BRAZOS RIVER BASIN, TEXAS

LANEPORT, NORTH FORK AND SOUTH FORK LAKES

SAN GABRIEL RIVER, TEXAS

NORTH FORK LAKE
DESIGN MEMORANDUM NO. 16

MASTER PLAN

U.S. ARMY ENGINEER DISTRICT, FORT WORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

OCTOBER 1973

DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102

SWFED-PR

31 October 1973

SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

THRU: Division Engineer, Southwestern

TO: HQDA (DAEN-CWP-V)
WASH DC 20314

1. Design Memorandum No. 16, Master Plan, for the development and management of the North Fork project is submitted for your review and approval.

2. The plan is being submitted for coordination to Federal, State, and local governmental agencies known to have an interest in the plan of development for North Fork Lake.

Floyd H. Henk

1 Incl (9 cys)
as

FLOYD H. HENK
Colonel, CE
District Engineer

(50 copies prepared)

BRAZOS RIVER BASIN, TEXAS

DESIGN MEMORANDUM NO. 16

MASTER PLAN
FOR
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

This report, prepared in the Planning Branch of the Engineering Division, Fort Worth District, has been coordinated with the Real Estate Division and the Operations Division and is recommended for approval.

Chief, Real Estate Division

Chief, Operations Division

BRAZOS RIVER BASIN, TEXAS

DESIGN MEMORANDUM NO. 16

MASTER PLAN
FOR
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

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BRAZOS RIVER BASIN, TEXAS
DESIGN MEMORANDUM NO. 16
MASTER PLAN
FOR
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

I - INTRODUCTION

1-01. Authority for the project.- Public Law 874 (87th Congress, 2d session), approved 23 October 1962, gives congressional authority for the construction of North Fork Dam and Lake. This is in accordance with the plan outlined in House Document No. 591 (87th Congress, 2d session). Authority to initiate advanced planning is contained in the Public Works Appropriation Act of 1965 (Public Law 88-511) approved 30 August 1964, and in Advice of Allotment C-124 dated 9 September 1964.

1-02. Authority for recreation program.- The project authorizing document, Public Law 874, designated recreation as an authorized project purpose.

1-03. Authority for fish and wildlife program.- Congressional authority for the fish and wildlife program at reservoir projects under the control of the Department of the Army is contained in the Fish and Wildlife Coordination Act of 1958, as amended, Public Law 85-624 (72 Stat 563), and Public Law 89-669 (80 Stat 926), approved 15 October 1966.

1-04. Authority for resources management program.- Authority for the development of the resources at North Fork is contained in Public Law 86-717 (74 Stat 817) approved 6 September 1960, and Public Law 89-298 (Sect. 302) approved 27 October 1965.

1-05. Land acquisition policy.- Land acquisition policy for the project is in accordance with EM 405-2-150, and Change No. 1 dated 10 October 1966.

1-06. Project purposes.- The North Fork Lake project purposes are flood control, water conservation storage, recreation, and fish and wildlife enhancement. Flood control is the principle benefit of the project, constituting 57 percent of the current (as of 1 July 1973) total benefits. Recreation and fish and wildlife benefits account for 18 percent of the total estimated benefits, and conservation storage is responsible for the remaining 25 percent.

1-07. Purpose of the master plan.- The purpose of the master plan is to provide a comprehensive plan to develop, improve, and manage the resources at North Fork Lake in accordance with current policy and

II - PROJECT DESCRIPTION

2-01. General.-

a. The authorized project is an important unit in a presently authorized system of 12 reservoirs in the Brazos River Basin for the multiple purposes of flood control, water supply, hydroelectric power, recreation, and fish and wildlife enhancement. Six of the reservoirs have been constructed and are now in operation. The six existing units are Whitney Lake on the Brazos River, Waco Lake on the Bosque River, Proctor and Belton Lakes on the Leon River, Stillhouse Hollow Lake on the Lampasas River, and Somerville Lake on Yegua Creek. Four authorized reservoir units are now in the planning stage. They are Millican and Navasota Lakes on the Navasota River, Aquilla Lake on Aquilla Creek, and South Fork Lake on the South Fork of the San Gabriel River. The two remaining units, Laneport Lake on the San Gabriel River and North Fork Lake on the North Fork of the San Gabriel River, are in the construction stage of development. The locations of the 12 reservoir units are shown on plate II-1.

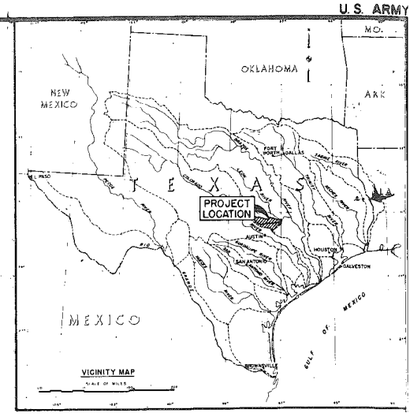
b. Laneport, North Fork, and South Fork Lakes are all to be located within the San Gabriel watershed. The three-lake San Gabriel project is scheduled for construction in stages, with Laneport and North Fork Lakes as the first-stage units, and South Fork Lake to be constructed when additional water supply is needed. Upon completion of the second stage, the water conservation storage of Laneport will be increased by transferring its flood control storage to South Fork Lake.

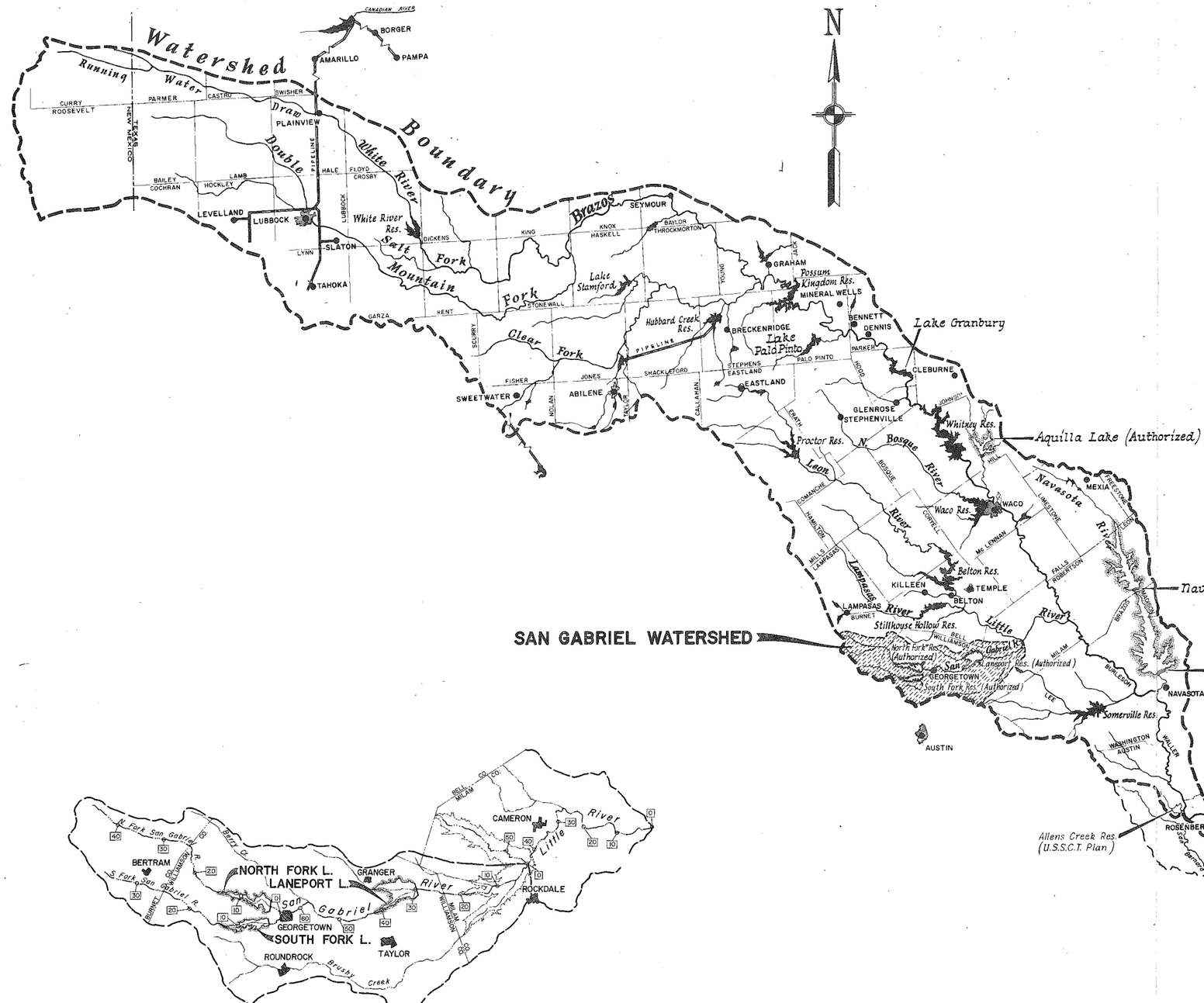
2-02. Location.- The project is located approximately 3.5 miles west of the city of Georgetown in Williamson County, Texas. The damsite is situated at river mile 4.3 on the North Fork of the San Gabriel River. The authorized project is served by Interstate Highway 35, U.S. Highway 183, State Highway 29, and Farm to Market Road 2338. Several all-weather county roads lead from the above-mentioned roads and will provide additional access to the lake area.

2-03. Climate. The climate is temperate, with hot summers and cool winters. The mean annual temperature is 68 degrees F, with approximately 238 days between killing frosts. January is the coldest month with an average daily temperature of 36 degrees F. The mean annual precipitation over the 80-mile-long watershed varies from 29 inches at its head to 35 inches at its eastern limits. In the North Fork Lake area the mean annual precipitation is 33 inches, with the heaviest rains falling from April through June. The greatest source of rain is the frontal storms, although cyclonic storms and thunderstorms do occur. The nature of the storms and the fact that the topography is conducive to rapid

CORPS OF ENGINEERS

U.S. ARMY





SAN GABRIEL WATERSHED

SCALE OF MILES
4 0 4 8 12 16

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

BRAZOS BASIN MAP

SCALE IN MILES
10 0 10 20 30 40 50

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO.16
MASTER PLAN

FILE. NO.16 PLATE II-1

2-05. Description of the dam.- The dam will be rockfill with an impervious earth core and will have a total length of 6,929 feet and a top width of 30 feet. The spillway will be an uncontrolled broadcrested type with a net length of 1,000 feet. The flood control outlet works will be an 11-foot-diameter tunnel controlled by two 5-foot by 11-foot hydraulically operated gates. Normal operating releases will be made from a multilevel, low-flow outlet system with inverts at elevations 777.0, 764.17, 751.33, and 738.50 feet msl. The general plan of embankment is shown on plate II-2.

2-06. Initial area and capacity data.- A tabulation of the initial area and capacity data for the lake at river mile 4.3 is shown in table II-2. The initial area and capacity curves and the capacity curve after 100 years of sedimentation are shown on plate II-3.

2-07. Fluctuation of pool.- According to the pool elevation probability and duration curves, as shown on plate II-4, pool elevation can be expected to vary about 24.0 feet in an average 5-year period. As indicated by the duration curve, the top of the conservation pool (elevation 791.0 feet msl) will be equaled or exceeded approximately 40 percent of the time. The average pool (elevation 787.8 feet msl) during the period June through August (prime recreation season) is only 3.2 feet below the top of the conservation pool. It will be equaled or exceeded 67 percent of the time. The fluctuation of the pool is not expected to be unusually high or low; it should not have a significant impact on recreation.

2-08. Cost-sharing features.-

a. Recreation.- In accordance with ER 1120-2-404, this project is classified as a class C project with recreation provided on a noncost-sharing basis.

b. Water conservation.- The Brazos River Authority, a State agency, indicated by letter dated 18 April 1966 that they would pay the project costs allocated to water conservation.

2-09. Status of the project.- The project is in the construction and land acquisition stages of development. Contracts have been awarded for the construction of the project building, visitors' overlook, comfort station, and the relocation of county road, part I. The current construction schedule completion calls for completion of the project by June 1978.

SWDPL-R (SWFED-PR 31 Oct 73) 5th Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Southwestern Division, Corps of Engineers, 1114 Commerce Street, Dallas, Texas 75202

31 JUL 1974

TO: District Engineer, Fort Worth

Barry G. Rought

BARRY G. ROUGHT
Chief, Planning Division

CF:
DAEN-CWP-V

DAEN-CWP-V (31 Oct 73) 4th Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Office of the Chief of Engineers, Washington, D. C. 20314 15 Jul 74

TO: Division Engineer, Southwestern, ATTN: SWDPL-R

1. While in general we believe that comment a of the 2nd Indorsement is valid and should stand, we also concur that flexibility is desirable in order that proposed facilities can be planned and developed to fit conditions in each geographical area and land form and to provide for dispersed parking where such would best serve the public and protect the project resources.

2. Should your further review require that a change be made in the District's plan, two copies of revised pages of the Master Plan should be provided DAEN-CWP-V for inclusion in record copies.

FOR THE CHIEF OF ENGINEERS:

for Norman E. Jackson

IRWIN REISLER
Chief, Planning Division
Directorate of Civil Works

SWDPL-R (SWFED-PR 31 Oct 73) 3d Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Southwestern Division, Corps of Engineers, 1114 Commerce Street, Dallas, Texas 75202 1 MAY 1974

TO: HQDA (DAEN-CWP-V) WASH DC 20314

1. We do not agree with comment a of the previous 2d Indorsement. Comments in this regard are as follows:

a. It appears that concepts for urban street or park design are being confused with rural park design. The functional design of a rural park should not be compared to urban street practices. The picnic units proposed here serve "day users," not the city park picnicker, toting only a picnic basket. The "day user" comes to the rural project with essentially all the gear a camper does and stays a good part of the day. He likes to drive as close to the picnic unit as possible to ease transportation of his gear. When parking is not provided close enough to suit his purpose, he drives to the table, causing a traffic control problem and deterioration of the resource. Traffic control in this case would require unsightly and expensive guard post installation along the road and/or parking area. All of the picnic units are on secondary park loop roads, experiencing slow-moving traffic.

b. It should be noted that individual parking pullouts are provided for campers without creating safety hazards and provision of same for the "day user" causes no increased hazards.

c. Our experience indicates that the functional aspects of rural park design and the recreation experience achieved with the design proposed warrants its implementation.

d. It is recognized that concepts for design of picnic sites should not switch totally to individual or dual space parking. We should, however, be responsive to public needs experienced on existing projects, which indicate a public desire to park as close to the picnic unit as possible. In any event, functional planning should take into account the space available, topography, vegetative cover, and aesthetic impact on the environment of each site and proposed facilities to be placed thereon. These considerations could result in the planner providing from one to any number of multiple spaces along one loop road, depending on the site. It is considered that the planner should have this option to prepare a design which best serves the public with a minimum impact on the environment. In this regard, reference is made to para 7f of ER 1110-2-400 dated 7 July 1972 which states "Moreover, the size of parking areas should be limited as much as possible for effective operation." Limiting the size of parking areas in a heavily timbered area such as the North Fork Project reduces the amount of clearing required since narrow (i.e., two-car)

SWDPL-R (SWFED-PR 31 Oct 73) 3d Ind 1 MAY 1974
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

parking units can be more easily placed in between the trees, likewise reducing the impact of construction on the environment. Also, reference is made to paragraph 4c of Appendix A to EM 1110-2-400 dated 1 September 1971 which addresses parking for picnic areas. It is noted in the above referenced paragraph that no restrictions are made concerning the minimum number of parking spaces to be provided at one location.

2. It is recommended that comment a be reconsidered and withdrawn.

FOR THE DIVISION ENGINEER:

Barry G. Rought

BARRY G. ROUGHT
Chief, Planning Division

CF:
SWFED-PR w cy 2d Ind

DAEN-CWP-V (31 Oct 73) 2nd Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Office of the Chief of Engineers, Washington, DC 20314 5 Apr 74

TO: Southwestern Division
ATTN: SWDPL-R

The Master Plan for North Fork Lake is approved subject to comments of the Division Engineer and the following:

a. Parking for picnic areas should be consolidated in lots of ten or more spaces with entrances and exits following the flow of traffic for the sake of public safety. The scattered two-car parking areas proposed create hazardous conditions and increase construction and OMR costs.

b. Studies reveal that a minimum of 150 campsites are required to provide a viable fee collection area and to reduce OM costs. The Division Engineer should insure that campgrounds are planned to facilitate fee collection and minimize OMR costs.

FOR THE CHIEF OF ENGINEERS:

Norman E. Jacobsen
for IRWIN REISLER
Chief, Planning Division
Directorate of Civil Works

wd all incl

SWDPL-R (SWFED-PR 31 Oct 73) 1st Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Southwestern Division, Corps of Engineers, 1114 Commerce Street, Dallas, Texas 75202 24 JAN 1974

TO: HQDA (DAEN-CWP-V) WASH DC 20314

1. Forwarded recommending approval subject to the following comments:

a. Para 2-04, Table II-1, Pertinent Data. The maximum design water surface elevation should be 856.2. This should be corrected.

b. Para 3-06, Soils. Plate III-1 and Table III-1 very adequately show the locations of soil series and engineering characteristics of each series. An additional table, similar to Table III-1, should be furnished which defines management implications of each series if the information is available. Such information as erosion potential, inherent fertility, suitability for desirable plant materials, peculiar management requirements, etc., should be provided.

c. Para 3-07, Vegetative Resources. A map which shows the location and vegetative types present should be furnished. The map should be adequately detailed to provide backup for a concept wildlife and vegetative management plan (See comment f below).

d. Section VI, Coordination With Other Agencies. There should be some discussion here about how and when coordination will be accomplished with EPA.

e. Para 7-02 c, Land Use Allocation Plan. It is noted that no agricultural uses are to be permitted on land under this allocation, but is permissible on lands allocated for intensive use. Change 1 to ER 1120-2-400 for both low density and intensive use allocations states that "no agricultural uses are permitted on these lands except on an interim basis for terrain adaptable for maintenance of open space and/or scenic values." This criteria should be followed or reasons furnished for deviation from same.

f. Para 7-07, Management of Environmental and Recreational Resources. Additional detail should be included in subparagraphs f and g, providing a concept plan for the development of the fish and wildlife resources, including species to be managed and generally how the plan is to be accomplished. Also, a wildlife habitat and vegetative cover type map should be provided in the master plan (Also see comment c above).

24 JAN 1974

SWDPL-R (SWFED-PR 31 Oct 73) 1st Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

g. Tables VIII-2, VIII-6, and VIII-7, Item 3, Boat Launching Ramps. Since these ramps are to be constructed as continuous concrete, the 4-lane ramp width should be 56 feet, providing four 14-foot lanes.

h. Para 9-02, Summary of Recreation Facilities and Costs, last sentence. It should be noted that construction costs are kept current in Fort Worth District through a computer program prepared for this purpose.

i. Para 10-04e, Sanitary Treatment Facilities. Information provided here is inadequate to establish a realistic basis of cost as required by SWDR 1110-2-9. Sufficient field work should be accomplished for specific determination as to type of treatment required. This determination is also necessary to adequately locate other park facilities for the health, safety, and recreation experience of the user.

j. Para 11-03, Revegetation Plan.

(1) Subpara b. While this paragraph lists species of native and introduced grasses for an establishment of vegetative cover, it appears that emphasis should be given to establishment of wildlife food plantings or inclusion of other plant species that would better provide for wildlife food refinements.

(2) Subpara d. This paragraph should be expanded to show how a diversity of plant species is to be established and maintained.

k. Para 11-08, Firebreak.

(1) Wording should be revised to make clear that a firebreak is most effective when located just below the ridgetop on the opposite side from the direction fire is expected to come.

(2) Recommend the wording concerning width of firebreaks be deleted. The 10-foot width quoted as a minimum is usually too narrow and this much detail is not necessary in a master plan.

l. Section XIII, Vegetative Management Plan. This section should contain a concept plan for development of the vegetative resources. Considering the development potential of the environment, the availability of resources, and public need, the plan should discuss generally the resource development to be done by land use allocation, and generally, the methods by which the goals will be reached.

24 JAN 1974

SWDPL-R (SWFED-PR 31 Oct 73) 1st Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

m. Appendix F, Para 12. Riprap protection should be provided downstream from the box culvert headwall.

2. A district presentation of the recreational resource development plan is to be made at a public meeting conducted by the County Judge of Williamson County on 11 February 1974. Any substantive comments concerning the concepts of development as presented in this DM should be furnished prior to this meeting.

FOR THE DIVISION ENGINEER:

JOEL F. WILSON
Acting Chief, Planning Division

1 Incl
wd 4 cys

CF: (wo incl)
SWFED-PR

SWFED-DC (SWFED-PR 31 Oct 73) 6th Ind
SUBJECT: North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan

DA, Fort Worth District, Corps of Engineers, PO Box 17300, Fort Worth, Texas 76102 16 December 1974

TO: Division Engineer, Southwestern, ATTN: SWDPL-R

Submitted for review and approval are nine copies of Supplement No. 1 to Design Memorandum No. 16, North Fork Lake, San Gabriel River, Texas, Master Plan. Copies are for distribution in accordance with the original submission.

FOR THE DISTRICT ENGINEER:

for GORDON A. WALHOOD
Chief, Engineering Division

1 Incl (9 cys)
Added 1 incl
2. Supp 1 to DM No. 16

SAN GABRIEL RIVER
BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE
DESIGN MEMORANDUM NO. 16

MASTER PLAN

SUPPLEMENT NO. 1

U. S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

December 1974

SAN GABRIEL RIVER
BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE
DESIGN MEMORANDUM NO. 16
MASTER PLAN

SUPPLEMENT NO. 1

1. Purpose.- This supplement contains the revisions or explanation to the comments contained in the 1st indorsement SWDPL-R, 24 January 1974, and 2d indorsement DAEN-CWP-V, 5 April 1974, to Fort Worth District letter SWFED-PR, 31 October 1973, subject, North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan. Replies to these comments are presented in the following referenced paragraphs. Supplement No. 1 also includes revisions in response to the review comment received from the coordination effort with Federal, State, and local governmental agencies. Updated recreation benefits have been included on revised page IX-9.

2. First Indorsement.

a. Paragraph 1a. Table II-1, Pertinent Data, has been corrected. Table II-1 is inclosed.

b. Paragraph 1b. Table III-1 has been amended to include the management implications for each of the soil series. This table has also been revised as suggested by the Soil Conservation Service. Revised Table III-1 is inclosed.

c. Paragraph 1c. The required vegetation type map has been added to revised Section XIII, Vegetative Management Plan.

d. Paragraph 1d. Section VI, Coordination With Other Agencies, has been amended to include the comments received from Federal, State and local governmental agencies. Paragraph 6-04 has been added to provide guidance in coordination with the Environmental Protection Agency. Revised Section VI is inclosed.

e. Paragraph 1e. Paragraph 7-02c has been corrected on revised page VII-2.

f. Paragraph 1f. A concept plan for the development of the fish and wildlife resources is inclosed as revised Section XV, Fish and Wildlife Management Plan.

g. Paragraph 1g. An investigation will be made to determine the most economical, and practical solution to the problem of providing boat ramps for this project.

DOLPH BRISCOE
GOVERNOR

OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION

JAMES M. ROSE
DIRECTOR

January 8, 1974

Lieutenant Colonel Charles J. Tracy
Deputy District Engineer
Department of the Army
Fort Worth District
Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102

Dear Lieutenant Colonel Tracy:

The Corps of Engineers' Design Memorandum No. 16, Master Plan, for the development and recreational resources of North Fork Lake, San Gabriel River has been reviewed by the Governor's Division of Planning Coordination and by other interested State agencies.

Review participants offered the following comments:

1. The Texas Parks and Wildlife Department made several comments concerning the affects that the proposed project would have on existing wildlife in this area. The Texas Parks and Wildlife Department also noted that a statement in paragraph G, Page VII-6, that "Wildlife areas of this project do not meet the Texas Parks and Wildlife Department criteria for a State management wildlife area," is not based upon a final or official judgment of the Texas Parks and Wildlife Department.
2. The Texas Department of Agriculture suggested that an estimate of the agriculture and pasture value of the dedicated land for the project should be used in calculating the benefit-cost ratio. The Texas Department of Agriculture felt that the amount of land resources were not excessive compared to the increased value for recreation and water management, however, noted that a greater appreciation of the value of agricultural land for production of food and fiber should be indicated in the project.
3. The Texas Water Quality Board noted that the proposed designs of solid waste disposal facilities should be

P. O. BOX 12428, CAPITOL STATION, AUSTIN, TEXAS 78711
Phone 512/475—2427 Offices Located in Sam Houston State Office Building

PARKS AND WILDLIFE DEPARTMENT

COMMISSIONERS
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CHAIRMAN, WELLS
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CLAYTON T. GARRISON
EXECUTIVE DIRECTOR
JOHN H. REAGAN BUILDING
AUSTIN, TEXAS 78701

December 20, 1973

Mr. James M. Rose
Division of Planning Coordination
Executive Department
Box 12428, Capitol Station
Austin, Texas 78711

Re: North Fork Lake--San Gabriel River, Design Memorandum No. 16, Master Plan

Dear Mr. Rose:

This Department has reviewed the North Fork Lake Master Plan, and the following comments are offered.

Some areas of the proposed impoundment may receive usage by substantial numbers of waterfowl, particularly in the lower portions of the reservoir, if management for them were applied (Page III-6).

Exotic grasses suggested for planting along the lake margin (bermudagrass and King Ranch bluestem) have lower value for wildlife and are ecologically less desirable than native species. Grasslike species such as native sedges should be established within zones of water fluctuation in lieu of the exotics mentioned. For natural purposes, native species including bluestems, Indiangrass and species of grama are also superior to exotic grasses on uplands (Page III-5).

The number of reservoirs being created on Texas rivers is such that they are greatly contributing to the excessive reduction and disruption of riparian and bottomland ecosystems. In the case of North Fork, this will be exemplified by loss of the prime squirrel habitat which is within the proposed conservation pool (Page III-6).

The kinds and extent of recreational activities which are compatible with the existence of Golden-cheeked Warbler populations is not known. It is thought that they prefer areas where human activities are minimal. Research to determine this and other facts about Golden-cheeks has recently been initiated by the Texas Parks and Wildlife Department in Meridian State Park. Perhaps plans to protect the threatened Golden-cheeked Warbler could be coordinated with the work in Meridian (Page III-6).

EDMUND L. NICHOLS
Assistant Commissioner

December 11, 1973

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428
Austin, Texas 78711

Dear General:

A review has been made of the North Fork Lake, San Gabriel River, Design Memorandum of November 8, 1973.

This draft environmental statement gives a complete and comprehensive set of plans for management of the land and other resources of the area for public recreational use.

It is noted that approximately 6,300 acres of land will be taken out of cultivation and pasture-agricultural use. Certain areas of the project may be leased for grazing as a land vegative conservation development tool.

In our opinion, the amount of land resources dedicated to this project plan is not excessive as compared with the increased value for recreation and water management. However, it is suggested that an estimate of the value of the dedicated land be used in calculating the benefit cost ratio. Greater appreciation of the value of agricultural land for production of food and fiber should be indicated in the project plan.

Thank you for the opportunity to review this statement.

Sincerely,

Edmund L. Nichols

ELN/lt

THIS PAPER IS MADE FROM COTTON A PRINCIPAL CROP OF TEXAS

Texas Department of Agriculture, John C. White, Commissioner, P.O. Box 12847, Austin, Texas 78711

Texas State Historical Survey Committee
Box 12276, Capitol Station, Austin, Texas 78711
Truett Latimer
Executive Director

December 10, 1973

Mr. James M. Rose , Director
Division of Planning Coordination
Office of the Governor
Box 12428, Capitol Station
Austin, Texas 78711

RE: North Fork Lake, San Gabriel River, Design Memorandum No. 16, Master Plan

Dear Mr. Rose:

In response to your request concerning the above-referenced project, we have examined the Design Memorandum and offer the following comments:

1. Sections 3-02 and 3-03 point out that archeological, historical, and architectural resources are present within the confines of the proposed reservoir area and that additional investigations are necessary to evaluate the archeological significance. These investigations might best be carried out in the form of an intensive archeological survey to locate, record and appraise all cultural (prehistoric, historic, and architectural) resources. This investigation should provide and result in, definition of research problems, cost, and strategy for further study leading to the mitigation of adverse effects on the resources.

2. Section 3-03 notes that no sites on the National Register of Historic Places are present within the project area and while this is correct, there may be several which merit National Registration. Historic Archival research and minimal sub-surface testing should be conducted at some of the sites presently located, as well as those sites located during intensive survey operations and during Executive Order 11593 investigation (discussed below), especially outside of the impoundment area.

3. Section 7-07:b notes that the objective of an archeological and historical management program is to salvage and preserve the archeological and historical resources associated with the project. All Corps properties which will not be subjected to controlled inundation must be examined from the standpoint of Executive Order 11593 (May 13, 1971), prior to any development in these areas. The data resulting from the 11593 investigations will prove invaluable in the formulation of development plans for facilities related to the lake. It must be pointed out that sites on federal lands are, by federal laws, protected from damage, alteration, or disturbance.

TEXAS WATER DEVELOPMENT BOARD

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P.O. BOX 13087
CAPITOL STATION
AUSTIN, TEXAS 78711

AREA CODE 512
475-2201

301 WEST 2ND STREET

November 28, 1973

IN REPLY REFER TO:
TWDBP-O

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

Please refer to your memorandum dated November 8, 1973 transmitting for review and comment the Corps of Engineers' Design Memorandum Number 16, Master Plan for North Fork Lake, San Gabriel River, Texas.

Staff level review of the North Fork Lake Plan has resulted in the finding of a few apparent discrepancies which are discussed below.

In Table IV-1, we find that the 1970 market area population is larger than either the projected 1980 or 1990 population, as shown in Table V-1.

We believe that per capita income projections (Table IV-3) should be clarified. Volume 4 of OBERS contains per capita income data on the water resource sub-area in which North Fork Lake is located. OBERS does not, however, reflect data contained in Table IV-3. If Table IV-3 was derived from another source, for instance from unpublished county income projections, it is suggested that such source be appropriately footnoted.

The procedures used in projecting recreation visitation may perhaps fail to measure recreation "demands," as opposed to hypothetical attendance based on similar projects with comparable characteristics. Certain types of problems result from this projection method, such as the fact that projected attendance and estimated optimum recreation capacity are equal in 1980.

THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
AUSTIN, TEXAS 78712

University Station, Box X
Phone 512—471-1534

November 26, 1973

General James M. Rose, Director
Division of Planning Coordination
Post Office Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

"Design Memorandum #16--North Fork Lake (San Gabriel River) Master Plan" has been reviewed by the staff of the Bureau of Economic Geology. Our comments deal with two aspects of the report.

Special consideration should be given to the possibility of reservoir leakage into underlying limestone strata. The Comanche Peak Limestone underlies most of the area to be covered by the dam and reservoir; thus these areas are not in immediate contact with the cavernous Edwards Limestone. However, joints, faults, small solution openings, and regional dip of strata to the southeast may provide conduits for water to flow from the reservoir into the limestone aquifer (Edwards) downdip to the east. Planning seasonal water uses should take into account this potential water loss.

Recreational-development suitability based on soil criteria (p. III2-III5) may be misleading. Much of the upland limestone terrane around the reservoir site is covered by only a few inches of soil. Thus, bedrock characteristics (not soils) are the factors controlling suitability of waste disposal methods and construction feasibility. Thin soils on cavernous limestone are not suited for placement of septic tanks and sewage lagoons, as there may be incomplete wastewater treatment. The cavernous bedrock then provides access to the lake for wastewater, ultimately posing a threat to lakewater quality.

Thank you for the opportunity to respond on these matters.

Sincerely,

W. L. Fisher
Director

WLF:ph

of the lake. The staff believes that the discussion should be extended to show that while the pool level is expected to vary about 24 feet in an average five-year recurrence interval, the pool can vary 40 feet in an average ten-year period, and over 60 feet in a 20-year period. The staff believes that statistical analysis regarding 10- to 20-year recurrence intervals would be more realistic.

2. The staff believes that further discussion is warranted regarding the advantages and justification for using the "similar project" concept in the determination of recreationalist visitations at the reservoir, and the recreational cost benefits accruing therefrom. Specifically, the referenced Design Memorandum would be enhanced if justification were furnished why the concept of "similar project," i.e., observed visitation rates to existing facilities, was selected in lieu of empirical prediction equations or interviews conducted in the market area of the proposed facility. In addition, recognizing the difficulty of deriving a realistic demand curve, and the availability of several optional techniques for estimating total visitation to a site, the staff believes that the referenced Design Memorandum would be enhanced if a discussion were included of the relative advantages of the three methods of estimating recreation benefits, i.e., (a) the user-expenditure method; (b) the user-fee method; and, (c) the unit-value method.

3. The staff suggests that the data for total fee area contained in Table II-1, page II-2, i.e., 6,300 acres, be reconciled with the total fee area of 5,650 acres indicated in Table VII-1, page VI-2.

NOV 19 1973

TEXAS INDUSTRIAL COMMISSION 814 SAM HOUSTON STATE OFFICE BUILDING ☐ 512/475 4331 ☐ BOX 12728, CAPITOL STATION ☐ AUSTIN, TEXAS 78711

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November 16, 1973

Mr. Leon Willhite
Office of the Governor
Division of Planning Coordination
Box 12428, Capitol Station
Austin, Texas 78711

Dear Leon:

I have reviewed the:

North Fork Lake, San Gabriel River, Design Memorandum No. 16, Master Plan.

The Texas Industrial Commission does not have any negative comments regarding this Design Memorandum.

If the Texas Industrial Commission may be of further assistance in this matter, please do not hesitate to contact me.

Sincerely,

Frank J. Call
Director of Research & Planning

FJC:co

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December 7, 1973

Mr. James M. Rose, Director
Division of Planning Coordination
Governor's Office
Sam Houston State Office Building
Austin, Texas 78711

Attn: Mr. Bill Duncan

Dear Mr. Rose:

Our review of the Draft Environmental Impact Statements for Lake Texarkana, North Fork Lake - San Gabriel River, and Pat Mayse Lake, indicates that the air quality impact of these projects will be negligible.

We appreciate the opportunity to evaluate these activities and look forward to future exchanges of information between our agency and your office. Your consideration is greatly appreciated.

Sincerely yours,

for Bill Stewart (Dir. Agency Operations)
Charles R. Barden, P.E.
Executive Director
Texas Air Control Board

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SERVING LOCAL GOVERNMENTS IN

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March 20, 1974

Charles J. Tracy, LTC, CE
Deputy District Engineer
Fort Worth District, Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102

RE: #3-11-13008 "Design Memorandum No. 16, Master Plan for North Fork Lake Brazos River, Basin Lake"

Dear Colonel Tracy:

Your project has been reviewed in response to state and federal requirements and in relation to the Capital Area Planning Council's (CAPCO) areawide planning responsibilities.

CAPCO's Executive Committee, sub-committee and staff reviewed your proposed project in relation to regional planning policies, procedures and objectives.

CAPCO's Executive Committee considered the recommendations and voted that the proposed project be given a favorable review.

Attached are related staff and GARC comments regarding your project.

Please let us know if you need further information on your proposal.

Sincerely yours,

Richard G. Bean
Executive Director

RGB:bc
Enclosures (2)

2021 Rosebud Drive
Irving, Texas 75060
October 14, 1971

U. S. Army Engineer District
Fort Worth Corps of Engineers
P.O. Box 17300
819 Taylor Street, Room 3010
Fort Worth, Texas 76102

Dear Sirs:

In accordance with Contract No. DACW63-72-M-0265, dated 8 September 1971, requesting my services to survey the proposed reservoir site on the North and South Forks of the San Gabriel River near Georgetown, Texas, the following final report is presented to your agency as per schedule in Requisition No. Eng-72-140.

The area of the proposed dam site definitely has Golden-cheeked Warbler habitat and the maintenance of these areas should be made. Since the Golden-cheeked Warbler is one of the avian species on the U.S. Fish and Wildlife Service's Rare and Endangered Species List, we all should do our utmost to preserve this rare species.

Recommendation 3 of my report sets forth the ideal means of carrying on a positive program in the area for the species. And to reiterate — a positive action by your agency would establish the first government sanctuary in Texas for this species. It would also do a great deal towards generating tremendous interest and good-will on the part of conservationists. The proposal is strongly recommended to your agency. The preservation of this area would not only benefit this species of bird but would provide for considerable other benefits.

It is requested by means of this letter that payment of said contract DACW63-72-M-0265 be provided now that my survey and report have been completed.

Sincerely yours,

Warren M. Pulich

Warren M. Pulich

September 1971) the Golden-cheeked Warbler is on its winter range in Central America, and the following comments are based on my overall knowledge of the species itself. Those remaining areas of cedar brake in the South Fork site, therefore, may or may not hold the Golden-cheeked Warbler during its breeding season. A conclusive evaluation of this area can be made only during the months of April or early May when the Golden-cheeked Warbler is in Texas and at the peak of its nesting activities. The South Fork site holds about 40 acres which, according to Game Warden Hughes, would be immediately affected by the proposed reservoir; however, since we did not have detailed maps of this site, this statement can be used only with reservations. An inspection of the area showed more than 40 acres of cedar, some of which certainly was not Golden-cheeked Warbler habitat as I know it. Other parts, ravines with mature cedars, looked as if they should probably support some Golden-cheeked Warblers, probably a small population of birds.

The North Fork site contains two areas which should be considered from the standpoint of the Golden-cheeked Warbler. The first area, known as the Booty Lowrance Ranch, is on the south banks of the North Fork. Although it was indicated that the area would be above the line of inundation by the proposed reservoir, the lands are within the take line and so would become government or public lands. Based on my experience, I believe that this area has some cedar brakes which appear to be fair habitat for the Golden-cheeked Warbler and certainly should have a few members of this species utilizing the land during the breeding season, but for proper evaluation of this tract a survey should be made when the species is present. It cannot be properly ascertained otherwise whether or not disturbance of this land by the project operation would be detrimental to the Golden-cheeked Warbler. If the area

Corps of Engineers were to provide an access road to the water through the middle of the Corps' cedar brake, then all will be lost as Golden-cheeked Warbler habitat.

Ideally, the Corps of Engineers should have purchased all the land in question (cedar brakes) in the first place. Other multiple land-use needs for recreational purposes such as deer and turkey hunting by permit only, limited water access use in picnic areas, swimming beach, and boat docks would not be incompatible with the retention of Golden-cheeked Warbler habitat, provided there were no clearing or construction of roads within the acreage proper.

In summary, my evaluation of Golden-cheeked Warbler habitat on the U.S. Corps of Engineers reservoir sites on the North and South Forks of the San Gabriel River near Georgetown results in the following recommendations:

1. It is recommended that a further evaluation of cedar brakes of the proposed reservoir site on the South Fork of the San Gabriel River be made during the months of April or the first part of May when the Golden-cheeked Warbler is present in Texas. This would provide a conclusive affirmative or negative answer as to whether or not the area provides for a population of the Golden-cheeked Warbler.

2. It is recommended that a further evaluation of cedar brakes, known as the Lowrance Ranch, on the North Fork of the San Gabriel River be made during the months of April or the first part of May when the Golden-cheeked Warbler is present in Texas. This would provide a conclusive affirmative or negative answer as to whether or not the area provides for a population of the Golden-cheeked Warbler.

3. It is recommended that those virgin cedar brakes, known as the Wade

VII - LAND AND WATER USE PLAN OF DEVELOPMENT

7-01. General.- The basic concept behind the land and water use plan of development is the integration of authorized uses of the project land and water areas into a balanced development plan for the best use of all project resources in the best interest of the public throughout the life of the project. The intent is to present a plan of development which is flexible enough to meet the present and future needs of the project in consonance with the land capabilities and the esthetics of the project. The objectives of this plan are to: (1) present a complete zoning and land use allocation plan which offers specific recommendations for the ultimate use and possible interim use to which all land and water should be dedicated; (2) to serve as a resource management guide for the comprehensive use of all project land and water areas through planned use of designated areas; and (3) to present the concept and objectives for the management of all project resources.

7-02. Land use allocation plan.- ER 1120-2-400 requires all lands at civil works water resource projects to be designated for a specific purpose in accordance with a land use allocation plan. The basic objective of the land use allocation plan is to provide stewardship of the project lands and its resources through prudent land use designation and management. Project lands were allocated for specific purposes only after considerable research was conducted to determine their highest and best use. It has been necessary to allocate certain lands for both interim and ultimate use. Land areas will be marked according to designated use as indicated on the land use allocation map with appropriate signs wherever necessary for proper land managment and administration. Table VII-1 presents a summary of the land use acreages. The land use allocation plan showing various designated land uses is present in plate VII-1. Descriptions of each of the allocated land areas follow:

a. Project operations.- Lands were acquired and allocated to provide for safe, efficient project operation for those authorized purposes other than recreation, and fish and wildlife. Agricultural use of these lands will be permitted only on an interim basis when not in conflict with the designated use.

b. Operations: recreation intensive use.- Lands acquired for project operations were allocated for ultimate use as developed public use areas for intensive recreational activities by the visiting public, including areas for concessions and quasi-public development. Fishing will be permitted except in restricted areas such as beach areas. No agricultural uses are permitted on these lands except on an interim basis for maintenance of open space and scenic values.

provided by an existing county road (Jim Hogg Road) that connects with FM Road 2338. This road will be utilized for permanent access to the outlet works, stilling basin, and downstream areas.

Table VIII - 8

AREA BELOW THE EMBANKMENT
DETAILS OF ESTIMATED COST FOR RECREATIONAL FACILITIES

Item	Unit	Unit Cost	Quantity	Cost
		$		$
1. Roads				
a. Gravel	L.S.	-	-	1,100
2. Parking area	S.Y.	5.00	220	1,100
3. Sanitary facilities				
a. Frame toilets (conc. vault)	Each	2,500.00	4	10,000
4. Signs				
a. Directional	Each	70.00	4	280
b. Traffic control		100.00	3	300
5. Site improvement	L.S.			800
6. Landscaping	L.S.			800
Subtotal				($14,380)
Subtotal (rounded)				($14,400)

8-12. Administration and maintenance buildings.- The project building shown on plate VIII-1, will be located on the left abutment about 300 feet from the end of the main embankment and directly west of the left abutment access road. The administration functions will include offices, administrative area, visitors' room, men's and women's restrooms, a lunch room, and a mechanical equipment room. The maintenance functions will include vehicle storage, a washrack, workmen's washroom and toilet, small tool and storage room, shop, paint storage, and water treatment room. Public access will be provided by the relocated left abutment access road which connects to FM Road 2338. A detailed description of the project building, visitors' overlook, and access road is presented in North Fork Design Memorandum No. 9.

8-13. Visitors' overlook.- The visitors' overlook shelter and parking area will provide an elevated view of the lake area. The location is shown on plate VIII-1.

BRAZOS RIVER BASIN, TEXAS

DESIGN MEMORANDUM NO. 16

MASTER PLAN
FOR
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

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II - PROJECT DESCRIPTION

2-01. General.-

a. The authorized project is an important unit in a presently authorized system of 12 reservoirs in the Brazos River Basin for the multiple purposes of flood control, water supply, hydroelectric power, recreation, and fish and wildlife enhancement. Six of the reservoirs have been constructed and are now in operation. The six existing units are Whitney Lake on the Brazos River, Waco Lake on the Bosque River, Proctor and Belton Lakes on the Leon River, Stillhouse Hollow Lake on the Lampasas River, and Somerville Lake on Yegua Creek. Four authorized reservoir units are now in the planning stage. They are Millican and Navasota Lakes on the Navasota River, Aquilla Lake on Aquilla Creek, and South Fork Lake on the South Fork of the San Gabriel River. The two remaining units, Laneport Lake on the San Gabriel River and North Fork Lake on the North Fork of the San Gabriel River, are in the construction stage of development. The locations of the 12 reservoir units are shown on plate II-1.

b. Laneport, North Fork, and South Fork Lakes are all to be located within the San Gabriel watershed. The three-lake San Gabriel project is scheduled for construction in stages, with Laneport and North Fork Lakes as the first-stage units, and South Fork Lake to be constructed when additional water supply is needed. Upon completion of the second stage, the water conservation storage of Laneport will be increased by transferring its flood control storage to South Fork Lake.

2-02. Location.- The project is located approximately 3.5 miles west of the city of Georgetown in Williamson County, Texas. The damsite is situated at river mile 4.3 on the North Fork of the San Gabriel River. The authorized project is served by Interstate Highway 35, U.S. Highway 183, State Highway 29, and Farm to Market Road 2338. Several all-weather county roads lead from the above-mentioned roads and will provide additional access to the lake area.

2-03. Climate. The climate is temperate, with hot summers and cool winters. The mean annual temperature is 68 degrees F, with approximately 238 days between killing frosts. January is the coldest month with an average daily temperature of 36 degrees F. The mean annual precipitation over the 80-mile-long watershed varies from 29 inches at its head to 35 inches at its eastern limits. In the North Fork Lake area the mean annual precipitation is 33 inches, with the heaviest rains falling from April through June. The greatest source of rain is the frontal storms, although cyclonic storms and thunderstorms do occur. The nature of the storms and the fact that the topography is conducive to rapid

runoff results in frequent flooding, which can occur at any time of the year. Winds in the region are generally from a southerly direction. The average wind velocity near the watershed is 9.5 mph, with 57 mph the maximum recorded.

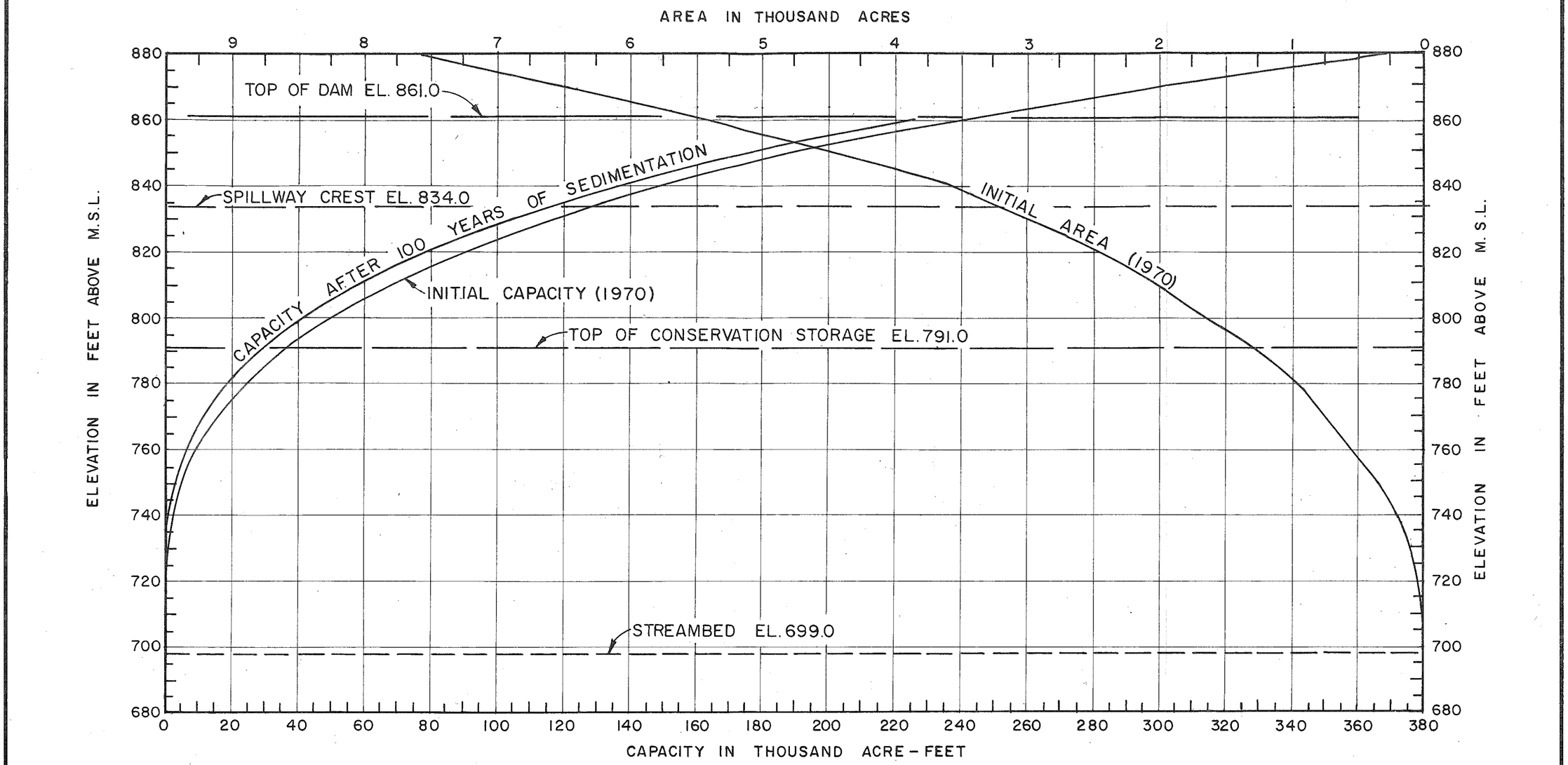
2-04. Lake area and general character.- The project will be located west of the Balcones Escarpment in the Texas "hill country", an area known for its rugged scenic beauty. The area is characterized by generally rugged topography and contains steeply eroded hills, tall rocky bluffs, spurs, knobs, and escarpments. The area of interest is on the eastern boundary of the Edwards Plateau. The project is located in a valley which is level to slightly rolling and is cultivated primarily for feed crops. Tree cover in the valley is restricted primarily to the banks of the narrow streams, to major tributaries, and to a few other small scattered timber tracts. The sides of the lake are steep, with numerous rock outcrops. The upland areas above the lake are covered with cedar, live oak, and some mesquite. The main body of the impoundment water at elevation 791.0 feet msl (the top of the conservation storage pool) will have a maximum length of 7 miles and a maximum width of 1 mile. The conservation pool will be characterized by a shoreline that has generally steep, rugged slopes, and deep water. Pertinent data is presented in table II-1.

Table II-1

NORTH FORK LAKE
PERTINENT DATA

Feature	Elevation (feet msl)	Area (acres)	Capacity (acre-feet)
Drainage area (246 square miles)		157,440	
Top of dam	861.0	5,570	
Maximum design water surface	856.2	5,070	220,100
Top of flood control pool (spillway crest)	834.0	3,220	130,800
5-year flood pool	802.2	1,740	54,000
Top of conservation pool	791.0	1,310	37,100
Recreation pool*	787.8	1,180	
Sediment reserve**			14,000
5-year frequency drawdown	778.5	920	23,400
10-year frequency drawdown	769.2	740	15,600
Total fee area		5,396	
Flowage easement		650	

*Average elevation during prime recreation season, June through August
**7,900 acre-feet below elevation 791.0



NOTE:
Drainage area = 246 sq.mi.
One inch of runoff = 13,120 ac.-ft.

BRAZOS RIVER BASIN, TEXAS
NORTH FORK RESERVOIR
SAN GABRIEL RIVER, TEXAS

AREA AND CAPACITY CURVES

SCALE AS SHOWN

U.S.ARMY ENGINEER DIST., FT. WORTH SEPT. 73

TO ACCOMPANY DESIGN MEMORANDUM NO.16
MASTER PLAN

FILE: NO.16 PLATE II-3

TABLE III - 1

Limitation*- of Soils for Recreation Development
Williamson County, Texas

Soil Series	Soil Ratings and Adverse Features Affecting: Sewage Disposal: Filter Fields	Sewage Disposal: Lagoon	Construction	Roads and Streets	Camp Areas	Picnic Areas	Playground	Paths and Trails	Wildlife Suitability	Range sites, production and plants
Brackett Gravelly clay loam, 1-12% slope (9)	Moderate-permeability	Moderate-slopes less than 7%; Severe-slope greater than 7%	Moderate-bearing capacity; Low corrosivity (concrete)	Moderate-traffic supporting capacity and shrink swell potential	Moderate-permeability	Slight-1 to 8% slopes; Moderate- 8 to 12%	Moderate-permeability severe-slopes over 6%	Moderate-texture and slope	Openland: poorly suited Woodland suited	Adobe site: 1,500 to 3,500 lbs/ac** Excellent condition: Little bluestem, tall grama, tall dropseed, silver bluestem, low panicums, Pasture Group: Improved bermudagrass, K. R. Bluestem, and Kleberg bluestem
Brackett Gravelly clay loam, 12-30% slope (5)	Severe-permeability	Severe-slopes	Severe	Severe-traffic supporting capacity	Severe	Severe-slopes	Severe-slopes	Severe-slopes	Openland: poorly suited Woodland suited	Steep Adobe site: 1,000 to 3,000 lbs/ac. Excellent condition: Sideoats grama, low panicums, silver bluestem, tall dropseed, tall grama, Pasture Group: Kleberg bluestem, K. R. bluestem and improved bermudagrass
Krum Silty clay, 1 to 8% slopes (3)	Moderate-permeability	Moderate-permeability	Moderate to severe-shrink swell potential	Severe-traffic supporting capacity	Severe-soil compaction	Severe-soil compaction	Severe-soil compaction	Severe-trafficability	Openland: well suited Woodland suited	Rolling Blackland site: 4,500 to 8,000 lbs/ac. Excellent condition: Little and big bluestem, indiangrass, eastern grama, switchgrass, and sideoats grama, Pasture Group: Friable clayey upland. Indiangrass switchgrass, K. R. bluestem, and improved bermudagrass, etc.
Lewisville Silty clay, 1 to 3% slopes (1)	Moderate-permeability	Moderate-permeability	Moderate to severe-shrink swell potential	Severe-graffic supporting capacity; low strength	Severe-poor trafficability	Severe-soil texture	Severe-soil compaction	Severe-poor trafficability	Openland: suited Woodland: suited	Rolling Blackland site: 3,000 to 5,000 lbs/ac Excellent condition: Indiangrass, big bluestem, switchgrass, little bluestem, Florida paspalum and Virginia wildrye. Pasture Group: Friable clayey upland, adapted species include improved bermudagrass, Johnsongrass, and K. R. bluestem.
Lewisville Silty clay, 3-5% slopes (2)	Moderate-permeability	Moderate-permeability	Moderate-to severe-shrink swell potential	Severe-traffic supporting capacity low	Severe-poor trafficability	Severe-soil texture	Severe-soil compaction	Severe-poor trafficability	Openland: suited Woodland: suited	Rolling Blackland site: 3,000 to 5,000 lbs/ac Excellent condition: Indiangrass, big bluestem, switchgrass, little bluestem, Florida paspalum and Virginia wildrye. Pasture Group: Friable clayey upland, adapted species include improved bermudagrass, Johnsongrass, and K. R. bluestem.

TABLE III -1

Soil Series	Soil Ratings and Adverse Features Affecting: Sewage Disposal: Filter Fields	Sewage Disposal: Lagoon	Construction	Roads and Streets	Camp Areas	Picnic Areas	Playground	Paths and Trails	Wildlife Suitability	Range sites, production and plants
Speck Stony clay 1-8% 5% slopes (2)	Moderate-perme-ability	Moderate-perme-ability	Moderate-to severe-shrink swell potential	Severe-traffic supporting capacity; low strength	Severe-poor traffic-	Severe-soil texture	Severe-soil compaction	Severe-poor traffic-ability	Openland: poorly suited Woodland: suited	Redland site: 1,500 to 3,500 lbs/ac Excellent condition: Tall grama, little bluestem, tall dropseed, silver bluestem, and sideoats grama Pasture Group: Adapted species include improved bermudagrass, Kleburg bluestem and K. R. blue-stem.
Tarrant Complex 0 to 5% slopes (6)	Severe-shallow soil depth	Severe-difficulty to install 20 inches	Severe-bedrock within 20 shrink swell	Severe-stones shallow depth to bedrock	Severe-poor trafficability stones	Severe-texture;	Severe-coarse fragment on surface	Severe-texture; stones	Openland: poorly suited Woodland: unsuited	Low Stony Hill site: 900 to 1,700 lbs/ac. Excellent condition: Sideoats gramma, little bluestem, Indiangrass, fall witchgrass, green sprangletop, curly mesquite, bush sunflower, guara, orange zexmenia, liveoak and shinoak.
Tarrant Stony clay, 0-12% slopes (7)	Severe-depth to bedrock	Severe-depth to rocks; stones	Severe-bedrock high shrink swell potential	Severe-bedrock within 20 inches; slopes	Severe-stones and coarse fragments on surface; steep slope	Severe-poor trafficability stones	Severe-stones and coarse fragments on surface	Severe-stones; steep slope	Openland: poorly suited Woodland:	Low Stony Hill site: 900 to 1,700 lbs/ac. Excellent condition: Sideoats gramma, little bluestem, Indiangrass, fall witchgrass, green sprangletop, curly mesquite, bush sunflower, guara, orange zexmenia, liveoak and shinoak.
Tarrant Stony clay, 12-30% slopes (8)	Severe-depth to bedrock	Severe-depth to rocks; stones	Severe-bedrock; high shrink swell potential	Severe-bedrock within 20 inches; slope	Severe-stones and coarse fragments on surface; steep slope	Severe-poor trafficability stones	Severe-stones and coarse fragments on surface	Severe-stones; steep slope	Openland: poorly suited Woodland: unsuited	Low Stony Hill site: 900 to 1700 lbs/ac Excellent condition: Sideoata grama, little bluestem, Indiangrass, fall witchgrass, green sprangletop, curly mesquite, bush sunflower, guara, orange zexmenia, liveoak and shinoak.

*Slight: The soil limitations are not serious; they are easy to overcome.
Moderate: It is generally feasibel to overcome or correct soil limitations by means that are in general practice.
Severe: Use of the soil is questionable because the limitation is difficult to overcome.

** Pounds of estimated production of air dry herbage per acre.

IV - FACTORS INFLUENCING AND RESTRICTING RESOURCE DEVELOPMENT AND MANAGEMENT

4-01. General.- The aim of the Master Plan is to balance the development of recreation facilities and the available project resources to ensure the wise use of the project's resources in the best interest of the public. The formulation of this plan requires the determination, as far as possible, of project resources and the factors influencing and restricting their development and management. The interrelationship between the factors discussed in this chapter and the project resources discussed in chapter III are vital in determining the recreational-use potential, the developability of the project resources, the ability of the project to sustain intensive use, and the plans for their development. Although various factors may be operative in particular situations, the factors presented in this chapter seem to be operative in general and to underlie the greatest impact upon the development and management of project resources.

4-02. Day-use zone of origin.- Experience at completed lake projects in the Fort Worth District and at similar projects elsewhere suggests that the primary recreational use of these projects falls within the day-use category. The term "day-use zone of origin" refers to a 2-hour or 100-mile driving range which will allow driving to the project, participating in recreational activities, and returning home the same day. Therefore, an irregular area with a boundary approximately 100 road miles from the project was evaluated. It was determined from the evaluation that the "day-use market area" (the geographical area from which over 80 percent of the day-users originate) would be within 30 road miles of the project. Consequently, the examination of the factors influencing and restricting resource development and management was centered primarily around the project and the surrounding day-use market area.

4-03. Effect of socioeconomic factors.- Although various factors may be operative in particular situations, the five basic factors presented in this section seem to be generally operative and to underlie the large and continuing rise in outdoor recreation activities at Corps of Engineers projects.

a. Existing population characteristics.- The existing population of the day-use market area is a mixture of urban and rural populations. The present large urban populations are distributed on an outer fringe of the day-use market in Austin, Temple, and Killeen. The immediate vicinity of the proposed lake is rural with a few small scattered towns. Eighty percent or more of the day-use visitation will be from parts of Bell, Travis, and Williamson Counties. Since city dwellers, on the average, patronize public outdoor recreation areas far more than do rural residents, the day-use visitation

primarily will be from urban areas. The large urban areas of Georgetown, Taylor, and Bartlett, and the smaller nearby urban centers such as Liberty Hill, Rockdale, Jonah, and Cameron, will be the primary sources of day-use visitation. Population data are shown by county in table IV-1 and by city in table IV-2.

Table IV - 1

POPULATION DATA BY COUNTIES

County	Population 1960	Total Population 1970	Percent Change from 1960 to 1970	Total Urban Population	Percent of Total
Bell	94,097	124,483	+32.3	105,555	84.8
Travis	212,136	295,516	+39.3	264,499	89.5
Williamson	35,044	37,305	+ 6.5	18,822	50.5
	341,277	457,304	+33.9	388,876	

Table IV - 2

POPULATION DATA FOR CITIES

City	County	Total Population 1960	Total Population 1970	Percent Change from 1960 to 1970
Florence	Williamson	672	610	-10.2
Granger	Williamson	1,256	1,339	+ 6.2
Georgetown	Williamson	5,218	6,395	+22.6
Hutto	Williamson	545	442	-23.3
Round Rock	Williamson	1,851	2,811	+49.7
Taylor	Williamson	9,434	9,616	+ 1.9
Holland	Bell	723	653	-10.7

b. Projected population characteristics.- The estimated population of Bell, Travis, and Williamson Counties has increased from 341,277 in 1960 to 457,304 in 1970. During this 10-year period, the population has increased over 33 percent. The greatest increase in population has occurred in Bell and Travis Counties (table IV-1). This rapid increase in population has been due primarily to the rapid growth of the large urban centers of Austin, Temple, and Killeen. Population growth in the day-use market area is expected to make notable gains in the future. The greatest increases are expected to occur in the large metropolitan areas, and the slowest growth is expected in the rural portion of the day-use market area. The present and predicted population growth of the market area is likely to result in increased demand for outdoor recreation.

c. Urban-rural relationship.- Since the 1940's the general trend has been movement away from the rural areas to the metropolitan areas. This trend has been evident in the day-use market area. It is expected to continue, but at a slower rate. Major changes have also taken place within the urban centers in the day-use market area. Because of increased income, racial problems, and other sociological elements, the general population of the large urban centers has migrated from the centers of cities to suburban areas. The net result of this trend has been a large radial expansion and encroachment upon adjacent rural areas. This trend is expected to continue until a large megalopolis consisting of Dallas, Fort Worth, Temple, Austin, and San Antonio is created.

d. Real income per capita.- The per capita income has steadily increased over the years and is expected to increase at a much more rapid rate in the future. An average projected per capita income for the counties composing Economic Area 129 is shown in table IV-3.

Table IV - 3

PROJECTED PER CAPITA INCOMES*
ECONOMIC AREA 129

1980	1990	2000	2010	2020
$3,765	$5,057	$7,014	$9,457	$12,655

*Source: Economic Activity in the United States by BEA Economic Areas, Historical and Projected 1929-2020, Volume 2, United States Water Resources Council, Washington, D. C.

Along with changes in average incomes, there are shifts in the distribution of income which make it economically possible for more people to engage in different kinds of outdoor activities. Table IV-4 shows the 1971 distribution of income by counties in the day-use market area. It should be noted that Travis and Bell Counties have a high percentage of households with higher incomes. This is primarily the result of the large metropolitan centers located in these counties.

Table IV - 4

PERCENTAGE OF HOUSEHOLDS BY CASH INCOME GROUPS*

Income Group	Bell	Travis	Williamson
0 - $3,000	19.8	17.3	31.9
$3,000 - $5,000	15.4	13.9	19.0
$5,000 - $8,000	29.7	21.9	21.9
$8,000 - $10,000	12.2	12.9	10.1
$10,000 - $15,000	14.4	19.5	11.1
$15,000 - up	8.5	14.5	6.0

*Source: 1972 Survey of Buying Power, "Sales Management and Marketing Magazine," 10 July 1972.

Williamson County reflects the traditional agrarian economy, with a high percentage of the households having low incomes. As the day-use area becomes more urbanized, the household incomes will increase in direct proportion to the urbanization rate. As a result, a greater proportion of this higher income will be discretionary, with a larger proportion being available for outdoor recreation than is true today.

e. Leisure time.- The average workweek of the day-use market area has declined considerably in the past 70 years. In 1900, the average workweek was about 60 hours. Today the workweek has declined to about 40 hours. The net result has been increased leisure time. Although it is anticipated that there will be continued gradual decline in the average workweek, leisure time will be most significantly changed by the recent trend to shift to a 4-day workweek and later to a possible 3-day workweek. This trend is expected to occur during the life of the project. With a larger amount of leisure time available each week, it is expected that an increased amount of participation in recreation will occur, and travel to recreation areas beyond the typical day-use market area should increase significantly.

4-04. Need for project recreation.- Determination of recreation needs is based on the demand and supply characteristics of the counties that comprise the day-use market area. Need arises when the demand for recreational opportunities exceeds the supply of recreational opportunities. The "State Comprehensive Outdoor Recreation Plan" (SCORP) recognized that in the region in which North Fork Lake is located there are deficiencies in facilities for many activities which relate to water based recreation. Activities mentioned in SCORP include fishing, boating, water skiing, swimming, camping, and picnicking. The need for water based recreation opportunities has been shown, but the demands will not be met completely by this project.

4-05. Interstate demand.- Visitation from other States is expected to be minimal due to the project's location. With Interstate Highway 35 passing relatively near North Fork Lake, there will be the potential for visitation by transient campers. The lake will be a possible stopover point for visitors traveling to Austin from the north or to Temple from the south.

4-06. Accessibility.-

a. Roads.- Interstate Highway 35 east of the lake is the major regional route and connecting link between the Dallas-Fort Worth-Waco, Temple-Austin, and San Antonio areas. U.S. Highway 183 crosses the upstream portion of the lake at the western end of the impoundment. Access to the northern portion of the lake will be provided by Farm to Market Road 2338. State Highway 29 parallels the lake to the south. Several planned new and relocated roads will provide

VI - COORDINATION WITH OTHER AGENCIES

6-01. General.- During the development of this master plan, input was requested from agencies at the Federal, State and local levels having collateral interest in the project. This section contains the history of the coordination effort and the comments of those who have reviewed the master plan.

6-02. History of project coordination prior to developing the master plan.

a. Public hearing.- Public hearings were held during March 1968. The purposes of these hearings were to inform the public of the areas selected for public use and to provide an opportunity for all interested persons to express their views concerning the San Gabriel project.

b. U. S. Public Health Service.- The U. S. Public Health Service presented a report entitled, "Municipal and Industrial Water Requirements, San Gabriel River, Lower Brazos River System, Texas," which is contained in Appendix IV of the survey report for the San Gabriel River watershed dated 12 January 1962. In June 1965 the U. S. Public Health Service submitted an updated water supply and water quality study on the Navasota River watershed, lower Brazos River system, Texas. This study includes the entire lower Brazos River; therefore, it includes the San Gabriel River projects. A copy of this report was incorporated in Appendix B, Supplement No. 1, Design Memorandum No. 4.

c. U. S. Fish and Wildlife Service.- The Fish and Wildlife Service prepared a report on the fish and wildlife to be affected by the San Gabriel and tributaries project, Texas, dated 28 April 1967. This report up-dates their survey report dated 12 September 1961. The updated report is presented in Appendix A, Supplement Number 1, Design Memorandum No. 4.

d. National Park Service.- The Park Service participated in a field reconnaissance of the San Gabriel project during February 1960. Their report is presented in Appendix IV of House Document 591; it is entitled, "Reconnaissance Report, Recreational Use and Development, San Gabriel River Watershed, Brazos River Basin."

6-03. Summary of project coordination since the initiation of the master plan.

a. Public meeting.- On 11 February 1974, representatives of the Fort Worth District participated in an open forum meeting held at the Williamson County Courthouse, Georgetown, Texas. The meeting was held at the request of Williamson County Judge C. L. Chance for the purpose of presenting our proposed recreation plans.

b. Coordination of the master plan.- In accordance with ER 1163-2-400 this master plan has been submitted to Federal, State, and local governmental agencies for their review and comments. This section contains a summary of the coordination effort and the comments of those who have reviewed the master plan. To facilitate finding certain comments of particular agencies, organizations, or individuals, and the response of the Corps of Engineers to those comments, a cross index is presented in table VI-1.

6-04. Environmental Protection Agency.- Wastewater treatment design and other pollution abatement plans will be coordinated with the Environmental Protection Agency in accordance with SWDED-E letter dated 2 October 1972, subject, Coordination with Environmental Protection Agency.

6-05. U. S. Fish and Wildlife Service.- The Fort Worth District requested the cooperation of the Fish and Wildlife Service in appraising the fish and wildlife potentialities of the proposed project. Pursuant to this request, a field reconnaissance was made during June 1974. Representatives of the Fish and Wildlife Service inspected the project site with personnel of the Fort Worth District and members of the Texas Parks and Wildlife Department. The Fish and Wildlife Service submitted their official report on 15 August 1974. This report has been incorporated in revised section XV, Fish and Wildlife Management Plan.

6-06. Synopsis of coordinated agencies comments.- The master plan was submitted to twenty agencies and individuals for review and comment. Their comments and the Corps of Engineers responses to them are presented in the following paragraphs.

Table VI-1

COORDINATING AGENCIES

Agency	Synopsis & Response	Full Text
U. S. Department of Agriculture		
Soil Conservation Service	VI-4	VI-11
U. S. Department of Health, Education & Welfare	No response	-
U. S. Department of the Interior		
Bureau of Outdoor Recreation	VI-4	VI-13
U. S. Fish and Wildlife Service	VI-4	VI-14
National Park Service	VI-4	VI-16
Environmental Protection Agency	VI-5	VI-17
State of Texas:		
Executive Department, Division of Planning Coordination	-	VI-19
Park & Wildlife Department	VI-5	VI-21
Department of Agriculture	VI-6	VI-23
Water Quality Board	VI-6	VI-24
Historical Survey Committee	VI-6	VI-25
Water Development Board	VI-6	VI-27
Bureau of Economic Geology	VI-7	VI-29
Water Rights Commission	VI-8	VI-30
Industrial Commission	VI-9	VI-33
Soil and Water Conservation Board	VI-9	VI-34
Air Control Board	VI-9	VI-35
Brazos River Authority	VI-9	VI-36
Capital Area Planning Council	VI-10	VI-37
Honorable C. L. Chance, County Judge, Williamson County	VI-10	VI-38

(1) U. S. Department of Agriculture, Soil Conservation Service.

Comment: Several constructive suggestions were made concerning soil and native vegetation.

Response: These suggestions were noted; they will be incorporated in the updated master plan.

(2) U. S. Department of Interior, Bureau of Outdoor Recreation.

Comment: "In this post authorization review our comments are normally focused on the recreation design aspects of the project. Since we didn't participate in preauthorization planning and haven't visited the site, we are addressing only certain appropriate sections of the Texas SCORP. We note in that document that although there is no need for more slack water for recreation in the entire market area of Laneport and North Fork, there is a deficit of picnicking facilities, camping facilities, and boat ramps. Your Master Plans for both projects seem to be designed to provide such facilities, and thus meet certain recreation needs."

(3) U.S. Department of Interior, U. S. Fish and Wildlife Service.

Comment: "Page VII-4, section 7-05. Hunting will be restricted in all developed parks and other posted areas. The restricted areas include so much of the project that it might be better to emphasize the areas tentatively planned for hunting."

Response: Comment noted. When project lands are opened to public hunting, specific areas will be designated for hunting by the District Engineer.

Comment: "Page XI-2, section b.(1), Bottomlands. We suggest that switchgrass also be considered in the revegetation of lands below the 5-year flood pool. Switchgrass is a better wildlife cover and food plan than buffalograss, Bermudagrass, or Johnsongrass and yet should produce the same soil binding qualities as Bermudagrass."

Response: Switchgrass will be utilized in the revegetation program below the 5-year flood pool. This suggestion has been included in revised Section XIII, Vegetative Management Plan.

(4) U. S. Department of Interior, National Park Service.

Comment: "We note on plate IV-1, Day Use Market Area, North Fork Lake, "Index to Points of Interest," the omission of Lyndon B. Johnson State Park as well as the Lyndon B. Johnson National Historic Site which is situated between Fredericksburg and Johnson City."

Response: Plate IV-1 will be amended when the master plan is updated to reflect the suggested inclusion.

(5) Environmental Protection Agency.

Comment: "Although sewage generated by the sanitary facilities at the lake will be biologically processed in packaged treatment plants, aerated lagoons or septic tank and lateral systems, we believe the plan would be strengthened by including more detailed information describing their proposed locations, design capacities, waste treatment efficiencies, and locations of any effluent discharge."

Response: The type of sanitary system selected for use at North Fork Lake will be based upon the best available, practical, and economical design that meets Federal, State and local requirements. The Fort Worth District will prepare detailed plans for a wastewater treatment system which will define design capacities, waste treatment efficiencies and other pertinent data. The wastewater treatment design and other pollution abatement plans will be coordinated with EPA in accordance with Executive Order 11507, "Prevention, Control and Abatement of Air and Water Pollution at Federal Facilities."

(6) Texas Parks & Wildlife Department.

Comment: "Exotic grasses suggested for planting along the lake margin (Bermudagrass and King Ranch bluestem) have lower value for wildlife and are ecologically less desirable than native species. Grasslike species such as native sedges should be established within zones of water fluctuation in lieu of the exotics mentioned. For natural purposes, native species including bluestem, Indiangrass and species of grama are also superior to exotic grasses on uplands (Page III-5)."

Response: Concur. These suggestions have been included in the revised Vegetative Management Plan, Section XIII.

Comment: "The kinds and extent of recreational activities which are compatible with the existence of Golden-cheeked Warbler populations is not known. It is thought that they prefer areas where human activities are minimal. Research to determine this and other facts about Golden-cheeks has recently been initiated by the Texas Parks and Wildlife Department in Meridian State Park. Perhaps plans to protect the threatened Golden-cheeked Warbler could be coordinated with the work in Meridian (Page III-6)."

Response: The Fort Worth District is coordinating their plans to protect the threatened Golden-cheeked Warbler with the Texas Parks & Wildlife Department.

(7) Texas Department of Agriculture.

Comment: "This draft environmental statement gives a complete and comprehensive set of plans for management of the land and other resources of the area for public recreational use."

(8) Texas Water Quality Board.

Comment: "The staff of the Texas Water Quality Board has reviewed the Corps of Engineers Design Memorandum 16, Master Plan, for North Fork Lake and have concluded that the proposals for the development and management of the project would not be in conflict with policies and procedures of this agency."

(9) Texas State Historical Survey Committee.

Comment: "Sections 3-02 and 3-03 point out that archeological, historical and architectural resources are present within the confines of the proposed reservoir area and that additional investigations are necessary to evaluate the archeological significance. These investigations might best be carried out in the form of an intensive archeological survey to locate, record and appraise all cultural (prehistoric, historic, and architectural) resources. This investigation should provide and result in, definition of research problems, cost, and strategy for further study leading to the mitigation of adverse effects on the resources."

Response: Additional archeological investigations and salvage will be accomplished prior to impoundment in order to locate and further identify the presence of archeological data. We are working with Balcones Research Center of the University of Texas at Austin, and the National Park Service to see that the work is accomplished.

Comment: "Section 12-12a should be amended to include protection of cultural resources from vandalism, disturbance, etc."

Response: Section 327.14 of Title 36 clearly states that the destruction, injury, defacement, or removal of public property including natural formations, historical and archeological features is prohibited. The updated master plan will be amended to emphasize the protection of these resources.

(10) Texas Water Development Board.

Comment: "We believe that per capita income projections (table IV-3) should be clarified. Volume 4 of OBERS contains per capita income data on the water resource sub-area in which North

Fork Lake is located. OBERS does not, however, reflect data contained in Table IV-3. If Table IV-3 was derived from another source, for instance from unpublished county income projections, it is suggested that such source be appropriately footnoted."

Response: Table IV-3 has been corrected; the source has also been appropriately footnoted.

Comment: "In Table IV-1, we find that the 1970 market area population is larger than either the projected 1980 or 1990 population, as shown in Table V-1."

Response: Concur. Table IV-1 has been revised.

(11) Bureau of Economic Geology.

Comment: "Special consideration should be given to the possibility of reservoir leakage into underlying limestone strata. The Comanche Peak Limestone underlies most of the area to be covered by the dam and reservoir; thus these areas are not in immediate contact with the cavernous Edwards limestone. However, joints, faults, small solution openings, and regional dip of strata to the southeast may provide conduits for water to flow from the reservoir into the limestone aquifer (Edwards) downdip to the east. Planning seasonal water uses should take into account this potential water loss."

Response: The Corps of Engineers considered the possibility of leakage during the design stage and completed ground water and structural geology studies of the reservoir area before concluding that leakage from the reservoir would be minimal. In addition, a grout curtain has been constructed through the Edwards limestone into the underlying Comanche Peak limestone along the alignment of the embankment site. This treatment to the Edwards is expected to preclude reservoir leakage beneath the embankment as well as through the abutments. Additional grout treatment will be made after impoundment of the lake, if it is required.

Comments: "Recreational-development suitability based on soil criteria (pages III-2-III-5) may be misleading. Much of the upland limestone terrain around the reservoir site is covered by only a few inches of soil. Thus, bedrock characteristics (not soils) are the factors controlling suitability of waste disposal methods and construction feasibility. Thin soils on cavernous limestone are not suited for placement of septic tanks and sewage lagoons, as there may be incomplete wastewater treatment. The cavernous bedrock then provides access to the lake for wastewater, ultimately posing a threat to lakewater quality.

Response: In respect to the possible use of upland topsoil for placement of septic tanks and sewage lagoons, this office concurs with the statement that such use would be at the risk of poluting the lake water. The Corps of Engineers' surface and subsurface investigations show very sparse overburden in the uplands and general solutioned conditions in the underlying Edwards limestone. Although most of the reservoir will be contained by the relatively "tight" Comanche Peak formation, sewage movement in the overlying solutioned Edwards limestone could conceivably find access to the reservoir through joints and fractures in the Comanche Peak. Some exceptions to the thin overburden occur in swales, sags, and tributary drainages but each of these would require individual attention and investigation concerning suitability for sewage disposal.

(12) Texas Water Rights Commission.

Comment: "The data and discussion contained in Section 2-07, concerning pool elevation fluctuation, appear to emphasize the relatively narrow range of fluctuation, depicting in effect, this narrow fluctuation as a highly favorable recreational characteristic of the lake. The staff believes that the discussion should be extended to show that while the pool level is expected to vary about 24 feet in an average five-year recurrence interval, the pool can vary 40 feet in an average ten-year period, and over 60 feet in a 20-year period. The staff believes that statistical analysis regarding 10- to 20-year recurrence intervals would be more realistic."

Response: The statistical data were not included to give the impression that reservoir fluctuations are small, but to summarize the analyses that had been made. Information regarding the day-to-day fluctuation of the reservoir level is presented in DM No. 1, Hydrology, Part B. It is concluded that studies which were the basis for statistical analyses quoted in DM No. 18 were conducted on a sound basis.

Comment: "The staff believes that further discussion is warranted regarding the advantages and justification for using the "similar project" concept in the determination of recreationalist visitations at the reservoir, and the recreational cost benefits therefrom. Specifically, the referenced Design Memorandum would be enhanced if justification were furnished why the concept of "similar project," i.e., observed visitation rates to existing facilities, was selected in lieu of empirical prediction equations or interviews conducted in the market area of the proposed facility."

Response: The purpose of section VI, Outdoor Recreation Needs and Facilities was to summarize the standard Corps procedure that was used to estimate recreation need at the proposed project,

not to justify or discuss the advantages or disadvantages of the procedure. The recreation use prediction procedure described in Technical Report No. 2 was used as the basis for predicting recreation use levels at the multiple-purpose project; this was done in accordance with instruction presented in ER 1120-2-403, dated 26 March 1970.

Comment: "The staff suggests that the data for total fee area contained in Table II-1, page II-2, i.e., 6,300 acres, be reconciled with the total fee area of 5,650 acres indicated in Table VII-1, page VI-2.

Response: Comment noted. Because the acquisition program is subject to adjustments in fee acreage, the correction will be made in the updated master plan.

(13) Texas Industrial Commission.

Comment: "The Texas Industrial Commission does not have any negative comments regarding this Design Memorandum.

(14) Texas State Soil & Water Conservation Board.

Comment: "We take no exception to the contents of the document."

(15) Texas Air Control Board.

Comment: "Our review..., indicates that the air quality impact of these projects will be negligible.

(16) Brazos River Authority.

Comment: "Table II-1 on page II-2 shows the recreation pool elevation as 1180 acres with a footnote stating; Average elevation during prime recreation season, June through August.

This has the potential of creating a problem for the Authority in making full use of the conservation pool."

Response: The recreation pool elevation is only utilized in planning for recreation facility development, determination of annual visitation and recreation benefits. There is not a conflict of water usage between the recreation pool and conservation pool. We fully realize that the elevation and area will vary between the top and bottom of the conservation pool depending upon hydrological factors and consumer's needs.

(17) Capital Area Planning Council.

Comment: CAPCO's Executive Committee considered the recommendations and voted that the proposed project be given a favorable review.

(18) Honorable C. L. Chance, County Judge, Williamson County.

Comment: "In response to your letter of November 6, 1973, I wish to request the Corps of Engineers to conduct an open forum type meeting in Georgetown presenting in particular the plans for parks and recreation areas on the North Fork Lake area. There is considerable interest in this project and a meeting like this will develop the local attitudes toward the planning that has been done so far."

Response: On 11 February 1974 representatives of the Fort Worth District participated in an open forum meeting held at the Williamson County Courthouse, Georgetown, Texas. The recreation plan of development was favorably received by the citizens in attendance.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P. O. Box 648
Temple, Texas 76501

December 4, 1973

LTC Charles J. Tracy
Deputy District Engineer
Department of the Army
Fort Worth District, Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102

Dear Colonel Tracy:

We have reviewed a copy of the Design Memorandum No. 16 Master Plan for the development and management of the environmental and recreational resources of North Fork Lake, San Gabriel River, Texas.

The memorandum describes measures for the preservation and enhancement of natural features in the project area.

You may wish to consider the following suggestions:

1. Page III-2

   3-06 a - Change third sentence "varieties" to"phases".

   3-06 a 1 - Remove "like" following Frio and Dev.

   3-06 a 2 - Add "with stones" to the end of third sentence.

2. Plate III-1

   Legend - Number 4 substitute "Speck" for "Tarpley".

   Title block - Delete "s" from "soils"

3. Table III-1

   Brackett Series(9), First column - Omit "slopes less than 10%".

   Sixth column-slight, substitute "1" for "0".

   Moderate, substitute "12%" for "15%".

Brackett Series(5) - Second column, delete "greater than 7%".

Column three, six, seven and eight delete numerical percent, should read severe slopes".

Krum Series(3) - Second column, delete "0 to 7% slopes".

Tarpley Series(4) - Substitute "Speck" for Tarpley".

Column one, delete "slopes less 10%".

Column two, delete "less than 7%; severe slope greater than 7%".

Column six, delete "0 to 8% slopes; moderate - 8 to 15% slopes".

Footnote at the top of the heading for Table III-1 should be inserted at the bottom of the table on page III-4.

4. Page III-5

3.07 b - In the eighth line "native juniper, cedar" are listed separately but they are the same plant.

5. Page XI-2

11.03 c - You may wish to delete black locust because it is highly susceptible to root rot. Hickory is best adapted to a sandy soil. Redbud, mescalbean, bur oak, and evergreen sumac could be added because they are adapted species.

We appreciate the opportunity to review and comment on this memorandum.

Sincerely,

for Edward E. Thomas
State Conservationist

cc:
Fred H. Tschirley, Office of the Secretary, USDA, Washington, D.C.
Kenneth E. Grant, SCS, Washington, D.C.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
South Central Regional Office

Patio Plaza, 5000 Marble N.E., Room 211
Albuquerque, New Mexico 87110

FEB 8 1974

Colonel Floyd H. Henk
Fort Worth District
Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102

Dear Colonel Henk:

We are responding by this letter on reviews of the Master Plans for both the Laneport and North Fork Lake projects, San Gabriel River, Texas. During an extended review time period granted by you, we met with Gordon Jones of the division office and representatives of all district offices in the Southwest Division. This day long discussion concerning recreation as a project purpose was very useful to us in clarifying certain procedures, aiding us in understanding methodology, and obtaining the State Recreation Planners' viewpoints concerning our mutual interests. We certainly didn't answer all the complex questions concerning such projects, but hopefully we are making progress.

In this postauthorization review our comments are normally focused on the recreation design aspects of the project. Since we didn't participate in preauthorization planning and haven't visited the site, we are addressing only certain appropriate sections of the Texas SCORP. We note in that document that although there is no need for more slack water for recreation in the entire market area of Laneport and North Fork, there is a deficit of picnicking facilities, camping facilities, and boat ramps. Your Master Plans for both projects seem to be designed to provide such facilities, and thus meet certain recreation needs.

Thank you for the opportunity to comment on these Master Plans and for the opportunity to meet with your staff during January. Such meetings are extremely helpful. Perhaps they should occur more frequently.

Sincerely yours,

for Rolland B. Handley
Regional Director

IN REPLY REFER TO: RB

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

November 27, 1973

District Engineer
Corps of Engineers, U. S. Army
P. O. Box 17300
Fort Worth, Texas 76102

Dear Sir:

As requested in LTC Charles J. Tracy's letter of November 6, 1973, we have reviewed the Design Memorandum No. 16, Master Plan for North Fork Lake, San Gabriel River, Texas, and have the following comments to make:

The Master Plan presents a program to develop, improve, and manage the resources at North Fork Lake. Among the beneficial aspects of the plan for fish and wildlife are the proposed development of a wildlife management area; adequate access, parking, and boat-launching facilities for fishermen and hunters; reservoir zoning plan for multiple uses including areas for fishing and hunting; planting of vegetation for erosion control and as food, cover, and edge effects for wildlife; fencing project lands; low density use areas for nature and wildlife studies and observations; and the development of a nature trail with limited facilities in the nonsensitive area of Walnut Springs Park. The Park contains a good stand of mature ash juniper which forms the typical habitat of the threatened golden-cheeked warbler.

Comments pertaining to specific sections of the report are as follows:

Page VII-4, section 7-05. Hunting will be restricted on all developed parks and other posted areas. The restricted areas include so much of the project that it might be better to emphasize the areas tentatively planned for hunting.

Page XI-2, section b.(1), Bottomlands. We suggest that switchgrass also be considered in the revegetation of lands below the 5-year flood pool. Switchgrass is a better wildlife cover and food plant than buffalograss,

Bermudagrass, or Johnsongrass and yet should produce the same soil binding qualities as Bermudagrass.

We appreciate the opportunity to review and comment on your Design Memorandum No. 16 for North Fork Lake.

Sincerely yours,

W O Nelson

Regional Director

cc:
Field Supervisor, BSFW, Div. of River Basin Studies, Fort Worth, Texas

United States Department of the Interior
NATIONAL PARK SERVICE
SOUTHWEST REGION
P.O. Box 728
Santa Fe, New Mexico 87501

IN REPLY REFER TO:
L7423

NOV 21 1973

Lt. Colonel Charles J. Tracy, CE
Deputy District Engineer
Fort Worth District, Corps of Engineers
Post Office Box 17300
Fort Worth, Texas 76102

Dear Colonel Tracy:

Thank you for the opportunity to review your Design Memorandum No. 16, Master Plan for North Fork Lake, San Gabriel River, Texas. It appears to be a well-conceived plan for development and management of the environmental and recreational resources of that reservoir.

We are pleased to note that the Corps intends to solicit the help of the State Historical Society, this, and other agencies in the investigation and salvage of archeologic and historic properties.

Your selection of recreation sites for both high and low density public use appears to follow good management objectives of scenic preservation together with visitor use and enjoyment.

We note on plate IV-1, Day Use Market Area, North Fork Lake, "Index to Points of Interest," the omission of Lyndon B. Johnson State Park as well as the Lyndon B. Johnson National Historic Site which is situated between Fredericksburg and Johnson City.

For ease of maintenance of the chemical toilet units in the isolated campsite areas, it would appear a practical solution to place the toilets relatively nearer the courtesy dock to facilitate pumpout into a sanitation barge.

On plate VIII-3, San Gabriel Park Sign Plan, there was a little confusion in the minds of our reviewers concerning the sign symbol for "Trailer Sanitary Station" at one of the service buildings while the Trailer Dump Station was located at the Campground Area entrance. Perhaps this was intended as a directional sign only. After all, we shouldn't "nit-pick" your plans at this preliminary Master Plan stage.

Sincerely yours,

Regional Director,
Southwest Region

DM 16, Supp 1

ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1600 PATTERSON, SUITE 1100
DALLAS, TEXAS 75201

November 26, 1973

OFFICE OF THE
REGIONAL ADMINISTRATOR

Lieutenant Colonel Charles J. Tracy
Deputy District Engineer
Fort Worth District, Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102

Dear Colonel Tracy:

We have reviewed the North Fork Lake Design Memorandum No. 16, Master Plan, as requested in your letter of November 6, 1973.

Generally, the plan adequately discusses the development and management aspects of the environmental resources at the proposed North Fork Lake facility.

In finalizing the document, we would like to call to your attention the importance of providing adequate controls for abating air, water and noise pollution during construction, maintenance and operation of North Fork Lake and its associated recreational facilities. Although sewage generated by the sanitary facilities at the lake will be biologically processed in packaged treatment plants, aerated lagoons or septic tank and lateral systems, we believe the plan would be strengthened by including more detailed information describing their proposed locations, design capacities, waste treatment efficiencies, and locations of any effluent discharge. We also look forward to reviewing the future wastewater treatment design and other pollution abatement plans in accordance with Executive Order 11507, Prevention, Control and Abatement of Air and Water Pollution at Federal Facilities.

Because of the magnitude of the proposed project and the probable development of a potentially high-density recreation area at North Fork Lake, we believe that the secondary effects on the neighboring communities might be substantial. Although the authority for enforcing zoning around the North Fork Lake recreation areas is the Williamson County Court, we suggest that you help in promoting a workable land use plan to prevent degradation of the air and water resources from uncontrolled development and over visitation. Additional consideration of this matter would also strengthen the plan.

We appreciate the opportunity to review this document and would appreciate being kept informed of future project developments.

Sincerely yours,

for Arthur W. Busch
Regional Administrator

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LIST OF PLATES (contd)

LIST OF APPENDIXES

Appendixes A through E to the North Fork master plan will be prepared and submitted in accordance with ER 1130-2-400 dated 23 May 1971.

N

SCALE: 1" = 400'

400 0 400 800

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

RECREATION DEVELOPMENT AREA BELOW THE EMBANKMENT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — DEC. 1974

TO ACCOMPANY SUPPL. NO.1 TO DESIGN MEMORANDUM NO.16 MASTER PLAN

FILE. NO. PLATE VIII-19

b. A $135,900 increase is due to the fact that the current PB-3 contains no allowance for Jim Hogg access road.

c. An extensive hiking and nature trail system has been added.

d. There is an increase in the number of picnic and camping facilities to serve the design day load.

e. Installing waterborne toilets in lieu of frame and masonry pit toilets increases cost.

f. An improved water supply and electrical system is provided to serve the new recreation facilities.

g. The overnight camping area in Jim Hogg Park is provided with individual water and electrical hookups.

h. More boat launching lanes have been added.

i. A detailed sign plan has provided a more accurate sign cost.

(4) Because construction costs have accelerated sharply in the last few months, the cost estimates (which are based on 1 July 1973 price levels, and abstracts of bids for the construction of facilities at other projects) reflects a significantly higher incremental increase in cost than is shown in the PB-3.

e. Engineering and design, and supervision and administration.- The $179,600 increase in engineering and design, and the $134,700 increase in supervision and administration are a reflection of the increase in the other project costs.

9-07. Computation of benefits.- Economic benefits resulting from the recreation visitation and the fish and wildlife aspects of the project were updated in accordance with the criteria established in Supplement No. 1, Senate Document No. 97 (87th Congress, 2d Session), "Evaluation Standards for Primary Outdoor Recreation Benefits." The benefits were computed on the basis of 427,000 recreation days for general recreation at $1.00 per recreation day, 181,200 fisherman days at $2.00 per fisherman day, and 1,800 hunter days at $3.00 per hunter day, for a total of $795,000.

f. Those areas of extensive tree cover within the project boundaries will be treated as necessary to maintain effective ground cover and to promote desirable wildlife habitat. Management will include cutting in some areas to promote browse production and possible planting to provide cover. These activities will be done by project personnel under the direction of the district forester and district biologist.

11-04. Project clearing requirements for recreation and resources development.- The features considered were requirements for shoreline stabilization, esthetics, vistas, safety, health, beach, marina development, and fish and wildlife. Clearing criteria contained in ER 415-2-1, and paragraph 5d(1) of ER 1130-2-400 for multiple purpose reservoirs cover most of the requirements. However, additional requirements were necessary as shown below.

a. Water tolerant species of trees should be left above the top of the conservation pool.

b. Trees in boat harbors should be cut close to the ground line.

c. Stumps in the beach areas should be removed.

d. Marketable timber below the normal conservation pool should be salvaged except in fish habitat areas.

11-05. Beautification.- Beautification will be considered in facility design, in relocations, and in excavation and spoil areas, and in clearing, landscaping, and planting plans. The criteria covering most of the beautification requirements are found in ER 1110-2-400, ER 1130-2-400, ER 1165-2-2, ER 1165-2-400, and 1110-2-400.

11-06. Boundary surveys and monumentation.- Because of the necessity to control encroachment on Government property, boundary lines will be surveyed and monumented as soon as possible in accordance with the provisions of ER 1120-2-400 and ER 405-1-200. Early completion of boundary monumentation is essential to control encroachments on Government property. These boundary line markers would be checked periodically by field personnel to ascertain if any changes have been made to the location of markers or boundary lines either by accident or impropriety. Boundaries and markers should be readily distinguishable at all times.

11-07. Fencing.- In order to achieve economic management and smooth administration of project lands, the boundary of the project

will be fenced. Fencing will prevent encroachment, disputes over boundary lines, trespassing by free-ranging livestock, and related damage or degradation of natural and developed resources. It also will be done to help control access to the area by funneling vehicles to established entries and roadways. This, in turn, should help prevent off-road vehicle traffic. By affecting control of people and livestock the fence will reduce administration problems and the costs associated with investigating and reporting encroachments.

11-08. Firebreak.- A firebreak will be built and maintained along the perimeter of the project. To be effective the firebreak should be located just below the ridgetop on the opposite side from the direction the fire is expected to come. Waterbars will be constructed to prevent excessive erosion on downslope firebreaks.

11-09. Entrance fees.- Section 210 of the Flood Control Act of 1968 (Public Law 90-383) prohibits the collection of entrance fees at Corps of Engineers administered projects. Under existing laws and directives it is the policy of the Corps of Engineers to charge user fees for highly developed camping areas and where special services are provided.

11-10. Special consideration of the handicapped and elderly.- As pointed out by the recent White House conference on aging, the elderly and handicapped people are indeed an important element of our population. With earlier retirements, better health care, and greater longevity, we can expect more older people to become active participants in outdoor recreation activities. Therefore, provisions for the elderly and the handicapped will be made. These special considerations will be in accordance with ER 1110-2-102, particularly in regard to site grading, sidewalks, parking areas, ramps, and toilet facilities.

11-11. Civil disturbances.- Because of the recent trend towards violent and disruptive demonstrations and other civil disturbances, the reservoir manager and his staff should be constantly aware of any signs of potential disturbance. ER 1130-2-313, SWDR 1130-2-4, and SWDR 1130-2-7 provide guidance on this subject.

green ash. The fence rows frequently contain sugar hackberry, soapberry, pecan, Mexican plum, walnut and prairie flame-leaf sumac. The existing vegetative cover is depicted on plate XIII-1.

c. Climate.- The project area is in a moderately humid region with an average annual rainfall of about 32 inches. The mean annual temperature is 68 degrees, with approximately 238 days between killing frosts.

d. Topography.- The project is located in a valley which is level to slightly rolling. The surrounding uplands are generally rugged topography which contains steeply eroded hills, tall rocky limestone bluffs and escarpments.

e. Soil types.- The principal soils of the project have developed from upland limestone parent material. The upland soils are characterized by a well-drained, shallow soil over limestone parent material. The principal soils associated with the lowlands have been collectively classified as mixed stony alluvium that is frequently flooded. Table III-1 presents soil characteristics information for each soil series. A description of the soil series found within the project boundaries is presented in paragraph 3-06.

13-05. Rare plants.- The Resources Management Section of the Texas Parks & Wildlife Department has provided a tentative list of plants which are considered to be seriously depleted and are known to occur in the San Gabriel River System, see table XIII-1. Every effort should be made to protect any known populations of rare plants. As techniques for reestablishment of rare species of plants become available, suitable areas should be dedicated for such extensions of their range.

XIII - VEGETATIVE MANAGEMENT PLAN

13-01. General.- The purpose of this section is to provide a conceptual plan for the management of the vegetative resource. The broad objectives of this proposed plan are to conserve, improve, and manage this resource for its best use and provide proper stewardship for the benefit of the general public. Specifically, this plan proposes to improve and restore project lands formerly used for agriculture purposes whicl enhancing and conserving the existing vegetative cover and wildlife habitat. This plan considers the physical characteristics of the project, vegetative management areas, and the management practices necessary to implement the plan.

13-02. Administration of the vegetative management plan.- The Fort Worth District will be responsible for administering and implementing this plan. Coordination will be maintained within the district to insure its effective accomplishments. When the project becomes operational the Operations Division will assume the primary responsibility for implementing the plan.

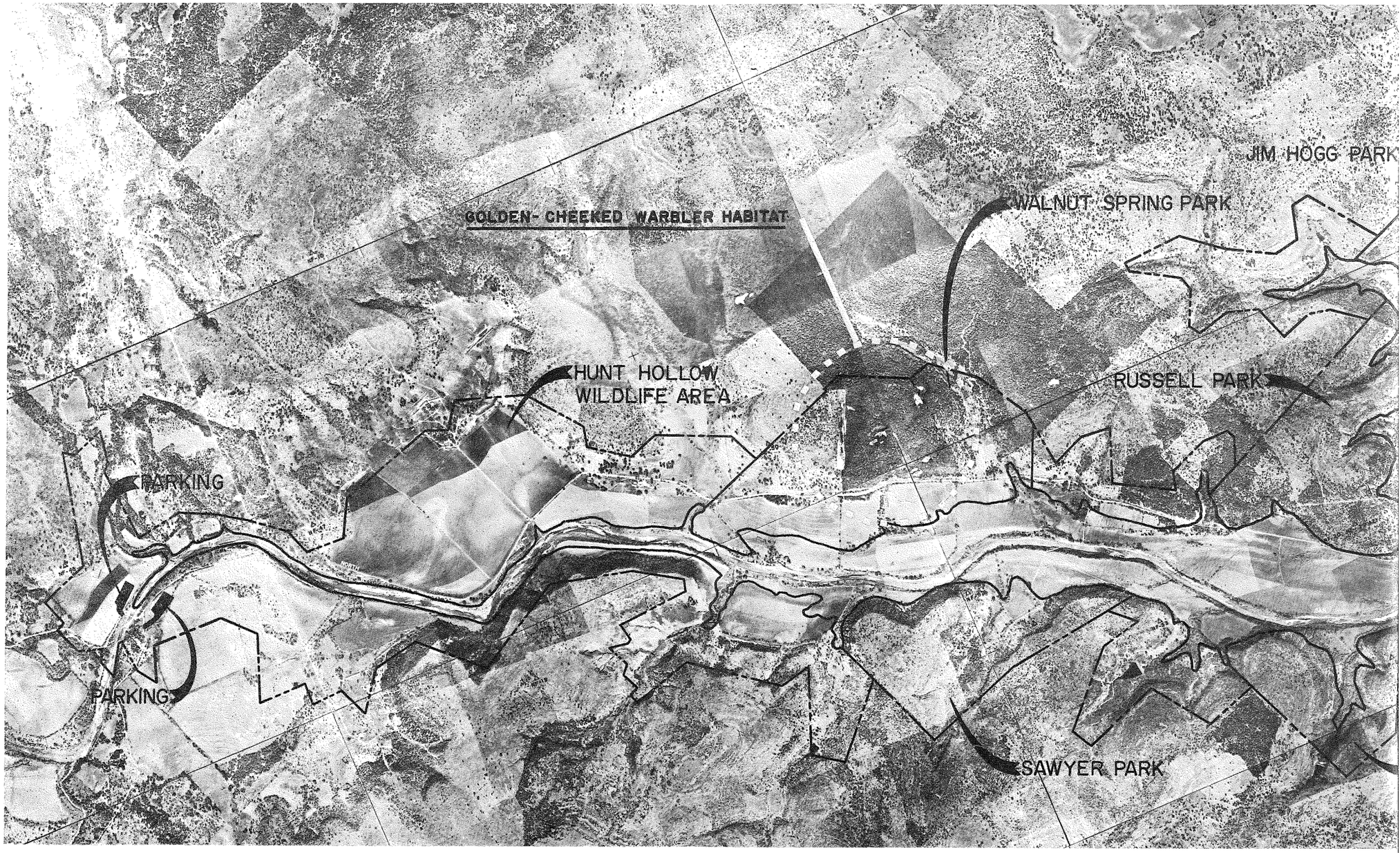
13-03. Cooperation with other agencies.- Continuous cooperation will be maintained with Federal, State or other governmental agencies having collateral interest in vegetative management to insure successful implementation of the vegetative management plan.

13-04. Physical characteristics.-

a. General.- The North Fork Lake site is located in the Grand Prairie physiographic region. The uplands are hilly and covered with thin limestone soils. The vegetation is primarily a grass understory with an oak-cedar overstory. The valleys have been cleared, where sufficiently level, and put into crops and improved pasture. A narrow band of timber, including pecan, ash, willow, and several species of oak, remains along the stream banks.

b. Existing vegetation.- The uplands in the project area are characterized by a vegetative cover ranging from dense ash juniper thickets to grass covered slopes with scattered clumps and individual specimens of live oak, Texas oak, ashe juniper, and Texas persimmon. The most common grasses are bluestem, Texas wintergrass, sideoats grama, perennial three-awn, Texas brome, and Johnsongrass. Scattered specimens of prickly-pear, yucca and devils head cactus are also found in the area.

The flood plain of the San Gabriel River contains the most diverse vegetation. The original forest area has been extensively cleared. The preponderance of woody vegetation now occurs adjacent to the stream on lands subject to frequent overflow. Woody species commonly found along the river are pecan, sycamore, willow and


GOLDEN- CHEEKED WARBLER HABITAT
JIM HOGG PARK
WALNUT SPRING PARK
HUNT HOLLOW
WILDLIFE AREA
RUSSELL PARK
PARKING
PARKING
SAWYER PARK

SCALE: 1 INCH = 2000 FEET

2000 1000 0 2000 4000

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE

SAN GABRIEL RIVER, TEXAS

VEGETATIVE COVER AREAS

U.S. ARMY ENGR. DIST., FT. WORTH DEC. 1974

TO ACCOMPANY SUPPL. NO. 1 TO D.M. NO. 16
MASTER PLAN

FILE: NO. PLATE XIII-1

IV - FACTORS INFLUENCING AND RESTRICTING RESOURCE DEVELOPMENT AND MANAGEMENT

4-01. General.- The aim of the Master Plan is to balance the development of recreation facilities and the available project resources to ensure the wise use of the project's resources in the best interest of the public. The formulation of this plan requires the determination, as far as possible, of project resources and the factors influencing and restricting their development and management. The interrelationship between the factors discussed in this chapter and the project resources discussed in chapter III are vital in determining the recreational-use potential, the developability of the project resources, the ability of the project to sustain intensive use, and the plans for their development. Although various factors may be operative in particular situations, the factors presented in this chapter seem to be operative in general and to underlie the greatest impact upon the development and management of project resources.

4-02. Day-use zone of origin.- Experience at completed lake projects in the Fort Worth District and at similar projects elsewhere suggests that the primary recreational use of these projects falls within the day-use category. The term "day-use zone of origin" refers to a 2-hour or 100-mile driving range which will allow driving to the project, participating in recreational activities, and returning home the same day. Therefore, an irregular area with a boundary approximately 100 road miles from the project was evaluated. It was determined from the evaluation that the "day-use market area" (the geographical area from which over 80 percent of the day-users originate) would be within 30 road miles of the project. Consequently, the examination of the factors influencing and restricting resource development and management was centered primarily around the project and the surrounding day-use market area.

4-03. Effect of socioeconomic factors.- Although various factors may be operative in particular situations, the five basic factors presented in this section seem to be generally operative and to underlie the large and continuing rise in outdoor recreation activities at Corps of Engineers projects.

a. Existing population characteristics.- The existing population of the day-use market area is a mixture of urban and rural populations. The present large urban populations are distributed on an outer fringe of the day-use market in Austin, Temple, and Killeen. The immediate vicinity of the proposed lake is rural with a few small scattered towns. Eighty percent or more of the day-use visitation will be from Bell, Travis, and Williamson Counties. The estimated 1970 population from these counties totals 457,304. Approximately 85 percent of the total population is found in urban areas. Since city dwellers, on the average, patronize public outdoor recreation areas far more than do rural residents, the day-use visitation

primarily will be from urban areas. The large urban areas of Austin, Temple, and Killeen, and the smaller nearby urban centers such as Georgetown, Rockdale, Taylor, and Cameron, will be the primary sources of day-use visitation. Population data for the market area are shown by county in table IV-1 and by city in table IV-2.

Table IV - 1

MARKET AREA POPULATION DATA BY COUNTIES

County	Total Population 1960	Total Population 1970	Percent Change from 1960 to 1970	Total Urban Population	Percent of Total
Bell	94,097	124,483	+32.3	105,555	84.8
Travis	212,136	295,516	+39.3	264,499	89.5
Williamson	35,044	37,305	+ 6.5	18,822	50.5
	341,277	457,304	+33.9	388,876	85.0

Table IV - 2

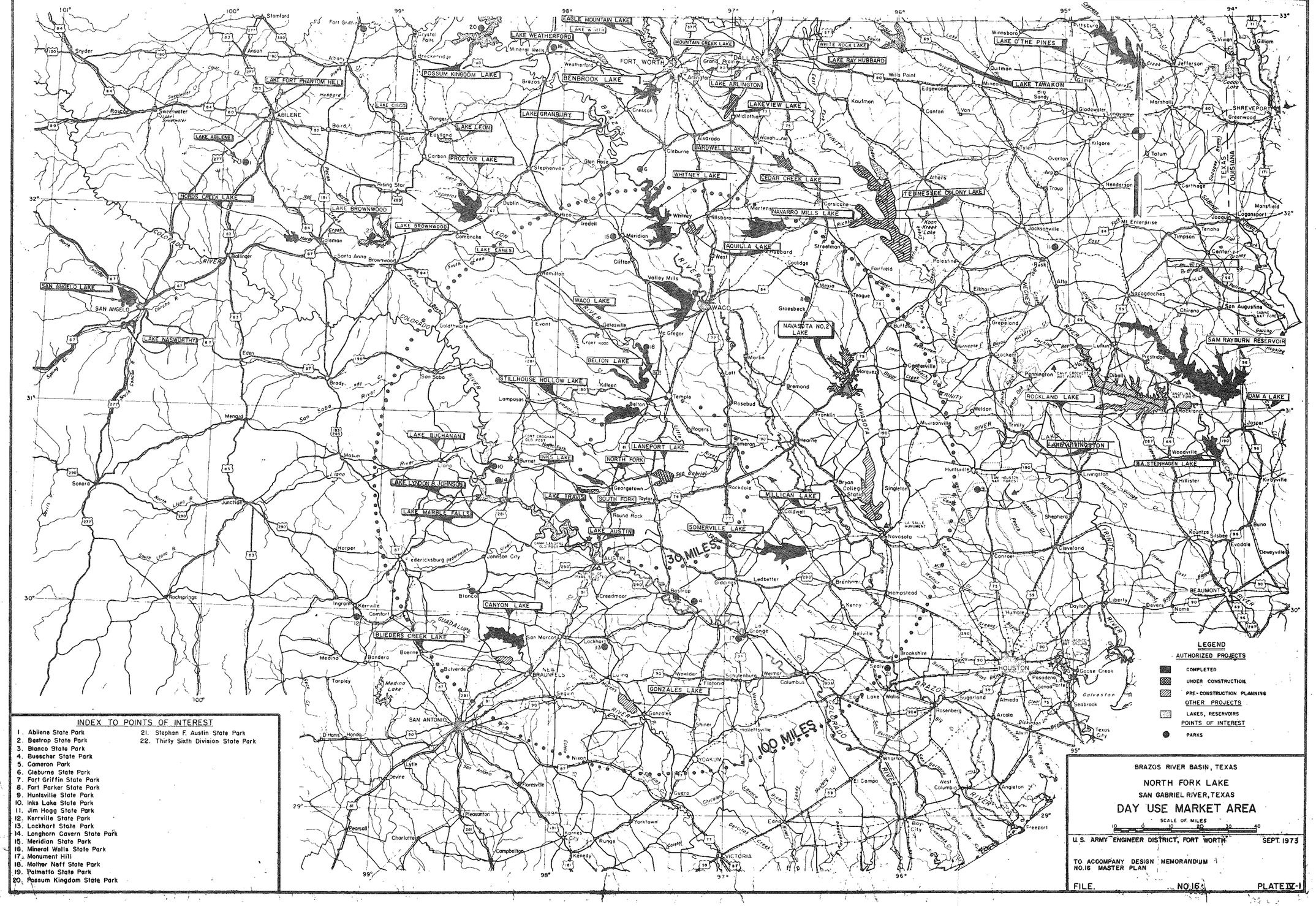
POPULATION DATA FOR CITIES IN THE MARKET AREA

City	County	Total Population 1960	Total Population 1970	Percent Change from 1960 to 1970
Austin	Travis	186,545	251,808	+35.0
Belton	Bell	8,163	8,696	+ 6.5
Georgetown	Williamson	5,218	6,395	+22.6
Killeen	Bell	23,377	35,507	+51.9
Round Rock	Williamson	1,851	2,811	+49.7
Taylor	Williamson	9,434	9,616	+ 1.9
Temple	Bell	30,419	33,431	+ 9.9

b. Projected population characteristics.- The estimated population of the three counties composing the day-use market area has increased from 341,277 in 1960 to 457,304 in 1970. During this 10-year period, the population of the day-use market area has increased over 33 percent. The greatest increase in population has occurred in Bell and Travis Counties (table IV-1). This rapid increase in population has been due primarily to the rapid growth of the large urban centers of Austin, Temple, and Killeen. Population growth in the day-use market area is expected to make notable gains in the future. The greatest increases are expected to occur in the large metropolitan areas, and the slowest growth is expected in the rural portion of the day-use market area. The present and predicted population growth of the market area is likely to result in increased demand for outdoor recreation.

CORPS OF ENGINEERS

U. S. ARMY



INDEX TO POINTS OF INTEREST

1. Abilene State Park
2. Bastrop State Park
3. Blanco State Park
4. Buescher State Park
5. Cameron Park
6. Cleburne State Park
7. Fort Griffin State Park
8. Fort Parker State Park
9. Huntsville State Park
10. Inks Lake State Park
11. Jim Hogg State Park
12. Kerrville State Park
13. Lockhart State Park
14. Longhorn Cavern State Park
15. Meridian State Park
16. Mineral Wells State Park
17. Monument Hill
18. Mother Neff State Park
19. Palmetto State Park
20. Possum Kingdom State Park
21. Stephen F. Austin State Park
22. Thirty Sixth Division State Park

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE

SAN GABRIEL RIVER, TEXAS

DAY USE MARKET AREA

SCALE OF MILES

10 0 10 20 30 40

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO.16 MASTER PLAN

FILE. NO 16 PLATE IV-1

c. Urban-rural relationship.- Since the 1940's the general trend has been movement away from the rural areas to the metropolitan areas. This trend has been evident in the day-use market area. It is expected to continue, but at a slower rate. Major changes have also taken place within the urban centers in the day-use market area. Because of increased income, racial problems, and other sociological elements, the general population of the large urban centers has migrated from the centers of cities to suburban areas. The net result of this trend has been a large radial expansion and encroachment upon adjacent rural areas. This trend is expected to continue until a large megalopolis consisting of Dallas, Fort Worth, Temple, Austin, and San Antonio is created.

d. Real income per capita.- The 1971 per capita income for the day-use market area varied from a low of $2,310 in Williamson County to a high of $3,377 in Travis County. The per capita income has steadily increased over the years and is expected to increase at a much more rapid rate in the future. An average projected per capita income for the counties composing the day-use market area is shown in table IV-3.

Table IV - 3

PROJECTED PER CAPITA INCOMES

1980	1990	2000	2010	2020
$3,371	$4,505	$6,133	$8,232	$10,942

Source: Economic Activity in the United States by Water Resources Regions and Subareas, Historical and Projected 1929-2020, Volume 3, United States Water Resources Council, Washington, D.C.

Along with changes in average incomes, there are shifts in the distribution of income which make it economically possible for more people to engage in different kinds of outdoor activities. Table IV-4 shows the 1971 distribution of income by counties in the day-use market area. It should be noted that Travis and Bell Counties have a high percentage of households with higher incomes. This is primarily the result of the large metropolitan centers located in these counties.

Table IV - 4

PERCENTAGE OF HOUSEHOLDS BY CASH INCOME GROUPS

Income Group	Bell	Travis	Williamson
0 - $3,000	19.8	17.3	31.9
$3,000 - $5,000	15.4	13.9	19.0
$5,000 - $8,000	29.7	21.9	21.9
$8,000 - $10,000	12.2	12.9	10.1
$10,000 - $15,000	14.4	19.5	11.1
$15,000 - up	8.5	14.5	6.0

Williamson County reflects the traditional agrarian economy, with a high percentage of the households having low incomes. As the day-use area becomes more urbanized, the household incomes will increase in direct proportion to the urbanization rate. As a result, a greater proportion of this higher income will be discretionary, with a larger proportion being available for outdoor recreation than is true today.

e. Leisure time.- The average workweek of the day-use market area has declined considerably in the past 70 years. In 1900, the average workweek was about 60 hours. Today the workweek has declined to about 40 hours. The net result has been increased leisure time. Although it is anticipated that there will be continued gradual decline in the average workweek, leisure time will be most significantly changed by the recent trend to shift to a 4-day workweek and later to a possible 3-day workweek. This trend is expected to occur during the life of the project. With a larger amount of leisure time available each week, it is expected that an increased amount of participation in recreation will occur, and travel to recreation areas beyond the typical day-use market area should increase significantly.

4-04. Need for project recreation.- Determination of recreation needs is based on the demand and supply characteristics of the counties that comprise the day-use market area. Need arises when the demand for recreational opportunities exceeds the supply of recreational opportunities. The "State Comprehensive Outdoor Recreation Plan" (SCORP) recognized that in the region in which North Fork Lake is located there are deficiencies in facilities for many activities which relate to water based recreation. Activities mentioned in SCORP include fishing, boating, water skiing, swimming, camping, and picnicking. The need for water based recreation opportunities has been shown, but the demands will not be met completely by this project.

4-05. Interstate demand.- Visitation from other States is expected to be minimal due to the project's location. With Interstate Highway 35 passing relatively near North Fork Lake, there will be the potential for visitation by transient campers. The lake will be a possible stopover point for visitors traveling to Austin from the north or to Temple from the south.

4-06. Accessibility.-

a. Roads.- Interstate Highway 35 east of the lake is the major regional route and connecting link between the Dallas-Fort Worth-Waco, Temple-Austin, and San Antonio areas. U.S. Highway 183 crosses the upstream portion of the lake at the western end of the impoundment. Access to the northern portion of the lake will be provided by Farm to Market Road 2338. State Highway 29 parallels the lake to the south. Several planned new and relocated roads will provide

direct access to the project (plate VIII-1). Access is not considered to be a problem.

b. Railroads.- The lake area is served by the Southern Pacific, Texas and Pacific, Missouri Pacific, Missouri-Kansas-Texas, and Georgetown Railroads. The nearest railhead is located at Granger, Texas.

c. Air.- There are no commercial air transportation companies serving the lake area. The nearest airport facilities are at Georgetown, Texas. The closest airports capable of handling commercial air transportation are located in Austin and Temple, Texas.

4-07. Existing and prospective alternative water-oriented recreation resources.- Because of the difficulty in determining the amount of all types of recreation alternatives and the degree to which each type constitutes a different recreation commodity, alternative recreation opportunities considered were primarily restricted to water-oriented outdoor recreation opportunities. Fortunately, the per capita use rate curve determination reflects the existing and prospective alternative water-oriented recreation opportunities available to the market area. A list of the major lakes in the market area is presented in table IV-5.

4-08. Developability of the project lands.-

a. Soil use and limitations.- Soils above the recreation pool elevation within the project boundary lend themselves to a variety of uses. Certain project soils are characterized by an inability to endure specific uses. However, these slight to severe limitations have been identified and considered in the land-use planning and management; they should not materially restrict the developability of the project.

b. Topography.- The project is characterized by generally rugged topography; it contains steeply eroded hills, tall rocky bluffs, spurs, knobs, and escarpments. In spite of the generally rugged topography and the steep shoreline that predominate throughout the project, suitable locations are available and adaptable for a variety of activities and associated development.

4-09. Pool fluctuation.- The expected pool fluctuations are not expected to be unusually high or low for this project. Due to the steep canyon and rugged terrain of the project, fluctuating water levels may cause a slight discoloration of the exposed rock bluffs. However, these factors should not have a major impact upon the recreation visitation.

Table IV - 5

MAJOR LAKES IN THE MARKET AREA

Name	County	Administering Agency	Project Purpose	Surface Acres
Belton Lake	Bell, Coryell	USAE	M-FC-IN IR-R-MI	12,300
Laneport Lake (Under construction)	Williamson	USAE	FC-C-R	4,400
South Fork Lake (Authorized)	Williamson	USAE	FC-C-R	1,160
Stillhouse Hollow Lake	Bell	USAE	M-IN-IR-FC R-MI	6,430
Somerville Lake	Lee, Burleson, Washington	USAE	M-IN-IR-FC R-MI	11,460
Tennessee Colony (Authorized)		USAE	FC-C-R	97,960
Lake Travis	Burnet, Travis	Lower Colorado River Authority	M-IN-IR-MI P-FC-R	18,930
Lake Austin	Travis	"	M-IN-P	1,830
Lake Bastrop	Bastrop	"	IN	906
Lake Marble Falls	Burnet	"	P	780
Lake Buchanan	Burnet, Llano, San Saba	"	M-IR-MI-P	23,060
Lake Lyndon B. Johnson	Burnet, Llano	"	P	6,375
Lake Waco	McLennan	USAE	M-FC-C-R MI	7,270
Tradinghouse Creek Lake	McLennan	Texas Power and Light	N	2,010

Legend:
C - Conservation
FC - Flood Control
R - Recreation
P - Power
M - Municipal
IR - Irrigation
IN - Industrial
MI - Mining, including oil production

4-10. Water quality and stratification.- Water in the lake will be of good quality for recreation, municipal, and industrial uses. As a fishery resource, it will rate only fair to moderate because of the fertility level. Moderate to strong thermal stratification is expected to develop during May, June, July, August, September, and October. Due to the clarity of the water, stratification is expected to be beneficial to the fishery resource because improved production of fish and food organisms could take place near or at the thermocline.

4-11. Water quality of tailwater region.- The water quality of the San Gabriel River below the damsite will be determined basically by the quality of the water in the pool and in the headwaters above the damsite. It is expected that the turbidity level of the tailwater region will increase significantly at times during the construction phase of the damsite. During periods of flooding, the water quality is predicted to be reduced in quality.

4-12. Drinking water standards.- The water of the San Gabriel River and its tributaries throughout the area studied meets the minimum chemical requirements for drinking water standards of the U.S. Public Health Service. Additionally, the waters of the San Gabriel River are classified as having medium salinity hazard and low sodium hazard according to standards set by the U.S. Salinity Laboratory staff. The water would, therefore, be satisfactory for irrigation.

V - OUTDOOR RECREATION ATTENDANCE AND FACILITIES

5-01. General.- The methodology used for predicting recreation attendance follows the instructions presented in ER 1120-2-403, dated 26 March 1970. In essence, the recreation prediction procedure utilizes the "similar project" concept. This technique involves using recreation use and attendance information from similar existing projects to project attendance at a proposed project.

5-02. Day-use market area evaluation.-

a. Projected population of the day-use market area.- The population within the day-use market area (the geographic area within 30 road miles of the project) was projected from the base year 1980 through the year 2020. These projections were based on the current Series C population projections. A summary of the current projected populations by decade for the years 1980 through 2020 are shown in table V-1.

Table V-1

PROJECTED POPULATION IN THE MARKET AREA
(Series C projections)

Decade	Population
1980	360,168
1990	422,261
2000	486,680
2010	559,115
2020	636,674

b. Selection of initial per capita use rate.- In order to minimize the chance of an erroneous attendance based on a unique situation, recreation use data from similar projects were pooled to derive a per capita use curve. The selection of an initial per capita use rate curve for this project was made by adjusting and revising the per capita use curve to more nearly fit the prospective project. From the initial per capita use curve, a per capita use rate was found for each zone of influence (table V-2).

Table V - 2

PER CAPITA USE RATES FOR DAY-USE MARKET AREA

Zone*	Per capita use rates
I	7.9
II	2.1
III	1.0

*Zones I through III are each 10 road miles wide; they comprise the day-use market area.

c. Estimating total initial recreation attendance.- After the per capita use rates were found for each zone of influence, the per capita use rates for each county in each zone were determined. The principal city of each county was used as a proxy for the population centroid of the county. The road-mile distance from the centroid to the project was then calculated. The per capita rate multiplied by the county population gives the expected recreation attendance from that county. This process is repeated for all counties within the market area, and the sum of these figures gives the initial recreation (day-use) for the base year 1980 from within the market area. The market area is defined as the area providing 80 percent or more of the total day-use; however, it has been found that the attendance from within the market area will constitute about 90 percent of the total recreation attendance, with 10 percent originating from outside the market area. From the project survey data, overnight use is estimated to be 14 percent of the total use. The total initial recreation attendance (base year 1980) has been estimated to be 610,000 recreation days.

d. Projection of potential recreation attendance.- An important part of the recreation analysis of the proposed project is the estimation of potential future recreation use. Although there are many factors that may affect future recreation attendance projections, there are essentially two basic items to be considered: (1) anticipated increase in future per capita use rates, and (2) population projections. Because present recreation participation rates on existing projects are increasing and are predicted to continue increasing, the initial per capita use rate must be adjusted to reflect the anticipated increase in per capita rates by decade. The initial per capita rates were adjusted by the factors presented in table V-3.

Table V - 3

ADJUSTMENT FACTORS FOR PER CAPITA USE RATES

1980	1990	2000	2010	2020
1.00	1.17	1.33	1.48	1.62

Then the adjusted per capita use rates were applied to the population projections to arrive at the projected recreation attendance. The total projected recreation attendance by decade is shown in table V-4.

Table V - 4

PROJECTED RECREATION ATTENDANCE

1980	1990	2000	2010	2020
610,000	773,000	970,000	1,197,000	1,448,000

5-03. Optimum capacity.- Optimum capacity is defined as the maximum number of visitors that an area can support through the critical summer use period without deterioration of the natural and recreational resources. A combination of related aspects which concern the ability of the project resources to sustain intense use were studied to determine this capacity. The optimum capacity is estimated to be 610,000 annual recreation days. This figure is a reflection of the aspects of size, location, sustained ecological balance, and other characteristics of the project. The initial recreation attendance in the year 1980 is predicted to be equal to the optimum capacity. It must be recognized that the optimum capacity reflects only the ability of the project to meet projected actual use and not the potential demand. The project will meet only a portion of the demand; however, it will not satisfy the demand within the market area.

5-04. Recreational facilities analysis.- The recreation facilities analysis in table V-6 was used to determine the recreation facilities required to support the initial and optimum recreation attendance demands. The recreation demands were broken into activities such as camping, picnicking, swimming, and boating. A summary of the estimated facility requirements for the base year (1980), and the optimum development is presented in table V-5.

Table V - 5

FACILITIES REQUIRED TO SUPPORT THE ANTICIPATED AVERAGE SUMMER WEEKEND VISITATION

Facility	1980	Optimum Development
Picnic units	120*	120
Camping units	218	218
Boat ramps	12	12
Beach acreage	0.9	0.9

*The recreation facilities for initial visitation and for optimum visitation are the same.

5-05. Supporting recreation facilities.- Supporting facilities such as sanitary facilities, trash receptacles, and change shelters will be determined through an analysis of the needs of each recreation layout. The design criteria presented in EM 1110-2-400 as well as the guidelines presented in chapter X will serve as guidelines in planning for these facilities.

Table V - 6

RECREATION FACILITIES ANALYSIS - INITIAL AND OPTIMUM ATTENDANCE

Design load computations: 7,800 design day load

Project: North Fork Lake

Total annual attendance: 610,000

Design day load:

Total annual attendance	610,000
Percentage of visits during summer months (51%)	x .51
	311,100
Percentage of visits on weekends (65%)	x .65
Total number of weekend users	202,215
Number of weekend days	÷ .26
Design day load	7,800

Picnicking:

Design day load	7,800
Percentage of visitors who are picnickers (23%)	x .23
Number of picnickers	1,794
Percentage of picnickers requiring facilities (40%)	x .40
Number of picnickers requiring facilities	717
Turnover rate (2)	÷ 2
	358
Load factor (3)	÷ 3
Picnic units required	120

Camping:

Design day load	7,800
Percentage of visitors who are campers (14%)	x .14
Number of campers	1,092
Load factor (5)	÷ 5
Camping units required	218

Boat ramps:

Design day load	7,800
Load factor (3)	÷ 3
Number of vehicles	2,680
Percentage of vehicles with boats (23%)	x 23
Number of boats	616
Number of launchings per day (50)	÷ 50
Boat launching ramps required	12

Table V - 6 (continued)

Beaches:

Design day load	7,800
Percentage of visitors who are swimmers (26%)	x 26
Number of swimmers	2,028
Percentage of swimmers on beach (60%)	x .60
Number of beach users	1,217
Turnover rate (3)	÷ 3
Number of users on beach at any one time	406
Number of square feet of beach per person (50)	x 50
Square feet of land area required for sand beach	20,300
	(.45 acre)

Number of swimmers	2,208
Percentage of swimmers in water (30%)	x 30
Number of swimmers in water	608
Turnover rate (3)	÷ 3
Number of swimmers in the water at any one time	203
Number of square feet of water surface per user (100)	x 100
Square feet of water surface required per swimmer	20,300
	(.45 acre)

Number of swimmers	2,208
Percentage of swimmers needing no additional land (10%)	x .10
Number of swimmers needing no additional land	130

VI - COORDINATION WITH OTHER AGENCIES

6-01. General.- Detailed guidance on coordination is given in EM 1120-2-101, ER 1120-2-401, and ER 1120-2-404. Pursuant to this guidance, Federal, State, and local governmental agencies were contacted during the preliminary master planning stages, and the plan has been coordinated with their desires. In accordance with ER 1165-2-400, this master plan is being submitted to other Federal, State, and local governmental agencies for review and comment. In addition, continuous cooperation will be maintained with all governmental agencies having collateral interest in the project during all stages of project planning, development, and operation.

6-02. Public hearing.- Public hearings were held during March 1968. The purposes of these hearings were to inform the public of the proposed development plans and to provide an opportunity for all interested persons to express their views concerning the San Gabriel River project.

6-03. Recreation.- Planning for recreational development was designed to be consistent with the Texas Parks and Wildlife Department Comprehensive Outdoor Recreation Plans and the Bureau of Outdoor Recreation survey and recreation trends. The needs of the handicapped have been considered in the design of recreation sites, areas, and facilities. Liaison will be maintained with the State Department of Mental Health and Mental Retardation and the Texas Education Agency to insure that the needs of the handicapped are met wherever possible.

6-04. Fish and wildlife.- The planning for the fish and wildlife features was coordinated with the Bureau of Sport Fisheries and Wildlife and the Texas Parks and Wildlife Department. Both expressed their desire to cooperate and assist in managing the resources. Their recommendations have been incorporated into the plan.

6-05. Vegetative cover.- The vegetative development and management program will be designed in accordance with the Memorandum of Understanding, 27 March 1963, between the Secretaries of the Department of Defense and the Department of Agriculture for the conservation of forests, vegetative cover, soil, and water on lands administered by the Department of Defense.

6-06. Soils.- The coordination of the soils management program will be the same as that for vegetative cover. The planning for protection, development, and management of soil resources and their effects upon recreational development and construction was coordinated with the Soil Conservation Service. Their survey data and guidance were utilized in developing the plan.

6-07. Archeological and historical.- Planning for development and protection of archeological resources and the effects of recreation development and construction on these resources was coordinated with the National Park Service. Development of historical resources will be accomplished by initiating a historical research program conducted by competent historians. The program will be coordinated with State universities and State historical commissions and societies.

6-08. Health and sanitation.- In June 1965, the U.S. Public Health Service submitted a water supply and quality study on the Navasota River Watershed, Lower Brazos River System, Texas. This study includes the entire lower Brazos River; therefore, it includes the San Gabriel River projects. A copy of this report was incorporated in appendix B, Supplement No. 1, Design Memorandum No. 4. The establishment of a malaria control survey, the testing of potable water, a beach sanitation and sewage disposal system, and the maintenance of health and sanitation standards at the project will be coordinated with the public health agencies.

VII - LAND AND WATER USE PLAN OF DEVELOPMENT

7-01. General.- The basic concept behind the land and water use plan of development is the integration of authorized uses of the project land and water areas into a balanced development plan for the best use of all project resources in the best interest of the public throughout the life of the project. The intent is to present a plan of development which is flexible enough to meet the present and future needs of the project in consonance with the land capabilities and the esthetics of the project. The objectives of this plan are to: (1) present a complete zoning and land use allocation plan which offers specific recommendations for the ultimate use and possible interim use to which all land and water should be dedicated; (2) to serve as a resource management guide for the comprehensive use of all project land and water areas through planned use of designated areas; and (3) to present the concept and objectives for the management of all project resources.

7-02. Land use allocation plan.- ER 1120-2-400 requires all lands at civil works water resource projects to be designated for a specific purpose in accordance with a land use allocation plan. The basic objective of the land use allocation plan is to provide stewardship of the project lands and its resources through prudent land use designation and management. Project lands were allocated for specific purposes only after considerable research was conducted to determine their highest and best use. It has been necessary to allocate certain lands for both interim and ultimate use. Land areas will be marked according to designated use as indicated on the land use allocation map with appropriate signs wherever necessary for proper land managment and administration. Table VII-1 presents a summary of the land use acreages. The land use allocation plan showing various designated land uses is present in plate VII-1. Descriptions of each of the allocated land areas follow:

a. Project operations.- Lands were acquired and allocated to provide for safe, efficient project operation for those authorized purposes other than recreation, and fish and wildlife. Agricultural use of these lands will be permitted only on an interim basis when not in conflict with the designated use.

b. Operations: recreation intensive use.- Lands acquired for project operations were allocated for ultimate use as developed public use areas for intensive recreational activities by the visiting public, including areas for concessions and quasi-public development. Fishing will be permitted except in restricted areas such as beach areas. No agricultural uses are permitted on these lands except on an interim basis for maintenance of open space and scenic values.

Table VII - 1

LAND USE ACREAGE
NORTH FORK LAKE

Land Use Allocation	Acres
Project Operations	148
Operations: Recreation Intensive Use	675
Operations: Recreation Low-Density Use	1,616
Operations: Wildlife Management Hunt Hollow Wildlife Area	1,272
Recreation Lands	375
Other Land Uses	
Conservation Pool	1,310
Total Fee	5,396
Total Flowage Easement	650
TOTAL	6,046

*The total acreage is in accordance with the project cost estimate PB-3 effective date 1 July 1973.

c. Operations: recreation low-density use.- This land was acquired for project operational needs and is allocated for multiple low-density recreation activities. Since Walnut Springs, Cedar Hollow, and Sawyers parks are well suited for primitive camping, nature study, and hiking trails, they have been included in this category. This allocation also applies to several tracts of land between the conservation pool and the project boundary. No agricultural uses are permitted on this land.

d. Operations: wildlife management.- The wildlife area designated on the land allocation map is project operation land which has been set aside to provide, through proper management, suitable habitat for the propagation and preservation of native species of wildlife. Such land should be continuously available for low-density recreation activities. Agricultural uses may be used as a management tool on an interim basis.

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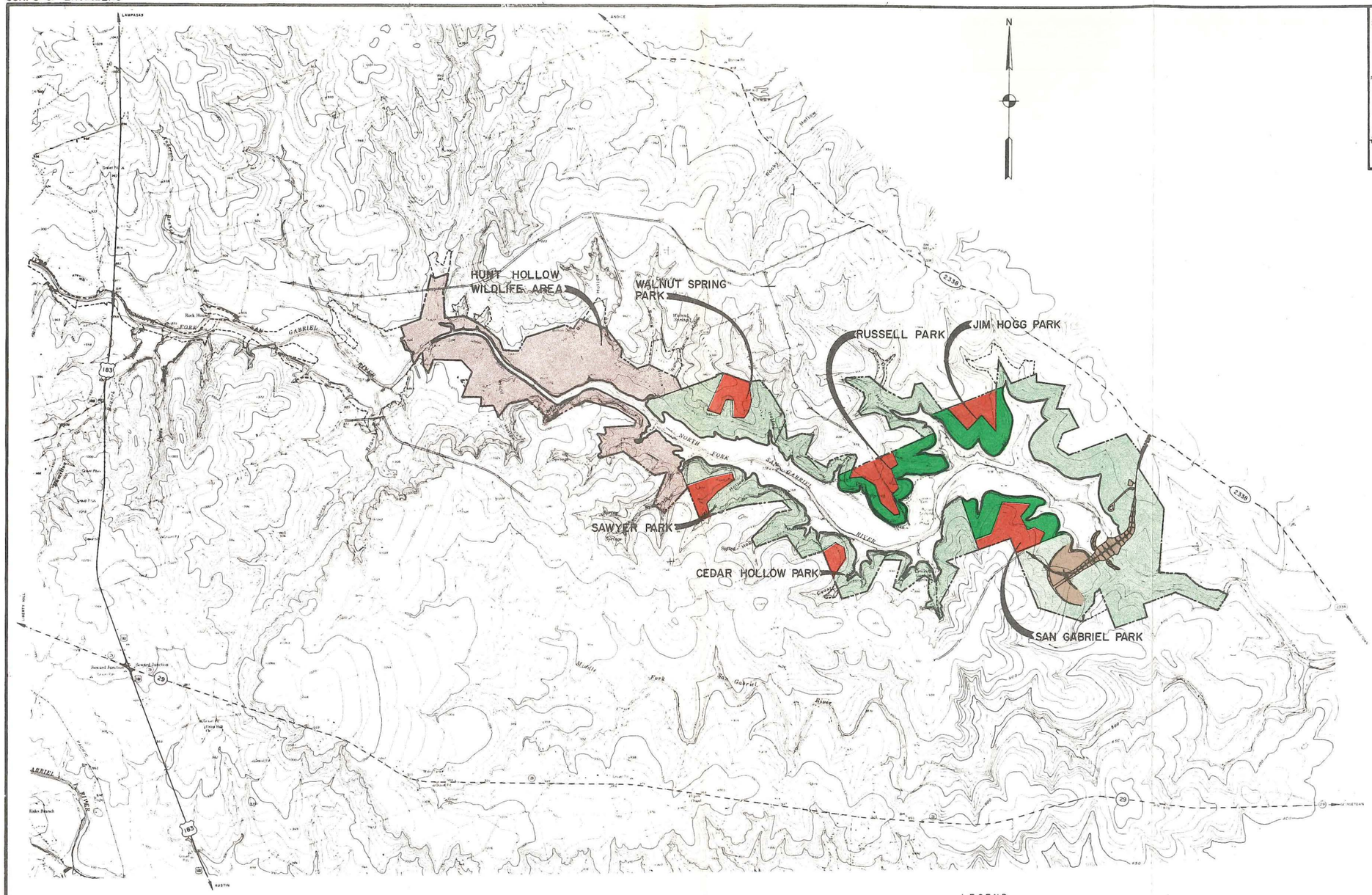

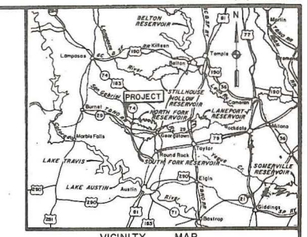

VICINITY MAP
SCALE OF MILES
10 0 10 20

N

LEGEND

APPROXIMATE LIMITS OF FEE ACQUISITION

APPROXIMATE LIMITS OF FLOWAGE EASEMENT ACQUISITION

PROJECT OPERATIONS

OPERATIONS: RECREATION - INTENSIVE USE

OPERATIONS: RECREATION - LOW DENSITY USE

OPERATIONS: WILDLIFE MANAGEMENT

RECREATION LANDS

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

LAND USE ALLOCATION PLAN

SCALE IN FEET
2000 0 2000 4000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VII-1

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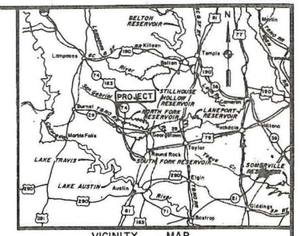
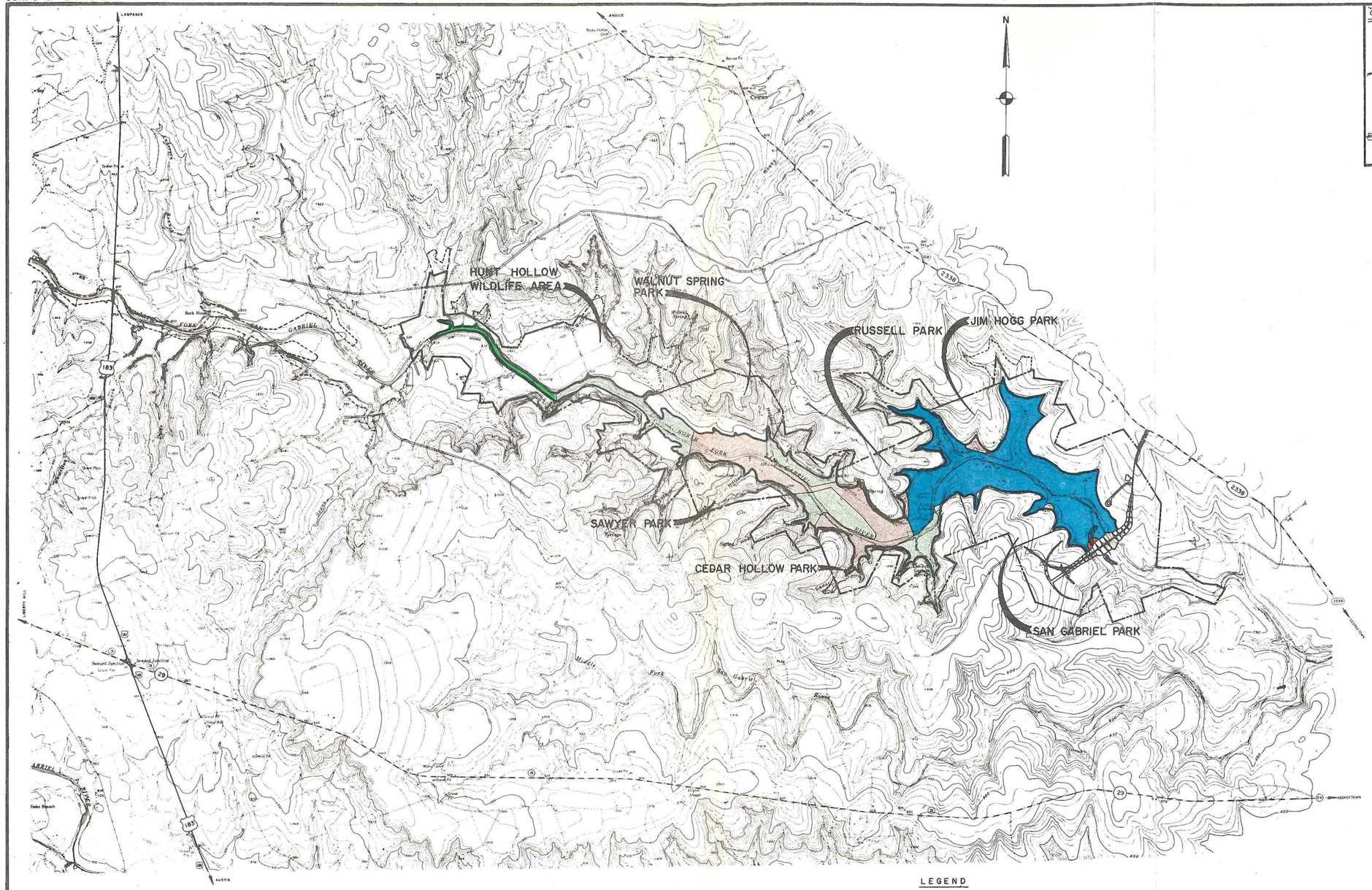


VICINITY MAP
SCALE OF MILES
0 5 5 10



LEGEND

APPROXIMATE LIMITS OF FEE ACQUISITION

APPROXIMATE LIMITS OF FLOWAGE EASEMENT ACQUISITION

SKIING AND HIGH SPEED BOATING AREA

SHALLOW AREAS

UNCLEARED AREAS

LOW SPEED BOATING AREAS

RESTRICTED AREAS

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

WATER USE PLAN

SCALE IN FEET
2000 0 2000 4000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 · PLATE VII-2

e. Recreation land.- This land was acquired for recreation purposes and allocated to multiple purpose recreation use. No agricultural uses are permitted on this land except on an interim basis on terrain adaptable for maintenance of open space and scenic values.

7-03. Water use plan.- Water areas are planned to minimize safety hazards while allowing maximum utilization of all the water areas available. These areas will be marked with buoys according to corresponding uses, restrictions, and rules as indicated on the water use planning plate. The water use map is shown on plate VII-2. A description of these areas is presented below.

a. Swimming area.- All authorized swimming areas will be identified by project signs and buoys. Only swimming and related activities are to be allowed in these areas. No boating or fishing will be permitted. The beach at Russell Park has been designated as a swimming area.

b. Water skiing and high-speed boating areas.- Only cleared areas having sufficiently deep water and the necessary space will be designated and managed as a water skiing and high-speed boating area. The water area between Russell Park and the embankment has been designated for this activity (plate VII-2). No effort will be made to restrict this area from other boating activities; however, appropriately marked signs and buoys will be placed to properly identify the area.

c. Low-speed boating area.- Except for the uncleared and shallow areas the water area from Russell Park through Hunt Hollow wildlife area has been designated for low-speed boating. Low-speed boating areas will also include areas in proximity to beaches, boat docks and ramps. Skiing will be prohibited in these areas.

d. Uncleared areas.- Uncleared (timbered) areas exist where surface and subsurface debris create a hazard to any type of boating activity. No effort will be made to restrict these areas from public use; however, they will be marked to alert the public.

e. Shallow areas.- Areas that are intermittent with shallow and deep water will be managed as shallow water areas in the interests of public safety. Floats advising the public of these areas will be maintained at the entrance or perimeter of the areas, as conditions warrant.

f. Restricted areas.- To insure visitor safety, the water area within 300 radial feet of the outlet and intake structures will be restricted from public use. Project personnel will classify any additional areas requiring extra safety restrictions. Buoys will be installed to indicate restricted areas.

7-04. Collateral and interim use.-

a. Grazing leases.- This plan proposes to make grazing leases available to the project manager as an alternative management tool. Grazing or other agricultural use of project land will be used as interim or corollary measures to maximize land productivity, or to maintain open space consistent with the authorized purposes. Any land leased for grazing will be subject to free public hunting and fishing.

b. Nonprofit groups and private clubs.- The recreational needs of nonprofit groups and private clubs will be accommodated on a nonexclusive, first-come-first-served, or short-term reservation basis. There is one group-use area in Russell Park which has been planned as a primitive camping or picnic area with limited facilities. Groups requiring additional recreation facilities will be assigned to a specific location within the intensive-use recreation areas.

c. Easements.- All outgrants, including easements for roads and utility lines, will be processed on an individual basis. The policy of attempting to have private roads and utility lines located on non-Government land will be adhered to as much as possible. Lands will be acquired in flowage easement to allow for possible inundation, and no buildings for human habitation will be constructed on these lands. The written consent of the District Engineer or his authorized representative shall be obtained for the type and location of any structure and for appurtenances thereto now existing or to be erected or constructed on flowage easement lands.

7-05. Hunting restrictions.- Shotgun hunting in accordance with State laws and regulations will be permitted for all game species on all land and water areas except those in developed parks and in other posted areas. Waterfowl hunting will be permitted from registered water blinds, temporary land based blinds, or by jump-shooting. Duck hunting could be safely permitted in most areas between the November and January dates usually set for the Texas season. Due to the lack of public access on private lands, hunting for

quail and other small game in season could be safely conducted in undeveloped parks and special use areas as noted on the land use map. All hunting must conform to Title 36 and the amendment to the Fort Worth District Regulation 1130-2-100, dated 3 November 1971.

7-06. Fishing.- Fishing in accordance with State laws and regulations will be permitted for all fish species on all water areas except in swimming areas and other restricted use areas shown on the water use map.

7-07. Management of environmental and recreational resources.-

a. General.- The concept underlying the management of project resources is to conserve, improve, and manage the resources for their best use and proper stewardship for the benefit of the general public. The intent of this section is to present the objectives for management of each project resource. It will serve as a guide until a more detailed resource plan can be developed. These objectives will be met by employing the most modern resource management techniques available. This will include but not be limited to controlling soil erosion, enhancing the vegetative cover for erosion control, providing wildlife habitat, increasing forage production, and providing for high quality public use. Specific management plans for the various resources will be developed by the project office following an on-site survey; they will be submitted as an appendix to the master plan.

b. Archeological and historical.- The objective of an archeological and historical management program is to salvage and preserve the archeological and historical resources associated with the project. During the development of the program, the Corps of Engineers will seek cooperation from the National Park Service, State universities, and State and county historical societies and commissions. In addition, the Corps of Engineers will exert every effort to develop an archeological and historical program agreeable to all cooperating agencies so that the maximum benefits can be obtained.

c. Scenic.- In developing the scenic resources, the purpose is to provide sensory pleasure to the majority of the visitors. Since a water resource project of this type greatly modifies the environment the primary objective will be to minimize the impact of the the project on the environment by protecting existing resources. In addition, a landscaping and beautification program will be initiated to harmonize facility development with its environs; it will be designed to emulate as far as practical the esthetically pleasing "natural" environment presently existing within the project area.

d. Soils.- The primary objectives in developing a soil resources management program will be conservation, improvement, and enhancement. Improvement and development of the soil resources will be accomplished by controlling erosion on graded and disturbed areas, stabilizing gullies, and establishing and maintaining desirable vegetative cover.

e. Vegetation.- The basic objective of a vegetative management program is to provide stewardship of the land and resources through protection, improvement, and management of vegetative cover. This will be accomplished by planting, maintaining, and improving desirable trees and grasses. During the early stages of development of the project, cultivated crops will be replaced with desirable trees and grasses. It is essential that the revegetation and tree planting program be initiated as soon as practicable to prevent further deterioration of the resources. During clearing operations, esthetically desirable and water tolerant trees at the 791.0 contour will be left. These trees will be selected by district personnel to remain after clearing. Areas above the upper clearing contour containing adequate tree and grass cover will not be disturbed.

f. Fisheries.- A fisheries management program will be provided for the purpose of conservation of species and derivation of maximum benefit from the fisheries resources. In managing the fisheries resources, the primary objective will be to increase the quality and quantity of the desirable game fish population. Such a program includes but is not limited to methods of controlling rough fish populations, stocking game fish, and buoying known areas of fish concentration points to facilitate their harvest by anglers. Although the responsibility of the fisheries resource is essentially that of the Texas Park and Wildlife Department, the Corps of Engineers will supply all possible aid and assistance to insure an adequate fisheries program.

g. Wildlife.- In order to obtain the greatest benefit from the wildlife resources, a scientifically based wildlife management program will be provided. The fundamental objective in managing this resource will be to attract the greatest variety of wildlife species and to maintain game populations consistent with the carrying capacity. This objective can be accomplished by providing plants which will supply both food and cover and create an edge effect. Controlled grazing will be used as a management tool and artificial aids such as nest boxes or platforms will be used when necessary. Every effort will be employed to protect endangered wildlife species. The wildlife areas of this project do not meet the Texas Parks and Wildlife Department criteria for a State managed wildlife area.

h. Water.- The ultimate objective of managing the water resources will be to maintain the highest water quality possible. This

can be accomplished by coordinating water management with the other resources management programs to prevent soil erosion, contamination by pollutants, and other factors influencing water quality. In addition, an appropriate water level regulation program will be necessary to optimize the multiple-use concept of this project. This program must be flexible enough to handle the assigned water storage and flood control responsibilities and still provide a water resource that will accentuate the other multiple-uses associated with the project.

7-08. Turfing and landscaping the public use areas.- Landscape planting including trees, shrubs, vines, perennials, annuals, and turf establishment will be an integral component in the design of the recreation sites, areas, and facilities. The objectives of the beautification program include, but are not limited to harmonizing development with the surrounding environment, provision of shade, reduction of undesirable wind, noise, dust, and erosion, and enhancement of structures. Each public use area has been analyzed to determine what natural resources are available, which should be preserved, and how recreational facilities should be blended with the surroundings to best complement the area. In keeping with sound landscape architectural principles, the principal consideration should be to develop a planting plan which is simple, functional, esthetically pleasing, and economical to maintain. Plant species will be limited to those proven hardy and tolerant of specific site conditions. Generally, plantings will be naturalistic and will avoid arboretum patterns. A landscape plan for the recreation-intensive use areas will be presented for approval when completed.

VIII - RECREATION PLAN OF DEVELOPMENT

8-01. General.- The purpose of the recreation plan of development is to delineate the areas selected for public use, to determine the type of use to which they should be put, and to present a functional plan of how the selected public use areas may best be developed and managed. This plan is intended to serve as a guide for recreation development while being flexible enough to meet the changing conditions and future variations in public demands. All public use areas and associated faciltiies will be located on land under the jurisdiction of the Corps of Engineers.

8-02. Basis for selection of public use areas.- The preliminary selection of the public use areas was accomplished in Design Memorandum No. 6. The location of the sites selected for public use are shown on plate VIII-1. Several variables analyzed in the selection of these areas include, but are not limited to the following:

a. Access to existing roads;
b. Topography of the area;
c. Existing vegetation in the area;
d. The existence of scenic areas;
e. Availability of shoreline access for recreational activities;
f. Degree of shelter for boats; and
g. Water depths for swimming beaches and boat ramps.

8-03. Recreation use allocation plan.- The intent of this section is to present a balanced recreation plan that offers the greatest variety of outdoor recreation experiences within the limits of the recreation resource and its authorized purposes. Experience at completed projects in the Fort Worth District and at similar projects elsewhere indicates a significant demand for land managed for the specific role of shaping public understanding of the environment. While some persons consider areas under-utilized when every acre is not packed with people, as is usually found in high intensive-use areas, it is considered that a higher quality experience is obtained when conditions are less crowded. Certain types of outdoor recreation activities, such as hiking, bird watching, nature study, and primitive camping can only be experienced in areas receiving relatively light use. Walnut Springs, Cedar Hollow, and Sawyer Parks are well suited for these activities. They have been planned as low-density recreation parks with limited support facilities. San Gabriel, Jim Hogg, and Russell Parks have been allocated to be developed as intensive recreation parks.

8-04. Management of the public use areas.-

a. Recreation: low-density parks.- Management of the low-density (primitive) parks will be designed to protect, maintain, and enhance existing environmental and recreational values. The primary objective will be to provide opportunities for outdoor recreation activities, such as hiking, bird watching, nature study, photography, and primitive camping. To achieve this objective, it will be necessary to take the following action:

(1) All camping areas will be sited in the field by district and project personnel. Attention will be focused on the proper distribution and use of the area to protect the natural resources and to enhance the recreational experience.

(2) A carrying capacity will be determined and implemented for each primitive camping area. The carrying capacity is the ability of a site to absorb outside influence and still retain its quality.

(3) The "fallow campground" concept, which requires camping areas to be rested from use periodically, will be employed.

(4) Simple comfort stations will be provided for recreation users. These toilets will be designed and located so that they are in harmony with their surroundings.

(5) Motorized land travel, except that required by project personnel to protect and maintain the parks, will be prohibited.

b. Recreation: intensive-use parks.- The management of intensive use parks shall give primary emphasis to providing the optimum number of recreation facilities for the continued enjoyment and maximum sustained use by the visiting public consistent with the carrying capacity and the esthetic and biological values. This requires a balanced approach to facility development which must take into consideration both the recreational and environmental goals in order to achieve an equilibrium between conservation of the natural environment and development for public use.

8-05. Schedule of recreation facility development.- Initial recreation facility development will be completed by the time the project is placed in useful operation. The facilities developed will include, but not limited to, roads, parking areas, boat launching ramps, sanitary facilities, water supply facilities, public camping and picnic areas, and essential informational and directional signs required in connection with these facilities.

8-06. Design criteria for recreation facilities.- Engineering design of the recreation facilities is in accordance with criteria

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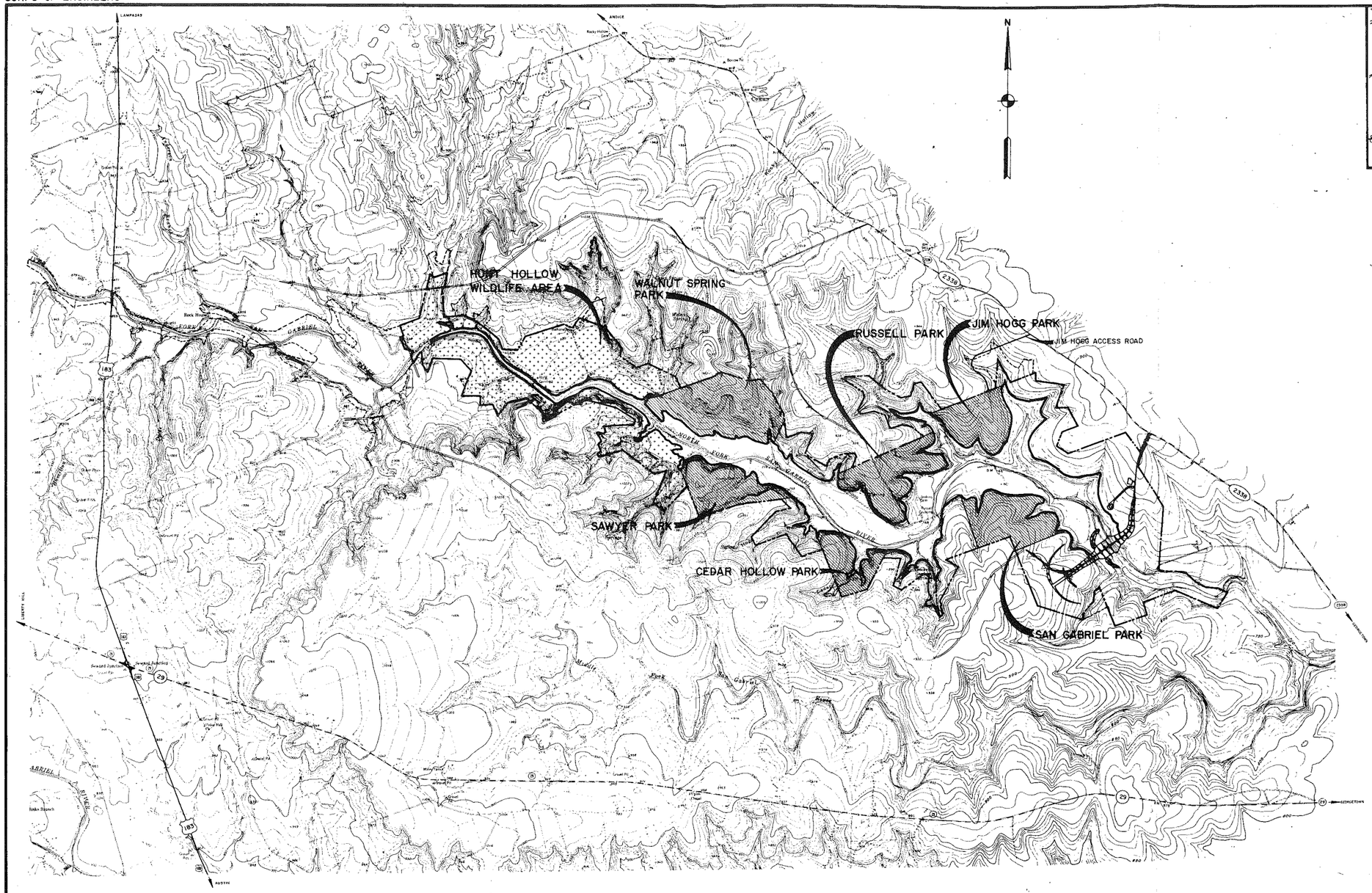
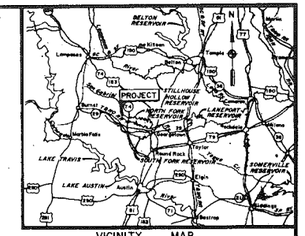




VICINITY MAP
SCALE OF MILES
0 0 0 10

LEGEND

- PUBLIC USE AREA
- WILDLIFE AREA
- APPROXIMATE LIMITS OF FEE ACQUISITION
- TOP OF INTERIM CONSERVATION POOL ELEV. 504
- APPROXIMATE LIMITS OF FLOWAGE EASEMENT ACQUISITION.

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

GENERAL DEVELOPEMENT PLAN

SCALE IN FEET
2000 0 2000 4000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO.16 PLATE VIII-1

outlined in ER 1110-2-400, "Design of Recreation Sites, Areas, and Facilities," and EM 1110-2-400, "Recreation Facilities Planning and Design Criteria." Only approved design criteria will be used in the construction of recreation facilities. The specific design criteria information for this project are outlined in chapter X.

8-07. Jim Hogg access road.- The proposed access road will provide access from FM Road 2338 to Jim Hogg Park. This road will follow the natural terrain as near as possible, and will be constructed on low fill to avoid excessive excavation. The design details and cost estimates of this road are included as appendix F. Plate VIII-1 shows the proposed location of the access road.

8-08. Cost estimates for proposed recreational facilities.- The estimated total cost for the construction of the proposed recreational facilities not including engineering and design, and supervision and administration is $2,687,700. All of the initial recreation development will be provided on a noncost-sharing basis. A summary of estimated recreational cost by account numbers is presented in chapter IX.

8-09. Recreation facilities plan of development.- This section translates the land and water use plan into specifics for actual facility development and cost as required for the life of the project. Proposals for facilities and associated sign layout for the initial public use development will serve as the basis for preparation of plans and specifications. Table VIII-1 presents pertinent acreage data for each of the six public use areas.

Table VIII-1

ACRES AVAILABLE IN PUBLIC USE AREAS

Public Use Areas	Above Conservation Pool El. 791.0	Above 5-Year Flood Pool El. 802.2	Above Flood Control Pool El. 834.0
San Gabriel Park	230	195	150
Cedar Hollow Park	130	120	100
Sawyer Park	185	170	135
Walnut Springs Park	340	275	185
Russell Park	255	215	180
Jim Hogg Park	190	165	110
Total Acres	1,330	1,140	860

A description, a detailed cost estimate, a site plan showing planned development, and a sign plan for each park follows.

a. San Gabriel Park.- (Plate VIII-2, sign layout plate VIII-3). San Gabriel Park has been designated to be developed as an intensive recreation use area with circulation roads, parking areas, waterborne toilets, and other facilities as shown on the plate. The park is located 0.5 mile west of the spillway on the south shore. Access will be over a road which will cross the embankment and will extend to the limits of the park. The topography is flat to rolling except for steep slopes along the shoreline.

Table VIII-2

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILTIES
FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

SAN GABRIEL PARK

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads	Mile			
a. Park roads(BIT)(two-way)		$90,000	1.0	$90.0
b. Park roads(BIT)(one-way)		60,000	1.3	78.0
c. Hiking trails		2,500	0.6	1.5
2. Parking areas(BIT)(Paved)	S.Y.	0.005	7,280.0	36.4
3. Boat launching ramps (conc) 4-lanes 68 ft wide	S.Y.	0.025	1,888.0	47.2
4. Water supply systems	Each			
a. Lake pump and filter		5,100	1.0	5.1
b. Drinking fountains		0.220	3.0	0.7
5. Sanitary facilities	Each			
a. Masonry waterborne toilets		38,700	2.0	77.4
b. Service building with toilets, showers, laundry facilities)		49,800	2.0	99.6
c. Sanitary dump station(trailer)		2,700	1.0	2.7
6. Utilities	Job			
a. Water distribution lines		11,400	1.0	11.4
b. Electric service lines		41,300	1.0	41.3
c. Light standards, etc.		4,000	1.0	4.0
d. Electrical hookup		3,000	1.0	3.0
e. Waterline hookup		2,400	1.0	2.4

Table VIII-2 (continued)

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
7. Picnic and camping units	Each			
a. Picnic units		$0.405	40	$16.2
b. Camp units		0.455	60	26.7
8. Table shelters	Each	0.555	100	55.5
9. Signs and Buoys	Job			
a. Park entrance signs		0.500	1.0	0.5
b. Directional signs		1.000	1.0	1.0
c. Registration booths		0.200	1.0	0.2
d. Traffic signs		1.200	1.0	1.2
e. Buoys and anchors		1.500	1.0	1.5
10. Site improvement	Job			
a. Underbrushing		1.000	1.0	1.0
b. Turfing(toilets, camping and picnic area)		12,500	1.0	12.5
11. Landscaping	Job			
Turfing and landscaping		15,000	1.0	15.0
12. Miscellaneous features	Each			
Traffic Gates		0.500	2.0	1.0
SUBTOTAL				$637.0

b. Cedar Hollow Park.- (Plate VIII-4, sign layout plate VIII-5). Tree cover is relatively light; the topography is generally flat on the ridges with gentle slopes down to the steep slopes of the shoreline. This area is planned to be a low-density recreation use area centering around primitive camping areas, hiking trails, and other recreation activities which require limited development. Cedar Hollow is situated about 3 miles upstream from the damsite on the south side of the lake. Access to the park will be limited to boats and a proposed nature trail which is approximately 2.3 miles long.

Table VIII-3

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILITIES
FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

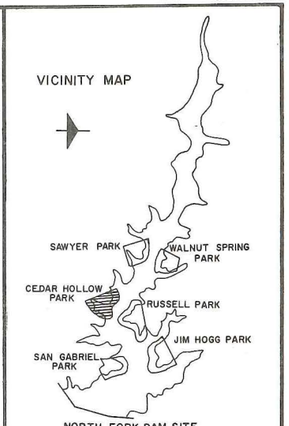
CEDAR HOLLOW PARK

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads Hiking trails	Mile	$2,500	1.3	$3.3
2. Sanitary facilities Frame toilets (chem unit)	Each	2,000	1.0	2.0
3. Floating docks Fishing	Each	2,200	1.0	2.2
4. Signs and buoys Directional signs	Job	.200	1.0	0.2
SUBTOTAL				$7.7

N

VICINITY MAP



LEGEND

	EXISTING BY C OF E	EXISTING BY OTHERS	PLANNED BY C OF E
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
CHEMICAL TOILET UNIT	cu	cu	cu
FRAME TOILETS (PIT TYPE)	F(E)	F(E)	F(E)
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE-(AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERV LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			
LIMITS OF CONTRACT SERVICE AREA			
LIMITS OF LICENSE OR LEASE AREAS			
LIMITS OF OVERFLOW AREA			
GOVERNMENT PROPERTY LINE			

POOL ELEVATIONS

CONSERVATION POOL ---------- 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD -- 802.2
POOL DRAWDOWN 5 YEAR ---------- 778.5

ACRES IN PARK

ABOVE CONSERVATION POOL- 130

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

CEDAR HOLLOW PARK

SCALE IN FEET
200 0 200 400

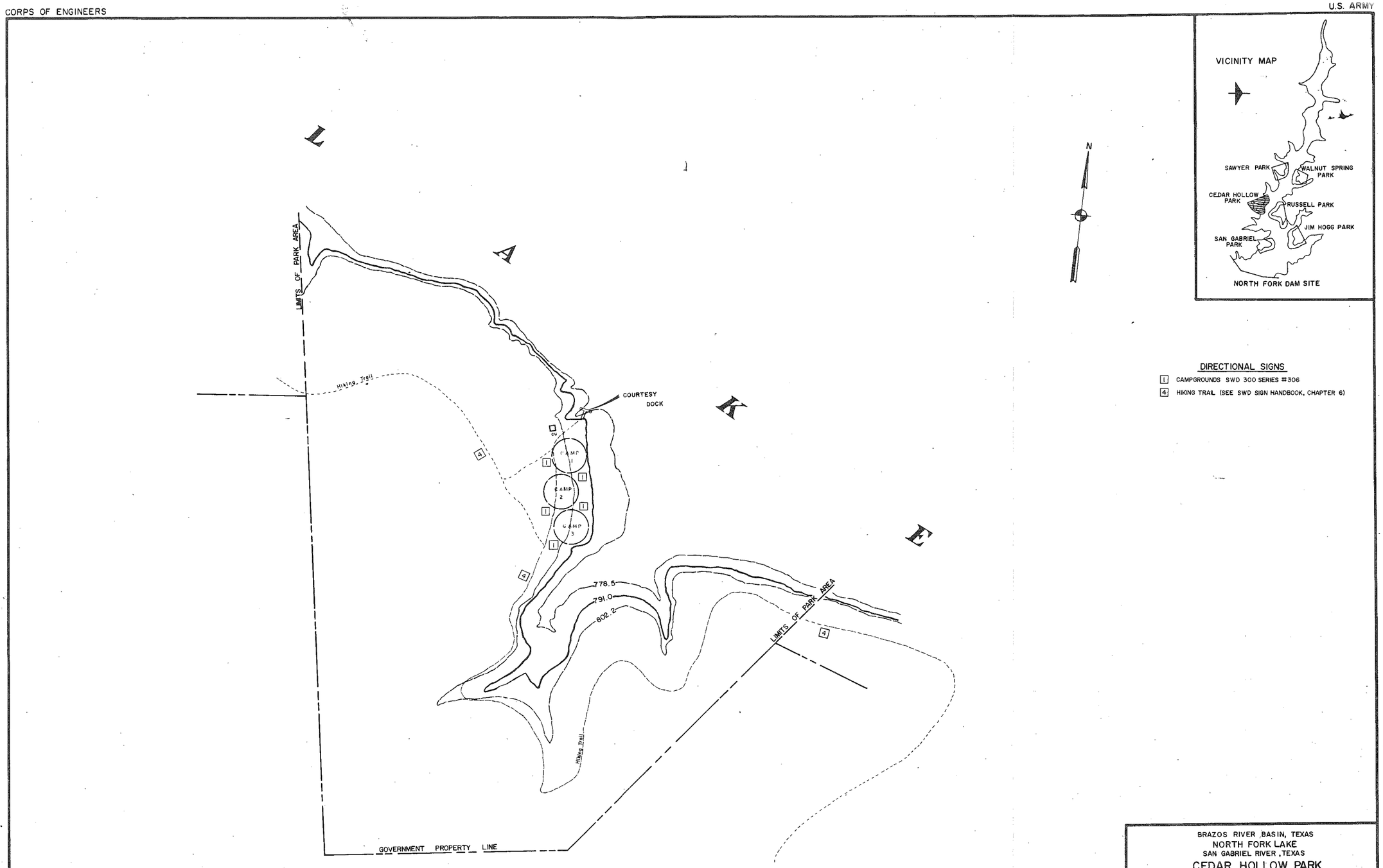
U.S. ARMY ENGINEER DISTRICT, FORT WORTH SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO.16
MASTER PLAN

FILE. NO.16 PLATE VIII-4

CORPS OF ENGINEERS

U.S. ARMY



VICINITY MAP

DIRECTIONAL SIGNS

[1] CAMPGROUNDS SWD 300 SERIES #306

[4] HIKING TRAIL (SEE SWD SIGN HANDBOOK, CHAPTER 6)

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE

SAN GABRIEL RIVER, TEXAS

CEDAR HOLLOW PARK

SIGN PLAN

SCALE IN FEET

200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VIII-5

c. Sawyer Park.- (Plate VIII-6, sign layout plate VIII-7). Sawyer Park is planned to be a low-density recreation use area, with limited development. Access to the area is by boat; however, a nature trail is planned to provide additional access. This park is located on the south shore about 4.5 miles upstream from the damsite. The terrain is characterized by a relatively flat ridge which slopes toward a generally steep shoreline. The uphill portion of the park is open to sparsely covered by trees, while the shoreline has moderately good tree cover.

Table VIII-4

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILITIES
FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

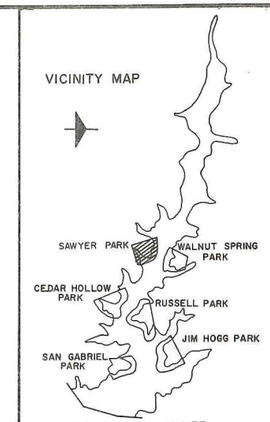
SAWYER PARK

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Cost
1. Roads	Mile			
Hiking trails		$2,500	2.3	$5.8
2. Sanitary facilities	Each			
Frame toilets(chem unit)		2,000	1.0	2.0
3. Signs and Buoys	Job			
Directional signs		200	1.0	0.2
SUBTOTAL				8.0

CORPS OF ENGINEERS U.S. ARMY

VICINITY MAP



LEGEND

	EXISTING BY C OF E	EXISTING BY OTHERS	PLANNED BY C OF E
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
CHEMICAL TOILET UNIT	CU	CU	CU
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			
LIMITS OF CONTRACT SERVICE AREA			
LIMITS OF LICENSE OR LEASE AREAS			
LIMITS OF OVERFLOW AREA			
GOVERNMENT PROPERTY LINE			

POOL ELEVATIONS

CONSERVATION POOL ---------- 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD -- 802.2
POOL DRAWDOWN 5 YEAR ---------- 778.5

ACRES IN PARK

ABOVE CONSERVATION POOL-185

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

SAWYER PARK

SCALE IN FEET
200 0 200 400

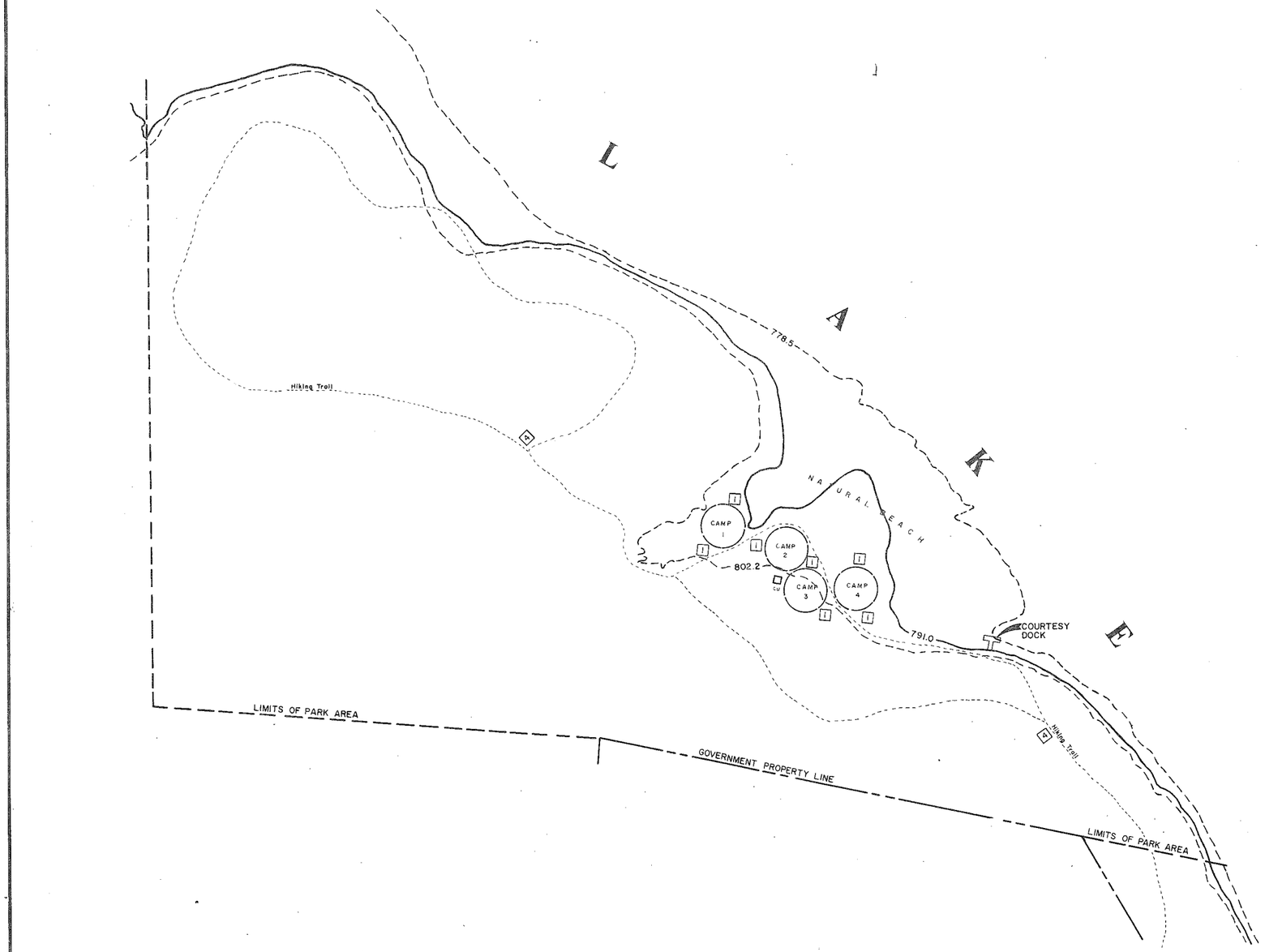
U.S. ARMY ENGINEER DISTRICT, FORT WORTH SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VIII-6

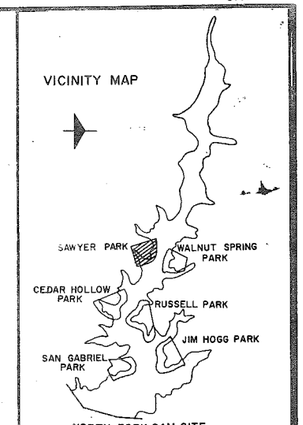
CORPS OF ENGINEERS

U.S. ARMY



N

VICINITY MAP



DIRECTIONAL SIGNS

1 CAMPGROUNDS SWD 300 SERIES #306

4 HIKING TRAIL (SEE SWD SIGN HANDBOOK, CHAPTER 6)

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

SAWYER PARK
SIGN PLAN

SCALE IN FEET
200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO.16 PLATE VIII-7

d. Walnut Springs Park.- (Plate VIII-10, sign layout plate VIII-11, plate VIII-12, sign layout plate VIII-13). This park is located on the north shore of the project approximately 4 miles upstream from the dam. Access to the park will be by boat and a 1.5 mile long hiking trail which originates in Russell Park. The southern portion of the park will be developed as a primitive camping area. Since the northern portion of the park contains a good stand of mature Ashe Juniper, the typical habitat of the rare and endangered golden-cheeked warbler, only compatible nature trails will be developed. A carefully sited nature trail system is planned for this area with limited facility development.

Table VIII-5

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILITIES
FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

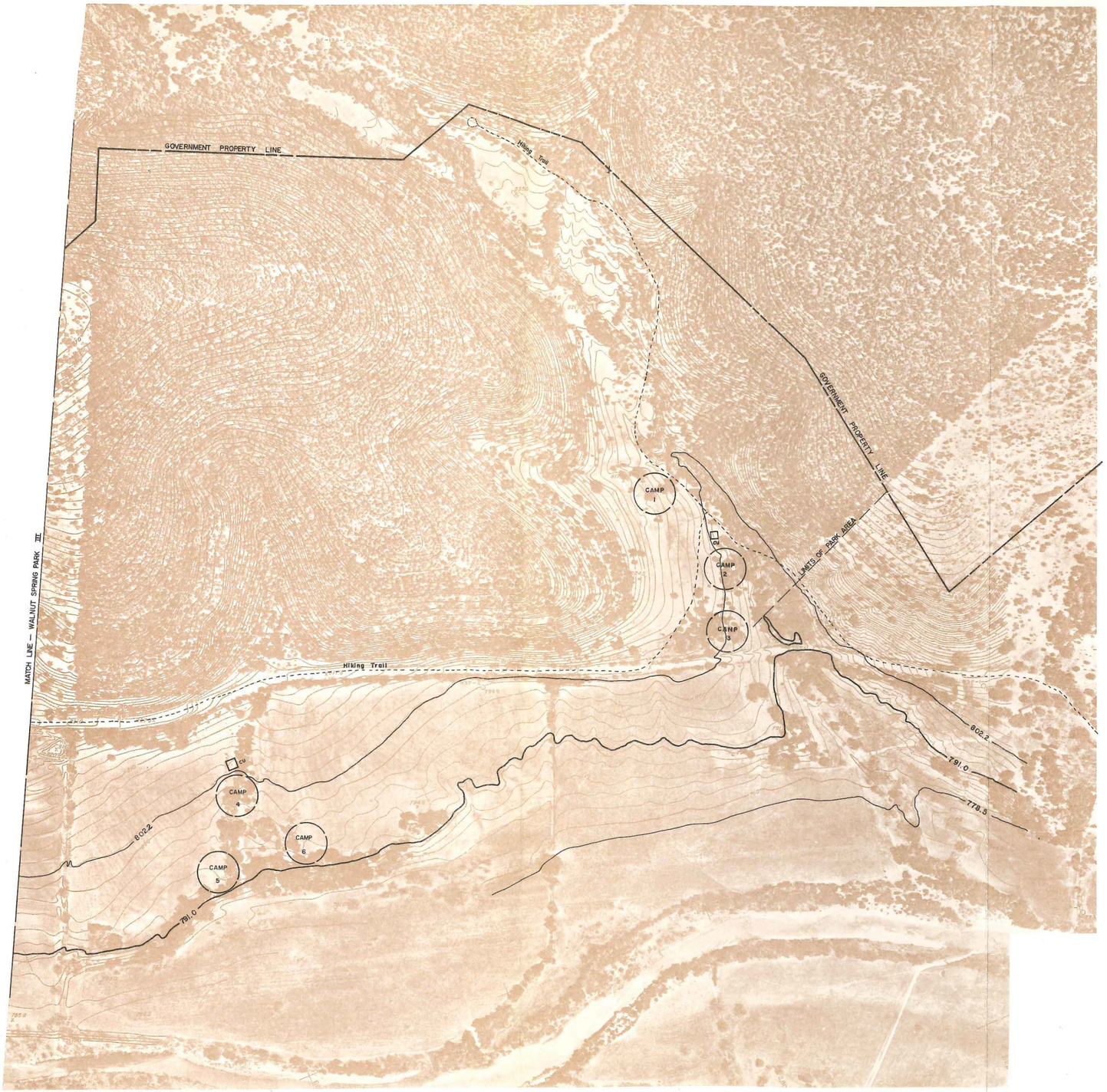
WALNUT SPRINGS PARK

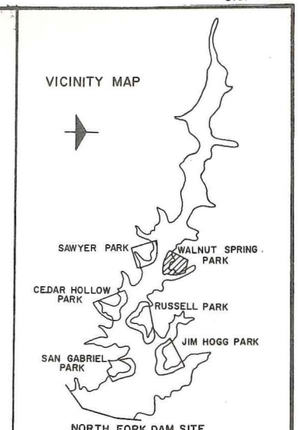
(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads Hiking trails	Mile	$2,500	2.5	$6.3
2. Sanitary facilities Frame toilets(chem unit)	Job	2,000	1.0	2.0
3. Directional signs		300	1.0	0.3
SUBTOTAL				8.6

CORPS OF ENGINEERS

U.S. ARMY





LEGEND

	EXISTING BY C OF E.	EXISTING BY OTHERS	PLANNED BY C OF E.
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
CHEMICAL TOILET UNIT	CU	CU	CU
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			
LIMITS OF CONTRACT SERVICE AREA			
LIMITS OF LICENSE OR LEASE AREAS			
LIMITS OF OVERFLOW AREA			
GOVERNMENT PROPERTY LINE			

POOL ELEVATIONS

CONSERVATION POOL ——— 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD ——— 802.2
POOL DRAWDOWN 5 YEAR ——— 778.5

ACRES IN PARK

ABOVE CONSERVATION POOL - 340

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

WALNUT SPRING PARK I

SCALE IN FEET
200 0 200 400

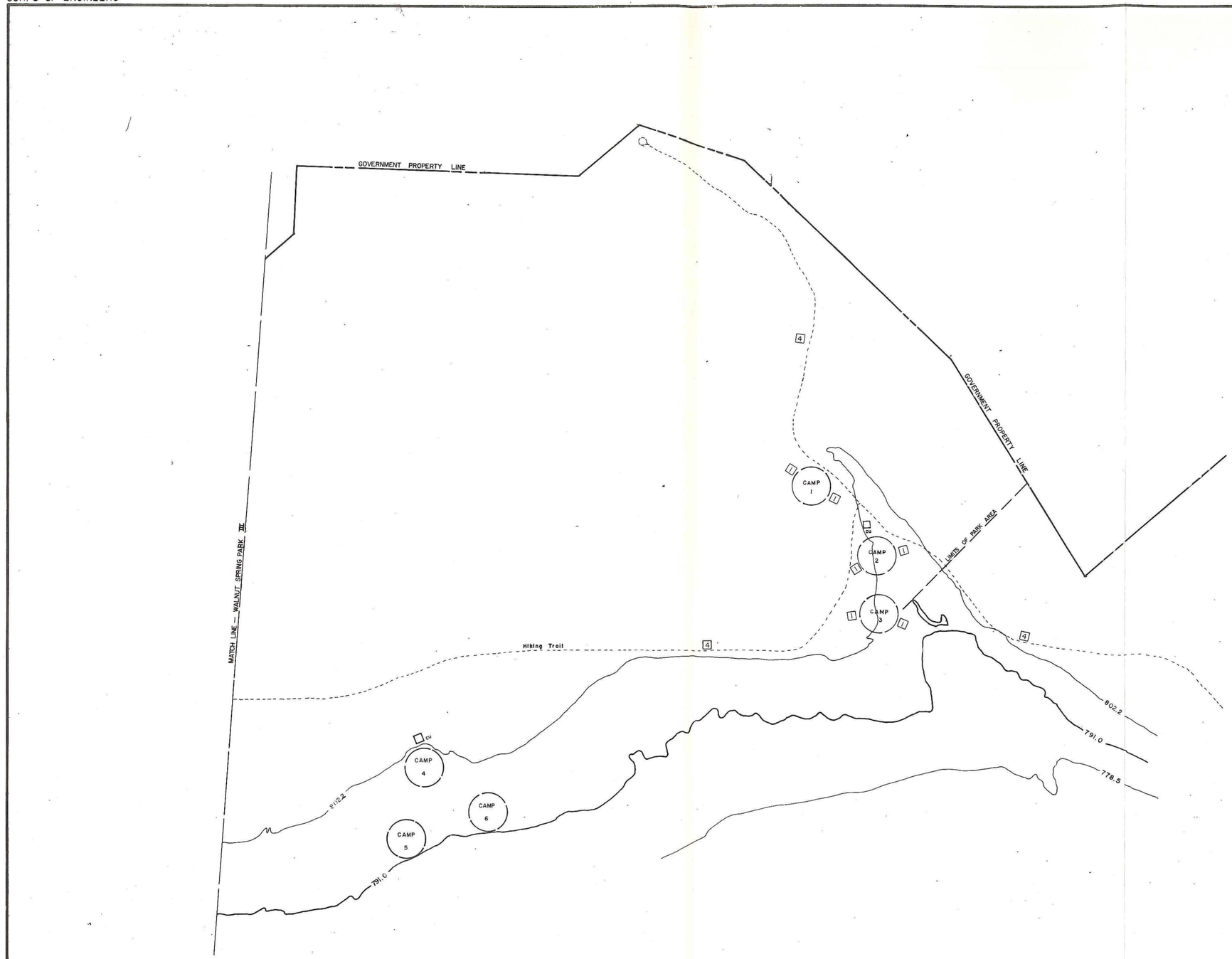
U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

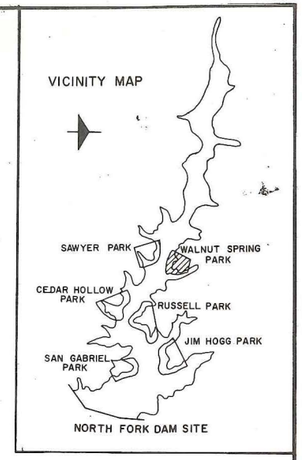
TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO.16 PLATE VIII-10

CORPS OF ENGINEERS

U.S. ARMY





N

DIRECTIONAL SIGNS

[1] CAMPGROUNDS SWD 300 SERIES #306

[4] HIKING TRAIL (SEE SWD SIGN HANDBOOK, CHAPTER 6)

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

WALNUT SPRING PARK I
SIGN PLAN

SCALE IN FEET
200 0 200 400

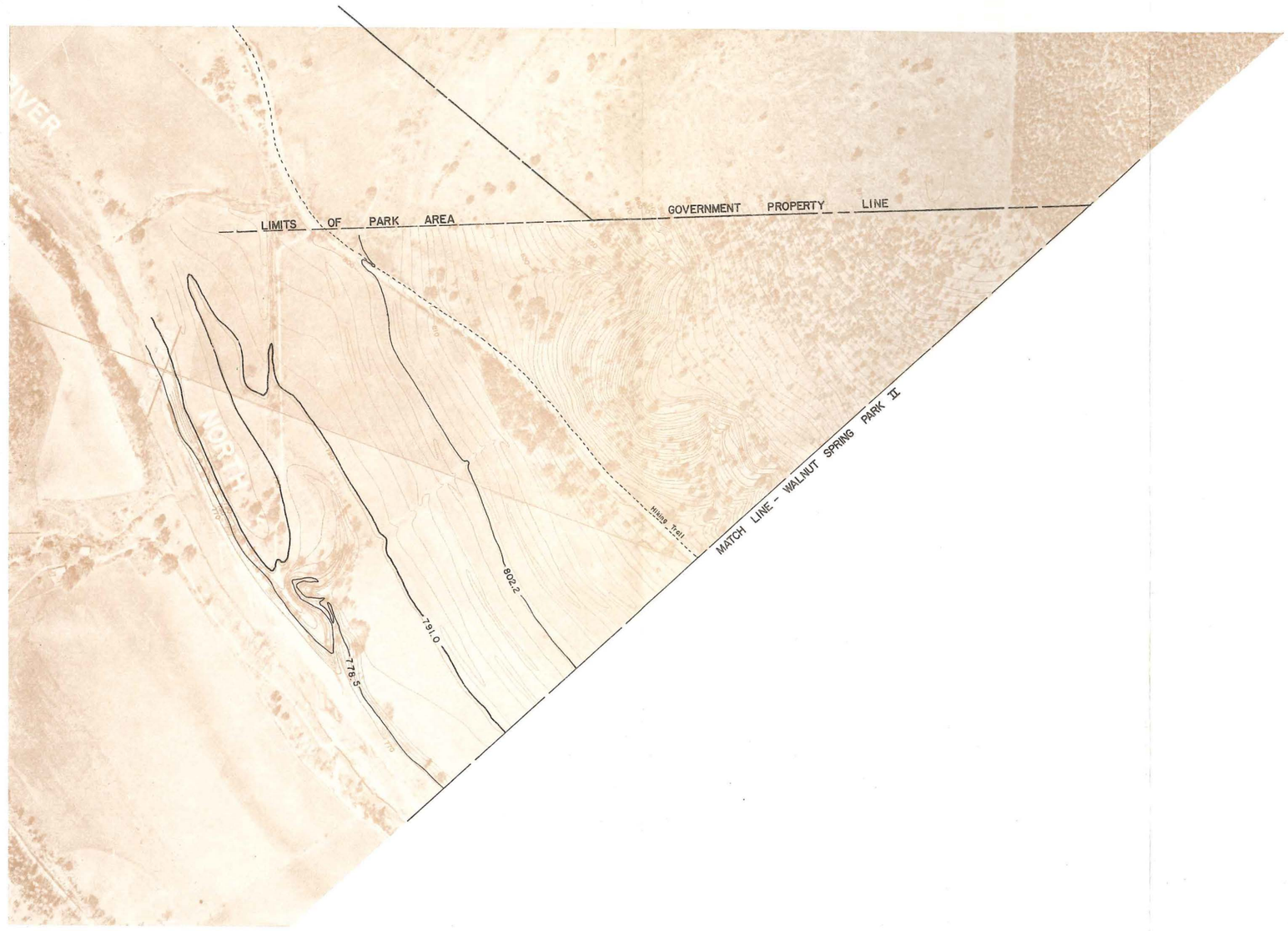
U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

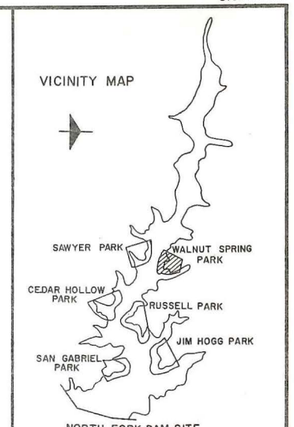
TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO.16 PLATE VIII-11

CORPS OF ENGINEERS

U.S. ARMY





LEGEND

	EXISTING BY C. OF E.	EXISTING BY OTHERS	PLANNED BY C. OF E.
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
FRAME TOILETS (PIT TYPE)	F(E)	F(E)	F(E)
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			

LIMITS OF CONTRACT SERVICE AREA

LIMITS OF LICENSE OR LEASE AREAS

LIMITS OF OVERFLOW AREA

GOVERNMENT PROPERTY LINE

POOL ELEVATIONS

CONSERVATION POOL---791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD---802.2
POOL DRAWDOWN 5 YEAR---778.5

ACRES IN PARK

ABOVE CONSERVATION POOL-340

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

WALNUT SPRING PARK II

SCALE IN FEET
200 0 200 400

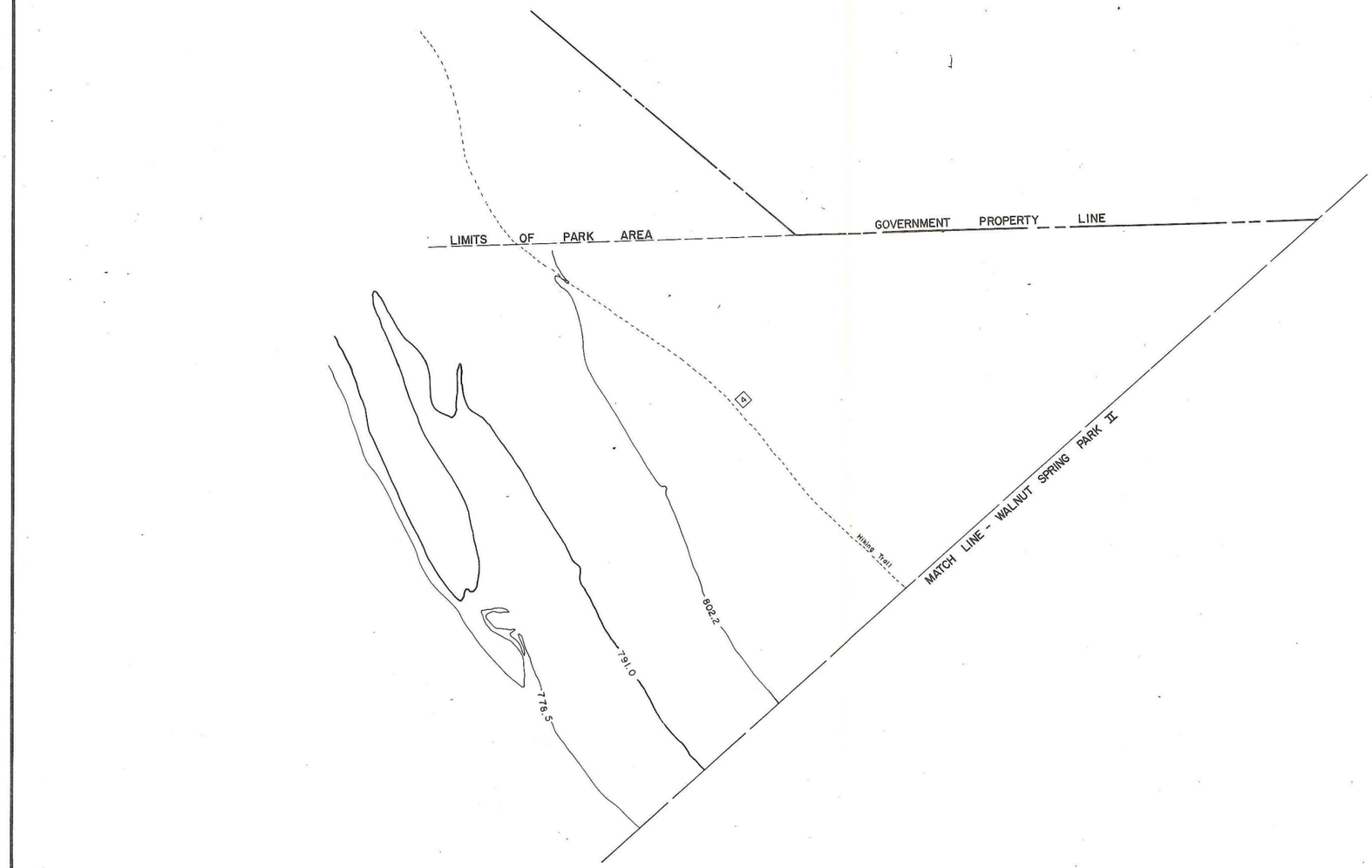
U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

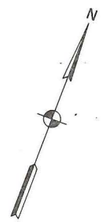
TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

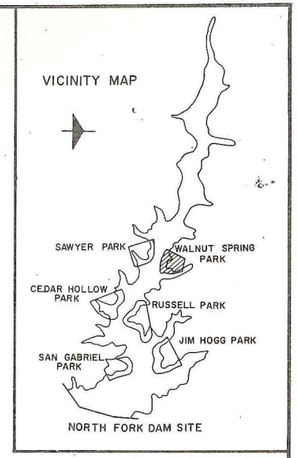
FILE. NO.16 PLATE VIII-12

CORPS OF ENGINEERS

U.S. ARMY







DIRECTIONAL SIGNS

4 HIKING TRAIL (SEE SWD SIGN HANDBOOK, CHAPTER 6)

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

WALNUT SPRING PARK II
SIGN PLAN

SCALE IN FEET

200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

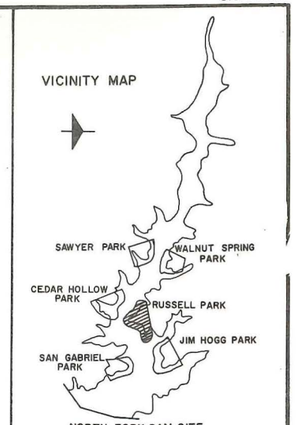
FILE. NO.16 PLATE VIII-13

CORPS OF ENGINEERS

U.S. ARMY

N

VICINITY MAP



LEGEND

	EXISTING BY C. OF E.	EXISTING BY OTHERS	PLANNED BY C. OF E.
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
CHEMICAL TOILETS UNIT	CU	CU	CU
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			
LIMITS OF CONTRACT SERVICE AREA			
LIMITS OF LICENSE OR LEASE AREAS			
LIMITS OF OVERFLOW AREA			
GOVERNMENT PROPERTY LINE			

PICNIC FACILITIES

PICNIC AREA NO.	ITEM	PLANNED BY C. OF E.	PLANNED BY OTHERS
1	TABLES	40	
	FIREPLACES	40	
	TRASH CANS	40	
	SHELTERS	40	
2	TABLES	40	
	FIREPLACES	40	
	TRASH CANS	40	
	SHELTERS	40	

POOL ELEVATIONS

CONSERVATION POOL ---------- 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD -- 802.2
POOL DRAWDOWN 5 YEAR ---------- 778.5

ACRES IN PARK

ABOVE CONSERVATION POOL-255

* NOTE:
EXISTING C. OF E. GRAVEL ROAD TO BE PAVED.

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

RUSSELL PARK

SCALE IN FEET
200 0 200 400

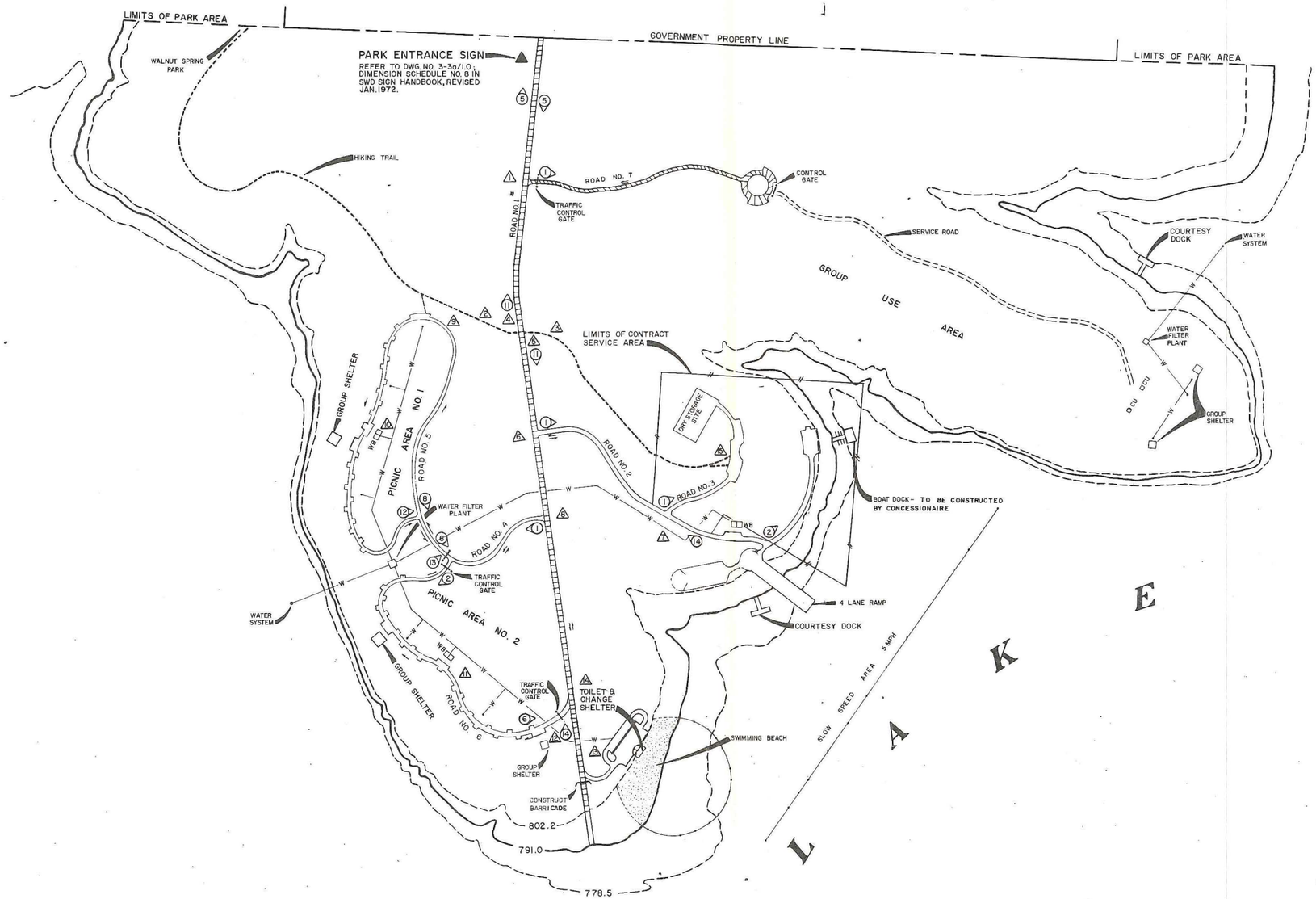
U.S. ARMY ENGINEER DISTRICT, FORT WORTH SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO.16
MASTER PLAN

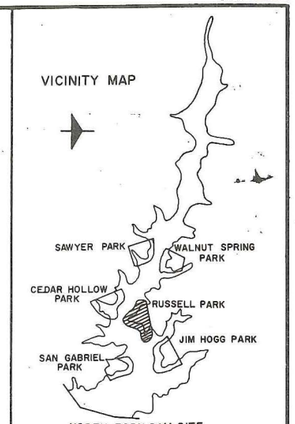
FILE. NO.16 PLATE VIII-14

CORPS OF ENGINEERS

U.S. ARMY



VICINITY MAP



DIRECTIONAL SIGNS

SYMBOL	SERIES	TYPE
1	RS-039A	PICNIC SHELTER
2	RS-068C	HIKING TRAIL
3	RS-068C	HIKING TRAIL
4	RS-016	PEDESTRIAN CROSSING
5	RS-016	PEDESTRIAN CROSSING
6	RS-022A	RESTROOMS
	RS-054A	LAUNCHING RAMP
7	RS-068A	HIKING TRAIL
8	RS-044B	PICNIC AREA
	RS-039B	PICNIC SHELTER
	RS-068B	HIKING TRAIL
9	RS-068B	HIKING TRAIL
10	RS-022A	RESTROOMS
11	RS-022B	RESTROOMS
12	RS-039A	PICNIC SHELTER
13	RS-035A	SHOWERS
	RS-061A	SWIMMING
14	RS-044B	PICNIC AREA
	RS-039B	PICNIC SHELTER
	RS-035A	SHOWERS
	RS-061A	SWIMMING
15	RS-068C	HIKING TRAIL

NOTE:
FOR TRAFFIC CONTROL SIGN SEE PLATE VIII-3

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

RUSSELL PARK
SIGN PLAN
SCALE IN FEET
200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VIII-15

e. Russell Park.- (Plate VIII-14, sign layout plate VIII-15). This park consists of flat to rolling terrain, with steep slopes along the shoreline and moderate tree cover. It is located on the north shore of the lake about 2 miles upstream from the dam. Access to the area will be over a relocated road which connects with FM Road 2338. This park will be developed primarily for a day-use area with picnic and group-use areas. A swimming beach with a bathhouse and toilet facilities is also proposed. A site for a commercial concession is also planned.

Table VIII-6

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILITIES
FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

RUSSELL PARK

(Amounts in thousands of dollars)

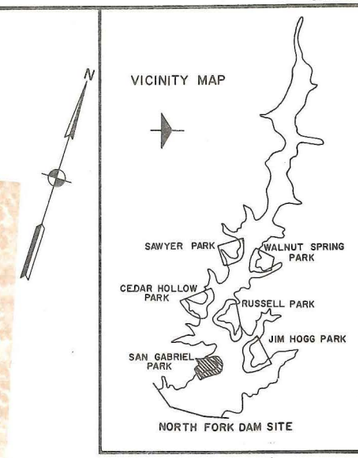
Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads	Mile			
a. Park roads (BIT) (two-way)		$90,000	1.8	$162.0
b. Park roads (BIT) (one-way)		60,000	1.1	66.0
c. Gravel		20,000	0.3	6.0
d. Hiking trails		2,500	0.7	1.8
2. Parking areas	S.Y.			
a. Paved (BIT)		0,005	9,257	46.2
3. Boat launching ramps (conc)	S.Y.			
a. 4-lanes 68 ft. wide		0.025	2267.0	56.7
4. Water supply systems	Each			
a. Lake pump and filter		5,100	2.0	10.2
b. Drinking fountains		220	8.0	1.8
5. Sanitary facilities	Each			
a. Masonry waterborne toilets		38,700	3.0	116.1
b. Bathhouse with toilets		47,600	1.0	47.6
c. Frame toilets (chem unit)		2,000	2.0	4.0
6. Utilities	Job			
a. Water distribution lines		14,000	1.0	14.0
b. Electric service lines		33,500	1.0	333.5
c. Light standards, etc.		8,000	1.0	8.0

Table VIII-6 (continued)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
7. Picnic and camping units	Each			
a. Picnic units		$0.405	80	$32.4
8. Table shelters	Each			
a. Single (1-table)		0.555	80	44.4
b. Group (3-tables)		4,400	5.0	22.0
9. Floating docks	Each			
a. Courtesy(boating)		2,200	2.0	4.4
10. Swimming beaches	Each			
a. Improved sand		25,000	1.0	25.0
11. Signs and buoys	Job			
a. Park entrance signs		500	1.0	0.5
b. Directional signs		1,700	1.0	1.7
c. Traffic signs		1,500	1.0	1.5
d. Buoys and anchors		3,000	1.0	3.0
12. Site improvement	Job			
a. Underbrushing		4,000	1.0	4.0
b. Turfing (toilets, camping and picnic area)		12,500	1.0	12.5
13. Landscaping	Job			
a. Turfing and landscaping		10,000	1.0	10.0
14. Gates	Each			
a. Traffic control gates		0.500	5.0	2.5
15. Miscellaneous features	Each			
a. Gravel dry storage		9,400	1.0	9.4
SUBTOTAL				$747.2

CORPS OF ENGINEERS

U.S. ARMY



PICNIC FACILITIES			
PICNIC AREA NO.	ITEM	PLANNED BY C. OF E.	PLANNED BY OTHERS
1	TABLES	40	
	FIREPLACES	40	
	TRASH CANS	40	
	SHELTERS	40	

CAMPING FACILITIES			
CAMP AREA NO.	ITEM	PLANNED BY C. OF E.	PLANNED BY OTHERS
1	TABLES	60	
	FIREPLACES	60	
	TRASH CANS	60	
	SHELTERS	60	

POOL ELEVATIONS

CONSERVATION POOL ---------- 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD --- 802.2
POOL DRAWDOWN 5 YEAR ---------- 778.5

ACRES IN PARK

ABOVE CONSERVATION POOL-230

LEGEND

	EXISTING BY C. OF E.	EXISTING BY OTHERS	PLANNED BY C. OF E.
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
FRAME TOILETS (PIT TYPE)	F(E)	F(E)	F(E)
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			

LIMITS OF CONTRACT SERVICE AREA
LIMITS OF LICENSE OR LEASE AREAS
LIMITS OF OVERFLOW AREA
GOVERNMENT PROPERTY LINE

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

SAN GABRIEL PARK

SCALE IN FEET
200 0 200 400

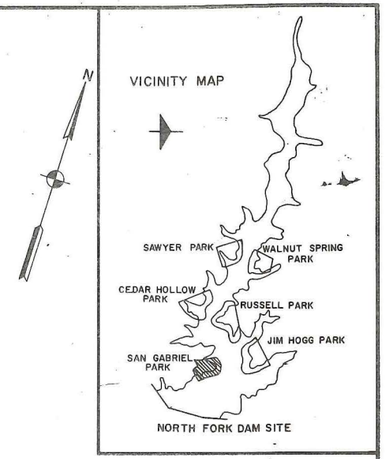
U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO.16
MASTER PLAN

FILE. NO. 16 PLATE VIII-2

CORPS OF ENGINEERS

U.S. ARMY



DIRECTIONAL SIGNS

SYMBOL	SERIES	TYPE
1	RS 034 A*	PARKING
	RS 068 A	HIKING TRAIL
2	RS 068	HIKING TRAIL
3	RS 038 A	CAMPGROUND
	RS 035 A	SHOWERS
	RS 041 A	TRAILER SANITARY STATION
	RS 044 C	PICNIC AREA
	RS 054 C	LAUNCHING RAMP
4	RS 044 B	PICNIC AREA
5	RS 022 A	RESTROOMS
6	RS 022 A	RESTROOMS
7	RS 041 B	TRAILER SANITARY STATION
8	RS 035 A	SHOWERS
9	RS 035 A	SHOWERS

NOTE:
DIRECTIONAL SYMBOL SIGNS SHALL BE IN ACCORDANCE WITH THE "NATIONAL PARK SERVICE SIGN SYSTEM STANDARDS."

*REFER TO DWG. NO. 4/7b1.1; S.W.D. SIGN HANDBOOK FOR DIRECTIONAL ARROWS.

TRAFFIC CONTROL SIGNS

SYMBOL	SERIAL	TYPE
1	R 1-1	STOP
2	R 1-2	YIELD
3	W1-2L	CURVE LEFT
4	R4-7A	KEEP RIGHT
5	R2-1	SPEED LIMIT 30
6	R2-1	SPEED LIMIT 10
7	W1-2R	CURVE RIGHT
8	R6-2	ONE WAY
9	R11-2	ROAD CLOSED
10	W6-3A	TWO WAY TRAFIC
11	W11-2	PEDESTRIAN CROSSING
12	R5-1	SLOW
13		DO NOT ENTER
14		CAUTION LAKE AHEAD SLOW TO 10 MPH

NOTE:
SIZE, COLORING, AND LOCATION OF ALL TRAFFIC SIGNS SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES HIGHWAYS DATED JUNE, 1971

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

SAN GABRIEL PARK
SIGN PLAN

SCALE IN FEET
200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

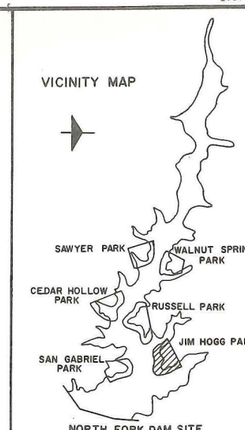
FILE. NO. 16 PLATE VII-3

CORPS OF ENGINEERS

U.S. ARMY

N

VICINITY MAP



LEGEND

	EXISTING BY C OF E	EXISTING BY OTHERS	PLANNED BY C OF E
GRAVEL ROADS			
PAVED ROADS			
SECONDARY ROADS			
GRAVEL PARKING AREAS			
PAVED PARKING AREAS			
FRAME TOILETS (CONCRETE VAULT)	F(C)	F(C)	F(C)
FRAME TOILETS (PIT TYPE)	F(E)	F(E)	F(E)
MASONRY TOILETS (CONCRETE VAULT)	M	M	M
MASONRY TOILETS (WATER BORNE)	WB	WB	WB
BOAT RAMPS	BR	BR	BR
BUILDING STRUCTURE (AS DESIGNATED)			
WATER WELLS (SUPPLY)			
WATER LINES	W	W	W
ELECTRIC SERVICE LINES			
RESERVOIR INFORMATION SIGNS	RI	RI	RI
PARK ENTRANCE SIGNS	PE	PE	PE
DIRECTIONAL SIGNS	D	D	D
BUOYS			
REGISTRATION BOOTH	RB	RB	RB
TREE COVER			
TRAFFIC COUNTERS	TC	TC	TC
SWIMMING BEACH			

LIMITS OF CONTRACT SERVICE AREA

LIMITS OF LICENSE OR LEASE AREAS

LIMITS OF OVERFLOW AREA

GOVERNMENT PROPERTY LINE

ACRES IN PARK

ABOVE CONSERVATION POOL- 190

POOL ELEVATIONS

CONSERVATION POOL ---------- 791.0
CONSERVATION POOL PLUS 5 YEAR FLOOD -- 802.2
POOL DRAWDOWN 5 YEAR ---------- 778.5

CAMPING FACILITIES

CAMP AREA NO	ITEM	PLANNED BY C OF E	PLANNED BY OTHERS
1	TABLES	73	
	FIREPLACES	73	
	TRASH CANS	73	
	SHELTERS	73	
2	TABLES	85	
	FIREPLACES	85	
	TRASH CANS	85	
	SHELTERS	85	

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

JIM HOGG PARK

SCALE IN FEET
200 0 200 400

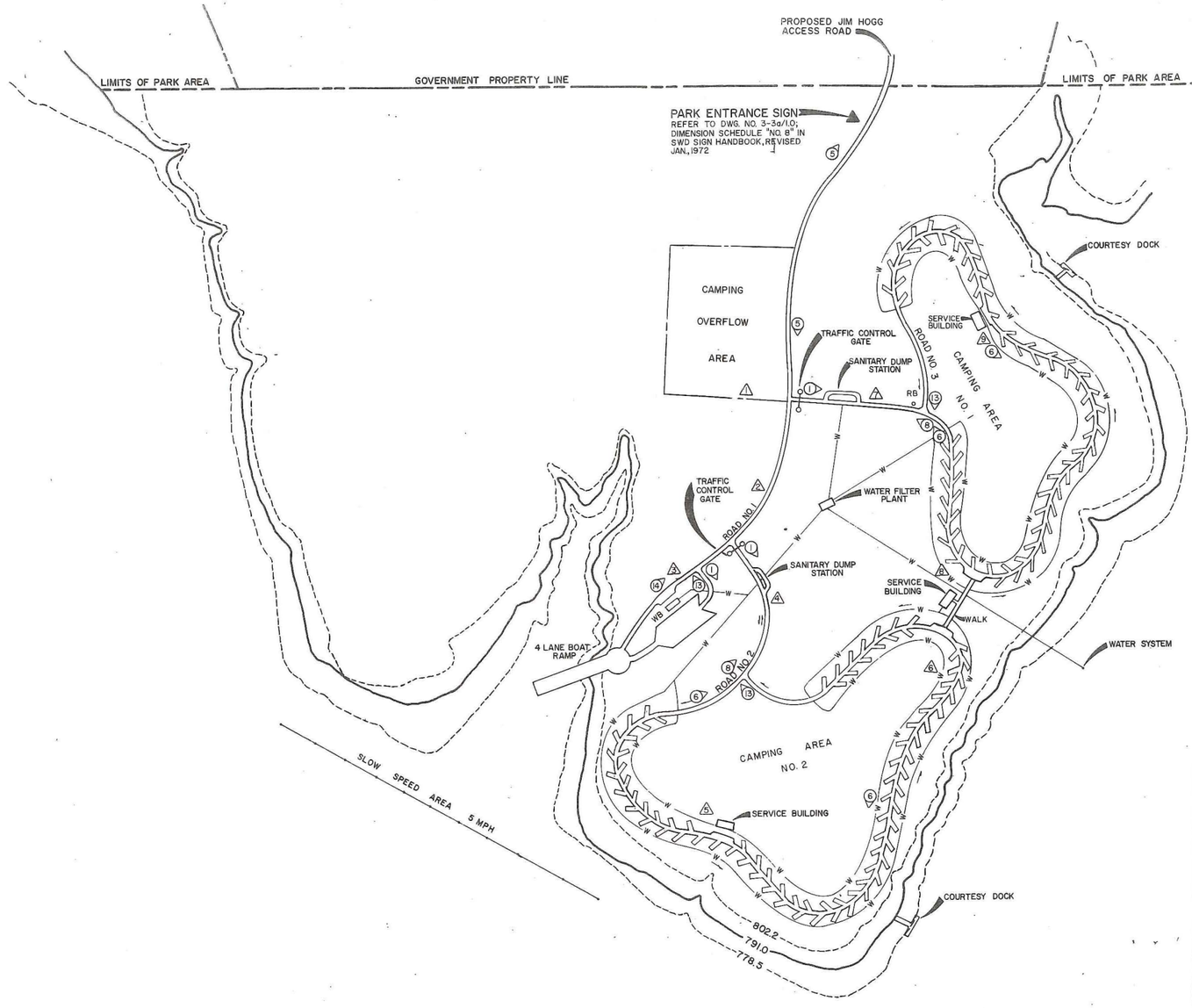
U.S. ARMY ENGINEER DISTRICT, FORT WORTH — SEPT. 1973

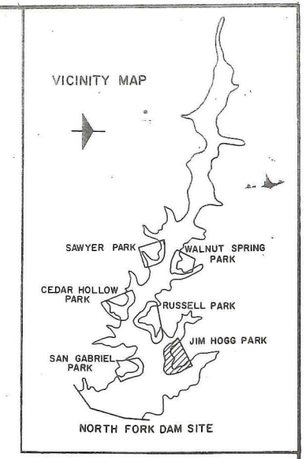
TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VIII-16

CORPS OF ENGINEERS

U.S. ARMY





DIRECTIONAL SIGNS

SYMBOL	SERIES	TYPE
1	RS-038A	CAMPGROUND
	RS-035A	SHOWERS
	RS-041A	TRAILER SANITARY STATION
	RS-061A	SWIMMING
2	RS-022C	RESTROOMS
	RS-054C	LAUNCHING RAMP
	RS-038A	CAMPGROUND
	RS-035A	SHOWERS
	RS-041A	TRAILER SANITARY STATION
	RS-061A	SWIMMING
3	RS-022A	RESTROOMS
4	RS-041B	TRAILER SANITARY STATION
5	RS-035A	SHOWERS
6	RS-041B	TRAILER SANITARY STATION
7	RS-041B	TRAILER SANITARY STATION
8	RS-035B	SHOWERS
9	RS-035A	SHOWERS

NOTE: FOR TRAFFIC CONTROL SIGNS, SEE PLATE VIII-3.

BRAZOS RIVER BASIN, TEXAS
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

JIM HOGG PARK
SIGN PLAN

SCALE IN FEET
200 0 200 400

U.S. ARMY ENGINEER DISTRICT, FORT WORTH SEPT. 1973

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

FILE. NO. 16 PLATE VIII-17

f. Jim Hogg Park.- (Plate 16, sign layout plate 17). This park is situated on the north shore of the lake approximately 1.5 miles west of the main embankment. Access to the area will be provided by the proposed Jim Hogg access road that will connect to FM Road 2338. Terrain in the park is generally flat to rolling with a steep slope near the shoreline. Tree cover in the park is moderate. This site will be developed as an overnight use area. Recommended facilities to be constructed include access roads, parking areas, boat ramps, and other facilities as shown on the above plate.

Table VIII-7

DETAILED ESTIMATE OF COST OF RECREATIONAL FACILITIES FOR PLANNED DEVELOPMENT AT NORTH FORK LAKE

JIM HOGG PARK

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads	Mile			
a. Park roads(BIT)(two-way)		$90,000	1.5	$135.0
b. Park roads(BIT)(one-way)		60,000	2.5	150.0
2. Parking areas	S.Y.			
a. Paved(BIT)		0.005	10,316	53.6
3. Boat launching ramps(conc)	S.Y.			
4-lanes 68-feet wide		0.025	2267.0	56.7
4. Water supply systems	Each			
a. Lake pump and filter		5,100	1.0	5.1
5. Sanitary facilities	Each			
a. Masonry waterborne toilets		38,700	1.0	38.7
b. Service building (with toilets, showers, laundry facilities)		49,800	3.0	199.2
c. Sanitary dump station (trailer)		2,700	2.0	5.4
6. Utilities	Job			
a. Water distribution lines		152,900	1.0	152.9
b. Electric service lines		61,600	1.0	61.6
c. Light standards, etc.		6,000	1.0	6.0
d. Electrical hookup		8,000	1.0	6.0
e. Waterline hookup		6,300	1.0	6.3

Table VIII-7 (continued)

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
7. Picnic and camp units	Each			
a. Camp units		$0.445	158	87.7
8. Table shelters	Each			
a. Single (1-table)		0.555	158	87.7
9. Floating docks	Each			
a. Courtesy (boating)		2,200	2.0	4.4
10. Signs and buoys	Job			
a. Park entrance signs		500	1.0	0.5
b. Directional signs		1,300	1.0	1.3
c. Registration booths		400	1.0	0.4
d. Traffic signs		1,200	1.0	1.2
e. Buoys and anchors		3,000	1.0	3.0
11. Site improvement	Job			
a. Underbrushing		8,000	1.0	8.0
b. Turfing (toilets, camping and picnic areas)		22,500	1.0	22.5
12. Landscaping	Job			
a. Turfing and landscaping		30,000	1.0	30.0
13. Gates	Each			
a. Traffic control gates		0.500	2.0	1.0
SUBTOTAL				$1,108.9

8-10. Hiking trails.- Since many areas within the project are well suited for nature study, plant and animal photography, and primitive camping, a system of hiking and nature trails are planned to provide access to these areas. The proposed locations of the hiking trails are shown on plate VIII-18. The final location of the hiking trails will be determined by district and project personnel in the field.

8-11. Area below the embankment.- The area immediately below the embankment is proposed as a low-density day-use area with a parking area, toilet, and a site for a canoe rental concessionaire. Access is

provided by an existing county road (Jim Hogg Road) that connects with FM Road 2338. This road will be utilized for permanent access to the outlet works, stilling basin, and downstream areas.

8-12. Administration and maintenance buildings.- The project building shown on plate VIII-1, will be located on the left abutment about 300 feet from the end of the main embankment and directly west of the left abutment access road. The administration functions will include offices, administrative area, visitors' room, men's and women's restrooms, a lunch room, and a mechanical equipment room. The maintenance functions will include vehicle storage, a washrack, workmen's washroom and toilet, small tool and storage room, shop, paint storage, and water treatment room. Public access will be provided by the relocated left abutment access road which connects to FM Road 2338. A detailed description of the project building, visitors' overlook, and access road is presented in North Fork Design Memorandum No. 9.

8-13. Visitors' overlook.- The visitors' overlook shelter and parking area will provide an elevated view of the lake area. The location is shown on plate VIII-1.

IX - COST ESTIMATES

9-01. General.- The estimated cost by account number for the construction of the proposed development at North Fork including engineering, design, supervision, and administration is presented in table IX-1. The major components under cost account 01 for the perpetual Jim Hogg road easement is shown in table IX-2. A summary of the major line items (cost account 03) for fencing, fireguards, and revegetation and erosion control is outlined in table IX-3.

Table IX-1

SUMMARY OF COST ESTIMATES BY COST ACCOUNT NUMBERS

Cost Account Number	Item	Present Cost Estimate
01	Lands and damages(Jim Hogg access road)	$36,000
02	Relocations (Jim Hogg access road)	400
03	Revegetation, erosion control, fencing, and firebreaks	117,650
14	Recreation development	2,687,700
20	Permanent operating equipment	24,900
30	Engineering and design	246,600
31	Supervision and administration	191,700
TOTAL		$3,304,950

Table IX-2

LANDS AND DAMAGES: COST ACCOUNT NUMBER 01

Item	Description of Work	Present Cost Estimate
Jim Hogg access road	Perpetual road easement, severance damages, including 25 percent contingencies (22.1 acres)	$33,000
	Administrative costs	3,000
TOTAL		$36,000

Table IX-3

FENCING, FIREBREAKS, REVEGETATION AND EROSION: COST ACCOUNT 03

Location	Description of Work	Present Cost Estimate
Hunt Hollow wildlife area	Revegetation, erosion control, and and wildlife habitat improvement	$24,000
Perimeter of Government land	Fencing	90,000
Perimeter of Government land	Firebreaks	3,650
SUBTOTAL		$117,650
	Engineering and Design	$10,000
	Supervision and Administration	7,850
TOTAL		$135,500

9-02. Summary of recreation facilities and costs.- The estimated cost of recreation facilities for each park is presented in table IX-4. The estimated cost summary for the entire recreation development program is shown in table IX-5. The detailed estimate of cost for each park area is presented in chapter VIII. These cost estimates are based on the Corps of Engineers developing all of the recreation facilities on a non-cost-sharing basis. The cost estimates for the planned development used in the tables are based on 1 July 1973 price levels, and abstracts of bids for the construction of recreation facilities at other projects.

Table IX-4

COST ESTIMATES BY PARK AREAS: COST ACCOUNT NUMBER 14

Park Area	Present Cost Estimate
San Gabriel	$637,000
Cedar Hollow	7,700
Sawyer	8,000

Table IX-4 (continued)

Park Area	Present Cost Estimate
Walnut Springs	$8,600
Russell	747,200
Jim Hogg	1,108,900
SUBTOTAL	$2,517,400
Other Major Items:	
Hunt Hollow wildlife area	$9,900
Recreation development below the embankment	14,400
Hiking trails outside the parks	10,100
Jim Hogg access road	135,900
SUBTOTAL	$170,300
Engineering and Design	$228,500
Supervision and Administration	177,600
TOTAL	$3,093,800

Table IX-5

SUMMARY OF COST ESTIMATES FOR RECREATIONAL FACILITIES

NORTH FORK LAKE

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
1. Roads	Mile			
a. Park roads (BIT) (two-way)		$90,000	4.3	$387.0
b. Park roads (BIT) (one-way)		60,000	4.9	294.0
c. Gravel		20,000	0.3	6.0
d. Hiking trails		2,500	11.1	28.0
e. Access road (BIT) (paved)		135,900	1.0	135.9
2. Parking areas	S.Y.			
a. Paved (BIT)		0.005	27,297	138.4
3. Boat launching ramps (conc)	S.Y.			
a. 4-lanes 68 ft. wide		0.025	6,422	160.6

Table IX-5 (continued)

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
4. Water supply systems	Each			
a. Lake pump and filter		$5,100	4.0	$20.4
b. Drinking fountains		0,220	11.0	2.5
5. Sanitary facilities	Each			
a. Masonry waterborne toilets		38,700	6.0	232.2
b. Masonry concrete vault toilets		12,000	1.0	12.0
c. Service building (with toilets, showers, laundry facilities)		49,800	5.0	298.8
d. Bathhouse with toilets		47,600	1.0	47.6
e. Sanitary dump stations (trailer)		2,700	3.0	8.1
f. Frame toilets(chem unit)		2,000	5.0	10.0
6. Utilities	Job			
a. Water distribution lines		178,300	1.0	178.3
b. Electric service lines		136,400	1.0	136.4
c. Light standards, etc.		18,000	1.0	18.0
d. Electrical hookup		11,000	1.0	11.0
e. Waterline hookup		8,700	1.0	8.7
7. Picnic and camping units	Each			
a. Picnic units		0.405	120	48.6
b. Camping units		0.445	218	97.0
8. Table shelters	Each			
a. Single (1-table)		0.555	338	187.6
b. Group (3-tables)		4,400	5.0	22.0
9. Floating docks	Each			
a. Courtesy(boating)		2,200	5.0	11.0
10. Swimming beaches	Each			
a. Improved (sand)		25,000	1.0	25.0
11. Signs and buoys	Job			
a. Park entrance signs		1,500	3.0	1.5
b. Directional signs		5,800	1.0	5.8
c. Registration booths		0,600	3.0	0.6
d. Traffic signs		3,900	1.0	3.9
e. Buoys and anchors		7,500	1.0	7.5

Table IX-5 (continued)

(Amounts in thousands of dollars)

Item	Unit	Unit Cost	Account 14 Quantity	Account 14 Cost
12. Site improvement	Job			
a. Underbrushing		$17,000	1.0	$17.0
b. Turfing (Camping, picnicking and toilets)		47,500	1.0	47.5
13. Landscaping	Job			
a. Turfing and landscaping		55,000	1.0	55.0
14. Gates	Each			
a. Traffic control gates		0,500	9.0	4.5
15. Miscellaneous features	Each			
a. Dry storage, gravel		9,400	1.0	9.4
16. Others	Job			
a. Wildlife areas		0.0	1.0	9.9
SUBTOTAL				$2,687.7
Engineering and Design				228.5
Supervision and Administration				177.6
TOTAL				$3,093.8

9-03. Permanent operating equipment.- The special permanent operating equipment required for recreation and resource management is listed in table IX-6.

Table IX-6

PERMANENT OPERATING EQUIPMENT: COST ACCOUNT NUMBER 20

Item	Present Cost Estimate
1 - Crawler tractor with dozer	$15,000
1 - Trailer, tilt deck, 10-ton	3,000
1 - Pontoon craft	3,000
Modifications	1,000

Table IX-6 (continued)

Item	Present Cost Estimate
1 - Outboard motor, 25 hp	$700
1 - Mobile pump-out station, 275 gallon capacity	1,600
1 - Gasoline engine, 3 hp - portable macerating pump and hose	600
TOTAL	$24,900

9-04. Operation and maintenance costs.- The estimated annual cost of operation and maintenance and real estate management is listed in table IX-7.

Table IX-7

FUNDS REQUIRED FOR OPERATION AND MAINTENANCE

Recreation Facilities	
Operation and maintenance of facilities (includes contract cleanup, mowing, grading and maintenance of roads, repair of structures, nature areas, etc.)	$120,000
Project office	11,000
District Office staff functions	10,000
SUBTOTAL	$141,000
Real Estate Management Services	
Real Estate records, reports, audits, and Federal jurisdiction	$2,000
Compliance inspections	2,500
Utilization	3,000
Outgrants	9,000
Crops, timber, and gravel	1,800
Other	2,000
SUBTOTAL	$20,300
TOTAL	$161,300

9-05. Comparison of costs.- A comparison of the present estimate of cost with latest approved Project Cost Estimate (PB-3) for FY 74, effective 1 July 1973, is presented in table IX-8.

Table IX-8

COMPARISON OF COSTS

(Amounts in thousands of dollars)

Cost Acct No.	Item	Present Cost Estimate	Latest Approved PB-3	Difference
01	Lands and damages	$36.00		+ 36.00
02	Relocations	0.40		+ 0.40
03	Revegetation	117.65		+ 117.65
14	Recreation development	2,687.70	$722.00	+1,965.70
20	Permanent operating equipment	24.90		+ 24.90
30	Engineering and design	246.60	67.00	+ 179.60
31	Supervision and administration	191.70	57.00	+ 134.70
TOTAL		$3,304.95	846.00	+$2,458.95

9-06. Analysis of change in cost.- The project cost estimate (PB-3) for FY 74, effective 1 July 1973, represents the approved cost for the initial recreation development at North Fork Lake. These estimates are based on 200,000 recreation days annually as outlined in the Preliminary Master Plan, Design Memorandum No. 6 (DM #6). The present cost estimate of $3,304,950 is representative of the optimum development based on 610,000 recreation days annually. The development presented in this master plan is closely corelated with the total development planned in the preliminary master plan. The comparison of the present estimate of cost with the PB-3 shows a significant

increase in cost as the result of the projected increase in visitation. This amounts to an increase of $2,458,950 in the total project cost. The reasons for the difference in cost for each cost account are explained in the following paragraphs.

a. Lands and damages.- The $36,000 increase is due to the addition of Jim Hogg access road which will provide access to Jim Hogg Park. The cost increase includes a perpetual road easement, severance damage, 25 percent contingency, and administrative costs.

b. Relocations.- A $400 increase in cost account 02 is attributed to the relocation of existing telephone and electrical lines associated with the access road.

c. Revegetation.- The approved PB-3 does not contain an allowance for fencing, fireguard, revegetation, and erosion control. Because of our responsibility to protect project resources, and to achieve economic management and smooth administration, it is necessary to include $117,650 in the budget for these items.

d. Recreation facilities.- This $1,965,700 increase is primarily due to the following:

(1) According to the preliminary master plan, DM #6, the initial projection was 200,000 recreation days annually, assuming that the project was completed by 1972. During the development of the master plan, the recreation demand was reevaluated in accordance with ER 1120-2-403. Subsequent study revealed that the initial use should be adjusted to 610,000 recreation days annually with project completion by 1980. Because of the projected significant increase in recreation demand, additional recreation facilities were added to accommodate the increase of 410,000 recreation days annually. Consequently, there is a significant increase in the cost estimate.

(2) The design standards for the facilities presented in the preliminary master plan DM #6, have been revised to comply with the updated planning and design criteria outlined in ER 1120-2-400 and EM 1110-2-400. This required action resulted in an increase in the number and type of recreation facilities.

(3) As previously stated, the increase in recreation facilities is due primarily to an increase in visitation and a change in design criteria. A critique of the significant changes is as follows:

a. There is a significant increase in the number of miles of road to provide the necessary circulation and access.

b. A $135,900 increase is due to the fact that the current PB-3 contains no allowance for Jim Hogg access road.

c. An extensive hiking and nature trail system has been added.

d. There is an increase in the number of picnic and camping facilities to serve the design day load.

e. Installing waterborne toilets in lieu of frame and masonry pit toilets increases cost.

f. An improved water supply and electrical system is provided to serve the new recreation facilities.

g. The overnight camping area in Jim Hogg Park is provided with individual water and electrical hookups.

h. More boat launching lanes have been added.

i. A detailed sign plan has provided a more accurate sign cost.

(4) Because construction costs have accelerated sharply in the last few months, the cost estimates (which are based on 1 July 1973 price levels, and abstracts of bids for the construction of facilities at other projects) reflects a significantly higher incremental increase in cost than is shown in the PB-3.

e. Engineering and design, and supervision and administration.- The $179,600 increase in engineering and design, and the $134,700 increase in supervision and administration are a reflection of the increase in the other project costs.

X - FACILITY LOAD AND OTHER DESIGN CRITERIA

10-01. General.- The purpose of establishing design criteria is to provide guidance to insure that the public is provided with a safe, high quality recreation development and facilities which promote their health, welfare, and esthetic enjoyment while enhancing or minimizing the damage to the overall environment of the site. Because each project has different site characteristics, design criteria that were appropriate in one situation may not suffice for another. Therefore, determination of design criteria and facility load has been based on analysis of each situation rather than upon reflection of what has been found to be applicable in other circumstances. The design criteria and guidelines presented in Engineer Regulations 1110-2-400, 1120-2-400, 1130-2-400, 1165-2-400; Engineer Manual 1110-2-400, Technical Manual 5-822-2, as well as the following comments, will be used as guidelines in planning new facilities. Every effort will be made to meet program requirements and to preserve and enhance natural resources.

10-02. Access and circulation.-

a. Roads.- Existing State and county roads which provide access to the various sites will be used wherever practicable. In addition, the State and county will be encouraged to continually improve existing roads that provide access to the project. All necessary rights-of-way which have been purchased or will be purchased by the Government to provide access from existing roads to public use areas will be 200 feet minimum width. Existing roads within public use areas are to utilized where possible; when used, they will be maintained in proper condition at all times. Specific guidance for the planning and design criteria of access, circulation, and service roads, and vehicular trails is presented in TM 5-822-2. Road surfacing materials will be bituminous, gravel, or other material which will provide for all-weather roads. A reasonable and safe speed limit for all project roads will be established in cooperation with the appropriate enforcement authority. Normally, the speed limit on primary access roads between the entrance and the improved public recreation area is no higher than 35 miles per hour. All road construction will be sited so as to preserve the lakeshore environment or other natural features of the project to best complement or lessen their impact upon the park environment. Additional guidance is provided in EM 110-2-400.

b. Picnic, trailer, and boat parking areas.- The parking areas shown on the recreation facilities plan of development will be sited in the field so they will be be in harmony with the environment. Parking areas will also be designed to avoid vehicular backing onto heavily traveled access roads. The minimum parking space for automobiles will be 10 feet by 20 feet for each

picnic table. Car-trailer spaces for boat ramp parking will be a minimum of 10 feet by 40 feet for 90-degree head-in parking, and 10 feet by 35 feet for 45-degree parking, with 25-foot wide access lanes. A car-trailer parking space at least 10 feet by 40 feet will be provided for each camping space. Specific instructions for each activity are provided in EM 110-2-400.

c. Boat launching ramps and courtesy docks.- Boat launching ramps will be 14 feet or multiples thereof with the length governed by the slope of the land and estimated water level fluctuations. The upper and lower vertical limits and the slope of ramps will be in accordance with paragraph 3a of appendix A of EM 1110-2-400 wherever practicable. Boat ramps will be constructed of concrete according to approved plans and will be located so as to minimize hazards to boating operations. Ramps will be provided with riprap protection as required. Floating courtesy docks will be provided at boat ramps and along the shoreline in camping areas. The minimum requirement for a courtesy dock is an expected 40 boat launchings per normal weekend day.

d. Walks.- Walks will be constructed within developed recreation areas as needed. They will be designed to provide convenient and safe pedestrian access and circulation to parking areas, bathhouses, comfort stations, and other facilities. Preservation of natural features is also stressed in siting walks.

e. Hiking trails.- A system of hiking and nature trails will be constructed to provide access for bank fishermen, hikers, and bird watchers, and to interconnect recreation areas or sites. In heavy use areas, trails will be surfaced with permanent materials such as gravel surfacing to control erosion and lessen the impact upon the site. The final location of the hiking and nature trails will be determined by district and project personnel in the field.

10-03. Structures.-

a. Architectural design.- The architectural design objective is to provide facilities which lend grace to the environment, provide mental stimulation, have pride-inducing personality, and make best use of the land. This can be done only by allowing the project to take on a character which will blend with its surroundings. The structures, therefore, should be constructed of local material, using up-to-date technology to keep the initial cost and maintenance at a minimum.

b. Siting.- All facility siting will be assigned only to portions of the site that are compatible with that use. All permanent structures constructed on project lands should be located above the 50-year flood frequency elevation wherever possible. Siting of sanitary facilities shall be in accordance with the "Rules and Regulations Governing Preparation of Plans and Specifications for

Public Works Projects" of the Texas State Board of Health. EM 1110-2-400 also outlines the basic design criteria for planning and siting structures.

c. Plans for facility construction.- Approved plans will be used in the construction of recreation facilities; therefore, their inclusion in this design memorandum is considered unnecessary.

10-04. Utilities.-

a. Water supply in public use area.- Because of undependable water bearing formations, potable water in each public use area will be provided from water filtration and treatment plants using lake water. However, municipal water will be used wherever practicable. All facilities for water supply and public use will be coordinated with the Texas Department of Health according to their general type and location. These facilities should be designed in accordance with EM 1110-2-4201 and should meet the standards required by Federal, State and local laws.

b. Water supply in project building and visitors' overlook.- The approved water supply plan provides for connecting onto the existing city of Georgetown's 6-inch line in the Oak Crest Estates. The water system will be used to supply domestic potable water to the administration and maintenance building and the visitors' comfort station, and for irrigating grass, shrubs, and trees planted in these areas.

c. Electrical supply.- The lake area is served by the Perdenales Electric Cooperative. The power lines can be extended as required for project needs. All power lines in all major recreation site developments will be placed underground unless special conditions make such an installation impracticable. The design and construction of any electrical facility will conform to the owner's standards and comply with Government codes.

d. Telephones.- When public telephones are required, they can be housed in a basic structure or in specially provided park-adapted telephone structures with markings harmonious to the adjacent recreation area. Rural telephone facilities are located in proximity to the project. Telephone service can be provided as the need arises. The location of the lines should be underground in all major development areas unless it is impracticable. Additional guidance is contained in EM 1110-2-400.

e. Sanitary treatment facilities.- Sewage generated by waterborne toilets, service buildings, trailer dump stations, and like facilities will be biologically processed in package treatment plants, aerated lagoons, or septic tank and lateral systems. These will be sited and sized on the basis of sound engineering practices which include

a buried sewage system and a floating unit to transport sewage from chemical toilet units in Cedar Hollow and Sawyer Parks, which are primitive areas inaccessible except by foot or water. This floating system will consist of a detachable trailer transport tank unit with a pump mounted on an outboard motor-powered pontoon so that the trailer unit may be removed and pulled by motor vehicle directly to a treatment plant for discharge. Transport of wastes from Walnut Springs Park will be accomplished by use of the trailer tank unit and a vehicle.

f. Waste disposal.- Nonbiological solid residues will be handled in an approved manner with disposal at sanitary landfills or municipal facilities. Only liquid effluents meeting State and Federal standards will be discharged to North Fork Lake.

10-05. Site improvements.-

a. Vegetative improvements.- A vegetative management plan, including a protection, development, and improvement program, will be prepared in accordance with ER 1130-2-400, and will be submitted when completed (see chapter XII). A turf and landscaping plan for all graded and disturbed areas in the vicinity of the project building and visitors' overlook and access road has been prepared and is presented in North Fork Lake, Design Memorandum No. 9 (Revised). In addition, a landscaping plan for the public use areas will be submitted when completed.

b. Clearing for road right-of-way in public access areas.- The clearing limits of the park roads will be confined within the top of the back slope and/or the toe of the fill area as far as practicable. In order to prevent the needless destruction of desirable trees and shrubs, the back slope shall be warped around such growth. Excessive ditching will be eliminated in order that vegetation may grow as close to the roads as possible. Selective clearing will be performed to encourage desirable growth on the back slopes. Selective clearing will be performed or supervised by trained district personnel after on-site analysis.

c. Site preparation.- Only a minimum of grading and clearing should be done in preparation for construction of recreation facilities. Since the cover is very limited, the decision whether to save or cut a tree should be made on an individual basis as the result of careful judgment and thorough consideration of site conditions. Additional reference is provided in EM 1110-2-400 and ER 1110-2-400.

10-06. Signs and interpretive guidance.- The objectives of a sign and interpretive guidance program will be to provide appropriate signs, markers, and displays for the proper protection and administration of the project resources and to guide, inform, educate,

and protect the visiting public. Signs, markers, and displays needed to accomplish these objectives will be developed and placed in accordance with instructions outlined in EM 1110-2-400, ER 1110-2-400, ER 1130-2-400, and the Handbook on Signs issued by the Southwestern Division.

XI - SPECIAL PROBLEMS AND CONSIDERATIONS

11-01. General.- Anticipated problems and features requiring special consideration because of their direct relationship to successful operation of the recreation and resources management program are discussed below.

11-02. Environmental protection.- The following measures will be undertaken in accordance with EM 1110-2-38 and Draft Specification CE-1300 to aid in the preservation of the environment, and for the prevention of despoilment of scenic attributes of the area.

a. Access roads.- To avoid additional landscape scars the limit of roadway clearing will not exceed 10 feet past the toe of fills or the top of cut back slopes. In other than solid rock, the harsh appearances of roadway will be subdued by rounding off tops of excavated slopes. All downed trees, loose rock, rubble, and other debris created by construction activities will be cleared from the area.

b. Borrow areas.- Borrow areas downstream of the embankment will be reserved for emergency use only. However, if these borrow areas are utilized, the rehabilitation measures are outlined in section 1-06 of North Fork Lake DM #23.

c. Recreation facilities construction.- During construction of the recreation facilities, all construction activity will be kept within the established limits of the construction area. Any area scarred by construction activities will be regraded to approximate natural topography, and will be revegetated to blend with the surrounding landscape.

d. Geologic features.- Rock faces and other interesting geologic features, including natural boat landings which will be exposed by drawdown shall be preserved.

11-03. Revegetation plan.- Since the bottomland areas of the project are in cultivation, a potential for erosion and siltation has been created. Therefore, it is necessary to phase out all cultivated crops as rapidly as possible and to implement a plan to restore project lands presently in cultivation to appropriate vegetative cover as soon as possible. The revegetation plan will consist of planting trees, native grasses, and introduced grasses above the 5-year frequency elevation. Bermudagrass and buffalograss will be planted below the 5-year flood elevation. This program should include lands below the conservation pool elevation in order to establish ground cover prior to initial storage of water. This

is one of the better opportunities to stabilize the shoreline and provide fertility in the form of organic matter for increased fisheries production during the early life of the project. The revegetation plan is presented on plate XI-1. In developing this plan the following guidelines have been considered:

a. The selection of planting areas and revegetation treatment will be coordinated with the appropriate district personnel, i.e., agriculturist, biologist, forester, agronomist, and landscape architect to insure that the plantings will be protected in the initial stages of new development. Protection will be accomplished by fencing and by coordination of the leasing program with the planting program. Qualified personnel under the direction of the appropriate district personnel will supervise selection of species and the planting operation.

b. The following grasses are recommended for revegetation in these areas:

(1) Bottomlands (below 5-year flood level of area)

Bermudagrass
Johnsongrass
Buffalograss

(2) Uplands (above 5-year flood level of area)

KR bluestem	Indiangrass
Kleberg bluestem	Texas wintergrass
Little bluestem	TAM Wintergrass
Big bluestem	Harding grass
Kleingrass	Bermudagrass
Side oats	Canadian wildrye
Virginia wildrye	

c. The following trees are recommended for the revegetation program:

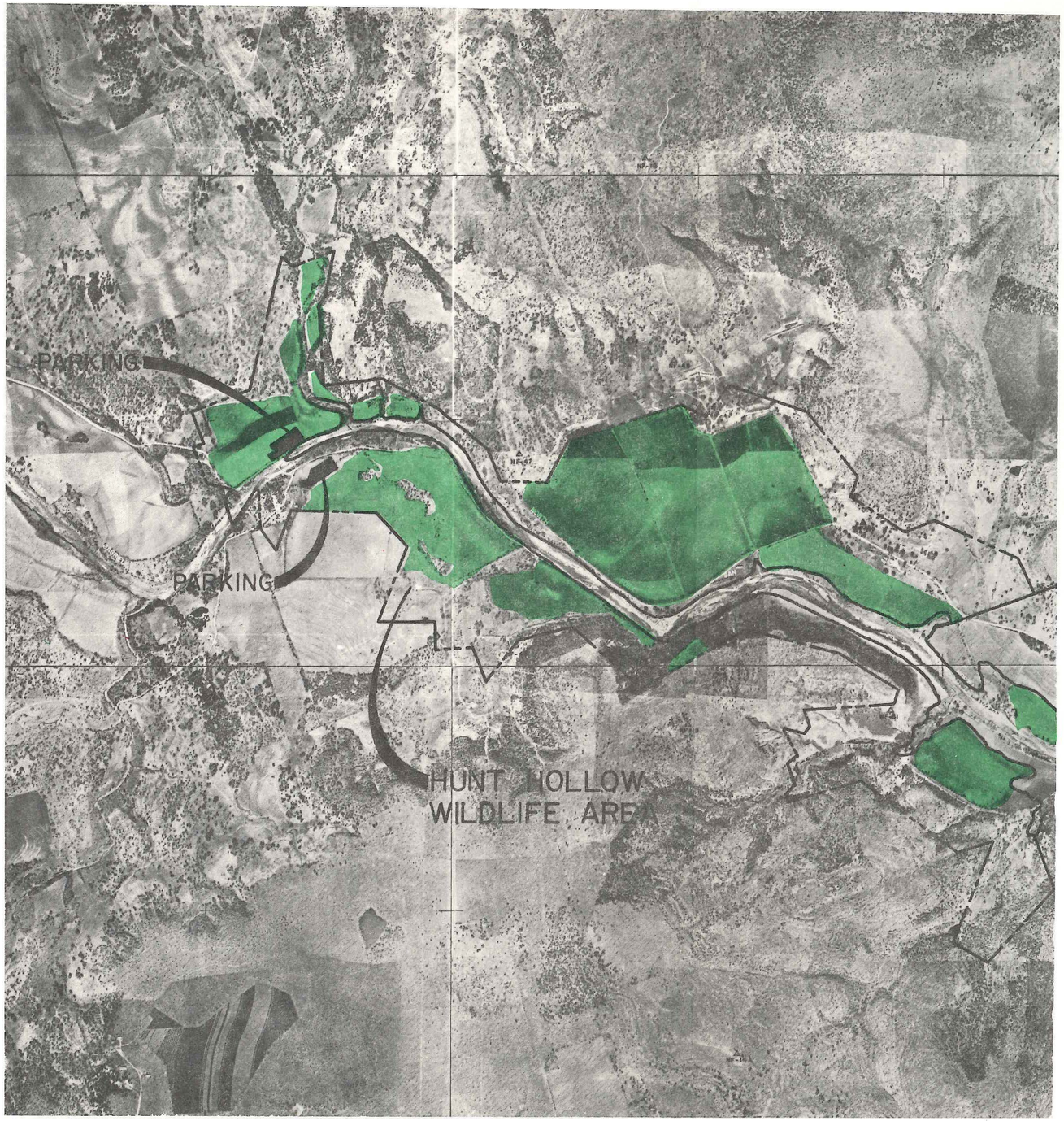
Pecan	Osage orange	Yaupon
Sycamore	Crape myrtle	Hickory
Red oak	Black locust	Ash
Cedar elm	Winged elm	Hackberry
Live oak	Cottonwood	Cypress

d. Consideration should be given to establishing and maintaining a diversity of plant species to minimize the possibility of complete loss by natural causes.

e. Areas containing adequate vegetative cover will not be disturbed if it can be avoided. A minimum of artificiality in design will be of prime importance.

CORPS OF ENGINEERS

U.S. ARMY



N

LEGEND

REVEGETATION AND WILDLIFE HABITAT IMPROVEMENT

SCALE 1 INCH = 2000 FEET

2000 1000 0 2000 4000

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE

SAN GABRIEL RIVER, TEXAS

REVEGETATION PLAN

U.S. ARMY ENGR DIST, FORT WORTH SEPT. 73

TO ACCOMPANY DESIGN MEMORANDUM NO. 16 MASTER PLAN

FILE: NO. 16 PLATE: XI-1

f. Those areas of extensive tree cover within the project boundaries will be treated as necessary to maintain effective ground cover and to promote desirable wildlife habitat. Management will include cutting in some areas to promote browse production and possible planting to provide cover. These activities will be done by project personnel under the direction of the district forester and district biologist.

11-04. Project clearing requirements for recreation and resources development.- The features considered were requirements for shoreline stabilization, esthetics, vistas, safety, health, beach, marina development, and fish and wildlife. Clearing criteria contained in ER 415-2-1, and paragraph 5d(1) of ER 1130-2-400 for multiple purpose reservoirs cover most of the requirements. However, additional requirements were necessary as shown below.

a. Water tolerant species of trees should be left above the top of the conservation pool.

b. Trees in boat harbors should be cut close to the ground line.

c. Stumps in the beach areas should be removed.

d. Marketable timber below the normal conservation pool should be salvaged except in fish habitat areas.

11-05. Beautification.- Beautification will be considered in facility design, in relocations, and in excavation and spoil areas, and in clearing, landscaping, and planting plans. The criteria covering most of the beautification requirements are found in ER 1110-2-400, ER 1130-2-400, ER 1165-2-2, ER 1165-2-400, and 1110-2-400.

11-06. Boundary surveys and monumentation.- Because of the necessity to control encroachment on Government property, boundary lines will be surveyed and monumented as soon as possible in accordance with the provisions of ER 1120-2-400 and ER 405-1-200. Early completion of boundary monumentation is essential to control encroachments on Government property. These boundary line markers would be checked periodically by field personnel to ascertain if any changes have been made to the location of markers or boundary lines either by accident or impropriety. Boundaries and markers should be readily distinguishable at all times.

11-07. Fencing.- In order to achieve economic management and smooth administration of project lands, the boundary of the project

will be fenced. Fencing will prevent encroachment, disputes over boundary lines, trespassing by free-ranging livestock, and related damage or degradation of natural and developed resources. It also will be done to help control access to the area by funneling vehicles to established entries and roadways. This, in turn, should help prevent off-road vehicle traffic. By affecting control of people and livestock the fence will reduce administration problems and the costs associated with investigating and reporting encroachments.

11-08. Firebreak.- Since the project is located in a region characterized by high fire danger, a firebreak will be developed and maintained along the perimeter of the project. Firebreaks will be tied to natural breaks such as the lake or roads; ridgelines and hilltops are the best locations to prevent the spread of wildfire. The firebreak will be at least 10 feet wide. Downslope breaks will be provided with waterbars to prevent erosion.

11-09. Entrance fees.- Section 210 of the Flood Control Act of 1968 (Public Law 90-383) prohibits the collection of entrance fees at Corps of Engineers administered projects. Under existing laws and directives it is the policy of the Corps of Engineers to charge user fees for highly developed camping areas and where special services are provided.

11-10. Special consideration of the handicapped and elderly.- As pointed out by the recent White House conference on aging, the elderly and handicapped people are indeed an important element of our population. With earlier retirements, better health care, and greater longevity, we can expect more older people to become active participants in outdoor recreation activities. Therefore, provisions for the elderly and the handicapped will be made. These special considerations will be in accordance with ER 1110-2-102, particularly in regard to site grading, sidewalks, parking areas, ramps, and toilet facilities.

11-11. Civil disturbances.- Because of the recent trend towards violent and disruptive demonstrations and other civil disturbances, the reservoir manager and his staff should be constantly aware of any signs of potential disturbance. ER 1130-2-313, SWDR 1130-2-4, and SWDR 1130-2-7 provide guidance on this subject.

XII - ADMINISTRATION AND MANAGEMENT

12-01. General.- The concept behind the administration and management of both created and natural project resources is to provide continued enjoyment and maximum sustained use by the public of the land, water, and associated recreation resources consistent with their carrying capacity, esthetic, and biological values. In accordance with this concept, the policies regarding the administration and management of the project have been formulated to make the majority of the lake and the Government-owned land available to the visiting public to the fullest extent compatible with an orderly and planned development. These policies control the administration, management, and development of the project area, but will not conflict with the operation of the project for its authorized purposes. They will be based on legislation enacted by Federal, State, and local governmental agencies, and experience gained in the operation and development of similar projects and public parks. The administration and management of the project are accomplished jointly through the district office and field personnel of the Fort Worth District.

a. District office.- District office personnel will be concerned principally with project operation and management in accordance with purposes for which the project was authorized; the nature, location, construction codes, and requirements of development and improvements; coordination and reconciliation of activities relative to policies and regulations; coordination with representatives of other agencies and individuals; processing of leases, licenses, and permits not delegated to field personnel for issuance; and public relations.

b. Field office.- Field office personnel assigned to the project will be concerned with direct operation, maintenance, and management of the project; supervision of all activities conducted on the impounded water and land over which the Government acquires fee title or a lesser interest; protection and maintenance of Government properties and interests; and requirement of high standards of public health and safety. The field personnel will be trained in the rudiments of fire and mosquito control. Sufficient materials and equipment will be made available at the project for the field personnel to conduct these activities when the conditions demand. The reservoir manager will enter into cooperative agreements with local Governmental agencies for particpation in suppressing fires without cost to the Federal Government when the need arises. The reservoir manager will be delegated as much authority as is practicable in order to maintain expeditious and beneficial administration and management of the project. He will be furnished with copies of all rules and regulations pertaining to maintenance and management of the project, including a manual outlining project procedures, policies, responsibilities, and duties.

12-02. Staffing and organization of the project.- Sound and efficient management requires that the staffing and organization at each project should provide for expertise in disciplines necessary for light construction, maintenance of facilities, and effective administration and management of the project and its related resources. Based on the above criteria, the Government personnel shall be composed of a resident engineer, a reservoir manager, a supervisory reservoir ranger, two reservoir rangers, an outdoor recreation planner, a clerk-typist, a reservoir maintenance foreman, three reservoir maintenance workers, and seasonal labor as required. Table XII-1 gives information regarding proposed project personnel. The total annual cost of the proposed personnel is estimated to be $119,500.

Table XII-1

PROJECT PERSONNEL

Resident engineer, GS-13 (part-time - 10%)	$3,500
Reservoir manager, GS-11	15,000
Supervisory reservoir ranger, GS-09	13,000
Reservoir rangers (2), GS-07	21,500
Outdoor recreation planner, GS-09	13,000
Clerk-typist, GS-05	7,500
Reservoir maintenance worker foreman, WS-05	10,500
Reservoir maintenance workers (3), WG-08	25,000
Laborers (2), WB-03 (seasonal labor)	10,500
PERSONNEL COSTS	$119,500

12-03. Operation and maintenance of the project.-

a. Operating agency.- The operation and maintenance of North Fork Lake will be a Federal function and will be administered by the Corps of Engineers under the direct control of the District Engineer, Fort Worth, Texas.

b. Operation and maintenance personnel.- It is the policy of the Corps of Engineers to limit full-time specially trained operation and maintenance personnel to the minimum number required for proper operation and maintenance of project facilities. Seasonal maintenance should be performed by hired labor or contract labor when it is in the best interest of the Government. Repairs involving substantial costs or extraordinary maintenance should be accomplished by contract in lieu of hired labor whenever it is to the advantage of the Government.

12-04. Park areas.- The six park areas will be administered and managed in accordance with ER 1130-2-400, ER 405-1-800, ER 405-1-830, ER 405-2-835, ER 405-2-12, EC 405-2-12, SWDR 1130-2-7, the Operations and Maintenance Manual, and the master plan.

12-05. Commercial sites and services.- Commercial sites have been designated in Russell Park and in the area below the embankment. It is proposed to operate the commercial sites on short term leases, or service contracts. The services provided by the concessionaires will include, but not limited to, boat and canoe rentals, bait shop, dry storage, boat gas and oil, launching of boats, and a shuttle system to the primitive park areas.

12-06. Access by adjacent property owners.- Owners of lands adjacent to the project will be allowed reasonable access to the lake in accordance with SWDR 1130-2-7 dated 25 September 1968. This does not mean that the adjacent owners are conveyed any right to Government-owned lands, nor does it mean that these owners have any private rights for lease therof for access or recreational purposes. The use of Government-owned roads by adjacent property owners shall be in accordance with SWDR 405-2-9 dated 11 December 1970.

12-07. Land and water zoning.- The land and water areas of the project have been zoned to insure safety, and protect property and the resources of the project. All zoned areas will be clearly and appropriately designated with approved signs or buoys. Temporary zoning for special events of short duration may be permitted after approval by the reservoir manager. SWDR 1130-2-7 contains detailed instructions regarding zoning of land and water areas.

12-08. Fishing and hunting.- Fishing and hunting on Government-owned lands and water will be in accordance with applicable Federal, State, and local laws; enforcement will be the responsibility of Federal and State agencies. In addition, fishing and hunting will be in accordance with the project land and water zoning plan. Reservoir managers should refer to SWDR 1130-2-100 and Title 36 for guidance.

12-09. Interim use.- Lands not required for immediate or near-future use for public use, fish and wildlife, and project operations may be leased for grazing purposes, may be designated for hunting, or may be left idle for soil restoration through native plant succession. Grazing will be used as a management tool.

12-10. Archeological and historical.- Any further investigations concerning excavation or historical study will be administered in accordance with ER 405-1-875. Only the National Park Service, either directly or through cooperating agents, is authorized to survey or excavate historical or archeological sites located on Federal lands. Other applicants will be so advised so that the National Park Service may make such arrangements with the applicant as are authorized.

12-11. Protection of biological resources of project lands and waters.- A biological management program for North Fork Lake is planned for the purpose of deriving maximum benefits from fish and wildlife resources associated with the project. The Corps of Engineers will solicit the assistance of and coordinate the efforts of the U.S. Fish and Wildlife Service, the Environmental Protection Agency, the U.S. Public Health Service, the Texas Parks and Wildlife Department, and the Texas Department of Health in the implementation of this program.

12-12. Visitor and facility protection.-

a. Law enforcement.- Enforcement of civil and criminal laws at the reservoir will remain the responsibility of duly constituted officers of Federal, State, and local governmental agencies. The Corps of Engineers, through field personnel, will cooperate fully with all law enforcement officers responsible for the enforcement of laws relative to civil actions, game and fish conservation, public health and sanitation, boating, and prevention of pollution. Citation authority covers refuse dumping and the provisions of Title 36 only. Where practicable, the resource manager will provide rangers to man selected park areas on a 24-hour basis during peak recreation periods to provide protection and reduce vandalism. The policy of the Corps of Engineers regarding law enforcement is contained in ER 190-2-3.

b. Pest control.- Insecticides, herbicides, and other chemicals may be used to control insects, weeds, and other pests which may be harmful to the health and safety of the public or detrimental to the natural features of the project when they cannot be controlled by other methods. The use of biological or mechanical control other than chemical pesticicides is encouraged where practicable and where such methods will not prove harmful to the ecosystems. All spraying and control activities will be coordinated through the Fort Worth District biologist and local and county health officials. ER 1130-2-232 (Pest Control Program for Civil Works Projects) and instructions on the labels will be followed when using and handling all pesticides, insecticides and other chemicals. A mosquito surveillance program will be conducted during periods when mosquitoes are most active (April to October). Mosquito samples will be forwarded to the Fort Worth District biologist, and analyzed for species and numbers. The results of the sampling will be made available to any interested agency upon request.

c. Pollution control.- The control of air and water pollution and solid waste disposal shall be in accordance with Executive Order No. 11507 on Prevention, Control and Abatement of Air and Water Pollution at Federal Facilities, and the Executive

order dated 23 December 1970 entitled Administration of Refuse Act Permit Program. All project personnel will maintain constant vigilance for sources of pollution to the reservoir and its stream tributaries. Guidance for this program is contained in ER 1165-2-116. Additional pollution control will be administered in accordance with ER 1130-2-400, ER 405-1-800, and the Operation and Maintenance Manual.

12-13. Health and safety.-

a. Safety.- A comprehensive safety program will be developed for all project land and water areas. Chapter XV presents general guidance for the safety program until such time as a project safety plan can be added to the master plan as an appendix.

b. Health and sanitation.- The development and use of the reservoir are planned for the public interest and the utmost consideration has been given to the maintenance of high standards of public health and safety. The State health laws, rules, and regulations are applicable to all facilities constructed and provided at the project. Commercial operators and licensees are also required to abide by the State health laws, rules, and regulations. Disposal of waste, trash, and debris will not be permitted on Government land without authorization, and then only in accordance with State laws and at designated locations.

c. Solid waste disposal.- All feasible solutions to solid waste disposal should be given thorough consideration, and studies should include discussions with the responsible local health officials. Solid waste disposal may be by contract with off-project sanitary collectors when such a method is economically and administratively feasible. Where practicable, arrangements should be made for disposal of solid wastes on nonproject lands. Where this is not feasible, disposal will be accomplished on the project by means of land fill in isolated areas or by incineration.

12-14. Boating.-

a. General.- All boating activities will be in accordance with applicable State laws or acts covering boats, boating, and water safety, and SWDR 1130-2-7. Boaters will be encouraged to comply with such laws and regulations. These boating laws and regulations will be posted at launching ramps, public use areas, and the project office.

b. Unsafe operation.- Authorized project personnel will issue citations in accordance with ER 190-2-4. The reservoir manager will also report any unsafe operation of boats to the local authorities charged with enforcement of the State boating and safety laws. In the period before arrival of law enforcement authorities, the reservoir manager will take action as deemed appropriate to protect life and property.

12-15. Visitor interpretation and education.- A visitor interpretation and education program will be developed to inform and educate the public with regard to the purposes and concept of operation of the project and the historical and natural features of the area. This program will be developed in accordance with ER 1130-2-400 and SWDR 1130-2-7.

XIII - VEGETATIVE MANAGEMENT PLAN

The Operations Division will prepare the vegetative management plan within the scope of ER 1130-2-400. It should be finalized and submitted for approval by higher authority as soon as practicable, but no later than 3 years after the project becomes operational. The purpose of this plan is to increase the value of project lands for recreation and wildlife, and to promote natural ecological conditions by providing a protection, development, and management program which is in accordance with accepted conservation and land management practices. The objectives of this plan include, but are not limited to, establishment of vegetation, control of erosion, provision of wildlife habitat, screening of unsightly areas, and provision of shade and protection from the sun and wind. In order to accomplish these objectives, each designated land area must be analyzed on an individual basis to determine what natural resources are available, which should be preserved, and the recommended treatment for its best and wisest use. This plan should include measures required for erosion control, wildlife habitat maintenance and enhancement, and other techniques for protecting and managing the vegetative resources of the project.

XIV - FIRE PROTECTION

The primary responsibility for the preparation, administration, and implementation of the fire protection plan will be that of the reservoir manager and his staff. The protection plan should be prepared according to ER 1130-2-400. It should be finalized and submitted for approval by higher authority as soon as practicable, but no later than 3 years after the project becomes operational. The objectives of the plan are to prevent, detect, and suppress all fires that may occur on the project lands, or on adjacent lands from which they will spread to project lands. This plan will include or provide for cooperative agreements with State, county, and local agencies for mutual assistance in fire detection and suppression, training of personnel, procedures in case of fire, and provision for necessary equipment and tools to be readily available for prompt suppression activities. In addition, this plan will provide for a fire prevention program that will include, but not be limited to public education programs, posting of fire laws and regulations, and dissemination of literature on fire prevention.

XV - FISH AND WILDLIFE MANAGEMENT PLAN

The basic objective underlying the development of a fish and wildlife management plan for the project is to provide for the conservation, maintenance, and management of fish and wildlife resources and wildlife habitat. The development of this plan will implement section 3 of the Fish and Wildlife Coordination Act (Public Law 85-624). Further guidance for the fish and wildlife program is contained in SWDR 1130-2-7, ER 1120-2-401, and ER 1130-2-400. The fish and wildlife plan should be developed in accordance with instructions presented in ER 1130-2-400. This plan would include, but not be limited to, species being managed, short- and long-range management objectives, wildlife habitat maintenance and enhancement plans, and coordinated efforts with other agencies relative to fish and wildlife management on the project.

XV - FISH & WILDLIFE MANAGEMENT PLAN

15-01. General.- The intent of this section is to present a conceptual plan for developing and managing project fish and wildlife resources. This plan will serve as a conceptual guide until a more detailed management plan can be developed. The broad objective of the fish and wildlife management plan is to conserve, maintain, and improve the fish and wildlife habitat in order to produce the greatest dividend of fish and wildlife for the benefit of the general public. The implementation of this plan is the first step towards achieving the goals of the Fish and Wildlife Coordination Act (Public Law 85-624).

15-02. Administration of the fish and wildlife management plan.- The Fort Worth District will assume the basic responsibility for developing and implementing the fish and wildlife habitat management plan. Coordination will be maintained within the district to insure that it is effectively carried out.

15-03. Management responsibilities of the Texas Parks & Wildlife Department and the U. S. Fish and Wildlife Service.- The responsibility for managing resident fish and game species is essentially that of the Texas Parks and Wildlife Department. The U. S. Fish & Wildlife Service also assumes a dual responsibility for the management of these resources with particular emphasis on migratory bird species. In recognition of the above responsibilities, it is the Corps of Engineers policy to encourage these agencies to actively manage or participate in the joint management of the fish and wildlife resources at this project.

15-04. Enforcement of game and fish laws and regulations.- Authorization for enforcement of game and fish laws and regulations pertaining to the taking of fish and wildlife lies with the State of Texas. Regulations governing the migratory bird species are administered under the authority of both the State of Texas and the U. S. Fish and Wildlife Service. Under Title 36 rules and regulations, the Corps of Engineers has the authority to close certain areas to hunting and fishing in the interest of safety and to prevent interference with project operations.

15-05. Consideration in development of the fish and wildlife management plan.- This report utilizes information furnished by the U. S. Bureau of Sport Fisheries and Wildlife (now the U. S. Fish and Wildlife Service) in their report on the fish and wildlife to be affected by the San Gabriel River and tributaries project, Texas, dated 28 April 1967. This report is presented in Appendix A, Supplement No. 1, General Design Memorandum No. 4. During June 1974, representatives of the Fort Worth District, U. S. Fish and Wildlife Service and the Texas Parks and Wildlife Department participated in a field reconnaissance of the North Fork Lake project. The Fish and

Wildlife Service submitted their recommendations in a report, dated 15 August 1974. This report has been included at the end of this section. Many of their comments and recommendations have been incorporated into this plan.

15-06. Coordination with other agencies.- Continuous coordination will be maintained with organizations having collateral interest in the fish and wildlife resource. Periodically the Fort Worth District will arrange timely conferences with the U. S. Fish and Wildlife Service and the Texas Parks and Wildlife Department to discuss the progress of the plan and the short and long term management goals.

15-07. Endangered and threatened species.- There are no known endangered or threatened species of mammals, amphibians, or reptiles in the project area (U. S. Department of Interior, Resource Publication 114, Threatened Wildlife of the United States). A review of the status of bird species indicates the Southern Bald Eagle and Whooping Crane are on the endangered species list. The American Peregrine Falcon and the Golden-cheeked Warbler are listed as threatened. Two species were listed as undetermined status: they are the American Osprey and the Black-capped Vireo.

15-08. Protection of golden-cheeked warbler habitat.- Special consideration will be given to the protection and extension of the golden-cheeked warbler habitat that is found on project lands. Because the threatened golden-cheeked warbler (Dendroica chrysoparia) has specific breeding habitat requirement for mature stands of Ashe juniper (Juniperus ashei), the clearing of mature stands of Ashe juniper is thought to be responsible for the species decline. All areas in which this vegetative type is present should be preserved if possible as habitat for the golden-cheeked warbler. Section 13-06 presents a more detailed discussion of the golden-cheeked warbler and its habitat.

15-09. Wildlife management plan.

a. General.- The primary objective of this plan is to make desirable wildlife species more available for human use whether it is for study, esthetics, hunting or photography. This objective will be met by protecting the existing habitat, improving low quality habitat, and developing new habitat. Basically, the wildlife management plan will deal with manipulating the food and cover resource.

b. Resident wildlife resource.- Since the project is characterized by a diversity of wildlife habitat, a situation has been created in which many forms of wildlife thrive. At present, the principal game species on project lands include whitetail deer, Rio Grande turkey, bobwhite quail, mourning dove, fox squirrel, cottontail, raccoon, oppossum and ring-tailed cat.

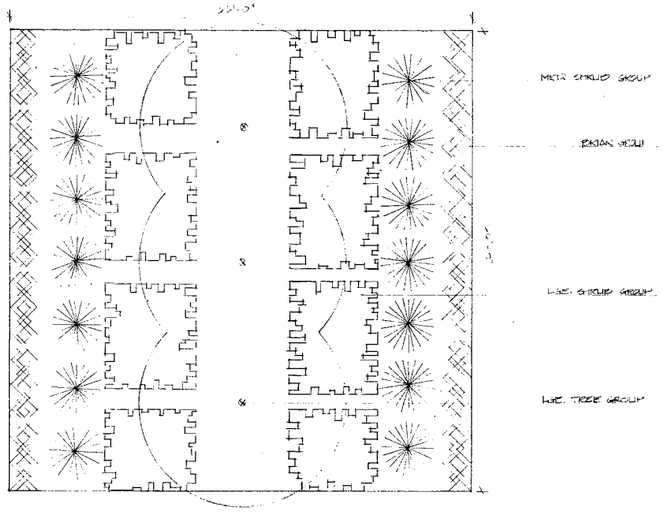
c. Wildlife management area.- Project fee lands above the normal conservation pool will total 4,340 acres. Of this acreage, 1,272 acres in the upper reaches of the project have been designated as the Hunt Hollow Wildlife Area. Approximately 175 acres of this land will be below the 5-year flood pool, 592 acres will be woodland and old fields which are now in the brushland stage of plant succession, and 505 acres are presently under cultivation. The woodland and brushland will be protected and allowed to follow a natural pattern of vegetative succession. The lands below the 5-year flood pool will be vegetated as discussed in section f. The cultivated acreage will be intensively managed for the improvement of habitat for bobwhite quail and mourning dove. Plate XV-1 shows the location of the management area as well as depicting the existing wildlife habitat.

d. Species to be managed.- The wildlife plan will utilize the featured species concept. Wildlife species having similar habitat requirement will be selected and the management efforts will be concentrated toward fullfillment of its needs. The purpose of selecting featured species is to use its habitat requirements to guide wildlife management including coordination, multiple use planning, direct habitat improvements, and cooperative programs. This plan will be oriented toward managing bobwhite quail and mourning dove above the 5-year flood pool. Fortunately, tailor-made plans for managing quail and dove will also greatly benefit cottontails, racoons, oppossums, songbirds, and small game animals. As an indirect benefit of this management program the habitat potential for whitetail deer, migratory water fowl, and numerous nongame animals also will be improved.

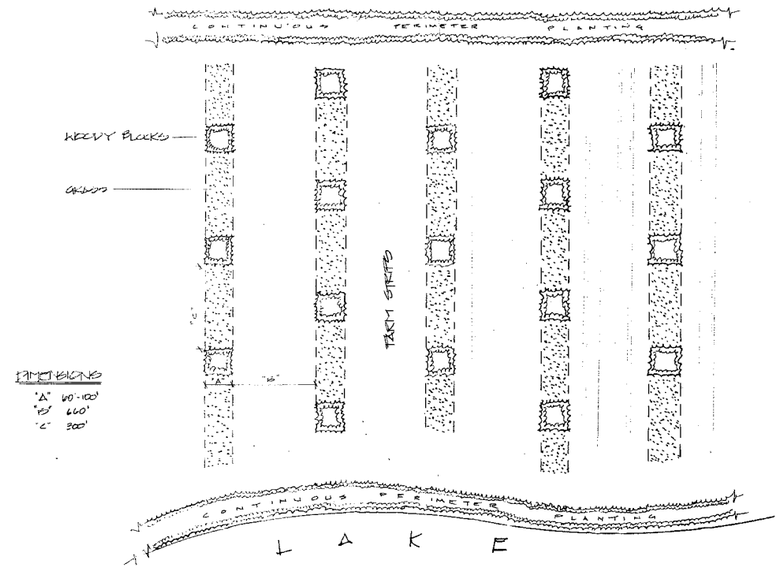
e. Standard management practices.- The standard management practices discussed in this plan are based upon the premise that quality food and cover habitat must occur in the proper condition and location to support wildlife species on a sustained basis. The primary elements of quality include nutritious foods which should be available during all seasons of the year, suitable cover for the various behavioral and physiological demands of animals, and favorable interspersion of the food and cover components within the range of the animal. Managers should insure that habitat quality is created or maintained for the featured species.

(1) Preservation of existing habitat cover.- The original forest area of the floodplain has been extensively cleared with a resulting patchwork of small pastures and cultivated fields. The preponderance of vegetation now occurs in upland pastures and adjacent to the stream on lands subject to frequent overflow, along tributary streams, fence rows and in woodlots. The primary emphasis of this management practice will be to protect and maintain this habitat. These areas will serve as the framework for the habitat improvement program.

(2) Planting strips of cover.- The best cover plan includes woodlands interspersed with brush, grass and cultivated fields. The existing woody cover does not provide quality habitat in a pattern of thickets interspersed with open space over a large contiguous area. Partitioning the area into smaller tracts with alternate strips of woody cover and grassland will greatly increase the carrying capacity for quail and dove. The strips of woody cover should be arranged in irregular rows which are composed of variable width blocks at least 60 feet square (100 feet dimension is considered as optimum). Each block should be separated by approximately 300 feet of open space. The distance between blocks of woody cover should not exceed 660 feet as indicated on Plate XV-2. It is important to select species with characteristics offering the most advantages to successful wildlife management. Table XV-1 presents a list of species suggested for use in the establishment of cover strips. Management rationale is based on the food and cover values of grass, shrub and tree species. Planting patterns are designed to meet growing conditions, as well as the needs of wildlife in the area. Junipers will function best in the north or west row of each block. They will serve as winter shelter, while providing winter food. The row next to juniper should be planted to black locust, which will produce seed for use in the winter and early spring. The third row can be planted to fruiting mulberry or Russian olive. Mulberry is attractive to songbirds, as well as game birds, and provides nest sites for mourning doves. Row four may be chickasaw plum or multiflora rose. Autumn olive should be planted on the outside row to restrict eventual spread of the plum or rose. The pattern just described will protect birds from winter or summer precipitation and bird or mannal predators. Block food resources will furnish year-round supplies of seeds, fruits, and berries of value to wildlife in the breeding or winter season. All planting material should be seedling size. No seed should be planted in the tree blocks. A supply of seed of desirable trees and shrubs may be planted for observation and to gain cultural experience in future management programs.

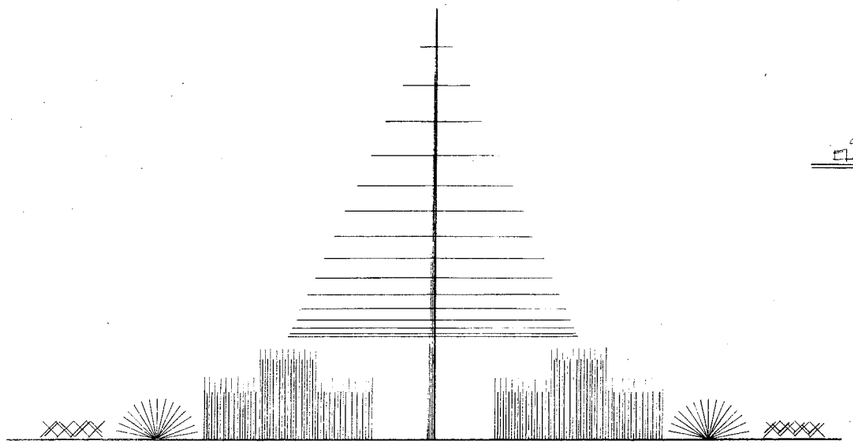


PLANTING PLAN



OVERALL ARRANGEMENT

CONCEPTUAL DIAGRAMS



STRIP ELEVATION

NORTH FORK LAKE · SAN GABRIEL RIVER

VEGETATIVE COVER STRIP DETAILS

PLAN, PROFILE, DIAGRAM

U.S. ARMY ENGINEER DISTRICT, FORT WORTH DEC 1974

TO ACCOMPANY SUPPL. NO. 1 TO DESIGN MEMORANDUM NO. 16 MASTER PLAN

FILE. NO.- PLATE XV-2

CORPS OF ENGINEERS

U.S. ARMY

N

SCALE 1 INCH = 2000 FEET

2000 1000 0 2000 4000

BRAZOS RIVER BASIN, TEXAS

NORTH FORK LAKE

SAN GABRIEL RIVER, TEXAS

HUNT HOLLOW WILDLIFE AREA

U.S. ARMY ENGR DIST, FORT WORTH DEC. 1974

TO ACCOMPANY SUPPL. NO. 1 TO D.M. NO. 16
MASTER PLAN

FILE: NO. 16 PLATE: XV-1

TABLE XV-1

TREES, SHRUBS, AND VINES RECOMMENDED
FOR WILDLIFE FOOD AND COVER PLANTINGS

Common Name	Scientific Name
Pecan	*Carya illinoensis*
Osage orange	*Maclura pomifera*
Black locust	*Robinia pseudoacacia*
Sugar hackberry	*Celtis laevigata*
Western soapberry	*Sapindus drammondii*
Texas oak	*Quercus shumardii* var *texana*
Russian-olive	*Elaeagnus angustifolia*
Autumn-olive	*Elaeagnus umbellata*
Flameleaf sumac	*Rhus copallina*
Mexican plum	*Prunus mexicana*
Chickasaw plum	*Prunus angustifolia*
Texas persimmon	*Diospyros texana*
Flowering dogwood	*Cornus florida*
Redcedar	*Juniperus virginiana*
Ashe juniper	*Juniperus ashei*
Red mulberry	*Morus rubra*
Common greenbrier	*Smilax rotundifolia*
Grape	*Vitis* spp.
Southern dewberry	*Rubus trivialis*
Japanese honeysuckle	*Lonicera japonica*

(3) Planting perimeter cover.- A continuous perimeter cover strip 30 feet in width will be planted along the border of the upland side of the Hunt Hollow management area to provide safe passage for entrance and exit to the managed zone. The perimeter cover strip will be interconnected with blocks of alternating cover strips planted for quail and dove management (see plate XV-2). A selection of mixed species listed in table XV-1 should be planted to provide food and cover suitable for protection from weather and predators.

(4) Brush piles.- A series of brush piles should be built in open areas to provide predator-proof escape cover for quail, cottontail, and songbirds. Brush piles should be at least 25 feet in diameter and should be within 100 yards of larger units of woody cover. Brush piles will be employed as interim cover on sites newly planted to trees and in open areas adjacent to existing woody cover. A cover of safety such as a brush pile is the mechanism that allows the nearby disked strips and food plots to function properly.

(5) Food plots.- Spring and fall plantings of grains concentrated in food patches, primarily for upland game bird use, will be made above the five-year flood pool. Spring plantings should contain grain sorghum or German millet. A mixture of rye, wheat, or oats with hairy vetch should be planted for fall and winter green browse. The plantings should be alternated to provide grain and green browse on adjacent plots. The grains should be broadcast in sufficient density or planted in 18 to 21 inch rows to shade out weed competition, minimize erosion, and increase cover value. Table XV-2 presents a list of suggested plants to be used in a supplemental planting program.

TABLE XV-2
PLANT SPECIES SUGGESTED FOR USE
IN SUPPLEMENTAL PLANTING PROGRAM

Common Name	Scientific Name
Corn	Zea mays
Sorghum	Sorghum spp
Lespedeza	Lespedeza spp
Wheat	Triticum spp
Winter rye	Secale spp
Oats	Avena spp
Cowpeas	Vigna spp
Vetch	Visia spp
Brown top millet	Panicum ranosum
Japanese millet	Echirochloa frumentacez

(6) Disking and controlled burning.- A rotational plan for disking and burning should be established to provide an annual reestablishment of preclimax grasses and forbs that would otherwise be crowded out under controlled conditions. Strips at least 15 feet wide and following the contour should be disked between 15 February and 20 March. Alternate strips should be disked every other year or in the third year. Strips that are not disked, i.e., those left to undergo plant succession, should be burned off when undesirable weeds accumulate or whenever grass densities and litter pose a fire hazard. All burns should be completed before the first of March to prevent weakening established grasses and destroying new growth.

(7) Establishment of adapted plant materials for wildlife food and cover.- The primary emphasis of this management practice will be placed upon establishing adapted plant material for the benefit of wildlife, as well as soil improvement and erosion control. Strips between the tree block plantings should be farmed on a rotation schedule with the inclusion of crop residues and legumes. Plant materials should be selected for hardiness, rapid growth, ease of establishment, soil protection, and wildlife food and cover. Table XV-2 and 3 presents a list of recommended plants for upland wildlife food and cover plantings. Farm strips may be planted by contract, by project personnel, or by lease rental abatement. Selected areas of uplands, formerly in pasture, may also be suitable for food plots. Foods such as maize, African millet, proso millet, oats, or wheat, and vetch, or forbs may be planted to supplement or diversify food resources in the area. Wheat and oats should be planted on fireguards to protect the base soil. Such a practice will provide green browse during critical winter months when food availability reaches the seasonal low. Fire breaks near parks, fences, and access roads will benefit wildlife as well as protect natural and manmade facilities. All strip plantings should be at least 30 feet wide and kept on the contour level, or on flat ground. It is recommended that strip plantings be located no further than 330 feet from established, or native woody vegetation. Plate XV-3 presents a conceptual plan for supplemental strips, farm strips, and upland strip plantings.

TABLE XV-3

PLANTS RECOMMENDED FOR UPLAND WILDLIFE FOOD AND COVER AND THEIR WILDLIFE HABITAT VALUES

Plant Species	Fall Food	Winter Cover	Spring Food	Summer Cover
GRASSES & SEDGES				
Annual bromes	X	X	X	X
Bluestems	-	XX	-	XXX
Bristlegrass	XX	X	XXX	X
Fringeleaf paspalum	X	X	X	X
Grames, blue, hairy & tall	-	X	-	X
Indian grass	X	XX	-	XX
Sand dropseed	X	X	X	X
Scribner panicum	XX	-	XX	-
Sedges		X		X
Switchgrass	X	X	-	X
Texas bluegrass	X	X	X	X
Vine-mesquite	X	X	X	X
Weeping lovegrass	X	XX	X	XX
LEGUMES				
Alfalfa	X	X	X	X
Deervetch	XX	-	XXX	X
Korean lespedeza	XXX	X	X	-
Madrid sweet clover	-	XX	-	XXX

TABLE XV-3

PLANTS RECOMMENDED FOR UPLAND WILDLIFE FOOD
AND COVER AND THEIR WILDLIFE HABITAT VALUES (CONT'D)

Plant Species	Fall Food	Winter Cover	Spring Food	Summer Cover
LEGUMES (Contd)				
Sericea lespedeza	X	XX	-	XX
Tickclover	XXX	X	-	X
FORBS				
Annual sumflower	XXX	X	XX	XX
Croton	XX	X	XX	X
Carolina cranesbill	XX	-	XX	-

SYMBOLS

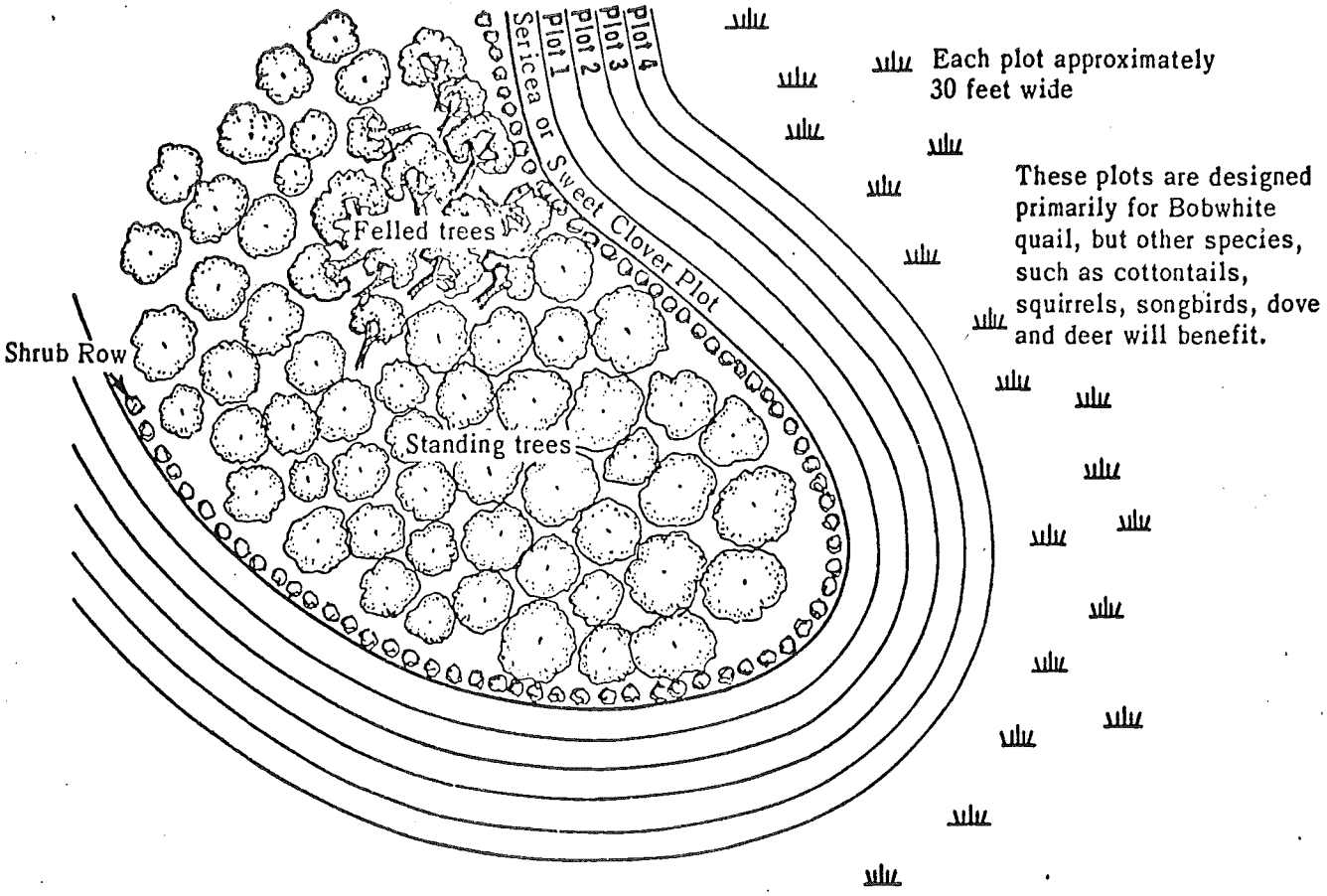
- = Little use or not known

X = Some value

XX = Medium value

XXX = High value

SUPPLEMENTAL PLANTING
DETAILS



Center Plot - Plant to trees, shrubs and border of Sericea lespedeza or sweet clover. Cultivate trees and shrubs twice each year for 2 or 3 years. Adapted cultivated crops such as corn, millet, sorghums, and cowpeas may be planted in surrounding plots.

First Year - Plow plots 1, 2, 3, and 4. Plant plot 1 to spring crops and plot 2 to wheat.

Second Year - Prepare seedbed and plant plot 3 and 4 to maize and wheat (respectively). Do not disturb plots 1 and 2.

Third Year - Prepare seedbed and plant plot 2 to maize and 1 to wheat. Do not disturb plots 3 and 4.

Fourth Year - Prepare seedbed and plant plot 4 to maize and 3 to wheat. Do not disturb plots 1 and 2.

Fifth Year - Repeat rotation from year one through year four.

During intervening years when plots are not tilled and planted to cultivated crops, they should be allowed to revegetate themselves naturally with native seed producing forbs, grasses, and legumes. They may be further improved for food production by overseeding with Korean lespedeza where adapted, the same year that crops are planted or the year following. These plots may be located on any arable soil where upland game habitat is needed. None of the small grains or wheat strips are to be harvested.

f. Planting plan for the area between the conservation pool and the 5-year flood pool.- There are approximately 480 acres of land between the top of the conservation pool and the 5-year flood pool. The establishment of hedgerows parallel to the shoreline would provide cover for wildlife and reduce potential problems of soil erosion resulting from wind-driven waves. The Fish and Wildlife Service recommended the establishment of hedgerows of giantreed or bush bamboo. Supplemental planting of water-tolerant trees along the lake margin is also planned, see table XV-4. Areas protected by the hedgerow and trees should be planted with a mixture of Japanese millet, switchgrass, bristlegrass, and other water-tolerant vegetation indicated in table XV-5.

TABLE XV-4
WATER-TOLERANT TREES

Common Name	Scientific Name
Baldcypress	Taxodium distichum
Tupelo	Nyssa aquatica
Eastern hop hornbean	Ostrya virginiana
Hickory	Carya spp
Winged elm	Ulmus alata
Blackgum	Nyssa sylvatica
Honey locust	Gleditaia triacanthos
Hawthorn	Crataegus spp
Sycamore	Platanus occidentalis
Cottonwood	Populus deltoides
Pecan	Carya illinoensis
Walnut	Juglans nigra

TABLE XV-5

RECOMMENDED WATER-TOLERANT GRASSES

Common Name	Scientific Name
Vine-mesquite	Panicum obtusum
Prairie cordgress	Spartina pertinata
Lowland switchgrass	Panicum vigatum, var.
Eastern gamagrass	Tripsacum dactyloids
Bristlegrass	Setaria spp.
Reed canarygrass	Phalaris arundinacea
Japanese millet	Echirochloa frumentacez
Bromegrass	Bromus inermis
Bermudagrass 1/	Cynodon dactylon
Buffalograss	Buchloe dactyloides
Fescue	Festuca spp.

1/ Bermudagrass and buffalograss is only recommended in heavy recreation use area or in areas having serious erosion problems.

g. Planting plan for shallow water areas.- The lake will have approximately 180 acres of water with a depth of 5 feet or less. For the benefit of migratory waterfowl, longleaf pondweed and softstem bulrush should be encouraged in cove areas where the water is less than 5 feet deep. Along the shoreline of these coves, a mixture of Japanese millet and switchgrass should be established.

15-10. Fisheries management plan.

a. General.- The fundamental goal of the fisheries management plan is to develop and administer a fisheries program in such a manner as to capture and enhance the fisheries resource. Specifically, this plan proposes to conserve, maintain and enhance the quality and quantity of game fish habitat.

b. Threatened fisheries.- A review of the U. S. Department of the Interior resource publication No. 114, Threatened Wildlife of the United States, indicates that there are no known threatened or endangered species of fish that will be affected by the project.

c. Description of the North Fork of the San Gabriel River.- The North Fork of the San Gabriel River within the vicinity of the project is a small, shallow, intermittent, clear stream with an average depth of less than one foot. The width of the streambed is about 20 feet with gradients of approximately 10 feet per mile.

d. Resident fisheries resource.- The U. S. Bureau of Sport Fisheries and Wildlife (now U. S. Fish and Wildlife Service) indicated in their fish and wildlife report of 1967 that the principal fisheries of the San Gabriel River and its tributaries within proximity of the project include largemouth bass, spotted bass, warmouth, channel catfish, flathead catfish, bluegill, green sunfish, gray redhorse, spotted gar, gizzard shad, river carpsucker, and several species of minnows.

e. Fisheries management area.- North Fork Lake will be a narrow, deep impoundment characterized by clear water and a dearth of littoral habitat. Impoundment to the top of the conservation pool, elevation 791.0, will create a 1,310 surface-acre lake of which approximately 180 surface acres will have a depth of 5 feet or less. The lake will be subject to pool fluctuation with a potential variation of about 24 feet in an average 5-year period.

f. Fish species to be managed.- Although the responsibility for management of the fisheries resource in Texas is vested in the Texas Parks and Wildlife Department, the Fort Worth District will supply all possible aid and assistance to secure a successful fisheries management program. According to the Fish and Wildlife Service, large-mouth bass, white crappie and channel catfish will provide the best fishing in the early years of the reservoir. In later years, less desirable fish such as carpsuckers and gizzard shad are expected to predominate in North Fork unless good operational procedures and prudent fish management practices are implemented.

g. Standard management practices.- The following management practices will be utilized to implement the fisheries management plan.

(1) Protecting existing habitat.- The primary emplasis of the fisheries plan will be placed upon protecting the existing habitat. Flooded trees, and shrubs, shoreline grasses, and emergent aquatic vegetation will provide the necessary cover habitat for juvenile fish.

(2) Clearing of existing vegetation.- The clearing plan that has been proposed in Design Memorandum No. 22, North Fork Lake, Clearing, was coordinated with the U. S. Fish and Wildlife Service, and the State of Texas, Executive Department, Division of Planning Coordination (State Planning and Development Clearinghouse). The recommendations of these agencies that no vegetation be removed from the project area except that required for project construction, efficient reservoir operation, and conformance with health regulation have been included in the clearing plan.

(3) Seining areas.- No special provisions will be needed for seining areas because existing pasturelands when inundated will be adequate for seining.

(4) Artificial habitat program.- Fish require shelter for escape from their enemies and for resting which is in some ways analogous to the shelter needs of land animals. It should be borne in mind that where adequate natural shelter is available, the policy should be to leave conditions undisturbed unless improvement measures are reasonably sure of success. Supplementary cover is needed only in waters deficient in natural cover. Brush shelters should be considered in the third year of impoundment because of the natural degradation of natural cover. Brush piles are utilized best by fish if in shallow water, though they can be used in deeper water. The best results for small fish accrue to brush piles in water less than 6 feet deep. Attached weights should be utilized to sink the shelters and to prevent floating debris.

h. Gathering population data.- Regulation of the season, size limits, and maintenance operations depend upon adequate population data. Fishing may be poor because there are too many fish present and therefore too few are able to reach legal size because of the competition for the limited food supply. The effectiveness of any operation or regulation can be tested only by means of carefully collected data. Creel census, population studies, catch studies and growth studies are four important studies recommended. While such programs are essentially the responsibility of the Texas Parks and Wildlife Department, the considerable burden imposed upon the Department by the increasing number of Corps of Engineers projects requires that the Fort Worth District supply all possible aid and assistance to secure an adequate management program.

15-11. Control of low value plants.- Excessive growth of undesirable plants can affect water quality, interfere with boating and result in an imbalance of the fish population. Many of these plants can be controlled with chemicals, or by grazing, plowing or burning during periods of drawdown. However, the best and most effective means of control is to watch for the undesirable species and destroy them before they become a problem. Table XV-6 presents some of the more objectionable plants species found within the region.

TABLE XV-6

SOME OF THE MORE OBJECTIONABLE PLANT SPECIES

Common Name	Scientific Name
Water hyacinth	Eichornia sp.
Cattail	Typha latifolia
Water lily	Nymphaea odorata
Frogbit	Limnobium spongia
Cocklebur	Xanthium pensylvanicum
Reed cane	Arundo donax
Cutgrass	Zazaniopsis milagea
Bladderwort	Utricularia sp.
Maidencane	Panicum humitomon
Bulrushes 1/	Scirpus sp.
Duckweed 1/	Lemna sp.
Coontail	Ceratophyllum demersum

1/ These plant species are of considerable value to waterfowl under certain conditions; yet when they are over abundant they may become undesirable.

15-12. Perimeter fence and fireguard.- Since the protection of the wildlife management area is a vital part of game management, this plan proposes the installation of a perimeter fence and fireguard. Fencing will serve to protect the wildlife resource by excluding unauthorized vehicles and providing control of livestock intrusions. Boundary fence will also reduce the incidence of accidental trespassing and encroachment. Table IX-3 presents the estimated cost for a perimeter fence and fireguard.

15-13. Estimate of cost.- The estimate of cost for the work proposed in this plan is shown in table XV-7. This cost is in addition to the cost approved in the North Fork Lake, San Gabriel River, Texas, Design Memorandum No. 16, Master Plan.

TABLE XV-7

FISH AND WILDLIFE MANAGEMENT PLAN

Cost Acct No.	Item	Unit	Unit Cost	Quantity	Cost
					$
03	Establishment of woody cover	L.S.	-	-	6,600
	Establishment of plant material between woody blocks	L.S.		-	7,900
	Subtotal				$ 14,500
	Contingencies, 15% ±				2,175
	TOTAL				$ 16,675
30	Engineering and Design				1,418
31	Supervision and Administration				1,167
	TOTAL COSTS				$ 19,260

15-14. Appendix D - Fish and Wildlife Management Plan.- Appendix D (Fish and Wildlife Management Plan) to the master plan will be prepared by Operations Division within the scope of ER 1130-2-400. It should be finalized and submitted for approval by higher authority as soon as practicable, but no later than 3 years after the project becomes operational. The development of this plan will implement section 3 of the Fish and Wildlife Coordination Act (Public Law 85-624). Further guidance for the fish and wildlife plan is contained in SWDR 1130-2-7 and ER 1105-2-129.

IN REPLY REFER TO: RB

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

August 15, 1974

District Engineer
Corps of Engineers, U. S. Army
P. O. Box 17300
Fort Worth, Texas 76102

Dear Sir:

This responds to your request for U. S. Fish and Wildlife Service participation in the formulation of a vegetative plan favorable to wildlife resources for project lands of North Fork Lake, San Gabriel River, Texas. This letter has been prepared as a planning aid statement intended to accompany your Design Memorandum for development of recreation and fish and wildlife resources.

We have reviewed your Design Memorandum No. 16 and have inspected the project site with personnel from your staff and from the Texas Parks and Wildlife Department. Based upon our joint findings we offer the following comments for your consideration:

Description of Project and Project Area

North Fork Lake will be a narrow, deep impoundment characterized by extremely clear water and a dearth of littoral habitat. Impoundment to the top of the conservation pool, elevation 791, will create a 1,310-surface-acre reservoir of which approximately 180 surface acres will have a depth of 5 feet or less. The reservoir water levels will be subject to wide fluctuations with a potential for variations of 24 feet.

Project lands, excluding those to be inundated by the normal conservation pool of the reservoir, will total 4,990 acres. Of this acreage, 1,272 acres in the upper reaches of the reservoir have been designated as the Hunt Hollow Wildlife Area and approximately 3,718 acres have been zoned for general recreational use or for project operation. Public hunting will be permitted on the Hunt Hollow Wildlife Area but the possibility of such activity on those lands zoned for general recreation or for project operation is doubtful.

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The project lands and surrounding area have been used primarily for grazing of domestic livestock and for hunting leases, however, the project has stimulated intense interest and activity in the form of real estate investment and development on lands adjacent to the project. The project lands presently contain a diversity of vegetative types and provide excellent habitat for a variety of wildlife species, but with completion of the reservoir and the development of peripheral lands for recreational purposes, drastic changes in this habitat will occur. The severity of the impact of these changes on the biota can be moderated through the management of the remaining resources. To accomplish this end an understanding of existing resources is needed as well as a programmed plan for their future development.

The uplands in the project area are characteristic of the rugged Texas Hill Country. The vegetative cover ranges from dense Ashe juniper thickets to grass-covered slopes with scattered clumps and individual specimens of live oak, Texas oak, Ashe juniper, and Texas persimmon. The most common grasses are Texas wintergrass, sideoats grama, perennial awngrass, Texas brome, and Johnsongrass. Scattered specimens of prickly-pear, yucca, and devils head cactus are also found in the area.

In areas of broken topography the composition of the vegetation is more diverse. In addition to those species previously mentioned, Texas black walnut, sugar hackberry, cedar elm, Mexican plum, prairie flame-leaf sumac, Texas buckeye, and skunkbush are frequently found. A lush growth of woody vines is generally present in these areas. Mustang grape, poison ivy, and common greenbriar are the most prevalent of the vine species.

The floodplain of the San Gabriel River contains the most diverse vegetation. The original forest area of the floodplain has been extensively cleared with a resulting patchwork of small pastures. The preponderance of woody vegetation now occurs adjacent to the stream on lands subject to frequent overflow, along feeder streams, fence rows and in woodlots.

Along the river, woody species such as pecan, sycamore, willow and green ash occur in abundance. The fence rows frequently contain sugar hackberry, soapberry, pecan, Mexican plum, Texas black walnut, prairie flame-leaf sumac, and live oak.

The cleared areas contain a variety of grasses and herbaceous species. Coastal bermuda, panic-grass, and improved varieties of sudan occur in improved pastures. Those areas not under intense cultivation have developed a floristic composition of Johnsongrass, standing cypress, bullnettle, longheaded coneflower, turks cap, common sunflower, silver bluestem, Texas thistle and

croton. Areas subject to partial shading contain stands of giant eupatorium and Virginia wildrye. The growth of vines such as mustang grape, sweet winter grape, poison ivy, peppervine, and common greenbriar is characteristic.

The interspersion of cleared and uncleared land has created a situation in which many forms of wildlife thrive. At the present time, game animal species on the project lands include whitetail deer, Rio Grande turkey, bobwhite quail, mourning dove, and fox squirrel. The potential exists for establishment of a small breeding population of wood ducks. One endangered species, the golden-cheeked warbler, is known to nest in stands of mature Ashe juniper on the project lands.

Vegetative Plan - Rare Species

In carrying out any form of vegetative recovery plan preference should be given to the protection and extension of species which have been depleted through past land use activities. On the project lands there is a breeding population of golden-cheeked warblers. The clearing of mature stands of Ashe juniper is thought to be responsible for the species population decline. All areas in which this vegetative type is present should be preserved as habitat for the golden-cheeked warbler. In addition to those areas in which mature stands of Ashe juniper now exist, consideration should be given to the preservation of developing stands of Ashe juniper which will provide an extension of suitable habitat for future use by the golden-cheeked warbler.

An area of resource conservation somewhat ill-defined at present is the subject of endangered plant preservation. The Resources Management Section of the Texas Parks and Wildlife Department has provided a tentative list of plants which are considered to be seriously depleted and known to occur in the San Gabriel River System (table 1).

Table 1. List of rare plants known to occur in the San Gabriel River system

1. Missouri maidenbush (Andrachne phyllanthoides)--on the limestone bluffs of the south fork of San Gabriel River "in Georgetown," Williamson County.

2. Plateau anemone (Anemone edwardsiana)--probably in crevices on limestone bluffs in the proposed reservoir area.

3. Roemer spurge (Euphoria roemeriana)--in rich, deep-shaded soil near creeks and rivers, along the San Gabriel "in

Table 1, Continued

Georgetown." Also likely in much of the proposed reservoir area.

4. Low lythrum (Lythrum ovalifolium)--the fork of the San Gabriel River, 7 or 8 miles above Georgetown.

5. Ground plum (Astragalus crassicarpus)--is found, rarely, within the proposed reservoir area. Likely to be found as a relict in upland grassland communities.

6. Small-flower Peach-brush (Prunus minutiflora)--if known from the area, but rare in Williamson County.

7. Spicebush (Lindera benzoin)--in wet seepy areas of rich soil in limestone. Known to occur in proposed reservoir area.

8. Texas bluegrass (Poa aracnifera)--in seepy, low areas of upland grasslands. Known from Williamson County in proposed reservoir area.

Every effort should be made to locate established populations of these species, and their continued development in the project area should be insured. As techniques for reestablishment of endangered species of plants become available, suitable areas should be dedicated for such extensions of their range.

Vegetative Plan - Project Uplands

In general, those project lands located above the five-year flood pool contour, with the exception of the 575 acres of cultivated land on the area designated as the Hunt Hollow Wildlife Area and the 150 acres dedicated to project operation, should be allowed to follow a normal successional pattern of vegetative development. Approximately 3,800 acres are involved in this land area.

Much of this acreage falls into the category of live oak-Ashe juniper-Texas oak upland and will be zoned for general recreational use. The effect of intensive grazing and browsing on this area is presently visible. It will be necessary to stop all grazing by domestic livestock for an indefinite period of time to allow the climax grassland species to recover. In conjunction with this action, it also may become necessary to periodically

reduce the number of deer which occur in the area to allow woody species to recover from past overbrowsing.

The product of successional development will be an increased stability in the floral community, an aesthetically pleasing vegetative complex, and improved habitat conditions for whitetail deer, fox squirrels, and numerous nongame animals. The habitat for wild turkeys will not be improved because increased human intrusion into the area and loss of bottomland habitat will be limiting factors. Bobwhite quail populations will increase above the present level, but increased vegetative growth will ultimately reduce this population. Mourning dove numbers should remain stable.

Vegetative Plan - Shallow Water and the 5-year Flood Pool

Approximately 180 acres of the reservoir will have a water depth of 5 feet or less, and 460 acres will have a depth of 15 feet or less when the reservoir surface is at conservation pool elevation. There will be approximately 480 acres of land in the 5-year flood pool under this same condition.

For the benefit of migratory waterfowl, longleaf pondweed should be encouraged in cove areas where the water is less than 15 feet deep. In cove waters less than 5 feet in depth, softstem bulrush should be established. Along the shoreline of these same cove areas establishment of a mixture of Japanese millet and switchgrass would be desirable.

On those land areas within the 5-year flood pool which are presently cleared, the establishment of a hedge row of giant-reed or bush bamboo, parallel to the shoreline, would provide cover for a wildlife poulations and reduce potential problems of soil erosion resulting from wind-driven waves during flood storage periods. Areas thus protected by this hedge should then be planted with switchgrass, bristlegrass, or other adapted hard-seed grasses.

Vegetative Plan - Hunt Hollow Wildlife Area

Of the 1,272 acres which will comprise the Hunt Hollow Wildlife Area, approximately 175 acres will be below the 5-year flood pool, 592 acres will be woodland and old fields which are now in the brushland stage of plant succession, and 505 acres will consist of land presently in cultivation. The woodland and brushland should be allowed to follow a natural pattern of

vegetative succession. The lands below the 5-year flood pool should be vegetated as discussed in the previous section of this report. The cultivated acreage should be intensively managed for the improvement of habitat for the bobwhite quail, mourning dove, and cottontail rabbit. As an indirect benefit of this management program the habitat potential for whitetail deer, migratory waterfowl, and numerous nongame animals also will be improved.

The management plan should be designed to optimize bobwhite quail carrying capacity. Accomplishment of this goal will necessitate the establishment of an optimum mix of cover and food.

Strips of cover composed of species listed in table 2 should be established. The tree species should be planted on the interior of each strip with the shrubs and vines toward the exterior. Each strip should be a minimum of 66 feet wide with 100 feet in width being considered as optimum. The distance between strips of woody cover should not exceed 600 feet. The ends of the cover strips must abut existing cover, otherwise it will be necessary to establish cross-strips. The distance between such cross-strips should not exceed 900 feet. All strips should be located so as to follow the natural topography of the land wherever possible.

An important aspect of the establishment of cover strips is the distance between strips. This recommended distance relationship of open land to cover will enable wildlife species to utilize the entire area of pastureland for feeding and yet still be in reasonable proximity to cover.

The objectives of establishing cover are numerous. Cover provides protection from the elements and from predators, including man, for a host of wildlife species. The diversity of trees, shrubs, and woody vines provides a variety of food in the form of buds, fruit, and browse for both game and nongame animals. The strips serve as protective nesting sites for both tree and ground-nesting species.

Table 2. Plant species suggested for use in the establishment of cover strips

Common Name	Scientific Name
Osage orange	Maclura pomifera
Black locust	Robinia pseudo-acacia
Sugar hackberry	Celtis laevigata
Western soapberry	Sapindus drummondii
Pecan	Carya illinoensis
Texas oak	Quercus shumardii var texana
Russian-olive	Elaeagnus angustifolia
Flameleaf sumac	Rhus copallina
Mexican plum	Prunus mexicana
Chickasaw plum	Prunus angustifolia
Texas Persimmon	Diospyros texana
Common greenbrier	Smilax rotundifolia
Mustang grape	Vitis candicans
Winter grape	Vitis berlandieri
Southern dewberry	Rubus trivialis

The procurement of plants for the establishment of cover strips will necessitate the purchase of nursery stock, the development of an on-site nursery, and the transplant of native stock found on project lands. One possible arrangement which would result in the availability of planting stock at a minimum cost to the government would be through contractural agreements with commercial nurseries for the transplanting of native stock and exchange of nursery stock for native stock.

Under such an agreement, project landswhich are to be cleared for facility development or ultimate reservoir impoundment would serve as the source of native stock. Commercial nurseries would be permitted to excavate native stock on a sharecrop basis. A pre-negotiated percentage of the plants excavated by the nursery would be transplanted in project areas where their presence would benefit wildlife, such as the cover strips recommended in this report. In those cases where plant species which are not present on the project lands are recommended for wildlife plantings, an agreement with the commercial nursery for exchange of native stock for nursery stock would be necessary. Where the nursery wishes to excavate one plant species for ultimate sale and wildlife needs necessitate the transplanting of others, the nursery would be required to excavate and transplant species desired for wildlife plantings in return for permission to excavate commercially valuable species.

It will be necessary to provide an ample food supply in combination with the cover strips for those species of wildlife which are to be encouraged in the area. To fulfill this need, the open ground between strips of cover should be cultivated. One technique would be to establish a grain crop such as browntop millet or sorghum. The planted area would then be harvested in strips leaving unharvested grain for wildlife use. An agricultural operation of this nature could be carried out at no cost under contract.

A second technique for insuring adequate food production is to compartmentalize the open area between the strips of cover into three units. One unit would then be disked each year in early March. By rotating the area disked each year it would be possible to provide three yearly stages of forb and weed development, all in close proximity to one another and to cover.

A specific addition to the vegetative plan which would greatly benefit whitetail deer would be the establishment of strip plantings of a green manure crop such as winter rye. During the winter months, when browse availability is a a crucial minimum, these plantings would be valuable as a supplemental food source. These green strips, if located adjacent to access roads or as subdivisions of the management area, also would act as fire breaks and therefore reduce the possibility of habitat loss due to wildfire. Such plantings would be advisable on this or other areas of project land, if only for their value in this respect.

The aforementioned establishment of cover and food producing species of plants if implemented, will result in the creation and improvement of bobwhite quail, mourning dove, cottontail

rabbit, and fox squirrel habitat, and will have the potential for attracting a small number of migratory waterfowl. Whitetail deer will benefit from the overall vegetative plan through the increased availability of food in the form of grain, browse, and winter grazing. Numerous nongame animals, particularly small songbirds, will occupy the brush area and feed in the vegetative complex.

The utilization of common names for the numerous species of plants mentioned in this report is in accord with Texas Plants - a Checklist and Ecological Summary, by F. W. Gould, or Texas Grasses, by W. A. Silveus.

We appreciate the assistance provided by your staff during this investigation. We hope the material presented will assist your planners in developing a vegetative plan for the project site which will meet planning objectives and also be of value to wildlife.

Sincerely yours,

Regional Director

cc:
Executive Director, Texas Parks and Wildlife Dept., Austin, Texas
Field Supervisor, FWS, Div. of River Basin Studies, Fort Worth, Texas

XVI - PROJECT SAFETY PLAN

The objective for developing a project safety plan is to formulate a plan of action for conducting the project activities in such a manner as to enhance the safety of project personnel and the general public while in attendance at the project. The safety program requirements for all Corps of Engineer activities and operations is established in EM 385-1-1, General Safety Requirements, and engineer regulations in the 385 series. Additional information is contained in SWDR 1130-2-7, FWDR 385-1-90, FWDR 385-1-90, FWDR 1130-2-61, and Title 36, chapter III, Code of Federal Regulations. Application of these regulations and laws is mandatory to all missions under the command of the Chief of Engineers. Resource personnel will become familiar with these instructions and implement and enforce those provisions applicable to both the Corps personnel and the visiting public. A detailed project safety plan will be developed by the reservoir manager as soon as practicable, and will be added to the master plan as an appendix. This plan must be completed and approved by higher authority within 3 years after the project becomes operational. The instructions and format for developing the project safety plan is represented in ER 1130-2-400 and appendix A of this regulation.

XVII - CONCLUSIONS AND RECOMMENDATIONS

17-01. Conclusions.-

a. It is believed that by implementing this master plan, the natural and created resources of the project can be maintained and adequately developed to meet the project's optimum usage within the scope of the authorized purposes.

b. It is believed that this master plan is in compliance with the Corps resource management objectives of providing a planned development program which will provide continued enjoyment and maximum sustained use by the public of the lands, water, and associated recreational resources consistent with their carrying capacity and their esthetic and biological values. The plan is flexible and will allow adjustments to be made in relation to future public needs.

17-02. Recommendation.- It is recommended that the master plan for North Fork Lake involving development for public use and land management be approved as proposed herein.

SAN GABRIEL RIVER, TEXAS

NORTH FORK LAKE

DESIGN MEMORANDUM NO. 16

APPENDIX F

JIM HOGG PARK ACCESS ROAD

APPENDIX F

BRAZOS RIVER BASIN, TEXAS

DESIGN MEMORANDUM NO. 16
ON
NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

JIM HOGG PARK ACCESS ROAD

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APPENDIX F

JIM HOGG PARK ACCESS ROAD

GENERAL

1. Purpose.- This appendix presents the basis for design and preparation of plans and specifications for the construction of the access road to Jim Hogg Park, North Fork Lake, Texas.

2. Project location.- North Fork Dam is located about 3.5 miles west of Georgetown, Texas, and is at river mile 4.3 on the North Fork of the San Gabriel River. The reservoir is located in Williamson County, Texas. Location of the project is shown on plate VIII-1.

3. Proposed work.- The access road will be constructed to provide access to the Jim Hogg Park. The road will begin at a point on the existing State Highway No. F.M. 2338. It will follow the natural terrain to the extent possible, and will be constructed on low fill. The road will be a two-lane road, with 10-foot double bituminous surfaced traffic lanes and 4-foot single bituminous surfaced shoulders. It will have a 200-foot wide right-of-way, with fence (woven wire) along the right-of-way. Details of the road are shown on plate F-1.

4. Operation and maintenance.- The road will serve only as an access to the park for recreation, therefore, it will be operated and maintained by the Government.

5. Other plans considered.- There were no other plans considered for access to the park. No route other than the existing alignment is considered feasible, based on field reconnaisance.

DESIGN CONSIDERATIONS

6. Traffic count and design criteria.- Based on visitation projections, the average daily traffic during the 6-month peak (April through September) is estimated to be 448 vehicles per day (two-way). The construction of this road is based on design elements and criteria as specified in TM 5-822-2 to meet the requirement of a class "E", two lane road in mountainous terrain which will accommodate 70-1000 vehicles per day. The new road will have a design speed (and speed limit) of 35 mph. The maximum degree of curve is 6° desirable (18° absolute), and the maximum grade 7% desirable (10% absolute).

7. Pavement design.

a. General.- This project entails the construction of flexible pavement for the access road to serve the Jim Hogg recreation area. The preliminary pavement section contained herein is based on incomplete design data and is intended for interim use.

b. Design.- The following tentative pavement section is recommended for the Jim Hogg access road. It was derived by using criteria in TM 5-822-5, a design index of 1 and a CBR value of 8 for raw subgrade compacted to 95 percent of maximum density.

Course	Thickness	% Max Density
Double Surface Treatment	--	--
Base Course	8"	100 min.
Subgrade	6"	95 min.
Fill	--	90 min.

8. Construction materials.- The construction materials will meet the requirements of the Texas Highway Department 1972 Standard Specifications.

a. Surfacing.

(1) Bituminous materials - THD Item 300, EA-CRS-2 for surface treatments, MC-30 for prime coat.

(2) Aggregate - THD Item 304, Precoated, Class B, type PD, Grades 2 and 4.

b. Base course - THD Item 248, type A, Grade 1.

9. Traffic signs.- Traffic signs will conform with the manual of "Uniform Traffic Control Devices" for streets and highways, dated 1971, approved by the U. S. Department of Transportation, Federal Highway Administration.

10. Intersections.- The intersection of the access road with State Highway No. F.M. 2338 will be a standard "tee" type as approved by the Texas State Highway Department.

11. Turfing.- All unpaved graded and disturbed areas within the right-of-way will receive turfing treatment. Perennial warm season grass will be established by fertilizing, tilling, sodding, seeding and mulching. The turfing work will be accomplished during the period from 1 March to 1 June following completion of the road construction. Approximately 3.5 acres will require turfing treatment. Existing trees within the right-of-way that are not required to be removed for construction of the road will be

conserved and protected. Estimated cost of the turfing work is $1,050. The design and execution of the work will be in accordance with guidance set forth in EC 1110-2-13 and multiple letter SWDGB-5, dated 10 December 1965, subject: Beautification of Civil Work Projects, EC 1110-2-13.

DRAINAGE

12. Drainage structures.- Concrete box culverts at stations 19+30 and 33+40 will be used to provide the necessary road cross-drainage. These culverts will pass the peak runoff from a storm having a frequency of once in ten years with minor ponding at the culvert intake. The minimum slopes for concrete box culverts (n = 0.013) will be 0.30 percent. An 18 inch pipe culvert will be placed at the intersection of the access road and F.M. 2338 for required drainage. The design discharges for the box culverts are shown in table 1 and were computed by the Rational Method. This table also shows the drainage areas, times of concentration, and rainfall intensities. Reinforced concrete headwalls and aprons will be provided at the box culverts.

ALTERATION OF EXISTING UTILITIES

13. Utility relocations.- Two facilities are affected by construction of the access road. They consist of electric and telephone lines. Electric lines will be raised and one pole moved to outside of the road right-of-way. The telephone cable along State Highway No. F.M. 2338 may possibly be affected and require alterations where access road intersects the state highway.

REAL ESTATE

14. General.- The estate to be acquired for the road right-of-way will be a perpetual easement. The right-of-way will be fenced for the entire length of the road, with provisions made for cattle access through the two box culverts.

15. Estimated acreage and number of ownerships.- The required acquisition of land for the road right-of-way will cover approximately 22.1 acres with two private ownerships.

ESTIMATE OF COST

16. Estimate of cost.- The estimate of cost for the work proposed in this appendix is shown in table 2.

TABLE 1

DRAINAGE STRUCTURE

DESIGN DATA

PROJECT North Fork Lake
LOCATION Jim Hogg Park Access Road
DIVISION SWD
DISTRICT FWD

ROAD STATION	FREQUENCY OF STORM (YEARS)	TIME OF CONCEN-TRATION (MINUTES)	INTENSITY (INCHES PER HOUR)	RUNOFF COEFFICIENT	ESTIMATED DRAINAGE AREA (ACRES)	DESIGN DISCHARGE (CFS)	OUTFALL VELOCITY (FPS)	REQUIRED STRUCTURE SIZE	
19+30	10	60	3.0	0.40	186.40	224	9.5	8' x 6' CBC	
33+40	10	90	2.5	0.40	490.35	490	10.2	2-7' x 7' CBC	
NOTES:									
(1) Based on rainfall intensity-duration-frequency curves, Austin, Texas, by Weather Bureau Cooperative Studies.									
(2) Based on flow at critical depth at outfall.									
(3) For condition of 10 year frequency storm runoff.									
(4) Provide downstream protection below outfall structures if the channel is not in rock.									
(5) Based on slope of 0.3 percent.									
REMARKS									

TABLE 2
ESTIMATE OF COST
(Based on October 1973 price level)

Cost Acct No.	Item	Unit	Quantity	Unit Cost $	Amount $
01.	LANDS AND DAMAGES				
	Perpetual Road Easement, Severance Damages, Incl. 25% Contingencies (22.1 Acres)	L.S.	-	-	33,000
	Administrative Costs	L.S.	-	-	3,000
	TOTAL, LANDS AND DAMAGES				36,000
02.	RELOCATIONS				
	Alteration of existing telephone & electric lines (incl 25% contingencies)	L.S.	-	-	400
	TOTAL, RELOCATIONS				400
14.	ROAD				
	Clearing & grubbing	Acre	6.62	350.00	2,317
	Borrow excavation	C.Y.	18,516	2.75	50,919
	Unclassified excavation	C.Y.	3,569	2.50	10,785
	Compacted roadway fill	C.Y.	12,532	0.20	2,506
	Base course, 8-inch	C.Y.	3,637	9.00	32,733
	Bituminous prime coat	Gal.	4,410	0.40	1,764
	Bituminous surface material	Gal.	5,000	0.50	2,500
	Surface aggregate	C.Y.	173	15.00	2,595
	Pipe culvert, 18-inch RCP	L.F.	40	11.00	440
	Concrete headwalls, 18-inch	Ea.	2	150.00	300
	CBC, 2-7'x7'x52'	L.F.	52	154.00	8,008
	CBC, 8'x6'x62'	L.F.	62	80.00	4,960
	Erosion control (turfing)	Acre	3.5	300.00	1,050
	Traffic control signs	Ea.	10	75.00	750
	Traffic paint (yellow)	L.F.	4,806	0.20	961
	Traffic paint (white)	L.F.	9,611	0.20	1,922
	Delineators Type I	Ea.	66	11.00	726
	Delineators Type II	Ea.	10	14.00	140
	Fence, woven wire	L.F.	9,570	1.10	10,527
	SUBTOTAL, ROAD				135,903
	Contingencies, 15%±				20,097
	TOTAL, ROAD				156,000

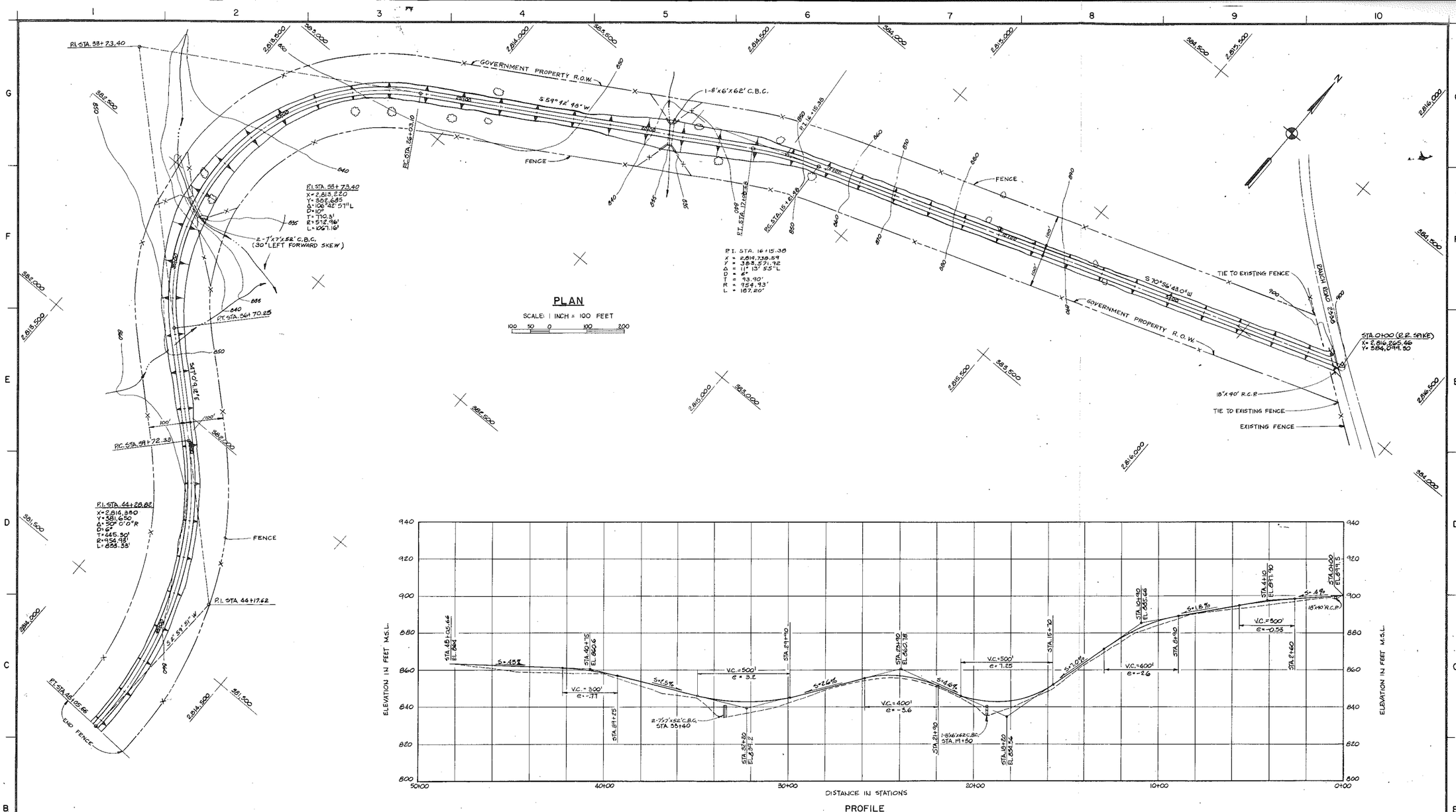
ESTIMATE OF COST (CONT'D)

Cost Acct No.	Item	Unit	Quantity	Unit Cost	Amount
				$	$
30.	ENGINEERING AND DESIGN				11,531
31.	SUPERVISION AND ADMINISTRATION				9,469
	TOTAL COSTS				213,400

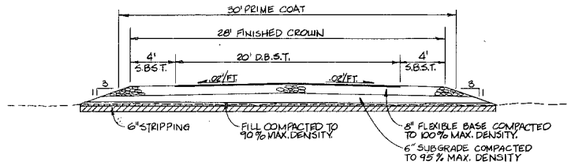
17. Comparison of present estimated with latest approved estimate.- Funds for the work proposed in this appendix was not included in the PB-3 because the need for this improvement was determined subsequent to submission of the general design memorandum.

RECOMMENDATIONS

18. Recommendations.- Recommend this appendix be approved as the basis for design and preparation of plans and specifications for the construction of the access road to Jim Hogg Park, North Fork Lake, Texas.



PROFILE



ACCESS ROAD
TYPICAL ROADWAY SECTION
NOT TO SCALE

SYM.	NO.	ACTION	DATE	DESCRIPTION OF REVISION

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

DESIGNED BY: B.K.
DRAWN BY: G.S.
CHECKED BY: J.W.H./L.E.H.

NORTH FORK LAKE
SAN GABRIEL RIVER, TEXAS

ACCESS ROAD - JIM HOGG PARK

PLAN, PROFILE AND SECTION

SUBMITTED BY:
ENGINEER:
INV. NO.
DATED:
CONTR. NO.
DRAWING NUMBER
SHEET NO. OF
SEQUENCE NO.
CONTR. NO.

TO ACCOMPANY DESIGN MEMORANDUM NO. 16
MASTER PLAN

PLATE F-1