

EXECUTIVE SUMMARY

This Detailed Project Report and Integrated Environmental Assessment is prepared under the authority of section 205 of the Flood Control Act of 1948, as amended. The study objectives centered on measures to reduce flooding along Farmers Branch in White Settlement, Texas. The primary objective focused on identification of a recommend a flood-damage-reduction project for implementation that met the criteria of being technically sound, economically feasible, environmentally acceptable, and supported by the city of White Settlement.

White Settlement is located in Tarrant County, Texas, about 8 miles west of downtown Fort Worth. Farmers Branch originates in the western part of the county and flows in an easterly direction through White Settlement. The Farmers Branch watershed encompasses an approximate area of 6.8 square miles.

Damageable property within the study area include approximately 303 residential and commercial structures lying within the 0.2-percent annual chance exceedence (ACE) flood event (500-year flood plain). The value of the floodplain investment is estimated at \$36.0 million. Residential structures make up 92 percent of the structures and 80 percent of the structure and contents value. Commercial structures make up six percent of the structures and six percent of the structure and contents value. Public structures make up 2 percent of the structures and 14 percent of the structure and contents value.

Significant flood damages occur with the 50 percent ACE flood event. A 1 percent ACE or 100-year flood could impact 244 or 81 percent of the improved properties and result in flood damages of over \$3.6 million. Annual flood damages are estimated at over \$1.6 million of which about 56 percent are associated with residential development.

The initial screening of measures identified permanent evacuation, detention, and channel and bridge modifications as alternatives warranting further investigation. Channelization measures met the majority of the Federal and non-Federal planning objectives. The National Economic Development (NED) plan includes channelization and bridge modifications along the mainstem of Farmers Branch and its tributary. The plan will also implement a permanent evacuation of the 20 percent ACE or 5-year flood zone for residential structures immediately upstream and downstream of the channel improvement. Specifically, the NED plan consists of a 6600-foot grass-lined channel of varying width (from 55 to 80 feet) extending along the Farmers Branch mainstem from White Settlement Road to Las Vegas Trail. The plan also includes a 1650-foot U-wall segment of channelization along the Las Vegas Trail tributary and permanent evacuation of 14 residential structures both upstream and downstream of the channel improvement within the 20 percent ACE. The total cost of the NED Plan was estimated at \$10.5 million with annual costs and benefits of \$624,300 and \$1,244,900, respectively. The projects net benefits were \$610,600 with a benefit to cost ratio of 2.0 to 1.0.

The city of White Settlement has selected to construct a locally preferred plan that provides a greater level of protection and reduces the risks to life, health, and safety during a flood event for the citizens of White Settlement. The NED plan would effectively reduce damages and move the start of damages from the 2-year event to the 10-year event for most residents. In contrast, the locally preferred plan captures 90 percent of the 100-year floodplain, effectively removing almost 60 percent of the structures from the 100-year flood plain. The design of the Locally Preferred Plan mimics the NED Plan, but varies in width between 50 and 180 feet.

The Locally Preferred Plan is the Recommended Plan. There is no recreation, ecosystem restoration features, or environmental mitigation lands as part of the recommended plan. The total cost of the locally preferred plan is \$13,949,300 with annual costs and benefits of \$835,700 and \$1,351,300, respectively. The projects net benefits were about \$515,500 with a benefit-to-cost ratio of 1.6 to 1.0.

The additional costs associated with the Locally Preferred Plan would be born by the city of White Settlement. The costs to the Federal government would be limited to the cost share derived by the NED plan. These Federal costs are estimated at \$5,443,061 and non-Federal costs are estimated at \$8,506,257.

TABLE OF CONTENTS

Description	Page
INTRODUCTION	1
STUDY AUTHORITY	1
STUDY PURPOSE AND SCOPE	1
STUDY PARTICIPANTS	1
PRIOR STUDIES AND REPORTS	2
FARMERS BRANCH WATERSHED	2
STUDY AREA	2
CLIMATE	7
GEOLOGY AND PHYSIOGRAPHY	7
TERRESTRIAL RESOURCES	8
AQUATIC RESOURCES	8
THREATENED AND ENDANGERED SPECIES	11
WATER QUALITY	11
AIR QUALITY	11
CULTURAL RESOURCES	12
HAZARDOUS, TOXIC OR RADIOLOGICAL WASTES	12
SOCIO-ECONOMIC CHARACTERISTICS	17
RECREATION	17
FLOODING PROBLEM	17
HISTORY OF FLOODING	17
FLOOD DAMAGE ANALYSES	18
DAMAGE REACHES	18
SINGLE EVENT DAMAGES	19
EXPECTED ANNUAL DAMAGES	20
FUTURE WITHOUT PROJECT CONDITION	21
PLAN FORMULATION	21
PLANNING OBJECTIVES	21
PLANNING CONSTRAINTS	22
TECHNICAL CRITERIA	22
ECONOMIC CRITERIA	23
ENVIRONMENTAL AND SOCIAL CRITERIA	23
SCREENING OF FLOOD DAMAGE REDUCTION MEASURES	23
<i>No Action Plan</i>	24
<i>Floodplain Management</i>	24
<i>Flood Forecast and Warning</i>	24
<i>Flood Proofing</i>	24
<i>Floodplain Evacuation</i>	25
<i>Diversion</i>	25
<i>Detention</i>	25
<i>Levees and Floodwalls</i>	26
<i>Farmers Branch (Channel) Improvements and/or Bridge Modifications</i>	26

Description	Page
DETAILED INVESTIGATIONS OF ALTERNATIVES	27
PERMANENT EVACUATION	27
DETENTION ALTERNATIVES	27
FARMERS BRANCH CHANNEL MODIFICATION ALTERNATIVE	27
ALTERNATIVE PLAN REFINEMENTS	31
NATIONAL ECONOMIC DEVELOPMENT PLAN	31
LOCALLY PREFERRED PLAN	33
PLAN DESCRIPTION	33
THE RECOMMENDED PLAN	34
ENVIRONMENTAL IMPACTS OF THE RECOMMENDED PLAN	41
IMPACTS AND MITIGATION	41
CUMULATIVE IMPACTS	41
REGULATORY REQUIREMENTS	42
IMPLEMENTATION OF THE RECOMMENDED PLAN	42
PROJECT COOPERATION AGREEMENT AND ITEMS OF NON-FEDERAL RESPONSIBILITY	42
COST APPORTIONMENT	44
VIEWS OF THE LOCAL SPONSOR	46
PUBLIC INVOLVEMENT	46
TECHNICAL, POLICY, AND LEGAL REVIEW	47
FINDINGS AND CONCLUSIONS	47
RECOMMENDATION	49
FINDING OF NO SIGNIFICANT IMPACT	51

List of Tables

<u>Description</u>	<u>Page</u>
Table 1. Federally Listed Threatened and Endangered Species _____	11
Table 2. Reach Descriptions _____	18
Table 3. Structure Inventory _____	19
Table 4. Single-Event Damages _____	20
Table 5. Expected Annual Damages _____	20
Table 6. Benefit Cost Analysis for Buyout and Detention Alternatives _____	28
Table 7. Benefit to Cost Ratio for Channel Alternatives _____	30
Table 8. Revised Without Project Expected Annual Damages _____	31
Table 9. NED Plan Residual Damages _____	32
Table 10. Incremental Analysis of NED Plan _____	32
Table 11. LPP Residual Damages _____	33
Table 12. Incremental Analysis of Locally Preferred Plan _____	34
Table 13. Estimated Project Cost Comparison _____	45
Table 14. Cost Apportionment of the National Economic Development Plan _____	45
Table 15. Cost Apportionment of the Locally Preferred Plan _____	46

List of Figures

Figure 1. Vicinity Map _____	3
Figure 2. Study Area Map _____	5
Figure 3. Vegetation _____	9
Figure 4. Counties Designated as Attainment, Near Nonattainment, or Nonattainment for Criteria Pollutants in Texas. _____	12
Figure 5. HTRW Site Map _____	15
Figure 6. Farmers Branch Channelization Optimization Curve _____	29
Figure 7. With and Without Project 100-Year Floodplain _____	35
Figure 8. Channel Improvement Limits _____	37
Figure 9. Permanent Evacuation Plan _____	39

List of Appendices

<u>Appendix</u>	<u>Title</u>
A	Hydrology (See CD)
B	Hydraulics
C	Environmental Investigations
D	Economics
E	Geotechnical
F	U.S. Fish and Wild Life
G	Cultural Resources
H	HTRW Analysis
I	Structural Engineering
J	Civil Design
K	Cost Estimating
L	Real Estate Plan
M	Correspondence
N	404(b)(1) Evaluation
O	Model PCA

INTRODUCTION

Study Authority

This Detailed Project Report is submitted under the authority of section 205 of the Flood Control Act of 1948, as amended. The feasibility study was conducted in response to a letter of request from the city of White Settlement. Section 205 of the Flood Control Act approved 30 June 1948, states:

“The Secretary of the Army is authorized to allot from any appropriations heretofore by congress, which come within the provisions of section 1 of the flood control act of 22 June 1936, when in the opinion of the chief of engineers such work is advisable. The amount allotted for a project shall be allotted under this section for a project at any single locality. The provisions of local cooperation specified in section 3 of the flood control act of 22 June 1936, as amended, shall apply. The work shall be completed in itself and not commit the united sates except as may result from the normal procedure applying to projects authorized after submission of preliminary examination and survey reports.”

Study Purpose and Scope

The objective of the study was to examine flood damage reduction along Farmers Branch, in White Settlement, Texas, and recommend a flood-damage-reduction project for implementation if one could be found that is technically and economically feasible, environmentally acceptable, and supported by the city of White Settlement. This document presents a summary of the Plan Formulation findings of 2003, updates damages and benefits and costs to September 2005 price levels. The final analysis applies the fiscal year 2006 interest rate of 5.125 percent and refines the engineering and costs of the National Economic Development and Recommended Plans.

Study Participants

The study was conducted by the Fort Worth District Corps of Engineers in partnership with the city of White Settlement, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the Texas Parks and Wildlife Department, the Texas Commission on Environmental Quality, and other interested governmental entities and the citizens of White Settlement.

Prior Studies and Reports

The following are studies and reports address or relate to Farmers Branch in White Settlement, Texas water resource issues.

The Fort Worth District, USACE, prepared a study entitled “*Integrated Environmental Assessment for Farmers Branch, White Settlement, Texas*” in February 2000 [USACE, 2000], which went unpublished. Recent aerial photography was used to update the degrees of urbanization and imperviousness.

The Fort Worth District, USACE, completed hydrologic and hydraulic analyses for a *Reconnaissance Study in May 1989*. The reconnaissance study was published in January 1990. The study investigated structural measures involving the placement of trapezoidal, concrete-lined channels in four separate areas on Farmers Branch. The study also investigated nonstructural measures involving floodplain evacuation.

A study entitled “*White Settlement Drainage Study and Master Plan*” was prepared for the City of White Settlement by Rady and Associates, Inc. in March 1987. This study identified the current drainage problems and recommended a drainage system plan that would help solve these problems and enable the City of White Settlement to incorporate the design into future developments

A “*Flood Insurance Study*” (FIS) for Tarrant County and White Settlement was completed by USACE (United States Army Corps of Engineers) in 1985, for the Federal Emergency Management Agency (FEMA). This study documented flows for the 10, 50, 100, and 500-year storm events, identified flooding sources.

FARMERS BRANCH WATERSHED

Study Area

White Settlement is located in Tarrant County, Texas, about eight miles west of downtown Fort Worth. Figure 1 is a vicinity map of the area. Farmers Branch originates in the western part of the county and flows in an easterly direction through White Settlement. The Farmers Branch watershed encompasses an approximate area of 6.8 square miles. The area of flood impacts begins at Academy Boulevard (in the City of Fort Worth) and extends downstream to Lockheed Boulevard, a distance of approximately 15,000 feet. Figure 2 is a map of the study area and watershed.

Climate

The study area generally experiences warm climate conditions with hot summers. Temperatures in this area have ranged from 113 °F in June 1980 to a minimum -1 °F in December 1989, with an average annual temperature of 65.6 °F. The region is prone to intense local thunderstorms and consequent flash flooding that can and does frequently occur. The average annual precipitation is approximately 32 inches.

Geology and Physiography

The City of White Settlement lies within the Grand Prairie Province of the Western Gulf Coastal Plain within the Trinity River Watershed. The Goodland Formation beneath the City and can be seen in many road cuts and stream banks throughout the area. The Goodland Limestone was deposited in shallow water with a muddy bottom, probably below wave base during the Early Cretaceous transgression. The formation is about 116 feet thick in the Lake Worth Area of Tarrant County. The strike and dip of the Goodland Limestone formation based on maps prepared by the Fort Worth Geological Society for the City of Fort Worth show the local dip near White Settlement to be about 26 feet per mile or about 0.28 degrees. The geologic formations strike North 10-12 degrees East and dip to the East-South-East (perpendicular to the strike).

Locally, in Farmers Branch Creek, the nodular, massively bedded limestone is seen to outcrop along the channel bottom and is exposed at numerous locations along the creek. Upon weathering, the more massive beds break down into nodular pieces that subsequently erode from the channel banks and become entrained bed load material. Mega-ripples observed at several locations along the creek are wavy beds likely formed by bottom currents that run parallel to the ripples during deposition (Cretaceous).

Probably in late Tertiary time (Pliocene); the Trinity River became the dominant stream in the area (Montgomery, 1993). As the Trinity River cut down through overlying shale and limestone, tributaries of the Trinity, extended headward from the main stem. The major streams draining the City of White Settlement flow into the West Fork of the Trinity River. This process of downcutting was episodic and often interrupted by intermediate periods of deposition in response to changing climates.

Channel and flood plain cross sections and geology change as one proceeds downstream. This change is due the combined increase in drainage area and discharge, as well as, the related incision of the channel into the soils and underlying rocks that comprise the local landscape. Typically, the smaller headwater streams in the City flow through residual soils formed from the marine chalks. These are black-brown clayey textured soils, which range in thickness from 3-6 feet. As one progresses down stream, the channel becomes more incised into the limestone. The stream-banks are composed of silty clay and clay loam, which is underlain by discontinuous, lenses of limestone gravel, or in some areas outcrops of limestone.

Terrestrial Resources

The floodplain within the study area is extremely narrow flowing within a highly urbanized area. Residential structures lie on both sides of the bank, many with retaining walls and fences on top of the stream bank. The open areas are park-like consisting of manicured grasses with occasional scattered trees as shown in Figure 3. Vegetation

The Farmers Branch drainage basin is located in the transition area of the Cross Timbers and Prairies and Blackland Prairies ecological regions. Climax vegetation of the Cross Timbers and Prairies is Post Oak and Blackjack Oak woodlands mixed with native short to mid-grass prairie. The terrestrial habitat along northern reaches of Farmers Branch consists of a narrow, densely vegetated riparian corridor interspersed with old-field and supports minimal wildlife habitat. The riparian corridor of Farmers Branch, extremely narrow in areas, supports minimal wildlife habitat. The historical characteristics of the riparian corridor have been significantly modified since the construction of the residential subdivisions. In many instances, fence lines or retaining walls extend to the top of the stream channel and vegetation in undeveloped areas is more reminiscent of manicured parkland than that of a bottomland hardwood community. Very little understory vegetation is present because of the groomed conditions. The most common tree species include hackberry, cedar elm, Osage-orange, and chinaberry.

Aquatic Resources

The proposed project area includes a reach of Farmers Branch extending from Las Vegas Trail to White Settlement Road. Farmers Branch is a meandering series of pool and riffle complexes with average pool depths averaging between 1-2 feet and the channel width varying from 5 to 35 feet. The majority of the flow is derived from primarily rainfall and stormwater runoff. Stream substrate consists of long stretches of exposed bedrock with intermittent depositional areas composed of sand and gravel. Within the project area, the stream bank exhibits areas of erosion. Throughout the watershed, retaining walls and/or fences have been placed at or near the top of the stream bank. The stream has periods with little/no flow, however, water remains in the deeper pools except under extreme drought conditions.

Results of a baseline fisheries survey conducted by the U.S. Fish and Wildlife Service in 2003, characterized the fish assemblage within Farmer's Branch as limited to intermediate. During this survey, 435 fish comprising 4 families and 8 species were collected. Western mosquito fish (*Gambusia affinis*) accounted for 63% of the total individuals collected, with central stoneroller (*Campostoma anomalum*) (14%), green sunfish (*Lepomis cyanellus*) (11%), and bluegill (*Lepomis macrochirus*) (10%) being the other dominant species collected. Tolerant individual species dominate the fish community, which lack intolerant species. This can likely be attributed to limited in-stream flow and pollutants entering the stream from urban runoff during rain events.

Threatened and Endangered Species

The only plant species listed on the Endangered, Threatened, and Watch List for Tarrant County, Texas, is the eared false-foxglove. Animals on the Endangered, Threatened, and Watch List, statewide for Texas, are the Texas Horned Lizard, Milk Snake, Bald Eagle, Golden Eagle, and the Merlin. According to the Fish and Wildlife Service, three species on the Federal threatened or endangered list are likely to occur in Tarrant County. These species are the Interior Least Tern, Whooping Crane, and Mountain Plover. There are currently two Federally listed endangered species and one Federally proposed threatened species in Tarrant County as shown in Table 1. below.

Table 1. Federally Listed Threatened and Endangered Species

Common Name	Scientific Name	Listing Status
interior least tern	<i>Sterna antillarum</i>	Endangered
whooping crane	<i>Grus americana</i>	Endangered
bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened

Based on respective habitat requirements and field observations, an encounter with Federally listed endangered species or Federally proposed threatened species is not expected within the proposed project area.

Water Quality

Current water quality in Farmers Branch is affected by rainfall and stormwater flows that originate from both industrial and non-industrial non-point sources. The major parameters measured to determine whether a water body meets usage standards include metals, organics, and fecal coliform bacteria, dissolved oxygen, and dissolved solids. Currently, no water quality data is available for Farmers Branch.

Air Quality

The federal air quality program in Texas is administered by the TCEQ. The State Implementation Plan (SIP) includes Tarrant County as a non-attainment area for ozone (i.e., air quality in Tarrant County has failed to meet national ambient standards for ozone). The Environmental Protection Agency (EPA) uses six "criteria pollutants" as indicators of air quality. Each has an established maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards (NAAQS). Areas of the country where air pollution levels persistently exceed the NAAQS may be designated as non-attainment areas. Conversely, areas of the country that do not persistently exceed the NAAQS are designated as attainment areas. The recommended project area would be located entirely within the Consolidated Metropolitan Statistical Area (CMSA). CMSA is currently designated as in non-attainment for 8-hour ozone as shown in Figure 4.

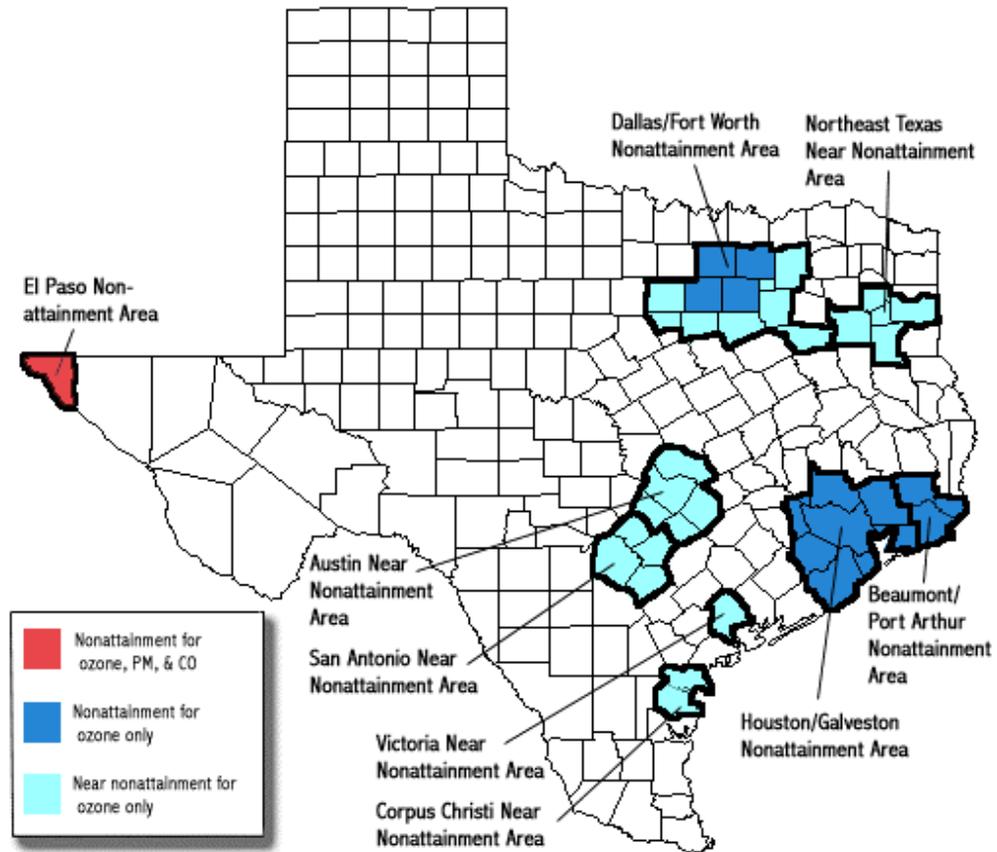


Figure 4. Counties Designated as Attainment, Near Nonattainment, or Nonattainment for Criteria Pollutants in Texas.

Cultural Resources

No records exist indicating the known presence of historic buildings, structures, archeological properties, traditional properties, or the presence of burials associated with historic or prehistoric Native American Indian occupation of the project area. The complete report, *The Archeological Potential of Farmers Branch, White Settlement, Texas* is included in this report as Appendix C. The area does not require a survey to locate previously unrecorded sites.

Hazardous, Toxic or Radiological Wastes

A Federal and State environmental regulatory database search for the study area was conducted and limited information concerning landfills located within the study area from the NCTCOG and the City of White Settlement was obtained. The Tarrant County Local Emergency Planning Committee (LEPC) provided a list of facilities reporting storage of hazardous materials compiled from records dating from 1987 to the present. See the CD-ROM for a complete listing of identified sites.

Based on the preliminary assessment, eleven sites may pose a significant environmental risk to the project study area. These sites are listed below.

- Lockheed Martin Plant #4, 1500 Lockheed Boulevard (Map ID No. 1) – The government-owned, contractor-operated facility at this site consists of 602 acres. Presently, contamination from the disposal of these wastes exists in the soil beneath the site, in the surface water, and in the groundwater.
- Special Projects Manufacturing, 7601 Wyatt Drive (Map ID No. 8) –The Resource Conservation and Recovery Information System identified this site as a Small Quantity Generator of hazardous waste. Waste streams listed for the facility included spent solid filters, non-halogenated solvents, and paint thinner.
- Clements Texaco, 823 S. Cherry Lane (Map ID No. 17) –The Texas Natural Resource Conservation Commission identified this site as a Leaking Underground Storage Tank facility. It has a TNRCC priority of “impacted groundwater within 500 feet-0.25 mile to the southwest used by humans and endangered species.”
- Capsyn Landfill, 8500 West Freeway (Map ID No. 20) – This site was identified by the NCTCOG as an unauthorized landfill site, Facility U2397. The Texas Department of Health determined that uncontrolled dumping had occurred on the site.
- Fill Area, West of Dale Lane/South of Farmers Branch (Map ID No. 21) – This site was identified during field reconnaissance. The site appeared to contain mostly construction debris, as evidenced by concrete and asphalt debris at the surface.
- Sudsville Coin Laundry/Di Ann Alterations, 843A S. Cherry Lane (Map ID No. 22) – Identified by visual observation during field reconnaissance, the facility on this site appeared to conduct on-site dry cleaning activities.
- City Cleaners, 8424 White Settlement Road (Map ID No. 23) – Identified during field reconnaissance, the facility on this site appeared to conduct on-site dry cleaning activities.
- Unauthorized Landfill, Alameda Road at West Point Boulevard (Map ID No. 24) – The NCTCOG identified this site as an unauthorized landfill containing household waste.
- \$1.99 Dry Cleaning, 9601 White Settlement Road (Map ID No. 41) – Identified during field reconnaissance, the facility on this site appeared to conduct on-site dry cleaning activities.
- Cowtown Express Cleaners, 9648 White Settlement Road (Map ID No. 46) – Identified during field reconnaissance, the facility on this site appeared to conduct on-site dry cleaning activities.
- Daniel’s Muffler and Brake, 8203 White Settlement Road (Map ID No. 30) – Identified in the Halff Associates Inc. report through a visual observation, this facility at this site houses an auto repair shop and former gas station. This property is located within 100 feet or less of the 100-year flood plain.

Based on the Halff Associates Inc. ESA report findings, field observations, and the recommended study conditions, one individual property was identified as having a “low” probability of having a potential HTRW issue. This property is identified by map ID No. 30 and is located near the Farmers Branch, White Settlement design footprint. The exact location of all identified is shown on the Figure 5 HTRW Site map.

Socio-Economic Characteristics

The Bureau of the Census reported the population for White Settlement as 13,506 persons in 1980 and 15,427 persons in 1990. These figures accounted for about 1 percent of the population in Tarrant County. The 2000 population is about 14,832 persons. The reduction in population is attributed to base housing removal at Naval Air Station Joint Reserve Base Fort Worth. The major employer in White Settlement is the White Settlement Independent School District with 613 employees. The major private employers in the area include Lockheed-Martin, Wal-Mart, Special Projects Manufacturing, and HIS of Fort Worth (nursing home). In January 2001, the unemployment in White Settlement was reported at 3.2 percent. Interstate Loop 820, Interstate 30, and US Highway 183 surround the City and Interstate 35 is just 11 miles to the east. White Settlement is served by DFW International Airport, which is less than 30 miles away. Three rail lines, including Union Pacific, Trinity River Express, and Fort Worth and Western Railroad, are within minutes of the city.

Recreation

The City of White Settlement has two public parks and a total of 12 parks and 2 lakes in the immediate local area. The two public parks, Central Park and Veterans Park, include playgrounds, softball and baseball fields, a football field, walking trails, hike & bike trails, duck ponds, a fishing pier, pavilions, volleyball courts, and horseshoe pitching pits. White Settlement also has a Recreation Center and a Historical Museum. The Texas Outdoor Recreation Plan projected the per capita outdoor recreation participation generated by Region 4 residents in each of 26 activities for 1995. The top five activities that people do most frequently are walking, bicycling, pool swimming, playground use, and jogging.

FLOODING PROBLEM

History of Flooding

The study area has been prone to flooding on an ever-increasing frequency, as the upstream watershed has become more and more developed since the early 1980's. Significant flood events occurred in September 1984, May 1989, June 2000, and June 2004. The May 1989 flood resulted in significant damage to 13 structures. The June 2000 flood resulted in 136 homes and 17 businesses receiving some flood damage totaling more than \$2,000,000.

The existing Farmers Branch channel capacity is approximately equal to a one to two-year recurrence flood event. The over-bank capacity combined with the channel capacity approximately equals a five-year recurrence flood event. The existing conditions flow path for Farmers Branch consists of open channels conveying flows west of Highway 820 in Fort Worth through the City of White Settlement with numerous low-water crossings, many of which are overtopped by the 2-year flood event. The creek is conveyed across the Joint Naval Air Reserve Base by two arch culverts that cannot convey the existing 5-year flood event without flooding upstream properties within the City of White Settlement.

Flood Damage Analyses

The principal purpose of these economic analyses was to identify the extent of the flood problem and, on a comparable basis, evaluate solutions to reduce monetary flood losses. The estimation of flood damages is based on the exceedence probabilities (frequency) of various flood events and a relationship between the depth of flooding and the estimated damages based on a percentage of the structure and content, or vehicle value. The exceedence probability is expressed as an “annual chance exceedence.” For example, a flood event with a 1-percent annual chance exceedence (ACE) means a flood of that magnitude has a 1-percent probability of being equaled or exceeded in any given year. Damages to the structures accumulated by frequency produce a frequency-damage function. An integration process using this frequency-damage data calculates estimates of expected annual damages. This involves aggregating the multiplication of the mean damage between each pair of flood events by the difference in exceedence probabilities for the full range of flood events in each damage category. The Corps of Engineers, Hydrologic Engineering Center, Flood Damage Analysis computer program is employed in the estimation of flood damages.

The Flood Damage Analysis (FDA) computer program integrates hydrologic, hydraulic, and flood plain characteristics through application of a Monte Carlo simulation, and computes single event and expected annual damages while accounting for uncertainty in the values of structures and contents. Hydrologic and hydraulic analyses developed water surface profiles for the 50-, 20-, 10-, 4-, 2-, 1-, 0.4-, and 0.2-percent annual chance exceedence (ACE) flood events. Profiles, delineated by the flood plain limits, determined the relationship of damageable properties to both elevation and frequency of flood occurrence. The accompanying CD contains the complete hydrologic, hydraulic, and economic analyses for all plans investigated. Structure inventory data used by the program includes the number and type of structures, structure and content values, and the elevation where the structure begins to sustain measurable damages, and a flood depth-damage relationship.

Damage Reaches

The study area was divided into reaches. Table 2 displays a summary of the reach descriptions. The previously shown study area map depicts the watershed, and a delineation of each reach. Table 3 displays a summary of the replacement value of floodplain properties. Over \$36 million in property is at risk of flooding in the city of White Settlement.

Table 2. Reach Descriptions

Reach Name	Upstream Limit	Downstream Limit
FB-1	Grants Lane	Cherry Lane
FB-2	Cherry Lane	Meadow Park
FB-3	Meadow Park	Las Vegas Trail
FB-4	Las Vegas Trail	Dale Lane
FB-5	Westpoint	Confluence
FB-6	I.H. 820	Confluence
FB-7	Academy Boulevard	Loop I.H. 820

Table 3. Structure Inventory
(May 2003 price level; 1,000 \$)

Reach	Damage Category	Number of Structures	Estimated Value				Total
			Structure	Content	Subtotal	Vehicle	
FB1	Commercial	17	\$992	\$261	\$1,253		
	Residential	51	\$893	\$691	\$1,584		
	Public	1	\$11	\$0	\$11		
	FB1 Total	69	\$1,896	\$952	\$2,848	\$82	\$2,930
FB2	Commercial	4	\$212	\$92	\$304		
	Residential	50	\$2,166	\$2,166	\$4,332		
	FB2 Total	60	\$2,378	\$2,258	\$4,636	\$313	\$4,949
FB3	Residential	114	\$4,726	\$4,726	\$9,452		
	Public	4	\$3,434	\$501	\$3,935		
	FB3 Total	118	\$8,160	\$5,228	\$13,388	\$800	\$14,188
FB4	Residential	87	\$2,208	\$2,208	\$4,415		
	FB4 Total	87	\$2,208	\$2,208	\$4,415	\$249	\$4,664
FB5	Residential	10	\$926	\$926	\$1,852		
	Single-Family	34	\$2,324	\$2,324	\$4,647		
	FB5 Total	44	\$3,250	\$3,250	\$6,499	\$210	\$6,709
FB6	Residential	21	\$435	\$435	\$869		
	FB6 Total	21	\$435	\$435	\$869	\$46	\$915
FB7	Residential	11	\$1,089	\$1,089	\$2,179		
	FB7 Total	11	\$1,089	\$1,089	\$2,179	\$0	\$2,179
Study Area							
	Single-Family	384	\$14,766	\$14,766	\$29,532		
	Commercial	21	\$1,205	\$353	\$1,558		
	Public	5	\$3,445	\$501	\$3,946		
	Grand Total	410	\$19,415	\$15,418	\$34,834	\$1,700	\$36,533

Single Event Damages

Table 4 displays a summary of damages by flood-event. Damages begin with a 50 percent ACE discharge (2-year event). It is estimated that a 1.0 percent ACE would cause damages exceeding \$3.0 million and a 0.2 percent ACE event could cause damages of about \$4.0 million in the study area; a 13 percent loss of the total floodplain investment.

Table 4. Single-Event Damages
(May 2003 prices level)

Zone	Commercial Damage #	Single-Family Damage #	Multi-Family Damage #	Public Damage #	Mobile Home Damage #	Total Damage	Number					
50%	\$32.9	7	\$415.8	144	\$12.1	8	\$0.1	1	\$1.5	5	\$462.3	165
20%	\$113.9	12	\$964.4	202	\$103.3	15	\$2.27	1	\$3.8	11	\$1,187.6	241
10%	\$150.1	14	\$1,303.2	234	\$140.3	17	\$50.7	3	\$5.4	15	\$1,649.7	283
4%	\$182.1	15	\$1,853.2	259	\$192.3	24	\$113.8	3	\$8.4	18	\$2,349.8	319
2%	\$201.6	16	\$2,190.1	280	\$238.2	27	\$162.5	4	\$11.2	20	\$2,803.6	347
1%	\$221.2	19	\$2,538.6	300	\$286.4	28	\$219.4	4	\$14.7	20	\$3,280.5	371
0.4%	\$247.1	19	\$2,803.8	315	\$322.7	28	\$254.6	4	\$16.7	20	\$3,644.8	386
0.2%	\$305.5	21	\$3,237.5	335	\$380.9	28	\$283.2	5	\$19.7	21	\$4,234.3	410

Expected Annual Damages

Estimates of expected annual damages (EAD) under without project conditions were calculated, using the risk and uncertainty model, through integration of frequency-damage data. As shown in Table 5, the expected annual flood losses in the study area totaled just over \$1.1 million based on May 2003 prices, of which 76 percent is associated with residential development and 8 percent with commercial development. As shown, Reach FB3 has the greatest EAD (Expected Annual Damages) and therefore the greatest potential for benefits, followed by reach FB2. All the other reaches experience about \$100,000 in damages or less. Reach FB7 damages are primarily due to the assumption of a 1.2 foot standard deviation in the 1% ACE flood event or higher.

Table 5. Expected Annual Damages
(May 2003 prices level)

Reach	EAD	Insurance Subsidy	Cleanup Damages	Total Damages
FB1	102.6	3.9	10.3	116.8
FB2	202.2	7.3	20.2	229.8
FB3	409.1	14.9	40.9	464.9
FB4	117.6	11.6	11.8	140.9
FB5	106.5	4.0	10.6	121.20
FB6	68.4	2.7	6.8	77.9
FB7	7.7	0.3	0.8	8.8
Total	1,014.2	44.7	101.4	1,160.3

Future Without Project Condition

Future increases in flood damages resulting from additional development within the watershed, manifesting as an increase in precipitation run-off and increased flood depths, and/or as an increase in the number of damageable property, are not anticipated or accounted for in the analysis of flood damages. The analysis uses 2015 future discharges as baseline conditions based on a 2010 construction completion that is within 90 percent of being fully developed.

PLAN FORMULATION

This section details the process of stating the planning objectives and constraints, initial screening of measures, evaluation of alternatives, and selection of the recommended plan. This process was conducted under the principles and guidelines of the Corps of Engineers for water resources projects and include, but are not limited to Engineer Regulation 1105-2-100 and Engineer Pamphlet 1165-2-1. The accompanying CD contains the complete hydrologic, hydraulic, and economic analyses for all plans investigated.

Planning Objectives

Planning objectives are an expression of public and professional concerns about the use of water and related land resources resulting from the analysis of existing and future conditions in the study area. The planning objectives for the period of analysis between the years 2008 to 2058 are as follows:

- Reduce the potential for loss of life associated with inundation, high velocities, isolation, and/or overtopping of roads and bridges, and improve overall health and safety along Farmers Branch in White Settlement (study area).
- Reduce flood damages to structures, contents, and vehicles within the study area.
- Reduce flood damages to public facilities and infrastructure within the study area.
- Reduce the public and private costs associated with flood fighting and recovery along Farmers Branch within the city limits of White Settlement.
- Reduce the disruption and costs associated with the closure of highways and streets along Farmers Branch. Specifically, at the Meadow Park bridge crossing.
- Reduce business and commercial losses resulting from a loss of production and/or economic activity for establishments along Farmers Branch within the city limits of White Settlement.
- Improve the overall health, safety, and quality of life of the citizens of city of White Settlement, the State of Texas, and the United States of America through flood-damage reduction measures along Farmers Branch.

- Provide the citizens of White Settlement the level of flood protection that equates to complete protection from a 100-year storm event (1% ACE), as defined by the Federal Emergency Management Agency.

Planning Constraints

The following planning constraints were identified to direct plan formulation efforts of flood damage reduction measures and alternatives.

- Alternatives will be limited to the study area within White Settlement along Farmers Branch.
- Alternatives reducing flood damages in one area should not result in measurable increases in the extent and magnitude of flooding in another area.
- Alternatives must avoid adverse impacts to significant ecological resources; and if avoidance is not feasible, then adverse impacts to ecological resources must be minimized. Unavoidable adverse impacts to ecological resources must be mitigated.
- Alternatives must avoid adverse impacts to significant cultural resources; and if avoidance is not feasible, then adverse impacts to cultural resources must be minimized. Unavoidable adverse impacts to cultural resources must be mitigated.
- Alternatives should avoid areas that are either known or suspected to be contaminated and/or contain hazardous, toxic, and radioactive waste.
- Alternative should avoid adverse aesthetic and visual impacts.
- Total annual monetary benefits must equal or exceed total annual monetary costs for an alternative to be implemented.
- The recommended plan must be generally acceptable to the public.
- The recommended plan must have a local non-Federal sponsor.
- Combined Federal expenditures on the planning, design, and implementation of the recommended plan shall not exceed \$7.0 million, if possible. This is the current limit for projects authorized under Section 205 of the Flood Control Act of 1948, as amended.

Technical Criteria

In order to develop a plan that would satisfy the primary objective of reducing flood damages and costs within the study area, the following technical criteria was adopted for use in developing, evaluating, and comparing alternative plans:

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- The plan should be effective, efficient and complete with regard to alleviating the specified problems and achieving the specified goals and provide a project life of at least 50 years.
- The plan must be technically feasible using engineering methods and construction equipment available in the study region and use Corps of Engineers' design manuals and regulations.
- Existing facilities should be utilized to the maximum extent possible.

Economic Criteria

In the plan formulation process, the plan that meets the planning objectives and avoids the planning constraints, and yields the greatest net benefits, best meets the objective of NED. Economic feasibility of a plan is measured as a relationship of benefits-to-costs. Benefits are the monetary savings due to damages prevented, reduction in the cost of emergency services, and the reduced disruption of the local economy. The annual benefits and the annual costs are then related in a benefits-costs ratio (BCR). To be economically feasible, a plan must have annual benefits that exceed annual costs, a BCR greater than 1.0. Each separable unit or purpose of a given alternative must provide benefits at least equal to its costs.

Environmental and Social Criteria

A plan formulated under federal directives should be consistent with protecting the existing environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems in the proposed project area. Ecosystem restoration is one of the primary missions of the Corps of Engineers Civil Works program, with the objective of contributing to the national ecosystem restoration. However, for this feasibility study, the sponsor has not requested that ecosystem restoration be pursued, either as a single purpose or as part of a multipurpose project.

Screening of Flood Damage Reduction Measures

In identifying flood damage reduction measures and alternatives for analyses, a number of nonstructural and structural measures were considered. Nonstructural measures, attempt to avoid flood damages by exclusion or removal of damageable properties from the flood prone areas. These measures do not affect the frequency or level of flooding within the floodplain; rather, they affect floodplain activities. Structural measures consist of structures designed to control, divert, or exclude the flow of water from the flood prone areas to the extent necessary to reduce damages to property, hazard to life or public health, and general economic losses. The structural measures considered most appropriate in dealing with the character of the flood problems encountered typically include small detention reservoirs, channel modifications, flood flow diversions, and levees.

No Action Plan

The “no action” alternative would not recommend any type of project, nonstructural or structural, be implemented. Although flood insurance would partially compensate for flood damages, the damages would still be incurred at an estimated average rate of over \$1 million annually. The City of White Settlement has stated that they are not willing to accept the no action plan

Floodplain Management

Effective floodplain management is dependent on the development of enforceable regulations that insure that uses of floodplain lands are compatible with the level of flood hazard. Several means of regulation are available to control future development, including zoning ordinances and building codes. Typical zoning ordinances would require installation of adequate drainage facilities, prohibit encroachment in floodway areas or require the placement of critical streets and utilities above a selected flood elevation. Building codes specify the criteria for the design and construction materials for both the repair and replacement of flood damaged structures. The specifications can make requirements such as requiring water-tightness of exterior walls, valves on sewer lines, and placement of utilities at elevations high enough to reduce or eliminate flood damages.

The City of White Settlement presently participates in the Regular Phase of the National Flood Insurance Program, and enacts floodplain land-use restrictions. These measures do not reduce the damages to existing development and this alternative did not require further consideration. It should be noted that the City of White Settlement would be required to complete and implement a floodplain management plan within one year of the completion of any flood damage reduction plan recommended and implemented by the Corps of Engineers.

Flood Forecast and Warning

Flood forecasting and temporary evacuation 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. The short warning time (or time of flood flow concentration) of Farmers Branch of less than one hour significantly reduces the reliability and would not represent a viable flood damage reduction measure, and therefore is not considered further in this study.

Flood Proofing

Flood proofing of residential and commercial structures can include providing watertight coverings for door and window openings, raising structures in place, constructing levees and floodwalls around individual buildings or groups of buildings, and waterproofing walls of structures. Flood proofing is more easily applied to new construction and more applicable where flooding is of short duration, low velocity, and infrequent. Flood proofing techniques would require major modifications to existing structures. Additional shortcomings include not protecting public facilities such as roads, bridges, and utilities, and the continued threat of road closures and the isolation of residents trapped in their homes and businesses. While flood proofing is not likely to result in significant or permanent adverse impacts to ecological or

cultural resources, it does not address fully the planning objectives or criteria previously discussed. Therefore, flood proofing is not considered further in this study.

Floodplain Evacuation

Floodplain evacuation involves the acquisition and demolition of frequently flooded structures from the floodplain, and the relocation of residents to flood free housing. The practicality of evacuation depends on several factors including, the frequency, and severity of flooding, the willingness of residents to move out, the availability of flood-free housing, the value of the property, and the need for areas more suitable for floodplain use such as parks or nature areas. Previous studies have concluded that floodplain evacuation is a viable solution, particularly for frequent flood events. Given 79 structures are situated within the 10 percent ACE, this measure warrants further investigation.

Diversions

The diversion of Farmers Branch away from the flooded areas was considered. The diversion alternatives investigated include:

DV 1 - Diversion of flows draining from west of Loop 820 to the north along the Loop 820 frontage road was briefly considered. Since the tributary of Lake Worth has only the capacity to convey the local runoff between Las Vegas Trail and Loop 820 and construction cost for this alternative was in excess of \$23 million, this alternative was not investigated further.

DV 2 - Diversion of excess floodwater to the north from the Las Vegas Trail culvert to the north to the tributary of Lake Worth was considered. The cost for this alternative was approaching the maximum for 100 percent damage reduction and any diverted flow would transfer the flooding problems from White Settlement to Fort Worth due to the limited capacity of the tributary. This alternative was not investigated any further.

DV 3 - Diversion of excess floodwater to the north along Las Vegas Trail and east down White Settlement Boulevard and discharging back into Farmers Branch was considered. The construction cost for this alternative was in excess of \$23 million, which is greater than estimated annual damages warrant and was not considered further.

Diverting sufficient flows from Farmers Branch to the tributary of Lake Worth to reduce damages in White Settlement would increase damages in Fort Worth. In addition, a flat hydraulic slope necessitates large structures and or longer structures increasing the costs. Based on the potential benefits and cost of diversion measures, they were eliminated from further consideration.

Detention

Detention is a measure whereby floodwaters are temporarily stored, at a location upstream of the damageable properties, and then gradually released as downstream conditions permit. Detention may significantly reduce peak flood discharges immediately downstream thereby resulting in lower peak flood stages. Detention requires an impoundment site that is capable of providing sufficient storage. In the City of White Settlement, four locations were identified as possible sites for either on- of-channel detention.

DT 1 – An impoundment (detention) site was identified in an area west of Loop 820 within the City of Ft. Worth. A portion of this site abuts the main stem of Farmers Branch and provides enough area for an on-line detention pond. This site warrants further investigation.

DT 2 – A detention site was identified east of I.H. 20 is an area within White Settlement containing one of the last undeveloped tracts of land with enough area for detention. Flow into this off-line detention comes from an overflow from the main stem of Farmers Branch and the West Tributary. This detention site warrants further investigation.

Levees and Floodwalls

Levees and floodwalls were considered between Grants Lane and the railroad embankment in reach FB1. However, the proximity of structures and the lack of available space make a levee physically infeasible because of the anticipated high relocation cost associated with removal of the structures where the levees would be constructed. Floodwalls, which require less real estate acquisition, are historically much more expensive than any other alternative, either structural or nonstructural. Based on the value of the properties to be protected, and considering the length of the reach and the required height (> 12 feet), the floodwall alternative would be prohibitively expensive. Therefore, levees and floodwalls were eliminated from further consideration.

Farmers Branch (Channel) Improvements and/or Bridge Modifications

This measure consists of modifying Farmers Branch by increasing the cross-sectional area of the stream channel and/or an existing structure (widening and/or deepening), straightening and realigning the stream channel, and/or reducing the friction losses of an existing channel through concrete lining. The channel modification design varies based on the topography of the existing stream and the developed property within the floodplain. Other factors to consider in the design of these hydraulic channel improvement alternatives include the existence of known or potentially significant ecological and cultural resources, as well as contaminated material.

Construction of additional culverts under the Joint Naval Air Reserve Base was also investigated. The cost of increasing the capacity of these culverts to convey the 10- or 1-percent ACE in addition to having to modify Lockheed Boulevard and Grants Lane Bridges made this alternative economically unfeasible. This measure was not considered for further analysis.

Several channel modification alternatives were investigated to determine the most appropriate locations for lining or leaving the channel in its natural condition. Four channel-lining options were considered for the White Settlement study area. These four linings included earthen, gabion, concrete, and concrete and gabion combination. Several site constraints influenced decisions made regarding the alignment, slope, cross-sectional area, location, and materials used for conveyance. A major wastewater interceptor owned by Fort Worth and White Settlement is aligned down Farmers Branch as it flows from west to east. This interceptor varies in size from 24" to 36" in diameter. It was determined that the cost of lowering the 24"-36" wastewater line from its present depth another 6-8 feet would be about \$250-\$325 per linear foot. This cost could not be justified when other channel modification alternatives were more attractive from a cost and environmental standpoint. In addition, several smaller water lines cross Farmers Branch at road crossings. These utilities will also have to be relocated if channel modifications are constructed.

Preliminary construction costs for a channel improvement between Dale Lane and White Settlement Road were estimated at \$5,000,000, well within the benefit range to justify a structural project. It appeared channel improvements warranted further investigation.

DETAILED INVESTIGATIONS OF ALTERNATIVES

During the initial screening of alternatives, three measures were selected for detailed investigations – permanent evacuation, detention, and channel modifications. The accompanying CD contains the complete hydrologic, hydraulic, economic analyses and environmental for each alternative investigated during the plan formulation phase by Halff Associates on behalf of the Fort Worth District.

Permanent Evacuation

Permanent evacuation of the 50-, 20-, and 10-percent ACE for each study reach was investigated. In summary the detailed investigation indicated that buy-out of either of the 50-, 20-, and 10-percent ACE flood zones within the study area was feasible. Table 6 displays a summary of the annual benefits, annual costs, benefit-cost ratio, and net benefits for these alternatives based on the 2003 analysis. The 50 percent ACE or 2-year buyout includes reaches 2, 3, 4 and 6. The 20- and 10- percent ACE or 5- and 10-year buyouts include reaches 1 through 6. The evacuation plan for the 5-year flood event generated the greatest net benefits with \$75, 000 in net benefits compared to \$37,000 and \$60,000, respectively for the 2-year and 10-year plans.

Detention Alternatives

Two detention sites received additional detailed investigation. The first site located west of I.H 820 is ideally situated in the upper part of the Farmers Branch watershed providing good detention for flow reduction. This on-line detention would cover an area of approximately 30-acres. The preliminary estimated construction cost of \$6.6 million and \$547,300 in benefits derived a benefit-to-cost ratio of 1.2 to 1.0. The second site is an off-line detention site receiving flow from an overflow from the main stem of Farmers Branch and from the West Tributary. As shown in Table 6, the estimated construction cost is \$2.4 million, with \$57,000 in benefits and a benefit-to-cost ratio of 0.32 to 1.0.

Farmers Branch Channel Modification Alternative

The without-project hydraulic condition was evaluated to determine the probable size and the extent of the channel modification. The channel modifications were designed to:

- Avoid existing 36-inch wastewater line located below the length of Farmers Branch. With relocation costs estimated upwards of \$325 per linear foot renders this action cost-prohibitive.

- Avoid impact to (excavating) the normal low flow channel (channel thalweg).
- Minimize right-of-way acquisition costs by keeping the channel footprint narrow.
- Minimize velocities and avoid erosion protection costs by widening the channel width as much as possible for the frequent flood events.

Table 6. Benefit Cost Analysis for Buyout and Detention Alternatives
(based on May 2003 prices and level of development)

Economic Factor	2-year Buyout	5-year Buyout	10-year Buyout	On-line Detention	Off-line Detention
Structures Removed	16	54	79		
INVESTMENT					
First Cost	\$1,168,400	\$3,943,400	\$5,769,000	\$6,618,600	\$2,373,000
Annual Interest Rate	0.056250	0.056250	0.056250	0.056250	0.056250
Compound Interest	25.33934	25.33934	25.33934	25.33934	25.33934
Capital Recovery	0.0601484	0.0601484	0.0601484	0.0601484	0.0601484
Interest During Construction	\$65,200	\$220,100	\$321,900	\$369,400	\$132,400
Investment Cost	\$1,233,600	\$4,163,200	\$6,090,875	\$6,988,000	\$2,505,400
ANNUAL CHARGES					
Interest and Amortization	\$74,200	\$250,420	\$366,360	\$420,300	\$150,700
O&M (Annual)	\$2,000	\$5,000	\$12,000	\$30,000	\$30,000
Total Annual Charges	\$76,200	\$255,420	\$358,360	\$450,300	\$180,700
BENEFIT-TO-COST					
Annual Benefits	\$111,370	\$325,420	\$427,030	\$547,300	\$57,800
BCR	1.5	1.3	1.2	1.2	0.3
Net Benefits	\$37,170	\$75,000	\$60,670	\$97,000	-\$122,900
Residual Damages	\$1,048,900	\$1,085,300	\$733,300	\$613,000	\$1,102,500

The channel modifications are located between White Settlement Road and Las Vegas Trail. The tributary Channel modifications up- and downstream of these roads were not justified. Flood damages between White Settlement Road and the railroad embankment are minimal, and modifications downstream of the railroad embankment increased water surface elevations due to the lower velocities combined with the backwater from downstream structures produced negative benefits.

The total length of the mainstem channel modification is approximately 6,500-feet. Three channel sizes with various bench cuts widths were studied to determine the most effective size. The Small channel has a constant 50 foot width, the Medium channel has varying widths up to 80-feet, and the Large channel has varying widths up to 120-feet.

The Las Vegas Trail Tributary is 0.6 square miles; less than the 1.5 square miles required. However, the discharges meet the ER 1105-2-100 criteria with a 10-year discharge of 1590 cfs exceeding the 800 cfs minimum and 2210 cfs for the 100-year which exceed the 1800 cfs

criteria. The total modification extends 1200 feet from the confluence with Farmers Branch upstream to George Street.

Table 7 shows the total cost, benefits, and benefit-to-cost ratio for these plans based on May 2003 prices and level of development, a 50-year project-life, and a 24-month construction period. As shown in the table and Figure 6 optimization curve, the Shortened Medium Channel between White Settlement and Judd and along the Las Vegas Trail Tributary provides the greatest net benefits.

Since the channel alternative did not address damages in reaches 1 and 6, the 20% ACE floodplain buyout alternative for reaches 1 and 6 was combined with the medium channel along the mainstem and channelization of the Las Vegas Trail Tributary. This plan, selected as the NED plan, was carried forward for refinement.

Figure 6. Farmers Branch Channelization Optimization Curve

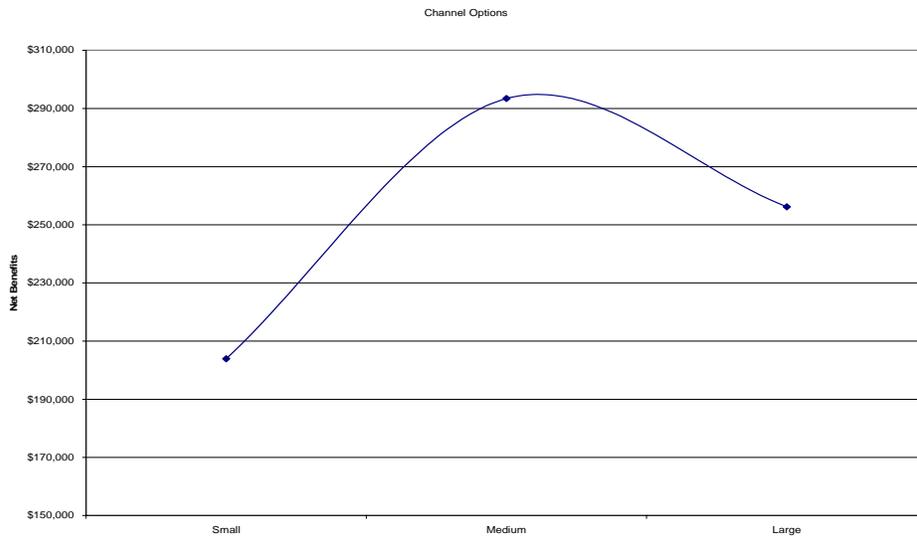


Table 7. Benefit to Cost Ratio for Channel Alternatives
(based on May 2003 prices and level of development)

	Small Channel with Tributary	Medium Channel with Tributary	Large Channel with Tributary	Medium Channel Without Tributary	Medium Channel with Culvert and Tributary	Medium Channel Shortened with Tributary
INVESTMENT COST						
First Cost	\$6,200,000	\$7,000,000	\$8,400,000	\$6,600,000	\$7,900,000	\$5,200,000
Annual Interest Rate	0.056250	0.056250	0.056250	0.056250	0.056250	0.056250
Compound Interest	25.33934	25.33934	25.33934	25.33934	25.33934	25.33934
Capital Recovery	0.0601484	0.0601484	0.0601484	0.0601484	0.0601484	0.0601484
Interest During Construction	\$346,000	\$390,600	\$468,800	\$368,300	\$440,900	\$290,200
Investment Cost	\$6,546,000	\$7,390,600	\$8,868,800	\$6,968,300	\$8,340,900	\$5,490,200
ANNUAL CHARGES						
Interest and Amortization	\$393,700	\$444,500	\$533,400	\$419,100	\$501,700	\$330,200
O&M (\$/year)	\$8,000	\$9,000	\$10,000	\$9,000	\$9,000	\$9,000
Annual Charges	\$401,700	\$453,500	\$543,400	\$428,100	\$510,700	\$339,200
BENEFIT-TO-COST RATIO						
Project Benefits	\$517,660	\$649,450	\$684,190	\$609,830	\$661,990	\$639,250
BCR	1.3	1.4	1.3	1.4	1.3	1.9
Net Benefits	\$115,960	\$195,950	\$140,790	\$181,730	\$151,290	\$300,050
Residual	\$642,600	\$510,850	476,110	\$550,470	\$498,310	\$521,050

Alternative Plan Refinements

At this point, the evaluation is based on a fully developed watershed, because it was recognized that development was proceeding at an accelerated rate. Under the future flow scenario from 2008 to 2058, the watershed would be fully developed for 45 of the 50 years. It is expected that by 2008 the watershed would be 90 percent developed. Therefore, 2015 fully developed flows were used for the remainder of the analysis. Additional flood damage data was collected for reach 5 to account for structures previously omitted from the floodplain. Other damage categories added to the analysis include emergency relief efforts and infrastructure damages. These refinements captured an additional \$452,000 in damages and potential benefits.

Since the NED Plan constitutes the basis for cost sharing in the recommended plan, more detailed cost estimates were derived following additional geological investigations. Channel erosion protection is necessary throughout the proposed channel due to velocities in excess of 9 ft/sec. Figure J-8 of the Civil Design Appendix shows delineation for the areas requiring erosion protection. In areas with velocities between 9 ft/sec and 11 ft/sec, erosion control matting is proposed. In areas with velocities between 11 ft/sec and 14 ft/sec, interlocking concrete mats are proposed. These benefits were based on actual costs incurred by the city of White Settlement during flood events over the past 10 years. The plan was also evaluated to determine the impacts of downstream inducements. The analysis revealed that the water surface profiles in reach 1 would increase .01 percent and resulted in dis-benefits totaling \$3,000. These damages did not constitute a taking; therefore, additional real estate was not required. Table 8 details the existing conditions damages based on the revisions previously outlined.

Table 8. Revised Without Project Expected Annual Damages
(September 2005 price level; 1,000's \$)

Reach	Structure Content EAD	Insurance Subsidy	Clean-up	Infrastructure	Total	100-Year Strs
FB1	\$ 151.1	\$ 5.4	\$ 15.1	\$ 10.6	\$ 182.2	33
FB2	\$ 154.5	\$ 5.9	\$ 15.5	\$ 10.8	\$ 186.7	36
FB3	\$ 440.4	\$ 10.4	\$ 44.0	\$ 30.8	\$ 525.7	64
FB4	\$ 134.0	\$ 5.9	\$ 13.4	\$ 9.4	\$ 162.6	36
FB5	\$ 384.8	\$ 10.1	\$ 38.5	\$ 26.9	\$ 460.3	62
FB6	\$ 79.5	\$ 2.1	\$ 7.9	\$ 5.6	\$ 95.1	13
Grand Total	\$1,344.3	\$ 39.8	\$ 134.4	\$ 94.1	\$1,612.6	244

NATIONAL ECONOMIC DEVELOPMENT PLAN

The National Economic Development (NED) plan is that alternative which reasonably maximizes net benefits, i.e., annual benefits in excess of annual costs. The final development of the NED plan is based on the 2004 analysis summarized in the above tables, and detailed in the Half Associates Plan Formulation Report (see CD insert) and adding the additional costs and benefits

outline above. The NED plan is identified as the shortened medium channel along Farmers Branch, channelization of the Las Vegas Trail Tributary and buy-out of the 20 percent ACE floodplain in reaches 1 and 6. Overall, this plan would leave 71 structures in the 100-year floodplain as shown in Table 9. Table 10 shows that the NED plan derives \$610,550 in net benefits and a benefit-to-cost ratio of 2.0 to 1.0. However, the NED does not satisfy the planning objective to provide a 100-year level of protection to the residents of White Settlement.

Table 9. NED Plan Residual Damages
(September 2005 price level; 1,000's \$)

Reach	Structure Content EAD	Insurance Subsidy	Clean-up	Infrastructure	Total Residual Damages	100-Year Strs
FB1	118.7	4.7	11.9	8.3	143.6	29
FB2	8.3	0.5	0.8	0.6	10.2	3
FB3	29.4	0.8	2.9	2.1	35.2	5
FB4	113.1	4.9	11.3	7.9	137.2	30
FB5	-	-	-	-	-	0
FB6	32.4	0.7	3.2	2.3	38.6	4
Grand Total	\$ 301.8	\$ 11.6	\$ 30.2	\$ 15.1	\$ 364.7	71

Table 10. Incremental Analysis of NED Plan
(September 2005 price level and 5.125 interest rate)

	Farmers Mainstem	Las Vegas Trail Tributary	5-Year Buyout	Total NED
INVESTMENT				
Estimated First Cost	6,268,555	2,829,975	1,375,071	10,473,601
Interest During Const.	240,945	108,825	52,829	402,599
Investment Cost	\$6,509,500	\$2,938,800	\$1,427,900	\$10,876,200
ANNUAL CHARGES				
Interest	333,600	150,600	73,200	557,400
Amortization	29,900	13,500	6,500	49,900
O&M	15,000	10,000	2,000	27,000
Total Annual Charges	\$378,500	\$174,100	\$81,700	\$634,300
ANNUAL BENEFITS				
Inundation Reduction	692,400	460,300	95,150	1,247,850
Dis-benefits	-3,000	0	0	-3,000
Total Annual Benefits	\$689,400	\$460,300	\$95,150	\$1,244,850
Net Annual Benefits	\$310,900	\$286,200	\$13,450	\$610,550
BENEFIT-COST RATIO	1.82	2.64	1.16	1.96
Residual Damages				\$367,750

LOCALLY PREFERRED PLAN

The NED plan provides the greatest net benefits, eliminates damages up to the 2 percent event along Farmers branch, the 10 percent ACE event along Las Vegas trail, and removes residences in the 20 percent ACE in reaches 1 and 6. However, the city of White Settlement is interested in providing a greater level of protect to the citizens. The city is also concerned about the safety of the residents during a storm event when floodwaters inundate Meadow Park and prohibit passage of emergency vehicles. Therefore, in the interest of safety, modifications to the channel width were expanded to capture 90 percent of the 1 percent ACE flood event between reaches 2, 3, 4 and 5. This increase in the channel width necessitates the expansion of the Meadow Park Bridge. As shown in table 9, residual damages for the LPP are \$259,000. This represents an 84 percent decrease from existing conditions compared to a 74 percent decrease in damages provided by the NED plan. Further, this plan decreases the number of structures remaining in the 100-year floodplain from 244 to 42 as shown in Table 11. Table 12 shows that the LPP exhibits a benefit to cost ratio of 1.6 to 1.0, with \$515,450 in net benefits. This plan satisfies the objective to provide a 100-year level of protection to the majority of the residents.

Table 11. LPP Residual Damages
(September 2005 price level; 1,000's \$)

LPP	EAD	Insurance Subsidy	Clean-up	Infrastructure	Residual Damages	100-Year Strs
FB1	118.7	4.7	11.9	8.3	143.6	29
FB2	2.1	-	-	0.1	2.3	0
FB3	14.5	-	1.4	1.0	16.9	0
FB4	48.7	-	4.9	3.4	57.0	0
FB5	-	-	-	-	-	0
FB6	32.4	2.1	3.2	2.3	40.0	13
Grand Total	\$ 216.3	\$ 6.8	\$ 21.4	\$ 15.1	\$ 259.8	42

Plan Description

The 6,600 ft channel along the mainstem is grass-lined and uses 3:1 side slopes. The channel above White Settlement Road consists of a 120-foot wide benched area on the left side for a distance of 600 linear feet. The right bank and existing flow line for this reach remains undisturbed. Upstream of Meadow Park Lane the improvements were modeled with a 120-foot wide rectangular concrete lined channel due to constraints near city hall. The low flow channel will consist of concrete for the first 50 feet above Meadow Park and then transition to earth for the remaining 250 feet. This plan includes one bridge relocation, one bridge demolition and utility relocations. Appendix B provides additional details. The tributary channel consists of a 32-foot bottom width concrete channel with vertical concrete retaining walls varying from 4.5 feet to 9.0 feet and a stilling basin and/or drop structures to slow the velocities. This concrete channel reach extends from the junction of Farmers Branch approximately 1650 feet in length to the upstream side of George Street Bridge. In addition, 18 structures located in Reaches 1 and 6 will be permanently evacuated.

Table 12. Incremental Analysis of Locally Preferred Plan
(September 2005 price level and 5.125 interest rate)

	Farmers Mainstem	Las Vegas Trail Tributary	5-Year Buyout	Total Locally Preferred
INVESTMENT				
Estimated First Cost	9,744,272	2,829,975	1,375,071	13,949,318
Interest During Const.	374,528	108,825	52,829	536,182
Investment Cost	\$10,118,800	\$2,938,800	\$1,427,900	\$14,485,500
ANNUAL CHARGES				
Interest	518,600	150,600	73,200	742,400
Amortization	46,400	13,500	6,500	66,400
O&M	15,000	10,000	2,000	27,000
Total Annual Charges	\$580,000	\$174,100	\$81,700	\$835,800
ANNUAL BENEFITS				
Inundation Reduction	798,800	460,300	95,150	1,354,250
Dis-benefits	-3,000	0	0	-3,000
Total Annual Benefits	795,800	460,300	95,150	1,351,250
Net Annual Benefits	\$215,800	\$286,200	\$13,450	\$515,450
Benefit-Cost Ratio	1.37	2.64	1.16	1.62
Residual Damages				\$259,800

THE RECOMMENDED PLAN

The City of White Settlement expressed clear planning objectives near the beginning of this feasibility study. The Locally Preferred Plan meets Federal planning objectives and better meets the City of White Settlement's objective to provide a 100-year level of protection to the residents currently living in flood prone areas. Further, this plan decreases the risks for loss of life and increases safety during 5-year to 100-year flood events. The Recommended Plan captures 90 percent of the 100-year floodplain, effectively removing almost 60 percent of the structures from the 100-year flood plain. The design of the Locally Preferred Plan mimics the NED Plan, but varies in width between 50 and 180 feet. Therefore, the Locally Preferred Plan is the Recommended Plan. Figures 7, 8 and 9 detail the 100-year floodplain without and without the project, the channel improvement limits, and the evacuation plan, respectively.

ENVIRONMENTAL IMPACTS OF THE RECOMMENDED PLAN

Impacts and Mitigation

Construction activities during channelization of the stream would displace an already limited fish population as well as alter existing in-stream aquatic habitat. In-stream structures should be established in the channelized portion of the stream to produce viable aquatic habitat. This would allow for the recovery of the stream's fisheries and may even in the future serve to enhance the diversity of the fish assemblage inhabiting this stream. This could be accomplished by constructing low water dams or current deflectors that will reduce bank erosion and provide aquatic habitat.

Construction activities during channelization of the stream would adversely affect 14.24 acres of grasslands, 7.08 acres of parklands, and 0.069 acres of upland forests. All grassland and parkland areas disturbed by construction activities should be revegetated with a variety of native grasses and forbs which provide wildlife food and cover benefits, reduce maintenance, and offer aesthetic qualities. Recommended vegetation includes native species such as buffalograss (*Buchloe dactyloides*), bluestems (*Andropogon* spp. or *Schizachyrium* spp.), bluebonnet (*Lupinus* spp.), and prairie clover (*Dalea* spp.). In addition, shrub mottes, brush piles, and other refuge areas should be established within the grassland areas in the western portion of the watershed. Mowing frequency should be reduced in sites adjacent to the channel and other grassland areas to encourage seed production and propagation of more desirable native, herbaceous grass and forbs. Non-mow zones should also be established along the creek channel to stabilize channel banks, provide filtering of runoff, and shading of the water surface.

Any mature trees greater than 6 inches in diameter removed during construction activities should be replaced by trees of equal or greater value for wildlife species on a 3:1 (replacement:removed) basis. Replaced trees should be native species that produce hard and soft mast and provide shelter for wildlife. Native trees and shrubs such as pecan (*Carya illinoensis*), red oak (*Quercus falcata*), black walnut (*Juglans nigra*), mexican plum (*Prunus mexicana*), sumac (*Rhus* spp.), hawthorn (*Crataegus* spp), and coralberry (*Symphoricarpos orbiculatus*) should be planted in the existing portion of the riparian woodland to improve canopy cover and food base. Approximately 70% of the stems planted should be trees and 30% shrubs. No more than 25% of the trees should be soft mast producers. The planting should be done in a random pattern leaving a few areas with open space for wildlife movement. In addition, standing snags should remain or be created in the existing forested areas to provide habitat for cavity-nesters. There is a very low risk of a necessity for environmental mitigation. However, should mitigation be required it is expected to be minimal with and restricted to project lands.

Cumulative Impacts

Numerous flood damage reduction, channelization, transportation, and recreation projects, along with general urbanization of the area have resulted in significant alterations to the historical conditions of the Farmers Branch Creek within the City of White Settlement. Historically, during heavy rains, flood-waters overtop several areas of the creek and its tributaries inundating

residencies and closing road crossings along the watershed. As development increases on the upper end of the watershed, the flooding problems will likely continue lowering flood protection of the surrounding homes and businesses. Present utilization of the proposed project site includes multiple crossings of the creek by bridges and low water crossings within a residential area. Some park-like open spaces adjacent to the creek may be utilized as well for recreation purposes.

The proposed alternative could have slight adverse impacts to water quality within the study area. Most of the proposed activities would occur directly in or along the watercourse increasing the likelihood of dust and loose sediment being released during construction. This could create temporary water turbidity problems. The cumulative effects of the reasonably foreseeable projects would be slightly adverse due to the cumulative sediment introduced through runoff from the various construction activities. However, it is anticipated that the sediments that could cumulate from these activities would be very low with the implementation of storm water control features and best management practices required during construction.

If implemented, the proposed project is expected to have a direct impact on residential areas adjacent to the project site. Local residences would benefit from an increase in flood control protection lowering the risk of floodwaters inundating homes and roads as well as control erosion. The proposed project would permanently displace 40 structures for implementation activities to take place and for elimination of homes within the 100-yr flood plain.

Regulatory Requirements

Preliminary investigations indicate that the proposed project could meet the terms and conditions of the 404 (b)(1) guidelines under Section 404 of the Clean Water Act. See Appendix C.

IMPLEMENTATION OF THE RECOMMENDED PLAN

Project Cooperation Agreement and Items of Non-Federal Responsibility

Prior to commencement of construction, the non-Federal sponsor must enter into a binding agreement with the Government to provide its required cooperation, the Project Cooperation Agreement (PCA). The PCA is an agreement setting forth the obligations of each party. Local interests must agree to meet the requirements for non-Federal responsibilities, as summarized below and in future legal documents. Appendix J is a draft model PCA.

a. Provide a minimum of 35-percent of the project costs allocated to flood damage reduction further specified as follows:

(1) Provide a cash payment equal to 5-percent of the total project cost.

(2) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas (LERRD's), and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the flood-damage reduction project.

(3) Provide additional funds needed to meet the 35% minimum non-federal share of the total project cost.

(4) In the event the sum of the 5% cash and the value of the LERRD's exceed 50-percent of the total project cost, the non-Federal sponsor is entitled to a reimbursement so that the maximum total contribution is equal to 50-percent of the total project cost.

(5) Provide 100% of all design and construction costs associated with project betterments.

b. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and any specific directions prescribed by the Federal Government.

c. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the local sponsor owns or controls for access to the project for the purpose of inspecting, completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

d. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

e. Hold and save the United States free from all damages arising for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

f. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence is required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20.

g. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction;

- h. Assume, as between the Federal Government and the Non-Federal sponsor complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.
- i. Agree, as between the Federal Government and the Non-Federal Sponsor, that the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project and otherwise perform its obligations in a manner that will not cause liability to arise under CERCLA.
- j. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might interfere with the proper functioning of the project, hinder operation and maintenance, or reduce the benefits of the project.
- k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.
- l. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".
- m. Do not use funds from other Federal programs, including any non-Federal contribution required as a matching share, to meet the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that the expenditure of such funds for such purpose is authorized.

Cost Apportionment

Table 13 provides a cost comparison between the NED and LPP. As shown, the LPP requires the purchase of more real estate and remediation of contaminants compared to the NED Plan.

Table 13. Estimated Project Cost Comparison
(September 2005 prices)

Item	NED	LPP
Lands and Damages	\$ 4,403,719	\$ 5,233,399
Channel	\$ 3,847,109	\$ 5,171,879
Bridges and utilities	\$ 169,011	\$ 973,711
Contaminant Remediation	\$ 796,180	\$ 1,090,034
Engineering and Design	\$ 853,849	\$ 997,920
Construction Management	\$ 403,733	\$ 482,375
Total	\$ 10,473,601	\$ 13,949,318

Tables 14 and 15 show the apportionment of the first cost and annual operation and maintenance and replacement costs between Federal and non-Federal interests for both the NED and the LPP, in accordance with the policies previously outlined. The first cost of the recommended (locally preferred) plan is estimated at \$13,949,318. The final apportionment for the locally preferred plan is limited by the total Federal expenditures applicable to the NED plan of \$5,443,061. The Non-Federal interests share totals \$8,506,257 including \$1,737,858 in additional cash.

Table 14. Cost Apportionment of the National Economic Development Plan
(September 2005 prices)

Feature	Federal	Non-Fed	Total
Relocations		\$ 877,504	\$ 877,504
Channels	\$ 3,138,616		\$ 3,138,616
Contaminants	\$ 596,613		\$ 596,613
Lands and Damages		\$ 3,293,107	\$ 3,293,107
PED and S&A	\$ 1,122,890	\$ 69,800	\$ 1,192,690
Structural Subtotal	\$ 4,858,118	\$ 4,240,411	\$ 9,098,530
5% Cash Requirement	\$ (454,926)	\$ 454,926	
Structural Plan Subtotal	\$ 4,403,192	\$ 4,695,338	\$ 9,098,530
	48%	52%	
Reimbursement	\$ 146,073	\$ (146,073)	
Structural Cost Share	\$ 4,549,265	\$ 4,549,265	\$ 9,098,530
	50%	50%	
Nonstructural Measure	\$ 893,796	\$ 481,275	\$ 1,375,071
Nonstructural % Breakout	65%	35%	
Apportionment Totals	\$ 5,443,061	\$ 5,030,540	\$ 10,473,601
% Breakout	52.0%	48.0%	

Table 15. Cost Apportionment of the Locally Preferred Plan
(September 2005 prices)

Feature	Federal	Non-Fed	Total
Relocations		\$ 1,682,204	\$ 1,682,204
Channels	\$ 4,463,386		\$ 4,463,386
HTRW	\$ 890,467		\$ 890,467
Lands and Damages		\$ 4,122,787	\$ 4,122,787
PED and S&A	\$ 1,275,799	\$ 139,604	\$ 1,415,403
Structural Subtotal	\$ 6,629,652	\$ 5,944,595	\$ 12,574,247
5% Cash Requirement	\$ (628,712)	\$ 628,712	
Structural Plan Subtotal	\$ 6,000,939	\$ 6,573,307	\$ 12,574,247
Structural Cost Share	48%	52%	
Reimbursement	\$ 286,184	\$ (286,184)	
	\$ 6,287,123	\$ 6,287,123	
Structural Cost Share	50%	50%	
Nonstructural Measure	\$ 893,796	\$ 481,275	\$ 1,375,071
Nonstructural % Breakout	65%	35%	
Apportionment Totals	\$ 7,180,920	\$ 6,768,398	\$ 13,949,318
% Breakout	51.5%	48.5%	
Additional Cash by Sponsor	\$ (1,737,858)	\$ 1,737,858	
Total	\$ 5,443,061	\$ 8,506,257	\$ 13,949,318

VIEWS OF THE LOCAL SPONSOR

The city of White Settlement supports the recommended plan, and intends to participate in its implementation. A letter of intent stating their support and intention to participate in project implementation has been received and is included in Appendix L.

PUBLIC INVOLVEMENT

Due to the number of structure demolitions, easements, and property buyouts along Farmers Branch a preliminary draft Detailed Project Report and Integrated Environmental Assessment was presented to the public and a public meeting was held on June 10, 2005 in White Settlement, Texas. The purpose of the public meeting was to seek input from the residents regarding the structures identified for purchase stemming from widening the creek. About 42 citizens attended

Draft Farmers Branch Detailed Project Report and Integrated Environmental Assessment

the meetings. Most of the initial comments received related to land acquisition, damage reduction along the Las Vegas Trail Tributary, funding, and the implementation schedule. There were no objections to the recommended plan.

TECHNICAL, POLICY, AND LEGAL REVIEW

All technical analyses and other studies have received an independent technical including hydrology, hydraulics, flood damage estimates, civil-, structural, geotechnical-, and cost-engineering, cultural and hazardous waste studies, environmental assessment and mitigation plan, and the gross appraisal and real estate plan. A policy review was conducted by the District's plan formulation specialist, the Chief of Planning Branch, and the Chief of Planning, Environmental, and Regulatory Division. The District's Office of Counsel has reviewed the report for legal sufficiency. A signed Certificate of Technical, Policy, and Legal Sufficiency is located in Appendix L.

FINDINGS AND CONCLUSIONS

The following conclusions are based on the study findings conducted in connection with this feasibility level report:

- The city of White Settlement experiences recurrent flooding from Farmers Branch within the city limits causing economic losses and a threat to health and safety. Flood damages begin with the 2-year flood event, with significant damages occurring prior to the 5-year event. The 10- and 100-year flood event result in single-event damages of \$1.6 million and \$3.3 million, respectively. Annual flood damages are estimated at \$1.6 million.
- The 6,500 channel along the mainstem is grass-lined and uses 3:1 side slopes. The channel above White Settlement Road consists of a 120-foot wide benched area on the left side for a distance of 600 linear feet. The right bank and existing flow line for this reach remains undisturbed. Upstream of Meadow Park Lane was modeled as a 120-foot wide rectangular concrete lined channel for approximately 300 linear feet due to its confinement in the city hall area. The low flow channel will consist of concrete for the first 50 feet above Meadow Park and then transition to earth for the remaining 250 feet. The recommended plan also identifies one bridge relocation, one bridge demolition and utility relocations. In addition to the land parcels, 21 residential structures and 1 commercial structure will be purchased and demolished.
- The plan requires the permanent evacuation of 18 residential structures.
- The tributary channel consists of a 32-foot bottom width concrete channel with vertical concrete retaining walls varying from 4.5 feet to 9.0 feet and a stilling basin and/or drop structures to slow the velocities. This concrete channel reach extends from the junction of Farmers Branch approximately 1,650 feet in length to the upstream side of George Street.

- The total project cost is estimated at \$13.9 million. Annual costs are estimated at \$835,700. The project provides annual flood-damage reduction benefits of \$1,351,300 and has a benefit-cost ratio and net benefits of 1.6 to 1.0 and \$515,450, respectively. The recommended plan reduces 93-percent of the annual damages.
- The city of White Settlement is identified as the local sponsor for implementation of the recommended plan. Federal and non-Federal cost apportionments for the recommended (locally preferred) plan are estimated at \$5,443,061 Federal and \$8,506,257 non-Federal.
- The recommended plan will cause no long-term adverse environmental impacts.
- The recommended plan is supported by the city of White Settlement.

A decision to invest in the Farmers Branch, White Settlement, Texas, local flood-damage reduction plan is warranted because the project will:

- Fulfill the Corps flood damage reduction mission
- Is in accordance with the Corps Civil Works Strategic Plan
- In is accordance with the Corps Environmental Operating Principles
- Is in compliance with Corps policy
- Is technically sound
- Satisfies the city of Whit Settlement's project objectives
- And White Settlement is prepared to implement the recommended plan immediately having secured all required funding for implementation

RECOMMENDATION

I propose the flood damage reduction identified as the recommended plan in the Farmers Branch White Settlement, Texas, Detailed Project Report and Integrated Environmental Assessment proceed with implementation in accordance with the cost sharing provisions set forth in this report.

This recommendation is made with the provision that prior to project implementation the non-Federal sponsor shall enter into a binding agreement with the Secretary of the Army to perform the items of local cooperation, as specified in this document.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent to the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Date _____

John R. Minahan
Colonel, Corps of Engineers
District Engineer

DRAFT
FINDING OF NO SIGNIFICANT IMPACT

**INTEGRATED PROJECT REPORT
AND ENVIRONMENTAL ASSESSMENT
FARMERS BRANCH CREEK
WHITE SETTLEMENT
TARRANT COUNTY, TEXAS**

White Settlement is located in Tarrant County, Texas, about 8 miles west of downtown Fort Worth. Farmers Branch originates in the western part of the county and flows in an easterly direction through White Settlement to its confluence with the Kings Branch just upstream of its confluence with the West Fork of the Trinity River. The Farmer's Branch watershed consists of an area approximately 6.5 square miles and is a sub-basin of the West Fork Trinity River. The floodplain within the study area is extremely narrow flowing within a highly urbanized area. At the request of the city of White Settlement, the U.S. Army Corps of Engineers, Fort Worth District initiated a feasibility study to evaluate potential solutions to flooding problems, under the authority of Section 205 of the Flood Control Act of 1948, as amended.

Four non-structural alternatives and four structural alternatives were considered in the development of the National Economic Development (NED). The NED plan alternative, which is also the locally preferred plan (LPP) alternative, incorporates facets from both the non-structural and structural alternatives. It entails (1) the purchasing of single 14 family residential properties within the floodplain between Judd Street and Redford Road and between Cherry Lane and Lockheed Boulevard subject to flooding by the 20% annual chance exceedance (ACE) fully developed watershed flood; (2) the channelization of the stream between Las Vegas Trail and Cherry Lane; and (3) channelization of the Las Vegas Trail tributary with a concrete trapezoidal channel.

Specific construction activities associated with the NED plan alternative include the channelization of Farmer's Branch for a reach length of 6,600 feet from downstream of the Judd Street low road crossing to upstream of the White Settlement Road bridge; channelization of Las Vegas tributary for a length of 1,650 feet from the confluence to George Street; construction of a new bridge at Meadow Park Drive; and demolition of the Pemberton Road bridge. In addition, where there is adequate room, the stream bank slopes will be stabilized with erosion control matting and/or rock riprap.

The recommended plan provides beneficial impacts to the human environment by providing flood damage protection. Construction activities during channelization of the stream would adversely affect 14.24 acres of grasslands, 7.08 acres of parklands, and 0.069 acres of upland forests. There are no known impacts to cultural resources or historical properties. The project would not impact wetlands; however, the project would have insignificant impacts to 8,250 linear feet of waters of the united states.

Based upon the environmental assessment and results of coordination, I have concluded that the proposed action would not have a significant adverse effect on the human or natural environment. Consequently, construction of the recommended plan would not constitute a major Federal action of sufficient magnitude to warrant the preparation of an Environmental Impact Statement.

Date _____

John R. Minahan
Colonel, Corps of Engineers
District Engineer

