VOLUME 2
Appendix 5-E to 10-A

FINAL
REGION 5 NECHES 2023 REGIONAL FLOOD PLAN

JANUARY 2023

PREPARED FOR THE

REGION 5 NECHES FLOOD PLANNING GROUP

APPENDIX 5-E
SUPPORTING DOCUMENTATION FOR RECOMMENDED FLOOD MITIGATION PROJECTS

Sabine Pass to Galveston Bay, Texas
Coastal Storm Risk Management and Ecosystem Restoration
Final Integrated Feasibility Report and Environmental Impact Study

Appendix C

Economic Analysis

May 2017

Table 2-10. Economic Performance of Orange-Jefferson CSRM
(FY 2015 Price Level/3.375 percent interest rate)

	Orange 1 New Levee					Orange 2 New Levee					Orange 3 New Levee			
	10 - Foot	**11 - Foot**	**12 - Foot**	**13 - Foot**		**10 - Foot**	**11 - Foot**	**12 - Foot**	**13 - Foot**		**10 - Foot**	**11 - Foot**	**12 - Foot**	**13 - Foot**
INVESTMENT														
Estimated First Cost	$32,300,000	$46,617,000	$60,935,000	$75,252,000		$32,870,000	$41,088,000	$49,305,000	$57,523,000		$205,338,000	$246,811,000	$288,284,000	$329,762,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%		3.375%	3.375%	3.375%	3.375%		3.375%	3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50		50	50	50	50		50	50	50	50
Construction Period (months)	36	36	36	36		36	36	36	36		36	36	36	36
Interest During Construction	$1,647,000	$2,377,000	$3,108,000	$3,838,000		$1,676,000	$2,095,000	$2,515,000	$2,934,000		$10,472,000	$12,587,000	$14,702,000	$16,818,000
Investment Cost	$33,947,000	$48,995,000	$64,043,000	$79,090,000		$34,546,000	$43,183,000	$51,820,000	$60,456,000		$215,810,000	$259,398,000	$302,986,000	$346,580,000
Interest	$1,146,000	$1,654,000	$2,161,000	$2,669,000		$1,166,000	$1,457,000	$1,749,000	$2,040,000		$7,284,000	$8,755,000	$10,226,000	$11,697,000
Amortization	$269,000	$388,000	$508,000	$627,000		$274,000	$342,000	$411,000	$479,000		$1,711,000	$2,056,000	$2,402,000	$2,747,000
OMRR&R ($/year)*											$4,084,000	$4,084,000	$4,084,000	$4,084,000
TOTAL ANNUAL COSTS	**$1,415,000**	**$2,042,000**	**$2,669,000**	**$3,296,000**		**$1,440,000**	**$1,800,000**	**$2,160,000**	**$2,520,000**		**$13,078,000**	**$14,895,000**	**$16,711,000**	**$18,528,000**
Without Project EAD	$312,000	$312,000	$312,000	$312,000		$68,000	$68,000	$68,000	$68,000		$29,987,000	$29,987,000	$29,987,000	$29,987,000
Residual EAD	$62,000	$39,000	$23,000	$12,000		$32,000	$26,000	$20,000	$16,000		$8,171,000	$5,242,000	$3,044,000	$1,654,000
Storm Reduction Benefits	$250,000	$273,000	$289,000	$300,000		$36,000	$42,000	$48,000	$52,000		$21,816,000	$24,745,000	$26,943,000	$28,333,000
TOTAL BENEFITS	**$250,000**	**$273,000**	**$289,000**	**$300,000**		**$36,000**	**$42,000**	**$48,000**	**$52,000**		$21,816,000	$24,745,000	$26,943,000	$28,333,000
NET BENEFITS	**($1,165,000)**	**($1,769,000)**	**($2,380,000)**	**($2,996,000)**		**($1,404,000)**	**($1,757,000)**	**($2,112,000)**	**($2,467,000)**		**$8,738,000**	**$9,851,000**	**$10,232,000**	**$9,804,000**
BENEFIT-COST RATIO	**0.2**	**0.1**	**0.1**	**0.1**		**0.0**	**0.0**	**0.0**	**0.0**		**1.7**	**1.7**	**1.6**	**1.5**

***For Mitigation**

Table 2-10. Economic Performance of Orange-Jefferson CSRM (continued)
(FY 2015 Price Level/3.375 percent interest rate)

	Beaumont A New Levee					Beaumont B New Levee					Beaumont C New Levee		
	11 - Foot	**12 - Foot**	**13 - Foot**	**14 - Foot**		**11 - Foot**	**12 - Foot**	**13 - Foot**	**14 - Foot**		**11 - Foot**	**12 - Foot**	**13 - Foot**
INVESTMENT													
Estimated First Cost	$62,661,000	$70,202,000	$77,743,000	$85,284,000		$1,695,000	$2,295,000	$2,895,000	$3,494,000		$15,793,000	$16,078,000	$19,007,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%		3.375%	3.375%	3.375%	3.375%		3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50		50	50	50	50		50	50	50
Construction Period (months)	36	36	36	36		36	36	36	36		36	36	36
Interest During Construction	$3,196,000	$3,580,000	$3,965,000	$4,349,000		$86,000	$117,000	$148,000	$178,000		$805,000	$820,000	$969,000
Investment Cost	$65,857,000	$73,782,000	$81,708,000	$89,634,000		$1,782,000	$2,412,000	$3,042,000	$3,673,000		$16,599,000	$16,898,000	$19,977,000
Interest	$2,223,000	$2,490,000	$2,758,000	$3,025,000		$60,000	$81,000	$103,000	$124,000		$560,000	$570,000	$674,000
Amortization	$522,000	$585,000	$648,000	$711,000		$14,000	$19,000	$24,000	$29,000		$132,000	$134,000	$158,000
TOTAL ANNUAL COSTS	**$2,745,000**	**$3,075,000**	**$3,405,000**	**$3,736,000**		**$74,000**	**$101,000**	**$127,000**	**$153,000**		**$692,000**	**$704,000**	**$833,000**
Without Project EAD	$6,937,000	$6,937,000	$6,937,000	$6,937,000		$23,000	$23,000	$23,000	$23,000		$262,000	$262,000	$262,000
Residual EAD	$1,449,000	$870,000	$494,000	$259,000		$7,000	$4,000	$3,000	$1,000		$12,000	$7,000	$4,000
Storm Reduction Benefits	$5,488,000	$6,067,000	$6,442,000	$6,677,000		$17,000	$19,000	$21,000	$22,000		$249,000	$255,000	$258,000
TOTAL BENEFITS	**$5,488,000**	**$6,067,000**	**$6,442,000**	**$6,677,000**		**$17,000**	**$19,000**	**$21,000**	**$22,000**		**$249,000**	**$255,000**	**$258,000**
NET BENEFITS	**$2,743,000**	**$2,992,000**	**$3,037,000**	**$2,942,000**		**($58,000)**	**($82,000)**	**($106,000)**	**($131,000)**		**($442,000)**	**($449,000)**	**($574,000)**
BENEFIT-COST RATIO	**2.0**	**2.0**	**1.9**	**1.8**		**0.2**	**0.2**	**0.2**	**0.1**		**0.4**	**0.4**	**0.3**

Table 2-10. Economic Performance of Orange-Jefferson CSRM (continued)
(FY 2015 Price Level/3.375 percent interest rate)

	Jefferson Main New Levee			
	10 - Foot	**11 - Foot**	**12 - Foot**	**13 - Foot**
INVESTMENT				
Estimated First Cost	$46,948,000	$65,726,000	$87,674,000	$104,747,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50
Construction Period (months)	36	36	36	36
Interest During Construction	$2,394,000	$3,352,000	$4,471,000	$5,342,000
Investment Cost	$49,342,000	$69,078,000	$92,145,000	$110,089,000
Interest	$1,665,000	$2,331,000	$3,110,000	$3,715,000
Amortization	$391,000	$548,000	$730,000	$873,000
OMRR&R ($/year)*	$371,000	$371,000	$371,000	$371,000
TOTAL ANNUAL COSTS	**$2,428,000**	**$3,250,000**	**$4,212,000**	**$4,960,000**
Without Project EAD	$28,231,000	$28,231,000	$28,231,000	$28,231,000
Residual EAD	$4,207,000	$2,520,000	$1,440,000	$776,000
Flood Reduction Benefits	$24,025,000	$25,711,000	$26,791,000	$27,456,000
TOTAL BENEFITS	**$24,025,000**	**$25,711,000**	**$26,791,000**	**$27,456,000**
NET BENEFITS	**$21,597,000**	**$22,461,000**	**$22,580,000**	**$22,496,000**
BENEFIT-COST RATIO	**9.9**	**7.9**	**6.4**	**5.5**

* For Mitigation

(OMRR&R) (with the exception of mitigation) was not taken into account, since these are expected to be proportional among alternatives and would not impact the ranking of alternatives. Mitigation was estimated using the Wetlands Value Assessment Model (WVA), and preliminary wetland mitigation costs were developed for use in plan comparison. These costs were based on compensation for a loss of 85.2 Average Annual Habitat Units (AAHUs) from forested wetlands and 181.7 AAHUs from coastal wetlands and applied to only the Orange 3 and Jefferson Main sections, since Beaumont B and C were already not economically viable, and to Beaumont A because they were small. The same costs were applied to all analyzed levee heights and did not vary. Since the alignment may change as a result of public, technical, and policy review, conceptual mitigation plans and preliminary cost estimates were developed to support TSP plan comparison and selection. The primary determinant in differentiating benefits is the scale of the levee being proposed along with the associated cost for that levee/floodwall height.

It should be noted that the initial evaluations of economic performance, as depicted in Tables up through 2-20, did not incorporate relative sea level change (RSLC). Subsequent analyses will

incorporate a number of changed conditions as the analysis progressed through the study including changes in interest rates, increases and other changes in costs and price levels of structure inventories, addressing the potential for repetitive damages, and the inclusion of additional damage categories. The changes in conditions of the analysis are documented in the appropriate sections of this economics appendix.

Table 2-10 displays the economic evaluation for a range of levee/floodwall heights modifications based on the beginning at 10 feet mean sea level (MSL) up to 13 feet MSL NAVD88. They show the economic performance of the Orange 1, 2, and 3 with new levees and the economic performance of Jefferson Main with new levee as well as Beaumont A, B, and C with new levees. All are calculated at a FY 2015 price level and interest rate.

Based on the information provided in the preceding tables the alternative with the highest net benefits for the Orange-Jefferson CSRM is a levee/floodwall at a height of 12 feet at Orange 3 with Orange 1 and 2 being removed from further consideration. For Beaumont, B and C are removed from consideration and the alternative with the highest net benefits for this area is a 13-foot levee/floodwall at Beaumont A. At Jefferson Main, the alternative with the highest net benefits is a 12-foot levee/floodwall. Residual economic damages in the reaches where an alternative is considered range from $1.7 to $8.1 million in Orange 3. At Beaumont A, annual residual economic damages run from $0.3 to $1.5 million. For the Jefferson Main reach, residual economic damages run from $0.8 to $4.2 million annually.

While both of the 12-foot raises at Orange 3 and Jefferson Main produce higher net benefits than the 11-foot raises, ER-1105-2-100 states “Where two cost-effective plans produce no significantly different levels of net benefits, the less costly plan is to be the NED plan, even though the level of outputs may be less” (Appendix G, pp. G-7 to G-8). The same scenario exists for the 13-foot Raise at Beaumont A versus the 12-foot raise. Based on this guidance, the 11-foot raise at Orange 3 and Jefferson Main and the 12-foot raise at Beaumont A are included as part of the TSP.

2.4.2 Port Arthur and Vicinity CSRM

Just as with the alternative selection with the Freeport CSRM and the Orange-Jefferson CSRM, FWOP damages will have rough order of magnitude costs to identify the NED. Parametric costs were estimated for the first-added resiliency features. The same costs per linear foot both length and height for both levees and floodwalls used for Orange-Jefferson were used for the next added 1- and 2-foot raises to the system. No environmental impacts were identified, and no mitigation costs were included in the comparison. The primary determinant in differentiating benefits lies in the without project damages which is based on the fragility curve at each potential failure location. Additional determinants include the raise of the levee being proposed along with the associated

costs associated with those required features, allowing for the removal of the fragility curve in the analysis and the costs for the increases in the levee/floodwall height.

Just as with the Freeport system, costs for any modifications above these resiliency and raise options begin to escalate significantly since reconstruction would be required for providing additional protection from these features. These additional costs include highway raises, gravity structures, closure structure replacement, replacement of I-wall, and additional pump stations, which are not incrementally justified.

The following tables display the economic evaluation for a range of alternatives beginning with "No Fail" resiliency measures (meaning that the levee/floodwall will not fail prior to overtopping) followed by raises to each reach. All are calculated at a FY 2015 price level and interest rate.

Based on the information provided in Table 2-11, the NED components for the Port Arthur and Vicinity CSRM are generally a "No Fail, One-Foot Raise" for the system. Net benefits for each reach range from $2.9 million to $50.7 million. Residual economic damages for the Port Arthur CSRM range from $3.3 to $10.0 million for 8-foot to10-foot I-Wall, $0.2 to $1.0 million at the Closure Structure, $7.1 to $16.3 million at the I-Wall near Valero, and $10.9 to $25.1 million at the Tank Farm.

2.4.3 Freeport and Vicinity CSRM

Just as with the alternative selection for the Orange-Jefferson CSRM, FWOP damages will have rough order of magnitude costs to identify NED benefits. The same costs per linear foot both length and height for both levees and floodwalls used for Orange-Jefferson were used for the next added 1- and 2-foot raises to the system. No environmental impacts were identified, and no mitigation costs were included in the comparison.

Costs for any modifications above these resiliency and raise options begin to escalate significantly since reconstruction would be required for providing additional protection from these features. These additional costs include features such as high performance turf reinforcement mats, replacement of the Tide gate, gravity structures, intake structures, and rebuilding the dock and floodwalls, which are not incrementally justified.

Table 2-11 displays the economic evaluation for a range of alternatives beginning with "No Fail" resiliency measures followed by raises to each reach. All are evaluated at a FY 2015 price level and interest rate. Just as with the Port Arthur CSRM, the primary determinant in differentiating benefits lies in the without-project damages, which is based on the fragility curve at each potential

failure location. Additional determinants include the raise of the levee being proposed along with the associated costs associated with those required features, allowing for the removal of the fragility curve in the analysis and the costs for the increases in the levee/floodwall height.

Table 2-11. Economic Performance of Port Arthur and Vicinity CSRM
(FY 2015 Price Level/3.375 percent interest rate)

	8ft-10ft I-Wall Raise			Closure Structure Raise			I-Wall Raise Near Valero			I-Wall Raise Near Tank Farm		
	No Fail	1-Foot Raise	2 -Foot Raise	No Fail	1- Foot Raise	2-Foot Raise	No Fail	1-Foot Raise	2-Foot Raise	No Fail	1-Foot Raise	2-Foot Raise
INVESTMENT												
Estimated First Cost	$3,330,000	$8,915,000	$66,744,000	$3,804,000	$10,654,000	$22,822,000	$7,655,000	$8,948,000	$312,523,000	$2,756,000	$4,627,000	$188,878,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50	50	50	50	50	50	50	50	50
Construction Period (months)	36	36	36	36	36	36	36	36	36	36	36	36
Interest During Construction	$170,000	$455,000	$3,404,000	$194,000	$543,000	$1,164,000	$390,000	$456,000	$15,938,000	$141,000	$236,000	$9,633,000
Investment Cost	$3,500,000	$9,370,000	$70,148,000	$3,998,000	$11,197,000	$23,986,000	$8,045,000	$9,404,000	$328,461,000	$2,897,000	$4,863,000	$198,511,000
Interest	$118,000	$316,000	$2,367,000	$135,000	$378,000	$810,000	$272,000	$317,000	$11,086,000	$98,000	$164,000	$6,700,000
Amortization	$28,000	$74,000	$556,000	$32,000	$89,000	$190,000	$64,000	$75,000	$2,604,000	$23,000	$39,000	$1,574,000
TOTAL ANNUAL COSTS	**$146,000**	**$391,000**	**$2,924,000**	**$167,000**	**$467,000**	**$1,000,000**	**$335,000**	**$392,000**	**$13,689,000**	**$121,000**	**$203,000**	**$8,273,000**
Without Project EAD	$23,413,000	$23,413,000	$23,413,000	$3,784,000	$3,784,000	$3,784,000	$61,867,000	$61,867,000	$61,867,000	$38,009,000	$38,009,000	$38,009,000
Residual EAD	$9,962,000	$5,730,000	$3,274,000	$995,000	$408,000	$156,000	$16,379,000	$10,813,000	$7,101,000	$25,130,000	$16,874,000	$10,893,000
Flood Reduction Benefits	$13,451,000	$17,683,000	$20,138,000	$2,788,000	$3,375,000	$3,628,000	$45,488,000	$51,054,000	$54,766,000	$12,879,000	$21,135,000	$27,116,000
TOTAL BENEFITS	**$13,451,000**	**$17,683,000**	**$20,138,000**	**$2,788,000**	**$3,375,000**	**$3,628,000**	**$45,488,000**	**$51,054,000**	**$54,766,000**	**$12,879,000**	**$21,135,000**	**$27,116,000**
NET BENEFITS	**$13,305,000**	**$17,292,000**	**$17,215,000**	**$2,622,000**	**$2,908,000**	**$2,628,000**	**$45,153,000**	**$50,662,000**	**$41,076,000**	**$12,758,000**	**$20,932,000**	**$18,843,000**
BENEFIT-COST RATIO	**92.1**	**45.2**	**6.9**	**16.7**	**7.2**	**3.6**	**135.8**	**130.2**	**4.0**	**106.4**	**104.1**	**3.3**

Table 2-12. Economic Performance of Freeport and Vicinity CSRM
(FY 2015 Price Level/3.375 percent interest rate)

	Dow Barge Canal Protection		Oyster Creek Levee Raise				East Storm Levee Raise				Freeport Dock Floodwall Raise		
	No Fail - Closure Structure		No Fail	1-Foot Raise	2 Foot Raise		No Fail	1-Foot Raise	2- Foot Raise		Partial Fail	No Fail	1-Foot Raise
INVESTMENT													
Estimated First Cost	$130,000,000		$1,663,000	$4,869,000	$54,244,000		$3,415,000	$6,530,000	$26,402,000		$1,500,000	$2,850,000	$150,000,000
Annual Interest Rate	3.375%		3.375%	3.375%	3.375%		3.375%	3.375%	3.375%		3.375%	3.375%	3.375%
Project Life (years)	50		50	50	50		50	50	50		50	50	50
Construction Period (months)	36		36	36	36		36	36	36		36	36	36
Interest During Construction	$6,630,000		$85,000	$248,000	$2,766,000		$174,000	$333,000	$1,346,000		$76,000	$145,000	$7,650,000
Investment Cost	$136,630,000		$1,748,000	$5,117,000	$57,010,000		$3,590,000	$6,863,000	$27,748,000		$1,576,000	$2,995,000	$157,650,000
Interest	$4,611,000		$59,000	$173,000	$1,924,000		$121,000	$232,000	$937,000		$53,000	$101,000	$5,321,000
Amortization	$1,083,000		$14,000	$41,000	$452,000		$28,000	$54,000	$220,000		$12,000	$24,000	$1,250,000
TOTAL ANNUAL COSTS	**$5,694,000**		**$73,000**	**$213,000**	**$2,376,000**		**$150,000**	**$286,000**	**$1,156,000**		**$66,000**	**$125,000**	**$6,570,000**
Without Project EAD	$166,660,000		$3,800,000	$3,800,000	$3,800,000		$1,701,000	$1,701,000	$1,701,000		$3,960,000	$3,960,000	$3,960,000
Residual EAD	$47,052,000		$1,717,000	$1,272,000	$933,000		$782,000	$581,000	$425,000		$3,771,000	$1,742,000	$1,333,000
Storm Reduction Benefits	$119,608,000		$2,083,000	$2,527,000	$2,866,000		$919,000	$1,121,000	$1,276,000		$189,000	$2,218,000	$2,627,000
TOTAL BENEFITS	**$119,608,000**		**$2,083,000**	**$2,527,000**	**$2,866,000**		**$919,000**	**$1,121,000**	**$1,276,000**		**$189,000**	**$2,218,000**	**$2,627,000**
NET BENEFITS	**$113,914,000**		**$2,010,000**	**$2,314,000**	**$490,000**		**$769,000**	**$835,000**	**$120,000**		**$123,000**	**$2,093,000**	**($3,944,000)**
BENEFIT-COST RATIO	**21.0**		**28.5**	**11.9**	**1.2**		**6.1**	**3.9**	**1.1**		**2.9**	**17.7**	**0.4**

Table 2-12. Economic Performance of Freeport and Vicinity CSRM (continued)
(FY 2015 Price Level/3.375 percent interest rate)

	Old River Levee Raise at Dow Thumb				South Storm Levee Raise			Tide Gate I-Wall Raise		
	No Fail	1-Foot Raise	2- Foot Raise		1-Foot Raise	2- Foot Raise		No Fail	1-Foot Raise	2- Foot Raise
INVESTMENT										
Estimated First Cost	$7,581,000	$8,294,000	$92,088,000		$3,325,000	$6,650,000		$1,720,000	$3,800,000	$35,644,000
Annual Interest Rate	3.375%	3.375%	3.375%		3.375%	3.375%		3.375%	3.375%	3.375%
Project Life (years)	50	50	50		50	50		50	50	50
Construction Period (months)	36	36	36		36	36		36	36	36
Interest During Construction	$387,000	$423,000	$4,696,000		$170,000	$339,000		$88,000	$194,000	$1,818,000
Investment Cost	$7,968,000	$8,717,000	$96,784,000		$3,495,000	$6,989,000		$1,808,000	$3,994,000	$37,462,000
Interest	$269,000	$294,000	$3,266,000		$118,000	$236,000		$61,000	$135,000	$1,264,000
Amortization	$63,000	$69,000	$767,000		$28,000	$55,000		$14,000	$32,000	$297,000
TOTAL ANNUAL COSTS	**$332,000**	**$363,000**	**$4,034,000**		**$146,000**	**$291,000**		**$75,000**	**$166,000**	**$1,561,000**
Without Project EAD	$2,517,000	$2,517,000	$2,517,000		$254,000	$254,000		$2,785,000	$2,785,000	$2,785,000
Residual EAD	$1,215,000	$913,000	$679,000		$182,000	$127,000		$1,184,000	$897,000	$675,000
Storm Reduction Benefits	$1,302,000	$1,604,000	$1,838,000		$72,000	$127,000		$1,601,000	$1,888,000	$2,110,000
TOTAL BENEFITS	**$1,302,000**	**$1,604,000**	**$1,838,000**		**$72,000**	**$127,000**		**$1,601,000**	**$1,888,000**	**$2,110,000**
NET BENEFITS	**$969,000**	**$1,241,000**	**($2,196,000)**		**($74,000)**	**($164,000)**		**$1,526,000**	**$1,721,000**	**$549,000**
BENEFIT-COST RATIO	**3.9**	**4.4**	**0.5**		**0.5**	**0.4**		**21.4**	**11.4**	**1.4**

Based on the information provided in the preceding table, the NED components for the Freeport and Vicinity CSRM are generally a "No Fail, One-Foot Raise" for the system. The exception is a "No Fail" closure structure at the Dow Barge Canal and a "No Fail" floodwall at Freeport Dock. No further consideration is given to the South Storm Levee, since neither of the two potential raises analyzed is economically justified. A "no fail" alternative was not analyzed, since this levee was not expected to fail prior to overtopping and it also has the highest crest elevation of 21 feet MSL. Residual economic damages are $47.1 million at the Dow Barge Canal, range from $0.9 to 1.7 million at the Oyster Creek Levee, range from $0.4 to $0.8 million at the East Storm Levee, $1.3 to $3.8 at Freeport Dock, $0.7 to $1.2 million at Old River Levee at the Dow thumb, and $0.7 to $1.2 million at the Tide Gate I-Wall.

2.4.4 Brazoria and Sabine Non-Structural

2.4.4.1 Non-Structural Measures

The following describes the non-structural measures considered to reduce the risk of flooding in the study area.

2.4.4.1.1 Floodplain Management

Floodplain management is most effective in controlling future development of the floodplain, thereby assuring that the existing flood problems do not become worse. However, floodplain management cannot, by itself, significantly alleviate existing flooding conditions within a highly urbanized floodplain. The technique of controlled land use is particularly helpful in planning for future development, but is of limited use in highly developed areas.

Effective regulation of the floodplain is dependent on developing enforceable ordinances to ensure that floodplain uses are compatible with the flood hazard. Several means of regulation are available, including zoning ordinances, subdivision regulations, and building codes. Zoning regulations require prudent use and development of the floodplain to prevent excessive property damage, expenditure of public funds, inconvenience, and most importantly, loss of life due to flooding. Subdivision regulations guide the division of large land parcels into smaller lots and requires proof of compliance with other regulations and ordinances. A subdivision ordinance with special reference to flood hazards would require installation of adequate drainage facilities, prohibit encroachment in floodway areas, require the placement of critical streets and utilities above a selected flood elevation, and require that building lots be filled or structures be elevated above a selected flood elevation.

Floodplain management is the most effective means to control future development of the floodplain, and ensure that existing flood problems do not worsen. This alternative did not require

further consideration because the municipalities participate in the National Flood Insurance Program.

2.4.4.1.2 Flood Forecast and Warning Systems

Flood forecasting and warning systems involves the determination of imminent flooding, implementation of a plan to warn the public, and organization of assistance in the evacuation of persons and some personal property. Notification of impending flooding can be accomplished by radio, siren, individual notification, or by elaborate remote sensor devices. Some type of flood warning and emergency evacuation effort should be a part of any FRM plan. These measures normally serve to reduce the hazards to life and damage to portable personal property.

Broad warnings as storm systems develop are coordinated through various agencies, such as the National Weather Service, which provides reports to the essential print and electronic media outlets. The National Weather Service generally releases tropical storm watches 48 hours in advance of any anticipated onset of tropical storm force winds. Since outside preparedness activities become difficult once winds reach tropical storm force, warnings are issued 36 hours in advance of any anticipated onset of tropical storm force winds. The Texas Department of Public Safety's Division of Emergency Management coordinates the state emergency management program, as well as implementing the Texas Emergency Tracking Network (ETN), part of a comprehensive data-management system that provides real-time information before, during, and after a disaster. Orange and Jefferson Counties are members of the Southeast Texas Alerting Network, which can alert users of emergencies, plant operations, traffic, and weather information or other outreach from emergency management. Both counties as well as Brazoria, also have emergency management departments that engage their respective cities, including specific evacuation plans and processes.

2.4.4.1.3 Flood Proofing

Damage to existing structures can be reduced or eliminated through various flood proofing measures. These methods protect damageable property by preventing flood waters from entering the building and/or reaching the contents inside. Flood proofing is most easily applied to new construction, and is most applicable where flooding is of short duration, low velocity, and infrequent occurrence of shallow depths. Flood proofing is usually employed in locations where structural flood protection is not feasible or where collective action is not possible. Typically, flood proofing techniques include water-tight door and window seals, raising of structures, installation of check valves on gravity-flow water and sewer lines, incorporation of seepage controls, and sandbagging of door openings during emergency situations. Due to the relatively large number of structures and the depth of flooding, this measure was not given further consideration.

2.4.4.1.4 Raising Structures in Place

One method of flood proofing involves raising the structures at their existing site. This plan is most applicable where a limited number of structures are receiving a large portion of the total flood damages along a given reach. Structure raising in Port Arthur and Freeport CSRM project areas would be ancillary to the improvement to existing levees/floodwalls system. Since a large portion of the total flood damages were already being addressed by the levee system the structure raising in Port Arthur and Freeport CSRM were removed from consideration. In the other areas the opportunities for structure raising was limited. Most structure would have to be raised several feet off the ground, which then would result in additional problems, such as access concerns, and increased wind damage during storm events. Based on these findings, a raise-in-place plan was determined to be not consistent with the goals and objectives of the project

2.4.4.1.5 Structure Relocation

Plans for structure relocation would involve moving the existing structures to a more non-flood-prone site. The practicality of this measure depends on the frequency of flooding, the value of the property, its importance to the community, and the need for land use areas that are more compatible with floodplain constraints. Relocation of the structures subject to catastrophic flood events within the existing systems to provide additional protection in the event of levee overtopping would be an impractical and potentially cost prohibitive solution. In areas without existing risk reduction systems it was determined that structure relocations were also not consistent with the goals and objectives of the project. Relocation of residential structures would be detrimental to community cohesion in the area. Many of the local industries employ local residents in the area. Due to the large flat floodplain, implementing structure relocations would place residents over an hour's drive away from their work place. Also many of the local communities rely on direct access to waterways to support the good and service in the area. Removing structures would have significant impacts on the local communities ability to provide services if structures would be relocated. Based on these findings, relocation was not considered any further.

2.4.4.1.6 Permanent Evacuation

Evacuation involves the acquisition and removal or demolition of frequently flooded structures from the floodplain. One advantage of floodplain evacuation is it generally provides high marginal benefits, because targeted structures are those being damaged at the most frequent events. Floodplain evacuation can also expand open space and enhance natural and beneficial uses and facilitate the secondary use of newly vacated land. Similar to the relocation measure, evacuation to provide additional protection can be impractical and potentially cost prohibitive. One area was analyzed for the potential for additional risk reduction due to it not receiving and flood risk benefits

from the proposed levee alignments at the Orange-Jefferson CSRM. An examination of the existing damages determined that there were limited opportunities for large scale reductions in damages with permanent structure evacuations due to the fact that there are limited damages to the residential structures associated with the Orange 3 project area. Only 15 percent of the total without equivalent annual damages are to residential structures. 65 percent of the damages in Orange 3 are to the industrial damage category, which are not conducive permanent structure evacuations. As stated above many of these local industries are dependent on the local waterways and transportation corridors.

In addition there would be OSE concerns with leaving local communities exposed while trying to only address industrial damages. Developing risk reduction systems (i.e. levees and floodwalls) for only the industrial areas could potentially induce stages in the local communities. Even with if structure relocations were included (i.e. flood proofing and raising), the area would still face detrimental flooding depths, limiting their ability to recover post storm events in the industrial areas. Based on these findings, permanent structure evacuations was not considered any further.

2.4.4.1.7 Ancillary Permanent Evacuation

Surveys of aerial imagery for the three counties were done to look for the potential for buyouts. Buyouts would be ancillary to the implementation of new levees/floodwalls in Orange and Jefferson Counties and to the enhancement of features in the Freeport and Port Arthur systems. Buyout opportunities in Brazoria are virtually non-existent and very limited in both Orange and Jefferson Counties. Several structures in Jefferson have the potential for being bought out. All of these structures, however, are commercial and buying out these structures is very unlikely to be the economically viable. Figure 2-8 shows the potential for buyouts in Orange County. There are approximately 20 residential structures that could be potentially economically viable and are currently being evaluated. While some of the parcels appeared to have no structures located on them, inspection of county appraisal records in many cases showed improvements on many of these parcels. Visual inspections of aerial photos and further inspection of the appraisal records showed that many of these were agricultural improvements and would therefore not be subject to any permanent evacuation analysis. A quantitative analysis was conducted to determine the viability of any proposed evacuation. Water surface profiles and stage/probability functions were developed from the ADCIRC points that intersected those parcels of interest and imported into HEC-FDA along with depth-damage functions and structure files representing these structures of interest and evaluated. The original list of 20 structures was whittled down to six. Four of these structures were in the 2 percent ACE, with the other two being in the 0.05 percent ACE. Without-project EADs were estimated for these structures which totaled $8,700. Costs for buying out these structures were low-balled to include merely the appraised value of the structure plus $10,000 to demolish the structure. Annual costs for evacuating all six were $21,700, creating net benefits of

-$13,000. Buying only the four in the 2 percent ACE produced net benefits of -$8,600. Based on this analysis, any potential buyouts to be included in the TSP are eliminated. The results of the analysis are captured in Table 2-13.

Figure 2-8. Potential Orange County Buyouts

Table 2-13. Non-structural Analysis

	0.02 to 0.01 % ACE Buyout	Total Buyout
INVESTMENT		
Estimated First Cost	$396,400	$511,900
Annual Interest Rate	3.375%	3.375%
Project Life (years)	50	50
Construction Period (months)	12	12
Interest During Construction	$7,200	$9,300
Investment Cost	$403,600	$521,200
Interest	$13,600	$17,600
Amortization	$3,200	$4,100
TOTAL ANNUAL COSTS	**$16,800**	**$21,700**
Without Project EAD	$8,700	$8,700

	0.02 to 0.01 % ACE Buyout	Total Buyout
Residual EAD	$500	$0
Flood Reduction Benefits	$8,200	$8,700
TOTAL BENEFITS	**$8,200**	**$8,700**
NET BENEFITS	**($8,600)**	**($13,000)**
BENEFIT-COST RATIO	**0.5**	**0.4**

2.5 ADJACENT IMPACTS/INDUCED FLOODING

The ERDC surge model ran a full “maximum” footprint for the Freeport, Port Arthur, Jefferson, and Orange levees and showed induced impacts could reach levels of nearly 1 to 1.5 feet in some areas along the Neches River and the Orange County levee. The levees on the Neches River that could induce damages in this area have been removed from the recommended plan eliminating these impacts. The existing systems of Port Arthur and Freeport showed negligible impacts during a 100-year event. Some induced flooding was at Orange 3 but these sections of levee were removed from the final selected plan and impacts in this area were negligible. This drastically reduces adjacent impacts caused by the proposed levee.

Adjacent impacts to the south and southeast of the levee were also analyzed and determined that most areas impacted are vacant areas of grasslands and wetlands. Surge modeling data for a 1 percent ACE were calculated and mapped for differences between the with-project and without-project water surface elevations which showed adjacent impacts to be minimal. The map showing adjacent impacts for a 1 percent ACE can be found in Engineering Map D-11 near the end of the Engineering Appendix. Most values are negligible with the exception of the areas previously mentioned with impacts measuring from 0.02 to 0.05 feet.

2.6 RISK PERFORMANCE OF PROPOSED ACTIONS

Engineer Regulation 1105-2-101 states that risk and uncertainty are intrinsic in water resources planning and design with inaccuracy in all measured or estimated values in project planning and design to some varying degrees. Invariably, the true values are different from any single, point values presently used in project formulation, evaluation, and design. The best estimates of key variables, factors, parameters, and data components in the planning and design of flood damage reduction projects are considered the "most likely" values. These values, however, are frequently based on small periods of record, sample sizes, and measurements that are subject to error.

The ER also states that risk analyses “captures and quantifies the extent of the risk and uncertainty in the various planning and design components of an investment project. The total effect of uncertainty on the project's design and economic viability can be examined and conscious decisions made reflecting an explicit tradeoff between risks and costs. Risk analysis can be used to compare plans in terms of the variability of their physical performance, economic success, and residual risks.”

Engineer Manual 1110-2-1619 identifies a number of potential sources of uncertainty. These include (1) uncertainty about future hydrologic events such as steam flow and rainfall; (2) uncertainty arising from the use of simplified models to describe complex hydraulic phenomena;

(3) economic and social uncertainty, particularly the relationship between depth and inundation damage, inaccuracies in estimates of structure values and locations, and the predictability of how the public will respond to a flood; and (4) uncertainty about structural and geotechnical performance of water-control measures when subjected to rare storm events.

Uncertainty in the hydrology and hydraulics is addressed primarily by utilizing graphical exceedance probability functions which sets confidence limits for discharges at each discrete exceedance probability based on the equivalent record length. Uncertainty for hydrology and hydraulics is also addressed by assigning distributions to stage-damage functions. In the case of this study, the equivalent record length is set at 15 years and the error for the stage-damage functions is set at 0.5 feet. No fragility curves are assigned to the proposed levee, since flooding durations are short and it would be overtopped regardless for those rare events. Economic uncertainties are similarly managed with normal distributions with standard errors assigned to the depth-damage functions and by defining uncertainty parameters for first floor corrections, structure and content values. Uncertainties are further handled by changing, if necessary, the number of Monte Carlo simulations and by varying the range of ordinates in the aggregated stage-damage functions.

HEC-FDA produces project performance reports to display the hydrologic and hydraulic performance of a particular plan. Table 2-14 shows the project performance for the proposed levee raise. For the future without-project condition, the expected annual exceedance probability (AEP) for the Orange Jefferson CSRM ranges from 2.8 percent for Beaumont A to 11.4 percent for Jefferson Main. For the Port Arthur CSRM, the expected AEP ranges from 0.0 percent for the Closure Structure to 0.2 percent for the I-Wall near Valero. For the Freeport CSRM, the expected AEP ranges from 0.1 percent for the South Storm Levee to 6.0 percent for the Dow Barge Canal. Implementing the TSP reduces these expected AEP substantially.

The lack of any long-term performance of the existing conditions at the Orange-Jefferson CSRM shows that the area where levees/floodwalls are being proposed has anywhere from a 76 percent to 99.8 chance of being inundated in 50 years and a virtually zero chance of not being exceeded by the 0.2 percent event. The long-term risk for the existing Port Arthur system is somewhat less, but the long-term risk for the existing Freeport system has a wide variation from the different potential failure locations ranging from 3.7 percent for the South Storm Levee to 95.5 percent for the Dow Barge Canal. Long-term risk is reduced considerably for all three CSRMs with implementation of the TSP. The non-exceedance probability for the 0.2 percent ACE also increases substantially with the implementation of the TSP. These results are also all listed in Table 2-14.

2.6.1 Performance of the Tentatively Selected Plan under Relative Sea Level Change

An analysis was conducted in order to assess how the TSP might perform under various relative sea level change (RSLC) scenarios. As part of this analysis, H&H determined what engineering guidance would need to be for levee/floodwall heights based on EC 1110-2-6067 and CFR 2000 Title 44 and additional guidance for the three CSRMs to address the projected 50-year RSLC under low, intermediate, and high scenarios. These required heights were averaged so that they could be compared to the recommended heights specified in the TSP. Table 2-15 shows these required engineering heights in the left side of the table, while the right side specifies the recommend heights based on the criteria to determine the TSP and the difference between the two sets of criteria. Under the three RSLC scenarios, the TSP addresses relative sea level change well for the Port Arthur and Freeport CSRMs. The Orange-Jefferson CSRM shows deficiencies ranging from 2.24 to 4.77 feet. These results are also in Table 2-15.

Table 2-14. Project Performance for the Tentatively Selected Plan

Without Project

		Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange -Jefferson CSRM										
Orange 3	7.7%	55.0%	86.4%	98.2%	85.4%	11.4%	2.1%	0.5%	0.2%	0.0%
Beaumont A	2.8%	24.8%	50.9%	75.9%	100.0%	77.7%	35.3%	13.0%	3.8%	1.8%
Jefferson Main	11.4%	70.2%	95.1%	99.8%	55.7%	5.3%	1.3%	0.4%	0.2%	0.0%
Port Arthur CSRM										
8ft-10ft I-Wall	0.1%	0.5%	1.2%	2.4%	100.0%	100.0%	100.0%	99.8%	94.2%	82.7%
Closure Structure	0.0%	0.0%	0.1%	0.1%	100.0%	100.0%	100.0%	100.0%	99.5%	98.0%
I-Wall Near Valero	0.2%	2.3%	6.8%	11.0%	100.0%	100.0%	99.9%	97.1%	75.4%	55.9%
I-Wall Near Tank Farm	0.1%	1.1%	2.7%	5.2%	100.0%	100.0%	100.0%	99.3%	87.2%	70.7%
Freeport CSRM										
Dow Barge Canal	6.0%	46.3%	78.9%	95.5%	83.6%	59.4%	43.1%	27.2%	12.3%	6.9%
East Storm Levee	0.5%	4.7%	11.3%	21.3%	100.0%	99.9%	97.1%	84.8%	59.2%	42.4%
Freeport Dock	1.2%	10.9%	25.1%	43.8%	100.0%	99.1%	84.2%	52.7%	21.6%	11.3%
Old River at Dow Thumb	0.7%	7.1%	16.8%	30.8%	100.0%	98.9%	91.8%	75.9%	46.4%	29.3%
South Storm Levee	0.1%	0.7%	2.2%	3.7%	100.0%	100.0%	100.0%	100.0%	97.7%	89.4%
Tide Gate I-Wall	0.8%	7.4%	17.5%	32.0%	100.0%	98.7%	91.0%	74.5%	44.9%	27.8%
Oyster Creek	0.6%	6.2%	14.9%	27.5%	100.0%	99.8%	94.2%	76.1%	49.7%	34.8%

Table 2-14. Project Performance for the Tentatively Selected Plan (continued)

With Project

		Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange -Jefferson CSRM										
Orange 3 New Levee (11-Foot)	0.2%	1.7%	1.7%	4.1%	100.0%	100.0%	100.0%	98.8%	87.0%	72.5%
Beaumont A New Levee (12-Foot)	0.1%	0.8%	2.1%	4.1%	100.0%	100.0%	100.0%	99.9%	95.9%	86.9%
Jefferson Main New Levee (11-Foot)	0.1%	0.8%	1.9%	3.8%	100.0%	100.0%	100.0%	99.7%	96.1%	89.3%
Port Arthur CSRM										
8- to 10-foot I-Wall Raise (1-foot)	0.4%	0.4%	1.2%	2.0%	100.0%	100.0%	100.0%	100.0%	99.8%	98.3%
Closure Structure Raise (1-foot)	0.0%	0.4%	1.1%	2.1%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
I-Wall Raise Near Valero (1-foot)	0.1%	0.5%	1.6%	2.7%	100.0%	100.0%	100.0%	100.0%	99.0%	94.3%
I-Wall Raise Near Tank Farm (1-foot)	0.1%	0.7%	2.1%	3.6%	100.0%	100.0%	100.0%	100.0%	97.4%	89.5%
Freeport CSRM										
Dow Barge Canal Gate Structure	0.6%	5.8%	16.4%	25.9%	100.0%	100.0%	97.7%	80.9%	45.2%	27.1%
East Storm Levee Raise (1-foot)	0.2%	1.6%	4.8%	7.9%	100.0%	100.0%	100.0%	98.7%	87.3%	72.7%
Freeport Dock (No Fail)	0.5%	4.8%	11.5%	21.7%	100.0%	100.0%	98.9%	87.0%	53.5%	32.9%
Old River Levee Raise at Dow Thumb (1-foot)	0.3%	2.5%	7.4%	12.1%	100.0%	100.0%	99.9%	97.3%	77.1%	55.6%
South Storm Levee	-	-	-	-	-	-	-	-	-	-
Tide Gate I-Wall - 1-foot	0.3%	2.5%	6.1%	11.9%	100.0%	100.0%	100.0%	97.5%	77.6%	55.8%
Tide Gate I-Wall Raise (1-foot)	0.3%	3.3%	8.0%	15.4%	100.0%	100.0%	99.5%	92.3%	69.8%	52.3%

Table 2-15. Tentatively Selected Plan Relative Sea Level Change Project Performance

	Engineering Criteria - FT NAVD				TSP Project Performance				
	Without RSLC	*Low RSLC*	*Intermediate RSLC*	*High RSLC*	*Recommended Height - TSP*	*Surplus/ Deficit (Without)*	*Surplus/ Deficit (Low)*	*Surplus/Deficit (Intermediate)*	*Surplus/ Deficit (High)*
Orange-Jefferson Floodwall	12.50	13.43	13.98	15.77	11.00	-1.50	-2.43	-2.98	-4.77
Orange-Jefferson Levee	12.33	13.24	13.83	15.59	11.00	-1.33	-2.24	-2.83	-4.59
Port Arthur Floodwall	13.25	16.10	16.72	18.25	19.00	5.75	2.90	2.28	0.75
Port Arthur Levee	12.94	13.86	14.43	16.20	18.00	5.06	4.14	3.58	1.80
Dow Barge Canal	15.85	16.58	17.15	18.93	26.00	10.15	9.43	8.85	7.08
Freeport Levee	16.42	17.13	17.66	19.45	20.75	4.33	3.63	3.09	1.30
Oyster Creek	16.41	16.41	16.41	16.41	19.00	2.59	2.59	2.59	2.59

2.6.2 Life Safety Considerations

The population at risk (PAR) is displayed by project area is included in Table 2-16. The PAR was developed based on the 2010 census blocks that intersect the damageable properties in the project areas. This population reflects the residential population that may be exposed to flood risk. This does not include transportation routes for evacuation or those at work in commercial or industrial areas. The PAR the same is due to the fact that virtually the same structures being protected by the levee at Jefferson Main are also being protected by the existing hurricane flood protection system at Port Arthur. In the case of Jefferson Main, the levee is protecting against surge coming up the Neches River. For Port Arthur, damages are being quantified from the failure locations along the HFPS. In the case of Beaumont A – C, all three reaches fall within the same census block.

Table 2-16. Population at Risk by CSRM

CSRM	Population at Risk
Orange-Jefferson	
Orange 1	17,014
Orange 2	13,952
Orange 3	60,044
Beaumont A	2,078
Beaumont B	2,078
Beaumont C	2,078
Jefferson Main	116,762
Port Arthur	116,762
Freeport	16,559

Discussed previously, broad warnings as storm systems develop are coordinated through various agencies, such as the National Weather Service, which provides reports to the essential print and electronic media outlets. The National Weather Service generally releases tropical storm watches 48 hours in advance of any anticipated onset of tropical storm force winds. Since outside preparedness activities become difficult once winds reach tropical storm force, warnings are issued 36 hours in advance of any anticipated onset of tropical storm force winds. The Texas Department of Public Safety's Division of Emergency Management coordinates the state emergency management program, as well as implementing the Texas Emergency Tracking Network (ETN), part of a comprehensive data-management system that provides real-time information before, during, and after a disaster. Orange and Jefferson Counties are members of the Southeast Texas Alerting Network, which can alert users of emergencies, plant operations, traffic, and weather information or other outreach from emergency management. Both counties as well as Brazoria,

also have emergency management departments that engage their respective cities, including specific evacuation plans and processes.

2.7 IDENTIFICATION OF THE TSP

The primary planning objective to select the TSP is to reduce economic damage for the 50-year period of analysis. The TSP also meets the Federal objective of maximizing net benefits. Alternatives were evaluated to show reductions in expected annual damages towards a plan that maximizes net benefits. To that end, the following summarizes each of the CSRMs with their respective alternatives with the highest net benefits to be included in the TSP.

2.7.1 Orange-Jefferson CSRM

- Orange 3 New Levee – 11-Foot Levee/Floodwall
- Jefferson Main New Levee –11-Foot Levee/Floodwall
- Beaumont A New Levee –12-Foot Levee/Floodwall

2.7.2 Port Arthur and Vicinity CSRM

- 8-10 ft I-Wall Raise (1-Foot)
- Closure Structure Raise (1-Foot)
- I-Wall Raise Near Valero (1-Foot)
- I-Wall Raise Near Tank Farm (1-Foot)

2.7.3 Freeport and Vicinity CSRM

- Dow Barge Canal Gate Structure
- Oyster Creek Levee Raise (1-Foot)
- East Storm Levee Raise (1-Foot)
- Freeport Dock No Fail
- Old River Levee Raise at Dow Thumb (1-Foot)
- Tide Gate I-Wall Raise (1-Foot)

The following tables display each of the maximized NED alternatives which comprise the TSP beginning with the Orange-Jefferson CSRM, then the Port Arthur and Vicinity CSRM, and finally the Freeport and Vicinity CSRM (Tables 2-16 through 2-18). It should be noted that no OMRR&R was calculated for Beaumont A since initial estimates were not found to be particularly sensitive across alternative ranking. This was also true for the existing CSRMs.

Table 2-17. TSP for Orange-Jefferson CSRM

(FY 2015 Price Level/3.375 percent interest rate)

	Orange 3	Jefferson Main	Beaumont A
	11 - Foot	11 - Foot	12 - Foot
INVESTMENT			
Estimated First Cost	$246,811,000	$65,726,000	$70,202,000
Annual Interest Rate	3.375%	3.375%	3.375%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,587,000	$3,352,000	$3,580,000
Investment Cost	$259,398,000	$69,078,000	$73,782,000
Interest	$8,755,000	$2,331,000	$2,490,000
Amortization	$2,056,000	$548,000	$585,000
OMRR&R ($/year)	$4,084,000	$371,000	
TOTAL ANNUAL COSTS	**$14,895,000**	**$3,250,000**	**$3,075,000**
Without Project EAD	$29,987,000	$28,231,000	$6,937,000
Residual EAD	$5,242,000	$2,520,000	$870,000
Storm Reduction Benefits	$24,745,000	$25,711,000	$6,067,000
TOTAL BENEFITS	$24,745,000	**$25,711,000**	**$6,067,000**
NET BENEFITS	**$9,851,000**	**$22,461,000**	**$2,992,000**
BENEFIT-COST RATIO	**1.7**	**7.9**	**2.0**

Table 2-18. TSP for Port Arthur and Vicinity CSRM
(FY 2015 Price Level/3.375 percent interest rate)

	8ft-10ft I-Wall	Closure Structure	I-Wall Near Valero	I-Wall Near Tank Farm
	1-Foot Raise	1-Foot Raise	1-Foot Raise	1-Foot Raise
INVESTMENT				
Estimated First Cost	$8,915,000	$10,654,000	$8,948,000	$4,627,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50
Construction Period (months)	36	36	36	36
Interest During Construction	$455,000	$543,000	$456,000	$236,000
Investment Cost	$9,370,000	$11,197,000	$9,404,000	$4,863,000
Interest	$316,000	$378,000	$317,000	$164,000
Amortization	$74,000	$89,000	$75,000	$39,000
TOTAL ANNUAL COSTS	**$391,000**	**$467,000**	**$392,000**	**$203,000**
Without Project EAD	$23,413,000	$3,784,000	$61,867,000	$38,009,000
Residual EAD	$5,730,000	$408,000	$10,813,000	$16,874,000

	8ft-10ft I-Wall	Closure Structure	I-Wall Near Valero	I-Wall Near Tank Farm
	1-Foot Raise	1-Foot Raise	1-Foot Raise	1-Foot Raise
Flood Reduction Benefits	$17,683,000	$3,375,000	$51,054,000	$21,135,000
TOTAL BENEFITS	**$17,683,000**	**$3,375,000**	**$51,054,000**	**$21,135,000**
NET BENEFITS	**$17,292,000**	**$2,908,000**	**$50,662,000**	**$20,932,000**
BENEFIT-COST RATIO	**45.2**	**7.2**	**130.2**	**104.1**

As stated earlier, the TSP for the Orange-Jefferson CSRM includes a 113,600 LF of levee and 29,800 LF of floodwall (total of 27 miles) combination at a levee crest of 11 feet MSL at Orange 3. This has an estimated first cost of $246.8 million annualized to $14.9 million. Total annual benefits are $24.7 million which produces $9.85 million in annual net benefits and benefit-to-cost ratio of 1.7. Also included are a 41,700 LF of levee and 16,200 LF of floodwall (11 miles) combination at Jefferson Main with 11-foot crest elevation and an estimated first cost of $65.7 million with annual costs of $3.3 million. Total annual benefits come to $25.7 million, leaving an estimate of $22.5 million in net benefits and 7.9 benefit-to-cost ratio. Finally, it also includes a combination of 3,100 LF of levee and 200 LF of floodwall (0.6 mile) with a 12-foot crest elevation with first cost of $70.2 million, annual costs of $3.1 million, annual benefits of $6.1 million, and annual net benefits of $3.0 million, and a 2.0 benefit-to-cost ratio.

Table 2-19. TSP for Freeport and Vicinity CSRM
(FY 2015 Price Level/3.375 percent interest rate)

	Dow Barge Canal	Oyster Creek Levee	East Storm Levee	Freeport Dock	Old River Levee at Dow Thumb	Tide Gate I-Wall
	No Fail - Closure Structure	1-Foot Raise	1-Foot Raise	No Fail	1-Foot Raise	1-Foot Raise
INVESTMENT						
Estimated First Cost	$130,000,000	$4,869,000	$6,530,000	$2,850,000	$8,294,000	$3,800,000
Annual Interest Rate	3.375%	3.375%	3.375%	3.375%	3.375%	3.375%
Project Life (years)	50	50	50	50	50	50
Construction Period (months)	36	36	36	36	36	36
Interest During Construction	$6,630,000	$248,000	$333,000	$145,000	$423,000	$194,000
Investment Cost	$136,630,000	$5,117,000	$6,863,000	$2,995,000	$8,717,000	$3,994,000
Interest	$4,611,000	$173,000	$232,000	$101,000	$294,000	$135,000
Amortization	$1,083,000	$41,000	$54,000	$24,000	$69,000	$32,000
TOTALANNUAL COSTS	**$5,694,000**	**$213,000**	**$286,000**	**$125,000**	**$363,000**	**$166,000**
Without Project EAD	$166,660,000	$3,800,000	$1,701,000	$3,960,000	$2,517,000	$2,785,000
Residual EAD	$47,052,000	$1,272,000	$581,000	$1,742,000	$913,000	$897,000
Storm Reduction Benefits	$119,608,000	$2,527,000	$1,121,000	$2,218,000	$1,604,000	$1,888,000
TOTAL BENEFITS	**$119,608,000**	**$2,527,000**	**$1,121,000**	**$2,218,000**	**$1,604,000**	**$1,888,000**
NET BENEFITS	**$113,914,000**	**$2,314,000**	**$835,000**	**$2,093,000**	**$1,241,000**	**$1,721,000**
BENEFIT-COST RATIO	**21.0**	**11.9**	**3.9**	**17.7**	**4.4**	**11.4**

The TSP for the Port Arthur and Vicinity CSRM includes a one-foot raise above the existing elevation of 8-foot to 10-foot I-Wall, 7,500 LF of 15-foot wide scour pad, and 2,000 LF of levee raised one foot. First costs are $8.9 million, annual costs are $0.4 million, and annual benefits are $17.7 million. Net benefits are $17.3 million with a benefit-to-cost ratio of 45.2. Next is a one-foot raise above the existing elevation at the Port Arthur Closure Structure. The structure would be replaced and 300 LF of 100-foot wide scour pad along with 12,000 LF of levee raised one foot. First costs are $10.7 million, annual costs are $0.5 million, annual benefits of $3.4 million with net benefits of $2.9 million, and a benefit-to-cost ration of 7.2. Next is another one-foot raise above the existing elevation at the I-Wall near Valero with 5,000 LF of 15-foot scour pad and 3,000 LF of levee raised one foot. First costs are $8.9 million annualized to $0.4 million, with annual benefits of $51.1 million. Net benefits are $50.7 million and the benefit-to-cost ratio us 130.2. Finally, the TSP would include a one-foot raise above the existing elevation near the Port Arthur Tank Farm and have 1,800 LF of 15-foot-wide scour pad and 7,000 feet of levee raised one foot. First costs are $4.6 million, annual costs are $0.2 million with annual benefits of $21.1 million. Net benefits are $20.9 million with a 104.1 benefit-to-cost ratio.

The TSP for the Freeport and Vicinity CSRM includes a No-Fail closure structure at the Dow Barge Canal with two sector gates approximately 500 feet long and 80 feet in width for vessel traffic with an estimated first cost of $130 million, annual costs of $5.7 million, annual benefits of $119.6 million and $113.9 in annual net benefits. The benefit-to-cost ratio is 21. Also included are a one-foot raise above the existing elevation at the Oyster Creek Levee 10,000 LF in length. First costs are $4.9 million, annual costs are $0.2 million, annual benefits of $2.5 million and net benefits of $2.3 million, with a benefit-to-cost ration of 11.9. Next, it would include a one-foot raise above the existing elevation at the East Storm Levee and 13,115 LF of High Performance Turf Reinforcement Mat (HPTRM). First costs are $6.5 million, annual costs are $0.3 million, annual benefits are $1.1, and net benefits of $0.8 million with a 3.9 benefit-to cost ratio. Next is a 3,000 LF of No-Fail floodwall at Freeport Dock with first costs of $2.9 million, annual costs of $0.1 million and annual benefits of $2.2 million. Net benefits are $2.1 million and the benefit to-cost ratio is 17.7. Next would be a one-foot raise above the existing elevation at the Old River Levee at the Dow Thumb with a distance of 3,000 LF. First costs are $8.3 million, annual costs $0.4 million, annual benefits are $1.6 million, and net benefits are $1.2 million with a benefit-to-cost ratio of 4.4. Finally, it would also include a reconstructed I-Wall raised one foot above the existing elevation, 700 LF in length. It would also have 2,000 LF of levee raised one foot. First costs are $3.8 million, annual costs are $0.2 million, annual benefits are $1.9 million with $1.7 million in net benefits, and an 11.4 benefit-to-cost ratio.

2.8 RE-OPTIMIZATION TO ACCOUNT FOR RELATIVE SEA LEVEL CHANGE (RSLC)

ER 1100-2-8162 provides "guidance for incorporating the direct and indirect physical effects of projected future sea level change across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects" and "Alternatives should be evaluated using "low," "intermediate," and "high" rates of future SLC for both "with" and "without" project conditions." ETL 1100-2-1 states that "Using a longer adaptation horizon enables us to improve robustness and resilience compared to planning for shorter time frames" and an "initial assessment that evaluates the exposure and vulnerability of the project area over the 100-year adaptation horizon will assist planners and engineers in determining the long-term approach that best balances risks for the project." The ETL goes on to "strongly recommend that some predictions of how the project or system might perform, as well as its ability to adapt beyond the typical 50-year economic analysis period, be considered in the decision-making."

One approach for addressing RSLC is to consider that the optimization has already taken place with the analysis that identified the TSP and using the identified levee/floodwall crest elevations from the average SWLs as the "base." Any increases to the crest elevation due to wave action and RSLC based on engineering criteria can be added followed by a fresh run HEC-FDA analysis to capture the additional benefits from the increased protection. Another approach is to perform a more rigorous re-optimization based on the 50-year, intermediate RSLC scenario. The following depicts the results for addressing RSLC both for the initial 50-year period of analysis. Based on the 2080 RSLC projections for the USACE intermediate curve at the Freeport NOAA gauge for the Freeport and Vicinity CSRM and the Sabine Pass North NOAA gauge for the Port Arthur and Vicinity CSRM and the Orange-Jefferson CSRM, water surface elevations were adjusted 1.94 and 2.32 feet respectively as provided by SWG's H&H Section. The following graphs depict the water surface elevations as they would be adjusted to reflect various RSLC scenarios for the 20-, 50, and 100-year epochs for each of the three CSRM systems along with the USACE low, intermediate, and high scenarios.

As discussed in the introduction of Section 2.0, after the TSP was verified, the team developed feasibility-level designs for the Recommended Plan. Investigations included detailed cost estimates, benefits, impacts, and implementation requirements. After the ADM, the Beaumont A New Levee (12-foot) and Jefferson Main New Levee (11-foot) were removed from consideration under the Recommended Plan. Beaumont A New Levee (12-foot) was removed due to the local industrial recent actions to reduce the area's risk from storm surges. In the last few years the local industries have developed a levee and floodwall system at the same location as the TSP. The

structural integrity of the existing system is not fully known; however, an assessment of the systems height appears to place it above the heights considered in the Recommended Plan. Additional detailed economic evaluation of Beaumont A was not performed following the ADM; however, it was estimated that the current residual economic damages and life-safety risk are now limited. Risk from storm surge flooding is mainly concentrated to the industrial areas which is now being mitigated for with the newly constructed system. Based on the considerations above the Beaumont A New Levee (12-foot) was removed from the final Recommended Plan.

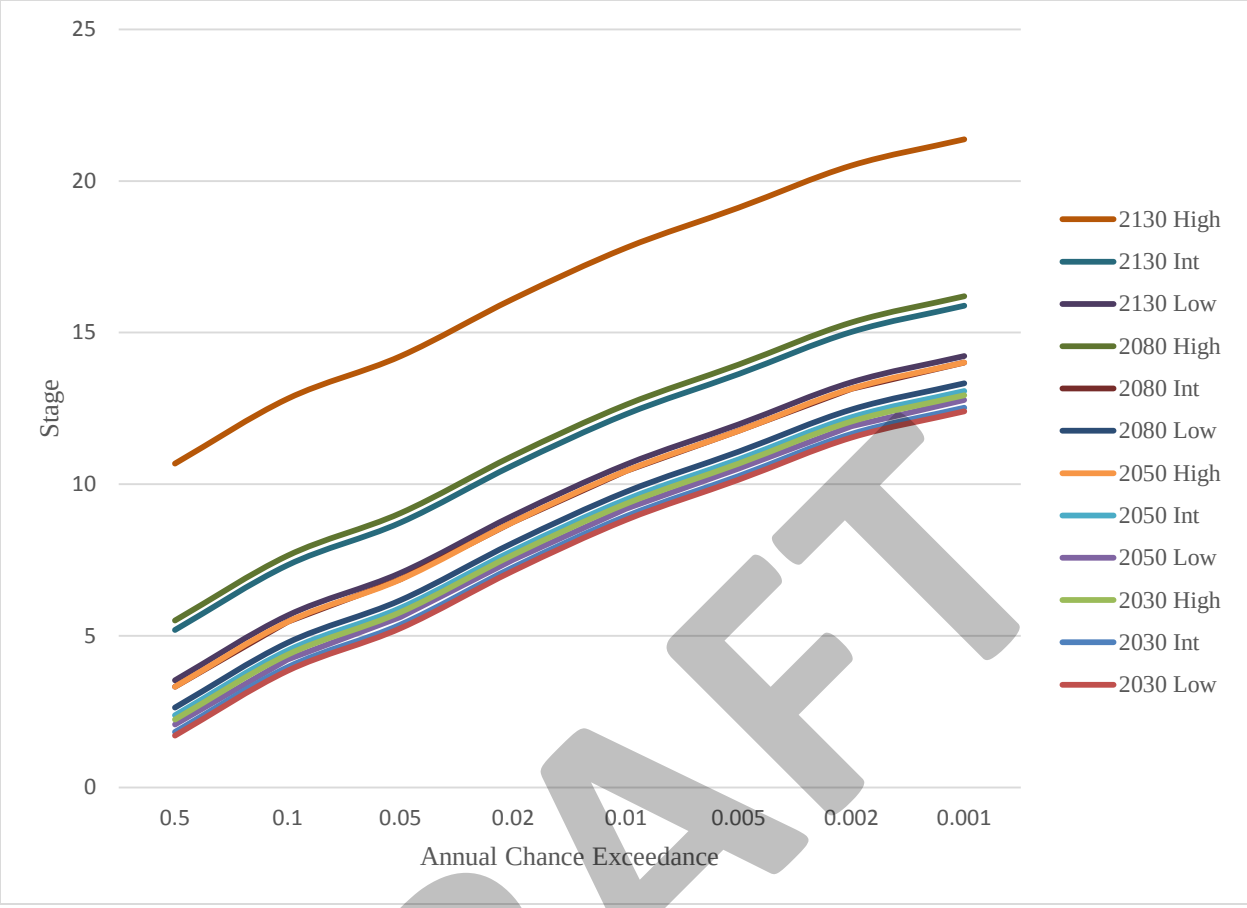


Figure 2-9. Orange-Jefferson CSRM RSLC Scenarios

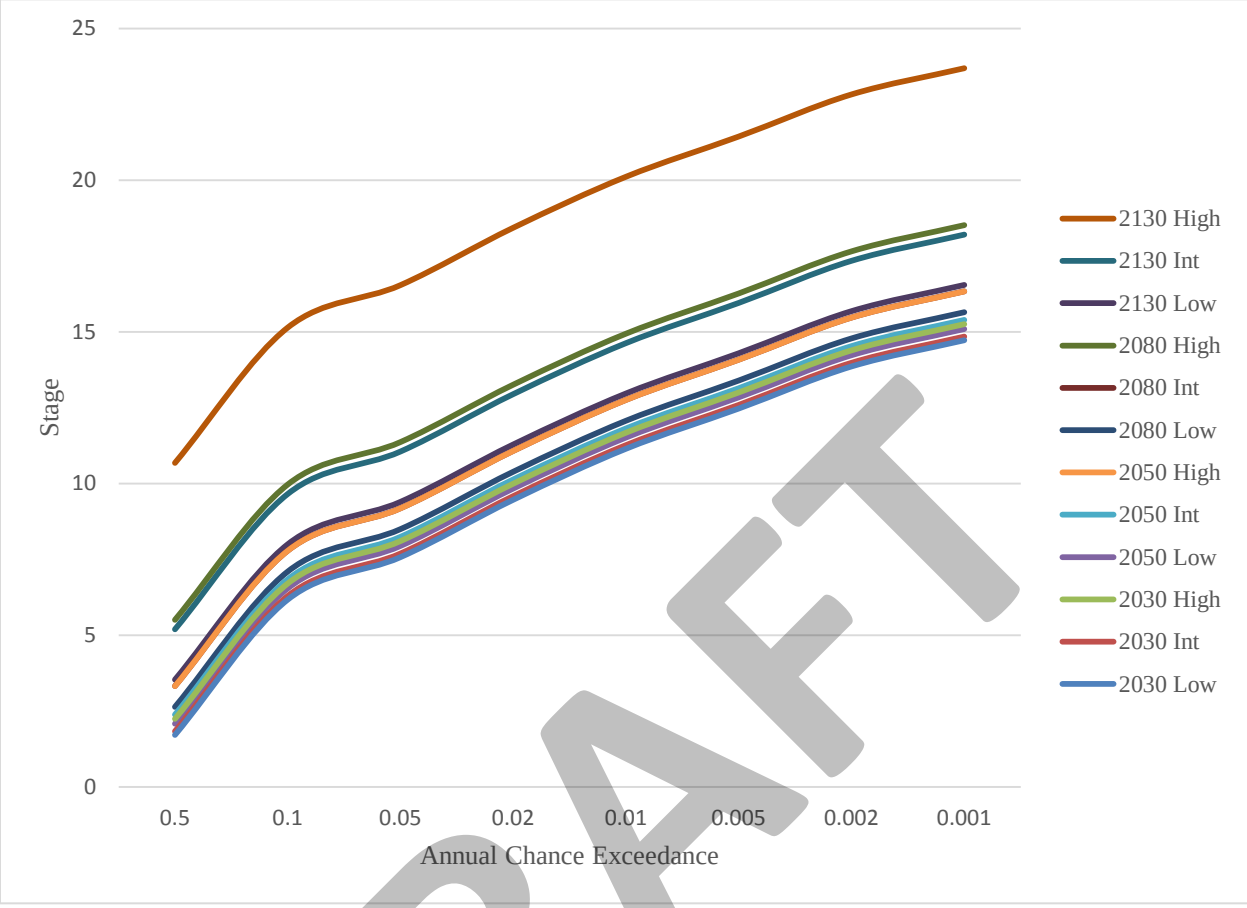


Figure 2-10. Port Arthur CSRM RSLC Scenarios

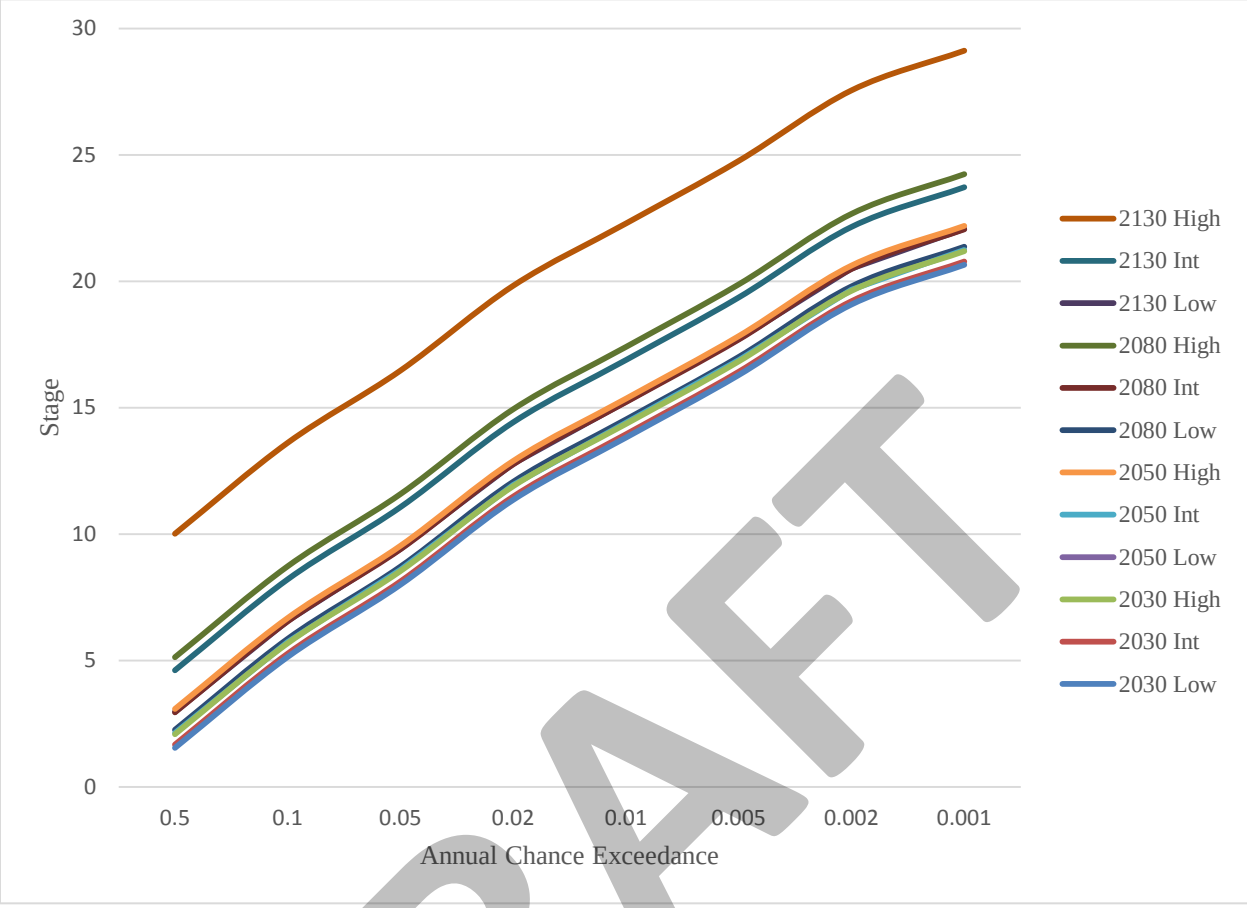


Figure 2-11. Freeport CSRM RSLC Scenarios

Systems Approach for Existing and New CSRMs

The previous analysis related to the identification of the TSP modeled damages at the existing Freeport and Port Arthur CSRMs as independent events at various locations as identified by GeoTech based on either completed or draft SQRAs. As part of the RSLC analysis in response to ATR comments from the Risk Management Center (RMC), without-project damages are estimated at one location identified to be the most likely of having a failure occur. For the Freeport CSRM that location is at the Dow Barge Canal. For the Port Arthur CSRM, that location is at the I-Wall near the Valero Refinery. This approach reduces the potential to overestimate benefits that may accrue at each of these systems. For the Orange-Jefferson CSRM, an "indicator geo-node" was identified for the basis of economic optimization. Once an "optimized" levee crest elevation was identified, the return interval associated with this height would then be applied to the remainder of the system.

Repetitive Damages and Net Benefits of Orange 3 Levee

An additional revision to the RSLC analysis was to address the potential for repetitive damages. No adjustments were done for the Freeport and Port Arthur systems since existing levees are already in place. The following without and with-project damage estimates to compensate for the potential for repetitive damages are based on results done under the 50-year intermediate RSLC scenario and under a reasonably aggressive repetitive damage scenario. All first-floor elevations that fell below the 2050 10-year ACE water surface elevation (4.52 feet) were raised to the 2050 100-year ACE water surface elevation (9.49 feet). This adjustment is similar to the approach used for other Gulf studies but more aggressive than the New Orleans District's *Morganza to the Gulf of Mexico* study and may therefore understate both the without and with-project damages. Damage estimates are based on equivalent annual damages using the water surface elevations and stage-probability functions with 2030 as the base year and 2080 as the most likely future year.

Updated Structure and Content Values

The following tables describe updated structure counts and values to reflect changes made to the structure inventory to match updated costs and to take into account changes due to repetitive damages and by changes in what structures are impacted by annual chance exceedances when RSLC is considered. The first table shows the update structure inventory while the second shows the structure counts by RSLC ACE.

Table 2-20. Updated Structure and Content Values of Inventoried Structures by CSRM and Type - 2016 Price and 2015 Development Levels

Orange 3

Category Name	Count	Structure Value	Content Value	Total
Commercial	265	174,588,000	174,588,000	349,176,000
Industrial	8*	1,908,899,000	1,908,899,000	3,817,798,000
Multi-Family	192	29,482,000	29,482,000	58,964,000
Mobile	600	10,796,000	10,796,000	21,592,000
Public	207	76,621,000	87,546,000	164,167,000
Vehicles	15,033	187,102,000	0	187,102,000
Single-Family	11,931	1,228,101,000	1,228,101,000	2,456,202,000
Grand Total	28,236	3,615,589,000	3,439,412,000	7,055,001,000

* Represents the number of actual parcels containing damageable structures. Parcels may contain anywhere from one to several dozen structures.

Freeport

Category Name	Count	Structure Value	Content Value	Total
Commercial	903	134,576,000	186,747,000	321,323,000

Industrial	49	6,369,294,000	11,160,863,000	17,530,157,000
Multi-Family	375	85,731,000	82,602,000	168,333,000
Mobile	6	168,000	161,000	329,000
Public	207	257,887,000	296,474,000	554,361,000
Vehicles	11,128	212,956,000	0	212,956,000
Single-Family	8,832	469,498,000	451,198,000	920,696,000
Grand Total	21,500	7,530,110,000	12,178,045,000	19,708,155,000

Port Arthur

Category Name	Count	Structure Value	Content Value	Total
Commercial	1,152	5,948,811,000	10,489,192,000	16,438,003,000
Industrial	9	230,903,000	404,504,000	635,407,000
Multi-Family	269	86,311,000	82,911,000	169,222,000
Public	452	248,987,000	273,145,000	522,132,000
Vehicles	26,431	0	0	0
Single-Family	20,977	2,377,533,000	2,283,727,000	4,661,260,000
Grand Total	49,290	8,892,545,000	13,533,479,000	22,426,024,000

Table 2-21. Updated Structure Counts and Damages by CSRM and RSLC ACE (FY 2016 Price Level, $1,000)

Orange 3

Event (ACE)	**0.1**		**0.05**		**0.02**		**0.01**		**0.005**		**0.002**		**0.001**	
Elevation (MSL Ft.)	5.46		6.86		8.76		10.44		11.76		13.15		14.02	
Damage Category	**No.**	**Dam.**	**No.**	**Dam.**	**No.**	**Dam.**	**No.**	**Dam.**	**No.**	**Dam.**	**No.**	**Dam.**	**No.**	**Dam.**
Commercial	4	$6,532	40	$13,988	49	$26,876	198	$65,768	201	$94,814	257	$139,523	257	$171,585
Industrial	1*	$118,920	6*	$397,175	6*	$964,017	8*	$1,765,198	8*	$2,158,850	8*	$2,606,137	8*	$2,768,134
Multifamily	0	$0	96	$1,624	100	$5,648	180	$12,417	180	$16,580	190	$20,422	190	$23,600
Mobile	2	$53	141	$1,777	154	$3,242	384	$9,092	386	$9,516	537	$10,851	539	$14,425
Public	5	$47	66	$3,565	77	$22,915	166	$49,975	166	$62,312	188	$74,512	188	$93,195
Vehicles	300	$4,296	3,591	$4,935	3,931	$49,927	11,513	$53,731	11,637	$141,890	14,065	$143,549	14,103	$145,123
Single-Family	25	$1,000	2,850	$87,206	3,120	$262,449	9,137	$689,907	9,236	$942,397	11,163	$1,118,302	11,193	$1,337,077
Grand Total	337	$130,848	6,790	$510,270	7,437	$1,335,074	21,586	$2,646,088	21,814	$3,426,358	26,408	$4,113,297	26,478	$4,553,138

* Represents the number of actual parcels containing damageable structures. Parcels may contain anywhere from one to several dozen structures.

Freeport

Elevation (MSL Ft.)	6.54		9.4		12.76		15.22		17.7		20.49		22.06	
Commercial	250	$39,042	287	$57,367	288	$63,783	289	$65,386	289	$65,813	289	66,000	289	$66,005
Industrial	12	$90,361	14	$1,453,293	14	$2,434,612	14	$3,086,560	14	$3,336,371	14	3,382,495	14	$3,382,539
Multifamily	114	$12,536	115	$15,535	115	$18,506	115	$23,168	115	$24,342	115	24,403	115	$24,403
Mobile	0	$0	1	$30	2	$66	2	$74	2	$75	2	75	2	$75
Public	60	$64,140	64	$81,057	65	$92,041	65	$97,818	65	$99,591	65	99,988	65	$100,014
Vehicles	3,018	$49,819	3,250	$54,136	3,284	$54,830	3,285	$54,851	3,285	$54,851	3,285	54,851	3,285	$54,851
Single-Family	2,395	$131,204	2,579	$160,383	2,606	$173,502	2,607	$176,690	2,607	$177,473	2,607	177,746	2,607	$177,795
Grand Total	5,849	$387,103	6,310	$1,821,803	6,374	$2,837,340	6,377	$3,504,548	6,377	$3,758,517	6,377	$3,805,559	6,377	$3,805,684

Port Arthur

Elevation (MSL Ft.)	7.79	9.19	11.08	12.76	14.09	15.47	16.34

Commercial	946	$5,395,927	956	$6,596,122	1,050	$8,050,284	1,057	$9,307,032	1,143	$9,617,172	1,144	$9,858,136	1,147	$9,867,585
Industrial	7	$3,431	7	$4,900	9	$99,457	9	$164,103	9	$206,545	9	$256,028	9	$280,020
Multifamily	216	$34,261	217	$44,040	250	$55,979	252	$62,940	261	$68,980	261	$78,053	262	$82,408
Public	400	$244,265	401	$273,957	435	$312,765	437	$330,352	445	$339,534	446	$353,751	446	$356,272
Vehicles	21,087	$187,352	21,341	$223,699	24,429	$241,933	24,564	$258,971	25,785	$260,236	25,879	$273,027	25,981	$273,594
Single-Family	16,736	$1,406,104	16,937	$1,702,403	19,388	$2,144,891	19,495	$2,403,789	20,464	$2,591,879	20,539	$2,752,980	20,620	$2,799,024
Grand Total	39,392	$7,271,339	39,859	$8,845,121	45,561	$10,905,309	45,814	$12,527,188	48,107	$13,084,346	48,278	$13,571,975	48,465	$13,658,903

Re-optimized Orange-Jefferson CSRM

The re-optimized Orange-Jefferson CSRM (under a 50-year intermediate RSLC scenario) has an estimated first cost of $1,087.799 million annualized to $49.412 million. Total annual benefits are $77.070 million which produces $27.657 million in annual net benefits and benefit-to-cost ratio of 1.6.

Table 2-22. Economic Performance of Orange-Jefferson CSRM (50-Year Intermediate RSLC Scenario) (FY 2016 Price Level/3.125 percent interest rate)

	Orange 3 New Levee		
	11 - Foot	**12 - Foot**	**13 - Foot**
INVESTMENT			
Estimated First Cost	**$1,087,799,000**	**$1,228,785,000**	**$1,439,239,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$51,304,000	$57,954,000	$67,879,000
Investment Cost	$1,139,103,000	$1,286,738,000	$1,507,118,000
Interest	$35,597,000	$40,211,000	$47,097,000
Amortization	$9,731,000	$10,993,000	$12,875,000
OMRR&R ($/year)*	$4,084,000	$4,084,000	$4,084,000
TOTAL ANNUAL COSTS	**$49,412,000**	**$55,287,000**	**$64,057,000**
Without Project EAD	$102,293,000	$102,293,000	$102,293,000
Residual EAD	$25,223,000	$17,047,000	$10,881,000
Storm Reduction Benefits	$77,070,000	$85,246,000	$91,412,000
TOTAL BENEFITS	**$77,070,000**	**$85,246,000**	**$91,412,000**
NET BENEFITS	**$27,657,000**	**$29,959,000**	**$27,355,000**
BENEFIT-COST RATIO	**1.6**	**1.5**	**1.4**

*****For Mitigation

Re-optimized Port Arthur CSRM

The re-optimized Port Arthur CSRM (under a 50-year intermediate RSLC scenario) has an estimated first cost of $262.011 million annualized to $10.918 million. Total annual benefits are $65.86 million which produces $54.942 million in annual net benefits and benefit-to-cost ratio of 6.0.

Table 2-23. Economic Performance of Port Arthur and Vicinity CSRM
(50-Year Intermediate RSLC Scenario)
(FY 2016 Price Level/3.125 percent interest rate)

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$255,275,000**	**$262,011,000**	**$327,011,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,040,000	$12,357,000	$15,423,000
Investment Cost	$267,315,000	$274,369,000	$342,434,000
Interest	$8,354,000	$8,574,000	$10,701,000
Amortization	$2,284,000	$2,344,000	$2,925,000
TOTAL ANNUAL COSTS	**$10,637,000**	**$10,918,000**	**$13,626,000**
Without Project EAD	$70,351,000	$70,351,000	$70,351,000
Residual EAD	$8,641,000	$4,491,000	$2,236,000
Storm Reduction Benefits	$61,711,000	$65,860,000	$68,115,000
TOTAL BENEFITS	**$61,711,000**	**$65,860,000**	**$68,115,000**
NET BENEFITS	**$51,073,000**	**$54,942,000**	**$54,489,000**
BENEFIT-COST RATIO	**5.8**	**6.0**	**5.0**

Re-optimized Freeport and Vicinity CSRM

The re-optimized Freeport and Vicinity CSRM (under a 50-year intermediate RSLC scenario) has an estimated first cost of $304.501 million annualized to $12.688 million. Total annual benefits are $184.077 million which produces $171.389 million in annual net benefits and benefit-to-cost ratio of 14.5.

Table 2-24. Economic Performance of Freeport and Vicinity CSRM (50-Year Intermediate RSLC Scenario) (FY 2016 Price Level/3.125 percent interest rate)

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$261,391,000**	**$304,501,000**	**$548,819,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,328,000	$14,361,000	$25,884,000
Investment Cost	$273,719,000	$318,862,000	$574,703,000
Interest	$8,554,000	$9,964,000	$17,959,000
Amortization	$2,338,000	$2,724,000	$4,910,000
TOTAL ANNUAL COSTS	**$10,892,000**	**$12,688,000**	**$22,869,000**
Without Project EAD	$233,118,000	$233,118,000	$233,118,000
Residual EAD	$63,212,000	$49,041,000	$37,797,000
Storm Reduction Benefits	$169,906,000	$184,077,000	$195,320,000
TOTAL BENEFITS	**$169,906,000**	**$184,077,000**	**$195,320,000**
NET BENEFITS	**$159,014,000**	**$171,389,000**	**$172,451,000**
BENEFIT-COST RATIO	**15.6**	**14.5**	**8.5**

The following tables depict the economic performance for the one- and two-foot increments above the "No-Fail" alternatives analyzed at the Orange-Jefferson, Port Arthur, and Freeport CSRMs. The purpose of this analysis is primarily to show that the costs associated with each increment above the least expensive analyzed alternative is economically justified (i.e. benefit-to-cost ratio > 1.0). This was done by using the estimated first cost for the "No-Fail" alternatives at the Port Arthur and Freeport CSRMs and the 11-Foot at the Orange-Jefferson CSRM as the "base" and annualizing the differences in first costs for the other two analyzed alternatives. The same procedure is used for the benefits in order to derive net benefits for each of the "No-Fail + 1 Foot" and "No-Fail + 2 Foot" alternatives at the existing systems and the 12- and 13-Foot alternatives at Orange-Jefferson. As the tables show, the 12-Foot levee/floodwall combination at Orange-

Jefferson generates -$1.783 million in incremental net benefits with a 0.8 benefit-to-cost ratio while the 13-Foot combination generates -$4.386 million incremental net benefits also with a 0.8 benefit-to-cost ratio. At the existing CSRMs, the "No-Fail + 1 Foot" alternative at Port Arthur provides $3.869 million in incremental net benefits while the "No-Fail + 2 Foot" alternative provides -$0.483 million in incremental net benefits with 14.8 and 0.8 benefit-to-cost ratios respectively. At Freeport, the "No-Fail + 1 Foot" alternative generates $12.374 million in incremental net benefits while the "No-Fail + 2 Foot" alternative generates $1.063 million in incremental net benefits with 7.9 and 1.1 respective benefit-to-cost ratios.

Table 2-25. Incremental Benefits for the Orange Jefferson, Port Arthur, and Freeport CSRM Alternatives
(50-Year Intermediate RSLC Scenario - FY 2016 Price Level/3.125 percent interest rate)
Orange-Jefferson CSRM

	11 - Foot	12 - Foot	13 - Foot
INVESTMENT			
Estimated First Cost	**$1,087,799,000**	**$140,986,000**	**$351,440,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$51,304,000	$6,649,000	$16,575,000
Investment Cost	$1,139,103,000	$147,635,000	$368,015,000
Interest	$35,597,000	$4,614,000	$11,500,000
Amortization	$9,731,000	$1,261,000	$3,144,000
OMRR&R ($/year)*	$4,084,000	$4,084,000	$4,084,000
TOTAL ANNUAL COSTS	**$49,412,000**	**$9,959,000**	**$18,728,000**
Without Project EAD	$102,293,000	$8,176,000	$14,342,000
Residual EAD	$25,223,000	$0	$0
Storm Reduction Benefits	$77,070,000	$8,176,000	$14,342,000
TOTAL BENEFITS	**$77,070,000**	**$8,176,000**	**$14,342,000**
NET BENEFITS	**$27,657,000**	**($1,783,000)**	**($4,386,000)**
BENEFIT-COST RATIO	**1.6**	**0.8**	**0.8**

Port Arthur CSRM

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$255,275,000**	**$6,736,000**	**$65,000,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36

Interest During Construction	$12,040,000	$318,000	$3,066,000
Investment Cost	$267,315,000	$7,054,000	$68,066,000
Interest	$8,354,000	$220,000	$2,127,000
Amortization	$2,284,000	$60,000	$581,000
TOTAL ANNUAL COSTS	**$10,637,000**	**$281,000**	**$2,709,000**
Without Project EAD	$70,351,000	$4,149,000	$2,255,000
Residual EAD	$8,641,000	$0	$0
Storm Reduction Benefits	$61,711,000	$4,149,000	$2,255,000
TOTAL BENEFITS	**$61,711,000**	**$4,149,000**	**$2,255,000**
NET BENEFITS	**$51,073,000**	**$3,869,000**	**($453,000)**
BENEFIT-COST RATIO	**5.8**	**14.8**	**0.8**

Freeport and Vicinity CSRM

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$261,391,000**	**$43,110,000**	**$244,319,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,328,000	$2,033,000	$11,523,000
Investment Cost	$273,719,000	$45,143,000	$255,841,000
Interest	$8,554,000	$1,411,000	$7,995,000
Amortization	$2,338,000	$386,000	$2,186,000
TOTAL ANNUAL COSTS	**$10,892,000**	**$1,796,000**	**$10,181,000**
Without Project EAD	$233,118,000	$14,171,000	$11,243,000
Residual EAD	$63,212,000	$0	$0
Storm Reduction Benefits	$169,906,000	$14,171,000	$11,243,000
TOTAL BENEFITS	**$169,906,000**	**$14,171,000**	**$11,243,000**
NET BENEFITS	**$159,014,000**	**$12,374,000**	**$1,063,000**
BENEFIT-COST RATIO	**15.6**	**7.9**	**1.1**

The following table depicts the benefits generated by the re-optimized plan for each of the aforementioned RSLC epochs and scenarios. As stated previously, the initially identified TSP was re-optimized under the 50-year intermediate USACE RSLC scenario. The numbers depicted below represent the "gross" benefits generated by taking the re-optimized alternatives evaluated for the TSP and subtracting the annual residual damages of each alternative from the without-project

benefits for each CSRM. Annual costs for each alternative are not taken into account since reformulation was done under 50-year epoch and intermediate RSLC scenario. For each CSRM, using the 50-year epoch as the "base," average annual benefits for the 20- and 100-year epochs are then compared in percentage terms. These changes are displayed in Table 2-26.

As would be expected, benefits for the re-optimized TSP are somewhat reduced under the 20-year epoch as compared to the 50-year epoch. Depending on the scenario, benefits may be reduced from 12 to 19 percent under the low RSLC scenario and increase from 50 to 52 percent under the high scenario for the Orange CSRM. For the existing CSRMs, changes in benefits stay relatively constant across the varying scales of alternatives. Under the 20-year epoch, benefits decrease around five percent at the Freeport CSRM and around ten percent at Freeport. Under the 100-year epoch, benefits increase around 22 to 23 percent for the Port Arthur CSRM under the low RSLC scenario and increase by over 600 percent under the high scenario. At Freeport, benefits decrease five percent under the 20-year low RSLC scenario and all alternatives increase by an average of 189 percent under the 100-year high scenario relative to the 50-year epoch. The bottom line from this analysis is that under these various epochs and RSLC scenarios, there is little variation in benefits in the array of alternative scales. In this regard, there is no compelling case to deviate from the NED in identifying the recommended plan.

Table 2-26. Benefit Sensitivities by CSRM System

	20-Year	50-Year	100-Year	% ch. 20-yr./50-yr.	% ch. 100-yr./50-yr.
Orange					
Low					
11 - Foot	$48,048,000	$54,648,000	$70,511,000	-12.1%	29.0%
12 - Foot	$49,507,000	$60,824,000	$78,093,000	-18.6%	28.4%
13 - Foot	$55,139,000	$66,816,000	$83,988,000	-17.5%	25.7%
Intermediate					
11 - Foot	$53,427,000	$77,070,000	$131,904,000	-30.7%	71.1%
12 - Foot	$59,479,000	$85,246,000	$143,294,000	-30.2%	68.1%
13 - Foot	$64,049,000	$91,412,000	$152,124,000	-29.9%	66.4%
High					
11 - Foot	$75,806,000	$157,082,000	$327,486,000	-51.7%	108.5%
12 - Foot	$83,663,000	$170,341,000	$563,628,000	-50.9%	230.9%
13 - Foot	$89,828,000	$180,418,000	$737,733,000	-50.2%	308.9%
Port Arthur					
Low					
No Fail	$46,324,000	$51,578,000	$63,153,000	-10.2%	22.4%
No Fail + 1	$49,370,000	$54,980,000	$67,538,000	-10.2%	22.8%
No Fail + 2	$50,997,000	$56,808,000	$69,877,000	-10.2%	23.0%
Intermediate					

No Fail	$50,582,000	$61,711,000	$102,307,000	-18.0%	65.8%
No Fail + 1	$53,910,000	$65,860,000	$109,926,000	-18.1%	66.9%
No Fail + 2	$55,699,000	$68,115,000	$114,285,000	-18.2%	67.8%
High					
No Fail	$67,447,000	$123,578,000	$875,555,000	-45.4%	608.5%
No Fail + 1	$71,982,000	$132,928,000	$942,822,000	-45.8%	609.3%
No Fail + 2	$74,454,000	$138,195,000	$986,739,000	-46.1%	614.0%
Freeport					
Low					
No Fail	$143,770,000	$151,311,000	$167,036,000	-5.0%	10.4%
No Fail + 1	$156,279,000	$164,314,000	$181,031,000	-4.9%	10.2%
No Fail + 2	$166,042,000	$174,603,000	$192,171,000	-4.9%	10.1%
Intermediate					
No Fail	$152,242,000	$169,906,000	$231,022,000	-10.4%	36.0%
No Fail + 1	$165,430,000	$184,077,000	$248,595,000	-10.1%	35.0%
No Fail + 2	$175,661,000	$195,320,000	$262,286,000	-10.1%	34.3%
High					
No Fail	$185,139,000	$270,916,000	$793,343,000	-31.7%	192.8%
No Fail + 1	$200,493,000	$290,612,000	$840,024,000	-31.0%	189.1%
No Fail + 2	$212,695,000	$306,323,000	$876,665,000	-30.6%	186.2%

Table 2-27. Economic Performance of Orange-Jefferson CSRM Under 50-Year Low RSLC Scenario
(FY 2016 Price Level/3.125 percent interest rate)

	Orange 3 New Levee		
	11 - Foot	**12 - Foot**	**13 - Foot**
INVESTMENT			
Estimated First Cost	**$1,087,799,000**	**$1,228,785,000**	**$1,439,239,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$51,304,000	$57,954,000	$67,879,000
Investment Cost	$1,139,103,000	$1,286,738,000	$1,507,118,000
Interest	$35,597,000	$40,211,000	$47,097,000
Amortization	$9,731,000	$10,993,000	$12,875,000
OMRR&R ($/year)	$4,084,000	$4,084,000	$4,084,000
TOTAL ANNUAL COSTS	**$49,412,000**	**$55,287,000**	**$64,057,000**
Without Project EAD	$73,565,000	$73,565,000	$73,565,000
Residual EAD	$18,917,000	$12,742,000	$6,749,000
Storm Reduction Benefits	$54,648,000	$60,824,000	$66,816,000
TOTAL BENEFITS	**$54,648,000**	**$60,824,000**	**$66,816,000**
NET BENEFITS	**$5,236,000**	**$5,537,000**	**$2,760,000**
BENEFIT-COST RATIO	**1.1**	**1.1**	**1.0**

Table 2-28. Economic Performance of Port Arthur and Vicinity CSRM Under 50-Year Low RSLC Scenario
(FY 2016 Price Level/3.125 percent interest rate)

	No Fail	**NF + 1 Foot**	**NF + 2 Foot**
INVESTMENT			
Estimated First Cost	**$255,275,000**	**$262,011,000**	**$327,011,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,040,000	$12,357,000	$15,423,000
Investment Cost	$267,315,000	$274,369,000	$342,434,000
Interest	$8,354,000	$8,574,000	$10,701,000
Amortization	$2,284,000	$2,344,000	$2,925,000
TOTAL ANNUAL COSTS	**$10,637,000**	**$10,918,000**	**$13,626,000**
Without Project EAD	$58,618,000	$58,618,000	$58,618,000
Residual EAD	$7,040,000	$3,638,000	$1,810,000

Storm Reduction Benefits		$51,578,000	$54,980,000	$56,808,000
TOTAL BENEFITS		**$51,578,000**	**$54,980,000**	**$56,808,000**
NET BENEFITS		**$40,941,000**	**$44,062,000**	**$43,182,000**
BENEFIT-COST RATIO		**4.8**	**5.0**	**4.2**

Table 2-29. Economic Performance of Freeport and Vicinity CSRM Under 50-Year Low RSLC Scenario
(FY 2016 Price Level/3.125 percent interest rate)

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$261,391,000**	**$304,501,000**	**$548,819,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,328,000	$14,361,000	$25,884,000
Investment Cost	$273,719,000	$318,862,000	$574,703,000
Interest	$8,554,000	$9,964,000	$17,959,000
Amortization	$2,338,000	$2,724,000	$4,910,000
TOTAL ANNUAL COSTS	**$10,892,000**	**$12,688,000**	**$22,869,000**
Without Project EAD	$209,064,000	$209,064,000	$209,064,000
Residual EAD	$57,753,000	$44,750,000	$34,461,000
Storm Reduction Benefits	$151,311,000	$164,314,000	$174,603,000
TOTAL BENEFITS	**$151,311,000**	**$164,314,000**	**$174,603,000**
NET BENEFITS	**$140,419,000**	**$151,625,000**	**$151,734,000**
BENEFIT-COST RATIO	**13.9**	**13.0**	**7.6**

Table 2-30. Economic Performance of Orange CSRM Under 50-Year High RSLC Scenario (FY 2016 Price Level/3.125 percent interest rate)

	Orange 3 New Levee		
	11 - Foot	**12 - Foot**	**13 - Foot**
INVESTMENT			
Estimated First Cost	**$1,087,799,000**	**$1,228,785,000**	**$1,439,239,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$51,304,000	$57,954,000	$67,879,000
Investment Cost	$1,139,103,000	$1,286,738,000	$1,507,118,000
Interest	$35,597,000	$40,211,000	$47,097,000
Amortization	$9,731,000	$10,993,000	$12,875,000
OMRR&R ($/year)*	$4,084,000	$4,084,000	$4,084,000
TOTAL ANNUAL COSTS	**$49,412,000**	**$55,287,000**	**$64,057,000**
Without Project EAD	$201,203,000	$201,203,000	$201,203,000
Residual EAD	$44,120,000	$30,862,000	$20,785,000
Storm Reduction Benefits	$157,082,000	$170,341,000	$180,418,000
TOTAL BENEFITS	**$157,082,000**	**$170,341,000**	**$180,418,000**
NET BENEFITS	**$107,670,000**	**$115,054,000**	**$116,361,000**
BENEFIT-COST RATIO	**3.18**	**3.08**	**2.82**

*For Mitigation

Table 2-31. Economic Performance of Port Arthur and Vicinity CSRM Under 50-Year High RSLC Scenario (FY 2016 Price Level/3.125 percent interest rate)

	No Fail	**NF + 1 Foot**	**NF + 2 Foot**
INVESTMENT			
Estimated First Cost	**$255,275,000**	**$262,011,000**	**$327,011,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,040,000	$12,357,000	$15,423,000
Investment Cost	$267,315,000	$274,369,000	$342,434,000
Interest	$8,354,000	$8,574,000	$10,701,000
Amortization	$2,284,000	$2,344,000	$2,925,000
TOTAL ANNUAL COSTS	**$10,637,000**	**$10,918,000**	**$13,626,000**
Without Project EAD	$137,926,000	$137,926,000	$137,926,000
Residual EAD	$19,391,000	$10,363,000	$5,331,000
Storm Reduction Benefits	$118,534,000	$127,563,000	$132,595,000
TOTAL BENEFITS	**$118,534,000**	**$127,563,000**	**$132,595,000**
NET BENEFITS	**$107,897,000**	**$116,645,000**	**$118,968,000**
BENEFIT-COST RATIO	**11.1**	**11.7**	**9.7**

Table 2-32. Economic Performance of Freeport and Vicinity CSRM Under 50-Year High RSLC Scenario
(FY 2016 Price Level/3.125 percent interest rate)

	No Fail	NF + 1 Foot	NF + 2 Foot
INVESTMENT			
Estimated First Cost	**$261,391,000**	**$304,501,000**	**$548,819,000**
Annual Interest Rate	3.125%	3.125%	3.125%
Project Life (years)	50	50	50
Construction Period (months)	36	36	36
Interest During Construction	$12,328,000	$14,361,000	$25,884,000
Investment Cost	$273,719,000	$318,862,000	$574,703,000
Interest	$8,554,000	$9,964,000	$17,959,000
Amortization	$2,338,000	$2,724,000	$4,910,000
TOTAL ANNUAL COSTS	**$10,892,000**	**$12,688,000**	**$22,869,000**
Without Project EAD	$358,388,000	$358,388,000	$358,388,000
Residual EAD	$87,473,000	$67,776,000	$52,065,000
Storm Reduction Benefits	$270,916,000	$290,612,000	$306,323,000
TOTAL BENEFITS	**$270,916,000**	**$290,612,000**	**$306,323,000**
NET BENEFITS	**$260,023,000**	**$277,924,000**	**$283,454,000**
BENEFIT-COST RATIO	**24.9**	**22.9**	**13.4**

The following figures recreate the information contained in Table 2-26 to display the annual benefits generated by the revised TSP for the 20-, 50-, and 100-year epochs and under each of the three RSCL scenarios.

Figure 2-12. Orange CSRM Benefits from RSLC Scenarios

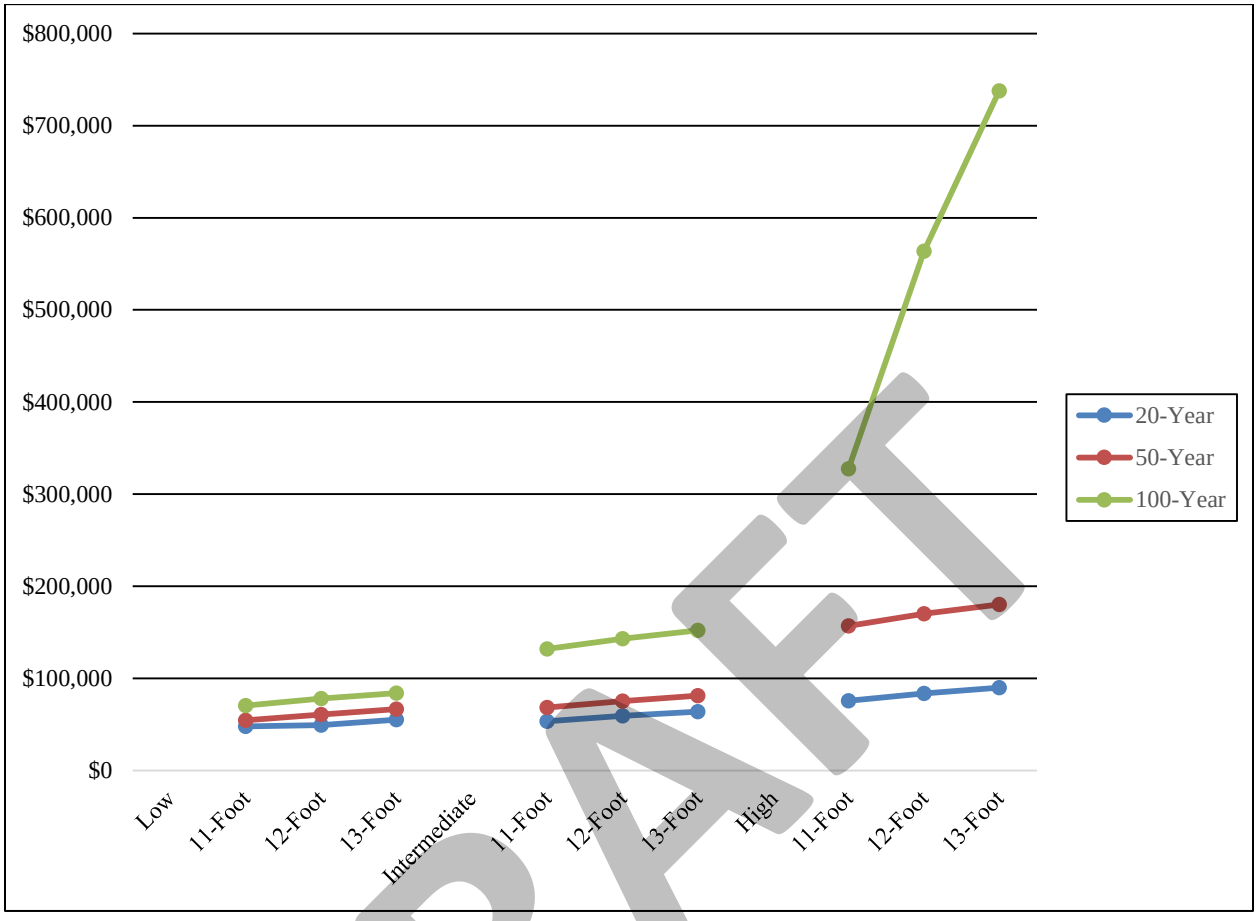


Figure 2-13. Port Arthur CSRM Benefits from RSLC Scenarios

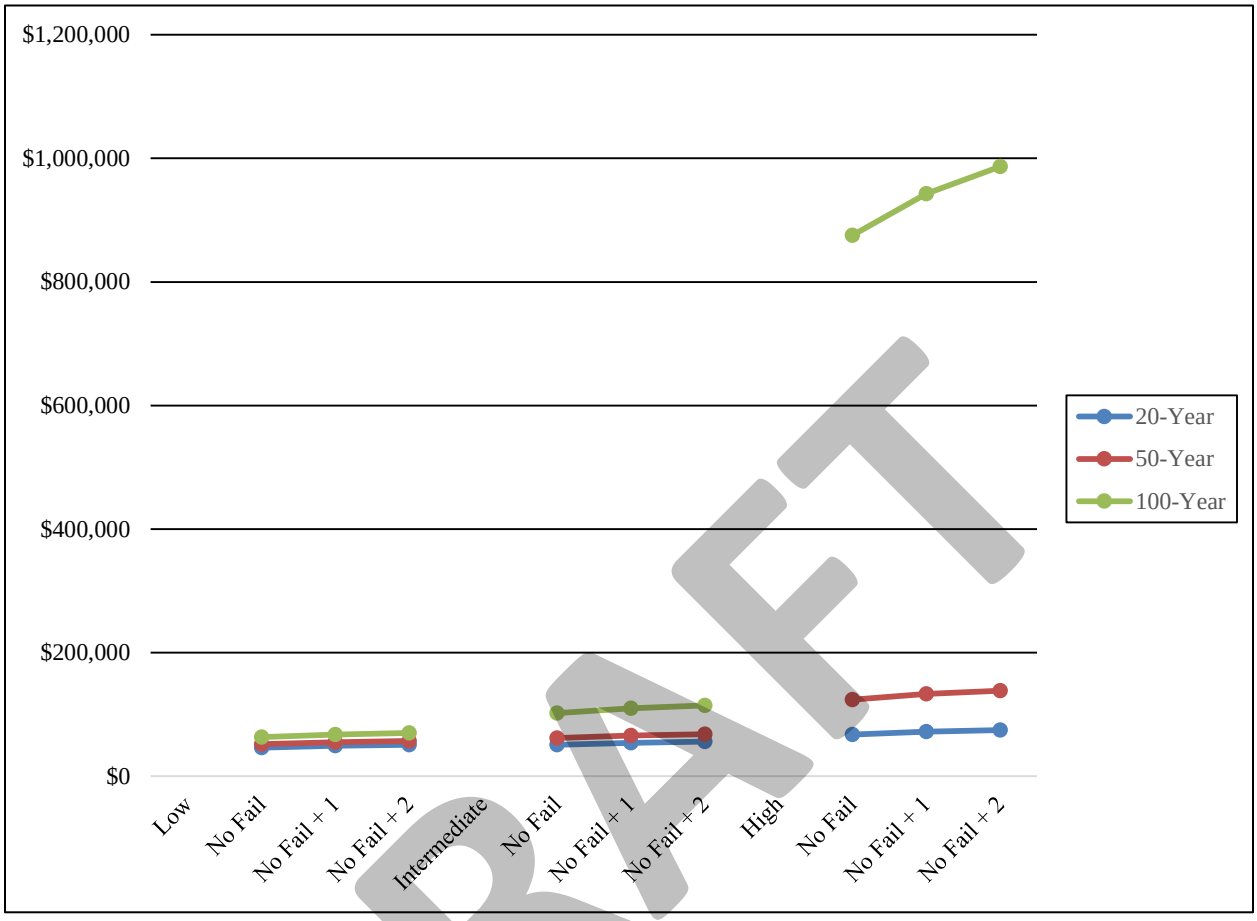
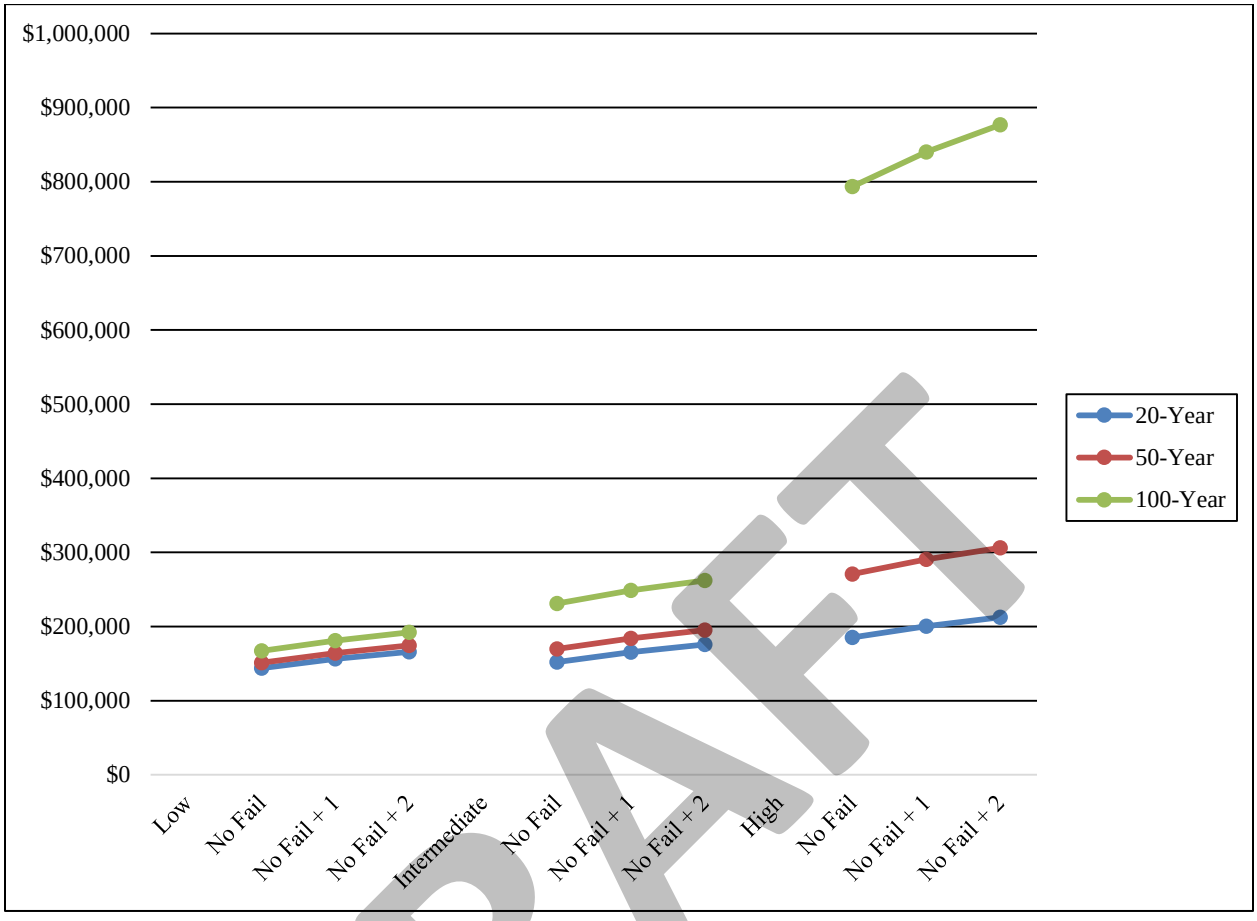


Figure 2-14. Freeport CSRM Benefits from RSLC Scenarios



2.9 RISK PERFORMANCE OF RSLC REVISED PROPOSED ACTIONS

The following table show the risk performance of the revised TSP under the 20-, 50-, and 100-year epochs and under the three RSLC scenarios.

Table 2-33. Project Performance for the Revised Tentatively Selected Plan – 20-Year Epoch

Low

			Long-Term Risk (years)	Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange 3 CSRM									
	Without	0.1049	0.6700	0.6083	0.0655	0.0117	0.0023	0.0000	0.0000
	11-Foot	0.0048	0.0473	0.9997	0.9997	0.9953	0.8648	0.5264	0.3327
	12-Foot	0.0053	0.0516	0.9997	0.9997	0.9959	0.8553	0.4686	0.2590
Port Arthur CSRM									
	Without	0.0021	0.0208	1.0000	1.0000	0.9959	0.9460	0.7874	0.6460
	No Fail	0.0006	0.0062	0.9997	0.9997	0.9997	0.9996	0.9908	0.9653
	No Fail + 1	0.0006	0.0057	0.9997	0.9997	0.9997	0.9997	0.9970	0.9859
	No Fail + 2	0.0005	0.0052	0.9997	0.9997	0.9997	0.9997	0.9992	0.9949
Freeport CSRM									
	Without	0.0808	0.5693	0.7823	0.5401	0.3758	0.2203	0.0901	0.0480
	No Fail	0.0073	0.0709	0.9997	0.9995	0.9564	0.7328	0.3616	0.2021
	No Fail + 1	0.0056	0.0550	0.9997	0.9997	0.9826	0.8291	0.4698	0.2789
	No Fail + 2	0.0044	0.0428	0.9998	0.9998	0.9938	0.8994	0.5772	0.3674

Intermediate

			Long-Term Risk (years)	Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange 3 CSRM									

	Without	0.1140	0.7019	0.5490	0.0500	0.0082	0.0017	0.0000	0.0000
	11-Foot	0.0055	0.0539	0.9997	0.9997	0.9923	0.8278	0.4633	0.2766
	12-Foot	0.0034	0.0335	0.9997	0.9997	0.9992	0.9422	0.6701	0.4590
Port Arthur CSRM									
	Without	0.0023	0.0233	1.0000	0.9997	0.9942	0.9320	0.7554	0.6065
	No Fail	0.0006	0.0061	0.9997	0.9997	0.9997	0.9995	0.9887	0.9586
	No Fail + 1	0.0006	0.0056	0.9997	0.9997	0.9997	0.9997	0.9963	0.9830
	No Fail + 2	0.0005	0.0052	0.9997	0.9997	0.9997	0.9997	0.9990	0.9939
Freeport CSRM									
	Without	0.0897	0.6094	0.7626	0.5202	0.3559	0.2022	0.0790	0.0408
	No Fail	0.0079	0.0763	0.9997	0.9993	0.9461	0.7013	0.3289	0.1782
	No Fail + 1	0.0061	0.0591	0.9997	0.9997	0.9780	0.8061	0.4351	0.2509
	No Fail + 2	0.0047	0.0457	0.9997	0.9997	0.9921	0.8840	0.5459	0.3372

High

			Long-Term Risk (years)	**Assurance by Event**					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange 3 CSRM									
	Without	0.1552	0.8148	0.3298	0.0163	0.0022	0.0000	0.0000	0.0000
	11-Foot	0.0084	0.0811	0.9996	0.9996	0.9678	0.6453	0.2489	0.1188
	12-Foot	0.0053	0.0515	0.9997	0.9997	0.9960	0.8571	0.4686	0.2590
Port Arthur CSRM									
	Without	0.0040	0.0396	1.0000	0.9992	0.9834	0.8710	0.6332	0.4686
	No Fail	0.0006	0.0063	0.9997	0.9997	0.9997	0.9988	0.9771	0.9268
	No Fail + 1	0.0005	0.0055	0.9997	0.9997	0.9997	0.9997	0.9926	0.9693
	No Fail + 2	0.0005	0.0050	0.9997	0.9997	0.9997	0.9997	0.9979	0.9887
Freeport CSRM									

	Without	0.1281	0.7460	0.7003	0.4590	0.2923	0.1479	0.0493	0.0232
	No Fail	0.0100	0.0954	0.9997	0.9975	0.8998	0.5868	0.2289	0.1123
	No Fail + 1	0.0077	0.0744	0.9997	0.9995	0.9551	0.7155	0.3259	0.1686
	No Fail + 2	0.0059	0.0574	0.9997	0.9997	0.9828	0.8212	0.4376	0.2437

Table 2-34. Project Performance for the Revised Tentatively Selected Plan – 50-Year Epoch

Low

			Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange CSRM											
	Without	0.1208	0.7242	0.9790	0.9984	0.5088	0.0411	0.0064	0.0000	0.0000	0.0000
	11-Foot	0.0062	0.0605	0.1707	0.2679	0.9997	0.9997	0.9885	0.7861	0.4047	0.2281
	12-Foot	0.0038	0.0376	0.1087	0.1745	0.9997	0.9997	0.9988	0.9257	0.6227	0.4071
Port Arthur CSRM											
	Without	0.0029	0.0282	0.0821	0.1331	1.0000	0.9997	0.9922	0.9207	0.7254	0.5709
	No Fail	0.0006	0.0061	0.0182	0.0302	0.9997	0.9997	0.9997	0.9994	0.9862	0.9514
	No Fail + 1	0.0006	0.0056	0.0168	0.0278	0.9997	0.9997	0.9997	0.9997	0.9955	0.9799
	No Fail + 2	0.0005	0.0052	0.0047	0.0140	0.0232	0.9997	0.9997	0.9997	0.9997	0.9977
Freeport CSRM											
	Without	0.0939	0.6270	0.9481	0.9928	0.7542	0.5125	0.3473	0.1945	0.0745	0.0380
	No Fail	0.0081	0.0784	0.2173	0.3353	0.9997	0.9992	0.9413	0.6876	0.3155	0.0169
	No Fail + 1	0.0063	0.0609	0.1719	0.2698	0.9997	0.9997	0.9757	0.7954	0.4205	0.2398
	No Fail + 2	0.0048	0.0471	0.1348	0.2145	0.9997	0.9997	0.9913	0.8769	0.5322	0.3251

Intermediate

			Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange CSRM											
	Without	0.1544	0.8131	0.9935	0.9998	0.3333	0.0165	0.0022	0.0000	0.0000	0.0000
	11-Foot	0.0084	0.0814	0.2248	0.3459	0.9996	0.9996	0.9670	0.6426	0.2489	0.1188
	12-Foot	0.0053	0.0516	0.1470	0.2327	0.9997	0.9997	0.9997	0.9625	0.7020	0.4675
Port Arthur CSRM											
	Without	0.0040	0.0397	0.1144	0.1833	1.0000	0.9992	0.9833	0.8709	0.6320	0.4687
	No Fail	0.0006	0.0063	0.0188	0.0312	0.9997	0.9997	0.9997	0.9987	0.9768	0.9267
	No Fail + 1	0.0005	0.0055	0.0164	0.0273	0.9997	0.9997	0.9997	0.9997	0.9925	0.9692
	No Fail + 2	0.0005	0.0050	0.0150	0.0249	0.9997	0.9997	0.9997	0.9997	0.9979	0.9887
Freeport CSRM											
	Without	0.1211	0.7248	0.9792	0.9984	0.7096	0.4681	0.3010	0.1556	0.0530	0.0253
	No Fail	0.0096	0.0923	0.2522	0.3840	0.9997	0.9980	0.9075	0.6051	0.2425	0.1209
	No Fail + 1	0.0074	0.0719	0.2006	0.3114	0.9997	0.9996	0.9591	0.7305	0.3411	0.1800
	No Fail + 2	0.0057	0.0555	0.1575	0.2485	0.9997	0.9997	0.9845	0.8321	0.4543	0.2575

High

			Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange CSRM											
	Without	0.4229	0.9959	1.0000	1.0000	0.0082	0.0000	0.0000	0.0000	0.0000	0.0000
	11-Foot	0.0217	0.1967	0.4816	0.6654	0.9996	0.9468	0.5235	0.0872	0.0077	0.0019
	12-Foot	0.0139	0.1306	0.3430	0.5034	0.9996	0.9957	0.8478	0.2977	0.0436	0.0112
Port Arthur CSRM											
	Without	0.0110	0.1050	0.2831	0.4258	0.9996	0.9786	0.8605	0.5597	0.2683	0.1523
	No Fail	0.0016	0.0161	0.0477	0.0782	0.9998	0.9998	0.9997	0.9865	0.8820	0.7372
	No Fail + 1	0.0009	0.0089	0.0266	0.0439	0.9997	0.9997	0.9997	0.9971	0.9537	0.8663

	No Fail + 2	0.0006	0.0058	0.0172	0.0285	0.9997	0.9997	0.9997	0.9994	0.9854	0.9430
Freeport CSRM											
	Without	0.2474	0.9415	0.9998	1.0000	0.5665	0.3227	0.1556	0.0531	0.0109	0.0042
	No Fail	0.0167	0.1547	0.3960	0.5684	0.9997	0.9746	0.6854	0.2885	0.0632	0.0209
	No Fail + 1	0.0129	0.1214	0.3219	0.4766	0.9997	0.9935	0.8271	0.4350	0.1158	0.0425
	No Fail + 2	0.0098	0.0942	0.2567	0.3901	0.9997	0.9997	0.9693	0.7353	0.2972	0.1320

Table 2-35. Project Performance for the Revised Tentatively Selected Plan – 100-Year Epoch

Low

			Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange CSRM											
	Without	0.1696	0.8442	0.9962	0.9999	0.2729	0.0116	0.0000	0.0000	0.0000	0.0000
	11-Foot	0.0093	0.0887	0.2432	0.3715	0.9996	0.9995	0.9548	0.5905	0.2063	0.0917
	12-Foot	0.0058	0.0566	0.1605	0.2529	0.9996	0.9996	0.9940	0.8256	0.4167	0.2179
Port Arthur CSRM											
	Without	0.0045	0.0439	0.1261	0.2012	1.0000	0.9988	0.9791	0.8515	0.6006	0.4357
	No Fail	0.0008	0.0076	0.0226	0.0374	0.9997	0.9997	0.9997	0.9984	0.9729	0.9169
	No Fail + 1	0.0005	0.0054	0.0163	0.0269	0.9997	0.9997	0.9997	0.9997	0.9912	0.9646
	No Fail + 2	0.0005	0.0050	0.0148	0.0246	0.9997	0.9997	0.9997	0.9997	0.9974	0.9868
Freeport CSRM											
	Without	0.1220	0.7278	0.9798	0.9985	0.7083	0.4668	0.2997	0.1545	0.0524	0.0250
	No Fail	0.0097	0.0928	0.2533	0.3854	0.9997	0.9979	0.9063	0.6026	0.2404	0.1197
	No Fail + 1	0.0075	0.0722	0.2015	0.3127	0.9997	0.9996	0.9585	0.7284	0.3388	0.1784
	No Fail + 2	0.0057	0.0558	0.1582	0.2496	0.9997	0.9997	0.9843	0.8306	0.4519	0.2556

Intermediate

			Long-Term Risk (years)			Assurance by Event					

Damage Reach	Plan Name	Expected AEP	10	30	50	10%	4%	2%	1%	0.4%	0.2%
Orange CSRM											
	Without	0.3673	0.9897	1.0000	1.0000	0.0186	0.0000	0.0000	0.0000	0.0000	0.0000
	11-Foot	0.0189	0.1736	0.4356	0.6146	0.9996	0.9734	0.6352	0.1415	0.0164	0.0038
	12-Foot	0.0122	0.1156	0.3083	0.4589	0.9996	0.9982	0.9009	0.3953	0.0763	0.0211
Port Arthur CSRM											
	Without	0.0096	0.0924	0.0252	0.3840	1.0000	0.9859	0.8928	0.6186	0.3195	0.1904
	No Fail	0.0014	0.0139	0.0411	0.0675	0.9997	0.9997	0.9997	0.9903	0.9054	0.7789
	No Fail + 1	0.0008	0.0078	0.0232	0.0384	0.9997	0.9997	0.9997	0.9979	0.9643	0.8911
	No Fail + 2	0.0005	0.0051	0.0153	0.0253	0.9997	0.9997	0.9997	0.9996	0.9892	0.9550
Freeport CSRM											
	Without	0.2174	0.9138	0.9994	1.0000	0.6005	0.3580	0.1896	0.0729	0.0172	0.0067
	No Fail	0.0146	0.1369	0.3571	0.5211	0.9997	0.9854	0.7596	0.3657	0.0954	0.0356
	No Fail + 1	0.0112	0.1069	0.2876	0.4318	0.9997	0.9966	0.8742	0.5167	0.1606	0.0658
	No Fail + 2	0.0086	0.0830	0.2290	0.3518	0.9997	0.9993	0.9449	0.6633	0.2512	0.1119

High

			Long-Term Risk (years)			Assurance by Event					
Damage Reach	**Plan Name**	**Expected AEP**	**10**	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
Orange CSRM											
	Without	0.9019	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	11-Foot	0.4296	0.9964	1.0000	1.0000	0.0065	0.0000	0.0000	0.0000	0.0000	0.0000
	12-Foot	0.2343	0.9307	0.9997	1.0000	0.1270	0.0004	0.0000	0.0000	0.0000	0.0000
Port Arthur CSRM											
	Without	0.1135	0.7004	0.9731	0.9976	0.5145	0.1420	0.0417	0.0085	0.0022	0.0015
	No Fail	0.0196	0.1795	0.4476	0.6282	0.9985	0.9216	0.6472	0.2279	0.0396	0.0091
	No Fail + 1	0.0124	0.1176	0.3129	0.4650	0.9997	0.9838	0.8588	0.4665	0.1300	0.0420
	No Fail + 2	0.0078	0.0749	0.2084	0.3226	0.9997	0.9978	0.9627	0.7188	0.3087	0.1316
Freeport CSRM											
	Without	0.5167	0.9993	1.0000	1.0000	0.2454	0.0258	0.0028	0.0010	0.0000	0.0000
	No Fail	0.0594	0.4581	0.8408	0.9533	0.9709	0.1933	0.0149	0.0009	0.0000	0.0000
	No Fail + 1	0.0457	0.3735	0.7541	0.9035	0.9964	0.4097	0.0547	0.0036	0.0001	0.0000

	No Fail + 2	0.0355	0.3030	0.6613	0.8355	0.9997	0.6584	0.1486	0.0144	0.0005	0.0000

HEC-FDA Analysis

2.10 RECOMMENDED PLAN

The Jefferson Main New Levee (11-foot) was removed from the final Recommended Plan based on a lack of local sponsorship and due to the limited perceived benefits. During the concurrent review period, local entities suggested that the economic performance of Jefferson Main should be reevaluated because there was not a perceived need for this component of the TSP. There was limited life-safety risk due to the industrial makeup of the area. Based on results of these evaluation, the sponsor decided to not to pursue this component of the final Recommended Plan.

Following the refinement and update of costs to account for interior drainage and the requisite pumps, costs, particularly for the Orange component (Orange 3) increased significantly. Twelve new pump stations were initially proposed for the Orange 3 levee reach however, due to the high cost of construction and maintenance for these structures, the benefit-to-cost ratio fell to well below unity (<1.0) therefore, a reduction in the pump discharge and number of pump stations was analyzed. A more detailed analysis and changes to the analysis included Joint Probability Analysis (JPA) to estimate discharge rates along with the potential to combine pumps. Additionally, the initial assumption of designing pumps for a 0.04 ACE with an additional ten percent capacity for RSLC was scrubbed in favor of basing pump design on the 0.04 ACE alone. The number of pumps as also reduced to seven from the initial twelve.

On the benefits side, additional benefits for debris removal and potential damages to roads, highways, and railroads were calculated. Information obtained from the New Orleans District included access to the report, *Development of Depth-Emergency Cost and Infrastructure Damage Relationships for Selected South Louisiana Parishes* which developed values as well as depth/damage functions for a number potential damage categories including debris removal and cleanup as well as evacuation activities and damages to transportation and critical infrastructure. Economic assumptions for debris removal and cleanup assumed debris would consist of vegetative (trees, shrubs, etc.), white goods (refrigerators, washers, stoves, etc.), electronic goods (TVs, computers, microwaves), hazardous waste, vehicles, vessels, and tires. Appropriate destination facilities were also identified depending on the type of debris. Assumptions also included consideration for flood-related labor diversion and capital use along with travel cost and the necessity for temporary/rental structures. Roads were divided into two categories; 1) major and secondary highways (assumed to be of the four-laned variety) and 2) streets (those assumed to consist of two lanes). These, along with railroads, were assumed to have been built to completion and are in some stage of depreciation. Unit values for these two damage debris removal and cleanup and roads, highways, and railroads were estimated based on the type of structure (for debris removal and cleanup) and by mile (for roads, highways, and railroads). These values were then adjusted for inflation, based on ENR's Cost Construction Index, and locality, based on the

CPI between Houma, Louisiana and Houston, Texas, the two most appropriate respective areas of analysis. Values for debris removal and cleanup were assigned to structures based on type. To minimize the potential for overestimation of benefits, structures with values below $10,000 were not assigned values for debris removal and cleanup. Roads, highways, and railroads were identified using GIS and values for were assigned per mile for those transportation networks within the protected areas of the recommended plan in each of the three CSRMs. Values for these to benefit categories are shown in the tables below.

Table 2-36. Values for Debris Removal and Cleanup and Roads, Highways, and Railroads

Debris Removal and Cleanup	**$ per structure, $000s**
Mobile Home	$6.09
Single-Family Residence	$5.90
Multi-Family Residence	$10.68
Eating or Recreation Facility	$35.81
Professional Office	$37.04
Public or Semi-Public Facility	$37.04
Warehouse or Construction Facility	$65.69
Streets, Highways, and Railroads	**$ per mile, $000s**
Streets	$255.73
Major and Secondary Highways	$695.72
Railroad	$329.23

As a validity check for estimates to roads and highways, a comparison was done utilizing roads and highway constriction estimates from a report prepared for the Orange County Economic Development Corporation and the Texas Water Development Board titled *Flood Protection Planning Study, Hurricane Flood Protection System, Orange County, Texas* dated December 2012. Estimates were derived using the principle components of road construction, asphalt for minor roads, concrete for major roads such as interstate and state highways, converted into a common unit and then costs calculated per mile. These values are listed in the table below.

Table 2-37. Values for Major and Minor Roads and Highways Based Orange County EDC Report

Minor Roads		
Item Description	**$ per SF**	**$ per Mile (000s)**
Excavation	$0.03	$1.96
Embankment (minus Levee)	$0.06	$3.91

Lime Treatment (6" EXST Material)	$0.44	$28.16
Lime (6% volume)	$1.90	$120.30
8" Asphalt Base	$0.95	$60.15
3" Asphalt Surface	$1.27	$80.20
Swale*	$2.50	$13.20
Signing/Paving Marking*	$15.00	$79.20
Seeding/Sodding	$0.02	$1.02
Total		**$388.10**

Major Roads		
Excavation	$0.03	$2.93
Embankment (minus Levee)	$0.06	$5.87
Lime Treatment for Subgrade	$0.44	$42.24
Lime (6% volume)	$1.90	$180.46
10" Concrete Pavement	$7.22	$686.40
6" Concrete Curb*	$10.00	$52.80
Swale*	$2.50	$13.20
Signing/Paving Marking*	$15.00	$79.20
Seeding/Sodding	$0.02	$1.53
Total		**$1,064.62**

* priced per LF

While these values do not take into consideration depreciation, they are significantly higher than the estimates based on the Louisiana report. In this regard, the values used for the benefit estimation appear valid. Uncertainties for residential and commercial cleanup costs were estimated based on the same method utilizing coefficients of variation for the values themselves assuming a normal distribution while uncertainties for elevations were derived from those used for residential and averages of commercial structures. Uncertainties for highways, streets, and railroads were estimated only for elevation assuming a normal distribution and utilizing coefficients of variation. No uncertainties were estimated for the values themselves.

The following table displays the without and with- project EADs for the recommended plan.

Table 2-38. Without and With-Project Equivalent Annual Damages for the Recommended Plan
(FY 2017 Price Level/2.875 percent interest rate, $1,000)

Without Project

	Damage Categories									
Reach	**Commercial**	**Industrial**	**Multifamily**	**Mobile**	**Public**	**POV**	**SFR**	**Debris**	**Roads**	**Total**
Orange CSRM	5,108	105,374	457	306	1,758	3,367	24,479	1,665	20,229	162,742
Port Arthur CSRM	146,428	4,739	609	0	2,650	1,871	19,904	1,100	637	177,937
Freeport CSRM	5,142	268,742	1,436	3	8,143	4,843	14,238	2,318	2,806	307,670

With Project

	Damage Categories									
Reach	**Commercial**	**Industrial**	**Multifamily**	**Mobile**	**Public**	**POV**	**SFR**	**Debris**	**Roads**	**Total**
Orange CSRM	2,320	36,781	267	152	1,008	1,646	14,660	761	1,633	59,228
Port Arthur CSRM	33,923	1,325	0	161	622	438	4,816	258	149	41,692
Freeport CSRM	991	97,676	318	1	1,687	710	2,352	359	581	104,674

Without Project

	Damage Categories									
Reach	**Commercial**	**Industrial**	**Multifamily**	**Mobile**	**Public**	**POV**	**SFR**	**Debris**	**Roads**	**Total**
Orange CSRM	3%	65%	0%	0%	1%	2%	15%	1%	12%	100%
Port Arthur CSRM	82%	3%	0%	0%	1%	1%	11%	1%	0%	100%
Freeport CSRM	2%	87%	0%	0%	3%	2%	5%	1%	1%	100%

With Project

	Damage Categories									
Reach	**Commercial**	**Industrial**	**Multifamily**	**Mobile**	**Public**	**POV**	**SFR**	**Debris**	**Roads**	**Total**
Orange CSRM	4%	62%	0%	0%	2%	3%	25%	1%	3%	100%
Port Arthur CSRM	81%	3%	0%	0%	1%	1%	12%	1%	0%	100%
Freeport CSRM	1%	93%	0%	0%	2%	1%	2%	0%	1%	100%

Table 2-39. Economic Performance of Recommended Plan
(50-Year Intermediate RSLC Scenario)
(FY 2017 Price Level/2.875 percent interest rate)

	Orange 11 - Foot	Freeport NF + 1 Foot	Port Arthur NF + 1 Foot	Combined
INVESTMENT				
Estimated First Cost	**$1,926,224,000**	**$593,313,000**	**$729,069,000**	**$3,248,606,000**
Annual Interest Rate	2.875%	2.875%	2.875%	2.875%
Project Life (years)	50	50	50	50
Construction Period (months)	120	72	72	120
Interest During Construction	$269,306,000	$44,315,000	$54,454,000	$368,075,000
Investment Cost	$2,195,530,000	$637,628,000	$783,523,000	$3,616,681,000
Interest	$63,121,000	$18,332,000	$22,526,000	$103,980,000
Amortization	$20,195,000	$5,865,000	$7,207,000	$33,267,000
OMRR&R ($/year)	$4,565,000	$708,000	$195,000	$5,467,000
TOTAL ANNUAL COSTS	**$87,881,000**	**$24,904,000**	**$29,928,000**	**$142,713,000**
Without Project EAD	$162,742,000	$307,670,000	$177,937,000	$648,349,000
Residual EAD	$59,228,000	$104,674,000	$41,692,000	$205,594,000
Storm Reduction Benefits	$103,515,000	$202,995,000	$136,246,000	$442,756,000
TOTAL BENEFITS	**$103,515,000**	**$202,995,000**	**$136,246,000**	**$442,756,000**
NET BENEFITS	**$15,634,000**	**$178,091,000**	**$106,318,000**	**$300,043,000**
BENEFIT-COST RATIO	**1.2**	**8.2**	**4.6**	**3.1**

The Orange CSRM recommended plan is a combination of levees and floodwalls designed to reduce the flood-damage potential from storm surge to much of the southern half of Orange County along the Sabine River and Bessie Heights Marsh. The plan consists of 82,169 LF of earthen levee and 56,755 LF of floodwall. The plan also calls for the inclusion of seven pump stations, 56 drainage structures, and 32 closure gates. First costs for this plan at the Orange CSRM reach are $1,926.224 million which annualizes to $87.881 million and produces $103.515 million in benefits with $15.634 million in net benefits for a 1.2 benefit-to-cost ratio.

The recommended plan for the Freeport and Vicinity CSRM consists of the construction of floodwalls, raising of levees, replacement of vehicular closure structures, and constructing a navigable gate structure in an active barge canal. Several sections of floodwall and levee require raising due in order to increase system capacity to prevent system failure. The plan consists of 69,375 LF of earthen levee and 29,205 LF of floodwall. The plan also includes four drainage structures, and ten closure gates. First costs for this plan at this CSRM is $593.313 million which annualizes to $24.904 million and produces $202.995 million in benefits with $178.091 million in net benefits for an 8.2 benefit-to-cost ratio.

The recommended plan for the Port Arthur and Vicinity CSRM consists of the construction of floodwalls, raising of levees, and replacement of vehicular closure structures. Several sections of floodwall and levee require raising due in order to increase system capacity to prevent system failure. The plan consists of 31,030 LF of earthen levee and 30,090 LF of floodwall. The plan also includes 26 closure gates. First costs for this plan at this CSRM is $729.069 million which annualizes to $29.928 million and produces $136.246 million in benefits with $106.318 million in net benefits for a 4.6 benefit-to-cost ratio. The following summarizes each of the CSRMs with their respective alternatives with the highest net benefits to be included as the recommended plan.

Estimates for OMRR&R received from Cost Engineering generally reflects an even stream of expenditures over the life of the project. For each of the CSRMs grassed levees will have to be regularly mowed and the floodwalls and gate structures routinely maintained. Occasional maintenance and repairs of the roadway on the levee crown will also be required. Due to the gate structures at the Orange CSRM, annual expenditures for OMRR&R spike one year per decade due to significant replacements. OMRR&R expenditures for the existing CSRMs at Freeport and Port Arthur spike as well but at much smaller magnitudes. Annual OMRR&R expenditures are therefore averaged over for the life of the project. OMRR&R estimates for the existing Port Arthur and Freeport CSRMs reflect the additional costs necessary for any potential improvements to the systems above what is currently need to operate and maintain the systems. These costs are depicted in Table 2-39.

Orange CSRM

- Orange 3 New Levee – 11-Foot Levee/Floodwall

Port Arthur and Vicinity CSRM

- 8-10 ft I-Wall Raise (1-Foot)
- Closure Structure Raise (1-Foot)
- I-Wall Raise Near Valero (1-Foot)
- I-Wall Raise Near Tank Farm (1-Foot)

Freeport and Vicinity CSRM

- Dow Barge Canal Gate Structure
- Oyster Creek Levee Raise (1-Foot)
- East Storm Levee Raise (1-Foot)
- Freeport Dock No Fail
- Old River Levee Raise at Dow Thumb (1-Foot)
- Tide Gate I-Wall Raise (1-Foot)

Table 2-40. Interest During Construction for the Recommended Plan
(FY 2017 Price Level/2.875 percent interest rate)

		Orange			Freeport			Port Arthur		
	Calendar Year	Construction Total	Compounded Value	Compound Factor	Construction Total	Compounded Value	Compound Factor	Construction Total	Compounded Value	Compound Factor
Base Year	2030	$192,622,000	$248,597,000	1.2906	$98,886,000	$113,941,000	1.1523	$121,512,000	$140,012,000	1.1523
	2031	$192,622,000	$241,649,000	1.2545	$98,886,000	$110,757,000	1.1201	$121,512,000	$136,100,000	1.1201
	2032	$192,622,000	$234,896,000	1.2195	$98,886,000	$107,662,000	1.0888	$121,512,000	$132,296,000	1.0888
	2033	$192,622,000	$228,332,000	1.1854	$98,886,000	$104,653,000	1.0583	$121,512,000	$128,599,000	1.0583
	2034	$192,622,000	$221,950,000	1.1523	$98,886,000	$101,728,000	1.0288	$121,512,000	$125,005,000	1.0288
	2035	$192,622,000	$215,748,000	1.1201	$98,886,000	$98,886,000	1.0000	$121,512,000	$121,512,000	1.0000
	2036	$192,622,000	$209,718,000	1.0888	0	0	0	0	0	0
	2037	$192,622,000	$203,857,000	1.0583	0	0	0	0	0	0
	2038	$192,622,000	$198,160,000	1.0288	0	0	0	0	0	0
	2039	$192,622,000	$192,622,000	1.0000	0	0	0	0	0	0
Total		$1,926,224,000	$2,195,530,000		$593,313,000	$637,628,000		$729,069,000	$783,523,000	

Summary	Orange	Freeport	Port Arthur
Implementation Costs:	$1,926,224,000	$593,313,000	$729,069,000
Interest During Construction:	$269,306,000	$44,315,000	$54,454,000
Total Construction Costs:	$2,195,530,000	$637,628,000	$783,523,000

Table 2-41. Probability Distribution
(FY 2017 Price Level/2.875 percent interest rate)

		Probability Damage Reduced Exceeds Indicated Values		
CSRM	**Equivalent Annual Damages Reduced (2017 prices)**	**0.75**	**0.50**	**0.25**
Orange	$103,515,000	$43,339,000	$98,190,000	$142,736,000
Freeport	$202,995,000	$23,064,000	$116,158,000	$316,250,000
Port Arthur	$136,246,000	$21,931,000	$27,002,000	$193,941,000

The evaluation incorporated uncertainty surrounding the economic and engineering inputs to generate results that can be used to assess the performance of the Recommended Plan. The percentiles displayed in Table 2-41 reflect the percentage chance that benefits may be greater than or equal to the indicated values. The probability distribution for expected and equivalent annual damages would typically be expected to follow a generally normal bell-shaped distribution with minimal skewing particularly for non-structural or where new structural measures are being proposed. This is case when observing the distribution for damages reduced for the Orange CSRM. For areas that are protected by existing systems, damages will tend to start at much less frequent events and can therefore tend to skew the probability distributions. This is the case for both the Freeport and Port Arthur CSRMs. Significant without-project damages for the Orange CSRM begin at around the 0.075 ACE (13-year event) and do not begin again until the 0.01 ACE (100-year event) under the proposed with-project condition. The distribution is somewhat skewed for the Freeport CSRM No without-project damages occur until approximately the 0.1 ACE (10-year event) and do not begin until the 0.01 ACE (100-year event). The probability distribution is extremely skewed for the Port Arthur CSRM due to no without-project damages starting until the 0.007 ACE (143 year-event) and with-project damages not beginning until the highest model water surface elevation at 0.001 ACE (1,000-year event).

2.11 CRITICAL INFRASTRUCTURE

The following describes the existing critical infrastructure in each project area. Critical infrastructure listed here includes industrial and manufacturing facilities as well as public facilities. This is a qualitative discussion of the future without-project condition focused on the impacts associated with potential storm surge flooding. The inventory of critical infrastructure came from information derived from the Homeland Security Infrastructure Program (HSIP), an infrastructure geospatial data inventory. The critical infrastructure is reported for the project areas by type (school, chemical manufacturing, etc.). A North American Industry Classification System (NAICS) code is included in the full listing of the inventory is at the end of this appendix. The

project areas are listed by county; Orange-Jefferson CSRM includes Orange and Jefferson County; Port Arthur and Vicinity CSRM includes Jefferson County; Freeport includes Brazoria County.

Orange CSRM (Orange County)

Public Facilities – Orange County

- 20 Schools
- 14 Law enforcement
- 2 Hospitals/6 nursing homes
- 11 Fire stations

Industrial and Manufacturing – Orange County

- 20 Chemical manufacturing
- 5 Electric generation
- 0 Petroleum refining
- 1 Airport

Some of the significant industrial and manufacturing facilities located in Orange-Jefferson CSRM include Exxon Mobil, DuPont, Honeywell, Firestone, Petrochemical, Chevron, Phillips, Laxness, Solvay Solexis, and Entergy. Exxon Mobil, located in Beaumont, Texas, on the Neches River, processes 345,000 barrels of crude oil per day and produces 2.5 billion gallons of gasoline annually.

Port Arthur and Vicinity CSRM (Jefferson County)

Public Facilities – Jefferson County

- 42 Schools
- 19 Law enforcement
- 13 Hospitals/7 nursing homes
- 26 Fire stations

Industrial and Manufacturing – Jefferson County

- 54 Chemical manufacturing
- 1 Electric generation
- Petroleum refining
- 1 Airport

Significant industrial and manufacturing facilities located in the Port Arthur and Vicinity CSRM include Valero, Premcor, Total, Motiva Enterprises and Huntsman Petrochemical. Jack Brooks

Regional Airport is also in the project area. Motiva is the largest petroleum refinery in the United States, with a capacity of approximately 600,000 barrels of crude oil per day.

Freeport and Vicinity CSRM (Brazoria County)

Public Facilities – Brazoria County

- 6 Schools
- 3 Law enforcement
- 0 Hospitals/0 nursing homes
- 2 Fire stations

Industrial and Manufacturing – Brazoria County

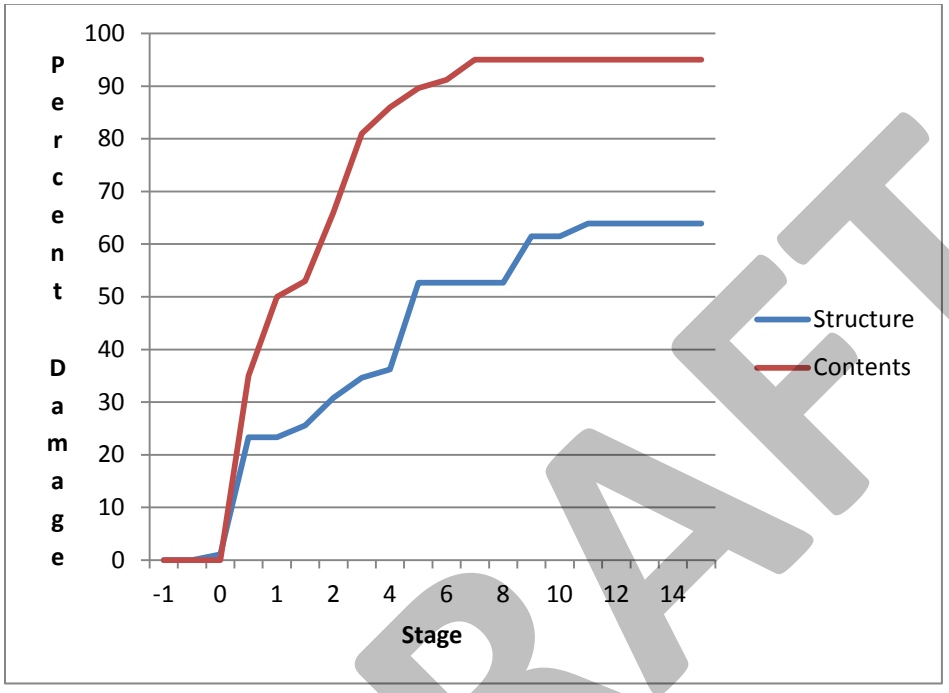
- 24 Chemical manufacturing
- 0 Electric generation
- 0 Petroleum refining

Significant industrial and manufacturing facilities located in the Freeport and Vicinity CSRM include Petroleum Reserve, Dow Chemical, Freeport LNG, Huntsman Gulf Chemicals, Phillips 66 Liquefied Petroleum Gas (LPG) Terminal, SI Group, and NALCO. A detailed description of each critical facility is not provided here; however, to explain one in some detail, Dow Chemical is the largest integrated chemical manufacturing complex in the western hemisphere. The Freeport site produces 44 percent of Dow's products sold in the U.S. and 20 percent of the company's products sold globally. A listing of these facilities is located at the end of this appendix.

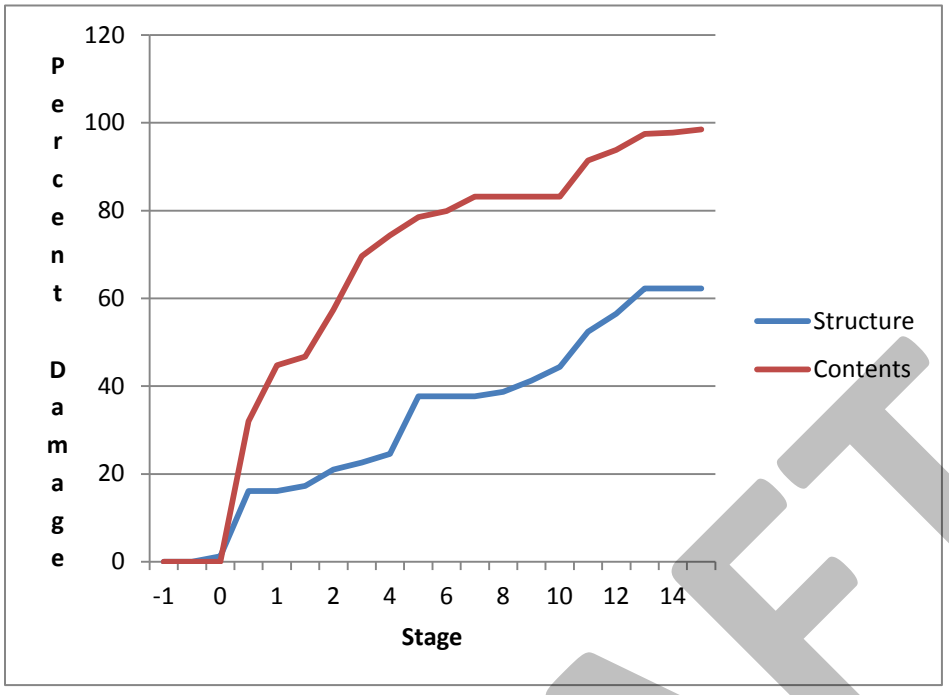
2.12 DEPTH DAMAGE FUNCTIONS

All depth-damage functions were obtained from the New Orleans District as part of their *Lower Atchafalaya and Morganza to the Gulf, Louisiana, Feasibility Study* with the exception of automobiles which are based on EGM, 09-04, *Generic Depth-Damage Relationships for Vehicles.*

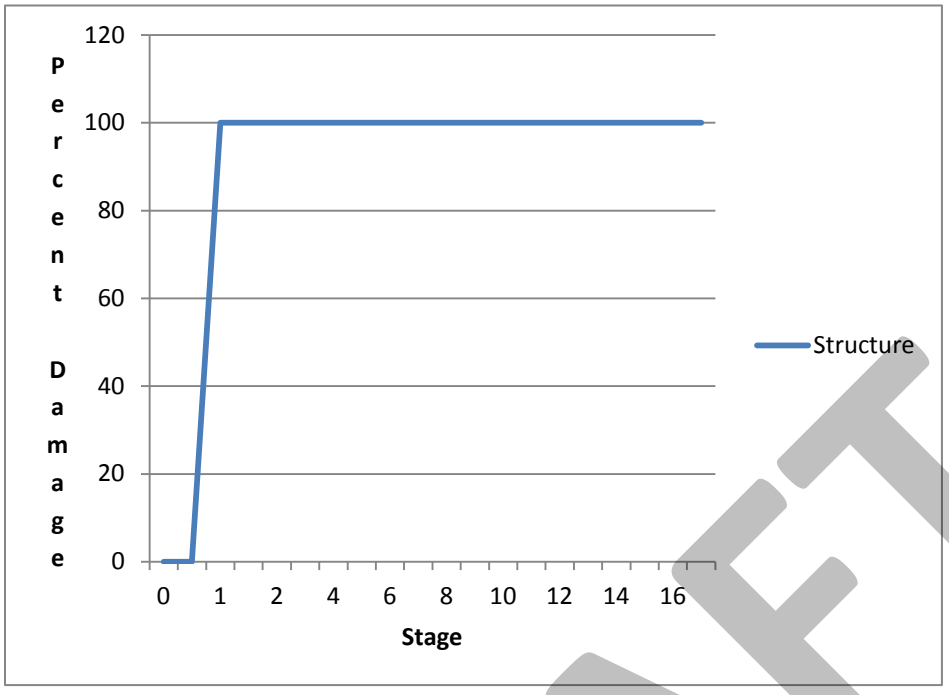
One Story Residence – Slab Foundation



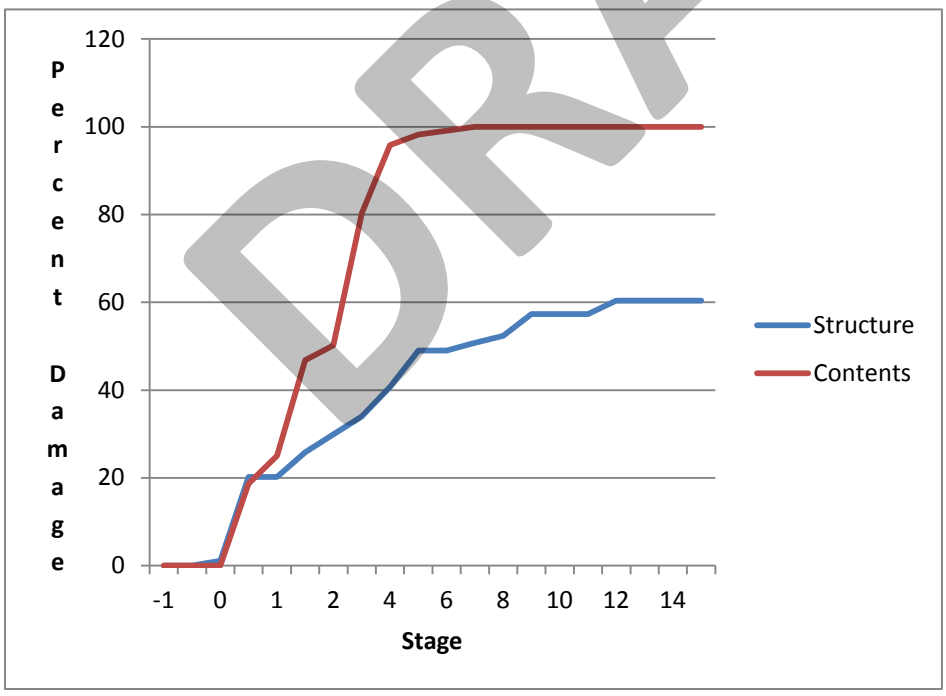
Two Story Residences – Slab Foundation



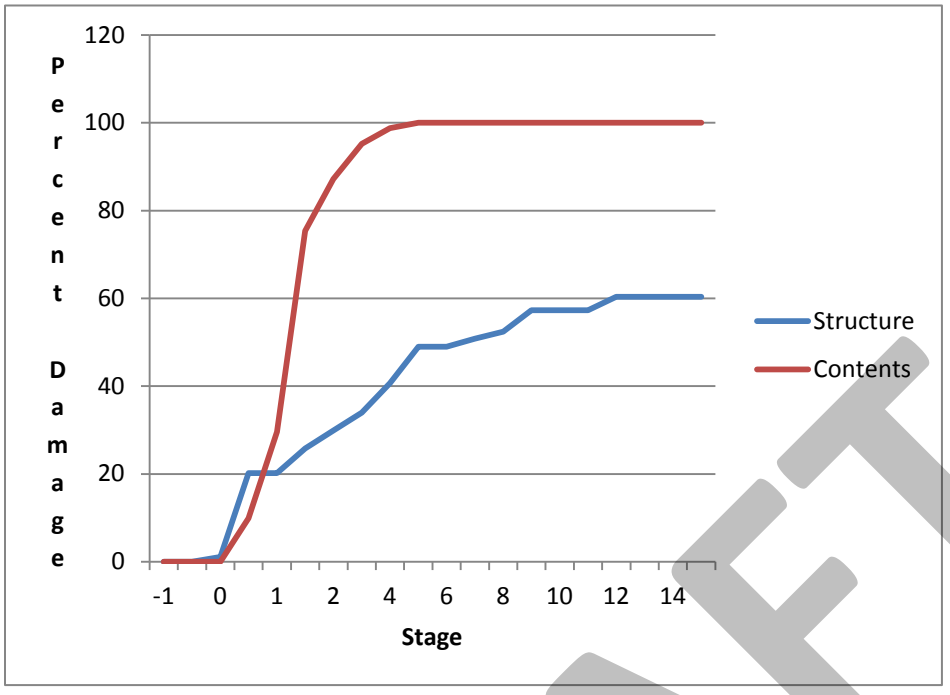
Autos



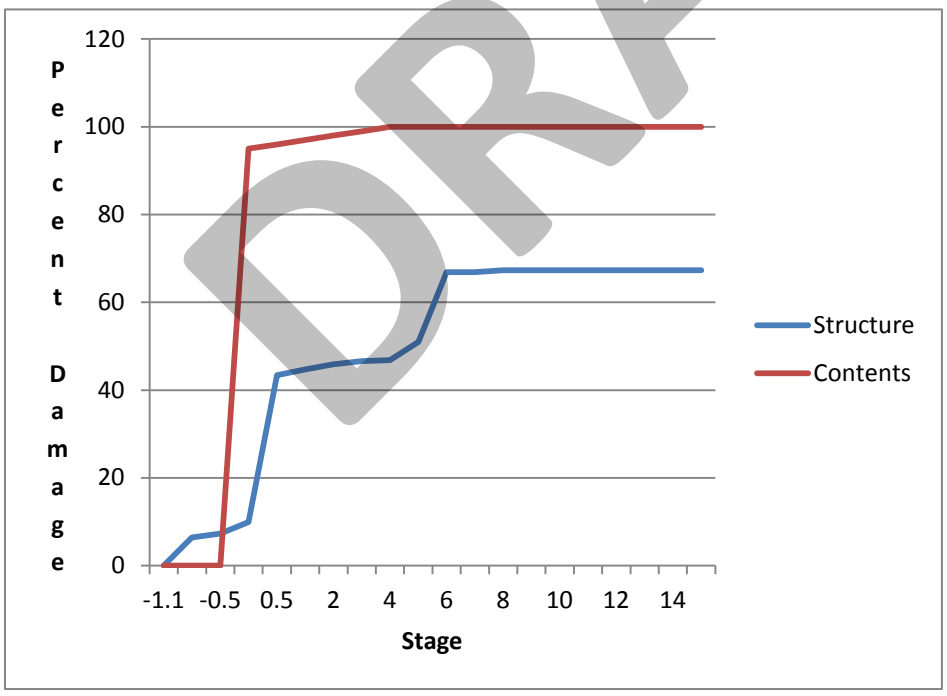
Eating Establishments



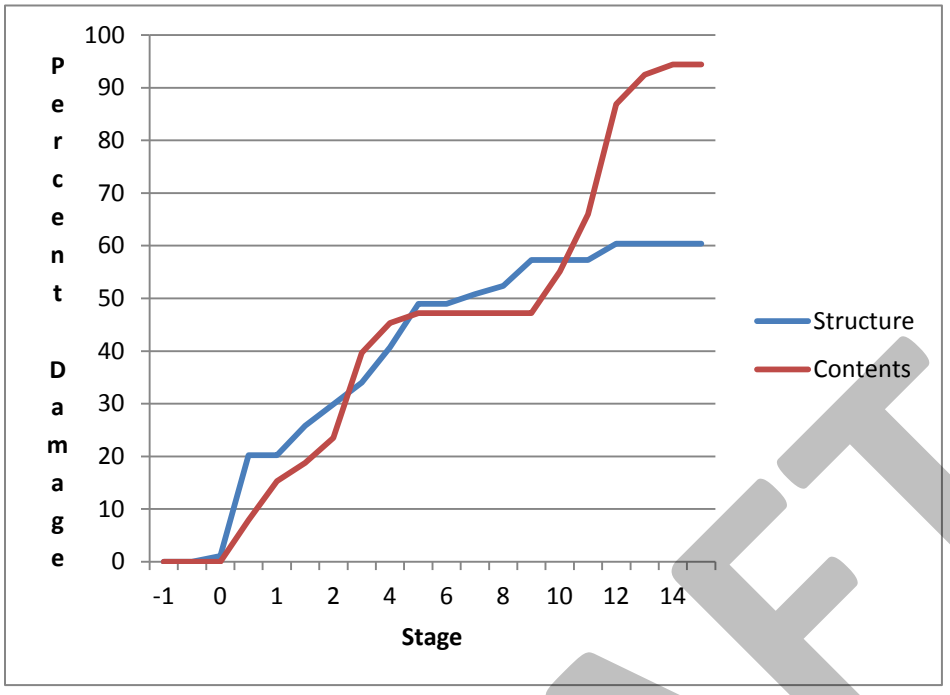
Grocery Stores



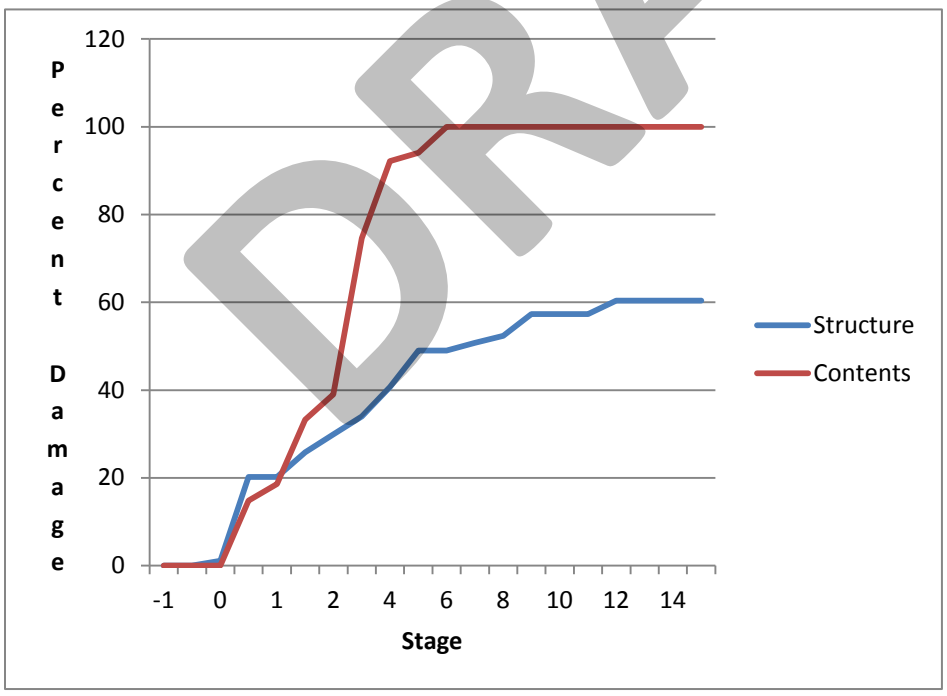
Mobile Residence



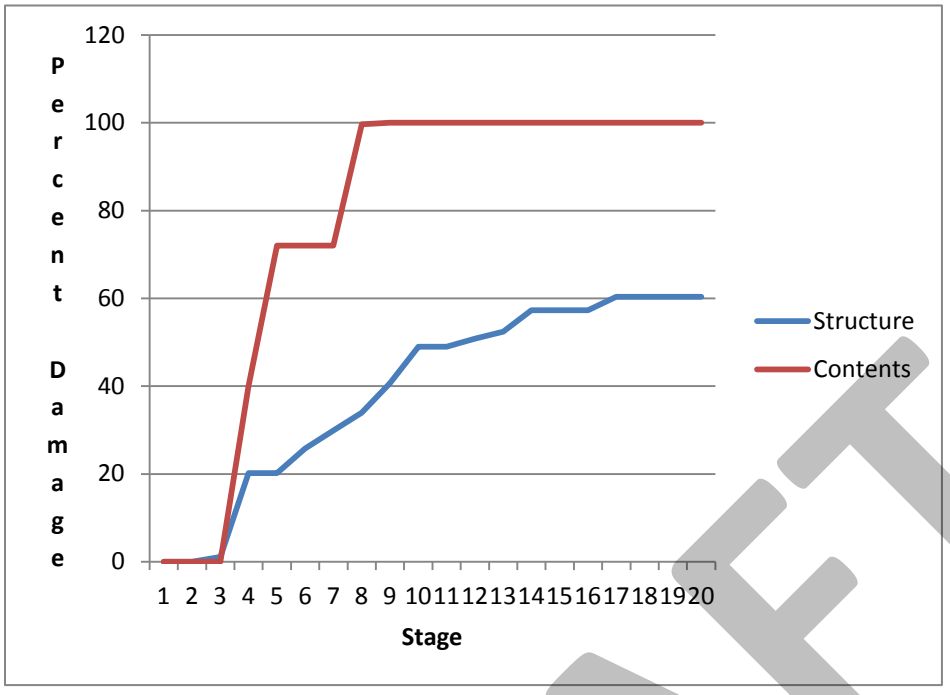
Multi-Family Residence



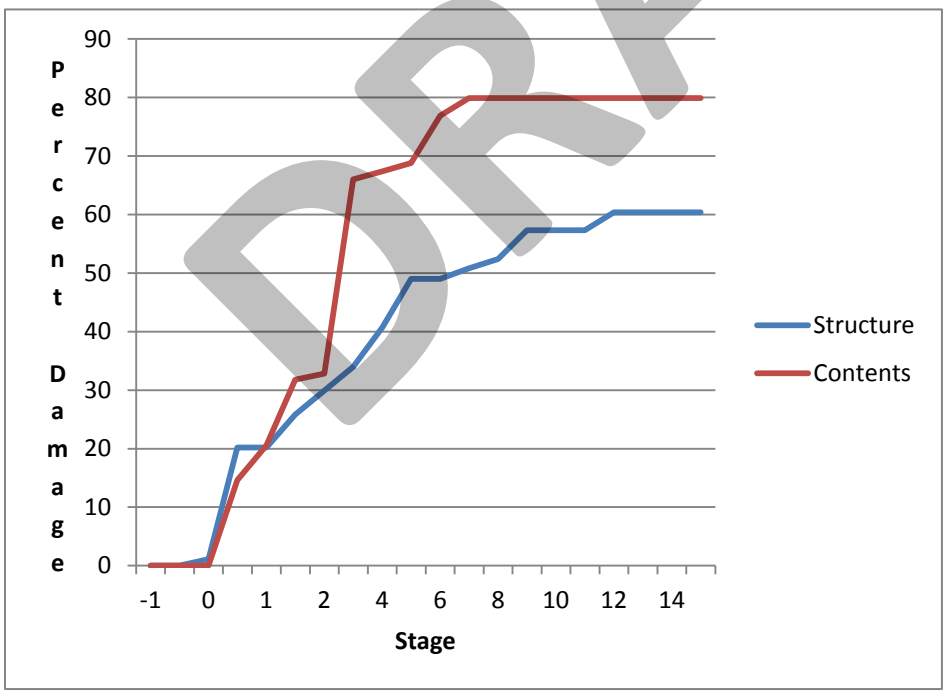
Professional Buildings



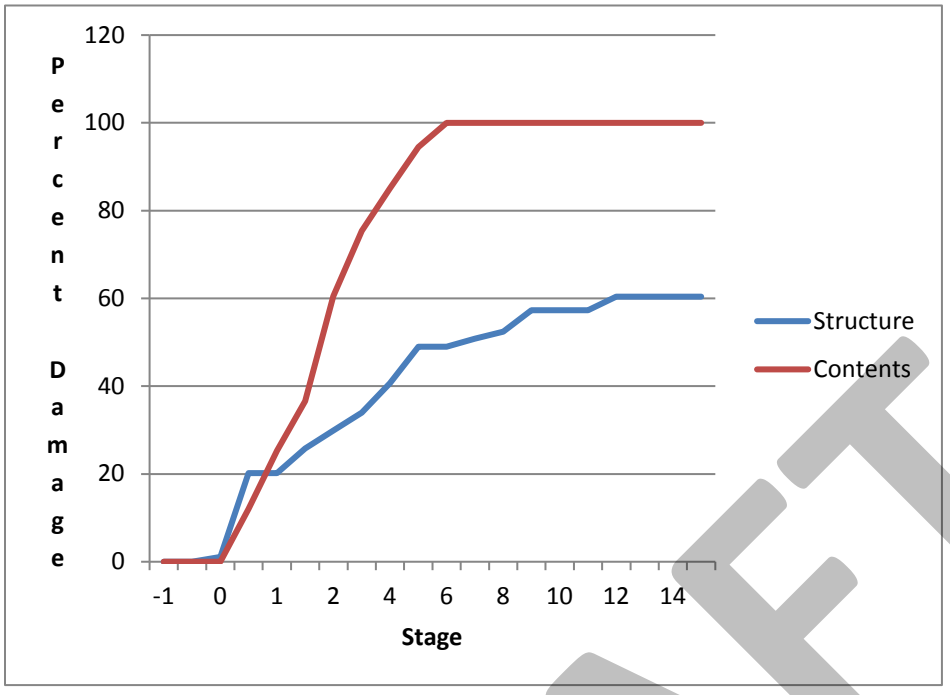
Public Buildings



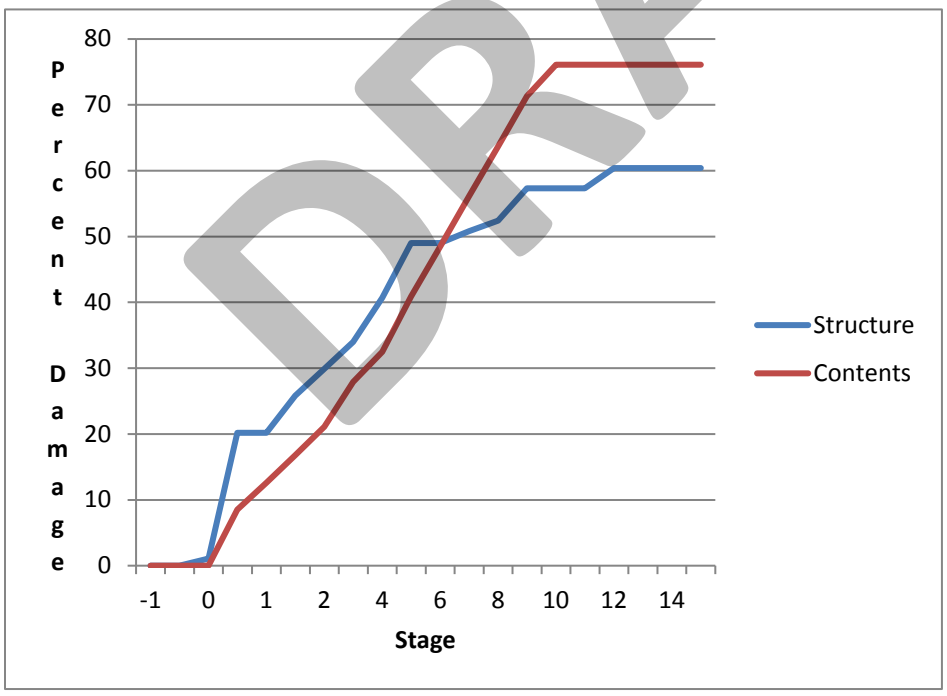
Repair



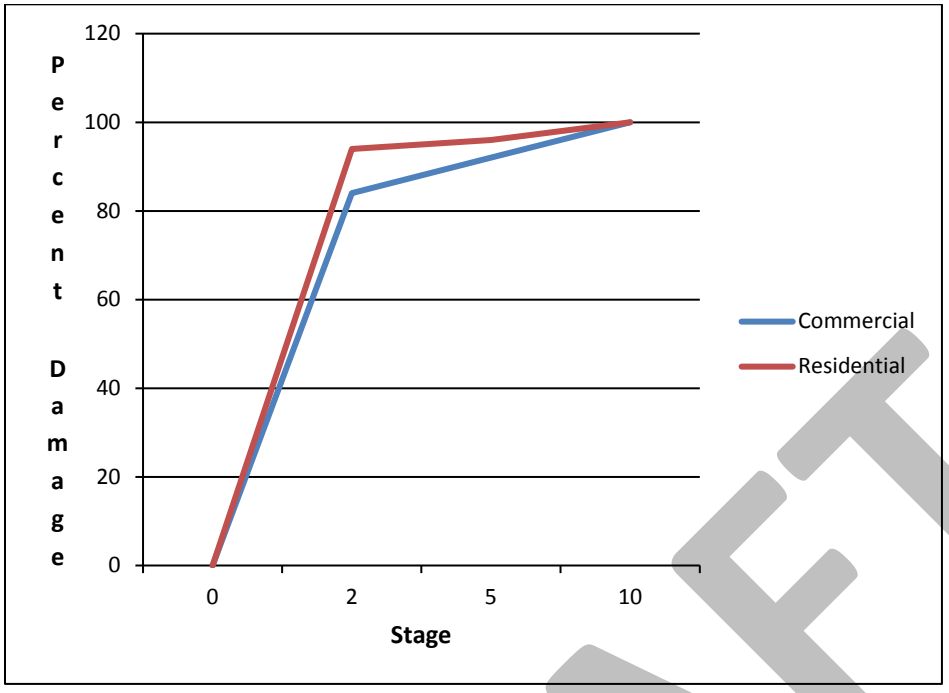
Retail



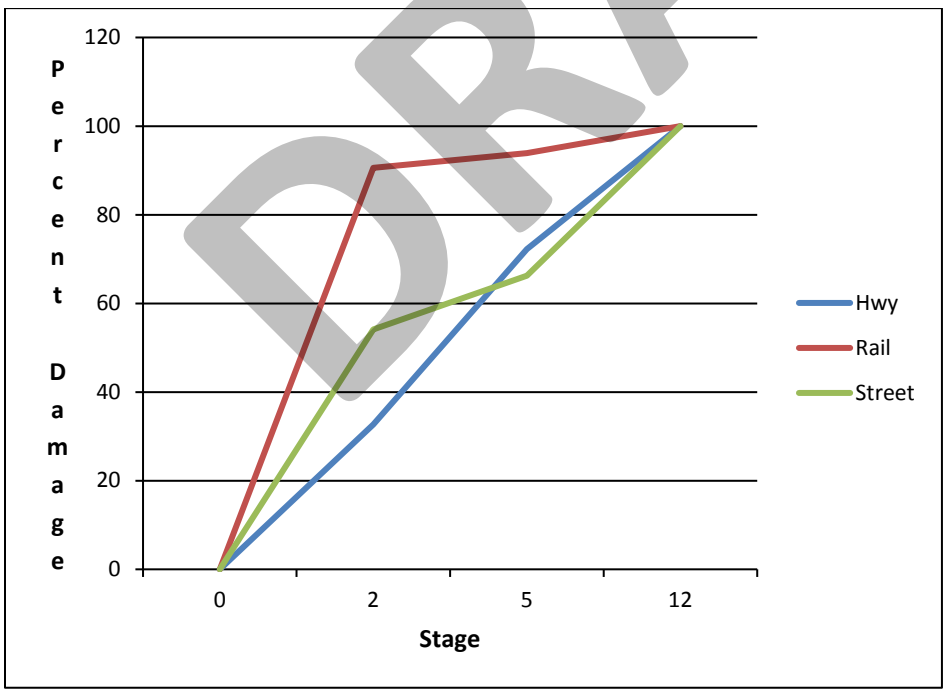
Warehouse



Debris Cleanup



Roads



2.13 LISTING OF CRITICAL INFRASTRUCTURE BY COUNTY

2.13.1 Orange

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
DuPont Sabine River Works	Orange	Pesticide and Other Agricultural Chemical Manufacturing
Solvay America Inc.	Orange	All Other Basic Inorganic Chemical Manufacturing
Latex Supply Inc.	Orange	All Other Basic Inorganic Chemical Manufacturing
Red Bird Supply, Inc.	Orange	Soap and Other Detergent Manufacturing
A Schulman Inc.	Orange	Plastics Material and Resin Manufacturing
Alloy Polymers, Inc.	Orange	Plastics Material and Resin Manufacturing
Clark & Company Inc.	Orange	All Other Basic Inorganic Chemical Manufacturing
Bourg Distributing Inc.	Bridge City	Polish and Other Sanitation Good Manufacturing
Hyett Manufacturing and Instrument Company, Inc.	Bridge City	All Other Basic Inorganic Chemical Manufacturing
Chevron Phillips Chemical Company LP	Orange	Plastics Material and Resin Manufacturing
Fine Line Colognes	Orange	Toilet Preparation Manufacturing
Lanxess Corporation Rubber Division	Orange	Synthetic Rubber Manufacturing
Invista S.A.R.L.	West Orange	Plastics Material and Resin Manufacturing
Chem32 LLC	West Orange	All Other Basic Inorganic Chemical Manufacturing
E. I. DuPont De Nemours and Company	Orange	Plastics Material and Resin Manufacturing
Nitrogen National	Orange	Industrial Gas Manufacturing
Lanxess Corp	Orange	All Other Basic Organic Chemical Manufacturing
Invista Capital Management, LLC	Orange	All Other Basic Organic Chemical Manufacturing
Invista S.A.R.L.	Orange	Plastics Material and Resin Manufacturing
Chevron Phillips Chemical Company LP	Orange	Plastics Material and Resin Manufacturing
Electric Generation		
Engineered Carbons Echo Cogeneration	Little Cypress	
Entergy Texas	Bridge City	
AirLiquide - Sabine Cogeneration LP	West Orange	
DuPont - Sabine River Works	West Orange	
SRW Cogeneration	West Orange	
Hospitals		
Harbor Hospital of Southeast Texas	Orange	

Memorial Hermann Baptist Orange Hospital	Orange
Nursing Homes	
Golden Years Assisted Living	Orange
Orange Villa Nursing and Rehabilitation	Orange
Pinehurst Nursing and Rehabilitation	Orange
Sabine House	Orange
The Meadows of Orange	Orange
Answered Prayer	Orange
Schools	
Little Cypress Jr. High	Orange
Bridge City High School	Bridge City
Bridge City Middle School	Bridge City
Little Cypress-Mauriceville High School	Orange
Little Cypress Elementary School	Orange
Little Cypress Intermediate	Orange
Oak Forest Elementary	Vidor
Vidor Middle School	Vidor
West Orange-Stark Elementary	Orange
West Orange-Stark Middle School	Orange
West Orange-Stark High School	Orange
North Early Learning Center	Orange
Orangefield Elementary	Orangefield
Orangefield High School	Orangefield
Orangefield Jr. High	Orangefield
Hatton Elementary	Bridge City
Bridge City Elementary	Bridge City
Bridge City Intermediate	Bridge City
OISD DAEP	Bridge City
Tekeo Academy of Accelerated Studies	Orange
Law Enforcement	
Orange County Sheriff Dept./Orange County Jail	Orange
Bridge City ISD Police Dept.	Bridge City
Orange Police Dept.	Orange
Rose City Police Dept.	Rose City
Vidor ISD Police Dept.	Vidor
Pine Forest Police Dept.	Vidor
Pinehurst Police Dept.	Orange
Vidor Police Dept.	Vidor
West Orange Police Dept.	Orange
Bridge City Police Dept.	Bridge City
Orange County Constable - Precinct 1	Orange
Orange County Constable - Precinct 2	Orange
Orange County Constable - Precinct 3	Orange

Orange County Constable - Precinct 4	Vidor
Fire Departments	
Bridge City Volunteer Fire and Rescue - Orangefield Station	Orange
Orange County Emergency Services District Station 1	Vidor
Orange County Emergency Services District Station 2	Vidor
Pinehurst Volunteer Fire Dept.	Orange
West Orange Volunteer Fire Dept.	West Orange
Little Cypress Fire and Rescue Station 1	Orange
Bridge City Volunteer Fire and Rescue	Bridge City
McLewis Volunteer Fire Dept.	Orange
City of Orange Fire Dept. Station 1	Orange
City of Orange Fire Dept. Station 2	Orange
City of Orange Fire Dept. Station 3	Orange
Airport	
Orange County Airport	Orange

2.13.2 Jefferson

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
Air Liquide America L.P.	Port Neches	Industrial Gas Manufacturing
Air Liquide America L.P.	Beaumont	Industrial Gas Manufacturing
Air Liquide Industrial U.S. LP	Nederland	Industrial Gas Manufacturing
Air Products and Chemicals, Inc.	Port Arthur	Industrial Gas Manufacturing
Arkema, Inc.	Beaumont	All Other Basic Inorganic Chemical Manufacturing
Ashland Elastomers LLC	Port Neches	Synthetic Rubber Manufacturing
Ashland Inc.	Port Neches	All Other Basic Organic Chemical Manufacturing
BASF Petro Chemicals	Port Arthur	All Other Miscellaneous Chemical Product and Preparation Manufacturing
BASF Petro Chemicals	Port Arthur	All Other Miscellaneous Chemical Product and Preparation Manufacturing
BASF Corporation	Beaumont	All Other Basic Organic Chemical Manufacturing
BASF Corporation	Port Arthur	All Other Basic Organic Chemical Manufacturing
Brock Specialty Services, Ltd.	Beaumont	All Other Basic Inorganic Chemical Manufacturing
Calabrian Corporation	Port Neches	All Other Basic Organic Chemical Manufacturing

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
Chemtrade Refinery Services Inc.	Beaumont	All Other Basic Inorganic Chemical Manufacturing
Chemtreat, Inc.	Nederland	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Chevron Phillips Chemical Company LP	Port Arthur	All Other Miscellaneous Chemical Product and Preparation Manufacturing
DuPont Performance Elastomers L.L.C.	Nederland	Synthetic Rubber Manufacturing
Elegant Designer Essences	Port Arthur	Toilet Preparation Manufacturing
Elixir Incense	Port Arthur	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Ethyl Additives Corporation	Port Arthur	All Other Basic Organic Chemical Manufacturing
Faubion Veterinary Clinic	Nederland	Pharmaceutical Preparation Manufacturing
Flint Hills Resources Port Arthur LLC	Port Arthur	All Other Basic Organic Chemical Manufacturing
G V C Holdings Inc.	Port Neches	Synthetic Rubber Manufacturing
Huntsman Corporation	Port Neches	Plastics Material and Resin Manufacturing
In Your Element Photography	Port Neches	All Other Basic Inorganic Chemical Manufacturing
Ineos Americas LLC	Port Arthur	All Other Miscellaneous Chemical Product and Preparation Manufacturing
J & M Resources	Port Arthur	Toilet Preparation Manufacturing
J F D Enterprises, Inc.	Groves	Toilet Preparation Manufacturing
Kbr Technical Services, Inc.	Beaumont	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Kmtex	Port Arthur	All Other Basic Inorganic Chemical Manufacturing
La Designs	Port Arthur	Toilet Preparation Manufacturing
Nature's Secret	Port Arthur	Medicinal and Botanical Manufacturing
Neo Fuels	Port Arthur	Petrochemical Manufacturing
Oci Partners LP	Nederland	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
Pd Glycol LP	Beaumont	Plastics Material and Resin Manufacturing
Penny's Style	Port Arthur	Toilet Preparation Manufacturing
Perfume Palace	Port Arthur	Toilet Preparation Manufacturing
Praxair, Inc.	Groves	Industrial Gas Manufacturing
Pro Star Industries, Inc.	Port Arthur	Polish and Other Sanitation Good Manufacturing
Rbf Port Neches LLC	Port Neches	Petrochemical Manufacturing
Reliable Polymer Services, LP	Port Arthur	Synthetic Rubber Manufacturing
Sally Beauty Supply LLC	Port Arthur	Toilet Preparation Manufacturing
Savage Services Corporation	Port Arthur	All Other Basic Inorganic Chemical Manufacturing

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
Scan Tech, Inc.	Nederland	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Service Offshore, Inc.	Beaumont	Paint and Coating Manufacturing
Smith and Thome Cardiovascular Consultants, L.L.P.	Port Arthur	Pharmaceutical Preparation Manufacturing
Sophia's International LLC	Port Neches	Toilet Preparation Manufacturing
Sunrose Scents	Nederland	Toilet Preparation Manufacturing
Texas Brine Company LLC	Beaumont	All Other Basic Inorganic Chemical Manufacturing
Texas Petrochemicals LP	Port Neches	All Other Basic Organic Chemical Manufacturing
Texas Petrochemicals LP	Port Neches	All Other Basic Organic Chemical Manufacturing
The Chemours Company Fc LLC	Beaumont	Synthetic Rubber Manufacturing
The Valspar Corporation	Beaumont	Paint and Coating Manufacturing
Worldwide Sorbent Products, Inc.	Port Arthur	Plastics Material and Resin Manufacturing
Petroleum Refining		
Exxon Mobil Refining & Supply Co.	Beaumont	
Total Petrochemicals Inc.	Port Arthur	
Motiva Enterprises LLC	Port Arthur	
Premcor Refining Group	Port Arthur	
Valero Refining Co.	Port Arthur	
Electric Generation	**City**	
JCO Oxides Olefins Plant	Port Neches	
Entergy Texas	Beaumont	
Public Schools	**City**	
Al Price State Juvenile Correctional Facility	Beaumont	
Jefferson County Youth Academy	Beaumont	
Preschool Center	Groves	
Groves Elementary	Groves	
Groves Middle School	Groves	
Van Buren Elementary	Groves	
Highland Park Elementary	Nederland	
Nederland High School	Nederland	
Alternative Education School	Nederland	
Helena Park Elementary	Nederland	
Hillcrest Elementary	Nederland	
Lanham Elementary	Nederland	
Central Middle School	Nederland	
Wilson Middle School	Nederland	
Dowling Elementary	Port Arthur	
Houston Elementary	Port Arthur	

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
Port Arthur Alternative Center	Port Arthur	
Stilwell Tech Center	Port Arthur	
Memorial High School	Port Arthur	
Tekeo Academy of Accelerated Studies	Port Arthur	
DeQueen Elementary	Port Arthur	
Jefferson Middle School	Port Arthur	
Lee Elementary	Port Arthur	
Travis Elementary	Port Arthur	
Tyrrell Elementary	Port Arthur	
Wheatley School Of Early Childhood Programs	Port Arthur	
Lincoln Middle School	Port Arthur	
Taft Elementary	Port Arthur	
Austin Middle School	Port Arthur	
Tekeo Academy of Accelerated Studies	Port Arthur	
Tekeo Academy of Accelerated Studies	Port Arthur	
Bob Hope School	Port Arthur	
Performing Arts School Of Technology	Port Arthur	
Staff Sergeant Lucien Adams Elementary	Port Arthur	
Washington Elementary	Port Arthur	
Memorial 9th Grade Academy at Austin	Port Arthur	
Woodcrest Elementary	Port Neches	
Port Neches Elementary	Port Neches	
Port Neches Middle School	Port Neches	
Port Neches-Groves High School	Port Neches	
Ridgewood Elementary	Port Neches	
Alter School	Port Neches	
Nursing Homes	**City**	
Gulf Healthcare Center	Port Arthur	
Magnolia Manor	Groves	
Oak Grove Nursing Home	Groves	
Senior Rehabilitation and Skilled Nursing Center	Port Arthur	
Cypress Glen East Nursing and Rehabilitation	Port Arthur	
Cypress Glen Nursing and Rehabilitation	Port Arthur	
Rose House	Port Arthur	
Hospitals	**City**	
Beaumont Bone and Joint Institute	Beaumont	
Christus Spohn Hospital - Saint Elizabeth	Beaumont	
Christus Spohn Hospital - Saint Mary	Port Arthur	
Dubuis Hospital of Beaumont	Beaumont	
Dubuis Hospital of Port Arthur	Port Arthur	

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
HealthSouth Rehabilitation Hospital - Beaumont	Beaumont	
Kate Dishman Rehabilitation Hospital	Beaumont	
Memorial Hermann Baptist Hospital	Beaumont	
Memorial Hermann Baptist Hospital - Behavioral Health Center	Beaumont	
Mid-Jefferson Extended Care Hospital	Nederland	
Promise Hospital of Southeast Texas	Nederland	
Renaissance Hospital - Groves	Groves	
The Medical Center of Southeast Texas	Port Arthur	
Law Enforcement	**City**	
Lamar University Police Dept.	Beaumont	
Beaumont Police Dept.	Beaumont	
Groves Police Dept.	Groves	
Port of Beaumont Port Authority Police Dept.	Beaumont	
Port Neches Police Department	Port Neches	
Bureau of Alcohol Tobacco & Firearms - Beaumont Field Office	Beaumont	
US Customs and Border Protection - Port of Entry - Port Arthur	Port Arthur	
Port Arthur Police Dept.	Port Arthur	
Jefferson County Sheriff's Office	Beaumont	
Beaumont ISD Police Dept.	Beaumont	
Nederland Police Department	Nederland	
Texas Dept. of Public Safety	Beaumont	
Jefferson County Constable - Precinct 1	Beaumont	
Jefferson County Constable - Precinct 2	Port Arthur	
Jefferson County Constable - Precinct 4	Beaumont	
Jefferson County Constable - Precinct 6	Beaumont	
Jefferson County Constable - Precinct 7	Beaumont	
Jefferson County Constable - Precinct 8	Port Arthur	
US Marshal's Service - Beaumont	Beaumont	
Fire Departments	**City**	
Port Arthur Fire Dept. Central Station	Port Arthur	
Beaumont Fire and Rescue Station 1	Beaumont	
Nederland Fire and Rescue	Nederland	
Beaumont Fire and Rescue Station 10	Beaumont	
Beaumont Fire and Rescue Station 11	Beaumont	
Beaumont Fire and Rescue Station 14	Beaumont	
Beaumont Fire and Rescue Station 2	Beaumont	
Beaumont Fire and Rescue Station 3	Beaumont	
Beaumont Fire and Rescue Station 4	Beaumont	

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
Beaumont Fire and Rescue Station 5	Beaumont	
Beaumont Fire and Rescue Station 6	Beaumont	
Beaumont Fire and Rescue Station 7	Beaumont	
Beaumont Fire and Rescue Station 7	Beaumont	
Beaumont Fire and Rescue Station 9	Beaumont	
Groves Fire Dept.	Groves	
Jefferson Volunteer Fire Dept.	Nederland	
LaBelle - Fannett Volunteer Fire/Emergency Medical Services - Substation	Beaumont	
Lamar Institute of Technology Regional Fire Academy	Beaumont	
Port Arthur Fire Dept. Station 1	Port Arthur	
Port Arthur Fire Dept. Station 2	Port Arthur	
Port Arthur Fire Dept. Station 3	Port Arthur	
Port Arthur Fire Dept. Station 4	Port Arthur	
Port Arthur Fire Dept. Station 5	Port Arthur	
Port Arthur Fire Dept. Station 6	Port Arthur	
Port Arthur Fire Dept. Station 8	Port Arthur	
Port Neches Fire Dept.	Port Arthur	

2.13.3 Brazoria

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
L C Huntsman-Cooper	Freeport	Plastics Material and Resin Manufacturing
Ineos Americas LLC	Freeport	All Other Basic Inorganic Chemical Manufacturing
K-Bin, Inc.	Freeport	Plastics Material and Resin Manufacturing
Air Liquide Large Industries U.S. LP	Freeport	Industrial Gas Manufacturing
Air Liquide Industrial U.S. LP	Freeport	Industrial Gas Manufacturing
S F Sulphur Company	Freeport	All Other Basic Inorganic Chemical Manufacturing
Nalco Energy Services L P	Freeport	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Services Enterprise	Freeport	Polish and Other Sanitation Good Manufacturing
Air Liquide America L.P.	Freeport	Industrial Gas Manufacturing
Shintech Incorporated	Freeport	Plastics Material and Resin Manufacturing
Air Liquide Large Industries U.S. LP	Freeport	Industrial Gas Manufacturing
Air Liquide Large Industries U.S. LP	Freeport	Industrial Gas Manufacturing
Samdac Industries	Freeport	Plastics Material and Resin Manufacturing
Si Group, Inc.	Freeport	Petrochemical Manufacturing

Chemical Manufacturing		
Business Name	**City**	**NAICS Category**
The Dow Chemical Company	Freeport	All Other Basic Inorganic Chemical Manufacturing
Avon	Freeport	Toilet Preparation Manufacturing
Solvay USA, Inc.	Freeport	All Other Basic Inorganic Chemical Manufacturing
The Dow Chemical Company	Freeport	Plastics Material and Resin Manufacturing
Matheson Tri-Gas, Inc.	Freeport	Industrial Gas Manufacturing
Vencorex U.S., Inc.	Freeport	All Other Basic Organic Chemical Manufacturing
Vencorex U.S., Inc.	Freeport	All Other Basic Organic Chemical Manufacturing
BASF Corporation	Freeport	All Other Basic Organic Chemical Manufacturing
Ineos	Freeport	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Americas Styrenics LLC	Freeport	Plastics Material and Resin Manufacturing
Schools	**City**	
Brazosport High School	Freeport	
OA Fleming Elementary	Freeport	
Freeport Intermediate	Freeport	
Jane Long Elementary	Freeport	
Velasco Elementary	Freeport	
O'Hara Lanier Middle School	Freeport	
Fire Departments	**City**	
Oyster Creek Volunteer Fire Dept.	Freeport	
Freeport Fire and Emergency Medical Services Dept.	Freeport	
Law Enforcement	**City**	
Freeport City Marshals Office	Freeport	
Freeport Police Dept.	Freeport	
Brazoria County Constable - Precinct 1	Freeport	

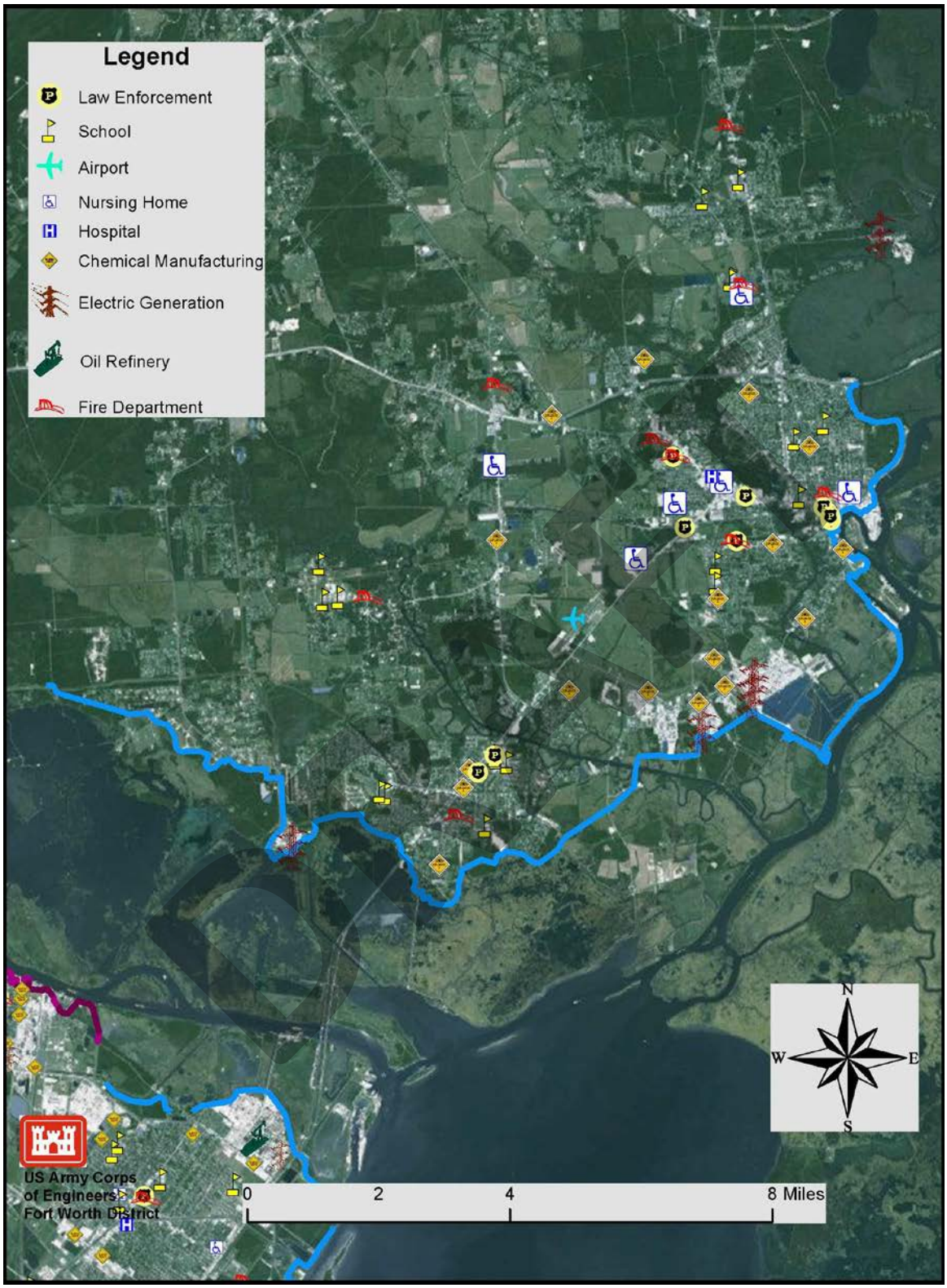


Figure 2-15. Orange County Critical Infrastructure

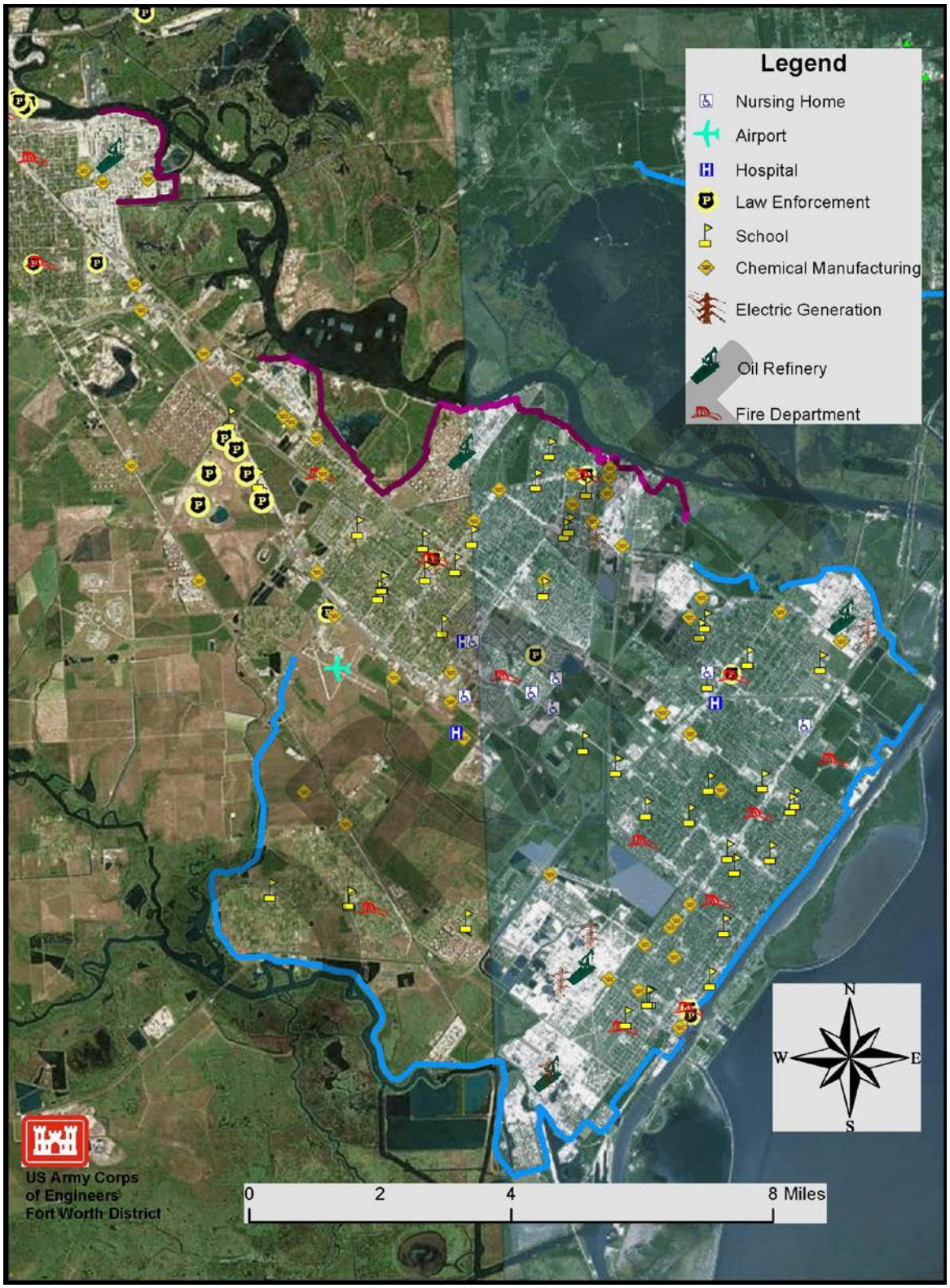


Figure 2-16. Jefferson County Critical Infrastructure

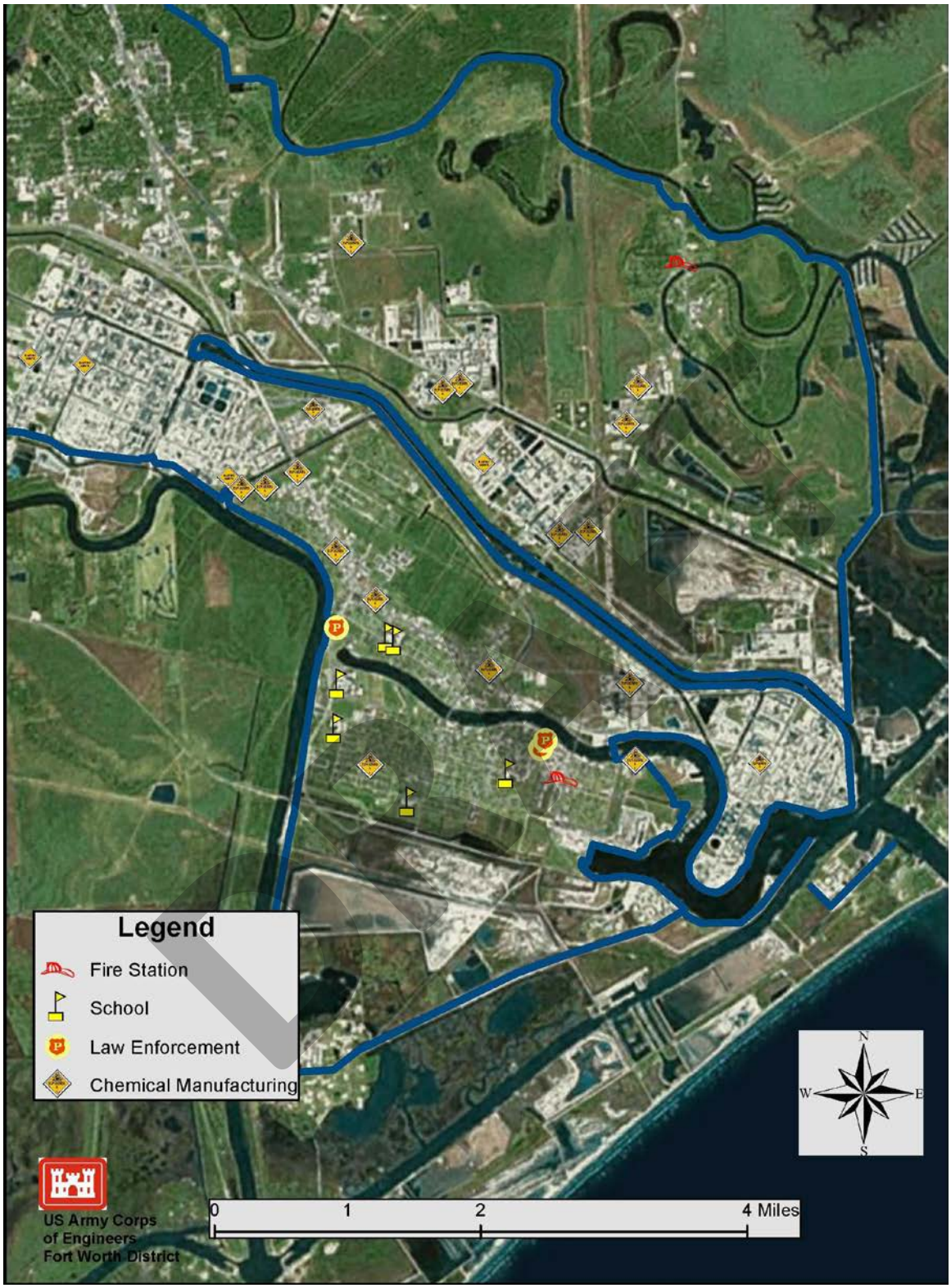


Figure 2-17. Brazoria County Critical Infrastructure

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APPENDIX 9-A
RESULTS OF FUNDING SURVEY FOR FLOOD MANAGEMENT EVALUATIONS, FLOOD MANAGEMENT STRATEGIES, AND FLOOD MITIGATION PROJECTS

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Anderson County	FME	Anderson County Update Flood Hazard Mapping	051000001	2034	$2,236,919	$0	$2,236,919	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FME	Angelina County Update Flood Hazard Mapping	051000002	2034	$3,900,000	$0	$3,900,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FME	Chambers County Update Flood Hazard Mapping	051000003	2034	$652,546	$0	$652,546	*Unknown*	*0%*	*100%*	*100%*
5	Cherokee County	FME	Cherokee County Update Flood Hazard Mapping	051000004	2034	$4,800,000	$0	$4,800,000	*Other*	*0%*	*100%*	*100%*
5	Galveston County	FME	Galveston County Update Flood Hazard Mapping	051000005	2034	$68,502	$0	$68,502	*Unknown*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Update Flood Hazard Mapping	051000006	2034	$1,800,000	$0	$1,800,000	*State or Federal*	*0%*	*100%*	*100%*
5	Henderson County	FME	Henderson County Update Flood Hazard Mapping	051000007	2034	$1,681,614	$0	$1,681,614	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FME	Houston County Update Flood Hazard Mapping	051000008	2034	$1,697,174	$0	$1,697,174	*Unknown*	*0%*	*100%*	*100%*
5	Jasper County	FME	Jasper County Update Flood Hazard Mapping	051000009	2034	$1,210,721	$0	$1,210,721	*State or Federal*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County	FME	Jefferson County Update Flood Hazard Mapping	051000010	2034	$1,900,000	$0	$1,900,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FME	Liberty County Update Flood Hazard Mapping	051000011	2034	$402,626	$0	$402,626	*Unknown*	*0%*	*100%*	*100%*
5	Nacogdoches County	FME	Nacogdoches County Update Flood Hazard Mapping	051000012	2034	$4,400,000	$0	$4,400,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County	FME	Orange County Update Flood Hazard Mapping	051000013	2034	$760,000	$0	$760,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FME	Polk County Update Flood Hazard Mapping	051000014	2034	$375,054	$0	$375,054	*Unknown*	*0%*	*100%*	*100%*
5	Rusk County	FME	Rusk County Update Flood Hazard Mapping	051000015	2034	$1,318,550	$0	$1,318,550	*Unknown*	*0%*	*100%*	*100%*
5	Sabine County	FME	Sabine County Update Flood Hazard Mapping	051000016	2034	$182,571	$0	$182,571	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FME	San Augustine County Update Flood Hazard Mapping	051000017	2034	$904,125	$0	$904,125	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FME	Shelby County Update Flood Hazard Mapping	051000018	2034	$711,827	$0	$711,827	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Smith County	FME	Smith County Update Flood Hazard Mapping	051000019	2034	$1,225,342	$0	$1,225,342	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FME	Trinity County Update Flood Hazard Mapping	051000020	2034	$1,540,238	$0	$1,540,238	*Unknown*	*0%*	*100%*	*100%*
5	Tyler County	FME	Tyler County Update Flood Hazard Mapping	051000021	2034	$1,800,000	$0	$1,800,000	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FME	Van Zandt County Update Flood Hazard Mapping	051000022	2034	$1,111,237	$0	$1,111,237	*Unknown*	*0%*	*100%*	*100%*
5	Anderson County	FME	Anderson County Master Drainage Plan	051000023	2034	$737,953	$0	$737,953	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FME	Angelina County Master Drainage Plan	051000024	2034	$1,700,000	$0	$1,700,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FME	Chambers County Master Drainage Plan	051000025	2034	$1,600,000	$0	$1,600,000	*Unknown*	*0%*	*100%*	*100%*
5	Cherokee County	FME	Cherokee County Master Drainage Plan	051000026	2034	$1,600,000	$0	$1,600,000	*Other*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Master Drainage Plan	051000027	2034	$1,000,000	$0	$1,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Henderson County	FME	Henderson County Master Drainage Plan	051000028	2034	$1,900,000	$0	$1,900,000	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FME	Houston County Master Drainage Plan	051000029	2034	$610,983	$0	$610,983	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jasper County	FME	Jasper County Master Drainage Plan	051000030	2034	$1,200,000	$0	$1,200,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County	FME	Jefferson County Master Drainage Plan	051000031	2034	$1,100,000	$0	$1,100,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FME	Liberty County Master Drainage Plan	051000032	2034	$201,313	$0	$201,313	*Unknown*	*0%*	*100%*	*100%*
5	Nacogdoches County	FME	Nacogdoches County Master Drainage Plan	051000033	2034	$1,900,000	$0	$1,900,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County	FME	Orange County Master Drainage Plan	051000034	2034	$450,000	$0	$450,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FME	Polk County Master Drainage Plan	051000035	2034	$150,021	$0	$150,021	*Unknown*	*0%*	*100%*	*100%*
5	Rusk County	FME	Rusk County Master Drainage Plan	051000036	2034	$1,400,000	$0	$1,400,000	*Unknown*	*0%*	*100%*	*100%*
5	Sabine County	FME	Sabine County Master Drainage Plan	051000037	2034	$76,348	$0	$76,348	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FME	San Augustine County Master Drainage Plan	051000038	2034	$379,732	$0	$379,732	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FME	Shelby County Master Drainage Plan	051000039	2034	$1,250,000	$0	$1,250,000	*Unknown*	*0%*	*100%*	*100%*
5	Smith County	FME	Smith County Master Drainage Plan	051000040	2034	$538,612	$0	$538,612	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FME	Trinity County Master Drainage Plan	051000041	2034	$481,324	$0	$481,324	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Tyler County	FME	Tyler County Master Drainage Plan	051000042	2034	$700,000	$0	$700,000	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FME	Van Zandt County Master Drainage Plan	051000043	2034	$484,386	$0	$484,386	*Unknown*	*0%*	*100%*	*100%*
5	City of Palestine	FME	City of Palestine Master Drainage Plan	051000044	2034	$700,000	$0	$700,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lufkin	FME	City of Lufkin Master Drainage Plan	051000045	2034	$1,000,000	$0	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Jacksonville	FME	City of Jacksonville Master Drainage Plan	051000046	2034	$560,000	$0	$560,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rusk	FME	City of Rusk Master Drainage Plan	051000047	2034	$280,000	$0	$280,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton Master Drainage Plan	051000048	2034	$380,000	$0	$380,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FME	City of Rose Hill Acres Master Drainage Plan	051000049	2034	$200,000	$0	$200,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Silsbee	FME	City of Silsbee Master Drainage Plan	051000050	2034	$320,000	$0	$320,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Athens	FME	City of Athens Master Drainage Plan	051000051	2034	$31,056	$0	$31,056	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	City of Jasper	FME	City of Jasper Master Drainage Plan	051000052	2034	$440,000	$0	$440,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Beaumont	FME	City of Beaumont Master Drainage Plan	051000053	2034	$600,000	$0	$600,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Nederland	FME	City of Nederland Master Drainage Plan	051000054	2034	$240,000	$0	$240,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Nacogdoches	FME	City of Nacogdoches Update Flood Control Study	051000055	2034	$1,080,000	$0	$1,080,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Henderson	FME	City of Henderson Master Drainage Plan	051000056	2034	$480,000	$0	$480,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Arp	FME	City of Arp Master Drainage Plan	051000057	2034	$1,300,000	$0	$1,300,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Tyler	FME	City of Tyler Master Drainage Plan	051000058	2034	$2,200,000	$0	$2,200,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Whitehouse	FME	City of Whitehouse Master Drainage Plan	051000059	2034	$150,000	$0	$150,000	*Other*	*0%*	*100%*	*100%*
5	Angelina County	FME	Willie Nerron Road and Gillan Creek Bridge Replacement	051000060	2034	$325,000	$0	$325,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	City of Diboll	FME	Hall Street over White Oak Creek Bridge Improvements	051000061	2034	$103,000	$0	$103,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Huntington	FME	Preliminary Engineering of Gibsonville Street and Porterville Road Bridges Improvements	051000062	2034	$650,000	$0	$650,000	*Other*	*0%*	*100%*	*100%*
5	City of Huntington	FME	Shawnee Creek Concrete Canal	051000063	2034	$390,000	$0	$390,000	*Other*	*0%*	*100%*	*100%*
5	City of Lufkin	FME	City of Lufkin Detention Pond Construction and Improvements	051000064	2034	$82,500	$0	$82,500	*Unknown*	*0%*	*100%*	*100%*
5	City of Anahuac	FME	Anahuac, North of Canal Drainage	051000065	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FME	Dredging West Fork- Double Bayou	051000066	2034	$1,400,000	$0	$1,400,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FME	Spindletop Bayou Ditch Improvement	051000067	2034	$1,500,000	$0	$1,500,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Anahuac	FME	North Anahuac Drainage	051000068	2034	$800,000	$0	$800,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Anahuac	FME	Southeast Drainage Ditch	051000069	2034	$125,000	$0	$125,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Anahuac	FME	Southwest Anahuac Ditch	051000070	2034	$125,000	$0	$125,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	City of Lumberton	FME	City of Lumberton Adler Ditch Drainage Improvements	051000071	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton East Village Creek Parkway Drainage Improvements	051000072	2034	$125,000	$0	$125,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton Greens Branch Ditch Western Extension	051000073	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton Drainage Chance Cut Off Concrete Lining	051000074	2034	$50,000	$0	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton Detention Pond at FM 421	051000075	2034	$50,000	$0	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FME	City of Lumberton Elevate Taft Road and Brushy Creek Subdivision	051000076	2034	$75,000	$0	$75,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FME	City of Rose Hill Acres Flood Mitigation Improvements	051000077	2034	$500,000	$0	$500,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	City of Nacogdoches	FME	City of Nacogdoches Flood Mitigation Project	051000078	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FME	City of Rose Hill Acres Ditch Improvements	051000079	2034	$50,000	$0	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FME	City of Rose Hill Acres Road and Bridge Elevation	051000080	2034	$50,000	$0	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Silsbee	FME	City of Silsbee Easy Street Drainage Improvements	051000081	2034	$50,000	$0	$50,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Vidor	FME	City of Vidor Schoolhouse Ditch Alternative B	051000082	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Vidor	FME	City of Vidor Schoolhouse Ditch Alternative C	051000083	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Vidor	FME	City of Vidor Drainage Improvements	051000084	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Black Creek Detention Pond	051000085	2034	$150,000	$0	$150,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Boggy Creek Detention Pond	051000086	2034	$150,000	$0	$150,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Cooks Lake Road Bridge Elevation	051000087	2034	$20,000	$0	$20,000	*State or Federal*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Hardin County	FME	Hardin County Reservoir	051000088	2034	$500,000	$0	$500,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County South Area Drainage System	051000089	2034	$1,000,000	$0	$1,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County SE Area Drainage System	051000090	2034	$1,250,000	$0	$1,250,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Pinewood Drainage Improvements	051000091	2034	$350,000	$0	$350,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Coon Marsh Gully Drainage Improvements	051000092	2034	$300,000	$0	$300,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FME	Hardin County Municipal Storm Drain Project	051000093	2034	$2,000,000	$0	$2,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Coffee City	FME	City of Coffee City Flood-prone Roadway and Infrastructure Evaluation	051000094	2034	$25,000	$0	$25,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Moore Station	FME	City of Moore Station Flood-prone Roadway and Infrastructure Evaluation	051000095	2034	$25,000	$0	$25,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Houston County	FME	Houston County Earthen Dike Construction	051000096	2034	$16,972	$0	$16,972	*Unknown*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FME	Ditch 100 A (East Caldwood) Improvements	051000097	2034	$75,000	$0	$75,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FME	Ditch 119 Crossings at Yount and Edson	051000098	2034	$50,000	$0	$50,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FME	Lateral B4A and B4A Ext. Improvements	051000099	2034	$225,000	$0	$225,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Pump Station	051000100	2034	$2,000,000	$0	$2,000,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Upgrade to Lateral B4B	051000101	2034	$50,000	$0	$50,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Beauxart Gardens Central Ditch Improvements	051000102	2034	$50,000	$0	$50,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Houston Upgrade Pumping Equipment	051000103	2034	$250,000	$0	$250,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Grannis Upgrade Pumping Equipment	051000104	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County Drainage District 7	FME	Foley Upgrade Pumping Equipment	051000105	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Lakeside Upgrade Pumping Equipment	051000106	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Upgrade Pumping Equipment	051000107	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	9th Avenue - Upgrade Pumping Equipment	051000108	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Halbouty Add two pumps (open spots in structure)	051000109	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Upper Build new station with associated levee	051000110	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Main C Diversion - Build New Pump Station and Channel	051000111	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Upper Johns Gulley Upgrade Drainage Channel	051000112	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County Drainage District 7	FME	Central Gardens Ditch - Upgrade Drainage Channel	051000113	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Pure Oil Ditch Improvements	051000114	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Gulley Ditch Improvements	051000115	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Main C Diversion Channel Improvements	051000116	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Main B Channel Improvements	051000117	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Main A Channel Improvements	051000118	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Lateral 5 Detention Pond Excavation	051000119	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Halbouty Detention Pond Excavation	051000120	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	9th Avenue Additional Detention Excavation	051000121	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County Drainage District 6	FME	Tevis Diversion	051000122	2034	$100,000	$0	$100,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FME	JCDD7 Hurricane Flood Protection Levee Study	051000123	2034	$777,000	$0	$777,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Crane Bayou Channel Improvements	051000124	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Upper Additional Pump Station	051000125	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 6	FME	South Park Diversion	051000126	2034	$100,000	$0	$100,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FME	Blanchette Diversion	051000127	2034	$100,000	$0	$100,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FME	Rodair Gully System Detention	051000128	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	El Vista Upgrade Pumping Equipment	051000129	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	W. Port Arthur Road Upgrade Pumping Equipment	051000130	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County Drainage District 7	FME	Central - Upgrade Pumping Equipment and Structure	051000131	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Star Lake Upgrade Pumping Equipment	051000132	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Crane Bayou Additional Pumping	051000133	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Lakeview Additional Pumping	051000134	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	City of Daisetta	FME	City of Daisetta Drainage Projects	051000135	2034	$150,000	$0	$150,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FME	Liberty County Culvert Replacement Project	051000136	2034	$100,657	$0	$100,657	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FME	Liberty County Recanalization Feasibility Study	051000137	2034	$26,171	$0	$26,171	*Unknown*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FME	Stadium Upgrade Pumping Equipment	051000138	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Delmar Upgrade Pumping Equipment	051000139	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Jefferson County Drainage District 7	FME	DeQueen Additional Pumping Equipment	051000140	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 7	FME	Shreveport Additional Pumping Equipment	051000141	2034	$100,000	$0	$100,000	*Taxes*	*25%*	*75%*	*100%*
5	Jefferson County Drainage District 6	FME	Delaware Diversion	051000142	2034	$500,000	$0	$500,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FME	Tyrrell Park Detention	051000143	2034	$500,000	$0	$500,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FME	Mayhaw Lateral Improvements	051000144	2034	$2,200,000	$0	$2,200,000	*State or Federal*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Feasibility Assessment for Increase in Size of Culverts and Railroad Trestles on Major Drainage Structures Throughout Orange County	051000145	2034	$150,000	$0	$150,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Orange County Drainage District	FME	Feasibility Assessment of the Capacity of Drainage Ditches and Channels that Convey Stormwater from Neighborhoods Located Within Orange County	051000146	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Orange County DD Harvey Repairs	051000147	2034	$130,000	$0	$130,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Orange County DD SW Detention/ Retention Facilities	051000148	2034	$130,000	$0	$130,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Feasibility Assessment of Widening and Deepening Segments of Tiger Creek	051000149	2034	$150,000	$0	$150,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Feasibility Assessment of Construction of a Stormwater Detention Pond Adjacent to Tiger Creek	051000150	2034	$100,000	$0	$100,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
5	Orange County Drainage District	FME	Feasibility Assessment of Widening and Deepening Segments of Ten-Mile Creek	051000151	2034	$175,000	$0	$175,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Feasibility Assessment of Widening and Deepening Segments of Anderson Gully	051000152	2034	$325,000	$0	$325,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Bullard	FME	City of Bullard Culvert Upgrades	051000153	2034	$50,000	$0	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	Smith County	FME	Smith County Drainage Capacity Upgrades	051000154	2034	$225,000	$0	$225,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Bridge City Drainage Outfall Improvement Project	051000155	2034	$200,000	$0	$200,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FME	Colonial Outfall Ditch Culvert Improvements	051000156	2034	$200,000	$0	$200,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Beaumont	FME	City of Beaumont Drainage Studies	051000157	2034	$118,750	$0	$118,750	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Anderson County	FMS	Anderson County Flood Education Program	052000001	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	Anderson County	FMS	Anderson County Natural Hazards Education Program Development	052000002	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Frankston	FMS	City of Frankston Flood Education Program	052000003	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FMS	Angelina County Public Education on Mitigation Techniques	052000004	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FMS	Chambers County Public Education on Mitigation Techniques	052000005	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Gallatin	FMS	City of Gallatin “Turn Around Don’t Drown” Campaign	052000006	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Jacksonville	FMS	City of Jacksonville Public Education on Mitigation Actions	052000007	2029	$20,000	*Unknown*	$20,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rusk	FMS	City of Rusk "Turn Around Don't Drown" Campaign	052000008	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	Henderson County	FMS	Henderson County Emergency Training Program	052000009	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Berryville	FMS	City of Berryville Public Education on Mitigation Techniques	052000010	2029	$3,000	*Unknown*	$3,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Brownsboro	FMS	City of Brownsboro Flood Mitigation Education for City Officials and Citizens	052000011	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Henderson County	FMS	City of Brownsboro Public Education on Mitigation Techniques	052000012	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*
5	Henderson County	FMS	City of Chandler Citizen/Business /City Mitigation Strategy Planning	052000013	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	Henderson County	FMS	City of Chandler Public Education on Code Red System	052000014	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Property Elevation and Public Education on NFIP	052000015	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Houston County	FMS	Houston County Public Education Program on Emergency Evacuation	052000016	2029	$22,200	*Unknown*	$22,200	*Unknown*	*0%*	*100%*	*100%*
5	City of Kennard	FMS	City of Kennard Public Awareness Program	052000017	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FMS	JCDD6 Public Education Material Distribution	052000018	2029	$50,000	*Unknown*	$50,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Daisetta	FMS	City of Daisetta Education of City Council on Mitigation Benefits	052000019	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Nacogdoches	FMS	City of Nacogdoches Public Education Program	052000020	2029	$20,000	*Unknown*	$20,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FMS	Polk County Public Education Campaign	052000021	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	San Augustine County	FMS	San Augustine County Public Education on Mitigation Techniques	052000022	2029	$10,600	*Unknown*	$10,600	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Public Education on Hazards	052000023	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Groveton	FMS	City of Groveton Public Education on Mitigation Actions	052000024	2029	$5,100	*Unknown*	$5,100	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FMS	Trinity County Public Education on Mitigation Actions	052000025	2029	$10,200	*Unknown*	$10,200	*Unknown*	*0%*	*100%*	*100%*
5	Anderson County	FMS	Anderson County Code Red System	052000026	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FMS	Angelina County Siren Warning System Installation	052000027	2029	$209,000	*Unknown*	$209,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Houston County	FMS	Houston County Alert/Notification System Installation	052000028	2029	$602,000	*Unknown*	$602,000	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Gage Installation and Monitoring	052000029	2029	$121,000	*Unknown*	$121,000	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Rainfall Observer Program	052000030	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Brownsboro	FMS	City of Brownsboro Code Red System Implementation	052000031	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Chandler	FMS	City of Chandler Warning Siren Maintenance	052000032	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Murchison	FMS	City of Murchison Warning Siren System Installation	052000033	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Jefferson County Drainage District 6	FMS	JCDD6 Increase Flood Predictive Capability for Streams and Creeks	052000034	2029	$100,000	*Unknown*	$100,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FMS	JCDD7 Update Data Operation System-Control Center	052000035	2029	$104,000	*Unknown*	$104,000	*Taxes*	*25%*	*75%*	*100%*
5	Orange County Drainage District	FMS	OCDD Hazard Notification System Development	052000036	2029	$11,000	*Unknown*	$11,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FMS	OCDD Installing Additional Stream Gages	052000037	2029	$534,000	*Unknown*	$534,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FMS	Polk County Improved Hazard Communication	052000038	2029	$3,110,000	*Unknown*	$3,110,000	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Electronic Hazard Warning Message Board Acquisition	052000039	2029	$111,000	*Unknown*	$111,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Shelby County	FMS	Shelby County Warning Siren Installation	052000040	2029	$3,319,000	*Unknown*	$3,319,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Groveton	FMS	City of Groveton Warning System Upgrades	052000041	2029	$11,000	*Unknown*	$11,000	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FMS	Van Zandt County Warning System Acquisition	052000042	2029	$82,000	*Unknown*	$82,000	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FMS	Angelina County Property Acquisition	052000043	2029	$2,100,000	*Unknown*	$2,100,000	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FMS	Angelina County Property Elevation	052000044	2029	$630,000	*Unknown*	$630,000	*Unknown*	*0%*	*100%*	*100%*
5	Hardin County	FMS	Hardin County Voluntary Flood Buyout	052000045	2029	$4,000,000	*Unknown*	$4,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FMS	Hardin County Voluntary Residential Structure Elevation	052000046	2029	$7,500,000	*Unknown*	$7,500,000	*State or Federal*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Kountze	FMS	City of Kountze Flood Buyout	052000047	2029	$6,000,000	*Unknown*	$6,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FMS	City of Lumberton Voluntary Flood Buyout	052000048	2029	$6,000,000	*Unknown*	$6,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FMS	City of Rose Hill Acres Voluntary Flood Buyout	052000049	2029	$5,000,000	*Unknown*	$5,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FMS	City of Rose Hill Acres Voluntary Residential Structure Elevation	052000050	2029	$6,000,000	*Unknown*	$6,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Silsbee	FMS	City of Silsbee Voluntary Flood Buyout	052000051	2029	$6,000,000	*Unknown*	$6,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Sour Lake	FMS	City of Sour Lake Voluntary Flood Buyout	052000052	2029	$6,000,000	*Unknown*	$6,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County	FMS	Jefferson County Property Elevation	052000053	2029	$1,110,000	*Unknown*	$1,110,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FMS	Liberty County Property Acquisition	052000054	2029	$2,140,000	*Unknown*	$2,140,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Nacogdoches	FMS	City of Nacogdoches Study and Ranking of Repetitive Loss Structures	052000055	2029	$327,000	*Unknown*	$327,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Acquisition and Conversion of Flood Prone Properties	052000056	2029	$530,000	*Unknown*	$530,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Structure Elevation	052000057	2029	$318,000	*Unknown*	$318,000	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Property Acquisition	052000058	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FMS	Trinity County Buyout Program Implementation	052000059	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Groveton	FMS	City of Groveton Buyout Program Implementation	052000060	2029	$100,000	*Unknown*	$100,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Diboll	FMS	City of Diboll Ordinance and Regulation Update	052000061	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Cuney	FMS	City of Cuney Bridge and Culvert Inspection Program	052000062	2029	$25,000	*Unknown*	$25,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Cuney	FMS	City of Cuney Seek NFIP Participation	052000063	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Gallatin	FMS	City of Gallatin Multi-Jurisdiction Coordination	052000064	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Jacksonville	FMS	City of Jacksonville Multi-Jurisdiction Coordination	052000065	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Reklaw	FMS	City of Reklaw Improved Enforcement of Ordinances	052000066	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rusk	FMS	City of Rusk Flood Maps Maintenance and Update	052000067	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Hardin County	FMS	Hardin County Continued NFIP Participation	052000068	2029	$80,000	*Unknown*	$80,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FMS	Hardin County Drainage District	052000069	2029	$900,000	*Unknown*	$900,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Kountze	FMS	City of Kountze Continued NFIP Participation	052000070	2029	$60,000	*Unknown*	$60,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Lumberton	FMS	City of Lumberton Continued NFIP Participation	052000071	2029	$80,000	*Unknown*	$80,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FMS	City of Rose Hill Acres Continued NFIP Participation	052000072	2029	$80,000	*Unknown*	$80,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Silsbee	FMS	City of Silsbee Continued NFIP Participation	052000073	2029	$50,000	*Unknown*	$50,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Sour Lake	FMS	City of Sour Lake Continued NFIP Participation	052000074	2029	$60,000	*Unknown*	$60,000	*State or Federal*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Mobile Home Inspection	052000075	2029	$61,000	*Unknown*	$61,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Jefferson County Drainage District 6	FMS	JCDD6 Multi-Jurisdiction Coordination	052000076	2029	$20,000	*Unknown*	$20,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FMS	JCDD6 Severe Weather Action Plan	052000077	2029	$60,000	*Unknown*	$60,000	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FMS	JCDD7 Storm Water Management Plan	052000078	2029	$50,000	*Unknown*	$50,000	*Taxes*	*25%*	*75%*	*100%*
5	City of Daisetta	FMS	City of Daisetta Property Construction Ordinance	052000079	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Daisetta	FMS	City of Daisetta Property Elevation Ordinance	052000080	2029	$5,000	*Unknown*	$5,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Hardin	FMS	City of Hardin Subdivision Ordinance Implementation	052000081	2029	$10,000	*Unknown*	$10,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Nacogdoches	FMS	City of Nacogdoches Stormwater Drainage Fee Implementation	052000082	2029	$40,000	*Unknown*	$40,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Nacogdoches	FMS	City of Nacogdoches Codes and Ordinances Update	052000083	2029	$30,000	*Unknown*	$30,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FMS	OCDD Drainage Criteria Manual and Regulations Enforcement	052000084	2029	$20,000	*Unknown*	$20,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FMS	OCDD Support/Create Stricter Floodplain Ordinances	052000085	2029	$40,000	*Unknown*	$40,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Continue NFIP Participation	052000086	2029	$53,000	*Unknown*	$53,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Linsdale	FMS	City of Linsdale Natural Runoff Policies Implementation	052000087	2029	$30,000	*Unknown*	$30,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Linsdale	FMS	City of Linsdale No Adverse Impact Implementation	052000088	2029	$60,000	*Unknown*	$60,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Troup	FMS	City of Troup Floodplain Ordinance Update	052000089	2029	$40,000	*Unknown*	$40,000	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FMS	Trinity County Dam/Levee Failure Data Collection	052000090	2029	$30,600	*Unknown*	$30,600	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FMS	Van Zandt County Higher Standards Incorporation	052000091	2029	$30,000	*Unknown*	$30,000	*Unknown*	*0%*	*100%*	*100%*
5	Anderson County	FMS	Anderson County Culvert Improvements	052000092	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Anderson County	FMS	Anderson County Dam Inspection and Maintenance Program	052000093	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Frankston	FMS	City of Frankston Culvert Improvements	052000094	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Palestine	FMS	City of Palestine Drainage System Expansion and Maintenance	052000095	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Angelina County	FMS	Angelina County Culvert Improvements	052000096	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Burke	FMS	City of Burke Drainage Ditch Capacity Upgrades	052000097	2029	$500,000	*Unknown*	$500,000	*Unknown*	*0%*	*100%*	*100%*
5	Chambers County	FMS	Chambers County Property Protection	052000098	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Cherokee County	FMS	Cherokee County Culvert Upgrades	052000099	2029	$2,000,000	*Unknown*	$2,000,000	*Other*	*0%*	*100%*	*100%*
5	City of Alto	FMS	City of Alto Culvert Improvements	052000100	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Reklaw	FMS	City of Reklaw Drainage System Upgrades	052000101	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rusk	FMS	City of Rusk Culvert Improvements	052000102	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Wells	FMS	City of Wells Culvert Improvements	052000103	2029	$1,000,000	*Unknown*	$1,000,000	*Taxes*	*100%*	*0%*	*100%*
5	Hardin County	FMS	Hardin County Culverts, Ditches, and Channel	052000104	2029	$3,000,000	*Unknown*	$3,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FMS	Hardin County Detention Ponds	052000105	2029	$1,000,000	*Unknown*	$1,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Hardin County	FMS	Hardin County Elevate Roads and Bridges	052000106	2029	$10,000,000	*Unknown*	##########	*State or Federal*	*0%*	*100%*	*100%*
5	City of Kountze	FMS	City of Kountze Culverts and Ditches	052000107	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Kountze	FMS	City of Kountze Elevate Roads and Bridges	052000108	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Kountze	FMS	City of Kountze General Drainage Improvements	052000109	2029	$1,500,000	*Unknown*	$1,500,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Lumberton	FMS	City of Lumberton Culverts, Ditches, and Channels	052000110	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FMS	City of Rose Hill Acres Flood Control Improvements	052000111	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Rose Hill Acres	FMS	City of Rose Hill Acres General Drainage Improvements	052000112	2029	$400,000	*Unknown*	$400,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Silsbee	FMS	City of Silsbee Detention, Culverts, Ditches and Channels	052000113	2029	$1,500,000	*Unknown*	$1,500,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Silsbee	FMS	City of Silsbee Drainage Ditches	052000114	2029	$1,000,000	*Unknown*	$1,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of SIlsbee	FMS	City of Silsbee Flood Mitigation for Hendrix Development	052000115	2029	$5,000,000	*Unknown*	$5,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Sour Lake	FMS	City of Sour Lake Channel Improvements	052000116	2029	$500,000	*Unknown*	$500,000	*State or Federal*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Sour Lake	FMS	City of Sour Lake Drainage Outfalls	052000117	2029	$1,000,000	*Unknown*	$1,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	City of Sour Lake	FMS	City of Sour Lake Stormwater Detention	052000118	2029	$7,000,000	*Unknown*	$7,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Drainage Culvert Upgrades	052000119	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Houston County	FMS	Houston County Flood Infrastructure Maintenance	052000120	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Grapeland	FMS	City of Grapeland Critical Facilities Flood-Proofing	052000121	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Kennard	FMS	City of Kennard Ditch Maintenance Program	052000122	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FMS	Liberty County Drainage Projects	052000123	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	City of Daisetta	FMS	City of Daisetta Culvert Maintenance and Upgrades	052000124	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FMS	OCDD Flood Infrastructure Improvements	052000125	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FMS	Polk County Facilities Hazard Hardening Retrofit	052000126	2029	$1,500,000	*Unknown*	$1,500,000	*Unknown*	*0%*	*100%*	*100%*
5	Polk County	FMS	Polk County Flood Infrastructure Improvements	052000127	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Henderson	FMS	City of Henderson Flood Infrastructure Maintenance	052000128	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Bridge Improvements	052000129	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Culvert Upgrades	052000130	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	San Augustine County	FMS	San Augustine County Facilities Hazard Hardening Retrofit	052000131	2029	$1,500,000	*Unknown*	$1,500,000	*Unknown*	*0%*	*100%*	*100%*
5	San Augustine County	FMS	San Augustine County Detention and Retention Pond Construction	052000132	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of San Augustine/City of Broaddus	FMS	City of San Augustine and City of Broaddus County Facilities Hazard Hardening Retrofit	052000133	2029	$1,000,000	*Unknown*	$1,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Detention and Retention Pond Construction	052000134	2029	$3,000,000	*Unknown*	$3,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Drainage Upgrades	052000135	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Shelby County	FMS	Shelby County Facilities Hazard Hardening Retrofit	052000136	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Shelby County	FMS	Shelby County Roadway/Bridge Elevation	052000137	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Tyler	FMS	City of Tyler Open Channel Improvements	052000138	2029	$1,500,000	*Unknown*	$1,500,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Whitehouse	FMS	City of Whitehouse Drainage Capacity Upgrades	052000139	2029	$1,000,000	*Unknown*	$1,000,000	*Other*	*0%*	*100%*	*100%*
5	Trinity County	FMS	Trinity County Flood Infrastructure Upgrades	052000140	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Trinity County	FMS	Trinity County Flood-prone Infrastructure Upgrades	052000141	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	City of Groveton	FMS	City of Groveton Flood Infrastructure Upgrades	052000142	2029	$750,000	*Unknown*	$750,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Van Zandt County	FMS	Van Zandt County Drainage Capacity Upgrades	052000143	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FMS	Van Zandt County Flood Infrastructure Maintenance	052000144	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Van Zandt County	FMS	Van Zandt County Road Elevation	052000145	2029	$2,000,000	*Unknown*	$2,000,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County	FMS	Liberty County Topographical Mapping Update	052000146	2029	$107,000	*Unknown*	$107,000	*Unknown*	*0%*	*100%*	*100%*
5	Liberty County Drainage District	FMS	Liberty County Drainage District Multi-County Coordination	052000147	2029	$50,000	*Unknown*	$50,000	*Unknown*	*0%*	*100%*	*100%*

Table 19: Results of FME, FMS, and FMP Funding Survey

RFPG Number	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan			Estimated percent (share) of total FMS, FMP, or FME estimated cost			
						Non-construction costs	Construction-related costs	Total estimated cost	Sponsor Funding		Other Funding Needed (including state, federal and/ or other funding)	TOTAL (auto) sum must = 100%
									ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)		
5	Jefferson County Drainage District 6	FMP	Bayou Din Detention Basin	053000001	2034	$0	$85,000,000	$85,000,000	*State or Federal*	*0%*	*100%*	*100%*
5	Orange County Drainage District	FMP	Bessie Heights Drainage Ditch Extension Project	053000002	2034	$0	$4,250,000	$4,250,000	*Unknown*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 6	FMP	Channel 100-A Concrete Repair	053000003	2034	$0	$39,570,866	$39,570,866	*State or Federal*	*0%*	*100%*	*100%*
5	Jefferson County Drainage District 7	FMP	Port Arthur and Vicinity Coastal Storm Risk Management Project	053000004	2035	$0	$863,000,000	$863,000,000	*State or Federal*	*35%*	*65%*	*100%*
5	Orange County Drainage District	FMP	Orange County Coastal Storm Risk Management Project	053000005	2035	$0	$119,900,000	$119,900,000	*State or Federal*	*35%*	*65%*	*100%*

APPENDIX 9-B
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CHAPTER 9. FLOOD INFRASTRUCTURE FINANCING ANALYSIS

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APPENDIX 10-A
COMMENTS RECEIVED ON DRAFT REGIONAL FLOOD PLAN AND RESPONSES

October 6, 2022

Neches River Flood Planning Group
Lower Neches Valley Authority
7850 Eastex Freeway
Beaumont, Texas 77708

Dear Members of the Neches River Flood Planning Group:

On behalf of the National Parks Conservation Association (NPCA), thank you for your time and effort to create the Draft 2023 Neches Regional Flood Plan to mitigate the impacts of flooding to communities and landscape in the Neches River basin. This first plan is extremely important to establish a framework for a strong and effective process to identify and recommend flood management evaluations, strategies and projects to reduce flood risk in the region. Completion of this first draft by the Regional Flood Planning Group (RFPG) is a significant accomplishment.

For over 100 years, NPCA has been dedicated to protecting and preserving America's national parks for current and future generations. Together, with our 1.7 million members and supporters, we speak up for the needs of our national park sites across the country. In southeast Texas, we've worked for more than a decade to enhance the resiliency of the Big Thicket National Preserve. Spread over 113,000 acres of land in 15 units across 7 counties, this national park is a cornerstone for conservation and an economic driver in the region.

Big Thicket National Park hosts upwards of 300,000 visitors annually, with a $28 million economic impact in 2021. The national park site, along with the neighboring landscape, is critical to protecting the long-term resiliency of our communities while increasing the ability to mitigate the growing impacts of climate change in the region. The increasing volatility of extreme weather events causes intense flooding in the region, adversely affecting the communities and residents of southeast Texas and the Big Thicket. These effects include the displacement of wildlife, impacts to park facilities and infrastructure and changes to the historical landscape of the area.

A robust regional flood plan with effective flood management evaluations, strategies and projects is critical to reducing the risks and impacts of flooding to communities and protecting unique treasures like the Big Thicket. We offer the following specific comments on the Draft 2023 Neches Regional Flood Plan to increase its ability to be a tool for protecting the Big Thicket and Neches River region.

- In Table 0-8, the recommended standard that "All municipalities should adopt minimum requirements outlined by FEMA for NFIP participation" is misleading. The accompanying text clearly indicates that requirements adopted should "at the least" meet benchmarks for participation, but this intent is not clear in the table, which is more likely to be read. The RFP should encourage standards above the minimum and clearly communicate this fully in its recommendations.

- While the inclusion in the recommendation is beneficial, the singular location of Nature-Based Solution [sic] as a recommended standard in the category of "New Development" in Table 0-9 is problematic. This conceptualization unnecessarily limits both the kinds of nature-based approaches to be considered and the contexts in which they should be considered. "New Development" can be ideal for such approaches, but so can infill, redevelopment, and brownfields. These approaches do not need to accompany development or construction at all. Nature-Based Solutions should both be elevated to its own category and also integrated into the guiding philosophy of each of the other categories and types.

- The RFPG goal included in Table 0-9 to "consider in all projects and…incorporate nature-based practices and floodplain preservation" is essential and significant, but the associated numerical targets are far too low. Corresponding goals included in the draft plan for the neighboring San Jacinto River basin, as an example, are dramatically higher. Given the expanse of differing needs and options for flood risk reduction in the region, nature-based practices should be included at a high rate from the very beginning.

- The discussion of evaluations of FME/FMS/FMPs states that quantifiable flood risk reduction is a heavily weighted criterion. This metric is a limited approach that discounts and even potentially removes critical tools for preventing flood risk and is contrary to the plan's stated goal of incorporating nature-based approaches. Taking a pre-disaster mitigation approach and preventing flood damage is widely recognized as the preferred approach. This also extends to preventing changes in the watershed that exacerbate future flood risk. Strategies like floodplain preservation and other nature-based approaches would automatically come up short when quantifying reduction alone is prioritized. The draft plan should be updated to more effectively weight criteria to ensure inclusion of flood prevention strategies and projects.

- We support the legislative recommendations to "incentivize buy-out programs to convert frequently flooded properties/neighborhoods into natural beneficial use areas" and "incentivize conservation easements for land in the 100-year floodplains," as well as the flood planning recommendation of promoting nature-based projects. These approaches are significant to meeting the regional flood planning charge to protect against loss of life and property. However, there is a sizable disconnect between these legislative recommendations and the actions included in the plan. The Regulatory and Guidance FMS partially accomplishes this goal to a limited extent. Buyout programs are also somewhat common and can contribute when done correctly. There are not any other FMS, FME, or FMPs described in the plan that adequately consider, much less incorporates, conservation easements or other nature-based approaches. Of over 300 recommended actions, only a few might be covered by these highlighted legislation and flood planning recommendations, and then only partially so. Identifying these as needs is substantial but addressing the glaring gap between goals and tangible action is crucial.

Abundant opportunities exist for flood prevention and reduction that can provide multiple benefits to drive strong local and regional economies while also preserving life and property. The Neches River basin is comprised of some of the highest-quality natural infrastructure and most widespread intact floodplains in Texas and includes many of the state's most feasible ecosystem restoration projects. Preservation and conservation of these resources should be a major component of the flood plan. The Neches Regional Flood Plan should give nature-based approaches the attention they deserve.

Thank you for your consideration of these comments, and your work to ensure a more resilient future for the Neches River basin, its communities, and residents.

Sincerely,

Cary Dupuy
Texas Regional Director

NPCA Texas Regional Office
1601 Clayton Lane, Suite 515W
Austin, Texas 78723

October 10, 2022

TEXAS PARKS & WILDLIFE

Life's better outside.®

Neches River Flood Planning Group
Lower Neches Valley River Authority
7850 Eastex Freeway
Beaumont, Texas 77708

Re: 2023 Neches River Basin Regional Flood Plan

Honorable Judge Jeff Branick,

In 2019 Senate Bills 7 and 8 established a regional and state flood planning process for Texas, aimed at better managing flood risk to reduce loss of life and property. As part of the process, Texas Parks and Wildlife Department (TPWD) was identified as a member of the regional flood planning groups (Texas Water Code Sec. 16.062). The mission of TPWD is to manage and conserve the natural and cultural resources of Texas and its ability to provide opportunities of hunting, fishing, and outdoor recreation for the use and enjoyment of present and future generations. TPWD values this opportunity to contribute to the flood planning process with the goal of enhancing flood risk management and achieving beneficial flood mitigation outcomes. Toward this effort TPWD members serve a dual role of supporting the voting membership in development of the plans and representing the natural resource interests of the state.

TPWD applauds the Neches Regional Flood Planning Group (RFPG) for their efforts in completing the inaugural regional flood plan (RFP) especially considering the abbreviated timeline. Through the exceptional efforts of the RFPG, this plan will be a meaningful tool for reducing flood impacts to society, especially in those disastrous events that cause loss of life and injury. Because this represents the initial region-wide plan, it has the potential to be precedent setting for subsequent iterations. As such, it is important this plan recognizes the role nature and nature-based solutions can play in flood risk management and promotes opportunities to protect, enhance and restore the flood mitigation benefits provided by natural landforms.

TPWD is supportive of the planning process outlined by the Texas Water Development Board (TWDB) because it aims to achieve an integrative flood risk management (FRM) approach that prioritizes risk reduction through implementation of floodplain management, land use regulations, policy, and a balanced use of grey and natural and nature-based (NNBS) flood mitigation measures that are formed by inclusive participation at all levels of society. TPWD believes this integrative approach, when implemented holistically, will achieve the maximum benefits for society and natural ecosystems while minimizing environmental impacts. Recent published works on FRM and NNBS (Bridges et al 2021, Glick et al 2020, World Wildlife Fund 2016, Sayers et al 2013) support TWDB integrative flood management approach and provide extensive resources for flood planners.

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AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

In the interest of achieving the state's flood risk management goals while protecting the state's fish and wildlife resources, TPWD reviewed regional flood plans based on the TWDB guidance principals as described in 31 TAC § 361 and 362. Special focus was provided on the following subset of guidance principals due to its relevance to fish and wildlife management. Does the draft flood plan use the best available science, data, models, and flood risk mapping?

- Does the draft flood plan consider the potential upstream and downstream effects, including environmental, of potential flood management strategies (and associated projects) of neighboring areas?
- Does the draft flood plan include strategies and projects that provide for a balance of structural and non-structural flood mitigation measures, including projects that use nature-based features that lead to long-term mitigation of flood risk?
- Does the draft flood plan consider natural systems and beneficial functions of floodplains, including flood peak attenuation and ecosystem services?
- Does the draft flood plan encourage flood mitigation design approaches that work with, rather than against, natural patterns and conditions of floodplains?
- Does the draft flood plan seek to not cause long-term impairment to the designated water quality as shown in the state water quality management plan as a result of a recommended flood management strategy or project?
- Does the draft flood plan consider benefits of flood management strategies to water quality, fish and wildlife, ecosystem function, and recreation, as appropriate?
- Does the draft flood plan minimize adverse environmental impacts and be in accordance with adopted environmental flow standards?
- Does the draft flood plan consider multi-use opportunities such as green space, parks, water quality, or recreation, portions of which could be funded, constructed, and or maintained by additional, third-party project participants?

Additionally, TPWD emphasizes that the following FRM concepts identified in the forementioned literature be incorporated into the RFP.

- Flood is a natural process that has many benefits to human and natural systems.
- Promoting some flooding as desirable and making room for water promotes native species, maintains vital ecosystem services, and reduces the chance of flooding elsewhere.
- Natural landscapes and watersheds provide flood mitigation functions that should be promoted, protected, enhanced, and restored.
- Prioritize risk reduction over flood control by focusing first on reducing loss of life and injury.
- Utilize limited resources fairly.
- Address flood risk using a portfolio approach, first implement non-structural (policy, land management, emergency management) followed by structural (grey and natural and nature-based) strategies.

- Criteria for assessing projects strategies should include a comprehensive suite of measures spanning economical, operational, societal, and environmental advantages and disadvantages. Assessments focusing on economics alone (number of buildings, acres) should be avoided.

Neches River Regional Flood Plan Comments

The Neches RFP recommends 157 Flood Management Evaluations (FMEs), five potentially feasible Flood Mitigation Projects (FMPs), and 147 Flood Management Strategies (FMSs) as part of the flood mitigation needs. All flood mitigation needs were evaluated for whether they included nature-based solutions. Out of the 157 FMEs, 37 include nature-based solutions for flood mitigation. No FMSs included nature-based solutions. Activities such as dredging and channelization are particularly impactful to natural environments and the resources that rely on these environments. Projects that include these activities should be evaluated for nature-based inclusions or alternatives. None of the FMPs include nature-based solutions. TPWD encourages NRFPG to continue to support the inclusion of nature-based solutions for flood mitigation and to include the ecological and societal benefits of flooding in any public education program.

Flood controls such as channelization and changes to the riparian zone of a waterbody can disconnect floodplains from the nutrient rich flood waters, degrade stream-side habitat, and impact the availability of resources for species of concern, such as Alligator Snapping Turtles (AST). ASTs were found in a recent study by Rosenbaum, et. al. (In press) to have the highest catch per unit effort in the Neches River. The presence of forest cover was the best predictor of occurrence of ASTs because of the increase in woody debris and available cover. TPWD would like to continue to work with the NRFPG to ensure conservation goals for ASTs and other Species of Greatest Conservation Need are met while also reducing negative impacts of flooding to populations and infrastructure.

Thank you for your consideration of these comments. TPWD looks forward to continuing to work with the planning group to develop flood plans that protect life and property but are also beneficial to the environment. Please contact me at (512) 389 – 8214 or at Marty.Kelly@TPWD.Texas.gov or Kirian Brown (903) 520 – 3821 or Kirian.Brown@TPWD.Texas.gov if you have any questions or comments.

Sincerely,

Marty Kelly
Water Resources Program Coordinator

MK:kb

References

Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. 2021. International Guidelines on Natural and Nature-Based Features for Flood Risk Management. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Glick, P., E. Powell, S. Schlesinger, J. Ritter, B.A. Stein, and A. Fuller. 2020. The Protective Value of Nature: A Review of the Effectiveness of Natural Infrastructure for Hazard Risk Reduction. Washington, DC:

Rosenbaum, D., D.C. Rudolph, D. Saenz, L.A. Fitzgerald, R.E. Melson, C.S. Collins, T.J. Hibbits, R.W. Maxey, P. Crump, C.M. Schalk. Distribution and demography of the alligator snapping turtle (*Macrochelys temminckii*) in Texas: a 20-year perspective. In press. Southeastern Naturalist.

World Wildlife Fund. 2016. Natural and Nature-based Flood Management: A Green Guide. Washington, DC: World Wildlife Fund. Http://envirodm.org/flood-managment 2016 WWF.

P. Sayers, Y. L.i, G. Galloway, E. Penning-Rowsell, F. Shen, K. Wen, Y. Chen, and T. Le Quesne. 2013. Flood Risk Management: A Strategic Approach. Paris, UNESCO.

My name is Mary Bernard. I am the director of the Big Thicket Biosphere Reserve, a conservation organization located in southern Hardin County.

On occasion, I have been able to phone into the Neches Regional Flood Planning Group meetings and I want to say how much I appreciate the work y'all are doing to improve flood management.

If I could, I'd like to recommend planning measures that enhance the natural functions of floodplains like nature-based applications that contribute to flood resilience.

Nature-based applications like planting trees, enhancing wetlands, or protecting streamside vegetation are a natural investment in flood management.

Nature-based applications can enhance water quality, resist soil erosion, absorb extreme rainfall events, and conserve biodiversity by improving habitats.

Natural vegetation along a river or stream can slow the flow of damaging floodwaters as well as add to the natural beauty of the watercourse.

For example, the Big Thicket Biosphere is currently engaged in grant work to enhance natural landscapes to improve Monarch Butterfly migration habitats by planting flowering plants in the Big Thicket.

Landscapes blanketed in flowering plants offer more than just natural beauty, they are offer an economic benefit in low-maintenance costs: they require no mowing, no pesticides, and no herbicides.

There are variety of innovative applications offered through nature-based flood planning, and we'd be happy to partner with the flood planning group to discuss implementing alternatives.

Good afternoon, Judge Branick, members of the Neches Regional Planning Board and distinguished guests.

I'd first like to Thank you for your service on this important community committee as well as hosting this public comment forum.

My name is Sandra Ramos, Texas Coastal Program Manager for the National Parks Conservation Association and a resident of the city of Beaumont, Jefferson County

For more than a decade, National Parks Conservation Association has served as a leader in building a more resilient Big Thicket, investing time and resources alongside local organizations and community stakeholders to restore, revive and renew this unique region, including restoring the longleaf pine and the upcoming reintroduction of the Red Cockaded Woodpecker into the National Park System's 1st National Preserve.

NPCA is growing a local coalition around the national park to restore important native habitat and connect the landscape to ensure a resilient economic and sustainable future for Big Thicket and the southeast Texas region.

Often referred to as a "biological crossroads," Big Thicket National Preserve contains an unusual mix of vastly different ecosystems, vegetation, land and water resources. From sand hills to swamps to forests and beyond, Big Thicket is a unique natural landscape in Beaumont's backyard, for local communities, families, and visitors from all over to explore and enjoy.

During Hurricane Harvey, Big Thicket experienced unprecedented flooding, with waterways reaching flooding levels never seen or experienced. High flood waters caused erosion and threatened park infrastructure and the storm washed out unpaved roadways in the park, displacing wildlife and left debris throughout the region, requiring extensive and expensive clean up and repairs.

Increased extreme weather and other impacts from structural development are harming the Big Thicket National Preserve and adjacent Southeast Texas communities.

Damages from these more intense and frequent storms and flooding could be reduced by decreasing future development in the flood plain and protecting and restoring land currently in the flood plain.

More importantly, we encourage the Neches Regional Flood Planning Group, as well as all flood planning groups in Texas, to consider and include historically protective, nature-based projects - not concrete infrastructure – to protect low-lying areas and surrounding communities from increasing storms and surging waters in the regional flood plan.

We know that healthy protective watersheds come from thoughtful flood projects.

Flooding is a big issue - a plan is only as good as the projects it moves forward. Historically protective nature-based projects provide more benefits than traditional structural alternatives including:

- Less infrastructure costs up front
- Less cost to maintain – which is important to our local governmental organizations that may not have the budget to maintain concrete and man-made infrastructure.
- Can benefit the community in more creative ways including the bolstering of Tourism including birding and outdoor recreation which in turn Bring in economic value to local communities.

  In 2021, Over 291,000 visitors came to the Big Thicket National Preserve and spent over $20 million in communities near the park. That spending supported 274 jobs in the local economy and this number continues to grow as outdoor recreation becomes more popular and people look to the outdoors as a sanctuary.

We strongly encourage you, as we will, to work with local entities to include more historically protective, nature-based Projects in the Neches Flood Plan moving forward to protect the Big Thicket and the Southeast Texas region.

Thank you for your time.

From: Stacey Francis
Sent: Thursday, October 20, 2022 12:30 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters, and thoughtful nature-based projects to conserve and protect these important lands allow local governments to spend less up front, cost less to maintain, and to do more within the region. Restoring wetlands that provide a natural buffer from increasing storms also create excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects that are under consideration will impact our local communities from continual flooding and increasing storms, as well as impact the Big Thicket National Preserve, a national park in our own backyard.

The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Stacey Francis

From: Ed Perry
Sent: Monday, September 26, 2022 3:40 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Ed Perry

From: Keely McLeod
Sent: Wednesday, September 21, 2022 11:37 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Keely McLeod

From: Roberto Molina
Sent: Monday, September 19, 2022 10:03 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Roberto Molina

From: Melinda Smiljanic
Sent: Monday, September 19, 2022 5:28 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Melinda Smiljanic

From: James Klein
Sent: Monday, September 19, 2022 3:52 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
James Klein

From: Don Barnhill
Sent: Sunday, September 18, 2022 8:42 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Don Barnhill

From: Kim George
Sent: Sunday, September 18, 2022 7:09 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Kim George

From: Sarah Sudheer
Sent: Sunday, September 18, 2022 2:40 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Sarah Sudheer

From: Joyce Ford
Sent: Sunday, September 18, 2022 3:36 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Joyce Ford

From: Jennifer Bowen-Shauver
Sent: Saturday, September 17, 2022 7:47 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Jennifer Bowen-Shauver

From: Gary Graham
Sent: Friday, September 16, 2022 1:46 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Gary Graham

From: Pat Perry
Sent: Friday, September 16, 2022 11:22 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Pat Perry

From: Corrine Alcantar
Sent: Thursday, September 15, 2022 9:52 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Corrine Alcantar

From: Dora Rushing
Sent: Thursday, September 15, 2022 9:35 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Dora Rushing

From: Corinne Pilon
Sent: Thursday, September 15, 2022 7:30 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Corinne Pilon

From: Eileen Mckee
Sent: Thursday, September 15, 2022 6:01 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Eileen Mckee

From: Jay Silver
Sent: Thursday, September 15, 2022 2:29 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Jay Silver

From: Sharon Frank
Sent: Thursday, September 15, 2022 1:30 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Sharon Frank

From: Amber Haseltine
Sent: Thursday, September 15, 2022 1:14 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Amber Haseltine

From: Kaveri Ray
Sent: Thursday, September 15, 2022 1:00 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned resident, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Kaveri Ray

From: Jane Van Praag
Sent: Thursday, September 15, 2022 12:41 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Jane Van Praag

From: Christian Richer
Sent: Thursday, September 15, 2022 12:13 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Christian Richer

From: Rajesh Iyer
Sent: Thursday, September 15, 2022 7:51 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Rajesh Iyer

From: Sabine Williams
Sent: Thursday, September 15, 2022 6:18 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Sabine Williams

From: Cathy Simmons
Sent: Thursday, September 15, 2022 1:52 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Cathy Simmons

From: Janet Delaney
Sent: Thursday, September 15, 2022 12:51 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Janet Delaney

From: Mark Olinger
Sent: Wednesday, September 14, 2022 3:11 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

Five years ago, during Hurricane Harvey, waterways surrounding Big Thicket National Preserve reached flood levels never seen before. High waters caused erosion and washed-out roadways in the park, displacing wildlife, and leaving debris throughout the region, requiring extensive, and expensive, clean-up and repairs.

Big Thicket is a cornerstone of conservation. Its pristine environments and diverse ecosystems preserve rare plants as well as endangered and threatened animals. It protects watersheds that provide safe drinking water and forests that store carbon. And it connects millions of people to the power of nature in ways few other places can. But for parks to be ecologically healthy, so must the surrounding lands and waters.

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Mark Olinger

From: Deborah Dewey
Sent: Wednesday, September 14, 2022 11:30 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Deborah Dewey

From: Thomas Haines
Sent: Wednesday, September 14, 2022 11:05 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Thomas Haines

From: Dallas Windham
Sent: Wednesday, September 14, 2022 10:50 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Dallas Windham

From: Dr. Fielder
Sent: Wednesday, September 14, 2022 10:47 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Dr. Fielder

From: Ellen Isaly
Sent: Wednesday, September 14, 2022 10:16 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Ellen Isaly

From: Alyssa Melton
Sent: Wednesday, September 14, 2022 10:14 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Alyssa Melton

From: Polly Martin
Sent: Wednesday, September 14, 2022 10:08 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Polly Martin

From: Greg Sells
Sent: Wednesday, September 14, 2022 10:04 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters, and thoughtful nature-based projects to conserve and protect these important lands allow local governments to spend less up front, cost less to maintain, and to do more within the region. Restoring wetlands that provide a natural buffer from increasing storms also create excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects that are under consideration will impact our local communities from continual flooding and increasing storms, as well as impact the Big Thicket National Preserve, a national park in our own backyard.

The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Greg Sells

From: Trigg Wright
Sent: Wednesday, September 14, 2022 9:22 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Trigg Wright

From: Karen Kawszan
Sent: Wednesday, September 14, 2022 9:21 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Karen Kawszan

From: Nicholas Gonzales
Sent: Wednesday, September 14, 2022 9:16 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

"A Society grows great when old men plant trees whose shade they know they shall never sit in"

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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"There is none which compares in importance with the great central task of leaving this land even a better land for our descendants than it is for us"

-Theodore Roosevelt

Regards,
Nicholas Gonzales

From: Cody Winstead
Sent: Wednesday, September 14, 2022 9:08 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Cody Winstead

From: Bridgett Rexford
Sent: Wednesday, September 14, 2022 8:47 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Bridgett Rexford

From: Judith Cherry
Sent: Wednesday, September 14, 2022 8:25 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Judith Cherry

From: Nina Davis
Sent: Wednesday, September 14, 2022 7:54 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Nina Davis

From: Christine Lockhart
Sent: Wednesday, September 14, 2022 7:51 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Christine Lockhart

From: Alison Abbott
Sent: Wednesday, September 14, 2022 7:46 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Alison Abbott

From: Chad Fuqua
Sent: Wednesday, September 14, 2022 7:13 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Chad Fuqua

From: Deborah Zarett
Sent: Wednesday, September 14, 2022 6:57 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Deborah Zarett

From: Stephen Englander
Sent: Wednesday, September 14, 2022 6:32 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Stephen Englander

From: Pamela Vangiessen
Sent: Wednesday, September 14, 2022 6:10 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Pamela Vangiessen

From: Cheryl Robison
Sent: Wednesday, September 14, 2022 5:42 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Cheryl Robison

From: Jerry Morrisey
Sent: Wednesday, September 14, 2022 5:31 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Jerry Morrisey

From: Mary Thornton
Sent: Wednesday, September 14, 2022 5:16 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Mary Thornton

From: Dan Roark
Sent: Wednesday, September 14, 2022 5:10 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Dan Roark

From: Edith Brown
Sent: Wednesday, September 14, 2022 5:01 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Edith Brown

From: Garry Kramchak
Sent: Wednesday, September 14, 2022 4:55 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Garry Kramchak

From: Dave Cross
Sent: Wednesday, September 14, 2022 4:35 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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With my sincere gratitude!

Regards,
Dave Cross

From: Leslie Arceneaux
Sent: Wednesday, September 14, 2022 4:28 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Leslie Arceneaux

From: Juanita Romero
Sent: Wednesday, September 14, 2022 4:19 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Juanita Romero

From: Pam Sohan
Sent: Wednesday, September 14, 2022 4:13 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters, and thoughtful nature-based projects to conserve and protect these important lands allow local governments to spend less up front, cost less to maintain, and to do more within the region. Restoring wetlands that provide a natural buffer from increasing storms also create excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects that are under consideration will impact our local communities from continual flooding and increasing storms, as well as impact the Big Thicket National Preserve, a national park in our own backyard.

The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Pam Sohan

From: Kimberly Allen
Sent: Wednesday, September 14, 2022 3:30 PM
To: NechesRFPG
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Regards,
Kimberly Allen

From: Chantal Eldridge
Sent: Wednesday, September 14, 2022 3:27 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Chantal Eldridge

From: Carol Clark
Sent: Wednesday, September 14, 2022 3:15 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Carol Clark

From: Bonni Scudder
Sent: Wednesday, September 14, 2022 3:12 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Bonni Scudder

From: Mark Olinger
Sent: Wednesday, September 14, 2022 3:11 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

Five years ago, during Hurricane Harvey, waterways surrounding Big Thicket National Preserve reached flood levels never seen before. High waters caused erosion and washed-out roadways in the park, displacing wildlife, and leaving debris throughout the region, requiring extensive, and expensive, clean-up and repairs.

Big Thicket is a cornerstone of conservation. Its pristine environments and diverse ecosystems preserve rare plants as well as endangered and threatened animals. It protects watersheds that provide safe drinking water and forests that store carbon. And it connects millions of people to the power of nature in ways few other places can. But for parks to be ecologically healthy, so must the surrounding lands and waters.

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Regards,
Mark Olinger

From: Ladonna Martin
Sent: Wednesday, September 14, 2022 3:04 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Ladonna Martin

From: Jennifer Holburn
Sent: Wednesday, September 14, 2022 2:58 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Jennifer Holburn

From: Sally Votteler
Sent: Wednesday, September 14, 2022 2:44 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Sally Votteler

From: Victoria Shih
Sent: Wednesday, September 14, 2022 2:44 PM
To: NechesRFPG
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Regards,
Victoria Shih

From: joanne burrows
Sent: Wednesday, September 14, 2022 2:25 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
joanne burrows

From: Fred Grimes
Sent: Wednesday, September 14, 2022 2:19 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Fred Grimes

From: Memfis Madyun
Sent: Wednesday, September 14, 2022 2:16 PM
To: NechesRFPG
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Regards,
Memfis Madyun

From: LauraL Vera
Sent: Wednesday, September 14, 2022 2:11 PM
To: NechesRFPG
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Regards,
LauraL Vera

From: Susan Betourne
Sent: Wednesday, September 14, 2022 2:08 PM
To: NechesRFPG
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Regards,
Susan Betourne

From: Mary Hancock
Sent: Wednesday, September 14, 2022 1:47 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Mary Hancock

From: Virginia Boucher
Sent: Wednesday, September 14, 2022 1:43 PM
To: NechesRFPG
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Regards,
Virginia Boucher

From: Bari Brookman
Sent: Wednesday, September 14, 2022 1:12 PM
To: NechesRFPG
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Bari Brookman

From: Ben Liles
Sent: Wednesday, September 14, 2022 1:12 PM
To: NechesRFPG
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From: Stacey Benham
Sent: Wednesday, September 14, 2022 1:12 PM
To: NechesRFPG
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Regards,
Stacey Benham

From: Priscilla Flores
Sent: Wednesday, September 14, 2022 1:11 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Priscilla Flores

From: Sandra La Mont
Sent: Wednesday, September 14, 2022 12:49 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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From: Francisco Salazar
Sent: Wednesday, September 14, 2022 12:47 PM
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The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Francisco Salazar

From: Andrew Jackson
Sent: Wednesday, September 14, 2022 12:46 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Andrew Jackson

From: Tina Weber
Sent: Wednesday, September 14, 2022 12:45 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Tina Weber

From: Sahand Naghavi
Sent: Wednesday, September 14, 2022 12:41 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Sahand Naghavi

From: Valerie Howell
Sent: Wednesday, September 14, 2022 12:41 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Valerie Howell

From: Linda Schmalstieg
Sent: Wednesday, September 14, 2022 12:37 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Linda Schmalstieg

From: Kelly Massey
Sent: Wednesday, September 14, 2022 12:29 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Kelly Massey

From: Solianni Cantu
Sent: Wednesday, September 14, 2022 12:14 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Solianni Cantu

From: Geanda Guidry
Sent: Wednesday, September 14, 2022 12:10 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Geanda Guidry

From: michael earney
Sent: Wednesday, September 14, 2022 12:09 PM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
michael earney

From: Jerell Lambert
Sent: Wednesday, September 14, 2022 11:57 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

I would like to see a strong framework of effective flood mitigation projects that reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan.

As currently written, our communities could be missing a huge opportunity to do the right thing right for communities and the environment..

We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters.

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Restoring wetlands that provide a natural buffer from increasing storms also creates excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects currently under consideration will protect our local communities from continual flooding and increasing storms, and how they impact the Big Thicket National Preserve, a national park in our own backyard.

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Regards,
Jerell Lambert

From: Angela Wilkinson
Sent: Wednesday, September 14, 2022 11:47 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Angela Wilkinson

From: Tanya Teneyuque
Sent: Wednesday, September 14, 2022 11:43 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Tanya Teneyuque

From: Stacy Moranville
Sent: Wednesday, September 14, 2022 11:43 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Stacy Moranville

From: Linda Reynolds
Sent: Wednesday, September 14, 2022 11:43 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Linda Reynolds

From: Marce Walsh
Sent: Wednesday, September 14, 2022 11:38 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Marce Walsh

From: Robert Yowell
Sent: Wednesday, September 14, 2022 11:30 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Robert Yowell

From: Deanna Pena
Sent: Wednesday, September 14, 2022 11:30 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Deanna Pena

From: Doug Young
Sent: Wednesday, September 14, 2022 11:23 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Doug Young

From: Sandra Breakfield
Sent: Wednesday, September 14, 2022 11:22 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Sandra Breakfield

From: Julie Sears
Sent: Wednesday, September 14, 2022 11:18 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Julie Sears

From: Claire Bush
Sent: Wednesday, September 14, 2022 11:13 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Claire Bush

From: Donald Cook
Sent: Wednesday, September 14, 2022 11:12 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Donald Cook

From: Andrea Christgau
Sent: Wednesday, September 14, 2022 11:11 AM
To: NechesRFPG
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Dear Neches Regional Flood Planning Group,

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We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters, and thoughtful nature-based projects to conserve and protect these important lands allow local governments to spend less up front, cost less to maintain, and to do more within the region. Restoring wetlands that provide a natural buffer from increasing storms also create excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects that are under consideration will impact our local communities from continual flooding and increasing storms, as well as impact the Big Thicket National Preserve, a national park in our own backyard.

The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

Regards,
Andrea Christgau

From: Pat LaStrapes
Sent: Wednesday, September 14, 2022 11:10 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Pat LaStrapes

From: joanne groshardt
Sent: Wednesday, September 14, 2022 11:09 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
joanne groshardt

From: Dennis Harper
Sent: Wednesday, September 14, 2022 11:01 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Dennis Harper

From: Taryn Geer
Sent: Wednesday, September 14, 2022 10:59 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Taryn Geer

From: Lisa Renzelmann
Sent: Wednesday, September 14, 2022 10:56 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Lisa Renzelmann

From: Gloria Gannaway
Sent: Wednesday, September 14, 2022 10:54 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Gloria Gannaway

From: Pamela Askew
Sent: Wednesday, September 14, 2022 10:53 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

Please protect Big Thicket and other vital wetlands from dangerous flooding.
As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Pamela Askew

From: Glory Arroyos
Sent: Wednesday, September 14, 2022 10:50 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Glory Arroyos

From: Chris Brunner
Sent: Wednesday, September 14, 2022 10:48 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Chris Brunner

From: Nicole Allison
Sent: Wednesday, September 14, 2022 10:43 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

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Regards,
Nicole Allison

From: Leslie Lee
Sent: Wednesday, September 14, 2022 10:41 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Leslie Lee

From: Sara Wood
Sent: Wednesday, September 14, 2022 10:38 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Sara Wood

From: Karl Fickling
Sent: Wednesday, September 14, 2022 10:33 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Karl Fickling

From: Leslie Richardson
Sent: Wednesday, September 14, 2022 10:33 AM
To: NechesRFPG
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Regards,
Leslie Richardson

From: Catherine Lacroix
Sent: Wednesday, September 14, 2022 10:28 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Catherine Lacroix

From: Andres Venegas
Sent: Wednesday, September 14, 2022 10:25 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Andres Venegas

From: Tracey Bonner
Sent: Wednesday, September 14, 2022 10:25 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Tracey Bonner

From: Jay Crail
Sent: Wednesday, September 14, 2022 10:25 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Jay Crail

From: Carolyn Nieland
Sent: Wednesday, September 14, 2022 10:23 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Carolyn Nieland

From: Thomas Nieland
Sent: Wednesday, September 14, 2022 10:23 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Thomas Nieland

From: John McIntosh
Sent: Wednesday, September 14, 2022 10:20 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
John McIntosh

From: Morris Narunsky
Sent: Wednesday, September 14, 2022 10:15 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

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Regards,
Morris Narunsky

From: Benjamin Garrett
Sent: Wednesday, September 14, 2022 10:14 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

Dear Neches Regional Flood Planning Group,

As a concerned citizen, I would like to see a strong framework and effective flood mitigation projects to reduce the impact of flooding in our communities by using protective nature-based projects in the Neches 2023 Regional Flood Plan. As currently written, our communities could be missing a huge opportunity to do the right thing, right from the start.

We know that healthy watersheds and functioning flood plains and wetlands can absorb and slow down flood waters, and thoughtful nature-based projects to conserve and protect these important lands allow local governments to spend less up front, cost less to maintain, and to do more within the region. Restoring wetlands that provide a natural buffer from increasing storms also create excellent wildlife viewing areas. This in turn provides opportunities for local communities to attract tourism dollars from wildlife and outdoor enthusiasts.

We must understand how the projects that are under consideration will impact our local communities from continual flooding and increasing storms, as well as impact the Big Thicket National Preserve, a national park in our own backyard.

The current plan needs more nature-based solutions to reduce the impacts of flooding, and additional information on how effective projects will be in reducing flooding.

We ask for you to continue strengthening the plan and working with local community leaders to incorporate more nature-based projects in the plan to ensure the natural resiliency and continued protection of the Big Thicket region and our communities.

We must leave a planet that our grandchildren and their grandchildren can exist on.

Regards,
Benjamin Garrett

From: Debra Atlas
Sent: Wednesday, September 14, 2022 10:13 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Debra Atlas

From: Lori Hester
Sent: Wednesday, September 14, 2022 10:09 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Lori Hester

From: Michael Spradlin
Sent: Wednesday, September 14, 2022 10:08 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Michael Spradlin

From: James Patak
Sent: Wednesday, September 14, 2022 10:07 AM
To: NechesRFPG
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Regards,
James Patak

From: Thomas Nieland
Sent: Wednesday, September 14, 2022 10:06 AM
To: NechesRFPG
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Regards,
Thomas Nieland

From: Stephanie Cormier
Sent: Wednesday, September 14, 2022 10:02 AM
To: NechesRFPG
Subject: Big Thicket National Preserve needs your help.

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Regards,
Stephanie Cormier