentail Damages	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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:		2	5	25	100	200	0	2	5	25	100	200	0
Probability of Levee Failure		1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	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 Grape	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	2	5	25	100	200	0	2	5	25	100	200	0
Probability of Levee failure	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Roads Inundated												
length of arterial roads inundated (miles)	0.60	0.60	0.60	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.60	0.00
length of major 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
length of minor 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
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)	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -
length of major roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
length of minor roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
length of unsealed roads inundated (miles)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Damages:	*$ 150,000*	*$ 150,000*	*$ 150,000*	*$ 150,000*	*$ 150,000*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 150,000*	*$ -*
Total Damage with levee failure ($):	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -

Return to Menu

Special Cases - Dollar Damages Incurred

	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	2	5	25	100	200	0	2	5	25	100	200	0
Probability of Levee failure	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Description / Site ID												
Local Business Losses	$ 71,250	$ 142,500	$ 142,500	$ 142,500	$ 142,500						$ 142,500	
Cost of Passenger Delays	$ 131,866	$ 263,733	$ 263,733	$ 263,733	$ 263,733						$ 263,733	
Cost of Frieght Traffic Delays	$ 21,168	$ 42,336	$ 42,336	$ 42,336	$ 42,336						$ 42,336	
Cost of Utility Line Damage	$ 275,297	$ 475,297	$ 475,297	$ 475,297	$ 475,297						$ 475,297	
Burrowing Owl Mitigation	$ 340,600	$ 340,600	$ 340,600	$ 340,600	$ 340,600						$ 340,600	
Total Damages:	$ 840,181	$ 1,264,465	$ 1,264,465	$ 1,264,465	$ 1,264,465	$ -	$ -	$ -	$ -	$ -	$ 1,264,465	$ -
Total Damage with levee failure ($):	840180.6601	1264464.697	1264464.697	1264464.697	1264464.697	0	0	0	0	0	1264464.697	0

Calculation of Without Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Y Intercept
Average Recurrence Interval (ARI)	2	5	25	100	200	0	
AEP	0.500	0.200	0.040	0.010	0.005	0.000	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 ($)	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ -	
Actual Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Potential Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Special Cases	$ 840,181	$ 1,264,465	$ 1,264,465	$ 1,264,465	$ 1,264,465	$ -	
Total Actual Damages	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ -	$ 1,414,465
Total Potential Damages	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ -	$ 1,414,465
EAD (Actual)	$ 643,590						
EAD (Potential)	$ 643,590						

Potential Damages

	Without Project							With Project						
Water Surface Elevation - channel (f)	0	0	0	0	0	0		0	0	0	0	0	0	
ARI	2	5	25	100	200	0		2	5	25	100	200	0	
Probability of Exceedence (AEP)	0.500	0.200	0.040	0.010	0.005	#DIV/0!		0.500	0.200	0.040	0.010	0.005	#DIV/0!	
Damages incurred	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ -	$ 1,414,465	$ -	$ -	$ -	$ -	$ 1,414,465	$ -	$ 1,414,465

Actual Damages

	Without Project							With Project						
Water Surface Elevation - channel (f)	0	0	0	0	0	0		0	0	0	0	0	0	
ARI	2	5	25	100	200	0		2	5	25	100	200	0	
Probability of Exceedence (AEP)	0.500	0.200	0.040	0.010	0.005	#DIV/0!		0.500	0.200	0.040	0.010	0.005	#DIV/0!	
Damages incurred	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ -	$ 1,414,465	$ -	$ -	$ -	$ -	$ 1,414,465	$ -	$ 1,414,465

Without Project

Water Surface Elevation - channel (f)	2	5	25	100	200	0
Probability of Exceedence (AEP)	0.500	0.200	0.040	0.010	0.005	0.005
Potential	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465
Actual	$ 990,181	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465	$ 1,414,465

With Project

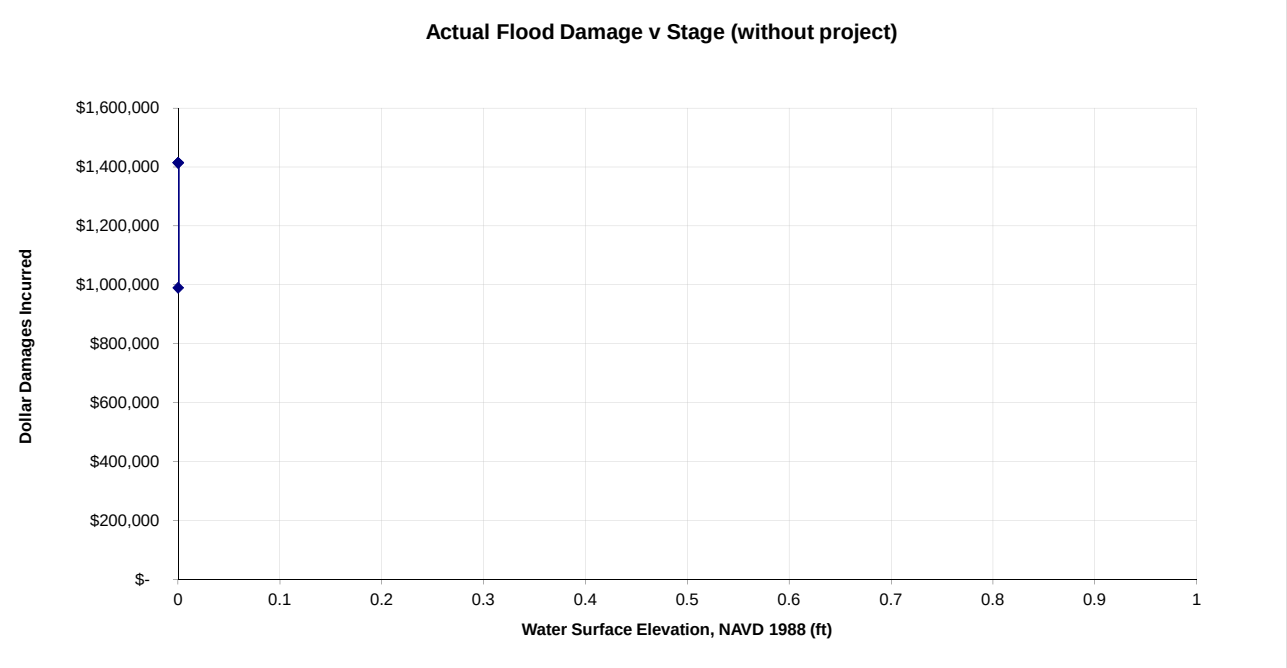
Water Surface Elevation - channel (f)	2	5	25	100	200	0
Probability of Exceedence (AEP)	0.500	0.200	0.040	0.010	0.005	0.005
Potential	$ -	$ -	$ -	$ 1,414,465	$ 1,414,465	$ 1,414,465
Actual	$ -	$ -	$ -	$ 1,414,465	$ 1,414,465	$ 1,414,465

Calculation of With Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
Average Recurrence Interval (ARI)	2	5	25	100	200	0	
AEP	0.500	0.200	0.040	0.010	0.005	0.000	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 ($)	$ -	$ -	$ -	$ -	$ 150,000	$ -	
Actual Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Potential Indirect Costs	$ -	$ -	$ -	$ -	$ -	$ -	
Special Cases	$ -	$ -	$ -	$ -	$ 1,264,465	$ -	
Total Actual Damages	$ -	$ -	$ -	$ -	$ 1,414,465	$ -	$ 1,414,465
Total Potential Damages	$ -	$ -	$ -	$ -	$ 1,414,465	$ -	$ 1,414,465

EAD (Actual)	$ 10,608
EAD (Potential)	$ 10,608

Return to Menu



Return to Menu

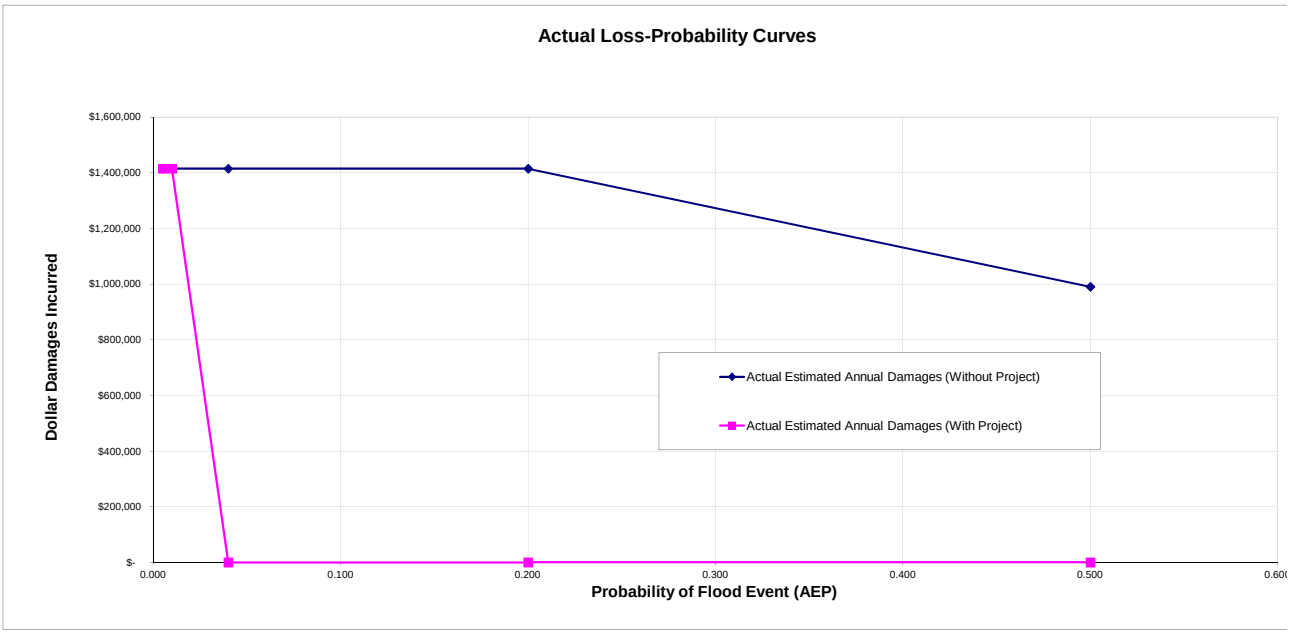


Exhibit B – Local Business Revenue Losses

Exhibit C – Daily Traffic Volume without Pine Avenue Closure

Exhibit D – Routes, Daily Volumes and Daily Delays with Pine Avenue Closure

Exhibit E – Burrowing Owl Survey Protocol and Mitigation Guidelines

Exhibit B - Local Business Revenue Losses		
Name of Business	Street Address	Reported Losses for 1-Week
Lizze Custom Processing	7310 Pine Ave	$50,000
Via Verde Nursery		$15,000
Placencia Nursery	8005 Pine Ave	$5,000
Superior Sod	16600 Hellman Ave	$1,250
	Total	**$71,250**

Exhibit C - Daily Traffic Volume without Pine Avenue Closure (1)							
Location:							
	NL	SR	EL	ET	ER	WT	Total
Cars	$732	$10	$0	$1,596	$944	$1,231	$4,513
Freight	$117	$0	$0	$113	$144	$91	$465
Total	$849	$10	$0	$1,709	$1,088	$1,322	$4,978
Location: Euclid Ave & Pine Ave							
	NR	SL	ET	WL	WT	WR	Total
Cars	$1,432	$567	$616	$1,475	$273	$266	$4,629
Freight	$120	$91	$52	$93	$24	$93	$473
Total	$1,552	$658	$668	$1,568	$297	$359	$5,102
						Total Traffic Affected on Pine Avenue:	**$10,080**
						Percent of Car Traffic:	**91%**
						Percent of Freight Traffic:	**9%**

(1) Source: Linscott Law & Greenspan, Traffic Impact Analysis South of Pine Avenue, 2007

Exhibit D - Routes, Daily Volumes, and Daily Delays with Pine Ave Closure												
						Per Vehicle				Total All Vehicles		
		Additional Daily Volume from Closure (1)	Daily Volume without Closure (1)	Daily Volume with Closure (2)		Distance (miles)	Time without Closure (min) (3)	Time with Closure (min) (4)		Time without Closure (hr) (5)	Time with Closure (hr) (6)	Difference (hr) (7)
Location: Chino Corona Rd/Mill Creek Ave & Pine Ave												
Direction	**Alternate Route**											
NL	North on Mill Creek Ave, West on Bickmore Ave											
SR	U-Turn, North on Mill Creek Ave, West on Bickmore Ave											
EL	North on Euclid Ave, East on Bickmore Ave, South on Mill Creek Ave											
ET	North on Euclid Ave, East on Bickmore Ave											
ER	North on Euclid Ave, East on Bickmore Ave, South on Mill Creek Ave											
WT	North on Mill Creek Ave, West on Bickmore Ave											
Affected Streets												
	North on Mill Creek Ave	2,181										
	South on Mill Creek Ave	1,088										
	East on Bickmore Ave	2,797										
	West on Bickmore Ave	2,181										
	North on Euclid Ave	2,797										
Location: Euclid Ave & Pine Ave												
Direction	**Alternate Route**											
NR	North on Euclid Ave, East on Bickmore Ave											
SL	U-turn, North on Euclid Ave, East on Bickmore Ave											
ET	North on Euclid Ave, East on Bickmore Ave											
WL	North on Mill Creek Ave, West on Bickmore Ave, South on Euclid Ave											
WT	North on Mill Creek Ave, West on Bickmore Ave											
WR	North on Mill Creek Ave, West on Bickmore Ave, South on Euclid Ave											
Affected Streets												
	North on Euclid Ave	2,878										
	South on Euclid Ave	1,927										
	East on Bickmore Ave	2,878										
	West on Bickmore Ave	2,224										
	North on Mill Creek Ave	2,224										
Totals												
	Mill Creek Ave (North of Pine Ave)	**5,493**	**3**	**5,496**		**0.30**	**0.45**	**0.90**		**0.022**	**82.436**	**82.413**
	Bickmore Ave (Between Euclid Ave and Mill Creek Ave)	**10,080**	**10,080**	**20,160**		**1.10**	**1.65**	**3.30**		**277.186**	**1,108.745**	**831.558**
	Euclid Ave (North of Pine Ave)	**7,602**	**5,005**	**12,607**		**0.60**	**0.90**	**1.80**		**75.071**	**378.191**	**303.120**
	Total	**23,175**	**15,088**	**38,263**		**2.00**	**3.00**	**6.00**		**352.280**	**1,569.372**	**1,217.092**

(1) Source: Linscott Law & Greenspan, Traffic Impact Analysis South of Pine Avenue, 2007. "Daily Volume without Closure" not available for Bickmore Ave; assumed to be equivalent to Pine Ave.
(2) Sum of "Additional Daily Volume from Closure" and "Daily Volume without Closure".
(3) Calculated using average vehicle speed of 40 mph.
(4) Although studies show that vehicle speed decreases as vehicle volume increases, the approximate relationship between speed and volume varies by individual street (Source: El-Shourbagy, "Speed/Flow Relationship on Some Urban Arterial Roads", 2002). For purposes of this analysis, we
(5) Product of "Time without Closure" and "Daily Volume without Closure".
(6) Product of "Time with Closure" and "Daily Volume with Closure".
(7) Difference between All Vehicles' "Time without Closure" and "Time with Closure".