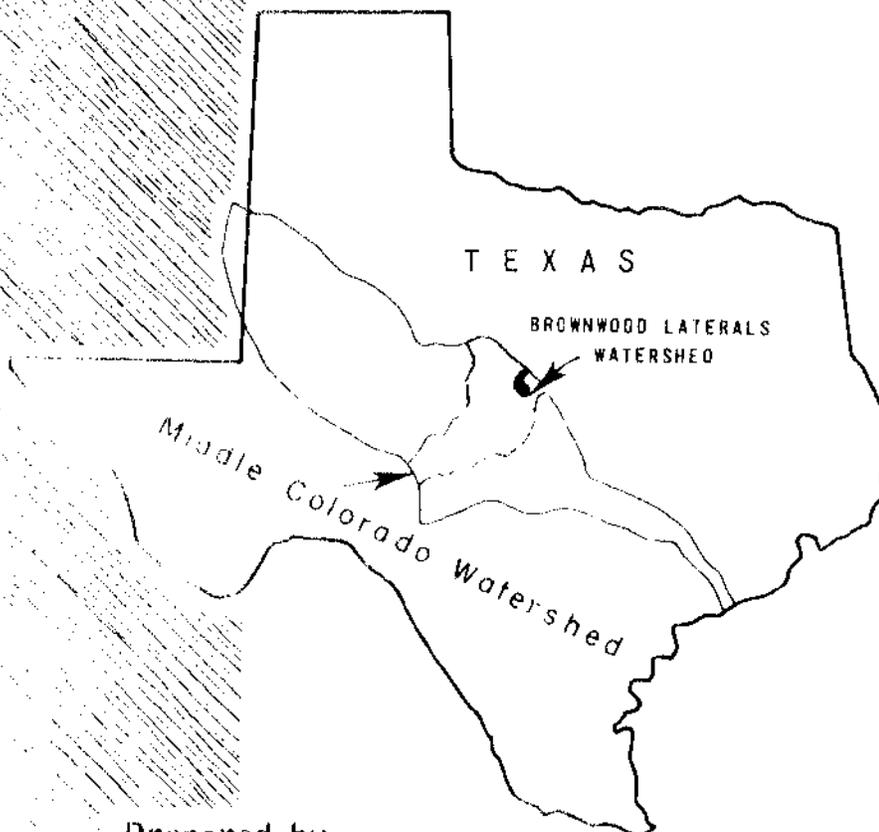


SUPPLEMENTAL AGREEMENT NO. II
WATERSHED WORK PLAN

BROWNWOOD LATERALS WATERSHED

OF THE MIDDLE COLORADO RIVER WATERSHED
BROWN AND MILLS COUNTIES, TEXAS



Prepared by
SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE
Temple, Texas
June 1973

SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT NO. II

Between the

Brown-Mills Soil and Water Conservation District
Local Organization

Brown County Commissioners Court
Local Organization

Mills County Commissioners Court
Local Organization

City of Brownwood, Texas
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)
State of Texas

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, the Watershed Work Plan Agreement for the Brownwood Laterals Watershed, State of Texas executed by the Sponsoring Local Organization named therein and the Service became effective on the 22nd day of December 1964; and

Whereas, the Supplemental Watershed Work Plan Agreement for the Brownwood Laterals Watershed, State of Texas, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 26th day of November 1971; and

Whereas, in order to carry out the Watershed Work Plan for said watershed, it has become necessary to modify said Watershed Work Plan Agreement as supplemented; and

Whereas, it has been found necessary to modify the Watershed Work Plan for the Willis Creek portion of said watershed by deleting planned Floodwater Retarding Structure No. 4 and the planned 3.44 miles of channel work and by adding Floodwater Retarding Structures No. 4A and 4B; and

Whereas, a Supplemental Watershed Work Plan which modifies the Watershed Work Plan dated December 1963 for said watershed has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service; which plan is annexed to and made part of this agreement;

Now therefore, the sponsoring local organization and the Service hereby agree upon the following terms, conditions and stipulations of said watershed work plan agreement:

1. Single purpose floodwater retarding structure No. 4 and 3.44 miles of channel work on Willis and South Willis Creeks are hereby deleted from the plan.
2. Single purpose floodwater retarding structures No. 4A and 4B are hereby included as part of the planned works of improvement.
3. Paragraph number 16 is hereby added as follows:

The Brown County Commissioners Court will acquire with other than Flood Prevention, such land rights required for floodwater retarding structures No. 4A and 4B.

4. The Sponsoring Local Organization and the Service further agree to all other terms, conditions and stipulations of said Watershed Work Plan, as supplemented, not modified herein.

Brown-Mills, Soil and Water Conservation District
Local Organization

By Kenneth L. Boyd

Title Chairman

Date 4-26-74

The signing of this agreement was authorized by a resolution of the Governing body of the Brown-Mills Soil and Water Conservation District

adopted at a meeting held on April 26, 1974

E. B. Boyd
 Secretary (Secretary, Local Organization)

Date 4-26-74

Commissioners Court of Brown County
Local Organization

By Ann H. Bunnell

Title County Judge

Date 4-29-74

The signing of this agreement was authorized by a resolution of the governing body of the Commissioners Court of Brown County

Local Organization

adopted at a meeting held on April 29, 1974

Mrs. Recie Bell
 (Secretary, Local Organization)

Date 4-29-74

Commissioners Court of Mills County
Local Organization

By *W. Edgar*
Title *County Judge*
Date *May 6 - 1974*

The signing of this agreement was authorized by a resolution of the governing body of the

Commissioners Court of Mills County
Local Organization

adopted at a meeting held on

May 6, 1974
Walter A. Bryant
(Secretary, Local Organization)

Date *May 6, 1974*

City of Brownwood
Local Organization

By *H. H. Hackett*
Title *MAYOR*
Date *4-30-74*

The signing of this agreement was authorized by a resolution of the governing body of the

City of Brownwood
Local Organization

adopted at a meeting held on

April 30, 1974
Alvin C. Hays
(Secretary, Local Organization)

Date *4-30-74*

United States Department of Agriculture
Soil Conservation Service

By *Edward E. Thomas*
State Conservationist

Date *5-8-74*

SUPPLEMENTAL WATERSHED WORK PLAN NO. II

**BROWNWOOD LATERALS WATERSHED
of the Middle Colorado River Watershed
Brown and Mills Counties, Texas**

**Plan Prepared and Works of Improvement
to be Installed Under the Authority
of the Flood Control Act of 1944
as Amended and Supplemented**

Prepared by:

**Brown-Mills Soil and Water Conservation District
Brown County Commissioners Court
Mills County Commissioners Court
City of Brownwood**

With Assistance by:

**U. S. Department of Agriculture
Soil Conservation Service**

June 1973

SUPPLEMENTAL WATERSHED WORK PLAN NO. II

BROWNWOOD LATERALS WATERSHED
of the Middle Colorado River Watershed
Brown and Mills Counties, Texas

June 1973

PURPOSE OF THE SUPPLEMENTAL WATERSHED WORK PLAN

The purpose of this supplemental watershed work plan for the Willis Creek portion of the Brownwood Laterals Watershed is to make the following modifications:

1. Delete planned Floodwater Retarding Structure No. 4 and add Floodwater Retarding Structures No. 4A and 4B. Since completion of the work plan, major developments have occurred at the planned structure. A large pipe line and a major power transmission line cross the planned embankment and sediment pool areas. In addition a large manufacturing company has installed a sanitary land fill for waste by-products in the planned sediment pool area. It is necessary to make the above changes in the structural program in order to have a plan that can be installed.
2. Delete the 3.44 miles of channel work planned for Willis and South Willis Creeks. The new evaluation, using current criteria revealed that insignificant damages in the urban area would occur as a result of the 100 year frequency flood event. Therefore this proposed channel work is deleted.
3. Extend the installation period an additional three years.
4. Modify the Willis Creek portion of the work plan to reflect current criteria and terminology relative to engineering and to list project administration costs as a line item.
5. Up date costs to 1972 price levels for Floodwater Retarding Structures No. 4A and 4B and for installation of planned land treatment measures.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Soil and water conservation measures are established and maintained in the watershed under the effective leadership of the Brown-Milla Soil and Water Conservation District. Technical assistance is furnished by personnel of the field office of the Service. The objective that each acre shall be used within its capabilities and treated in accordance with its needs, is basic to proper land use.

Application and maintenance of land treatment measures will be applied to 16,269 acres. This treatment will reduce the sediment accumulation and retard runoff into the three floodwater retarding structures. This treatment on the 9,372 acres not controlled by floodwater retarding structures will be significant in reducing floodwater, sediment, and scour damages. Land treatment measures itemized in Table 1 are to be established during the installation period.

Cultivated land will receive a combination of land treatment measures needed to control erosion and retard runoff. Proper grazing use, seeding, and deferred grazing will be practiced to improve the quality of vegetation and maintain adequate cover for soil protection. Farm ponds will be constructed to alleviate conditions of over-use occurring around present watering places. Gullied land areas will be shaped and vegetated under going programs.

The protection of existing wildlife habitat and the establishment of additional food, cover and water will be provided through the practices such as critical area planting and wildlife upland habitat management.

Structural Measures

This Supplemental Watershed Work Plan provides for the deletion of Floodwater Retarding Structure No. 4 and 3.44 miles of Channel Work, and the addition of Floodwater Retarding Structures No. 4A and 4B. The total drainage area controlled by floodwater retarding structures is 10.78 square miles, representing 42.41 percent of the watershed at Valley Section No. W-1.

The three floodwater retarding structures have an aggregate capacity of 4,599 acre-feet. This total includes 4,067 acre-feet for floodwater detention and 532 acre-feet for sediment storage. Capacity is provided to store a 100-year accumulation of sediment. The sediment pools will inundate 46 acres at the lowest ungated outlet and 56 acres at the principal spillway crest. An additional 287 acres will be subject to temporary inundation by the floodwater detention storage. Floodwater detention capacity, expressed in inches of runoff from the controlled area is 6.00 watershed inches. Floodwater Retarding Structure No. 3 has been constructed.

EXPLANATION OF INSTALLATION COST

The estimated cost of planning and installing land treatment measures is \$193,720 based on current program criteria (Table 1). Prior to supplemental work plan preparation, landowners and operators have established land treatment measures at an estimated non-federal cost of \$107,049 (Table 1A).

The estimated total installation cost for floodwater retarding structures is \$770,860, of which \$209,010 is for Structures No. 4A and 4B and \$561,850 is for Structure No. 3. Allocation of the total installation cost is \$603,140 to construction, \$33,240 to engineering, \$37,740 to land rights and \$96,740 to project administration.

Distribution of project administration cost is \$95,240 and \$1,500 for Federal and other funds, respectively. Federal project administration cost consists of construction inspection, maintenance of records and accounts and contract administration.

Total project costs are shown on Table 1 and costs of all structural measures are shown on Table 2.

The tentative schedule of obligations for the 3-year project installation period, including installation of both land treatment and structural measures is as follows:

| Fiscal Year | Measures | Federal Funds | Non-Federal Funds | Total |
|--------------|---|----------------|-------------------|----------------|
| | | (dollars) | (dollars) | (dollars) |
| First | Land Treatment | 2,000 | 24,157 | 26,157 |
| Second | Floodwater Retarding Structures No. 4A and 4B | 193,260 | 15,750 | 209,010 |
| | Land Treatment | 2,000 | 24,157 | 26,157 |
| Third | Land Treatment | 2,000 | 24,157 | 26,157 |
| Total | | 199,260 | 88,221 | 287,481 |

This schedule may be adjusted from year to year on the basis of any significant changes in the plan found to be mutually desirable and in the light of appropriations and accomplishments actually made.

EFFECTS OF WORKS OF IMPROVEMENT

After installation of the combined program of land treatment and structural measures the average annual flooding, excluding flood plain inundated by structure pools and in urban areas, will be reduced from 391 acres to 15 acres, a 96 percent reduction. This project will benefit directly approximately 46 owners of agricultural flood plain lands.

The area flooded without and with the project installed, is estimated as shown below:

Area Inundated 1/

| Evaluation: | Average Recurrence Interval | | | | | | | |
|-------------|-----------------------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|
| | 3-Year | | 10-Year | | 25-Year | | 100-Year | |
| No. | Without Project | With Project | Without Project | With Project | Without Project | With Project | Without Project | With Project |
| | (acres) | (acres) | (acres) | (acres) | (acres) | (acres) | (acres) | (acres) |
| 5 | 535 | 12 | 685 | 50 | 745 | 81 | 883 | 132 |

1/ Exclusive of flood plain inundated by structure pools and in urban areas.

Since the 1963 Work Plan was prepared there has been approximately 170 acres of relative high value agricultural flood plain converted to or in the process of being converted to urban development. This trend is expected to continue. No benefits have been claimed for this land use change.

Within the present urban area, owners and occupants of 380 residential units, five commercial establishments, one church and one public school will benefit from the project.

Within the present urban area, damage from the 100-year storm with project will be on lawns of two apartments and two duplex residences and will be insignificant.

The average annual flood plain scour and overbank deposition is expected to be reduced about 99 percent.

The annual sediment yield to the mouth of Willis Creek is expected to be reduced from 2536 tons to 1566 tons.

Incidental recreation such as camping, fishing, hunting, and swimming will be realized from sediment pools of the floodwater retarding structures. About 1,420 visitor days are expected annually with a peak daily use estimated at 180 visitors.

Sanitary facilities will be necessary in order to prevent contamination of water to be used for recreational purposes. Landowners and other private interests have indicated to the sponsors that they will develop sanitary facilities meeting State and local health agency requirements prior to making the sites available to the general public.

Evaluation of damage reduction below the mouth of Willis Creek is not included in this supplement.

Secondary benefits, including increased business activity and improved economic conditions in the area, will result from the installation of the project. Local secondary benefits were considered 10 percent of direct primary benefits. In addition there are intangible benefits such as increased sense of security and better living conditions.

The effect on the environment resulting from the proposed changes will be minor. The installation of the two floodwater retarding structures, to be added will require the commitment of 212 less acres than the deleted floodwater retarding structures. The area to be cleared for dams, spillways, and sediment pools, and for which vegetative habitat will be destroyed or altered, will be about 29 acres less than that required in the original planned structural system.

PROJECT BENEFITS

The estimated average annual monetary floodwater, sediment, erosion, and indirect damage will be reduced from \$303,809 to \$109 by the project (Table 5). This is a reduction in excess of 99 percent. Of this reduction 90 percent is creditable to structural measures.

The following presentation shows the floodwater damage reduction attributal to the project.

| Direct Monetary Floodwater Damage | | | | | | | | |
|-----------------------------------|-----------------------------------|--------------------------------|-----------------------------------|--------------------------------|-----------------------------------|--------------------------------|-----------------------------------|--------------------------------|
| Average Recurrence Interval | | | | | | | | |
| Evaluation: Reach | 3-Year | | 10-Year | | 25-Year | | 100-Year | |
| | :Without :Project (dollars) | :With :Project (dollars) | :Without :Project (dollars) | :With :Project (dollars) | :Without :Project (dollars) | :With :Project (dollars) | :Without :Project (dollars) | :With :Project (dollars) |
| 5 | 51,804 | 49 | 620,564 | 425 | 2,355,191 | 926 | 3,621,292 | 4,526 |

The average annual benefits incidental to the project are \$921; of which \$708 is to recreation and \$213 to livestock water.

It is estimated that the project will produce local secondary benefits, which exclude indirect benefits, averaging \$24,899 annually. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

COMPARISON OF BENEFITS AND COSTS

The total average annual cost of structural measures is \$25,407. These measures are expected to produce average annual benefits, excluding secondary benefits, of \$273,792 resulting in a benefit-cost ratio of 10.8:1.0.

The ratio of total average annual project benefits, accruing to structural measures (\$298,691) to the average annual cost of structural measures (\$25,407) is 11.8:10 (Table 6).

PROJECT INSTALLATION

Land Treatment Measures

The land treatment measures itemized in Table 1 will be established by farmers and ranchers in cooperation with the Brown-Mills Soil and Water Conservation District during the three year project installation period. The District is giving assistance in the planning and application of these measures under its going programs.

Structural Measures

The Brown County Commissioners Court will acquire the land rights necessary to construct floodwater retarding structures No. 4A and 4B. They have the right of eminent domain under applicable state laws and financial resources necessary to fulfill their responsibilities.

The Service will contract for the construction of the floodwater retarding structures.

The three floodwater retarding structures planned for the Willis Creek portion of the Brownwood Laterals Watershed have been grouped into one construction unit, (No. 2). Costs and benefits for these proposed structures are as shown below:

| Construction Unit | Structure Numbers | Annual Benefits (dollars) | Annual Cost (dollars) | Benefit-Cost Ratio |
|-------------------|-------------------|------------------------------|--------------------------|--------------------|
| 2 | 3, 4A and 4B | 298,691 | 25,407 | 11.8:1.00 |

The floodwater retarding structures planned for Willis Creek can be installed in any sequence desired. Construction will not be started on any structure until all requirements for land rights have been handled to the satisfaction of all concerned parties. Brown County Commissioners Court will be responsible for working with the Service during construction of the works of improvement.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be operated and maintained by the owners and operators of the farms and ranches on which the measures are installed under agreements with the Brown-Mills Soil and Water Conservation District. Representatives of the District will make periodic inspections of the land treatment measures to determine maintenance needs and to encourage land owners and operators to perform maintenance.

Structural Measures

The three floodwater retarding structures will be operated and maintained by the Brown-Mills Soil and Water Conservation District, the Brown County Commissioners Court and the City of Brownwood.

The estimated average annual operation and maintenance cost is \$543, adjusted normalized prices.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Brownwood Laterals Watershed, Texas
Willis Creek Portion
(Middle Colorado River Watershed)

| Installation Cost Item | Unit | Estimated Cost (Dollars) ^{1/} | | | Total |
|----------------------------------|-------|--|----------------|----------------|----------------|
| | | Non-Fed. Land | Non-Fed. Land | Non-Fed. Land | |
| LAND TREATMENT | | | | | |
| Land Areas ^{2/} | | | | | |
| Cropland | Acres | 1,180 | --- | 120,592 | 120,592 |
| Pastureland | Acres | 1,115 | --- | 21,510 | 21,510 |
| Rangeland | Acres | 10,979 | --- | 37,418 | 37,418 |
| Technical Assistance | | | 14,200 | -- | 14,200 |
| TOTAL LAND TREATMENT | | | 14,200 | 179,520 | 193,720 |
| STRUCTURAL MEASURES | | | | | |
| <u>Construction</u> | | | | | |
| Floodwater Retarding Structure | No. | 3 | 603,140 | -- | 603,140 |
| <u>Engineer Services</u> | | | 33,240 | -- | 33,240 |
| Project Administration | | | | | |
| Construction Inspection | | | 43,120 | 300 | 43,420 |
| Other | | | 52,120 | 1,200 | 53,320 |
| Subtotal - Administration | | | 95,240 | 1,500 | 96,740 |
| <u>Other Cost</u> | | | | | |
| Land Rights | | | -- | 37,740 | 37,740 |
| TOTAL STRUCTURAL MEASURES | | | 731,620 | 39,240 | 770,860 |
| TOTAL PROJECT | | | 745,820 | 218,760 | 964,580 |

^{1/} Price base: Actual contract cost for structure constructed prior to June 1973; 1972 prices.

^{2/} Include only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just adequately treated areas.

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TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
Brownwood Laterals Watershed, Texas
Willis Creek Portion
(Middle Colorado River Watershed)

| <u>Measures</u> | <u>Unit</u> | <u>Applied To Date</u> | <u>Total Cost (Dollars)^{1/}</u> |
|--------------------------------------|-------------|------------------------|--|
| <u>LAND TREATMENT</u> | | | |
| Contour Farming | Acre | 163 | 163 |
| Crop Residue Use | Acre | 368 | 247 |
| Conservation Cropping System | Acre | 368 | 478 |
| Proper Grazing Use | Acre | 8,063 | 2,419 |
| Deferred Grazing | Acre | 7,820 | 2,581 |
| Range Seeding | Acre | 150 | 2,480 |
| Pasture Planting | Acre | 965 | 14,475 |
| Pasture Management | Acre | 914 | 274 |
| Brush Control | Acre | 1,100 | 13,695 |
| Terraces | Foot | 10,620 | 637 |
| Farm Ponds | No. | 10 | 7,200 |
| Land Leveling | Acre | 555 | 55,500 |
| Structures for Water Control | No. | 560 | 4,200 |
| Irrigation Ditches | Foot | 15,000 | 2,550 |
| Wildlife Upland Habitat Management | Acre | 50 | 150 |
| Sub-Total | | | 107,049 |
| <u>STRUCTURAL MEASURES</u> | | | |
| Floodwater Retarding Structure No. 3 | No. | 1 | 561,850 |
| TOTAL | | | 668,999 |

^{1/} Price Base: 1972 price for land treatment and actual cost for floodwater retarding structure.

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Table 2
ESTIMATED STRUCTURAL COST DISTRIBUTION
 Brownwood Laterals Watershed, Texas
 Willis Creek Portion
 (Middle Colorado River Watershed)
 (Dollars) 1/

| Item | Federal Installation Cost | | | Other Installation Cost | | | Total Installation Cost |
|---------------------------------|---------------------------|-------------|---------|-------------------------|--------|---------|-------------------------|
| | Construction | Engineering | Federal | Land Rights | Other | Total | |
| Floodwater Retarding Structures | | | | | | | |
| <u>NOT BUILT</u> | | | | | | | |
| 4A | 93,240 | 6,530 | 99,770 | 5,500 | 5,500 | 105,270 | |
| 4B | 60,650 | 4,250 | 64,900 | 9,250 | 9,250 | 74,150 | |
| Project Administration | | | 28,590 | | 1,000 | 29,590 | |
| Sub-Total | 153,890 | 10,780 | 193,260 | 14,750 | 15,750 | 209,010 | |
| Floodwater Retarding Structures | | | | | | | |
| <u>BUILT</u> | | | | | | | |
| 3 | 449,250 | 22,460 | 471,710 | 22,990 | 22,990 | 494,700 | |
| Project Administration | | | 66,650 | | 500 | 67,150 | |
| Sub-Total | 449,250 | 22,460 | 538,360 | 22,990 | 23,490 | 561,850 | |
| Grand Total | 603,140 | 33,240 | 731,620 | 37,740 | 39,240 | 770,860 | |

1/ Price Base: 1972 prices; Actual contract cost for structure constructed prior to June 1973.

TABLE 3 - STRUCTURAL DATA
 STRUCTURES WITH PLANNED STORAGE CAPACITY
 Brownwood Laterals Watershed, Texas
 Willis Creek Portion
 (Middle Colorado River Watershed)

| ITEM | UNIT | STRUCTURAL MEASURES | | | |
|--|----------|---------------------|--------|--|---------|
| | | 4A | 4B | Structure constructed prior to 6/30/73 | Total |
| Class of Structure | | C | C | | |
| Drainage Area (Total) | Sq.Mi | 0.80 | 1.14 | 8.84 | 10.78 |
| Curve No. (1-day) (AMC II) | | 82 | 79 | xxx | xxx |
| Elevation Top of Dam | Ft. | 1472.3 | 1474.5 | xxx | xxx |
| Elevation Crest Emergency Spillway | Ft. | 1465.5 | 1468.0 | xxx | xxx |
| Elevation Crest High Stage Inlet | Ft. | 1453.8 | 1456.8 | xxx | xxx |
| Elevation Crest Low Stage Inlet | Ft. | | | | |
| Maximum Height of Dam | Ft. | 31 | 32 | | |
| Volume of Fill | Cu.Yds. | 70,332 | 55,000 | 512,000 | 637,332 |
| Total Capacity ^{1/} | Ac.Ft. | 299 | 426 | 3,874 | 4,599 |
| Sediment Submerged 100 years | Ac.Ft. | 38 | 54 | 400 | 492 |
| Sediment Aerated | Ac.Ft. | 5 | 7 | 28 | 40 |
| Retarding | Ac.Ft. | 256 | 365 | 3,446 | 4,067 |
| Between High and Low Stage | Ac.Ft. | | | 202 | 202 |
| Surface Area | | | | | |
| Sediment Pool | Acres | 9 | 16 | 36 | 61 |
| Retarding Pool ^{1/} | Acres | 35 | 55 | 253 | 343 |
| Principal Spillway Design | | | | | |
| Rainfall Volume (areal) (1-day) | In. | 9.10 | 9.10 | xxx | xxx |
| Rainfall Volume (areal) (10-day) | In. | 14.40 | 14.40 | xxx | xxx |
| Runoff Volume (10-day) | In. | 9.97 | 9.32 | xxx | xxx |
| Capacity of Low Stage (Max.) | cfs. | 27 | 27 | xxx | xxx |
| Frequency operation - Emer. Spillway | %Chance | 1.0 | 1.0 | xxx | xxx |
| Dimensions of Conduit | Ft.orIn. | 30 | 30 | xxx | xxx |
| Emergency Spillway Design | | | | | |
| Rainfall Volume (ESH) (areal) | In. | 12.70 | 12.70 | xxx | xxx |
| Runoff Volume (ESH) | In. | 10.39 | 9.98 | xxx | xxx |
| Storm Duration | Hrs. | 6.0 | 6.0 | xxx | xxx |
| Type | Veg. | | | | |
| Bottom Width | Ft. | 100 | 130 | | |
| Velocity of Flow (^V _e) | Ft./Sec. | 6.5 | 5.8 | xxx | xxx |
| Slope of exit channel | Ft./Ft. | .04 | .03 | xxx | xxx |
| Max. reservoir water surface elevation | Ft. | 1467.5 | 1469.9 | xxx | xxx |
| Freeboard Design | | | | | |
| Rainfall Volume (FH) (Areal) | In. | 30.40 | 30.40 | xxx | xxx |
| Runoff Volume (FH) | In. | 27.92 | 27.43 | xxx | xxx |
| Storm Duration | Hrs. | 6.0 | 6.0 | xxx | xxx |
| Max. reservoir water surface elevation | Ft. | 1472.3 | 1474.5 | xxx | xxx |
| Capacity Equivalents | | | | | |
| Sediment Volume | In. | 1.00 | 1.00 | xxx | xxx |
| Retarding Volume | In. | 6.00 | 6.00 | xxx | xxx |

^{1/} Crest of Emergency Spillway

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TABLE 4 - ANNUAL COSTS ^{1/}
Brownwood Laterals Watershed, Texas
Willis Creek Portion
(Middle Colorado River Watershed)
(Dollars)

Construction Unit No. 2

| Evaluation Unit | Amortization of Installation Costs 2/ | Operation and Maintenance Costs 3/ | Total |
|--|---|--|---------------|
| Floodwater Retarding Structures No. 3, 4A, and 4B | 21,736 | 543 | 22,279 |
| Project Administration | 3,128 | | 3,128 |
| Total | 24,864 | 543 | 25,407 |

1/ Does not include work plan preparation cost.

2/ Price Base: FWRS No. 3 based on contract cost, amortized at 3 percent for 100 years. Floodwater Retarding Structures No. 4A and 4B 1972 Prices amortized at 3.25 percent for 100 years.

3/ Adjusted normalized prices, April 1966.

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TABLE 5
ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS
 Brownwood Laterals Watershed, Texas
 Willis Creek Portion
 (Middle Colorado River Watershed)

(Dollars) 1/

| Item | Estimated Average Annual Damage | | Damage Reduction Benefit |
|---------------------|---------------------------------|--------------|--------------------------|
| | Without Project | With Project | |
| Floodwater | | | |
| Crop and Pasture | 2,128 | 7 | 2,121 |
| Other Agricultural | 1,517 | 56 | 1,461 |
| Nonagricultural | | | |
| Road and Bridge | 3,264 | 0 | 3,264 |
| Urban | 268,860 | 30 | 268,830 |
| Subtotal | 275,769 | 93 | 275,676 |
| Sediment | | | |
| Overbank Deposition | 75 | 1 | 74 |
| Erosion | | | |
| Flood Plain Scour | 346 | 5 | 341 |
| Indirect | 27,619 | 10 | 27,609 |
| Total | 303,809 | 109 | 303,700 |

1/ Adjusted normalized prices, April 1966

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Brownwood Laterals Watershed, Texas
 Willis Creek Portion
 (Middle Colorado River Watershed)

(Dollars)

| Evaluation Unit | AVERAGE ANNUAL BENEFITS ^{1/} | | | Average Annual Cost ^{3/} | Benefit Cost Ratio |
|---|---------------------------------------|--------------------------|---------------|-----------------------------------|--------------------|
| | Damage Reduction | Incidental ^{2/} | Secondary | | |
| Floodwater Retarding Structures No. 4A and 4B | 272,871 | 921 | 24,899 | 22,279 | 13.4:1.0 |
| Project Administration | | | | 3,128 | |
| Grand Total | 272,871 ^{4/} | 921 | 24,899 | 25,407 | 11.8:1.0 |

1/ Adjusted Normalized Prices April, 1966.

2/ Includes \$213 benefits from livestock water, and \$708 from recreation.

3/ From Table 4.

4/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$30,829 annually.

TABLE 7 - CONSTRUCTION UNITS
Brownwood Laterals Watershed, Texas
Willis Creek Portion
(Middle Colorado River Watershed)
(Dollars)

| <u>Measures in Construction Unit</u> | <u>: Annual Benefits Within Unit</u> | <u>: : :</u> | <u>Annual Costs</u> |
|---|--|----------------------|---------------------|
| Construction Unit No. 2 | | | |
| Floodwater Retarding Structures No. 3, 4A and 4B | 273,792 | | 25,407 |

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- LEGEND**
- Primary Road
 - Secondary Road
 - +—+— Railroad
 - ~ Drainage
 - W-24 ○ Valley Cross Section
-
- 100 YEAR FLOOD BOUNDARY**
- Without Project
 - - - With Project

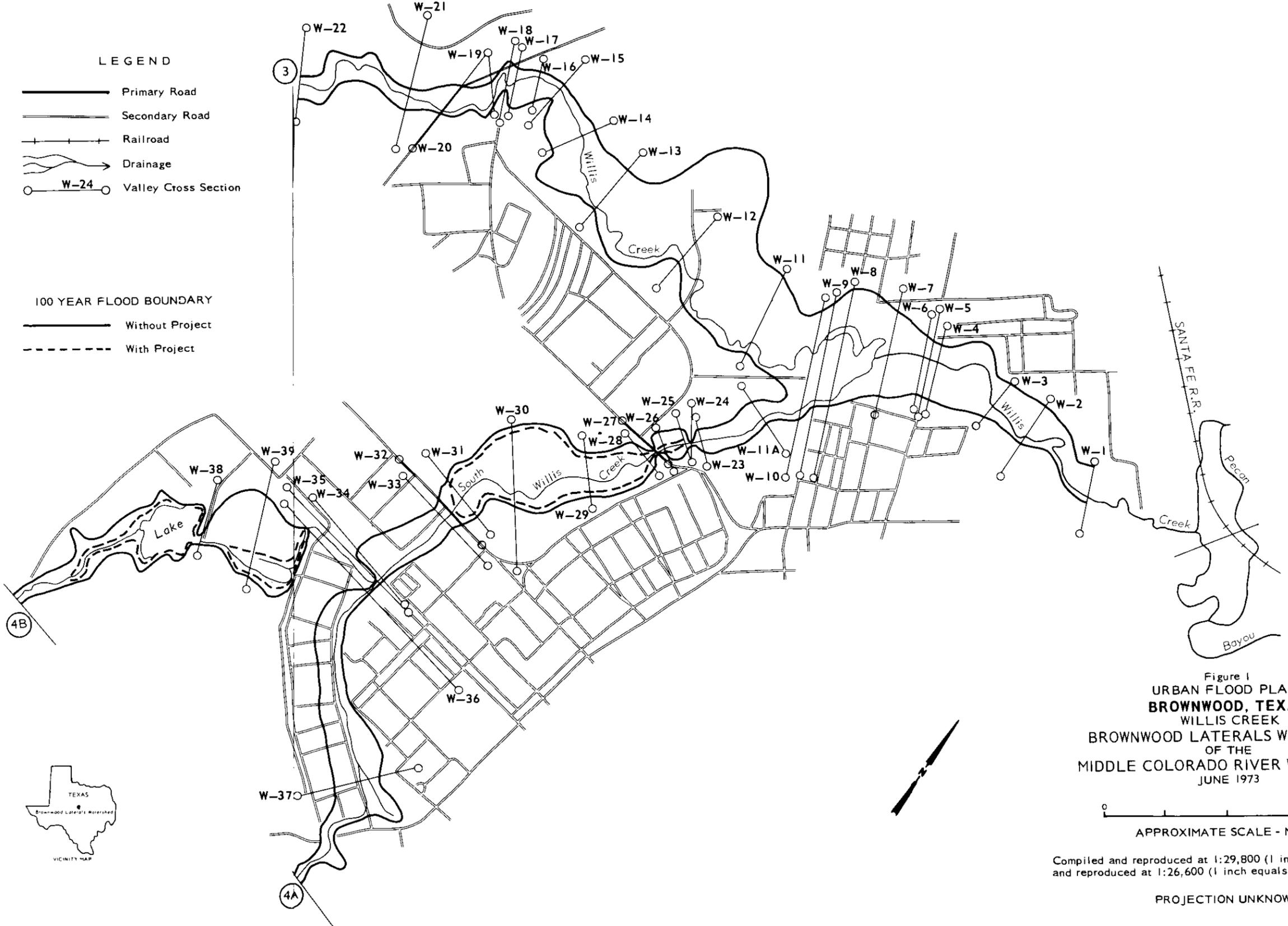


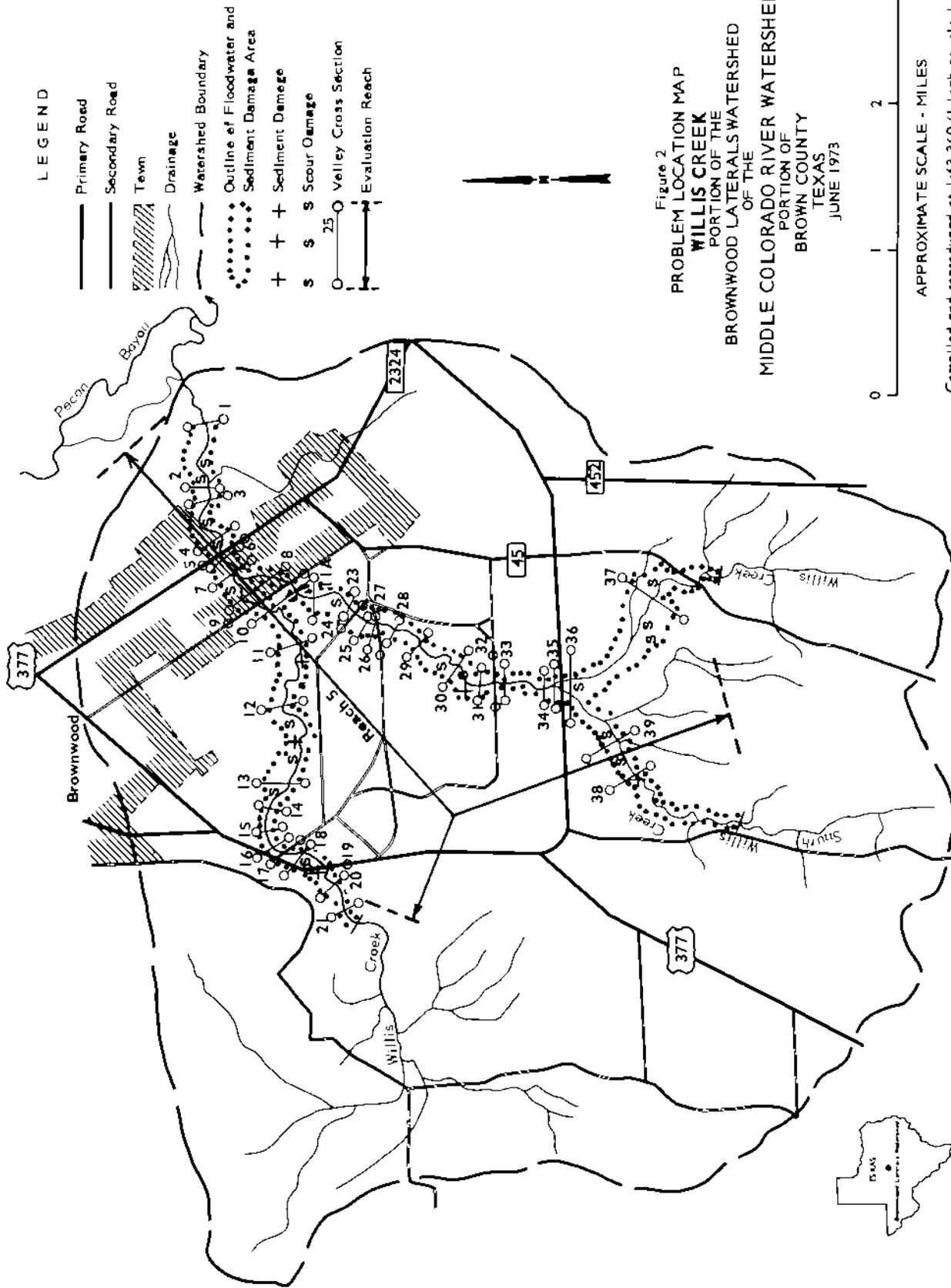
Figure 1
URBAN FLOOD PLAIN
BROWNWOOD, TEXAS
 WILLIS CREEK
 BROWNWOOD LATERALS WATERSHED
 OF THE
 MIDDLE COLORADO RIVER WATERSHED
 JUNE 1973

0 1
 APPROXIMATE SCALE - MILES

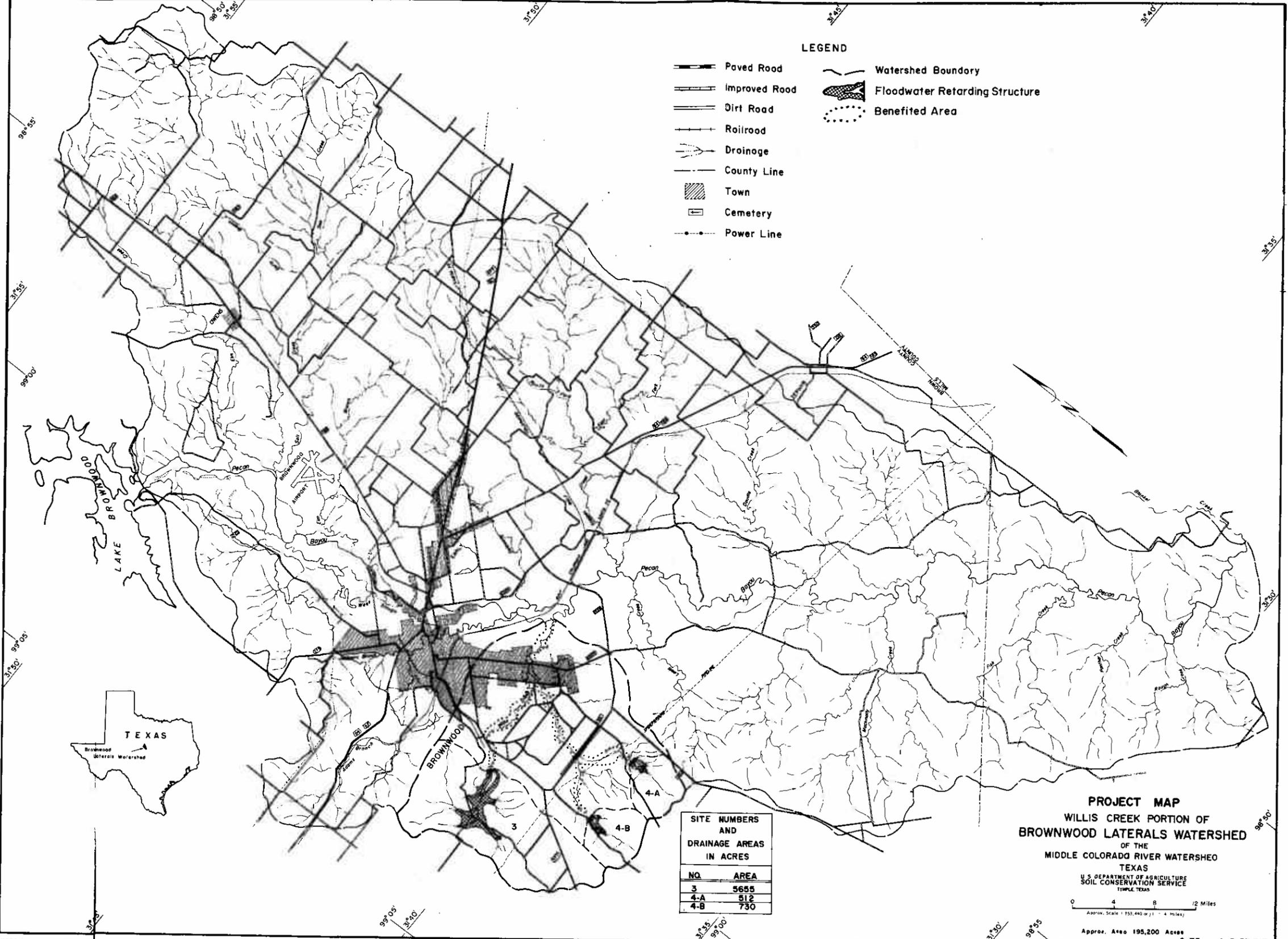
Compiled and reproduced at 1:29,800 (1 inch equals .47 Miles)
 and reproduced at 1:26,600 (1 inch equals .42 Miles).

PROJECTION UNKNOWN

JULY 1974 4-R-34149



16



- LEGEND**
- Paved Road
 - Improved Road
 - Dirt Road
 - Railroad
 - Drainage
 - County Line
 - Town
 - Cemetery
 - Power Line
 - Watershed Boundary
 - Floodwater Retarding Structure
 - Benefited Area

SITE NUMBERS AND DRAINAGE AREAS IN ACRES

| NO. | AREA |
|-----|------|
| 3 | 5655 |
| 4-A | 512 |
| 4-B | 750 |

PROJECT MAP
 WILLIS CREEK PORTION OF
 BROWNWOOD LATERALS WATERSHED
 OF THE
 MIDDLE COLORADO RIVER WATERSHED
 TEXAS
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 TEMPLE, TEXAS

0 4 8 12 Miles
 Approx. Scale 1:150,000 or 1:40,000

Approx. Area 195,200 Acres
 9-73 4-R-33,317
 Revised 4-64 4-R-17,124