MINOR REVISION
WATERSHED WORK PLAN

Big Creek Watershed
Brazos County, Texas
December 1966

The Big Creek watershed work plan was developed in 1962. Since that time the Missouri-Pacific Railroad, whose track influenced the location and design of floodwater retarding structures, has discontinued operation and removed the track through the watershed. This prompted the sponsors to request a revision of the work plan in order to reduce both local and Federal costs for project installation.

The proposed changes include:

(1) Relocating floodwater retarding structure No. 1 upstream approximately 6,800 feet and renumbering as No. 1A.

(2) Relocating floodwater retarding structure No. 2 approximately 2,800 feet downstream and renumbering as No. 2A.

(3) Changing classification of floodwater retarding structures Nos. 3 and 5 from "B" to "A," based on removal of railroad.

(4) Deleting original floodwater retarding structure No. 4 and adding structures 4A and 4B upstream approximately 8,400 feet and 2,600 feet, respectively.

For purposes of comparison, total cost of structural measures, annual cost of structural measures, and benefit-cost ratio accruing to structural measures have been calculated: (1) as planned, (2) as planned, with costs updated to current level, and (3) as revised using current costs. Installation costs were calculated at the interest rate of 2.625 percent in the plan. Floodwater retarding structures were amortized for 50 years and stream channel improvement for 25 years. This revision and the plan updated to current costs use the current interest rate of 3.125 percent and an amortization period of 50 years for all structural measures.

The completed evaluation of proposed structural changes showed the following effect on Big Creek watershed:

1. Change in annual damages: None

2. Change in total cost of structural measures (dollars):

	PL 566	Other	Total
As Planned	924,091	232,442	1,156,533
As Planned (Costs updated)	1,053,464	264,984	1,318,448
As Revised	905,067	191,617	1,096,684
	- 148,397	- 73,367	- 221,764

3. Change in annual cost of structural measures (dollars):

	Installation	O & M	Total
As Planned	53,777 1/	8,320	62,097
As Planned (Costs updated)	52,461 2/	8,320	60,781
As Revised	43,637 2/	8,329	51,966
	- 8,824	+ 9	- 8,815

1/ Floodwater retarding structures were amortized for 50 years and stream channel improvement for 25 years at 2.625 percent.
2/ All structural measures amortized for 50 years at 3.125 percent.

4. Change in drainage area controlled by floodwater retarding structures:

As Planned	16.08 square miles	(39.22 percent)
As Revised	12.09 square miles	(29.49 percent)
	- 3.99 square miles	(-9.73 percent)

This loss in control has been partially offset by the construction, by an individual landowner, of a reservoir having a capacity for 312 acre-feet of floodwater detention.

5. Change in area benefited by floodwater retarding structures (acres):

As Planned	3,462
As Revised	3,567
	+ 105

6. Change in area flooded by design storm (24-hour, 5-year frequency) (acres):

As Planned	271
As Revised	588 1/
	+317

1/ Includes 86 acres in evaluation reach C-1 which were located in pool area of Site 4.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Big Creek Watershed, Texas

Installation Cost Item	Unit	Number to be Applied 1/	Estimated Cost (Dollars) 2/ Public Law 566 Funds	Other Funds	Total
Land Treatment					
Soil Conservation Service					
Conservation Cropping System	Acre	9,500	-	16,351	16,351
Cover & Green Manure Crops	Acre	3,000	-	22,080	22,080
Crop Residue Use	Acre	9,500	-	-	-
Grassland Renovation	Acre	3,800	-	53,200	53,200
Proper Pasture Use	Acre	9,000	-	-	-
Pasture Planting	Acre	650	-	13,000	13,000
Brush Control	Acre	650	-	26,000	26,000
Farm Ponds	No.	18	-	7,200	7,200
Drainage	Acre	782	-	6,256	6,256
Structures for Water Control	No.	25	-	6,250	6,250
Land Smoothing	Acre	200	-	2,800	2,800
Mains and Laterals	Foot	33,400	-	33,100	33,100
Surface Field Ditches	Foot	32,000	-	-	-
Technical Assistance			3,690	3,330	7,020
SCS Subtotal			3,690	189,567	193,257
TOTAL LAND TREATMENT			3,690	189,567	193,257
STRUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	7	337,700	-	337,700
Stream Channel Improvement	Foot	128,670	375,328	51,472	426,800
SCS Subtotal			713,028	51,472	764,500
Subtotal - Construction			713,028	51,472	764,500
Installation Services					
Soil Conservation Service					
Engineering Service			124,268	-	124,268
Other			67,771	-	67,771
SCS Subtotal			192,039	-	192,039
Subtotal - Installation Services			192,039	-	192,039
Other Costs					
Land, Easements, & Rights-of-Way			-	135,645	135,645
Administration of Contracts			-	4,500	4,500
Subtotal - Other			-	140,145	140,145
TOTAL STRUCTURAL MEASURES			905,067	191,617	1,096,684
TOTAL PROJECT			908,757	381,184	1,289,941
SUMMARY					
Subtotal SCS			908,757	381,184	1,289,941
TOTAL PROJECT			908,757	381,184	1,289,941

1/ No Federal lands involved.
2/ Price Base: 1966

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7. Change in reduction in annual damages (percent):

As Planned	98
As Revised	92
	- 6

8. Change in annual benefits from structural measures (dollars):

As Planned	210,826
As Revised	206,835
	- 3,991

9. Change in benefit-cost ratio:

As Planned	3.4:1.0
As Planned (Costs updated)	3.5:1.0
As Revised	4.0:1.0

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Big Creek Watershed, Texas
(Dollars) 1/

Structure Site No. or Name	Installation Cost-Public Law 566: Construction	Installation Services: Engineering	Installation Services: Other	Total Public Law 566	Installation Cost - Other Funds: Construction	Other: Adm. of Contracts	Other: Easements & R/W	Total Other	Total Installation Cost
1A	33,000	7,260	3,070	43,330	-	500	7,475	7,975	51,305
2A	67,100	10,065	5,884	83,049	-	500	10,500	11,000	94,049
3	41,800	7,524	3,761	53,085	-	500	4,450	4,950	58,035
4A	50,600	9,108	4,552	64,260	-	500	3,075	3,575	67,835
4B	61,600	9,240	5,402	76,242	-	500	2,175	2,675	78,917
5	28,600	7,150	2,726	38,476	-	500	1,000	1,500	39,976
6 2/	55,000	9,900	4,949	69,849	-	500	2,700	3,200	73,049
Subtotal	337,700	60,247	30,344	428,291	-	3,500	31,375	34,875	463,166
Stream Channel Improvement									
Big Creek	254,021	42,933	25,098	322,052	32,199	500	56,800	89,499	411,551
Big Creek Slough	85,910	14,520	8,488	108,918	10,890	500	31,800	43,190	152,108
Ditch D1	17,768	3,003	1,756	22,527	2,252	-	7,800	10,052	32,579
Subtotal	357,699	60,456	35,342	453,497	45,341	1,000	96,400	142,741	596,238
Group Laterals	17,629	3,565	2,085	23,279	6,131	-	7,870	14,001	37,280
GRAND TOTAL	713,028	124,268	67,771	905,067	51,472	4,500	135,645	191,617	1,096,684

1/ Price Base: 1966.
2/ Includes the estimated cost of the floodwater diversion

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TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Big Creek Watershed, Texas

(Dollars) 1/

Item	Purpose: Flood Prevention	Purpose: Drainage	Total
COST ALLOCATION			
Single Purpose			
Floodwater Retarding Structures	463,166	-	463,166
Multiple Purpose			
Mains	475,857	120,381	596,238
Group Laterals	18,640	18,640	37,280
Total	957,663	139,021	1,096,684
COST SHARING			
Public Law 566			
Construction	671,246	41,782	713,028
Installation Services	169,872	22,167	192,039
Total Public Law 566	841,118	63,949	905,067
Other			
Construction	-	51,472	51,472
Administration of Contracts	4,298	202	4,500
Land, Easements, and Rights-of-Way	112,247	23,398	135,645
Total Other	116,545	75,072	191,617
Total	957,663	139,021	1,096,684

1/ Price Base: 1966

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES

Big Creek Watershed, Texas

Item	Unit	Structure Number 1A	2A	3	4A	4B	5	6	Total
Drainage Area	Sq. Mi.	2.26	4.10	1.05	2.20	1.27	.44	.77	12.09
Storage Capacity									
Sediment Pool (200 acre-feet or less)	Ac. Ft.	36	66	17	35	20	19	21	214
Sediment Reserve (Below riser)	Ac. Ft.	-	-	-	-	-	-	-	-
Sediment in Detention Pool	Ac. Ft.	12	22	5	12	7	4	8	70
Floodwater Pool	Ac. Ft.	876	1,454	400	800	464	166	279	4,439
Total	Ac. Ft.	924	1,542	422	847	491	189	308	4,723
Surface Area									
Sediment Pool 1/	Acre	15	30	7	16	9	5	8	90
Floodwater Pool	Acre	123	172	65	85	52	19	30	546
Volume of Fill	Cu. Yd.	48,000	99,000	60,000	79,000	103,000	46,000	82,000	517,000
Elevation Top of Dam	Foot	243.8	224.7	248.6	254.6	230.8	231.3	224.9	xxx
Maximum Height of Dam 2/	Foot	29	28	28	32	29	29	29	xxx
Emergency Spillway									
Crest Elevation	Foot	240.0	220.5	245.5	250.5	227.5	228.0	220.5	xxx
Bottom Width	Foot	80	120	60	100	120	50	50	xxx
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	xxx
Percent Chance of Use 3/		2.9	3.0	2.9	3.0	3.1	3.4	3.3	xxx
Average Curve No. - Condition II		80	75	79	79	78	81	77	xxx
Emergency Spillway Hydrograph									
Storm Rainfall (6-hour) 4/	Inch	7.13	6.95	7.32	7.13	7.27	7.46	7.37	xxx
Storm Runoff	Inch	4.82	4.10	4.88	4.71	4.73	5.23	5.14	xxx
Velocity of Flow (V_c)	Ft./Sec.	0	0	0	0	0	0	0	xxx
Discharge Rate	C.F.S.	0	0	0	0	0	0	0	xxx
Maximum Water Surface Elevation	Foot	-	-	-	-	-	-	-	xxx
Freeboard Hydrograph									
Storm Rainfall (6-hour) 5/	Inch	17.53	17.08	17.99	17.53	17.88	18.34	18.13	xxx
Storm Runoff	Inch	14.85	13.64	15.15	14.70	14.90	15.79	14.98	xxx
Velocity of Flow (V_c) 6/	Ft./Sec.	8.3	8.8	7.5	8.4	7.7	7.7	9.1	xxx
Discharge Rate 7/	C.F.S.	1,437	2,580	769	1,887	1,668	703	1,175	xxx
Maximum Water Surface Elevation 7/	Foot	243.8	224.7	248.6	254.6	230.8	231.3	224.9	xxx
Principal Spillway									
Capacity - Low Stage (Maximum)	C.F.S.	23	41	11	22	13	5	5	xxx
Capacity Equivalents									
Sediment Volume	Inch	.30	.30	.30	.30	.30	.80	.52	xxx
Sediment Reserve Volume (Below riser)	Inch	-	-	-	-	-	-	-	xxx
Sediment in Detention Pool	Inch	.10	.10	.09	.10	.10	.20	.20	xxx
Detention Volume	Inch	7.27	6.65	7.15	6.82	6.85	7.05	6.78	xxx
Spillway Storage 8/	Inch	4.43	3.75	4.76	4.52	2.85	3.15	3.70	xxx
Class of Structure		A	A	A	A	A	A	A	xxx

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1/ Surface area to the top of the riser.

2/ Difference in elevation between the top of the settled dam and the bottom of the stream channel.

3/ Is the average number of times the emergency spillway will be expected to function in 100 years, based on a regional analysis of gaged runoff.

4/ Storm rainfall is the 6-hour rainfall shown on figure 3.21-1, NEH-4, Supplement A, multiplied by .5.

5/ Storm rainfall is the 6-hour rainfall shown on figure 3.21-1, NEH-4, Supplement A, multiplied by 1.23.

6/ Obtained from curves drawn from figure 4-R-11472 revised 3-59 and ES-98 dated 4-27-55, based on flowed obtained from routing of hydrographs.

7/ Values ohtained from routing.

8/ Watershed inches stored between the emergency spillway crest and the top of the settled dam.

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TABLE 3A - STRUCTURE DATA
GRADE STABILIZATION STRUCTURES
Big Creek Watershed, Texas

Item	Structural Site Number	Drainage Area 1/ (acres)	Drop (feet)	Required Capacity (c.f.s.)
Big Creek	101	85	8.9	77
	102	755	9.1	389
	103	416	12.1	292
	104	109	12.1	85
	105	166	12.1	17
	106	115	10.5	92
	107	102	10.1	11
	108	634	10.3	318
	109	1,472	9.7	100
	110	230	10.0	170
	111	365	9.6	31
	112	480	9.9	330
	113	256	12.4	138
	114	365	12.4	31
	115	38	9.3	34
	116	26	9.6	51
	117	819	11.5	720
	118	218	10.2	163
	119	1,288	6.1	88
	120	1,031	6.8	75
	51 additional small standard drops			
Big Creek Slough	201	965	3.8	209
	202	250	5.8	23
	203	398	4.8	204
	204	70	4.5	20
	205	83	4.4	31
	206	231	5.4	21
	207	250	4.3	23
	17 additional small standard drops			
Ditch D1	301	57	4.3	51
	302	40	5.4	27
	303	114	7.4	92
	304	64	7.3	54
	305	260	5.9	24
	306	240	4.9	22
	307	84	5.5	75
	5 additional small standard drops			
Lateral 6	401	471	4.0	39
	402	206	3.8	19
	2 additional small standard drops			

1/ Does not include the drainage area controlled by floodwater retarding structures.

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TABLE 3B - STRUCTURE DATA

CHANNELS

Big Creek Watershed, Texas

Channel Designation	Station Numbering for Reach: Station (100 ft.)	Station (100 ft.)	Watershed Area 1/ (sq. mi.)	Required Capacity 2/ (c.f.s.)	Planned Channel Capacity (c.f.s.)	Average Bottom Width (feet)	Average Side Slope	Average Depth (feet)	Average Grade (pct.)	Average Velocity in Channel (ft./sec.)	Volume of Excavation (1,000 cu.yds.)
Big Creek	0+00	9+25	1.48	58	61	4	2:1	3.6	0.085	1.53	
	9+25	10+25	Transition Section								
	10+25	26+95	1.53	69	73	4	2:1	4.0	0.050	1.40	
	26+95	28+95	Transition Section								
	28+95	35+95	1.65	97	95	4	2:1	4.9	0.050	1.40	
	35+95	36+95	Transition Section								
	36+95	51+15	2.17	168	170	4	2:1	6.0	0.050	1.77	
	51+15	52+15	Transition Section								
	52+15	66+20	2.25	209	212	4	2:1	6.6	0.050	1.88	
	66+20	67+20	Transition Section								
	67+20	68+15	2.25	209	219	8	2:1	8.0	0.010	1.14	
	68+15	69+15	Transition Section								
	69+15	95+15	2.54	340	330	10	2:1	9.0	0.010	1.27	
	95+15	96+15	Transition Section								
	96+15	105+40	3.58	550	560	12	2:1	10.3	0.010	1.62	
	105+40	106+40	Transition Section								
	106+40	156+05	4.99	687	682	12	2:1	11.5	0.010	1.69	
	156+05	157+05	Transition Section								
	157+05	168+15	5.71	910	912	14	2:1	12.7	0.010	1.82	
	168+15	169+15	Transition Section								
	169+15	203+00	6.15	965	962	14	2:1	13.0	0.010	1.85	
	203+00	204+00	Transition Section								
	204+00	240+00	6.78	1,020	1,030	14	2:1	13.4	0.010	1.88	
	240+00	270+00	6.84	1,104	1,104	14	2:1	11.3	0.030	2.70	
	270+00	271+00	Transition Section								
	271+00	291+65	8.12	1,424	1,485	16	2:1	12.0	0.030	3.10	
	291+65	292+65	Transition Section								
	292+65	298+70	10.21	1,633	1,675	20	2:1	12.0	0.030	3.17	
	298+70	299+70	Transition Section								
	299+70	345+45	12.06	1,762	1,780	22	2:1	12.0	0.030	3.22	
	345+45	346+45	Transition Section								
	346+45	412+75	13.22	1,935	1,968	26	2:1	12.0	0.030	3.28	
	412+75	413+75	Transition Section								
	413+75	592+15	19.06	2,399	2,365	34	2:1	12.0	0.030	3.40	
	592+15	593+15	Transition Section								
	593+15	606+70	20.43	2,581	2,570	38	2:1	12.0	0.030	3.46	
	606+70	607+70	Transition Section								
	607+70	640+20	21.49	2,724	2,670	40	2:1	12.0	0.030	3.48	1,156.1

(Footnotes on last page table 3B)

TABLE 3B - STRUCTURE DATA - Continued

CHANNELS

Big Creek Watershed, Texas

Designation	Station Numbering for Reach: Station (100 ft.)	Station (100 ft.)	Watershed Area 1/ (sq. mi.)	Required Capacity 2/ (c.f.s.)	Planned Channel Capacity (c.f.s.)	Average Bottom Width (feet)	Average Side Slope	Average Depth (feet)	Average Grade (pct.)	Average Velocity in Channel (ft./sec.)	Volume of Excavation (1,000 cu. yds.)
Big Creek Slough	14+00	110+70	6.44	858	858	60	2:1	7.2	0.010	1.60	
	110+70	114+65	6.15	832	838	60	2:1	7.1	0.010	1.59	
	114+65	115+65	Transition Section								
	115+65	163+00	5.50	818	818	60	2:1	7.0	0.010	1.58	
	163+00	164+00	Transition Section								
	164+00	219+70	3.91	679	690	50	2:1	7.0	0.010	1.54	
	219+70	220+70	Transition Section								
	220+70	222+85	3.80	623	642	46	2:1	7.0	0.010	1.53	
	222+85	223+85	Transition Section								
	223+85	246+30	2.39	596	618	44	2:1	7.0	0.010	1.52	
	246+30	375+00	2.39	435	438	44	2:1	7.0	0.005	1.08	
	375+00	376+00	Transition Section								
	376+00	378+00	2.14	76	76	6	2:1	5.4	0.015	0.84	
	378+00	434+90	2.14	76	114	6	2:1	5.0	0.047	1.43	389.9
D1	0+00	12+00	1.38	359	362	28	2:1	7.0	0.010	1.23	
	12+00	13+00	Transition Section								
	13+00	20+00	1.00	291	303	22	2:1	7.0	0.010	1.20	
	20+00	21+00	Transition Section								
	21+00	33+00	0.63	240	239	16	2:1	7.0	0.010	1.14	
	33+00	34+00	Transition Section								
	34+00	48+50	0.42	155	160	6	2:1	5.9	0.035	1.52	
	48+50	49+50	Transition Section								
	49+50	58+40	0.32	128	130	4	2:1	5.8	0.035	1.45	
	58+40	59+40	Transition Section								
	59+40	71+00	0.31	121	130	4	2:1	4.6	0.100	2.15	
	71+00	72+00	Transition Section								
	72+00	79+40	0.18	74	71	4	2:1	3.7	0.100	1.68	
	79+40	80+40	Transition Section								
	80+40	83+00	0.17	71	78	4	2:1	3.0	0.300	2.50	
	83+00	84+00	Transition Section								
	84+00	89+00	0.11	46	45	4	2:1	2.3	0.300	2.24	
	89+00	90+00	Transition Section								
	90+00	100+00	0.04	14	54	4	2:1	2.0	0.800	2.32	51.1
D4B	0+00	21+50	1.61	60	73	6	2:1	3.4	0.099	1.68	
	21+50	36+00	1.12	44	73	6	2:1	3.4	0.099	1.68	
	36+00	37+00	0.81	34	73	6	2:1	3.4	0.099	1.68	
	37+00	67+10	0.81	34	37	6	2:1	3.4	0.026	0.86	9.6

(Footnotes on last page table 3B)

TABLE 3B - STRUCTURE DATA - Continued

CHANNELS

Big Creek Watershed, Texas

Channel Designation	Station Numbering for Reach: Station (100 ft.)	Station Numbering for Reach: Station (100 ft.)	Watershed Area 1/ (sq. mi.)	Required Capacity 2/ (c.f.s.)	Planned Channel Capacity (c.f.s.)	Average Bottom Width (feet)	Average Side Slope	Average Depth (feet)	Average Grade (pct.)	Average Velocity in Channel (ft./sec.)	Volume of Excavation (1,000 cu. yds.)
D5	0+00	6+00	1.51	70	74	6	2:1	5.0	0.020	0.93	
	6+00	15+00	1.51	70	74	6	2:1	5.0	0.020	0.93	
	15+00	16+00	1.12	59	62	6	2:1	4.6	0.020	0.89	
	16+00	18+00	0.78	48	51	6	2:1	4.2	0.020	0.85	3.2
D6	0+00	12+64	2.01	78	79	6	2:1	6.0	0.010	0.73	
	12+64	13+50	1.94	78	79	6	2:1	6.0	0.010	0.73	
	13+50	23+80	0.88	36	36	6	2:1	4.2	0.010	0.60	6.1
D6A	0+00	4+30	0.32	15	16	4	2:1	2.7	0.020	0.63	
	4+30	16+70	0.31	15	16	4	2:1	2.7	0.020	0.63	2.6

Total Length = 24.36 miles
Total Excavation = 1,618,600 cubic yards

Note: Data applicable at lower end of reaches.

1/ Does not include the area controlled by floodwater retarding structures.

2/ Includes release flows from floodwater retarding structures.

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TABLE 4 - ANNUAL COST

Big Creek Watershed, Texas

(Dollars)

Evaluation Unit	Amortization of Installation Cost 1/	Operation and Maintenance Cost 2/	Total
Floodwater Retarding Structures 1A, 2A, 3, 4A, 4B, and 5 and 14.2 miles of Stream Channel Improvement (Big Creek, D4B, D6, and D6A)	32,324	5,265	37,589
Floodwater Retarding Structure 6, and 10.2 miles of Stream Channel Improvement (Big Creek Slough, D1 and D5)	11,313	3,064	14,377
TOTAL	43,637	8,329	51,966

1/ Price Base: 1966 prices amortized at 3.125 percent for 50 years.

2/ Long-term prices as projected by ARS, September 1957.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Big Creek Watershed, Texas

(Dollars) 1/

Item	Estimated Average Annual Damage: Without Project	With Project	Damage Reduction Benefits
Floodwater			
Crop and Pasture	113,554	9,005	104,549
Other Agricultural	5,011	558	4,453
Subtotal	118,565	9,563	109,002
Sediment			
Overbank Deposition	1,349	163	1,186
Erosion			
Flood-Plain Scour	663	9	654
Indirect	12,058	974	11,084
TOTAL	132,635	10,709	121,926

1/ Price Base: Long-term prices as projected by ARS, September 1957.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Big Creek Watershed, Texas
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/				Average Annual Cost 2/	Benefit-Cost Ratio
	Flood Prevention		Agricultural Water Management	Total		
	Damage Reduction	More Intensive Land Use	Drainage			
Floodwater Retarding Structures 1A, 2A, 3, 4A, 4B, and 5, and 14.2 miles of Stream Channel Improvement (Big Creek, D4B, D6, and D6A)	102,519	27,335	27,335	157,189	37,589	4.2:1
Floodwater Retarding Structure 6, and 10.2 miles of Stream Channel Improvement (Big Creek Slough, D1 and D5)	12,538	18,554	18,554	49,646	14,377	3.5:1
GRAND TOTAL	115,057	45,889	45,889	206,835	51,966	4.0:1

1/ Price Base: Long-term prices as projected by ARS, September 1957.
2/ Derived from installation costs based on 1966 price level and operation and maintenance costs based on long-term price levels as projected by ARS, September 1957.
3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $6,869 annually.

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